CLUSTER EVALUATION

Solar Power Operations

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European Bank
for Reconstruction and Development

Independent
Evaluation

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This evaluation was implemented by Tomasz Bartos, Associate Director, Senior Evaluation Manager and Theo Sands, Principal Evaluation Manager, with assistance of Natalia Lakshina, Analyst and Stephanie Crossley, Analyst, all from the EBRD's Evaluation Department. Valuable comments were provided by an external peer reviewer, José Carbajo, the former Director at the IEG, the World Bank. The Evaluation team would like to thank colleagues from the Sustainable Infrastructure Group for the provision of information and support. Special thanks are directed to bankers and administrative staff from the Bank's Resident Offices in Amman, Tashkent and Kyiv, who were instrumental in arranging EvD's interviews with the clients and project beneficiaries.

One Exchange Square
London EC2A 2JN
United Kingdom
Website: www.ebrd.com

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Abbreviations

ADB	Asian Development Bank
AfDB	African Development Bank
AIIB	Asian Infrastructure Investment Bank
CA	Central Asia
COD	Commercial Operations Date
COOs	EBRD Countries of Operations
CO_2	Carbon dioxide
COP	UN Climate Change Conference of the Parties
CSs	EBRD Country Strategies
CSP	Concentrated Solar Power
CTF	Clean Technology Fund
DAQs	Directors Assistants' Questions
DFF	Direct Financing Facility
DFI	Development Finance Institution
DSCR	Debt Service Coverage Ratio
EBITDA	Earnings Before Interest, Tax, Depreciation and Amortisation
EBL	Equity Bridge Loan
EDB	Economic Development Board
EGP	Egyptian Pound
EH&S	Environment, Health and Safety
EIB	European Investment Bank
EPG	EBRD Economics, Policy & Governance Department
ERF	Egypt Renewables Framework
E&S	Environmental & Social
ESAP	Environmental and Social Action Plan
ESD	EBRD Environmental and Social Department
ETC	Early Transition Countries
ETS	Emission Trading System (EU)
EU	European Union
EvD	EBRD Evaluation Department
FiT	Feed-in-Tariff
FMO	The Netherlands Development Finance Company
FOPC	Financial and Operational Policies Committee
GCF	Global Climate Fund
GDP	Gross Domestic Product
GEF	Global Environmental Fund
GET	Green Economy Transition
GHG	Greenhouse Gases
GiZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GREF	Greek Renewable Energy Framework
GWh	Giga Watt hours
IBRD	International Bank for Reconstruction and Development
ICBC	Industrial and Commercial Bank of China
IEA	International Energy Agency
IEG	Independent Evaluation Group (of the World Bank)
IFC	International Finance Corporation
IFI	International Financial Institution
IRENA	International Renewable Energy Agency
ISO	International Organisation for Standardisation

JICA	Japan International Cooperation Agency
KAZREF	Kazakhstan Renewable Energy Framework
KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
kWh	Kilowatt hour
KZT	Kazakh Tenge
LCOE	Levelised Cost of Energy
MDBs	Multilateral Development Banks
MoU	Memorandum of Understanding
MW (p)	Megawatt (peak time)
NDCs	Nationally Determined Contributions
NEGU	National Electric Grid of Uzbekistan
NEFCO	Nordic Environmental Finance Corporation
NEPCO	National Electric Power Company (Jordan)
NGO	Non-governmental Organisation
OCCO	Office of Chief Compliance Officer (EBRD)
O&M	Operations and Management
OPA	Operational Performance Assessment
PD	Policy Dialogue
PPA	Power Purchase Agreement
PPP	Public Private Partnership
PRC	Peoples' Republic of China
PV	Photo Voltaic (panel)
RE	Renewable energy
RES	Renewable energy sources
SCF	Strategic and Capital Framework (EBRD)
SDG	Sustainable Development Goals
SEI	Sustainable Energy Initiative
SEMED	South and Eastern Mediterranean
SPREF	SEMED Private Renewable Energy Framework
SPV	Special Purpose Vehicle
SSF	Shareholders' Special Fund
TC	Technical Cooperation
TI	Transition Impact
TIQ/TQ	Transition Impact Quality or Transition Quality
USAID	United States Agency for International Development
US$	United States Dollar
USELF	Ukraine Sustainable Energy Lending Framework
WBG	World Bank Group
WeBSEDFF	Western Balkans Sustainable Energy Direct Financing Facility

Terms specific to solar power/renewable energy

Power Purchase Agreement	**A long-term contract**, under which an off-taker (see below) agrees to purchase electricity directly from an energy generator.
Off-taker	**One of the parties to the PPA**. It is often an intermediary entity or a transmission company, which agrees to purchase (take off) all electricity produced by a solar generator at an agreed price.
Feed-in Tariff	**A policy designed to support the development of renewable energy sources** by providing a guaranteed, above-market price for electricity generators.
Solar/RE auctions	**A competitive process for procuring electricity** generated by renewable energy. In an auction, energy project developers bid against each other to supply energy through long-term contracts at the lowest possible price.
Just transition	**A framework developed by the trade union movement** to encompass a range of social interventions needed to secure workers' rights and livelihoods when economies are shifting to sustainable production, primarily combating climate change and protecting biodiversity.
Holistic approach to energy sector development	**An approach comprising** due attention to all aspects of the sector's operations and support for balanced development of all of its sub-sectors (as required). It generally consist of financing, policy dialogue and technical cooperation.
Hybrid solar/RE auction	**An auction** (see above) for electricity generation, combined with electricity storage.

Executive summary

Introduction

Solar energy is of critical importance in achieving global strategic goals, including those under the Paris Agreement and SDGs, in particular it is crucial for reaching net zero emissions by 2050. Solar power is to play a central role in the global energy system's transition, which will require scaling up annual installed capacity to 630 gigawatts (GW) per annum (more than four times the level installed worldwide in 2020). This strategic importance requires all MDBs, including the EBRD, most governments, and many private companies and civil societies to increase their engagement in the solar sector.

This report contains a review of EBRD operations and policy dialogue in support of utility-scale solar projects until the end of 2020. Based on the assessment of a sample of 10 projects in six countries and a thorough portfolio analysis, the evaluation identifies trends, lessons and themes relevant to this sector.

An attractive energy source, benefiting from falling costs – but not without challenges

Globally, installed solar (photovoltaic or PV) panel capacity increased 14x between 2010 and 2019, mainly due to the reduced cost, which more than halved during this period, as well as incentives supporting renewable energy sources (RES). The cost of solar power in most of the Bank's countries of operations' (COOs) is now below the cost of producing wind or hydro energy. Switching from often generous feed-in-tariffs to an auction-based system resulted in substantial savings and many COOs embraced solar power as part of their energy strategies.

However, although solar power projects are relatively simple in comparison to other RE projects in terms of construction and operation, it is very challenging to balance the electricity they generate in the energy network. Indeed, solar energy is produced mostly during the day/summer when demand is usually lower and not during the night/winter when demand is the highest.

Therefore it is critically important to properly integrate such additional, intermittent electricity generation capacity in a country's overall electricity supply system, preventing sudden surges of electricity supply (which, in the case of "green energy", has to be accepted by the network operator).

A sector of strategic importance for the EBRD

Solar operations are critically important for the EBRD as they directly contribute to the Bank's climate-related strategic goals and advance its ambition to become a driving force in its COOs transition to a low carbon economy. Since its first solar power operation in 2012 until year-end 2020, the Bank provided almost €1.3 billion financing to 69 projects supporting close to 3 gigawatts (GW) of industrial-scale solar power generating capacity. An additional €1.2 billion has been invested in the last five years in projects indirectly supporting solar power generation development, such as electricity grid expansion and other transmission infrastructure.

Concentrated portfolio

EBRD financing of solar power until year end 2020 has been **geographically concentrated** in four countries (Egypt, Jordan, Kazakhstan and Ukraine), both in terms of number of projects (83%) and volume (78%). They were among countries with the highest carbon intensity.

The Bank financed on average 42% of a solar project's cost. The rest was **financed in parallel by another IFI, DFI or a national development bank** and a sponsor's equity. None of the solar projects' loans was syndicated to commercial banks. Some solar projects benefited from concessional tranches (typically financing 15-20% of the total costs).

All solar power projects were **private** but in many countries they were **enabled by sovereign guarantees** covering payments under the PPAs due from off-takers or by other government undertakings. All projects used **debt** financing.

52 solar projects (75% of the total), accounting for almost €0.8 billion, were financed under different **frameworks.** These frameworks ensured that the Bank took an integrated approach to the development of the solar sector, providing consultants (under TCs), who screened project proposals, prepared appraisals, monitored implementation and supported policy dialogue. These frameworks were instrumental in enabling the Bank to scale up solar power operations quickly.

Mixed performance and results

Strategic issues

In some countries EBRD did "things right" but it not always did the "right things". The Bank successfully implemented a holistic approach to solar power, but in some cases it contributed to network imbalances and even financial distress of off-takers in selected countries (most seriously in Ukraine). The Bank has been focusing on financing salient power generation projects but also on strengthening energy network capacity, as well as providing policy, legal and regulatory support for improved network management. However, in some countries, insufficient attention was paid early on to supporting electricity storage, decommissioning of thermal power and cross-border connections: in other words measures facilitating electricity network balance. At the same time, over-generous FiTs created a boom in solar power (for example there was a 250% increase in solar capacity in Ukraine in 2017 alone), which in some COOs led to electricity balancing challenges, financial distress for the off-takers and in the case of Ukraine, retroactive tariff reduction.

As a result, the governments in Ukraine Egypt and Jordan have suspended the development of solar power. Although the Bank's (and other IFIs') financing unintentionally contributed to this "solar bubble", there is no doubt that on a strategic level, this financing did support the transformation of energy systems in those countries from thermal to RE-based and thus furthered the achievement of climate-related goals. Importantly, affected countries have been taking steps to address their electricity balancing (now suspended in Ukraine due to war) and in the long term, the Bank-financed solar projects will benefit them.

More recently, the Bank has been targeting more decisively (through policy dialogue, TCs and investments) measures to improve network balancing; for example it has launched a TC framework to explore electricity storage options or covenanting thermal power decommissioning in its sovereign loans.

This report contains a specific case study of Ukraine, which stands out as a unique case; in 2018, more utility-scale solar PV capacity was installed in Ukraine than in all of the Bank's other economies combined (with the exception of Turkey). The Bank played an important role in this scale up as 44% of its solar investments made in 2018 and 2019 were in Ukraine. Yet by 2020, all of these projects were in corporate recovery and the industry was in turmoil. Evidence shows that in October 2018 the Bank had correctly diagnosed the system's problems, as well as high risks associated with continued financing of new solar capacity in Ukraine. The Bank clearly recognised that the solar sector in Ukraine, based on FiT, was not appropriate nor sustainable[1], but continued to support the sector. The ultimate demise of this system came when COVID-19 hit and the demand collapsed, with the supply from solar producers still high. The pandemic was arguably impossible to predict, however the Bank was aware of the cracks in this system well before it happened. This had negative implications with respect to both sound banking and transition impact.

Enabling policy dialogue and technical cooperation

The Bank's policy dialogue was often intense and critical in enabling early solar projects in all sample countries**.** It was initially focused on the development of bankable PPAs and more recently, on more strategic issues (sector Master Plans, Low Carbon Pathways), as well as supporting the transfer from a FiT-based to an auction-based RE development contract award system.

However, the solar power sector has been fast-moving, susceptible to political changes and has attracted support from many IFIs and institutions with shifting priorities. It has been challenging for the Bank to plan long-term, TC-supported policy dialogue in this environment. Policy dialogue objectives (to be achieved by TCs with multi-million dollar budgets) stated in some of the Board Reports for RES frameworks (for example KAZREF, USELF), were **not always well diagnosed or became less relevant** due to subsequent policy changes or the engagement of other IFIs. Some objectives were then dropped or replaced with other tasks. The Bank's agility and adaptability has been commendable, however these important changes were introduced without informing the Board. In some cases (Kazakhstan), ***ad-hoc* advice by Bank staff** has been more frequent (and often more effective), than a structured approach based on large TCs. The development of a **Low Carbon Pathway** in Uzbekistan proved to be an effective blueprint for sector development and spearheaded RES-supportive energy policies (a similar project is being now implemented in Jordan).

The EBRD has developed a strong record and reputation both in providing technical assistance to the development of a **competitive auction** process (for example in Albania, Armenia, Kazakhstan and Uzbekistan), as well as in providing financing to successful bidders. This resulted in much more competitive tariffs for solar power than under FiT-based projects.

During the early days of the pandemic, the EBRD has also acted as a broker between public and private parties when payments to RES producers were suspended in Jordan and Ukraine, and tariff reduction was announced in the latter. The Bank has contributed to the reinstatement of payments and the repayment of arrears in both countries (so far only partial in Ukraine). Its attempts to prevent retroactive tariff reduction in Ukraine were less successful.

[1] Letter of 19 October 2018 from Energy Community (co-signed by EBRD) to the Ukrainian Parliament (see more in 3.1.4)

Clients' perspective

Solar investors (EvD interviewees) were in agreement that project finance, offered by the Bank, has been the most attractive type of financing for them but it was only feasible in markets with policy frameworks that support the **allocation of risks within bankable financing arrangements**. This supports the Bank's drive to develop such policy frameworks well in advance of scaling up of solar, envisaged by some COOs.

EBRD's financial "additionality" in solar projects has been generally strong, as in many countries IFIs remain the only source of project finance for RE/solar operations. Clients have also been attracted to EBRD financing due to the perception that it can provide **political protection**, for example against tariff reduction, curtailment, and so on. Developments in Ukraine suggest that the Bank is able to lobby for RES investors in times of crisis, however this has had mixed results.

Creditworthiness of an off-taker has been critically important to solar investors, however many off-takers do not have the required levels of capitalisation or a payment track record. This requires support from other (usually state) entities or sovereign guarantees to back up the PPAs. All of the Bank's solar projects have been (correctly) categorised as private, however not all would have been possible without state support to the offtakers.

Project performance issues (related to the 10 projects evaluated under this review)

Our evaluation of ten solar projects (two each in Egypt, Jordan, Kazakhstan and Cyprus and one each in Ukraine and Uzbekistan) points to their relatively good performance, with most rated overall *Good*[2] and only one rated *Acceptable.* Their physical implementation generally went well, although some experienced delays and technical faults, which have however been rectified. In almost all cases, electricity production has been in line with or above the initial projections and thus the CO_2 savings they generated have also aligned with expectations. Similarly, the financial performance of most of the solar operations was good; meeting or exceeding forecasts at approval. They were also highly lucrative, achieving EBITDA margins in the range of 78-91%. However, when the COVID-19 pandemic started, several projects were threatened with curtailment, partial payment delays or tariff cuts. The tariff cuts actually materialised in Ukraine (with a 15% tariff reduction and payment arrears, which have only recently been partially settled).

Backward linkages of solar projects to the local economy have been relatively weak as there are no large-scale solar equipment manufacturers in the Bank's COOs (equipment, usually imported, accounted for about 85% of capital expenditure in most projects), while employment at solar plants is low.

Sustainability of results in most of the evaluated projects seems reasonably assured as all benefit from 12-25 year PPAs and all the relevant governments have ambitious commitments to increase RES/reduce GHGs under their international agreements and strategic plans (although the recent war on Ukraine threatened the projects there – in March 2022 there was a missile attack on Yavoriv military training ground, which is adjacent to the solar plant financed by the Bank).

[2] Ratings for overall performance are based on the following scale: Outstanding – Good – Acceptable – Poor – Very Poor ("-" or "+" may be added to distinguish minor performance differences among similarly rated projects).

Lessons

Financial

- Very generous electricity producer tariffs might be welcomed by financiers, however they are often **unsustainable** and carry a high risk of subsequent reduction (lesson from Ukraine).
- As solar power investments have relatively high capital expenditure costs but low operating costs, their financing cost is of paramount importance for investors. Limited access to **concessional financing** (to blend with commercial), puts the EBRD at a disadvantage, compared to other IFIs, especially in ETC markets (lesson from Uzbekistan).
- Revenue **stability and predictability** over the asset lifetime is an absolute pre-condition for solar investors, given the costs are almost entirely fixed rather than variable – in countries with competitive auctions, bankable long-term contracts and transparent procedures, the cost of capital for utility-scale solar PV has been of critical importance (lesson/message from all solar clients interviewed in all sample countries).

Policy dialogue/reforms

- As solar power/RE is a fast-changing sector, in some countries the provision of focused, often ***ad-hoc*, advice from the Bank's staff** has been more frequent (and often more effective), than a structured approach based on large TCs (lesson from Kazakhstan).
- By following a previously agreed strategic approach to the power sector (under the Low Carbon Pathway, prepared with the Bank's assistance), it has been possible to **covenant decommissioning** of old thermal power units under subsequent sovereign projects and unblock electricity generation capacity for solar/RE projects (lesson from energy sector projects in Uzbekistan).
- Setting FiTs (or other fixed tariffs) **within primary legislation** makes them more challenging to adjust when the context changes and thus suggests caution when financing RE in such context (or advising in policy dialogues). In a market as dynamic as solar, this creates the risk that tariffs will remain fixed, while the cost structure changes dramatically (lesson from Ukraine).
- **Affordability of solar** (and RES in general) is best addressed through the transfer of a FiT-based system to one based on **auctions**, which has demonstrated the ability of investors to offer tariffs several times lower than the FiT (lesson from solar projects in Jordan, Uzbekistan).

Technical

- Financing new solar projects in a country experiencing electricity network capacity limits, can **exacerbate the network's (supply and demand) balancing challenges, because of oversupply of electricity,** and be detrimental to an off-taker (lesson from Ukraine).
- It is critical that analysis of RES growth dynamics (and the grid's ability to accommodate intermittent solar electricity), incorporates the growth trajectory of the **distributed solar market** (rooftop-mounted PV panels). Distributed solar has the same energy generation profile as utility solar, but is more difficult to regulate and control (lesson from Jordan, Egypt, Ukraine).

- Incidences of **curtailment,** partial **payment delays or/and tariff reduction threats** arose more frequently in countries where the solar/RES sectors were more mature or its deployment happened quickly. This was due to **low capacity in the transmission network or balancing constraints**, because network expansion is generally slower to design, build and commission than RES generation. Even small RES projects can tip the balance (lesson from Ukraine, Jordan and Cyprus).
- As the share of solar in power generation grows, the utility of the cost of solar energy generation as an indicator of its competitiveness diminishes. This is because such cost does not include the challenges of incorporating intermittent power and is **not an accurate reflection of its competitiveness** (lesson from Jordan and Uzbekistan).

Recommendations:

Strategic recommendations

- **Recommendation 1:** In countries experiencing rapid growth of solar power and network integration challenges, **strengthen and increase support for expanding the capacity of power systems to successfully integrate intermittent renewable energy sources**. This would entail intensifying policy support (including the development of related regulation, market reforms and capacity building), as well as starting financing for electricity storage, decommissioning of old thermal power plants (including support for "just transition"), construction of new thermal and hydro balancing capacity, network upgrades, cross-border interconnections and demand management.
- **Recommendation 2:** Where economically justified, encourage relevant authorities to consider **hybrid auctions**, integrating storage, particularly for large solar generation capacities.

Operational recommendations

- **Recommendation 3:** For future country-specific solar power PV financing frameworks, incorporate in the Board Report:
    - **Analysis of the impact of additional electricity generation** capacity, envisaged to be financed under the financing frameworks, on network balancing. It should include a summary from the discussions with a TSO/SO and national authorities, as well as the [5]-year electricity balance forecast of supply (including the baseload, decommissioned capacity, all commissioned and key pipeline projects, as well as the growth of distributed solar power), and consumption, including at peak generation time.
    - **Assessment of the tariff regime's sustainability**, by comparing the tariff price to local LCOE on a like-to-like basis, to clearly demonstrate the level of implicit subsidy.
- **Recommendation 4:** Increase efforts to obtain co-financing for solar projects with specific targets and incentives:
    - Commercial for projects in more advanced markets, also through policy dialogue aimed at making banking regimes more RE-friendly.

- Blended for projects in ETCs and SEMED by approaching selected donors to attract investors into countries with unrealised solar power potential more effectively (and to match other IFIs' offerings).

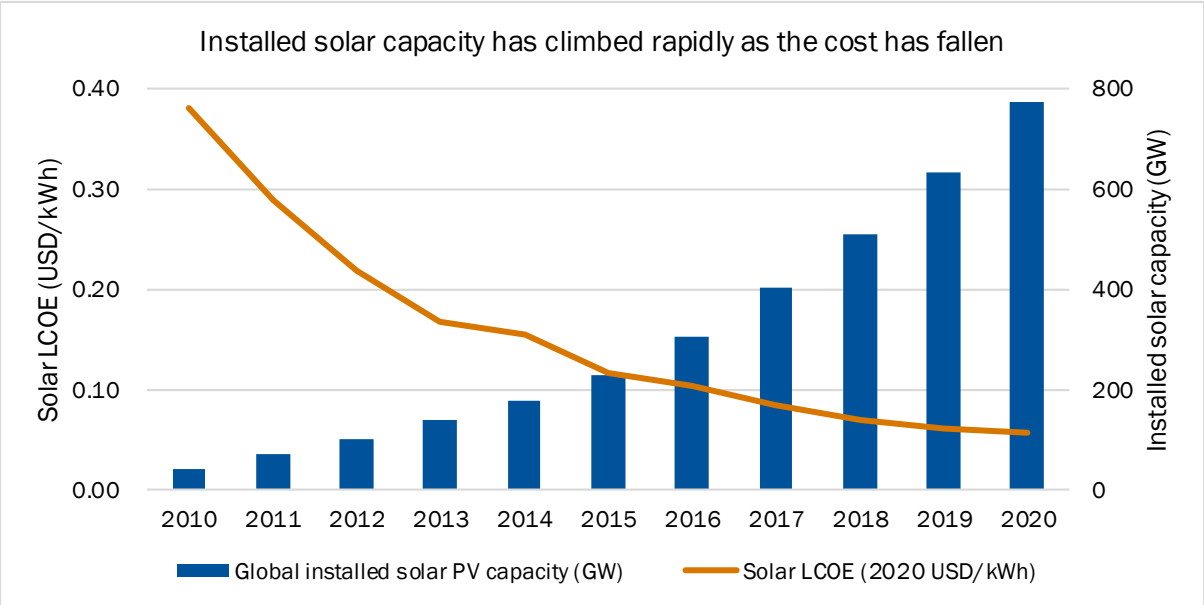
1. Introduction, evaluation objectives and methodology

1.1. Background to the review

From the 1860s and Auguste Mouchout's first solar-powered motor, which produced steam in a glass-enclosed iron cauldron, to the early 1900s and Frank Shuman's 45kW sun-tracking parabolic plant in Meadi, Egypt, people have sought to harness the energy generated by the sun. However, it was only in the early 1980s that the Israeli company Luz International Ltd. commercialised solar thermal power technology by building a series of nine solar electricity generating plants in the Californian Mojave desert, which totalled 354 MW.

The expansion of the solar sub-sector was initially slow due to the relatively high cost of the photo voltaic (PV) panels. Solar power accounted for up to 20% of annual global RES investments in the first decade of this century, however, as the cost of panels started decreasing in 2010, investments in solar climbed rapidly. In 2021 an estimated record 290 GW of RE was added, about 50% solar. By 2050 solar power is predicted to be the largest single source of global electricity.

Figure 1. Installed global solar capacity and average price of a PV panel



Source: EvD's own calculations based on data from Our World in Data.com/Renewable Energy

For the EBRD, the increasing commercial viability of solar power coincided with a shift in its strategy towards supporting the Green Economy, as well as the expansion of its operations into the SEMED region – one with abundant solar resources. Solar energy is critical in achieving net zero emissions by 2050. The International Energy Agency (IEA) has calculated that to reach this target, the share of renewables in the global energy mix must increase from 29% now to over 61% in 2030. This will require scaling up renewables rapidly in the 2020s, reaching annual additions of 630 gigawatts (GW) of solar PV power (and 390 GW of wind) by 2030, four times the levels of 2020. For solar PV, this is equivalent to installing the world's current largest solar park roughly every day.

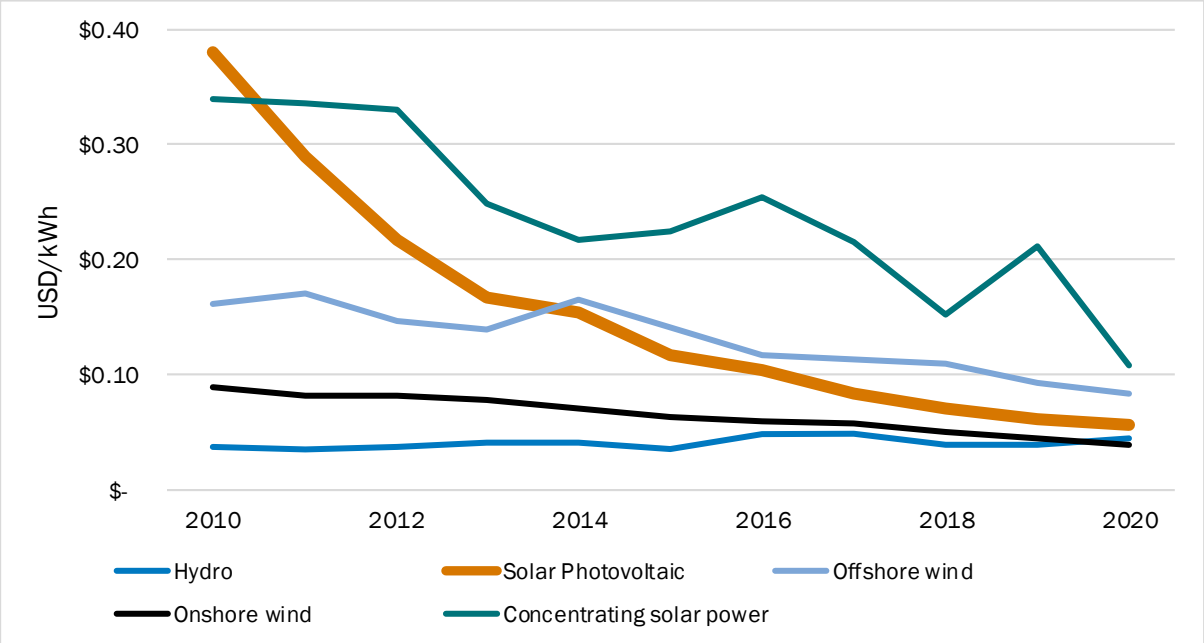
Box 1: Solar power - definition and key facts

Solar power is the conversion of energy from sunlight into electricity, either directly using photovoltaics (PV), indirectly using concentrated solar power (CSP), or a combination of the two. CSP systems use lenses or mirrors and solar tracking systems to focus a large area of sunlight into a small beam. PV cells convert light into an electric current using the photovoltaic effect. The focus of this evaluation is on solar PV projects, because they account for almost all of the EBRD's solar portfolio.

The International Energy Agency has projected by 2050 that solar photovoltaics and concentrated solar power will contribute about 16% and 11%, respectively of worldwide electricity consumption, and solar will be the world's largest source of electricity. In 2020, solar power provided 3.1% of total worldwide electricity production, growing over 23% from the previous year. China accounted for 32% (290 GW) of the world's installed solar capacity, the USA 12% and Japan 10%. In the EBRD's region of operations, Turkey (6.6 GW), Ukraine (5.3 GW) and Poland (4 GW) had the largest installed solar capacities.

As mentioned, key to the increased attractiveness of solar power in the last decade was a massive drop in solar energy costs, relative to other RES. In many COOs the cost of solar power is now lower than that of wind or hydro. This dramatic drop in the cost of solar energy is due to a decrease in the cost of PV panels, which fell by 85% between 2010 and 2020, because of new technologies. Although PV panel prices increased 15% in 2021 due to a rise in the price of polysilicon (the core raw material), the transition from feed-in tariff (FiT) to competitive auctions incentivised project sponsors to cut costs.

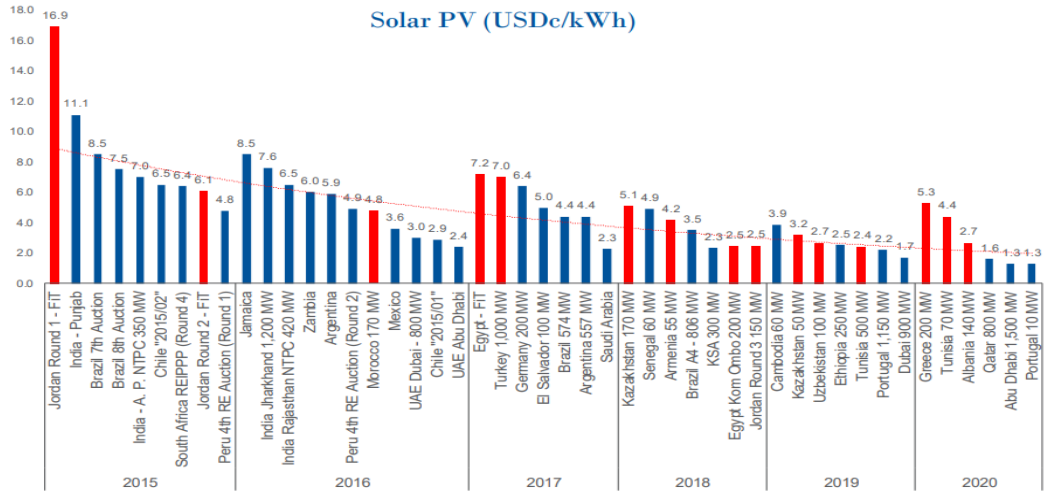
Figure 2: Comparison of RE prices – cost of solar PV has dropped 85% in 10 years



The declining price of solar PV panels has been reflected in the tariffs payable for solar energy, which have fallen significantly in the past five years. This trend is also reflected in the evaluation

sample – the most recent project (Nur Navoi in Uzbekistan) agreed a price of US$ 0.026/kWh, whilst in comparison the Yavoriv 1 project, signed in 2017, had an initial price of US$ 0.18/kWh.

Figure 3: Comparison of tariffs payable to solar generators in different countries 2015-20



Box 2: Comparing tariffs between solar projects

Although comparison of solar tariffs can be helpful, there are several contextual factors to explain price differentials which imply that basic price comparisons cannot be taken at face value. Some elements may differ from one example to another:

- **Solar irradiance** (for example the estimate for the Yavoriv projects in Ukraine were for annual irradiation of 1,132 kWh/m^2 versus 2,417 kWh/m^2 at the Benban site in Egypt).
- **Length of PPA** (for example the Yavoriv projects in Ukraine had on average a 12-year PPA, versus 25 years in Egypt).
- **Local content manufacturing requirements**. Analysis of Turkey's local content requirements suggest that they will increase costs by 30%.
- **The credibility of key counterparts** (particularly the regulatory regime and the off-taker).
- **FX indexing of tariffs**: indexation (or €/US$ tariffs) mean developers do not face FX risk.
- **Costs of capital,** given the high level of upfront fixed costs for solar.
- **Wider costs of doing business**, including labour and costs of importing and transporting inputs.

Although solar energy has become a key tool in the low carbon transition, it is not without its drawbacks. Then key advantages and disadvantages of solar power are summarised below:

Key advantages of solar power:

- **Sustainability:** while fossil fuels have an expiry date that may be fast approaching, the sun is likely to be around for at least a few billion years.
- **Low environmental impact:** GHG emissions are zero as the technology does not require fuel combustion. Although some CSP plants use large amounts of water, the correct technology significantly increases their efficiency, whilst PV solar cells do not require any water when generating electricity.
- **Availability:** every country is a potential solar energy producer, thus allowing for greater energy independence and security.

Key disadvantages of solar power:

- **Intermittency:** energy is only generated while the sun is shining. The shortage created by this interruption would not be a problem if there were low-cost ways of storing energy from sunny periods. There is significant ongoing research to address the high cost of storage.
- **Land use:** larger utility-scale PV systems require 3.5-10 acres per MW and CSP between 4-16.5 acres per MW. The impact can be reduced by placing facilities in low-density areas or along existing transmission corridors.
- **Scarcity of materials:** solar technologies, particularly PV panels, require rare materials in their production (for example, molybdenum, cadmium, selenium). Recycling PV material and advances in solar-cell efficiency could both help boost supply.
- **Potential links to forced labour:** PV solar panels are manufactured using polysilicon. There have been allegations of forced labour within polysilicon manufacturing. This issue is summarised in Box 3.

Box 3: Allegations of forced labour in solar panel supply chains

Reported allegations of forced labour within solar panel supply chains first emerged in 2020 and became a serious issue for the industry in 2021. The EBRD temporarily paused financing for solar projects as it developed a response, and has since been coordinating closely with an MDB working group to develop a common approach to this issue.

It is not within the scope of this evaluation to determine whether forced labour was used in projects financed by the Bank. EvD is also not assessing whether the Bank may have failed to recognise the risk of financing projects with potential forced labour components; when the projects in the evaluation sample were approved, there were no reports of forced labour or perceived risks.

However, recognising the importance of this issue, EvD asked clients and sector stakeholders if they were aware of the forced labour reports and if they had developed a response. Brands of panels used in the sample project were verified and their links to reports linking them to forced labour analysed. This was intended to provide insights to Management and Board on the industry levels of awareness of this issue.

1.2. Objectives, questions, methodology and limitations

This report aims to assess the Bank's response to the rapidly growing solar power sub-sector, presenting it in the broader context of the EBRD's "green" strategic agenda. It seeks to examine the Bank's achievements in supporting solar power development in physical, environmental and, particularly, policy dialogue and transition terms. It identifies trends, as well as common lessons and themes relevant to this sub-sector. The ultimate goal is to draw lessons for the EBRD's future approach to this sector or/and the design and implementation of future projects of this type, contributing to improved quality, as well as to scaling up the Bank's solar power operations.

The evaluation is based on a "cluster" approach, that is it examines in detail a sample of 10 projects from the Bank's solar power portfolio and tries to identify prevailing trends and commonalities in these projects and activities (see more in the next section on the cluster approach). The process for selecting the 10 "cluster" projects (listed in Annex 1) was described in the Approach Paper for this review.[3] Seven projects are from the four countries where the Bank

[3] SS21-162 Solar Power Projects – Approach Paper, April 2021

has completed by far the most solar projects – Egypt, Jordan, Kazakhstan and Ukraine, while one is from a new solar market (Uzbekistan) and two from Cyprus, where the Bank has recently discontinued financing of new projects. Specific cluster projects were selected based on their structure (those linked to policy dialogue activities were favoured), size of investment, maturity, as well as the accessibility of clients and policy dialogue beneficiaries. In some cases, the recommendations of the Banking department were followed.

This report aims to respond to the following evaluation questions. The full evaluation framework, including the evaluation criteria, indicators, and data sources are presented in the Approach Paper.

The overarching evaluation question is:

What has been the performance and results of the EBRD in its solar energy projects (as per the ten cluster projects)?

With the following three sub-questions:

- EQ1: How has the EBRD's approach to solar energy evolved to adapt to its strategic objectives?
- EQ2: What results did the EBRD achieve in the solar sector through its policy dialogue, in the sample project countries?
- EQ3: What were the performance and results of the EBRD's cluster solar projects?

The methodology employed was based on document reviews, as well as interviews with bankers[4], consultants, clients and stakeholders. Due to the COVID-19 pandemic, some interviews were arranged virtually, however those in Cyprus, Jordan, Ukraine and Uzbekistan were held in person. In total, 35 clients and stakeholders (mainly government officials) were interviewed for this evaluation. Moreover, cluster projects sites in these four countries were visited and their operations managers interviewed.

In the countries in the evaluation sample, in addition to the evaluation of individual projects, EvD has also assessed the Bank's wider policy dialogue activities that are relevant to the development of the solar sector. This includes policy dialogue activities with only a tangential relationship to the sample projects, or those which were largely implemented well before the sample projects were completed. To provide a framework for understanding the Bank's policy dialogue, EvD has developed a Theory of Change for the Bank's approach in the sector (see Annex 4).

This evaluation approach was adopted because the Bank has been very active in policy dialogue in the solar sector, and it is also an area of particular interest for the Board. One potential downside of taking a cluster approach is that, in most countries, policy dialogue carried out by the Bank in this sector is not tied to specific solar investments, and so technically falls outside the remit of individual project evaluations. Moreover, many of the policy issues discussed relate to all sources of renewable energy, not just solar.

To assess the results of the cluster projects, EvD prepared an *ex-post* results framework for each project (see Annex 2), which were based on project approval documents, TI objectives and data collected during project monitoring. All project result frameworks were discussed and agreed with the Banking teams. These results frameworks contain clear project-specific performance

[4] Over 20 Bankers and Directors (including three Country Directors at ROs, as well as the Head of Energy Eurasia and the Head of SBI Sustainable Markets) were interviewed.

indicators (usually timely project completion, amount of energy to be generated, amount of CO_2 to be saved, demonstration effect indicators, contribution to national climate targets and so on). These indicators were often related to the TI benchmarks presented in the Board Reports at approval (although most cluster projects were approved under frameworks, which stated only aggregate targets for an entire framework). Defining policy dialogue-specific indicators was more challenging as Board Reports (usually for relevant frameworks) often referred to activities, rather than expected results of the dialogue. Nevertheless, EvD derived expected outputs and outcomes from the description of such activities. Following document analysis and stakeholder interviews, evidence related to each indicator was gathered and then the ratings for each of three key evaluation criteria were derived: relevance (which included EBRD additionality), effectiveness (operational and policy dialogue results in terms of outputs, outcomes, impacts and sustainability of results) and efficiency (financial performance). The overall project performance rating was largely based on these three categories.[5]

This review presented some challenges and it had certain limitations. The COVID-19 pandemic prevented timely visits to all sample countries, which complicated data collection. The country visits (crucial for this type of evaluation) were possible only relatively late in the year, leaving limited time to draft detailed evaluations, discuss them with the Banking teams and compile the overall report. The evaluation sample is relatively small, however, with two validations covering four additional solar projects, see Box 4 (the conclusions of which were taken into account), it accounts for 20% of the Bank's solar portfolio, which is considered sufficient for this type of evaluation.

Box 4: Previous evaluations of solar projects

So far, none of the Bank's solar operations has been fully evaluated. However, EvD has validated two self-evaluations (OPAVs) of four solar projects: the **Scatec Solar portfolio in Jordan**, covering three projects (EJRE, Greenland and Oryx – PEX18-732), and **Burnoye Solar in Kazakhstan** (PEX18-733).

The validation of the Scatec Jordan portfolio highlighted project design shortcomings, such as weak links between outputs and outcomes, as well as an inadequate monitoring framework for some indicators, making it difficult to measure its contribution to expected outcomes. The OPAV also raised some operational issues, such as disagreements between the shareholders over technical takeover and costs, as well as issues with tracking systems and inverters. Moreover, the impact of high temperatures, which resulted in slightly lower production were highlighted. However overall, the projects were assessed as successful, achieving most of their performance indicators and demonstrating successful PPP under the first bankable PPA in Jordan, prepared with the Bank's assistance.

The validation of the Burnoye Solar project was largely complimentary about this first large-scale solar project in Kazakhstan. However, it pointed to the importance of a robust FX and irradiation sensitivity analysis, as well as mitigation of environmental risks. Kazakh Tenge devalued by 63% during the evaluation period, resulting in the client breaching some financial ratios. Fortunately, before the project, the Bank had engaged in policy dialogue with the Kazakh authorities to introduce 70% FX indexation of RES tariffs to the US$/KZT exchange rate movements, which limited the client's FX losses.

[5] Ratings for each category are based on the following scale: *Excellent – Fully Satisfactory – Partly Satisfactory – Largely Unsatisfactory – Unsatisfactory*. Ratings for overall performance are: *Outstanding – Good – Acceptable – Poor – Very Poor* ("-" or "+" was added to some overall ratings to distinguish minor performance differences among similarly rated projects).

1.3. The cluster approach and the report's structure

The project's cluster approach entails full evaluation of similar projects – from the same sector, sub-sector, country, or having similar objectives (Regional Integration, Supply Chains and Backward Linkages, and so on). This type of cluster evaluation bears some similarities to a sector evaluation, however it is more focused on evaluating the results of specific projects (and identifying common trends among them), rather than looking at the wider portfolio and establishing its alignment with the sector strategy (although the latter also often includes an abbreviated evaluation of a sample of projects). The cluster approach is often selected for the assessment of sub-sectoral activities, which are not guided by a dedicated strategy. Solar is not a recognised sector/sub-sector within the EBRD (it falls under the wider Energy Sector Strategy). It has no clearly delineated top-down approach or strategic framework. Given that there is no wider strategic set of objectives against which to develop an evaluative framework, a bottom-up, "cluster" approach is deemed to be more feasible than a top-down 'sectoral' approach.

This report starts by presenting the evolution of the Bank's growing involvement in solar power and the contribution of solar projects to the GET's strategic objectives. It then moves on to a brief analysis of the Bank's solar power portfolio and explores why the Bank has been prolific in certain countries but absent from others with solar potential. It then examines the links with solar power in selected EBRD country strategies. Section 3 evaluates the results of the Bank's policy dialogue in cluster countries. Project-level evaluations are summarised in Section 4, which presents the main characteristics of the cluster projects' performance under three key evaluation criteria (relevance, effectiveness and efficiency), and identifies trends and commonalities in the performance of these projects. The efficiency section also compares the time and resources needed for processing both framework and stand-alone solar projects. Section 5 summarises lessons, issues and recommendations from this evaluation. Six detailed evaluations of 10 cluster projects, their Results Frameworks, as well as other analysis supporting the findings are presented in the annexes.

2. The EBRD's growing involvement in solar power

Evaluation Question: How has the EBRD's approach to solar energy evolved to adapt to its strategic objectives?

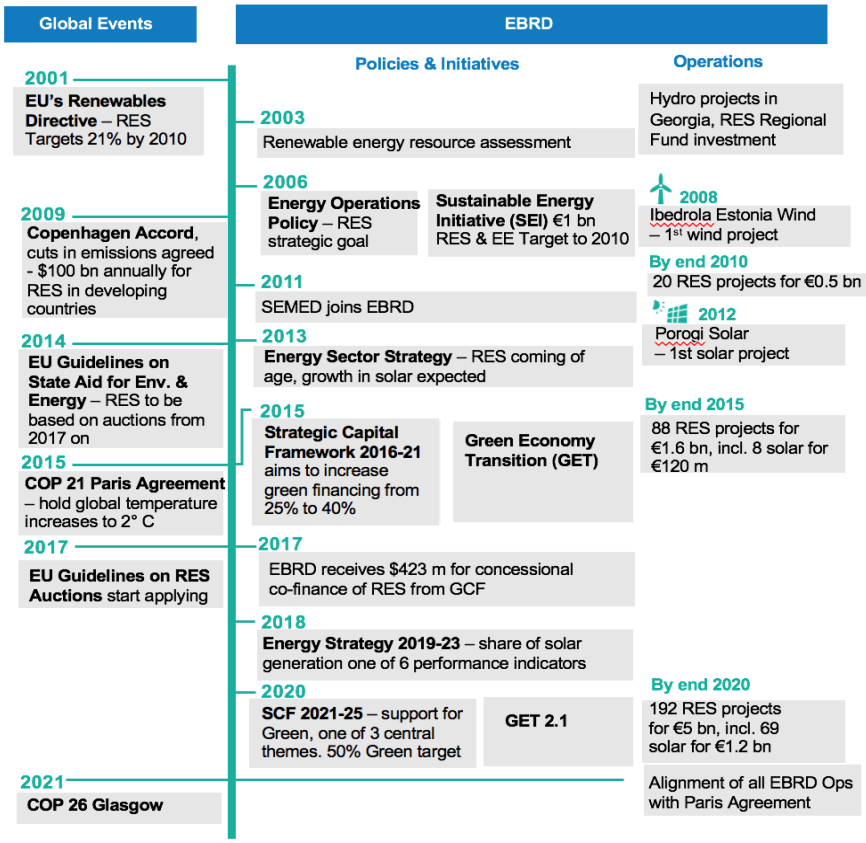
- The Bank's growing commitment to RES has reflected the increasing importance of climate change issues on the global agenda. Each of the Bank's subsequent energy sector strategies has contained increasingly stronger calls for EBRD support for RES.
- Hydro and wind power dominated the early period of EBRD support for RES; solar power emerged only in the 2010s after a substantial fall in the price of PV panels.
- Ukraine, with its generous FiT system, led the way in the Bank's solar operations. An integrated, framework-based approach became instrumental for quick scale up of the Bank's solar projects there. The EBRD's expansion into the SEMED region provided a strong boost to the Bank's engagement in solar power.

A review of the Bank's activities related to solar power cannot be separated from its overall support for renewable energy. Although the Bank's first solar power project was only signed in 2012 and it did not finance this sub-sector on a larger scale until 2014, it had been involved much earlier in policy dialogue in several countries to enable bankable RES projects, including solar.

2.1. Evolution of the Bank's approach to solar power

This section highlights key milestones in the Bank's approach to the solar power, while Annex 7 contains more detailed description of this evolution, illustrated by Figure 4.

Figure 4: Timeline of the Bank's operations in the solar sector



Source: EvD's own elaboration

In 2006 the Board approved a new Energy Operations Policy (BDS06-093F), which for the first time mandated the Bank to *"increase its support for energy efficiency and renewable energy"* However, it was relatively cautious, noting that even in Western Europe renewables are regarded as "expensive" compared to "conventional" generation and have required subsidies to support development. The policy did note that EU member and candidate countries had to adopt **RES targets under the 2001 Renewables Directive.**[6] This suggested that significant investment in RES would be needed in certain COOs, and that new EU member states should develop comprehensive support frameworks for renewables. The Policy stated that the Bank stood ready to assist.

Following this new policy, the Bank started to provide practical support for RES development, focusing on hydro power, mainly in Georgia[7] and the Western Balkans, as well as wind power, principally in the new EU countries.[8] Policy dialogue aimed at enabling bankable RES projects played a key part in the EBRD's activities in this period. It concentrated on the development of standard PPAs, acceptable for lenders (for example in Kazakhstan and Ukraine), as well as support for the development of FiT or green certificate schemes (for example in Poland, Kazakhstan and Ukraine).

[6] Promotion of Electricity from Renewable Energy Sources in the Internal Electricity Market, 2001/77/EC
[7] See Hydropower Projects, Georgia Evaluation (SS18-137)
[8] See Four Wind Energy Projects Evaluation (PE15-593)

By the end of 2010 the Bank had signed 20 RES projects with over €0.5 billion financing; it then doubled this amount with an additional 30 projects signed during the following two years. The Bank's policy dialogue in Ukraine during the early 2010s (focused on improving the bankability of the PPA) paved the way for its first solar power project (Porogi Solar, in 2012, under the **Ukrainian Sustainable Energy Lending Facility (USELF)**) which was followed by two more projects in 2013.

More generally, relatively fast scaling up of the Bank's RES operations in selected countries during this period was possible due to the adoption of a "wholesale" and "integrated" approach to RES through financing facilities (in addition to Ukraine, similar RES financing frameworks were developed for Kazakhstan and later Egypt – see Section 2.2 for more info).

The Bank's support for RES received a boost in 2011 when countries from the SEMED region joined the EBRD as recipient countries. They had abundant solar resources and land available for solar power production. The introduction of auctions, combined with the drop in PV panel prices contributed to the improved economics of solar power and increased interest from governments and investors in this form of RES.

The Bank's **2013 Energy Sector Strategy** (BDS13-291F) increased the emphasis on energy efficiency and the role of renewables. It stressed the growing climate challenge and declared that support for renewable energy is "*central to the Bank's approach*". It made numerous references to solar energy, and noted that *"the Bank expects to see major growth in the role of solar power over the Strategy period".*

In **2015**, the **21st Conference of Parties (COP21) of the UNFCCC in Paris** gave a new impetus to development of RES. Soon after this the Sustainable Development Goals (SDGs) were adopted, several of which reinforced the importance of addressing climate change challenges.

Against this background, in **2015**, the Board approved the Strategic Capital Framework (SCF) for 2016-21, which aimed to increase the Bank's "green" financing from 25% to 40%. The Bank adopted the first **Green Economy Transition Approach** to operationalise this target**.** It noted significant potential for solar energy in SEMED.

One of the primary features supporting the Bank's approach to RES at that time was access to international concessional climate finance, with the EBRD receiving commitments for US$ 423 million from the GCF in 2017. The Bank's own Shareholder Special Fund (SSF) was also an important source of GET funding, providing €29 million in 2017.

The 2018 Energy Strategy for 2019-23 highlighted the rapid growth of the solar portfolio in 2017, led by large operations in Egypt and Jordan. The Performance Monitoring Framework tracked the *"share of intermittent solar and wind in electricity generation"* as a key performance indicator.

The Green Economy Transition Approach 2021-25 (BDS20-082, GET 2.1), approved in 2020, singled out solar energy as a particularly promising sub-sector. It also notes the potential of this sector to have a positive impact on job creation and inclusion in COOs.

The Bank's **Strategic and Capital Framework** (SCF) for 2021-25 (BDS20-030), adopted in 2020, set the support for transition to a "green", low carbon economy as one of the central themes of the Bank's future operations. The SCF set targets to raise the share of the Bank's "green" finance to at least 50% and reduce CO_2 emissions by 25 to 40 million tonnes by 2025. It noted that the *"Bank's support for the transition of its COOs' energy systems from high to low carbon-based would*

be critical for the achievement of these ambitious goals. It will require substantial scaling up of investments into RES, including solar energy generation, which by then would become the lowest cost new energy source in many COOs".

Finally, during the **2021** AGM the Bank's shareholders voted in favour of a resolution that all EBRD activities be **fully aligned with the goals of the Paris Agreement**. This constitutes another strong incentive to scale up investments into RES, including solar.

2.2. Contribution of solar projects to the GET's strategic objectives

The Bank's strategic approach to its green agenda has been guided by its **Green Economy Transition Approach** (BDS15-196), approved by the Board in October 2015, which, in addition to one overall target of reaching 40% of "green" financing in total by 2020, set three targets for the Bank's activities in order to support green economy during the five-year period of 2016-20:

- EBRD GET financing of up to €18 billion with annual GET financing reaching over €4 billion by 2020.
- Based on historical leverage of EBRD climate finance, these would mobilise another €60 billion for a total project value up to €78 billion.
- Driven by the EBRD business model, between half and two-thirds of GET financing would be expected to be in the private sector.

As 100 per cent of the Bank's solar power project financing has been classified as "green" (GET-eligible), this financing during the GET's five-year period amounted to €1,152.5 million, contributing 6.3% to the GET target. Also, all solar power projects have been private, making an important contribution to the GET's third target.

The RES overall accounted for 17% of GET financing during this period, that is €3.06 billion, which includes an important 37% contribution from solar (€1.1 billion).

However, solar power projects have largely not been able to leverage the EBRD's financing with commercial co-financing – none of the 10 cluster projects included this type of co-financing, most being co-financed by other IFIs and sponsors' equity. Even in more advanced countries, such as Cyprus, solar projects were unable to attract commercial co-financing. Also, outside of the cluster sample, the EDPR Solar project in an EU country (Romania) was not co-financed by commercial banks, rather by the Black Sea Trade and Development Bank (which ultimately halved its planned loan from €20 million to €10 million due to the perceived high regulatory risk).

If, however, one accepts that the GET target referred to overall (not only commercial banks) mobilisation (other MDBs financing and sponsor's equity), then solar project co-financing from 2016-20 amounted to €1.6 billion, contributing 2.6% to the GET's second target.

In addition to the three targets mentioned above, GET stated that **its activities would be driven by the following four factors:**

- ramping up existing activities through the recognition of scale effects on systemic impact
- enhanced innovation
- broadening environmental dimensions
- an active use of private and public channels of transition impact within the Bank's mandate.

The solar power operations were in line with all these factors. The Bank indeed ramped up solar projects substantially after 2016 (as illustrated in the Figure 6). The main tool for this ramp up was

RES-dedicated financing frameworks – in addition to the three pre-existing frameworks (two USELFs and SPREF), the Bank added five new ones (two KAZREFs, USELF III, ERF and GREF). Innovation has been promoted mainly by the transfer of advanced technologies related to solar generation to COOs. Environmental objectives have been supported by solar being emission neutral and thus offsetting CO_2 emissions, which would have otherwise been released to produce the required electricity (during the five-year GET period the Bank co-financed the addition of 2.8 GW of solar generation capacity). The solar sub-sector has also been an example of generally successful integration of public and private interests, with the EBRD engaging in active policy dialogue in most COOs with the former and financing the latter.

In conclusion, the Bank evolved its approach to solar power relatively well in order to adapt to its wider, strategic objectives. It initially engaged in active policy dialogue to enable RE projects (see Section 4.3 for more information), followed by cautious support for several pilot solar projects, mainly in Ukraine, then by adopting a wholesale approach through several RE financing facilities. With an aggregate envelope of over €2 billion and often the support of a consultancy team for screening of project proposals, appraisal and monitoring (as well as, in the case of KAZREF, a concessional tranche to blend the Bank's commercially-priced financing), these frameworks proved to be critical for a fast scale-up of the Bank's RE operations, financing €0.8 billion of solar. Solar operations contributed 6.3% to the GET's target volume, while all the operations were in the private sector, and therefore fully aligned with the GET's secondary objective.

2.3. The EBRD's solar power portfolio

- High concentration in four countries – Egypt, Jordan, Kazakhstan and Ukraine.
- Solar power projects have been co-financed almost exclusively by other IFIs, with very few syndications to commercial banks (none under cluster projects).
- In the past, some of the Bank's solar power projects benefited from concessional co-financing. However, more recently the Bank has been less attractive for solar investors in some ETCs as, unlike other IFIs, it cannot offer this type of concessional co-financing.
- Three quarters of projects were financed under frameworks – which enabled scaling up of solar projects due to consultancy support for project screening, pre-selection and appraisal.

During the nine years from 2012-20, the EBRD financed 69 solar energy projects in 13 countries, for a total of €1,286.9 million (see Annex 1). The annual portfolio grew quickly, from three projects signed in the first two years of this period, to 23 signed in the last two years. Overall, the share of solar projects accounted for 45% of the total number and 32% of the total volume of the Bank's RES projects signed during these nine years.

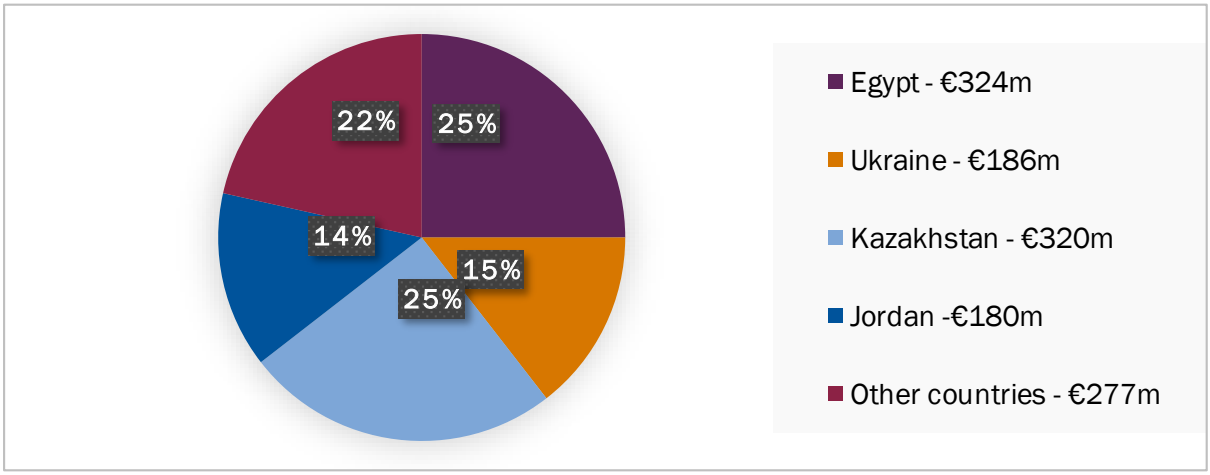
The following main characteristics of the Bank' solar energy portfolio were identified:

(i) **High geographical concentration** –Four countries (Egypt, Jordan, Kazakhstan and Ukraine) dominate the EBRD's solar portfolio, both in terms of number of projects (83%) and volume (78%) – see Figure 5. In addition to these four leading countries, only Poland (three) and Cyprus (two) had more than a single solar energy project in the Bank's portfolio. In the remaining seven countries the Bank supported only one solar project per country.

(ii) **The average amount of Bank financing** (on its own account) of a solar project was €18.6 million. This was almost exactly half of the average amount of Bank financing for a wind project during

this period. The highest average amount of financing was provided to solar projects in Kazakhstan (€24.6 million), due to three larger loans.

Figure 5: Geographical distribution of the Bank's solar financing



Source: EvD's portfolio analysis

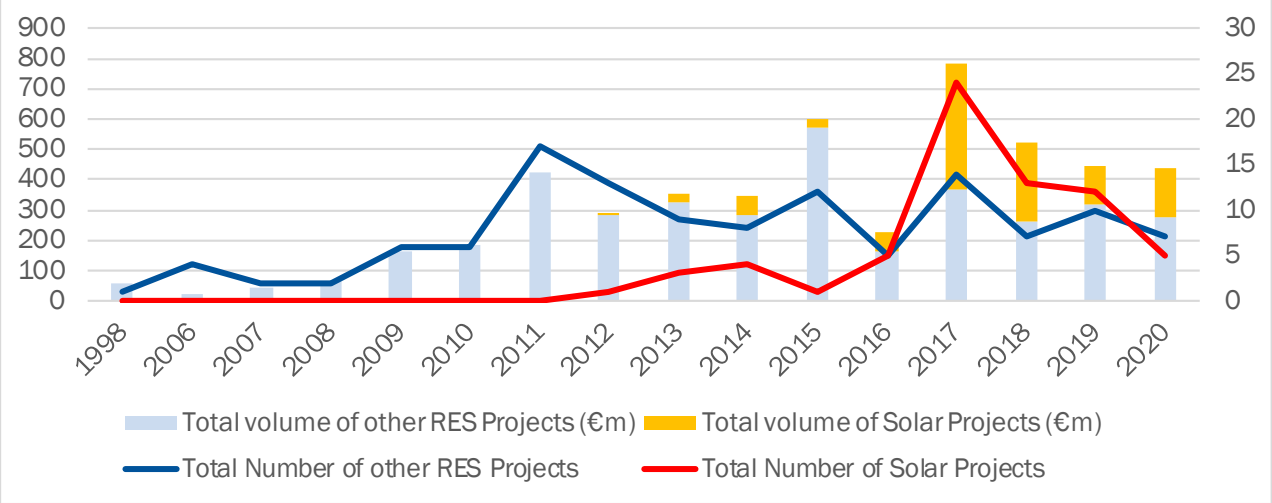
(iii) The Bank's financing supported the installation of 2,974 Megawatts of peak capacity (MWp). **The average total cost per 1MWp** of solar power in the Bank co-financed projects amounted to €1.04 million (although this is based on total project costs indicated in Board Reports, rather than actual costs). They compare favourably with the average total project cost of Bank co-financed wind operations, which amounted to €1.64 million per MWp. The solar projects with the highest total cost per MWp in the Bank's portfolio were those in Turkey, Mongolia and Poland (ranging from €1.36 million to €2.6 million per MWp), while the lowest costs were in Armenia, Greece and North Macedonia (ranging from €0.67 million to €0.76 million per MWp).

(iv) The Bank financed on average 42% of the cost of a solar project. The rest was **financed in parallel by another IFI, DFI or a national development bank** and a sponsor's equity. None of the cluster project loans was syndicated. Leverage (based on six cluster projects) varied and ranged from 66% (TPT, Cyprus) to 75% (both Jordanian projects). Some solar projects benefited from concessional financing. Particularly under frameworks, 15-20% of the total costs were financed by concessional or semi-concessional loans from the Clean Technology Fund (CTF), the Global Climate Fund (GCF) or the Global Environmental Fund (GEF). The Bank's financing of Nur Navoi solar plant was an equity bridge loan; senior debt was provided by the ADB and the IFC, which were able to offer blended finance.

(v) The **rapid increase in the Bank's provision of financing for solar energy** is illustrated by the increased share of solar in the total volume of the Bank's RES projects. It jumped from 10% of the Bank's total cumulative financing of RES in 2012-16 to 50% in 2017-20. However, the trend has not been a steady year-on-year growth. **2017 stands out as an extraordinary year** for the volume (€415 million) and number (24) of solar power projects, mainly due to the signing of 16 Benban site projects in Egypt – one of the largest solar power developments in the world. After

that, the annual volume of solar power financing stabilised at about €200-230 million, while the number of projects fluctuated between 8 and 15 per annum. See Figure 6.

Figure 6: EBRD's renewable energy portfolio



Source: EvD own calculations based on EBRD project data

(vi) A relatively large number of the solar power projects have been executed with **the same clients**, often in different countries. For instance, the Bank financed 12 operations with Scatec Solar; six in Egypt and three each in Jordan and Ukraine. There were also five projects with ACWA in Egypt and Jordan for a total of €103 million.

(vii) 52 solar projects (75% of the total), accounting for almost €0.8 billion, were financed under different **frameworks**. This approach was based on the first framework of this type – the Ukrainian Sustainable Energy Lending Facility (USELF), approved in 2009 (and twice extended since), which financed all 17 solar energy projects in Ukraine. The Bank set up similar facilities to support RES projects in Egypt, Greece, Kazakhstan and SEMED. Frameworks dedicated to RES took a holistic approach to new technologies – they integrated consultants (under TCs), who provided project screening, appraisal, preparation, implementation monitoring and policy dialogue support. The Bank's Risk Management department also took a holistic view of such frameworks. This allowed the bankers to market the Bank's offering rapidly and for Risk and Credit to process proposals efficiently.

Table 1: Summary of frameworks supporting solar power

Facility	Facility financing envelope (€ million)	Number and value of solar projects (€ million)	Main policy dialogue objectives
Ukrainian Sustainable Energy Lending Facility (USELF), 3 iterations 2009, 2014, 2018	350	17/180.8	New legal and regulatory framework for competitive RES auctions and transition from FiT.
Kazakhstan Renewable Framework (KAZREF) 2 iterations 2016 and 2019	500	13/188	Drawing upon earlier PD but ultimately support for change to auction system.

SEMED Private Renewable Energy Framework (SPREF) 2015	227.5	2/16 (1 in Jordan, 1 in Egypt)	Elimination of barriers preventing the development of private renewable energy markets in SEMED.
Egypt Renewable Framework (ERF) 2017	456	16/320 (all related to Benban)	The solar grid code, with characteristics required for PV plants to connect safely and reliably to the high voltage network; SESA.
Greek Renewable Energy Framework (GREF) 2017	300	1/75	Promotion RE investments in Greece, as a means to increase its energy security and sustainability.
Direct Finance Framework	250	3/11.4	None.

(viii) All 69 solar power project borrowers were in the **private** sector and the Bank provided **debt** financing for all of them. Nevertheless, EvD notes that the Bank made some **equity and capital market debt** investments (which are not on the Banking team's list of solar energy projects), which might have benefited the solar power sub-sector. In particular in December 2019 the Bank invested €39 million in a 20% stake of Infinity Solar S.A.E. in Egypt. The use of proceeds from this investment was described as "new wind or solar projects, as well as electricity transmission network expansion and electricity trading". Other examples include a €65 million equity investment into IC ICTAS Renewable of Turkey, which primarily operates wind farms but might also include solar among their future investments. Similarly, investments in the Eurobonds of GEK Terna (€15 million) and Hellenic Petroleum (€28.3 million), both in Greece, were to be used for "renewable energy projects", which could include wind or solar power developments. These investments are not classified as solar power by the Banking team as the clients have some discretion in the application of their proceeds, however some of their capital might ultimately contribute to the expansion of solar energy generation.

(ix) Although the Bank made impressive progress in scaling up its support for solar projects, their number in the last nine years was roughly **equal to the number of the Bank's hydrocarbon operations** (oil, natural gas and coal) signed during the same period. Moreover, the **volume of the latter was almost four times larger** (see "Evaluation of Hydrocarbon Projects", SS20-159).

2.4. Country involvement and links to country strategies

As highlighted above, the Bank has been prolific in its solar operations in four countries, while being absent or financing only a single project in other countries with solar potential. The first part of this section provides some evidence why this has been the case. The highlights are:

- Weak additionality has been the most common barrier to the EBRD's financing of solar operations in several countries, particularly in those providing sovereign guarantees.
- Limited concessional financing made the EBRD's offer less attractive compared to other IFIs.
- Local content requirements for solar projects created another type of barrier for the Bank, given its strong opposition to local content requirements with distortionary effects.
- Even without making direct investments in solar, the EBRD has still played a critical role in the sector in many countries through policy dialogue or via grid infrastructure investments.

EvD has conducted a "light-touch" review to understand why the Bank's solar investments have been concentrated in a small subset of countries. Management explained, that in its choice of markets for solar support, the Bank favoured those with the highest carbon intensity[9]. Moreover, this review found that in some cases where the Bank has not invested in solar, it has still played a significant role in the development of the RES sector through policy dialogue or through support of grid infrastructure.

However, in countries with a more developed solar sector, the Bank has found it challenging to demonstrate additionality. An example of this situation is **Greece**, where the Bank has only financed one solar project. The 2020 Greece Country Strategy stated that the *"€300m Renewable Energy Framework has increased renewables penetration but [the] crowded space has limited opportunities for the Bank"*. The one solar project the Bank has participated in, was a bond issue from Hellenic Petroleum (HP) in 2020. This project's approval records demonstrate the challenges the Bank has faced: HP had successfully tapped the commercial bond markets in 2019, which triggered an increased focus on additionality at approval stage. The EBRD has also found it challenging to provide investment in countries with significant sovereign support for the solar sector, given its private-sector focus. In **Morocco**, which has heavily prioritised solar, 80% of the large Noor project is being funded with sovereign guarantees, with other IFIs' financing.

In other countries, the Bank has supported the emerging solar sector, but at this point has made limited direct investments in solar. One example is **Tunisia,** where the Bank has engaged in extensive policy dialogue to support the development of a competitive tender process for solar, and is working on financing of the first round of solar projects. In addition, in 2020, the EBRD agreed a €300 million loan to Société Tunisienne de l'Electricité et du Gaz (STEG), the state-owned national electricity utility. As the Board Memorandum explains, an essential part of the rationale for this investment was to support STEG's *"stability and efficiency [which] is essential for the success of the renewable energy programme"*. Similarly, in **Albania**, although the EBRD had not directly financed solar by the end of 2021, its policy dialogue was critical to the successful launch of the country's first solar auctions.[10]

Developing the correct regulatory environment to attract private sector sponsors can also be difficult. In **Mongolia**, for instance, the Bank supported the first utility-scale solar PV plant in 2018, but as noted in the DAQs, it took two years for the project to move from Concept Review to Board submission, as the EBRD negotiated over the terms of the PPA. Similarly, in **Armenia**, the Bank signed a deal in 2020 to support the first utility-scale solar power plant. As in Mongolia, there was a two-year gap between Concept Review and signing the loan, and the Banking team highlighted the complex process of negotiating terms with the Armenian authorities.

The introduction of local content manufacturing requirements has also created challenges for the Bank, given the Board's strong opposition to local content requirements with distortionary effects. This is clearest in **Turkey**, now one of the Bank's largest markets, where despite a rapid scale-up of solar energy the Bank has only supported one project, in 2018. At that point, Turkey's FiT for solar had a "local content premium" component, giving the project sponsor a tariff premium based on the extent to which manufactured components were produced in Turkey. The project supported

[9] EvD notes that indeed Ukraine, Kazakhstan and Egypt were among COOs with the highest carbon intensity (positions 25, 26, 27 respectively according to Worldometer). However, such intensity was even higher in Turkey and Poland (16, 20), https://www.worldometers.info/co2-emissions/co2-emissions-by-country/

[10] https://www.pv-magazine.com/2018/01/11/albanias-erbd-supported-50-100-mw-solar-auction-moves-forward/

by the Bank had a small local content premium, and the only component sourced locally "would not normally be sourced internationally" and therefore in "this particular case is not distortionary". However, even with those caveats, the Board minutes clearly outline some directors' disapproval, with the Director for the EU stating that he *"would like the Bank to refrain from developing new operations with these features"*. Since then, Turkey has introduced even stronger local content requirements, which independent analysis suggests could raise costs by up to 30%.[11] In that context, limited Bank investments are justified.

In terms of linkages of the Country Strategies (CSs) to solar power, EvD reviewed those CSs which used to support solar investments within the evaluation sample (Egypt, Jordan, Ukraine, Uzbekistan, Kazakhstan and Cyprus), as well as the CSs of four additional countries (Greece, Morocco, Tunisia and Turkey) with high irradiation levels. This was to address the evaluation question on the relationship between the Bank's support for solar investments, the Bank's Country Strategies, and COO governments' priorities. Annex 5 provides a detailed country-by-country breakdown of the relationship between country strategies and support for solar, with common trends and findings highlighted here.

Support for renewable energy, including solar, was a central component of most of the Bank's Country Strategies. There has been a small increase in the prominence of RES in more recent strategies, but even historic Country Strategies tended to emphasise support for both investments and policy dialogue in the solar/RES sector. Support for renewable energy and green economic transition was a key strategic objective in five of the seven CSs that underpinned the investments within the evaluation sample. Of the two outliers, one was not a full country strategy, but an update (the Yavoriv 1 investment in Ukraine was made under the Ukraine CS 2014 Update). The other outlier was Cyprus (BDS/CY/15-1), which did not include support for renewable energy as a key priority, but did provide scope for support for solar investments and accompanying policy dialogue in the detail. It is worth noting that the Bank stopped investing in new operations in Cyprus from the end of 2020.

In addition to financial support, almost all Country Strategies highlighted the importance of policy dialogue in the RES/solar sector. This reflected the extent to which the Bank identified political and regulatory risks as the main impediments to investment in this sector. In particular, common issues across countries included the corporate governance of off-takers, local content manufacturing requirements, transition to competitive auctions, PPA bankability and energy price subsidies.

The Bank's support for solar investments was normally linked to the Transition Qualities "Green", "Resilient", and "Competitive". By supporting renewable energy in carbon-intensive economies, the Bank contributes to a green economic transition. Solar energy can also support the development of more resilient economies, particularly for major energy importers. Finally, unreliable or unaffordable energy is a significant constraint on private-sector competitiveness; investing in solar can help increase the supply of affordable energy and improve economic competitiveness.

There was some limited provision to measure performance in solar in Country Strategies. Within the Performance Framework, most had an indicator measuring changes in energy generation from RES. There were some inconsistencies as to whether these indicators tracked country-wide

[11] https://www.pv-magazine.com/2021/01/12/turkey-to-hold-1-gw-solar-tender-between-march-8-12/

changes in renewable energy, or only measured changes attributable to projects in which the Bank had an involvement (for example an indicator within the Jordan 2020 CS measured "RES capacity added to the network", whilst Egypt's 2017 CS monitored "Changes in renewable energy generated with the Bank's support"). Adopting a more uniform set of indicators would strengthen comparability of performance across countries. None of the CSs had explicit targets for investment commitment to solar energy, or RES more widely. They also did not include explicit objectives or targets around changes in solar energy capacity, or private-sector investment mobilisation. Some CSs did aim to mobilise private-sector investment, with the caveat that mobilising finance for solar can be challenging "given the current near-zero level of penetration".

National governments were focused on expanding solar energy as part of their own national priorities. This was a result both of international environmental commitments (for example as part of COP21), as well as national-level policy considerations, which often focused more on energy security and business competitiveness. Every country reviewed had set ambitious targets for the expansion of renewable energy. Notwithstanding this government support, as noted above the CSs identified political risk as the predominant threat to investment in the sector. Entrenched and oligopolistic energy market structures create incentives for market actors to preserve the status quo, whilst in some instances energy price subsidies have become a sensitive political issue for the wider public.

The solar and RE-related objectives contained in the cluster Country Strategies were broadly achieved through active policy dialogue and ramping up of solar projects, often under dedicated financing facilities. Table 2 illustrates key features of this implementation.

Table 2. Implementation of solar and RE-related commitments contained in the cluster country strategies

Country	Relevant component of Country Strategy	Examples of implementation
Cyprus	Expansion of the renewable energy sector	Projects supported by the Bank directly expanded the renewable energy sector (for example CYPV and TPT Solar)
Egypt	Support Egypt's Green Economy Transition	Support for Benban site projects and associated PD, support to wind and energy efficiency projects, grid investment
Jordan	Enhance energy sustainability and energy efficiency: supporting Jordan to meet growing demand while reducing the country's energy import dependence, that is the development of renewable sources for electricity generation	Support to solar projects (for example Al Mafraq and Al Safawi), as well as investments in grid infrastructure and associated capacity building
Kazakhstan	Promoting low-carbon growth and energy efficiency	Support to Kazakhstan solar projects through the Kazakhstan Renewable Energy Framework, and associated policy dialogue (for example on developing a carbon market).
Ukraine	Strengthening energy security through effective regulation, market liberalisation, diversified and increased production, and energy efficiency	Support to Electricity Market Law of 2017, associated PD and capacity building for the regulator, developing PPA template for

		renewables, and investment in solar projects (for example Yavoriv 1 and 2)
Uzbekistan	Promoting green energy and resource solutions across sectors	Support to first utility-scale solar plant (Nur Navoi) and subsequent support to follow-on solar (Samarkand) and wind plants

3. Results of policy dialogue related to solar power operations

Evaluation Question: What results did the EBRD achieve in the solar sector through its policy dialogue, in the sample project countries?

- The Bank has played a significant role in policy dialogue in solar power sector (which often also benefited other RE sub-sectors). However, progress has been uneven, with regulatory and policy constraints an ongoing barrier to investment in some COOs.
- There is no defined strategy encapsulating the Bank's policy dialogue in the solar sector. However, the Bank's policy dialogue objectives have been generally consistent across different COOs.
- Even without a defined strategy in place, in most countries within the evaluation sample the Bank has taken a holistic approach towards development of the solar sector. This recognises that in most cases the Bank has invested in solar with a longer-term vision for the energy sector, and supported other components (for example the grid) with financing and TC.
- The results of the Bank's policy dialogue activities are best demonstrated by the success of competitive auctions in attracting international sponsors to develop solar plants in counties with a nascent solar industry, at very competitive prices.

The Bank does not have a defined strategy for its policy dialogue interventions in the solar sector; whilst the Energy Strategy 2019-23 outlines the Bank's objective to support the development of the solar industry, it does not explicitly set out the Bank's policy approach. Despite that, the Bank has taken a relatively consistent approach in countries within the evaluation sample, as Box 5 summarises.

In **Egypt**, the Bank has supported the development of a bankable PPA as well as the transition from FiT to competitive auctions. It also provided guidance on incorporating solar into the grid.

In **Ukraine**, the Bank began by supporting the development of a set of guidelines for competitive auctions. The focus of its policy dialogue has now switched to strengthening the energy off-taker.

In **Uzbekistan** the Bank assisted in unbundling Uzbekenergo and supported corporate governance improvements at the unbundled companies. It also helped to organise competitive auctions (for wind power) and to develop a high-level vision for Uzbekistan's Green Transition – the Low Carbon Pathway.

In coordination with the World Bank and USAID, the EBRD supported the launch of competitive RE auctions in **Kazakhstan**, and also provided advice on strengthening the bankability of PPA.

In **Jordan**, the focus of the Bank's policy dialogue has been on the integration of intermittent solar energy into the national grid, as well as support to the renewable energy approval process.

In **Cyprus**, the Bank has provided advice to improve the bankability of renewable energy projects and has supported studies to assess barriers towards investment in solar and other RES.

To help visualise the causal mechanisms and to provide an overarching structure for assessing the Bank's policy dialogue functions, EvD has developed a Theory of Change (in Annex 4). This Theory of Change was developed retrospectively based on EvD's analysis of how different components interact and what their intended outcomes are.

The Bank's policy dialogue to support solar can broadly be split into **four components under two main headlines**:

1. Policy dialogue *directly* related to the development of solar power:
   - The development of a **bankable PPA**
   - Supporting **competitive auctions**
2. Policy dialogue *indirectly* related to the development of solar power:
   - Initiatives to **manage the challenges of intermittent power** generation from solar (often associated with financing of transmission grids)
   - Expanding **carbon credit markets** to incorporate solar
   - Providing support for the development of a **holistic, macro vision** for the energy sector

3.1. Developing bankable PPAs and supporting competitive auctions

A critical first step for the Bank was the development of a "bankable" PPA, which offers investors the security to make long-term investments in solar power plants. A bankable PPA has several key components, including length of contract, clear dispute resolution mechanisms, minimisation of local currency risk, and a credible and creditworthy off-taker. Concrete examples of the Bank's policy dialogue engagement in this area include advocacy in Egypt to include an international arbitration clause in the PPA, and support for introducing FX-indexation to Kazakhstan's FiT. The Bank has also taken a firm stance against the local content requirements, see Box 6.

Box 6: Local content requirements in solar manufacturing

In supporting the development of PPAs, the EBRD has taken a consistent stand against both "local content requirements", which require a certain share of project value to be manufactured in-country, as well as "local content premiums", which incentivise domestic production via a tariff premium. This has led to the EBRD effectively halting financing in some countries (for example Turkey) where there are significant local content requirements. As well as advocating against local content preferences in discussions with policy counterparts, the Bank has also developed an internal incentive, with projects with local content components automatically attracting a TI-Score downgrade. Policy-makers emphasised to EvD the strength of the Bank's position on this matter, which is clearly in line with the EBRD's guidance on *Renewable Energy Projects in Countries with Local Content Policies* (SGS19-431). None of the projects within the evaluation sample have benefited from local content premiums.

The Bank has also focused on building capacity in solar energy off-takers. This support reflects the central role of the off-taker as a source of risk for solar energy projects; building the capacity and credibility of off-takers helps to improve bankability. The Bank's support has typically comprised advice on unbundling of state-owned energy enterprises, guidance on corporate governance and financial investment. In Uzbekistan, for example, with the Bank's support the national power utility was "unbundled" into three companies. Subsequent follow-on support has included TC to strengthen the unbundled generation company's and grid operator's compliance function, as well helping them to attain an internationally-recognised anti-corruption certificate. In Jordan, the Bank

has funded TC on the off-taker's compliance, HR and risk functions, whilst in Ukraine the initial off-taker (Ukrenergo) received TC, through which it became the first state organisation in the country to receive a Certificate of Excellence in Procurement from the UK-based Chartered Institute of Procurement and Supply.

After developing a bankable PPA, the Bank has typically shifted towards supporting the transition from FiT to competitive auctions. Whilst FiT can offer attractive financial incentives for investors entering the market, competitive auctions help to deliver the lowest price energy for consumers and for governments. The EBRD has implicitly prioritised low-cost solar energy through supporting the transition from FiT to competitive auctions.

Whilst the Bank has supported FiT projects (as in Egypt, Jordan and Ukraine), this support is normally linked to wider policy dialogue to move towards competitive auctions[12]. The Board has also requested closer scrutiny of all FiT-based RES projects. The Bank has supported the launch of auctions in Egypt, Kazakhstan and Uzbekistan, and has provided ongoing support to the auctions process in Ukraine. As a result of the Bank's growing expertise and reputation in the area of policy auctions, the EBRD has co-produced guidelines for the *Competitive Selection and Support for Renewable Energy*, in coordination with the International Renewable Energy Agency (IRENA). Using that as a foundation, the EBRD has supported auctions in the sample countries (often in cooperation with other IFIs, see Box 5) or outside the evaluation sample (see Box 7).

Box 7: The Bank's experience with renewable energy auctions

In **Albania**, the Bank has been supporting auctions, auctioneers' training and also governance improvements for the off-taker to make the scheme workable and bankable. The Bank has also provided support for RE law compatibility with EU legislation (working with KfW) and advised on balancing provisions.

In **Lebanon** the Bank started with a small TC on PPAs as the country had already started competitive procurement (round 1 for wind and solar). The Banking team provided support on the post-auction contractual framework, while ESD advised on environmental issues (bird migration). The Bank has also worked to improve transparency of the distribution company (EDL).

In **Serbia**, the Bank provided support for the bidding scheme, PPA, and it is now working on RE Law, which includes an auction approach for RES.

Azerbaijan didn't have any RES legal framework or auction-related contractual documents. These were prepared from scratch under a TC.

When **Greece** was designing its auction programme (2017-18) the Bank participated in the consultation process and advised the regulator on bankability issues. Currently, the Bank is implementing a TC to assist the Greek Ministry of Environment and Energy in developing an Offshore Wind Regulatory Framework.

In several countries the EBRD has played a central role in the solar auction process, both as a financer but also as a provider of policy dialogue and other forms of support. In Uzbekistan, the Head of Power at the Ministry of Investment and Foreign Trade (MIFT) stressed that without the unbundling process and corporate governance improvement supported by the EBRD, the country would not have been able to attract private-sector investors to its RE sector because of corporate

[12] For example in the Board Memo for the Infinity /ib Vogt 1 project, it states that the Bank will "continue that policy dialogue with a focus on supporting the introduction of competitive tenders" (BDS17-075 ADD4).

governance and transparency concerns. Similarly, representatives from the Egyptian Electricity Transmission Company (EETC) emphasised the importance of the TC project to draft a grid code for solar, which delineated responsibilities between the off-taker and developers and was a critical starting point for attracting investors.

There have been **three primary concrete results** from the Bank's policy dialogue activities in improving bankability and supporting the transition to competitive auctions:

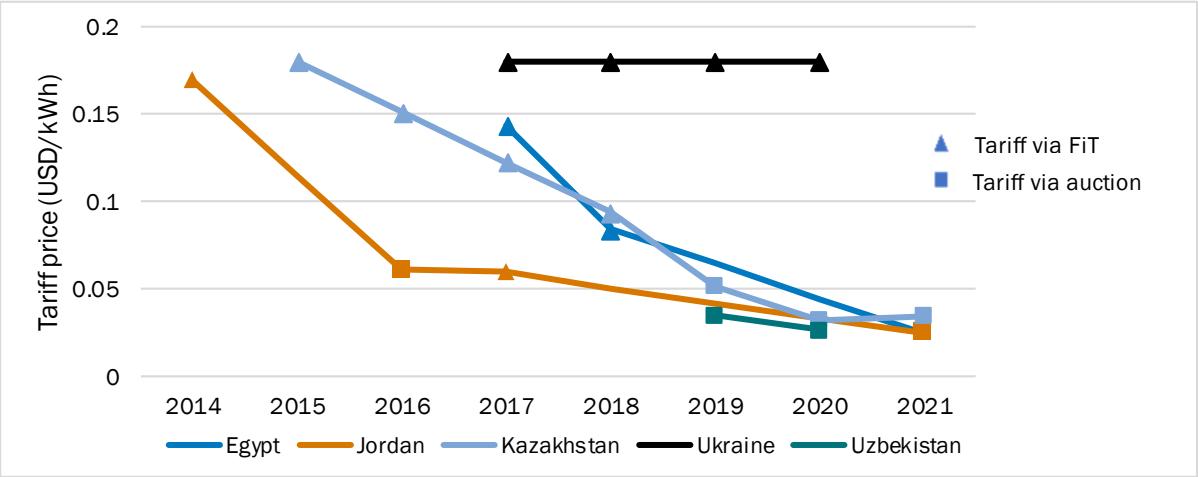
- The average solar energy tariff has fallen as FiTs were adjusted and auctions launched;
- Private sector RES developers have invested in countries with a limited track record of supporting solar energy and private-sector participation in the energy sector;
- Solar PV capacity has climbed rapidly, especially in Egypt, Jordan and Ukraine.

Subsequent sections of this chapter briefly describe these results.

3.1.1. *Falling cost of solar tariffs*

The tariffs payable for solar power decreased as countries adopted competitive auctions, the technology improved and the credibility of off-takers increased. The solar power concessions granted following auctions had much lower tariffs than those granted through tenders based on FiTs. This reconfirmed the rationale of the Bank's policy dialogue focus on introducing auctions.

Figure 7: Comparison of solar tariff prices in selected evaluation countries



Source: EvD's analysis of Board documents

Table 3 below presents tariffs achieved under the sample projects.

Table 3. Solar producer tariffs under the evaluation sample (and Spitalle Solar in Albania)

Project	Country	Signed	Pricing method	Price as per PPA	Generator's tariff (US$ per KWh)
Nur Navoi	Uzbekistan	2020	Auction	US$ 0.027	0.027
Albania Spitallë (not evaluation sample)	*Albania*	*2021*	*Auction*	*€0.02889*	*0.035*
Al Safawi solar PV project	Jordan	2017	Auction	US$ 0.063	0.063
FRV Al Mafraq Solar PV Project - 50MW	Jordan	2016	Auction	US$ 0.0766	0.077
EREF:Infinity / Ib Vogt Solar PV 1 - 30 MW	Egypt	2017	FiT	US$ 0.084	0.084
EREF:Infinity / Ib Vogt Solar PV 2 - 50 MW	Egypt	2017	FiT	UD$ 0.084	0.084

KAZREF - Risen Solar	Kazakhstan	2018	FiT	KZT 34.61	0.100
KAZREF - Chulakkurgan	Kazakhstan	2019	FiT	KZT 34.61	0.100
DFF - CYPV Solar -7.4 MW, Famagusta	Cyprus	2016	Auction	€c0.82-0.99	0.110
DFF - TPT Solar - 4.5 MW, Nicosia/Nisou	Cyprus	2016	Auction	€c0.82-0.99	0.110
USELF: Yavoriv Solar Power Plant	Ukraine	2017	FiT	€0.15	0.180
Yavoriv 2 (merged with 1)	Ukraine	2019	FiT	€0.15	0.180

Box 8: The Bank's approach to analysis of consumer affordability in solar power projects

The Bank has sometimes incorporated in the Board Reports assessments of the relative cost of solar power, and the extent to which that affects consumers (affordability) and governments. This is important as, if the Bank expects to make a significant number of RE investments in a single country, it might have a material impact on end-user tariffs. However, the affordability analysis methodology and approach used have not been uniform. In Ukraine, for example, the Bank forecast the percentage change in household monthly expenditure on electricity, while in Egypt, it calculated the percentage change in end-user electricity prices. Using different metrics makes comparability challenging. In other countries where the Bank has supported renewables outside of a framework, EvD has not found similar analysis.

The Bank could consider adopting a simpler methodology by providing a comparison of the solar energy tariff with the country-specific prevailing wholesale energy price. This would provide a clear picture of the extent to which solar providers are receiving an implicit subsidy.

3.1.2. *Increased private-sector participation*

Even as tariffs have fallen, the policies supported by the Bank have attracted private-sector sponsors to the solar sector. All of the Bank's projects have also been correctly classified as "private". However, the state's involvement in these projects (through sovereign payment guarantees provided to off-takers) has been instrumental for the success (for example in Egypt and Uzbekistan). There has also been good diversification of project sponsors, including large sponsors with multi-country portfolios (for example FRV in Jordan, Risen in Kazakhstan and Masdar in Uzbekistan), partnerships between international and local firms (for example Infinity-and IB Vogt in Egypt) and local entrepreneurs (in Ukraine and Cyprus).

The Bank's engagement in Egypt demonstrates how improving bankability can attract private-sector investors. Egypt's initial FiT, launched in 2014, attracted only a single developer, despite a generous tariff. The central issue for developers and bankers was the arbitration court's jurisdiction (in Egypt), which increased the perceived risks for investors and bankers. The Bank led engagement with the Egyptian authorities on resolving this issue, and international arbitration was introduced into the PPAs under the second round of the FiT, launched in 2017. The second round of Egypt's FiT had a substantially lower tariff (US$ 0.084 per kWh compared to US$ 0.143 per kWh in the first round of the FiT), but was markedly more successful, with a total of 30 solar projects

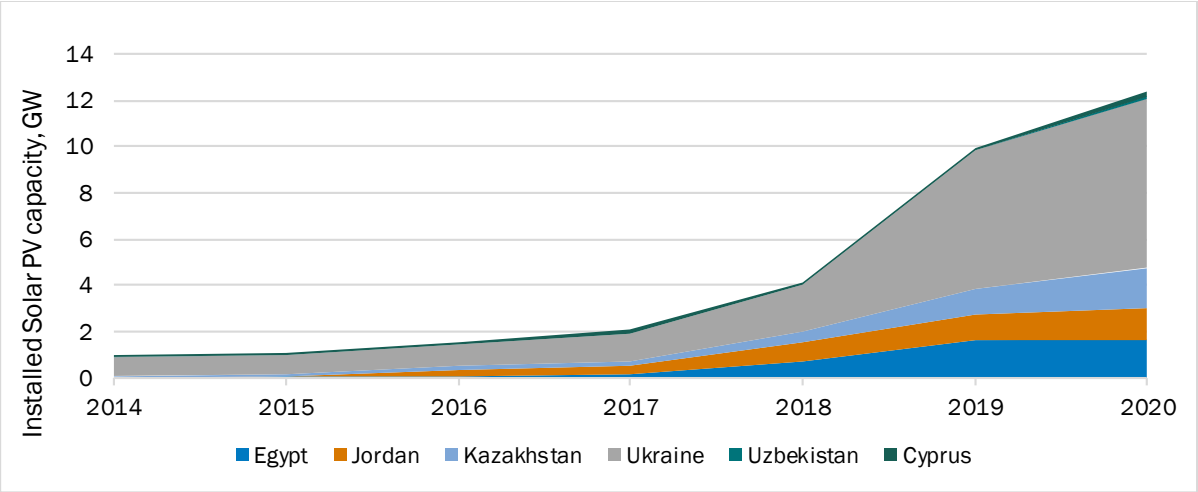
reaching financial close, providing a combined 1,390MW of capacity.[13]

Although there has been tangible success in attracting private-sector developers, financing continues to be dominated by IFIs rather than commercial banks. This reflects the risk appetite of IFIs and their access to concessional green-related financing, as well as prohibitive restrictions which constrain local financial institutions from offering project finance for solar power (for example in Egypt, Jordan and Ukraine) – see recommendation 4.

3.1.3. *Rapid increase in solar energy installed capacity*

The third tangible result is the rapid increase in installed solar capacity within the countries in the evaluation sample. The combined installed capacity increased from 0.98GW in 2014 to 12.37GW in 2020 – and will rise further, given that this figure does not include plants connected to the grid in 2021 (for example Nur Navoi in Uzbekistan, a 100MW plant evaluated in this study), as well as plants which have been contracted but not yet built. This growth outpaced the global average; global solar PV capacity increased by 404% between 2014 and 2020, whilst in the six countries assessed by EvD installed capacity rose by 1,268% in the same period, see Figure 8.

Figure 8: Combined installed solar capacity in evaluation sample



Source: IRENA Renewable Energy Database

3.1.4. *Ukraine case study*

Ukraine requires specific analysis, as a case study which illustrates the risk in trying to balance incentives for solar power producers with cost and capacity constraints. It stands out as a unique situation: in 2018, more utility-scale solar PV capacity was installed in Ukraine than in all of the Bank's other economies combined, with the exception of Turkey. Some 44% of the Bank's solar investments made in 2018 and 2019 were in the Ukraine. Yet by 2020, all of these projects were in corporate recovery and the industry was in turmoil.

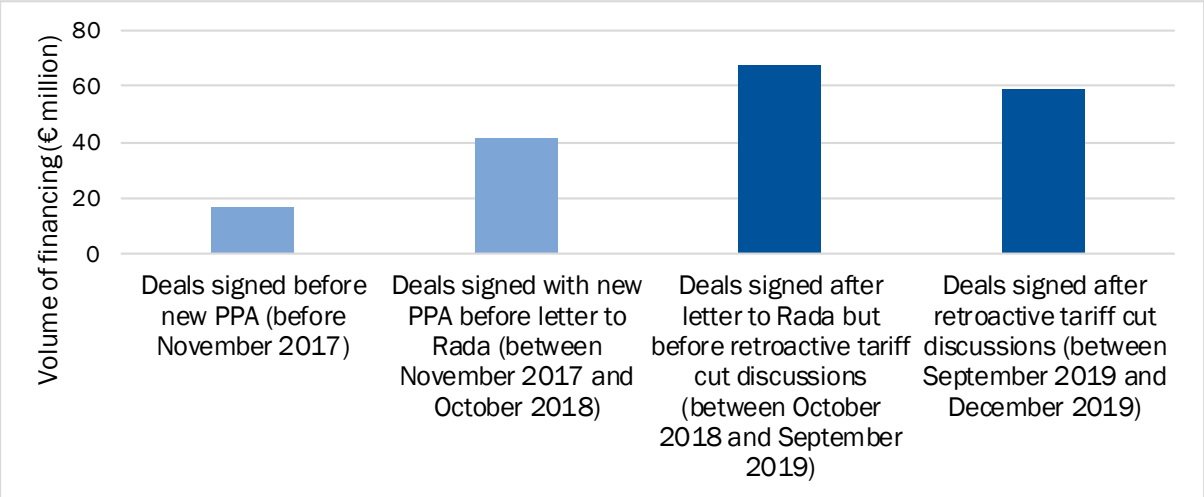
Although on one hand a rapid increase of solar is desirable and fully in line with the country's (and the Bank's) strategic objectives, it does create serious challenges for some of the Bank's region. The case of Ukraine illustrates the risk in trying to develop RES quickly through generous incentives but with cost and capacity constraints. The introduction of a bankable PPA in late 2017, combined with a generous FiT, led to a surge of interest in the sector, and solar power capacity in Ukraine

[13] https://ijglobal.com/articles/130622/egypt-closes-solar-fit-2-at-half-the-price

increased dramatically between 2017 and 2020 (some 250% in 2019 alone).

Although the Bank did not play any part in the design of generous FiT[14], it provided added incentive through support to the design of a bankable PPA in 2017 (mobilising TC-funded legal support and working closely with the sector regulator to revise the PPA template for renewables). It was also "strongly supportive" of the Electricity Market Law of 2017, which enshrined within primary legislation the FiT rate for solar, and started the process of creating a new entity, the Guaranteed Buyer, as the off-taker for renewable energy. The creation of the Guaranteed Buyer itself might not have been a problem, had its role and the funding structure been properly defined at the start and secured. However, as the new off-taker was only a pass-through entity, with no significant balance sheet of its own or the means to generate cashflow, it experienced serious liquidity problems as soon as demand eased (mainly due to the pandemic). Such liquidity was restored only in late 2021, after the Bank-supported bond issue by Ukrenergo. Finally, the Bank provided significant funding for solar projects during this period (see Figure 9).

Figure 9: EBRD investment in solar projects in Ukraine 2012-20



Source: EvD portfolio analysis

The combination of a lower demand, a rapid surge in solar energy with an extraordinarily high FiT and a newly-established Guaranteed Buyer without a strong balance sheet – along with the lack of government's support and wider political instability – created a serious liquidity crisis for the off-taker, later exacerbated by the Covid-19 crisis[15]. In September 2019 there were growing signs of the government's intention to cut the FiT retrospectively, with public reports of impending cuts in October 2019.[16] In 2020, after the COVID-19 pandemic started, the off-taker started to miss payments to renewable energy producers, and subsequently imposed a 15% cut in the FiT. Even after imposing the tariff cut, the off-taker has fallen behind with scheduled payments.

In the opinion of several interviewees, the Bank contributed to limiting these tariff cuts to 15% (the initial proposal was for 30%). The Bank also supported a US$ 825 million green bond placement

[14] A high level of such FiT is partially explained by a relatively short period of the PPA compared to economic life of the project (11 vs 20+ years).

[15] EvD notes that the Ukrainian Government first announced plans to consider tariff cuts during the Ukraine Energy Forum (held 25-27 February 2020), before Ukraine had experienced a single case of Covid-19. The pandemic exacerbated a very significant pre-existing issue (https://www.pv-magazine.com/2020/03/02/ukraine-mulls-retroactive-fit-cuts/)

[16] https://www.pv-magazine.com/2019/10/18/ukraine-solar-industry-poised-between-optimism-and-fears-of-fit-renegotiation/

in November 2021 by the state electricity grid operator, Ukrenergo, the proceeds from which were directed to the Guaranteed Buyer to cover part of its debts to RE producers. Some reports have argued that this didn't address *"the problem of the state's payment to green energy producers in the long term, which brought the Guaranteed Buyer to this abysmal debt"*.[17] However, according to EBRD bankers, the Bank took care as part of this transaction, to ensure sustainability of the Guaranteed Buyer's good financial condition[18].

It is clear that by 2018-19, the FiT, which level was originally set in 2008 became overly generous, mainly due to considerable drop in cost of PV panels over the last 10 years. This was evident both in the rapid growth of the sector, which reflects excessive incentives, as well as in a comparison of the FiT price with the prices in other countries. Tariffs for solar projects commissioned in 2019 in other COOs ranged from US$c 1.7/kWh to US$c 3.9/kWh (auctions) or US$c 8,4 - 10/kWh for older FiT tariffs (see table 3). In comparison, the Yavoriv-2 Solar Project (signed in 2019) had a FiT of US$c 18/kWh (€0.15/kWh). Box 9 provides more information. EvD notes that this issue has been historical and EvD has already outlined in its 2014 report on Policy Dialogue in Ukraine (PE13-577S) its concern about EBRD's inadvertent participation in the design of new RE frameworks and green tariffs, which have subsequently benefited certain oligarch groups.

Box 9: Political interference in the solar FiT in Ukraine

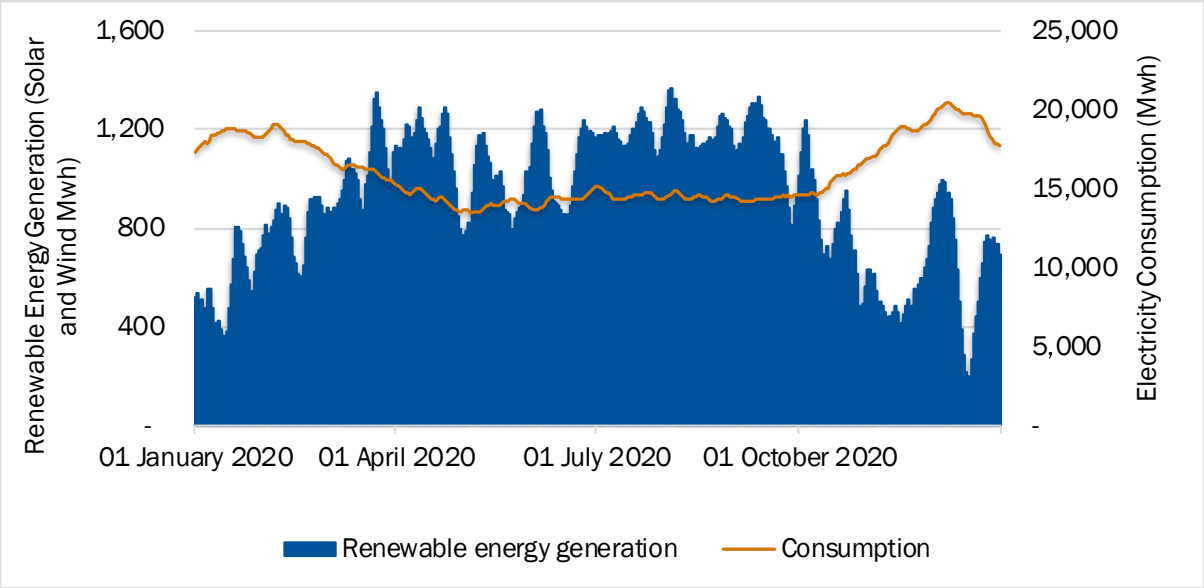
EvD was informed by multiple stakeholders that one of the key reasons behind the high solar tariff in Ukraine was the role of vested interests close to political decision-makers. This conclusion has also been supported by investigations conducted by the Organised Crime and Corruption Reporting Project (OCCPR) – *The Rich and Powerful Cash in from Ukraine's Green Energy Gold Rush (9 May 2019)*. EvD does not suggest that there was any political relationship involving the Bank's clients. However, given that this was public knowledge at the time, it does raise questions over why the Bank continued to invest in a sector which delivered benefits to oligarchs.

The EBRD recognised in this period that the Ukraine FiT was not sustainable. A letter to the Ukrainian Parliament dated 19 October 2018[19] highlighted the Bank's view that the FiT was *"no longer appropriate to support its long-term development"*, and as a result *"The EBRD will no longer be able to finance new projects in Ukraine that are relying on the GT [FiT] other than those already in its pipeline, unless the amended law is approved to guarantee the long-term sustainability of the sector"*. The Board Memorandum for USELF III[20] (3 July 2018) also recognised the risk of *"retroactive change to FiT regime"*, the probability of which was assessed as "high".

However, despite recognising the risk of tariff cuts and lack of sustainability in the system, the Bank continued to provide significant financing to the sector. It financed more solar power in Ukraine *after* publicly highlighting concerns over sustainability than it did before.

[17] https://www.kyivpost.com/business/ebrd-backs-ukrenergos-825-million-green-bailout.html
[18] One of the Condition Precedent for subscription of the new bond has been the signing of the Trilateral Agreement among Ukrenergo (TSO), the Regulator and the Ministry of Finance, which included Regulator's commitment to maintain tariffs payable to TSO at full cost recovery level, including 100% of the anticipated compensation to RES through TSO's transmission tariff. It has been implemented as planned and the TSO's tariffs have been raised. As the Guaranteed Buyer has been wholly owned by Ukrenergo, it is anticipated that such a solution will address the Guaranteed Buyer's liquidity issues in the long term.
[19] The letter from the Energy Community, co-signed by the EBRD, the World Bank and the European Commission to the Head of the Energy Sector Committee at the Ukrainian Parliament, dated 19 October 2018.
[20] BDS18-133

Figure 10: Generation is often highest when consumption is lower (weekly rolling average, Ukraine, 2020)



Source: Ukrenergo data (available from https://ua.energy/en/)

Even after concrete discussions on retroactive tariff cuts had started (which EvD is dating to September 2019, based on interviews), the Bank continued to accelerate the pace of financing to the sector to support projects seeking the FiT before the deadline at the end of 2019 (although no new projects were initiated/concept cleared after the announcement of the tariff cut).

This decision to continue supporting the sector despite raising concerns over the risk and sustainability had implications with respect to both sound banking and transition impact. At the end of 2020, all of the Bank's solar projects in Ukraine were in corporate recovery, as a result of missed payments from the Guaranteed Buyer. From a transition impact perspective, the development of the renewable energy sector has stalled, with declining investor confidence, ongoing court action between the Government of Ukraine and renewable energy producers, and no political consensus on adopting a competitive auction system.

Evidence shows that it was questionable of the Bank to continue to support a system it knew not to be appropriate nor sustainable. Whilst the Bank did try to raise concerns with policy-makers (for instance in the letter to the Ukrainian Parliament in October 2018), the continued provision (and acceleration) of financing to solar generation projects, arguably undermined the Bank's own position. A stronger signal would have been to recognise that a bubble was forming, and to cut funding to solar projects entirely.

EvD does not have evidence to suggest that the Bank was the cause of this "solar bubble". Although the Bank supported the Electricity Market Law of 2017, and was consulted on it, the EBRD was not behind the decision to enshrine the FiT in primary legislation (which made it difficult and time-consuming to change). The Bank did provide significant financing between 2017 and 2019 (a total of €168 million), but the sector developed so rapidly that it is not clear whether this financing was pivotal; estimates suggest that over 2018-19 the sector attracted over €5 billion of investment[21] (which perhaps raises a different question over additionality). However, a clear signal

[21] https://www.renewableenergyworld.com/solar/why-ukraines-once-thriving-renewable-energy-sector-could-be-at-dire-risk-of-failure/#gref

by a well-respected IFI to pause financing, rather than enthusiastic support, may have contributed to a more effective long-term policy environment for the solar industry.

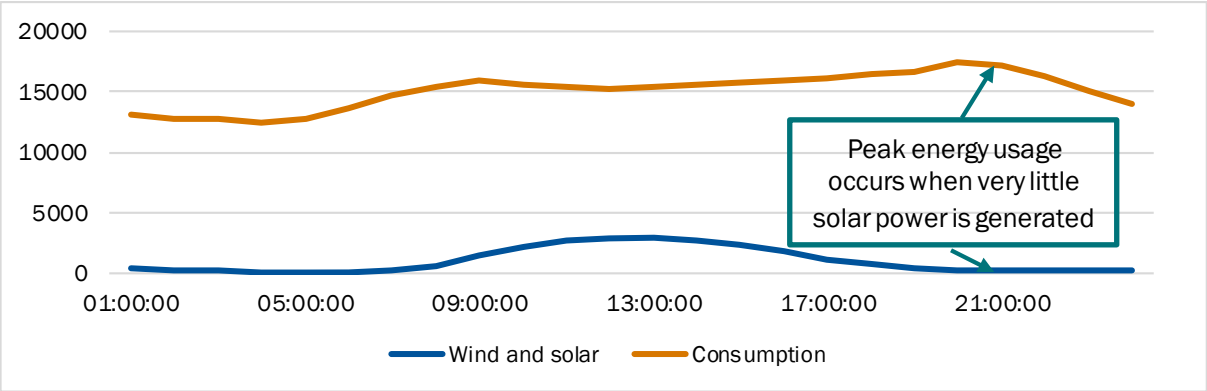
EvD would also note that more broadly, the Bank has made significant and positive contributions to the Ukrainian climate action and energy sector in general. Stakeholders interviewed by EvD highlighted the importance of the Bank's work in contributing to the increased capacity and independence of key institutions, and to modernising the national grid.

Finally, EvD notes that COVID-19 pandemic, which ultimately exacerbated the Guaranteed Buyer's liquidity problems, was impossible to predict. Nevertheless, evidence shows that the Bank could have been more careful with financing solar operations in Ukraine on a large scale, after it had correctly diagnosed (in October 2018) serious flaws in the system and high risks associated with the continuation of such financing.

3.2. Managing intermittent power generation – policy dialogue indirectly related to solar power development

Solar is an intermittent power source; solar energy is generated in daylight hours, which does not always correlate with peak levels of demand. In Ukraine, for example, energy demand typically peaks during the evening, when energy generation from solar is low.

Figure 11: Hourly variation in renewable energy output in Ukraine, versus consumption



Source: Ukrenergo data (available from https://ua.energy/en/)

Furthermore, output can vary significantly throughout the year due to seasonal changes. In some locations (for example Ukraine), the peak of energy demand is in winter, when solar energy generation is low.

Managing the intermittency of solar generation becomes a significant challenge when solar becomes a major source of power. Whilst it is possible to develop the first wave of solar PV without addressing intermittency, it can become a major constraint to scaling and expanding the sector further. The challenge of intermittency also varies by country; Ukraine is an extreme example, where solar generation is much lower and energy consumption higher in winter than in summer.

There are two central issues related to solar intermittency. First, grids need to be modernised and upgraded, to enable "smart" management of the system, so that no energy is wasted during peak solar generation. Second, without storage, cross-border connections, effective demand management or other flexible forms of energy generation there can be challenges balancing the energy produced by solar energy with demand.

These barriers can effectively halt growth. In Jordan, for example, the government suspended

approvals of renewable energy projects in 2019 pending analysis of the grid's technical capacity.[22] Similarly, in Romania, the government capped the volume of RE projects at 4,000MW, as without further support the grid could not accommodate more intermittent power generation. This also was the case with Egypt in 2021.

Box 10. Distributed solar system

Distributed solar systems (that is, small household solar systems connected to the national grid) can create significant challenges for managing intermittency. The supply profile of energy from distributed solar mirrors the supply of energy from utility solar projects (that is, electricity is generated during the day), and so an expanding distributed solar market can exacerbate the mismatch between supply and demand. From a strategic and planning perspective, it is difficult to control the growth of distributed solar; whilst utility-scale power plants require a licensing and regulatory process, giving policy-makers the capacity to steer development and control market size, the same is not true for household solar.

In Jordan, the growth of the distributed solar surprised policy-makers, and contributed to a pause on commissioning new utility-scale plants given issues in managing capacity and intermittency. The government now expects most renewable growth in the next 10 years to come from expansions in distributed solar, rather than new utility-scale solar plants.

The EBRD's solutions for managing intermittency combine investments in projects related to solar, with associated policy dialogue and TC. The tools can be summarised as:

- Support to grid infrastructure and grid technical capacity.
- Supporting the development of energy storage options.
- Developing cross-border regional interconnections.
- Financing non-solar energy to support grid balancing (for example gas).

3.2.1. *Support to grid infrastructure*

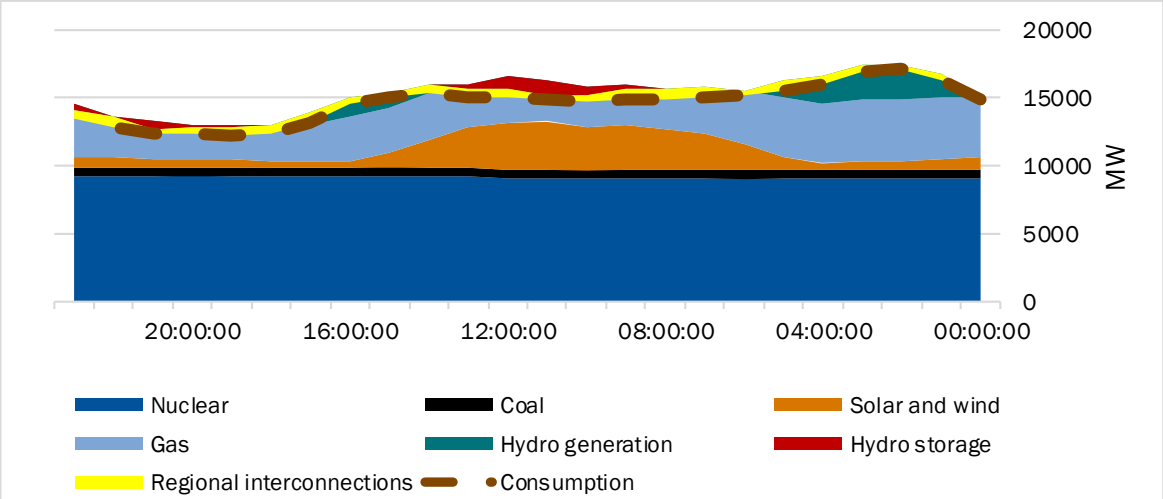
A key challenge in managing intermittent energy generation is having robust grid infrastructure. This can be a particular issue with solar generation, as solar PV plants are often located in inhospitable environments (areas of high sun), and given the space required, in low-population density regions. Prior to the development of solar, these regions often lacked the transmission infrastructure to transport energy to where demand is. In Egypt, for example, the Benban plant, which covers 37.7 km^2, is located in the sparsely populated area of Upper Egypt. This required the development of additional grid infrastructure.

The Bank has consistently recognised the importance of coupling direct investments into solar electricity generating plants with support to grid infrastructure. This is reflected both within country strategies and diagnostics, as well as by the Bank's active investment in and support to national grids to accommodate intermittent solar energy generation. See Table 4.

22 https://www.pv-magazine.com/2019/01/28/jordan-suspends-renewables-auctions-new-licenses-for-projects-over-1-mw/

Box 11: Balancing electricity grids

Analysis of power generation in Ukraine demonstrates the importance of developing cross-border connections, financing non-solar energy (particularly gas), and supporting energy storage. The graph below shows electricity generation versus consumption by hour on 6 September 2021 in Ukraine. Coal and nuclear (in black and dark blue) are baseload power sources which cannot easily be turned off or on. Renewables (85% of which is solar), in orange, peaks in daylight hours. Gas and hydro (in light blue and turquoise) are used for grid balancing – scaling up and down electricity generation to accommodate solar energy and to meet changes in electricity demand (the dashed brown line). Ukraine also has some limited capacity to sell excess energy via cross-border electricity interconnections (in yellow) and store electricity using hydro pump storage (in red). This helps to manage the fact that peak renewable energy generation does not coincide with peak demand, and ensures that no excess electricity generation is "wasted". More broadly, investment into the national grid and capacity building for the grid manager helps to enable switching between different energy types and efficient grid balancing.



Source: Ukrenergo data (available from https://ua.energy/en/)

Table 4: Summary of EBRD support to grid infrastructure

Country	EBRD support to grid infrastructure
Jordan	US$ 265 million sovereign-guaranteed loan to the National Electric Power Company (NEPCO), including US$ 65 million of financing of capex to improve renewable energy integration. In addition, €500,000 TC on RE Integration (assessing RE absorption capacity of the grid).
Egypt	€182.9 million sovereign loan to Egyptian Electricity Transmission Company, to construct and upgrade high voltage substations. Rationale for investment included "connection of new renewable energy plants" to enable "Egypt's accelerating exploitation of its outstanding renewable energy resources".
Kazakhstan	Multiple loans to KEGOC, the national transmission company. More recently financing of regional transmission providers, for example KZT 5 billion to Karaganzy Zharyk to assist "in the development of the renewables sector in the region [which] is endowed with significant renewable energy potential with three solar projects" including both the Kazakh solar projects within the evaluation sample. Funding was for the modernisation of substations, construction of new power lines, and control systems.
Ukraine	€149 million sovereign-guaranteed loan to the National Energy Company (Ukrenergo) to finance 26 new transformers and the upgrade of 12 high voltage sub-stations. Associated TC included a grid absorption study "aimed at contributing to the launch of renewable auctions and renewable quota setting".
Uzbekistan	US$ 96.1 million and US$82.5 million sovereign loan to National Electric Networks of Uzbekistan to finance the construction of a high-voltage transmission line and high voltage sub-stations in the Navoi region, which is a "fundamental ingredient to strengthen the grid around Navoi to exploit the solar potential in Navoi".

In aggregate, the Bank has invested approximately €0.8 billion in transmission networks in five of the six countries within the evaluation sample, and in each the Board Memorandum has highlighted the relationship between investments within transmission infrastructure and renewable energy. Furthermore, in Jordan, Kazakhstan and Uzbekistan, there is a clear and direct connection between the Bank's grid investment and the solar projects. Beyond the evaluation sample, in 2016-20 the Bank financed an additional €0.4 billion of transmission infrastructure improvements in Armenia, Bosnia & Herzegovina, Georgia, Moldova, Poland and Tunisia.

These investments are significant, as they demonstrate that the Bank is taking a holistic approach towards the development of the solar/RE/energy sector; and supporting activities which are integral to the sector's expansion. Financing transmission infrastructure can be difficult as within COOs this generally involves public-sector entities with sovereign backing, who often have significant challenges with respect to corporate governance and cashflow. Given these challenges, it is a credit to the Bank that it has supported grid financing, providing in aggregate approximately similar amounts of funding to such projects as it has too much simpler private-sector solar power plant projects.

Moreover, EvD notes that the benefits of the Bank's work with the transmission network operators go well beyond technical considerations. This is because historically, such operators have been often resistant to scaling up renewables, due to their typically close association with incumbent generators, conservative and risk-averse culture, as well as the overriding objective of system stability rather than decarbonisation. The Bank's role and success in "spreading the green gospel" among the transmission companies' management, should not be underestimated (and it was evident during the EvD's interviews with the heads of NEPCO in Jordan, Ukrenergo and the National Electric Networks of Uzbekistan, all of who expressed their support for RE in general).

3.2.2. *Developing cross-border regional interconnections*

Promoting regional energy connections can help accommodate solar power generation by deepening the electricity market and by changing the profile of demand and supply (particularly if across time-zones). The importance of interregional connections to the development of the sector was repeatedly emphasised by stakeholders. In particular, policy-makers in Ukraine, Jordan, and Uzbekistan noted that cross-border connections would be a "game-changer" for solar power.

In the last five years the Bank financed two cross-border interconnection lines: North Macedonia – Albania Transmission (Id 46274, €37 million, 2015) and Moldova-Romania Power Interconnection (Id 47087, for €80 million, 2017). It has also supported the integration of regional electricity systems through policy dialogue and TC particularly in Ukraine, where there have been regional integration components to several EBRD projects with Ukrenergo, the grid operator. Compared to other MDBs, there is perhaps a smaller role for the EBRD here: regional energy interconnections often involve sovereign rather than private-sector projects, and the EBRD also faces a comparative disadvantage in not always working with all countries in a region (for instance in Jordan, a potential transmission line to Lebanon runs through Syria, which is not a COO; there is also a planned transmission line to Iraq, which is currently not a COO either; in Ukraine, the government is considering integration with countries such as Austria and Germany).

3.2.3. *Financing non-solar energy to support balancing*

Financing other sources of electricity can also help with "balancing" the grid to better support intermittent solar energy generation. In particular, gas complements solar well as it can be easily turned off and on to accommodate changes in solar energy generation. Policy-makers in Cyprus, Jordan, Ukraine and Uzbekistan stressed the role that modern gas power plants have in supporting the growth of solar by providing greater flexibility to the power generation infrastructure.

The EBRD has supported such investments in the past, for example by providing a US$ 200 million loan in Uzbekistan to develop a gas-fired power plant (Syrdarya Power Project: BDS21-008). As described in the Board Memorandum for that project, that plant will play a critical role in facilitating the *"rapidly growing renewable generating capacity additions to the system"*. This project is also aligned with the strategy set out in Low Carbon Pathway for Uzbekistan, which mapped out Uzbekistan's trajectory to zero-carbon energy generation by 2050 (prepared under the Bank's TC).

Similarly, in Cyprus the Bank has invested in a floating storage unit for gas (FSRU, BDS20-076). The rationale for this investment included facilitating the expansion of renewable energy generation, as floating storage infrastructure provides the flexibility to accommodate intermittent solar power.

3.2.4. *Supporting the development of energy storage options*

Energy storage can ensure that excess solar generation can be deployed in later periods. Three primary forms of energy storage exist:

- Chemical batteries, typically lithium-based. This technology is currently expensive but is developing rapidly, with some estimates suggesting that costs have fallen by nearly 70% in the past five years,[23] with a further 40% cost reduction expected by 2030.[24]
- Using hydrogen as an energy vector (see Box 12).
- Pump hydro storage, which is a proven technology which boasts 70-80% energy storage efficiency, but requires a particular geography and has environmental implications.

In 2018, the Bank's TC developed an initial energy storage roadmap for Jordan, with a focus on enabling regulation. The government decided not to proceed with a pilot project due to very high cost estimates. However, GiZ and JICA have built on the EBRD study to conduct a feasibility assessment of two technical options (one being pump-hydro storage) in Jordan. Internally, the Bank has approved a TC framework for the development of energy storage systems (TCRS #10717) which will "build on the Bank's specific experience in engaging in supporting legal and regulatory reforms focused on energy storage in Jordan".

The Bank's clearest contribution to addressing the challenge of solar intermittency has been in providing finance and associated TC to grid operators, which has had a direct impact in underpinning the development of the solar sector. This has been a comprehensive and holistic approach, with grid infrastructure investments made in five of the six countries within the evaluation sample, and an explicit relationship articulated between the grid investments and solar projects within project approval documents.

[23] https://www.eia.gov/todayinenergy/detail.php?id=45596&src=email
[24] https://www.nrel.gov/docs/fy19osti/73222.pdf

In other areas, whilst the Bank has started to explore options to solve intermittency problems, so far these have not evolved to become a significant and integral part of the Bank's approach to the sector. Initial TC assignments exploring the feasibility of storage and cross-border actions have broadly not translated into bankable projects with material outcomes.

Box 12: Green hydrogen

"Green" hydrogen has significant potential as a vector for energy storage. Electricity generated from renewable energy sources is used to split water into hydrogen molecules, thereby creating an effective fuel for combustion. Hydrogen can be used as an energy source in a variety of different applications, including transport, heating and electricity generation. It could also be an effective "storage" unit for surplus electricity from intermittent renewable energy sources, and therefore could address a significant constraint on the sector related to intermittency and energy storage. The green hydrogen market is currently very small, but is expected to develop rapidly as the technology improves and has the potential to address the climate emergency. The EBRD forecasts that the hydrogen market will require a total of US$ 3.7 trillion of investment by 2050.

Although the market is nascent, some of the EBRD's clients have started to explore hydrogen options; Masdar, the developer behind Nur Navoi plant in Uzbekistan, is currently trialling a green hydrogen project in Abu Dhabi, whilst FRV, the sponsor behind Bank-supported projects in Jordan, is participating in a green hydrogen transport project in Madrid. Eco-Optima, the developer behind the Yavoriv solar projects in Ukraine, has signed an exploratory agreement with energy companies in Austria, Germany and Slovakia to create green hydrogen from solar power in Ukraine for use in Austria and Germany.

The EBRD has recognised the importance of hydrogen in the climate transition and held an Information Session for the Board in January 2021. Although not a full strategy, it did outline short-term actions the Bank could take to support the development of the hydrogen market. The Bank has also launched a consultancy assignment to assess emerging opportunities for green hydrogen in EBRD countries.

3.3. Carbon credit markets and solar power generation

The Bank has provided policy support for the development of a carbon credit market, primarily in Kazakhstan and Uzbekistan. Part of the underlying rationale is to help monetise the positive environmental impact from solar power, thereby increasing the incentives for investment.

These assignments have had little impact on the solar sector yet. In Uzbekistan, policy work on the development of the carbon credit market is ongoing, and the market is not yet operational. In Kazakhstan, the market is open, but it is small and no solar projects are registered on it.

3.4. Developing a macro vision for the energy sector

The EBRD has also engaged in the development of wider strategic visions for the sector, including through designing "Low Carbon Pathways". The first Low Carbon Pathway was launched in Uzbekistan, and the Bank is now (early 2022) implementing the second such project, this time in Jordan. A low carbon pathway can help in developing a holistic picture of energy systems with renewables at their centre, and in doing so develop solutions for accommodating energy intermittency.

In Uzbekistan the Low Carbon Pathway demonstrated the importance of developing modern gas power stations to support energy balancing. Co-developing a low carbon pathway with government

authorities can also help create political consensus and momentum behind the development of renewables and a plan for decommissioning the least efficient thermal units. The Bank's loan under the VISP Response project contains covenants requiring the government to decommission 450MW of old thermal units, and the Bank's Syrdarya Power project refers to the government's commitment to decommission 1,170 MW of thermal power. The Deputy Minister of Energy confirmed with EvD that Uzbekistan's government will decommission an additional 4.5 GW of inefficient thermal power capacity, replacing it with RES and gas-fired capacity.

In addition to involvement in the various types of policy dialogue described in this section, the Bank has also engaged in *ad hoc* interventions on behalf of solar investors, which could be treated as policy dialogue, see Box 13.

Box 13: The EBRD as a dispute mediator

The EBRD has also played a critical role in mediating disputes between off-takers and solar energy producers. In Jordan, for example, at the beginning of the COVID-19 pandemic the off-taker, temporarily deferred the settlement of 25% of the invoiced generation payments. A range of stakeholders, including the client, highlighted during EvD's interviews that the EBRD helped to settle the situation between the off-taker and power producers "by acting as a bridge between the two sides and proposing an acceptable compromise…the settlement agreement was largely prepared by the Bank and its advisors". The eventual settlement saw the off-taker settle all debts.

The Bank had a similar position in Ukraine, after the government made clear in 2019 that it planned to retrospectively cut the solar FiT and stopped payments to RE producers. Whilst the overall outcome of the Bank's involvement in this dispute was mixed, stakeholders suggested that without the Bank's strong pressure the tariff cut could have been much more damaging. The Bank then supported the issue of Ukrenergo's corporate bond, from which proceeds most of the arrears have been repaid.

The Bank's overall performance in policy dialogue in respect of solar/RE has been generally good and particularly beneficial for the enhancement of the sector's bankability in many COOs; a pre-requisite for rapid development of solar power in those economies. However, there were differences among the sample countries, with initial policy dialogue objectives not always being achieved (or being achieved by other IFIs) in Kazakhstan and Ukraine, while policy dialogue objectives in Cyprus had relatively low ambition (see annexes 3 and 4 for details of components that were not implemented or were implemented by other IFIs). The Bank's policy intervention targets were generally achieved in Egypt, Jordan and Uzbekistan.

4. Performance and results of the cluster projects

Evaluation Question: What were the performance and results of EBRD's cluster solar projects?

- Project **relevance was generally strong** as solar power aligned very well with the Bank's strategic objectives. However, with the benefit of hindsight, in some countries (Egypt, Jordan, Ukraine) this relevance was eroded by the contribution of Bank-financed projects to so-called "solar bubbles".
- Physical investments were completed on or below the budget and most were completed on **time, helped by their relative simplicity. However, some equipment faults and delays occurred.**
- Irradiation was usually as projected, resulting in electricity production and CO_2 savings **as planned or higher.**

- Most projects had **simple TI structure** (often with aggregate volume targets set under a framework, to which specific projects contributed), with usually two to-three TI benchmarks. They were typically achieved.
- **Most projects performed well** financially; **EBITDA margins were high (around 80%) but profitability often negative due to high depreciation**.
- But projects benefiting from very high FiTs were **vulnerable to their retroactive reduction**, as occurred in Ukraine. However, even after this reduction, the client has so far been able to service the Bank's debt.

Six evaluations of the ten cluster projects (eight evaluated in pairs and two individually) is presented in Annex 3, with results frameworks in Annex 2. The principal issues identified for each evaluation category are described in the following sections. The methodology and ratings applied for these evaluations is explained in footnote 3 in section 1.2.

The **evaluability of physical results** of most projects was relatively good as they were technically uncomplicated. However, additional infrastructure had to be built for larger plants (Nur Navoi), as well as access roads. Nevertheless, the Board Reports were typically clear as to what the Bank's loan was financing and the operational objectives that the projects were expected to achieve. The frameworks had an overall target for the facility, however specific projects also had the amount of electricity they were to produce and CO_2 savings defined at the project level. Nevertheless, their TI benchmarks were typically those of the framework, thus their utility for evaluation was limited. Project completion dates were also clear in most Board Reports.

However, **the evaluability of policy dialogue** components (usually related to the RE financing frameworks) was often poor as its objectives described in the Board Reports changed due to insufficient diagnostics, a government's policy shift or proliferation of other IFIs (for example in Kazakhstan and Ukraine). New objectives were set but these were not reported to the Board (even for TC packages with large budgets envisaged at framework approvals). The project teams claimed that policy dialogue was conducted (often in response to *ad hoc* requests from governments) but this was scarcely recorded (some traces of correspondence exist), while both Bank staff and beneficiary counterparts involved had typically left the company. Evaluation of this policy dialogue was therefore challenging and relied mainly on statements from third parties (bankers or beneficiary staff who were not directly involved), as well as in some cases, on correspondence or consultants' reports.

4.1. Relevance

The relevance of the Bank's solar projects was strong as they **aligned well with the Bank's "green" country/sector strategies and the GET Initiative.** The EBRD has prioritised support to renewable energy and the low carbon transition as part of both the 2013 and the 2018 Energy Sector Strategies (BDS13-291/F and BDS18-237/F), and both strategies emphasised the potential of solar in the EBRD's COOs. This support for solar was also reflected in the country strategies, of which almost all prioritised support for RES (see section 3).

Support for solar was also clearly aligned with national government strategies and priorities, including with their targets for RE generation and commitments to CO_2 reduction (NDCs) under the Paris Agreement. However, more recently, following electricity surpluses, some countries declared **moratoriums on solar power** (Egypt, Jordan, Ukraine) or introduced barriers to utility-size solar

projects for other reasons (Cyprus). This eroded the relevance of the Bank's solar projects in these countries as they did contribute to solar generation overcapacity. This was most pronounced in Ukraine, where the Bank financed the second phase of the Yavoriv solar project *after* it became clear that there was a serious problem with electricity surpluses and network balancing (see 3.1.4). Following a "solar bubble", political commitment in Ukraine towards supporting the solar industry has wavered. Nevertheless, with the exception of Yavoriv-2, the overall relevance of most projects in these countries was seen as good because they did align very well with economies' existing RE development strategies and they are expected to benefit from them in the long-term. Moreover, the relevance rating of the Infinity project in Egypt (part of the Benban complex) takes into account the unique nature of this development: the largest solar complex on the continent, which has the potential to serve as an example of a large-scale solar plant that could be replicated elsewhere in Africa.

Both financial and non-financial additionality were generally strong across most of the portfolio (with the exception of financial additionality in Uzbekistan). Interviews with market participants in all countries confirmed that local banks were still reluctant to provide project-financing (at reasonable margin, leverage and required tenor) to utility solar projects. Even in more advanced countries, for example Cyprus (where both the energy regulator and investors expressed deep regrets about the Bank's departure), there has been no long-term financing available for RE projects with reasonable terms. In other countries, there were regulatory/provisioning barriers, which constrained local financial institutions from providing this sort of financing (Ukraine). The Bank's use of local currency project financing in a long-tenor loan in Kazakhstan demonstrated particular additionality. There are signs that some local banks in Cyprus, Ukraine and Kazakhstan have started providing financing to RE projects but these are still at limited tenor (five-six years) and high cost.

For Nur Navoi – the first competitively auctioned, large solar project in Uzbekistan, the Bank provided an equity bridge loan (EBL) to a UAE-based company, self-sustained financially but linked to a large sovereign wealth fund. This type of financing raised questions related to the Bank's financial additionality from the Board at approval. Senior debt under this project was provided by the IFC and the ADB (which were able to offer blended finance). The Board enquired how the Bank was providing terms not available elsewhere on the market, given that the client was an established and cash-rich international company. Nevertheless, the project's non-financial additionality was stronger as **it was important for the Bank to participate in this landmark project**, to uphold its credentials as a leading RE financier and policy dialogue provider in Uzbekistan. Although there were doubts over financial additionality, the Bank has demonstrated additionality via relevant and effective policy dialogue in the energy sector. Moreover, the client has been pursuing other RE projects in Uzbekistan and other COOs (estimated at US$ 2 billion), therefore equity "saved" on this transaction could be invested in other RE projects.

The Bank also provided non-financial additionality via extensive policy dialogue in the solar sector across all the countries within the evaluation sample, as described in section 3.3. ESD's assistance with the preparation and implementation of ESAPs has also supported the Bank's non-financial additionality.

Accordingly, the relevance of three cluster projects (in Cyprus, Egypt and Kazakhstan) was rated "*Excellent*" and that of two in Jordan and Uzbekistan "*Fully satisfactory*". However, the combined

relevance of two phases of Yavoriv project in Ukraine was rated "*Partly satisfactory*" because of the questionable relevance of the second phase, which was approved when the network balancing issue, caused by rapid growth of solar capacity and the system's lack of flexibility, was already well known to the Bank (see section 4.2.5 for details).

4.2. Effectiveness

4.2.1. Physical implementation – outputs and key performance issues

The cluster projects were implemented within budget (with capex costs in the range of US$ 0.73 million per MW for Yavoriv Phase 2 to US$ 1.39 million per MW for Al Mafraq in Jordan) and **most were commissioned on time**. Two of the solar power plants had minor technical issues, which delayed construction, but which did not have more serious consequences for their power generation and financial performance. They included Chulakkurgan solar plant in Kazakhstan, which was delayed due to late tracker commissioning because of supply chain issues caused by COVID-19 mobility restrictions. The plant then suffered from a transformer fault, which resulted in lower-than-projected electricity generation. This has since been rectified, with confirmation that the fault has been fixed by the Bank's independent engineer. Also, the issuance of the Provisional Acceptance Certificate for the Al Safawi plant in Jordan was delayed following damage to trackers after a storm. The EPC contractor reinforced the trackers, while the sponsor received US$ 1 million in liquidated damages from the supplier in compensation. However, the certificate was delayed by two years. The importing of equipment from China for Nur Navoi was delayed due to COVID-19 restrictions. However, the EPC contractors (also from China) were eventually able to clear customs and put the plant into operation ahead of schedule.

Also in Cyprus, the start of the construction of three smaller plants was delayed by about a year due to protracted licensing and other permitting procedures (the client was not experienced in this sector), as well as (in the client's view) the Bank's lengthy due diligence and loan approval. Approval of these projects took the longest of all the sample projects. According to the Banking team, this was due to novel nature of the project (one of the first private, industrial solar plants) and the Bank's relative lack of experience in this market.

Some framework operations, for example Yavoriv-1, benefited from a project preparation TC, provided by the USELF framework consultant, who completed feasibility studies, investment memoranda and carried out the initial environmental due diligence of the project. The solar plant was located on the waste backfill of the former Yavoriv sulphur plant – an **excellent example of land reclamation**.

Half of the sample's sponsors used related parties (shareholders' subsidiaries) as EPC contractors (Ukraine, Egypt, Kazakhstan). In the latter case, the shareholder/contractor was also the PV panel supplier. In the opinion of other shareholders (and based on the Bank's Procurement Department's view), such EPCs and supply contracts were granted based on arms' length, at market prices and the contractors performed well.

Producers of PV panels used in **eight** solar projects (out of 10 in the sample), were **linked to allegations of forced labour in their supply chains**. Most clients were aware of this issue and were waiting for advice from IFIs/the Bank on how to address it.

4.2.2. Outcomes related to physical implementation and transition benchmarks[25]

Energy generation objectives were achieved by almost all projects, with **five projects (50%) slightly above P90 projections,** three in line with these projections and one more (Nur Navoi), likely to achieve its projections based on its performance during the first two months of operation. Only one project (Chulakkurgan in Kazakhstan) was 14% below its P90 projections in 2020. This was due to a delay with tracker commissioning because of supply chain issues and mobility restrictions caused by the COVID-19 pandemic and then to faulty transformer (leaking oil). This fault was repaired and in 2021 the plant was generating electricity as planned.

Good generation results were mostly due to **irradiation levels, which were relatively close to projections** (Chulakkurgan's shortfall was due to a technical fault, rather than lower irradiation). The client of the Yavoriv plant (which overshot its projections by 20%) confirmed that 2020 was an exceptionally sunny year and electricity generation in 2021 will be much more in line with the original projections. Nur Navoi's generation during the first two full months of operation (September-October 2021) was largely aligned with the original projection (the plant only was fully completed in December 2021). Based on electricity generated, **CO_2 reduction was also in line with the forecast.** Nine sample projects in aggregate saved almost 573,000 tonnes of CO_2 emissions in 2020 (Nur Navoi is expected to save an additional 154,000 tonnes per annum).

Table 5: Summary of electricity generation at solar power plants

Country	Name	P90 Forecast (GWh per year)	Actuals (GWh per year)	Variation %
Egypt	Infinity / Ib Vogt Solar PV 1 - 30 MW	82.9	89.4	+7
	Infinity / Ib Vogt Solar PV 2 - 50 MW	139.3	160.9	+15.5
Cyprus	CYPV Solar	12	12.6	+5
	TPT Solar	4.9	4.9	0
Jordan	FRV Al Mafraq Solar PV Project	137	141	+3
	Al Safawi Solar PV project	143	144.5	+1
Ukraine	Yavoriv 1 and 2	66.2	79.5	+20
Kazakhstan	Risen Solar	51.1	51.4	0
	Chulakkurgan	70	60.8	-13
Uzbekistan	Nur Navoi	N/A		

Source: Data collected from projects by EvD

The solar projects had generally **simple transition frameworks and objectives** (including indicators) and therefore their monitoring was usually good. The main TI quality targeted by them was "Green" – the expansion of renewable energy generation or helping to fulfil NDC pledges. More widespread private ownership was also targeted, particularly by earlier projects (which would qualify under the

[25] Transition Impact results stemming from policy dialogue (which was a core element of most projects TI) are presented in section 3. This section covers performance in relation to the remaining TI benchmarks.

"Competitive" TI quality now). They were **typically achieved**.

TI benchmarks that were not achieved related mainly to the demonstration effect – completion of target solar capacity in a given country, in some cases with participation of a commercial bank. **Failure of these benchmarks was often due to moratoriums put on new solar projects due to capacity constraints** or unwillingness of local banks to accept regulatory risk related to RES financing.

The Bank's policy dialogue (see Section 3) made critical contributions to the TI of all projects, although its objectives sometimes evolved due to changing circumstances (Kazakhstan, Ukraine) or were not particularly ambitious (Cyprus).

The solar projects made an **impact on local employment, however mostly temporary**, during construction (usually lasting about a year). Large projects, such as Benban in Egypt employed up to 10,000 construction workers, while Nur Navoi in Uzbekistan employed up to 3,000. But smaller projects, like Yavoriv, employed only about 100 workers during construction. Permanent employment opportunities created by these plants have been limited as their operation consists mainly of monitoring and is highly automated. Two plants in Egypt employ 34 staff, while at the other end of the spectrum, three smaller plants in Cyprus are operated by a team of eight contractors. However, solar plants located in the desert environment require regular PV panel cleaning, which is often outsourced to local companies. In addition, Al Mafraq solar plant (located close to the Syrian border) employs about 60 Syrian refugees seasonally for vegetation removal. There were women among the engineering and maintenance teams at almost all plants, although the overwhelming majority of staff was male.

Other backward linkages to the local economy were relatively weak as almost all equipment (accounting for about 85% of the project cost) was imported. The solar plants did have local community engagement programmes, however they were not particularly extensive. Nevertheless, the client in Kazakhstan financed the completion of a water supply to local community, while the solar plant in Jordan sponsors one student per annum from the local community to go to a top Spanish business school.

ESAPs were prepared with the Bank's ESD's assistance and implemented. They included such measures as reinforced drainage and bird hazard prevention. Many solar plants have been constructed in remote desert or steppe areas (Egypt, Jordan, Kazakhstan, Uzbekistan) with **limited or no negative impact on the environment**. The plant in Ukraine has been built on reclaimed land from a sulphur-producing factory. Solar plants in Cyprus are located in industrial areas, relatively far from human dwellings.

As for **broader impacts**, all solar plants made important contributions to the national RE-related targets of their host countries (climate action), usually around 2-6%. However, the Bank's contribution to national targets can be better illustrated by analysis of its aggregate financing of solar projects in a given country. For instance, in Kazakhstan both sample projects contributed a respectable 5.6% of generation capacity to the government's 1.6 GW RES capacity target. However, all 13 of the Bank's solar projects there made a 27% contribution.

Similarly, two Infinity projects contributed 2.2% to Egypt's 3.5 GW target of electricity generation from solar power; however in aggregate all 18 of the Bank-financed solar projects there contributed about 20%. In Ukraine, the Bank financed 8% (426MW) of its total installed solar power capacity

(5.3 GW). However, as explained earlier the very rapid increase in solar capacity also had its less positive side.

Sustainability of results of the evaluated solar projects seems assured as all benefit from 12-25 year PPAs and all relevant governments have ambitious climate-related commitments under their international agreements, which imply an increase of RES in their electricity generation mix. Sustainability of policy dialogue results will depend even more on individual governments' commitment to RES and their ambition to achieve climate-related goals agreed under international treaties. Sustainability of some of policy dialogue outcomes (for example unbundling of vertically integrated energy companies) seems assured, however there is more uncertainty as to other results (some consultancy reports, approaches prepared, laws and regulations drafted have not yet been implemented and may remain that way).

Effectiveness was assessed "Fully satisfactory" for sample projects in Cyprus, Egypt, Jordan and Uzbekistan (with potential for "Excellent" in the latter) and "Partly satisfactory" for the project in Ukraine (mainly due to non-achievement of policy dialogue objectives as set at approval). Despite this generally positive assessment, some projects experienced some delays or technical faults. Electricity generation and CO_2 savings have been, in almost all cases, in line with or in excess of projections. TI benchmarks were typically achieved. The Bank also undertook extensive policy dialogue in most countries, although its objectives sometimes evolved due to changing circumstances (Kazakhstan, Ukraine) or were not particularly ambitious (Cyprus).

4.3. Efficiency

The financial performance of most projects has been **in line with or in excess of projections**. Due to low operating costs, EBITDA margins of solar plants were very attractive. However, EBITDAs of some projects (for example CYPV Cyprus) suffered (in 2019) from the sponsor's booking the development expenses related to other plants, into the borrower SPV (for example licensing expenses)[26]. This was a one-off cost and the EBITDA returned to its projected level the following year. However, this practice should be discouraged in the future through appropriate covenants in the loan agreements. Despite high EBITDAs all solar plants (except for Al Mafraq and Risen) were **unprofitable** in 2020 as being relatively new developments, their depreciation charges were high. However, all of them generated sufficient cash to service the Bank's debt in full so far.

Off-takers reneging on payments is the critical financial risk for solar power plant operators. In Ukraine, **the off-taker has missed part of its payments for most of 2020-21 and has imposed a 15% cut in the contractual FiT** for solar power producers. About 70 per cent of these payment arrears were repaid in November 2021 to most of the producers (mainly thanks to a Bank-supported bond to Ukrenergo). Nevertheless, as a result, the Yavoriv (and all other Ukrainian solar projects) have been in Corporate Recovery (while all Ukrainian solar projects are classified as non-performing loans). Thanks to relatively conservative leverage (70%) and the borrower's financial strength, the Bank's loan to the Yavoriv project has been serviced, whilst the Bank's sensitivity analysis demonstrates that the project will still be able to service debt despite the cut to the FiT. In Jordan, the off-taker also temporarily halted payments as a result of COVID-19, citing *force majeure*. However, in that case after negotiations (with the Bank as mediator) between solar producers and the off-taker, the latter has resumed payment and fully settled arrears. In Cyprus,

[26] According to the project's Operation Leader, this change was agreed at signing of the loan agreement.

at the beginning of the pandemic, the regulator announced the possibility of curtailment (a limit on electricity to be taken from the producers and paid for), however it was not carried through.

In Kazakhstan, the Chulakkurgan solar plant was downscaled after Board approval from 63 MW to 50 MW (and the Bank's loan from US$ 40.4 million to US$ 32 million). Its revenue generation in the first 18 months of operation was well below forecasts, due to issues with a faulty transformer. However, it improved in the following year.

The value of solar energy produced under the sample projects for consumers (or rather governments, as consumer tariffs were typically subsidised), varied widely. **The projects for which tariffs were set under FiT laws (in Egypt, Kazakhstan and Ukraine) represented poor value** (the FiT in Ukraine was 2.5 times above average electricity wholesale price). In Cyprus, although the producer tariffs concerned were established through a competitive process, tariffs were high as it has one of the highest electricity prices in EU due to its isolation as an island and lack of interconnections.

Under more recent projects in Jordan, and particularly Uzbekistan where tariffs were set through **auctions**, the off-takers were obtaining electricity generated by the Bank's clients at **much better values.** However, their thermal energy purchase cost was still lower. Table 3 in section 4.2 compares producer tariffs in the sample with a recent Bank-financed solar power project in Albania, where a record low tariff (by European standards) was achieved. Nevertheless, caution should be exercised when comparing tariffs as many variables need to be considered (see Box 2).

In terms of the **Bank's efficiency in processing project proposals**, the average time for a standalone project to go from concept to signing was 299 days (based on four projects); and 164.4 days for facility projects (based on five projects). The projects in Cyprus, for which preparation took 451-464 days to signing are treated separately as DFF was not a specialised RES financing facility and the projects were the first project-finance transactions the Bank had done there. Thus (as informed by the project team) the development of these projects took much longer than in other countries where the Bank already had a legal and financial template for similar, often RES-related, projects.

Overall, the efficiency of sample projects in Egypt, Cyprus and Jordan was rated as "Fully satisfactory", whilst that of projects in Kazakhstan and Ukraine was "Partly satisfactory". The efficiency of the Nur Navoi project in Uzbekistan was evaluated as "having potential to be fully satisfactory" as its guarantor's performance has been good but the plant's construction was completed only in August 2021, meaning that it lacked a financial track record at the time of evaluation.

Table 6. Comparison of time spent to develop solar (cluster) projects

Project	Concept Rev.	Final Rev.	Board	Signing	Days from concept to signing	Approval
Infinity / Ib Vogt PV 1 -	24/3/17	19/5/17	7/6/17	12/10/17	202	Framework
Infinity / Ib Vogt PV 2 -	24/3/17	19/5/17	7/6/17	23/10/17	213	Framework
CYPV Solar -7.4 MW,	24/3/15	8/3/16	8/3/16	17/6/16	451	DFF
TPT Solar - 4.5 MW,	24/3/15	8/3/16	8/3/16	30/6/16	464	DFF
FRV Al Mafraq Solar -	18/12/15	30/6/16	20/7/16	13/12/16	361	Standalone

Al Safawi Solar PV	10/3/17	23/6/17	18/7/17	8/9/17	182	Standalone
Yavoriv Solar Power	7/11/17	12/12/17	12/12/17	21/12/17	44	Framework
Yavoriv 2	12/10/18	10/5/19	5/6/19	28/6/19	259	Standalone
Risen Solar	13/2/18	29/5/18	29/5/18	6/6/18	113	Framework
Chulakkurgan	4/5/18	28/9/18	17/10/18	14/1/19	255	Framework
Nur Navoi	6/9/19	4/9/20	30/9/20	5/10/20	395	Standalone

4.4. Overall rating and concluding remarks

Overall, most solar power projects in this cluster performed relatively well. However, it was the **Bank's policy dialogue** associated with them that made the critical, beneficial and hopefully sustainable impact on most of the host countries' renewable energy sectors; far beyond that of the individual solar power operations. This is reflected in the sample projects' overall ratings (for which the rationale is explained in detail in their evaluation briefs (see Annex 3). To summarise, the two Infinity projects in Egypt were rated ***Good+***, reflecting the considerable contribution of the Bank's policy dialogue to enabling the Benban project – one-of-a-kind and with high (although not yet realised) demonstration potential. The attainment of an *Outstanding* rating by these projects was prevented by their ultimate contribution to Egypt's electricity oversupply (at least in the short term), which resulted in the current moratorium on new utility solar power development. However, the ***Outstanding*** rating should be achievable by Nur Navoi project. It is currently also rated ***Good+,*** reflecting the Bank's thoughtful design of its policy dialogue in the energy sector in Uzbekistan (strategic and inclusive of measures mitigating the network's capacity challenges, such as thermal power decommissioning and attention to storage). However, this rating also factors in some questions around the Bank's financial additionality in this project. Nevertheless, if the solar plant's good performance during a longer period is confirmed, the overall rating of this landmark project could be upgraded.

The overall rating for the Al Mafraq and Al Safawi projects in Jordan is ***Good***, reflecting the Bank's similarly important policy dialogue in Jordan's RE sector, but also taking into account the current solar generation overcapacity[27] and a moratorium on new solar projects in this country. This could be temporary as Jordan is developing electricity storage and cross-border interconnections.

Risen and Chulakkurgan solar projects in Kazakhstan are rated ***Good-*** as the Bank's policy dialogue there was relevant and impactful, however it evolved differently than planned. Only a fraction of the originally envisaged large consultancy budget was utilised, although the Bank made effective contribution to policy dialogue through its own staff. This rating also takes into account certain shortcomings in Chulakkurgan plant's operational and financial performance. The CPVY and TPT projects in Cyprus are also rated ***Good–*** as they were beneficial for the country's energy sector, still dominated by a state-owned incumbent company, and they have been performing well. However, the Bank's policy dialogue there had limited impact, largely due to the country's relatively advanced legal and regulatory system.

[27] According to the projects' Operation Leader, the solar generation overcapacity (prevailing during most of 2021), is no longer an issue in Jordan, due to increased demand in 2022.

Finally, the Yavoriv project in Ukraine is rated ***Acceptable*** mainly due to the weak rationale for Phase 2, which was approved *after* the Bank became aware of the country's network balancing problems caused by huge solar capacity additions in previous years, as well as the high probability of FiT reduction (see footnote 19 in section 3.1.4). The project's financial performance has suffered because of the tariff reduction, although so far it has managed to service the Bank loan. However, the project itself has not been a failure. In 2020 the plant generated electricity well above what had been forecast. The sponsor is committed and in good financial condition, while the project did contribute to the government's strategic long-term goal to replace thermal electricity generation capacity with RES. The off-taker's arears have been partly repaid and with political will to decommission thermal power capacity and/or improve cross-border interconnections, Ukraine's RE sector might recover.

These assessment results **compare generally favourably with those of other cluster evaluations of energy sub-sector projects** completed by EvD in recent years, including:

- Wind Power cluster PE15-593 (out of four operations evaluated, two were rated *Good* and two *Acceptable*, most projects missed their TI benchmarks and underperformed financially).
- Hydropower in Georgia, SS18-137 (unrated but generally positive assessment, however seven of the 15 projects experienced significant challenges and delays, public complaints were raised on all five major investments).
- Hydrocarbon Projects SS20-159 (out of six projects evaluated two were rated *Good*, the rest *Acceptable* or *Poor*, most projects were only partially implemented, many TI benchmarks/environmental components missed, financial underperformance was common).

Table 7 below summarises the rating of ten solar projects assessed under this evaluation.

Table 7: Summary of cluster projects evaluation ratings[28]

Project	Relevance and additionality	Effectiveness	Efficiency	Overall Performance
Infinity / Ib Vogt Solar PV 1 &2, Egypt	Excellent	Fully satisfactory	Fully satisfactory	**Good+**
FRV Al Mafraq & Al Safawi, Jordan	Fully satisfactory	Fully satisfactory	Fully satisfactory	**Good**
CYPV and TPT Solar, Cyprus	Excellent	Fully satisfactory	Fully satisfactory	**Good-**
Yavoriv Solar I & II, Ukraine	Partly satisfactory	Partly satisfactory	Partly satisfactory	**Acceptable**
Risen and Chulakkurgan Solar, Kazakhstan	Excellent	Fully satisfactory	Partly satisfactory	**Good -**
Nur Navoi, Uzbekistan	Fully satisfactory	Excellent (potential)	Fully satisfactory (potential)	**Good+ (current) Outstanding (potential)**

5. Lessons, key issues and recommendations

[28] Ratings for each category are based on the following scale of: Excellent – Fully Satisfactory – Partly Satisfactory – Largely Unsatisfactory - Unsatisfactory. The overall performance rating scale is: Outstanding – Good – Acceptable – Poor – Very Poor ("-" or "+" may be added to the overall performance rating to distinguished minor performance differences among similarly rated projects).

This section presents lessons, key issues and recommendations stemming from this evaluation.

5.1. Lessons

Financial

- Very generous electricity producer tariffs might be welcomed by financiers, however they are often **unsustainable** and carry high risk of reduction (lesson from Ukraine).
- As solar power investments have relatively high capex costs but low operating costs, their financing cost is of paramount importance for investors. Limited access to **concessional financing** (to blend with commercial), puts the EBRD at a disadvantage compared to other IFIs, especially in ETC markets (lesson from Uzbekistan).
- Revenue **stability and predictability** over the asset lifetime is an absolute pre-condition for solar investors, given that the costs are almost entirely fixed rather than variable – in countries with competitive auctions, bankable long-term contracts and transparent procedures, the cost of capital for utility-scale solar PV has been of critical importance (lesson/message from all solar clients interviewed in all sample countries).

Policy dialogue/reforms

- As solar power/RE is a rapidly changing sector, in some countries the provision of focused, often ***ad-hoc* advice by the Bank's staff** has been more frequent (and often more effective), than a structured approach based on large TCs (lesson from Kazakhstan).
- By following a previously agreed strategic approach to the power sector (for example under the Low Carbon Pathway, prepared with the Bank's assistance), it has been possible to **covenant decommissioning** of old thermal power units under subsequent sovereign projects and unblock electricity generation capacity for solar/RE projects (lesson from energy sector projects in Uzbekistan).
- Setting FiTs (or other fixed tariffs) **within primary legislation** makes them more challenging to adjust when the context changes. In a market as dynamic as solar, this creates the risk that tariffs will remain fixed, whilst the cost structure changes dramatically (lesson from Ukraine).
- **Affordability of solar** (and RES in general) is best addressed through the transfer of a FiT-based system to one based on **auctions**, which demonstrated the ability of investors to offer tariffs several times lower than FiT (lesson from solar projects in Jordan, Uzbekistan).

Technical

- Financing new solar projects in a country experiencing electricity network capacity limits, can **exacerbate that network's balancing challenges** and be detrimental to an off-taker (lesson from Ukraine).
- It is critical that analysis of RES growth dynamics (and the grid's ability to accommodate intermittent solar electricity), incorporates the growth trajectory of the **distributed solar market** (rooftop-mounted PV panels). Distributed solar has the same energy generation profile as utility solar, but is more difficult to regulate and control (lesson from Jordan, Egypt, Ukraine).

- Incidences of **curtailment, payment delays or/and tariff reduction threats** arose more frequently in countries where the solar/RES sectors were more mature or had been deployed rapidly. This was due to the low capacity of the **transmission network or balancing constraints**, because network expansion is generally slower to design, build and commission than RES generation. Even small RES projects can tip the balance (lesson from Cyprus, Jordan and Ukraine).
- As the share of solar in power generation grows, the utility of the cost of solar energy generation as an indicator of its competitiveness diminishes. This is because such cost does not include the challenges of incorporating intermittent power and is **not an accurate reflection of its competitiveness** (lesson from Jordan and Uzbekistan).

5.2. Key issues

1. **The importance of a holistic approach.** Investing in solar projects is relatively straightforward, developing a large and sustainable solar sector is very complex. As a private-sector focused MDB with a transition mandate, the EBRD has to do both. Even without an overarching strategic framework, the Bank has broadly recognised this balance, and combined investments in solar with investments in grid expansion, capacity building for regulators and grid operators, and policy dialogue to improve bankability and transition to competitive auctions. However, as evidenced by this evaluation, fast, often Bank-supported development of solar generation turned out to be a "mixed blessing" for some economies. Insufficient ability to balance energy network through storage or export, forced some of the countries (Egypt, Jordan and Ukraine), to impose moratoria on further development of solar power. In Kazakhstan, Uzbekistan and many other COOs solar generation capacity is still relatively low and there is room for expansion. However, lessons should be derived from earlier projects elsewhere, to ensure that, appropriate measures are taken to safeguard the energy system's flexibility, to prevent electricity oversupply and off-taker's financial distress in parallel with rapid development of solar generation capacity.

This calls for a country-tailored and generally more selective approach to financing of solar power generation projects, while balancing them with strengthening the flexibility of energy systems to store or export excess power - **see recommendation 1.**

2. **Critical role of electricity storage and need for MDB participation in its financing.** Solar is now a proven technology with a clear track record and investment profile. Solar power plants are not technically challenging, and there is limited scope for serious construction issues or direct outcomes (for example energy generation) that differ materially from expectations. However, developing solar projects with storage components is technically much more challenging, and there is no clearly advantageous tried-and-tested technology. The next step for MDBs that want to continue supporting the development of the sector and operate at the cutting edge (and take on risk that the private sector is not prepared to take on) is to finance projects with storage components. So far, the EBRD has funded some high-level studies of the feasibility of different storage options, but has not yet directly invested in a solar storage project - **see recommendation 2**.

3. **Understanding the "bigger picture" and sustainability of a country's energy system.** This evaluation clearly demonstrates the need for deeper and wider diagnostics of a given country's

energy system to be presented at project approval stage. It also shows that it is critical to balance expansion with sustainability: financial sustainability of the off-taker/consumer, sustainability of the tariff system and sustainability of grid capacity and balancing requirements. Without sufficient focus on sustainability, there is a risk of supporting unsustainable and potentially harmful growth (as happened in Ukraine). Generous FiTs may be welcomed in the short-term (particularly by a financier's Credit Department) but their appeal for investors (and the Bank) has been inversely correlated to their attractiveness for consumers and governments, calling for increased attention to this aspect - **see recommendation 3**.

4. **Leveraging the EBRD's solar financing with that of commercial banks (or with concessional funds in selected countries).** Although the Bank scaled up solar projects quickly in some places, none has yet been commercially co-financed, even in more advanced economies. Lack of progress on this front will perpetuate IFIs' involvement, holding back the sector's development. Solving this requires addressing regulatory constraints, which limit commercial banks from supporting solar projects (for example in Jordan and Ukraine) – even if that means "strengthening the competition". At the other end of the scale in ETCs, lack of or limited access to concessional financing put the Bank at a disadvantage versus other IFIs. Action should be taken to address these issues – **see recommendation 4.**

5.3. Recommendations

Strategic recommendations

- **Recommendation 1:** In countries experiencing rapid growth of solar power and network integration challenges, **strengthen and increase support for expanding the capacity of power systems to successfully integrate intermittent renewable energy sources**. This would entail intensifying policy support (including the development of related regulation, market reforms and capacity building), as well as starting financing for electricity storage, decommissioning of old thermal power plants (including support for "just transition"), construction of new thermal and hydro balancing capacity, network upgrades, cross-border interconnections and demand management.
- **Recommendation 2:** Where economically justified, encourage relevant authorities to consider **hybrid auctions**, integrating storage, particularly for large solar generation capacities.

Operational recommendations

- **Recommendation 3:** For future country-specific solar PV financing frameworks incorporate in the Board Report:
    - **Analysis of the impact of additional electricity generation** capacity planned under the financing frameworks on network balancing. It should include a summary from the discussions with a TSO/SO and national authorities, as well as the [5]-year electricity balance forecast of supply (including the baseload, decommissioned capacity, all commissioned and key pipeline projects, as well as the growth of distributed solar power), and consumption, including at peak generation time.

- **Assessment of the tariff regime's sustainability**, by comparing the tariff price to local LCOE on a like-to-like basis, to clearly demonstrate the level of implicit subsidy.

- **Recommendation 4:** Increase efforts to obtain co-financing for solar projects with specific targets and incentives:
  - Commercial for projects in more advanced markets, also through policy dialogue aimed at making banking regimes more RE-friendly.
  - Blended for projects in ETCs and SEMED by approaching selected donors to attract investors into countries with unrealised solar power potential more effectively (and to match other IFIs' offerings).

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Annex 1: Cluster projects and the Bank's solar power portfolio

OpID	Project Name	Country	EBRD loan €m	Signed	Short description (capacity, location, main sponsor, co-financing)
49211	EREF: Infinity / Ib Vogt Solar PV 1 - 30 MW	Egypt	14.2	10.2017	30 MW solar power plant, part of Benban solar park, with the total 1.8GW capacity. Local sponsor (Infinity), teamed with a German PV developer. EBRD mobilised co-financing from FMO and GCF. This and 49302 project approved and monitored together.
49302	EREF: Infinity / Ib Vogt Solar PV 2 - 50 MW	Egypt	23.8	10.2017	As above but a bigger, 50 MW capacity plant.
48153	FRV Al Mafraq	Jordan	30.8	12.2016	50MW solar photovoltaic power plant, 80 km north of Amman within the King Hussein Bin Talal Development Area. The project achieved one of the first PPAs awarded through an auction rather than based on FiT. FRV (the main sponsor) owns 70% of the project while Hareon's 30% is in the process of acquisition by another investor. Proparco (the French development financier) provides parallel loan of the same amount.
49072	Al Safawi Solar	Jordan	28.1	09.2017	51MW solar power plant in the Safawi area, 150 km east of Amman. The sponsor is FRV (as above) teamed with ATC – a Jordanian private conglomerate operating in various industries. The EBRD is providing a senior secured A/B loan of US$ 64.5 million in partnership with FMO.
47520	DFF: CYPV Energy	Cyprus	6.7	7.2016	Three smaller solar power plants with a total capacity of 7.4MWp. The sponsor is a Russian ICT and RES entrepreneur, teamed with a local partner.
47697	DFF: TPT	Cyprus	4.1 (1.5 pre-paid)	6.2016	Two smaller solar power plants with total capacity of 4.5MWp: Paliometocho (1.5 MW) and Malounta (3 MW). Both sold in 2019 - the Paliometocho tranche was prepaid before the plant was sold. The Malounta tranche remains with the EBRD.
49664 [50439]	USELF: Yavoriv Solar I&II	Ukraine	23.1	12.2017 10.2019	72 MW solar power plant constructed and financed in 2 phases (2017 and 2019), developed by a local energy entrepreneur. CTF provided co-financing.
50002 50294	KAZREF: Risen Solar	Kazakhstan	19.1	6.2018	40MW solar plant by Risen Energy, a Chinese private sector solar developer, in South-Eastern Kazakhstan. The EBRD provided a local currency loan with co-financing from the CTF and the GCF.
50218	KAZREF: Chulakkurgan	Kazakhstan	35.1	1.2019	50MW solar plant led by Risen Energy. The EBRD provided local currency financing with co-financing from the GCF.
51454	Nur Navoi	Uzbekistan	52.2	12.2020	100 MW solar plant located in Nur Navoi region, central Uzbekistan. The EBRD provides an innovative equity bridge loan to the sponsor Masdar, while IFC and ADB provide senior debt. Bank's first solar power project in Uzbekistan.

Op ID	Operation Name	Country	Signing year	EBRD Finance (€m)	Capacity (MW) ~ MWp for solar	Total Project Value (€m)
44290	USELF Porogi Solar Energy Project	UKRAINE	2012	4.1	4.5	5.7
44501	Sunelectra Power Project	UKRAINE	2013	3.9	4.2	9.3
44978	Gnatkov Solar Energy Project	UKRAINE	2013	3.8	5.0	5.4
44428	EDPR Solar	ROMANIA	2014	20.0	50.4	58.0
44973	Ma'an Solar Power Project	JORDAN	2014	21.7	23.8	54.9
46421	Oryx Solar Project Jordan	JORDAN	2014	10.1	10.4	25.7
46700	EJRE Solar Project Jordan	JORDAN	2014	21.7	22.0	55.0
46701	Greenland Solar Project Jordan	JORDAN	2014	11.1	11.0	28.0
46570	Burnoye Solar Power Plant	KAZAKHSTAN	2015	38.0	50.0	67.7
47520	DFF - CYPV Solar	CYPRUS	2016	6.7	7.4	10.1
47697	DFF - TPT Solar	CYPRUS	2016	4.1	4.5	6.0
48147	USELF - Shargorod Solar	UKRAINE	2016	5.0	9.6	10.6
48153	FRV Al Mafraq Solar PV Project	JORDAN	2016	30.8	66.9	93.2
48322	ACWA Power Mafraq PV IPP	JORDAN	2016	23.5	60.9	68.2
47797	Access/EREN Benban PV I	EGYPT	2017	24.3	63.0	63.6
47798	Access/EREN Benban PV II	EGYPT	2017	24.3	63.0	63.6
47972	Scatec Benban I (Aswan Solar Project)	EGYPT	2017	16.6	63.1	61.7
47973	Scatec Benban II (Kom Ombo Project)	EGYPT	2017	16.8	63.1	62.3
47974	Scatec Benban III (Sun Infinite Project)	EGYPT	2017	16.8	63.1	62.3
47975	Scatec Benban IV (Red Sea Solar Project)	EGYPT	2017	16.6	63.1	61.7
47976	Scatec Benban V (Zafarana Solar Project)	EGYPT	2017	16.6	63.1	61.7
49224	Scatec Benban VI (Philadelphia Project)	EGYPT	2017	16.8	63.1	62.3
48174	EDF EN Benban PV	EGYPT	2017	24.1	65.0	61.8
48203	ELSEWEDY Benban PV	EGYPT	2017	24.1	65.0	61.8
48545	KAZREF - Burnoye Solar Power Plant Extension	KAZAKHSTAN	2017	36.0	50.0	54.9
49025	Risha Solar PV Project	JORDAN	2017	19.5	61.3	50.0
49055	Alfa Solar Binban PV	EGYPT	2017	24.8	62.8	23.8
49072	Al Safawi Solar PV Project	JORDAN	2017	28.1	66.7	71.8
49136	ACWA Benban Solar PV I	EGYPT	2017	24.5	67.5	64.8
49319	ACWA Benban Solar PV II	EGYPT	2017	9.7	28.0	25.7
49320	ACWA Benban Solar PV III	EGYPT	2017	26.1	70.0	68.8
49211	Infinity / Ib Vogt Solar PV 1 - 30 MW	EGYPT	2017	14.2	38.3	36.9
49302	Infinity / Ib Vogt Solar PV 2 - 50 MW	EGYPT	2017	23.8	64.3	61.5
49664	USELF: Yavoriv Solar Power Plant	UKRAINE	2017	23.1	72.0	60.2
48576	Desert Solar Power Project	MONGOLIA	2018	9.2	30.0	41.7
48691	USELF: Ekotechnik Solar	UKRAINE	2018	5.6	7.0	8.6
48821	KAZREF - Zadarya Solar Power Plant	KAZAKHSTAN	2018	6.9	14.0	12.2
49296	KAZREF - BAIKONUR SOLAR PLANT	KAZAKHSTAN	2018	22.3	50.0	47.1
49339	DFF - Project Tepco	EGYPT	2018	0.6	1.0	1.0
49534	USELF - Kness Solar	UKRAINE	2018	18.5	33.9	37.2
50002	Risen Solar	KAZAKHSTAN	2018	19.1	40.0	34.7
48611	Akfen Solar Power Project	TURKEY	2018	44.8	103.0	152.6
50027	KAZREF - Nomad Solar Power Plant	KAZAKHSTAN	2018	29.5	28.0	39.3
50324	SES Saran	KAZAKHSTAN	2018	43.3	100.0	90.4
50201	USELF - Mykolaiv Solar	UKRAINE	2018	18.1	47.0	51.8
50190	USELF - Kamianka Solar	UKRAINE	2018	12.2	29.9	34.9
50415	ELEM Solar Project - Photovoltaic plant	NORTH MACEI	2019	5.9	11.6	8.8
50218	KAZREF - Chulakkurgan Solar	KAZAKHSTAN	2019	35.1	50.0	64.4
49918	USELF: Ingulets	UKRAINE	2019	17.5	57.6	52.9
50025	M-KAT Green Solar Power Plant	KAZAKHSTAN	2019	50.0	100.0	105.1
50640	KAZREF - Universal Energy Zhangiz Solar	KAZAKHSTAN	2019	10.3	30.0	22.3
50602	USELF - Chigirin Solar	UKRAINE	2019	19.7	55.4	53.4
50371	SPREF: Kawar/Orange Project	JORDAN	2019	13.0	36.8	41.0
50690	USELF III: Modus Solar PV Project	UKRAINE	2019	22.8	33.4	35.4
50456	USELF: Aquanova Shalanky	UKRAINE	2019	2.0	3.5	2.9
50367	USELF: Vita Solar Power Plant	UKRAINE	2019	8.5	13.5	12.2
50685	KAZREF - Karaganda Solar Power Plant	KAZAKHSTAN	2019	21.9	50.0	42.8
50670	KAZREF - Zhanakorgan Solar 1	KAZAKHSTAN	2019	3.8	10.0	8.3
50404	USELF: Balahivka Solar	UKRAINE	2019	4.8	9.3	8.3
50403	USELF: Shevchenkove Solar	UKRAINE	2019	5.0	10.5	8.9
50775	USELF - Irshanska Solar	UKRAINE	2019	12.0	30.0	23.3
51126	Enefit Green	REGIONAL	2020	8.8	19.2	16.3
51676	Quadran Wind - Linowo	POLAND	2020	15.5	11.0	40.2
51677	Quadran Wind - Rzepin	POLAND	2020	19.3	14.0	58.3
52071	Helpe Solar	GREECE	2020	75.0	204.0	136.0
50022	Masrik-1 Solar Power Plant	ARMENIA	2020	15.4	62.0	41.5
51655	KAZREF - Karaganda solar Phase II	KAZAKHSTAN	2020	3.6	26.0	25.1
51454	Nur Navoi Solar Power Plant	UZBEKISTAN	2020	52.2	100.0	90.4
51038	SPREF - Global Energy (TAQA PV)	EGYPT	2020	3.2	6.0	8.1
	TOTAL			~~1,286.9~~	~~2,973.7~~	~~3,096.8~~

Annex 2: Cluster Projects Results Frameworks

This annex presents the Results Frameworks prepared ex-post by EvD for six cluster projects (or pairs of projects) and agreed with the project teams. The text in colour summarises the results of each intended output, outcome and impact, with objectives in green considered achieved, in blue partially achieved, in red not achieved and those in purple achieved by other IFIs.

FRV Al Mafraq Solar PV Project and Al Safawi Solar PV Project – Results Framework

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
Project developers have both the financial capacity and the technical expertise to develop solar power plants Offtaker continues to operate and make payments in line with the PPA Regulatory support for competitive auction process ESAP implemented as agreed	**FRV Al Mafraq Solar PV Project (OpID 48153)**			
	1. EBRD senior loan of USD $35.47mn, with an 18-year maturity. 2. Proparco B loan of USD $35.47mn with an 18-year maturity 3. Sponsor equity investment of USD $24.49mn	1. Construction of a 50MW solar PV plant in Mafraq, with commercial operations beginning by mid-2018 *Commercial operations started on 24th September 2018.* 2.EBRD-compliant ESAP (including Community Integration Plan) fully implemented *Implemented*	1. Al Mafraq generates 137GWh of solar energy annually (P90 level) or 148.5 GWh under P50 *First year generation was 138GWh, versus P90 level forecast of 137GWh, while second year generation (2020) was 140GWh.* 2. Al Mafraq sells power to the national grid (NEPCO) at the price set by the competitive tender process *Power sold (but it also added to electricity surplus) and NEPCO's financial distress*	1. The two projects together reduce CO2 emissions by 180,000 t CO2 per year *96,250 t CO2 saved under Al Mafraq and 99,950 t CO2 under Al Safawi in 2020* 2. Jordan achieves its target of 20% of electricity demand from RE sources by 2020 (increased from 10%) and is on track for 30% in 2030 (contribution from two projects)

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
				Jordan achieved 20% target by 2020 (25% in 2021). Contribution from 2 projects was 4.6% of total RE capacity for 2020.
			3. Support to local employment and skills development *The client developed a Labor and Employment Plan with recruitment targets for local residents. The project provided about 200 jobs during construction and 6 permanent jobs during operations.*	3. Positive impact on local economic development of the Al Mafraq and Al Safawi regions (no clear target – new jobs, backward linkages) *Good employment impact during construction (about 200 local workers hired for each plant for about a year). More limited impact on permanent employment (about 6 positions at each plant, 10 part-time cleaners, 60 refugees employed for vegetation removal during summer). For both projects: FRV introduced the 'Young Talented Leaders' scholarship at IE University, Spain to supports students from the local communities.*
	Al Safawi Solar PV Project (OpID 49072)			
	1. Senior secured A/B loan of USD $64.5mn, of which 50% was syndicated to FMO.	1. Construction of 51MW Solar PV plant in Al Safawi, with commercial operation starting by March 2019	1. Renewable energy generated - target 143,000 GWh/year under P90 and 152.2 GWh/year under P50	

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
	Because of cost savings the committed amount has been reduced by USD65,000 2. USD $15.07mn of Sponsor equity provided by FRV Solar Holdings 3. USD $6.5mn of sponsor equity provided by Arabia Trading.	*Commercial operation started April 2019. PAC was issued on 30 April 2021.* 2. EBRD-compliant ESAP (including Community Integration Plan – *details in DAQs*) *Implemented*	*In 2020, the Project generated 144,4 GWh of renewable energy.* 2. Power is sold to the national grid in line with the agreed PPA *Power sold (but it also added to electricity surplus) and NEPCO's financial distress* 3. Support to local employment and skills development *240 jobs created during construction). Training provided. The Community Integration plan agreed and being implemented. 14 permanent jobs created during operations.*	4. Projects have wider demonstration effect, evidenced with at least two additional RE power plants commissioned in Jordan, at least one of which involves financing from a commercial bank *EBRD participated in the financing of 10 RE projects (solar + wind) with a total capacity of 390MW (one project included financing from a local commercial bank – Arab Bank), one more project was co-financed by DEG.*
	Policy Dialogue: 4. TC (under NEPCO loan) Renewable Energy Integration: estimated budget up to EUR 500,000:	4.RE Integration Capacity Technical Study (ICTS), assessing the system and its capacity to absorb renewable energy, and identifying investment needs, risks and mitigants to	4.RE ICTS' recommendations implemented (including investments, if any) *The electricity Masterplan review recommendations were included*	4.Increased capacity of Jordan's transmission system, able to accommodate increased share of RES in Jordan's electricity generation

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
	(i) assess the renewable energy absorption capacity of the grid for planned solar and wind projects through a comprehensive technical study; (ii) identify the risks and mitigants.	maximise RE absorption - with recommendations; *A study reviewing the electricity Masterplan including renewable energy integration was concluded by a consultant (CESI) in September 2020*	*in the Energy Strategy, however there is no evidence of the recommendations being implemented yet (they might be under a new Bank's project recently signed with NEPCO)*	*Jordan experienced electricity surpluses in recent years. Balancing the grid has been a problem. However, under a new project with NEPCO, new investments into grid, partially addressing this issue, are envisaged* NEPCO's staff understands and applies in practice selected mitigants when needed
	(iii) capacity building support for NEPCO's staff to implement selected mitigants.	Advice and staff training to implement selected mitigants; *NEPCO staff attended a number of training sessions and workshops related to internal audit, risk, procurement, and strategy (run by Nestor and PWC consultants)*	NEPCO's staff trained and capable of implementing selected mitigants *Given imbalances experienced by Jordan's electricity system, there is no evidence NEPCO has been able to effectively mitigate related risks*	*RES development has been put on hold as the supply and demand issues in the electricity market are being addressed (storage development, cross-border interconnections, decommissioning of old thermal plants)* Regulatory framework for electricity storage in Jordan non-discriminatory and functioning well *No framework yet*
	Other PD assignments:	EBRD's Battery Storage Study with recommendations on non-discriminatory permanent regulatory framework for electricity storage *Completed by Mott McDonald in 2018, providing the regulator*	Jordanian authorities adopt the non-discriminatory permanent regulatory framework for electricity storage (largely as recommended) *Not implemented (too soon) in 2018. Update needed*	

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
	(i) support for the establishment of a non-discriminatory permanent regulatory framework for electricity storage, in support of further RE penetration in the Jordanian system. (ii) Preparation and publication of Generation Adequacy Assessment and system development reports in line with best EU/international standards (iii) Formulation of investment approval process by the regulator and preparation of 10-year development plans by NEPCO in line with best EU/international standards	*(EMRC) with recommendations about market design, contractual agreements and bylaws.* Generation Adequacy Assessment and system development reports prepared and published in line with EU/int'l standards *Nestor Advisors and PWC provided an advice to NEPCO on disclosure policies.* Investment approval process by the regulator formulated and 10-year development plans prepared by NEPCO in line with best EU/international standards *Financial modeling template for long-term capex planning was developed by PWC. NEPCO is in the process of reviewing it. Training in its utilization will be the next step*	GAA and system development reports feeding into the Action Plan for Energy (developed by the Min of Enviro) *There is no evidence of the above* More efficient and transparent RES approval process functioning in practice Clarity of RES development needs in Jordan (adopted in the Action Plan for Energy) *There is no evidence of this being achieved yet but might be in the future. There is more clarity now about RES development needs*	Improved RES development planning and improved conditions for RES investors, both evidenced by RES development in accordance with Action Plan for Energy *Currently RES development is on hold due to overcapacity. An update to the storage study needed* Jordan proceeds with one or more rounds of renewable capacity using the competitive tender model *Jordan proceeded with three rounds of solar tenders. However in 2019 it experienced electricity generation surplus, indicating that planning has not been ideal. RES projects have been largely put on hold, i.e. wind portion of the tender concluded in 2018 was cancelled with just the solar tender proceeding slowly and with reduced capacity. PPAs remain unsigned and negotiations are still ongoing.*

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
	(iv) Bank support to the Jordanian authorities to create a robust regulatory framework and to switch from a fixed tariff to a competitive tender system	Bank's advice on the creation of a competitive tender system for RES, including procedures for next round of auctions and bid evaluation methodology *Advice provided by Banking*	Bank's recommendations adopted *According to the regulator, the Bank's recommendations were adopted (bids were evaluated under more structured and transparent methodology)*	*It is possible that some terms of the original tender would be modified. The new solar plants are not expected to reach commercial operation till 2024.*
		Risks to Achievement of Outputs:	**Risks to Achievement of ST Outcomes:**	**Risks to Achievement of Impacts:**
		-Risks related to the development and construction of the solar plants, on time and on budget	-Risk that the power realised is below P90 projections - Risks related to offtaker creditworthiness	- Risks related to ongoing regulatory and policy reform (e.g. commitment to auction based model)

Infinity / IB Vogt Solar 1 and 2 – Results Frameworks (including policy dialogue related to ERF)

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
Project developer have both the financial capacity and the technical expertise to develop solar power plants Offtaker continues to operate and make payments in line with the PPA Conducive regulatory environment for further investment	<u>Infinity/IB Vogt Solar 1 (30MW):</u> 1.USD 16.35mn A loan from the EBRD (18 year maturity) 2.USD 5.02mn A Loan from GCF (Pari Passu) 3.USD 11.32mn B Loan from the EBRD (financed by FMO) <u>Infinity/IB Vogt Solar 2 (50MW):</u> 1.USD 27.35mn A loan from EBRD (18 year maturity) 2.USD 18.23mn B loan from the EBRD (financed by FMO) 3.USD 9.12mn Loan from GCF 4.USD 18.2mn equity from the Sponsors	1. Construction of Infinity/Ib Vogt Solar PV 1 (30MW) *COD reached in early 2019* 2. Construction of Infinity/Ib Vogt Solar PV 2 (50MW) *COD reached early 2019*3. Project sponsor implements ESAP *Fully implemented*	1. 80MW of RE capacity installed by a private developer *Completed* 2. 91.6GWh produced in first year of operation by PV 1 (P50 projection) *89.8 GWh produced in 2020* 3. 155.3GWh produced in first year of operation by PV 2 (P50 projection) *Achieved.* 4. Power is provided to the national grid at the FiT rate *Power provided as planned at FiT rateh*	1. The two projects together reduce CO2 emissions by 110,0000 tCO2e per year *104,600 tCO2 savings calculated based on electricity produced in 2020.* 2. Substantial contribution from two projects (and other Benban projects) to Egypt achieving its target of 20% of electricity generation from RE sources by 2022 *Infinity's 80 MW – 2.2% contribution* *Benban's 1.65 GW –40% contribution* 3. Positive impact on local economic development of the Aswan province (no clear target – new jobs, backward linkages) *10,000 jobs created during the Benban's construction, 34 jobs during operation (Infinity only)*

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
				4.Benban projects have wider demonstration effect, evidenced by (from framework): -At least 1,000 MW of renewable capacity is commissioned by private sponsors under the FiT *1,465 MW commissioned under Benban* -At least 500 MW of additional privately sponsored renewable capacity outside the Egypt Renewable Energy Framework is commissioned in Egypt. *Partly achieved. 250MW was commissioned by YE 2019, and Egypt expects to reach 500MW by YE 2021* - At least one renewable energy project in Egypt reaches financial close with commercial bank financing. *No evidence* - At least 200 MW of tender-based renewable energy capacity reaches financial close.

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
				Not achieved. Benban's capacity reduced form 1.8 GW to 1.4 GW due to lack of financial closing by selected developers
TC consultants are competent and have the relevant expertise Environmental assessments of new areas do not identify significant issues	<u>Policy dialogue and TC supported by the Bank</u> 1.EUR 75,000 to fund consultancy support in drafting of the solar grid code (TCRS 38578) 2.EUR 75,000 to support preparation of a Strategic Environmental and Social Assessment (SESA) for the Benban site (TCRS 1070) 3.EUR 1,350,000 for a SESA for a new area on the East Side of the Nile earmarked for future projects (TCRS 1070)	1.Draft of the solar grid code *Completed* 2.SESA for the Benban site *Completed* 3.SESA for the East Side of the Nile completed	1.EETC adopts solar grid code *Adopted in 2016* 2.Solar generators at Benban take coordinated approach to risk through the SESA *Coordinated approach taken* 3.Sponsors begin to develop projects at new location on the east side of the Nile following publication of SESA *Development of East side solar plant suspended due to overcapacity*	1.No "unacceptable effects" for solar PV plants upon connection to grid and solar generators comply with new solar grid code *Connection procedures clear* 2.Benban site is developed in accordance with international best practice and to maximise the benefits for the local population and other stakeholders *No environmental/social issues at Bemban* 3.New Solar PV plants at East side of Nile site become operational in accordance with international best practice *Currently no plans to develop new large solar plants in Egypt*

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
	4.Policy dialogue prior to establishment of framework (focused on the form of the PPA and on the contractual framework for investors) 5.Policy dialogue focused on transition to competitive auctions	4.Revision of FiT contractual framework, introduction of international arbitration *Completed* 5.Legislation to enable competitive tenders *Legislation for competitive bid's developed*	4.New FiT contractual framework attracts investors (including commercial investment) *Evidenced by interest and investments in Benban* 5.Government launches competitive tender schedule *Competitive tenders launched*	4.At least 1000 MW of RW energy is commissioned through the FiT scheme *1.46 GWh commissioned for Benban* 5.Government awards competitively tenders contracts to private solar sponsors (at lower price than current FiT) *Competitively awarded contracts for solar – prices down 3x – from USc7.3 for Benban to USc 2per KWh)*
		Risks to Achievement of Outputs:	**Risks to Achievement of ST Outcomes:**	**Risks to Achievement of Impacts:**
		-Risks related to the development and construction of the solar plants, on time and on budget	-Risk that the power realised is below projections - Risks related to offtaker creditworthiness - Risks that SESA identifies issues which impedes development - Technical risk related to compliance with the new solar grid code	- Risks related to ongoing regulatory and policy reform (e.g. transition to competitive tenders)

CYPV and TPT solar plant projects – Results Frameworks

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
Need to increase generation and diversify Cyprus' energy sources. RES regulatory environment attractive for investors Solar irradiation in Cyprus the highest in Europe Technical capacity of investors to construct PV solar plant 20 years PPA with EAC (off-taker) and a Support Agreement with the Support Scheme Special Fund (the SSSF or RES Fund), the government's vehicle to channel financial support for RES	EBRD loan: € 6.7 m Sponsor's equity: €3.4 m - CYPV	1. Construction of 3 solar power plants near Famagusta and Nicosia with the total capacity of 7.4 MW (CYPV) *2 plants completed in 3.2017 one in 7.2017*	1. 12.1 GWh of annually generated power provided to the grid and the end users *12.8, 12.6 and 12.3 GWh generated in 2018, 2019, 2020*	1.GHG emission reduced by 8,200 T per annum (CYPV) and 4,940 T per annum (TPT) *Confirmed Based on electricity generation level* 2.Contribution to the reduction of Cyprus' total GHG emissions (% of total emissions reduced due to the project) *Reduction of total CO2 emissions by 2.6%* 3.Contribution to Cyprus' increased electricity generation (% of total) 4.Contribution to Cyprus' electricity generation mix from RES (% of RES in total and share of the project in total RES) *Added 14% of total installed solar power capacity* 6. Demonstration effect of the viability of the RES support scheme, amended in 2013(>15 MW added by other private solar operators)
	EBRD loan of € 3.6 m Sponsor's equity €1.7 m - TPT	2.Construction of 2 solar plants near Nicosia with the total capacity of 4.5 MW (TPT) *Completed*	2.Electricity in the amount of 7.3 GWh (4.9 GWh after one plant's sale/pre-payment) provided to the grid and the end users *4.9 GWh generated in 2020*	

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
				35 MW had been installed from the 50 MW tender held in 2013 (deducting the 12 MW capacity under the EBRD-financed, leaves 23 MW additional private capacity by year-end 2018. However no additional solar tenders held after 2013.
	Policy dialogue: TC €28,300 for assisting the Cyprus Energy Regulatory Authority (CERA) and the Electricity Market Operator in the assessment of the new electricity arrangements and associated market rules being proposed under the new market model with a view to promote RES *(from FSRU).*	An assessment report (from CEER) with recommendations for changes to the rules to ensure completeness, consistency and suitability, with a particular focus on implications for promoting investment in RES *Completed by CEER, however CERA reported limited value due to most recommendations already being implemented*	The assessment report's recommendations (below) implemented - rules changed evidenced by the adoption of new laws and regulations • EAC's (TSO) greater independence; *Unbundling completed in 2.2020 EAC formally (legally) independent. But its practical independence to be verified with the clients* • measures to increase transparency and liquidity in the Forward and Day-Ahead Markets, while at the same time mitigating the market power of EAC; *No evidence*	Liberalised electricity market allowing competition in generation and supply and in line with the EU's Target Model for market coupling and cross-border trading – evidenced by lower consumer tariffs and more market participants *Liberalised electricity market introduced, planned to be fully aligned with EU's Target Model by October 2022.* Improved conditions for investment in RES – more transparent rules, greater protection for investors - evidenced by the increased number of RES concessions granted in Cyprus

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
	Bank's staff PD with the Ministry of Energy, EAC and the regulator to improve bankability of RES projects (enabling limited recourse financing)	Recommended amendments to the PPA and Support Agreement (for the 2 projects) *Recommendations provided*	• greater facilitation of Renewables through the identification and removal of technical barriers to the operation of renewable generation; *Barriers partially removed, however some still exist* • measures to improve the market operation arrangements. *Some measures introduced* The amendments adopted for a new model PPA and Support Agreement *New PPA and the amendments to SA adopted*	*No new private RE concessions granted after 2013* New PPA and SA enable limited-recourse project finance of RES – evidenced by increased number of such financing No new Res private projects
		Risks to Achievement of Outputs:	**Risks to Achievement of ST Outcomes:**	**Risks to Achievement of Impacts:**
		-Technical risks related to procurement and construction of solar plants, as well as their connection to the grid	-Risks related to insufficient irradiation levels, thus output and generation of electricity -Risks related to lack of political commitment to adopt CEER's recommendations	-Risks related to macro-economic situation in Cyprus -Risks related to the government's commitment to RES and GHG reduction targets

Nur Navoi, Uzbekistan – Results Framework

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
Project developer has financial capacity and the technical expertise to develop solar power plants Project sponsor continues to have sovereign backing Offtaker continues to operate and make payments in line with the PPA Conducive regulatory environment for further investment 100% of the Bank's proceeds are used for solar plant construction	1. USD $60mn equity bridge loan provided by the EBRD, with a six year tenor and a bullet payment at maturity. 2. USD $26mn of senior debt provided by IFC and ADB (USD $17mn by IFC) and USD $9mn by ADB) 3. USD $17mn concessional finance provided by the Canada-IFC Blended Climate Finance Programme (at 0.85% interest) 4. USD $9mn concessional finance provided by the Clean Energy Financing Partnership Facility (at 1.4% interest), managed by the ADB	1. 100 MW solar PV plant with P90 forecast of 1,708kWh/m irradiation *Completed 4 months before scheduled completion in August 2021* 2.Timely connection to the National Grid *Connected to grid in August 2021, ahead of planned schedule*	1. Potential to generate 252.2 MWh of power annually *In the first month of operation (Sept), the plant generated 13 MWh of power and in October 15 MWh (as planned). Potential to achieve 252.2 MWh in 2022 is good.* 2. Start of power sale to the national grid at the price determined by the first competitive auction (USDc 2.68/kWh) *Nur Navoi started selling power to the grid in late August at the agreed price*	1. Potential for annual CO2 savings of 154,000 tonnes *Based on the planned electricity production and sale, this benchmark has good potential to be achieved* 2. Potential to serve as a demonstration of a successful private sector investment within the Uzbekistan RE sector (targets include successful completion of second auction). *No visits at the new plant yet but enquiries from international companies which consider investing in solar in Uzbekistan. The second auction completed.* 3. Contribution to the country's low-carbon transition via adding 100 MW solar generation capacity (2% contribution to 5,000 MW target for solar by 2030), reducing the country's current high reliance on thermal power generation. *Achieved*

Policy Dialogue	Project`s Inputs:	Project`s Output:	Project`s Outcome:	Intended Impacts:
	Policy dialogue conducted by the Bank's staff, some well in advance of the Nur Navoi project 1.Preparation of the Low Carbon Pathway for the power sector of Uzbekistan (TC) 2.Support to the unbundling of vertically integrated Uzbekenergo through capacity building assistance on the power sector market structures and unbundling; support for compliance function (TC)	1. The Low Carbon Pathway for the power sector report and a presentation to the policymakers and broader public, securing the buy-in from policymakers and a MoU on the long-term decarbonisation strategy for the development of the power sector *Report and a presentation completed. MoU signed 2.21* 2. Workshops and seminars conducted by the Bank's consultants. Set of documentation for the compliance department developed *Completed (30 persons trained in compliance function) Also peer-to-*	1. Implementation of the Low Carbon Pathway *Report published on the website of the Min Energy. 3 solar and 1 wind auctions held.* *In August 2021 the Ministry of Energy announced it is considering increasing 2030 RES target from 8 GW to 12 GW in the energy mix.* 2. Unbundled single buyer established and operational; compliance function improved Unbundling completed..Compliance departments set up and operational at the generation	1. Uzbekistan's energy sector development proceeding based on RES, leading to the achievement of 2030 goals for 8GW from RES (5GW solar) and 2050 climate neutrality goal. *Based on the government's declarations (and a new MoU signed with EBRD in November 2021 on Advancing Decarbonisation and Transition to Green Economy), commitment of Uzbek government to RES seems strong* 2. Structure of Uzbek energy market in line with international practice (separate generators, transmission company and distributors), liberalised and opened to private

		peer exchanges between the regulators through the Council of European Energy Regulators, (focused on energy affordability and market structures). Compliance department established.	(GenCo) and transmission (TransCo) companies. Both companies received the international standard certificate ISO 37001: 2016 on "Anti-bribery management system"	*Uzbek energy market in line with international practice. Liberalisation (transfer to spot market) planned after regulator established (2022-23)* Compliance departments contributing to improved CG *Compliance departments at the new generation company and at NEGU operational. High impact on NEGU's credibility and image (according to its Head)*
	3.Capacity building promoting renewables, and subsequent support in the implementation of the first wind auction (TC)	3. Workshop on renewables (including a site visit to the Bank-financed 100MW Burnoye SPP in Kazakhstan), MoU on cooperation in developing wind auctions (impact on solar), comments on the first wind auction concept, wind measurements, work on subsequent non-sovereign guarantee RES. *Workshop and a site visit to Burnoye completed. MoU signed, Bank consultants assisting in the first wind auction (completed)*	3. The first wind auction in Uzbekistan launched, high investor interest, wind measurements info utilised in the auctions, new RES projects accepted by investors/financiers without sovereign guarantees *Auction launched April 2020, attracted 70 companies, shortlist compiled (currently completed at a record low price of US 2.5695 cents/kwh)*	3. Wind generation scale up ongoing, on target for 3GW by 2030 *According to the MoE, the consultant has been professional and needed, but in the past working too slowly. However, the recent auction was processed fast and efficiently* *In March 2022, the Bank signed an MoU with the Government of Uzbekistan expanding the Bank's support with wind auctions from 1 to 2 GW.*

	4.Drafting of new Electricity Law and establishment of a single buyer (TC)	4.Bank's draft of new Electricity Law and establishment of a single buyer off-taker *Completed*	4.New Electricity Law enacted *Draft under review, expected to proceed with being enacted, A single buyer (NEGU) has been established in the process of Uzbekenergo unbundling*	4.Uzbek energy legal framework in accordance with international practice, serving the new (unbundled) structure. Single off-taker entering into PPA (non-sovereign guaranteed) with new RES investors *Achievement possible in longer term. Currently the off-taker does not have financial track record and sovereign guarantees have been needed. Regulator to be established (with Bank's assistance) in 2022*
	5.Support to pandemic related stress-tests for the power generation sector (TC)	5.Presentation of the stress test to the state power company and the authorities and development of a set of measures to mitigate risks. Report on pandemic related stress-test for the power generation sector *Completed*	5. Measures to mitigate risks implemented *The stress test helped the Government identify the most vulnerable areas of GenCo's operations, and helped target the state support to the segments most in need. In result, tariffs paid to some (thermal) generators increased*	5No major impact/disturbance from the pandemic on Uzbek energy system *Pandemic had certain impact on the Uzbek electricity system. EBRD provided VISP: Electricity Support Facility to GenCo (a power*

				generation company of Uzbekistan).
		Risks to Achievement of Outputs:	**Risks to Achievement of ST Outcomes:**	**Risks to Achievement of Impacts:**
		-Risks related to the development and construction of the solar plant, on time and on budget	-Risk that the power realised is below P90 projections	- Risks related to ongoing regulatory and policy reform

Chulakkurgan and Risen Solar solar plant projects (including policy dialogue related to KAZREF I) – Results Framework

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
Project developers have both the financial capacity and the technical expertise to develop solar power plants Significant FX depreciation doesn't affect borrower ability to repay Offtaker continues to operate and make payments in line with the PPA Conducive regulatory environment for further investment	1. USD $40.4mn loan equivalent in Tenge with 13 years tenor (subsequently adjusted downwards to USD $32mn) 2. $10mn of concessional financing provided by GCF (adjusted downwards to $8mn) 3. $21.6mn of Sponsor equity (adjusted down to $17.6mn)	1. A solar power plant constructed and 63MW capacity added (adjusted downwards to 50MW) in Chulakkurgan district, by 2020 *50 MW plant completed, COD December 2020 (6 months late)* 2. The sponsor participates in Bank-led workshops providing information/training to local businesses in developing Bankable RES projects (by February 2020).) *The sponsor participated in one event in Kazakhstan and another in China, sharing its experience with local RE developers*	1. Project generates 102.3 GWh energy annually (*this target has not yet been formally adjusted to account for the reduction in the project size)* *Shortfall due to a faulty transformer. 60.8 GWh generated in 10 months (70GWh target) of 2020; 83 GWh generated in 2021 (in line with the revised P90 scenario of 78 GWh)* 2. Project is commercially successful (pays dividends) - from 2021 *Dividends not yet paid but financial performance as planned* 3. Potential RE developers trained (in total, 50 plus local developers trained by YE 2020 - framework's target). *No evidence of a training workshop*	1. The two projects together generate annual savings of 118,800 tCO2 emissions *Note: this target was adjusted downward to account for reduction of Chulakkurgan capacity size.* *Based on electricity generated to date, the target is likely to be achieved.* 2. The two projects (and the Bank's workshops) have demonstration effect encouraging other private companies to invest in Kazakh RE sector (framework targets 400MW of RE projects developed by private developers without EBRD support, and 7 projects financed under the framework with majority private investors) *No evidence of EBRD workshop or the plants having any demonstration effect*

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
	1. USD $22mn in Tenge with 14 year tenor. 2. EUR €100,000 of TC for technical, environmental, and legal due diligence on a co-funding basis with the project sponsor 3. USD 4.9mn provided by the CTF on a 20 year time period with a 8 year grace period. 4. USD 4.2 mn loan from GCF 5. USD 13.57mn of Sponsor's equity	1. Construction of a solar plant and addition of 40MWp to the grid in the Karaganda region of Kazakhstan by long stop completion date of June 2020. *The plant completed and connected to the national grid in January 2019 and officially commissioned in April 2019.*	1. Project generates 55.1GWh annually (P90 scenario) – from 2019 *51.4 GWh generated in 2019. 65.3 GWh generated in 2020 (above 51. 1 GWh target under P90).* 2. Project is commercially successful (pays dividends) – From 2020 *Dividends not yet paid but financial performance as planned*	*However 960MW solar installed by end 2020; 13 solar projects financed by the Bank for 600MW (360MW without the Bank)* 3. Contribution of 5% capacity by both projects combined to 3% (1.8 GW) renewable energy generation by 2020 target set by GoK *Chulakkurgan project reduced by 13 MW. However still contribution of 90 MW by both projects in aggregate (5.6%) to 1.6 GW of 3% RES target. In total, 0.6 GW solar financed by EBRD in Kazakhstan (37%)*
	Original objectives of Policy dialogue under KAZREF 1 (*Framework provided an indicative budget of €10mn for PD), however only €460,000 utilised, PD objectives evolved)* 1.Mapping electricity grid balancing capabilities *Completed by USAID*			

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
	2.Review of how RES is treated in the Kazakh Emissions Trading Scheme *TC started and currently ongoing*	2.RES integrated in Kazakh ETS *TC ongoing (certification of RE operations not yet possible)*	2.RES operators benefiting from ETS *TC ongoing*	1.Increased attractiveness of Kazakh RES system, to achieve critical mass of private RES projects *Not yet verifiable*
	3.Review of FiT system (including development of a calculation mechanism and support to FX indexation)	3.FiT operational *The Bank provided support for FiT calculation methodology and indexation in the early days but more recently no need to do it as the Government moved to auction scheme earlier than initially expected*	3.FiT-based system operational until auctions introduced in 2018 *Completed*	2.Further increased private sector interest and confidence in Kazakhstan RE sector (demonstrated through success of RE auctions) *Auctions successful and generating high interest from international investors*
	4.Capacity building support to Financial Settlement Center (FSC), (including development of telemetry for remote monitoring of RES projects)	4.Well-functioning FSC *The Bank made contribution to the establishment of the FSC* *Main work and capacity building done by USAID, MRV system developed by the World Bank*	4.RES generators paid on time and in full by FSC *No issues with payments by FSC*	3.Payment system based on FSC satisfactory to RES investors So far the FSC-based system has been working well
	5.Development of auction based system for RES *EBRD started but leadership taken over by USAID*	5.Auction system's rules and regulations prepared *Contributions to PPA, legislation, improved auction procedures*	6.Well-functioning auction system *28 auctions held in 2018-2019 and 13 in 2020-21, no complaints so far*	4.Launch of wind auctions *Wind auctions launched and supported by EBRD's consultants*

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
		Risks to Achievement of Outputs:	**Risks to Achievement of ST Outcomes:**	**Risks to Achievement of Impacts:**
		-Risks related to the development and construction of the solar plants, on time and on budget	-Risk that the power realised is below P90 projections - Risks related to offtaker creditworthiness - FX risks creating currency liability mismatches	- Risks related to ongoing regulatory and policy reform (e.g. transition to auctions)

Yavoriv 1 and 2 solar plant projects (including policy dialogue related to USELF) – Results Framework

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
Project developer have both the financial capacity and the technical expertise to develop solar power plants Offtaker continues to operate and make payments in line with the PPA Conducive regulatory environment for further investment	1.EUR 16.9mn loan from the EBRD (10 years with one year grace period) – Phase 1 Investment *EUR 0.6mn cancelled (unused contingency)* 2.EUR 6.7mn (semi-commercial – 400 bp vs 650 Bank)) loan from the CTF (11 year with one year grace period) – Phase 1 Investment 3.A-Loan of EUR 5.9mn provided by EBRD of 9.5 year tenor (Phase 2 investment) 4.B-loan of EUR 12.5mn through EBRD funded by Triodos (Phase 2 investment) 5.Sponsor equity of EUR 3.9mn (Phase 1) and EUR 3.4 m (Phase 2) 6.Equity loan of EUR 1.7mn from NEFCO (Phase 1) and EUR 2.5 m (Phase 2)	1. Construction of 36MW Solar PV plant Yavoriv 1. Target COD date in 2018. *Connected to the grid in Nov 2018.* 2. Construction of 36MW Solar PV plant Yaroviv 2 Target COD date of November 2019 *Commissioned in November 2019* 3. Project sponsor implements ESAP *ESAP fully implemented including concreate drainage channels around the whole plant and bird hazard prevention*	1. 71.1MW (in aggregate phase 1 and 2) of RE capacity installed by a private developer *Completed* 2. 66,180 MWh produced in first year of operation (P75 projection) *83 MWh produced in 2020* 3. Power is provided to the national grid at the FiT rate *Power provided but FiT payments were stalled and FiT was cut 15%*	1. The two projects together generate annual savings of 141,000 tCO2 emissions *Achieved, based on production level* 2. Demonstration effect, showcasing attractiveness of Ukraine RE sector (framework targets 300MW of RES projects -10 RES projects (90 MW) for phase 1 and 10 (60MW) for phase 2 (no IFIs) -commercial finance at least 20% -no need for subsidised finance (80% of CTF loans priced commercially) *As the offtaker has not been settling its payments to solar producers during the pandemic (arrears now repaid) and the payments were reintroduced with a 15% tariff cut, the attractiveness of the Ukrainian solar sector for investors diminished.*

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
	Policy dialogue conducted by the Bank EUR 4mn grant under USELF Framework for a TC to support PD and DD, including: 1.Review of legislation to facilitate introduction of RE auctions 2.Technical support to RE auctioneer 3.Support to authorities to prepare transparent procedures for RE approval 4.Engagement with the government on competitive procurement authorities (including over LCR)	1.Report with recommendations for changes to enable RE auctions *Work of the consultants has been suspended due to non-payment by the off-taker. As arrears have been partly settled, it may be reactivated in 2022 (although there are views that market-based model, currently used could remain permanent)* 2.Workshops and training of auctioneers *TC on auctions suspended* 3. Report with recommendations for removal of deviation from international practice *TC on auctions suspended*	1.Governmetn implements recommendations – introduces new law and launches auction/competitive tender process *The auction primary law has been adopted (and according to MoE secondary law has been prepared by MoE) but no auctions have been held* 2.Auctioneers trained and ready to conduct auctions *TC on auctions suspended* 3. Recommendations accepted, streamlined RE approval procedures adopted (including detailed technical and operational procedures for assessment and approval of RE projects by distribution companies) *TC on auctions suspended*	1.Private sector sponsors submit proposals for RE via competitive tender at lower prices than existing FiT *TC on auctions suspended* 2.well-run RE auctions *TC on auctions suspended* 3.RE approval procedures perceived by RE operators as fair and transparent *TC on auctions suspended*

Assumptions:	Project's Inputs:	Project's Outputs:	Project's Outcomes:	Intended Impacts:
		4.Agreement by the government to review local content premiums component *No such agreement was reached*	4. Removal/reduction of local content premiums *Local content premiums still applicable*	4. Auction participation procedures perceived as fairer *No auctions held however local premium not seen as an obstacle*
	5. Strategic Environmental Review of renewable energy technologies	5.Strategic Environmental Review of renewable energy technologies completed *Due to off-taker's payment default, this TC has been suspended. It might be reactivated in 2022*	5.Strategic Environmental Review of renewable energy technologies approved by authorities covering key regions with RES potential *On hold*	5.Clearer regional RES development strategy *On hold*
	6.Marketing to private RES developers	6. 20 reached ph 1 and 40 ph 2 *Due to off-taker's non-payment, no new solar licenses have bene granted in recent years*	6. Part of RES developers contacted decide to participate in auctions *No auctions held*	6.More RES developers participating in auctions *No auctions held in 2020-21*
		Risks to Achievement of Outputs:	**Risks to Achievement of ST Outcomes:**	**Risks to Achievement of Impacts:**
		-Risks related to the development and construction of the solar plants, on time and on budget	-Risk that the power realised is below projections - Risks related to offtaker creditworthiness	- Risks related to ongoing regulatory and policy reform (e.g. transition to auctions)

Annex 3: Cluster Projects' Evaluations

Ratings for each category are based on the following scale of: Excellent – Fully Satisfactory – Partly Satisfactory – Largely Unsatisfactory - Unsatisfactory. The overall performance rating scale is: Outstanding – Good – Acceptable – Poor – Very Poor ("-" or "+" may be added to the overall performance rating).

1. Al Mafraq and Al Safawi, Jordan

Background

The Bank provided individual project finance loans to support two projects awarded as part of Jordan's second round of renewable energy auctions. The lead developer behind both projects is FRV, an international RES developer headquartered in Madrid, Spain. Offtake was via a PPA with NEPCO, the state electricity grid operator. Given the similarities, the projects have been evaluated together.

For Al Mafraq, the EBRD provided a senior loan of US$ 35.47 million, with an 18-year maturity, alongside a parallel loan from Proparco of the same size and tenor, and the sponsor's equity investment of US$ 24.49 million. Al Mafraq is a 50MW solar PV plant, which was scheduled for completion by mid-2018. The Bank also provided a US$ 64.5 million senior A/B loan to finance Al-Safawi, of which 50% was syndicated to FMO, alongside US$ 23.3 million of sponsor's equity. Al Safawi is a 51MW solar PV plant, which was scheduled for completion in March 2019. The Bank agreed an ESAP as part of both projects, which included objectives around support to local employment and skills development.

The transition impact for both projects was expected to derive from their contribution to reducing greenhouse gases, increasing private sector participation in Jordan's energy sector, and the demonstration of new replicable behaviours/activities such as assisting Jordan to achieve its target percentage of electricity demand met by renewable energy sources. In addition, although not formally a transition impact target, the Board reports for both projects noted the importance of "[economically developing] the area by providing skills training and employment locally".

The Bank has also engaged in extensive policy dialogue in the Jordanian renewable sector, which is included in the remit of this evaluation. Some of this policy dialogue is tied to a large loan to NEPCO, the state-owned power offtaker. Key activities included a renewable energy integration technical study to assess the Jordanian grid capacity for absorbing renewable energy, support for the establishment of a battery storage regulatory framework, and advice on the competitive tender system for renewable energy auctions.

Relevance

The relevance of both projects is assessed in line with the 2014 Jordanian Country Strategy, which prioritised "the development of renewable sources for energy generation". This called for the Bank to offer "sustained support for Jordan's plans to development a significant volume of renewable energy capacity (particularly solar and wind)" as well as "policy dialogue and technical assistance on fostering a conducive and sustainable investment in these areas". These projects are clearly relevant under that strategy.

The projects were also relevant to the Jordanian government's Vision 2025, the National Development Plan (as well as the currently applicable 2020-2030 Energy Strategy). This sets out the ambition of expanding renewable energy, primarily by exploiting solar resources, with a target of generating 20% of electricity from RES by 2020 (the current Strategy aims

to reach 50% of electricity generation from renewable sources by 2030). Under its Nationally Determined Contribution (NDC) commitment, Jordan has also targeted of the reduction of greenhouse gas emissions to 30% below "business as usual" levels by 2030.

Financial investment in solar PV plants combined with policy dialogue to support the further expansion of the sector is therefore clearly relevant in meeting those targets, and with the Bank's support Jordan actually achieved the objective of generating 20% of its electricity from renewable sources by 2020.

The additionality of both projects rested on three components: the inclusion of an ESAP, EBRD policy dialogue, and the limited availability of long-term project financing. The client informed EvD that the EBRD offered the most competitive financing terms, combined with an efficient and diligent financing process. Other stakeholders confirmed that commercial banks in Jordan have rarely been able to offer long-term financing to match the tenure of the renewable energy PPA because of the high provisioning requirements imposed by the Central Bank. Furthermore, the EBRD also approached the co-lenders, FMO and Proparco, mobilising additional sources of finance.

The Bank also offered support in the preparation and implementation of an ESAP, which was appreciated by the client.

The Bank engaged in extensive policy dialogue in Jordan, and clearly contributed to additionality from that perspective. Specific support included financing a study conducted by Mott MacDonald on a non-discriminatory regulatory framework for electricity storage, capacity-building at NEPCO, and advice on the competitive tender process.

However, EvD notes that in 2019 (shortly after both projects became operational), Jordan experienced an electricity generation surplus which, due to the lack of electricity export agreements and limited cross-border interconnections, could not be exported, compounded by the lack of energy storage assets which prevented it from being stored for later consumption. Furthermore, over 800MW of distributed solar power (mainly roof-mounted by households) has been added (accounting for c.12% of total of the country's installed solar capacity).

This surplus caused imbalances in the network and aggravated the financial situation of NEPCO (the sole RES and thermal energy offtaker, obliged to buy all energy produced). Subsequently, the Ministry of Energy decided to reduce the capacity of an ongoing tender for new solar power (launched in 2018) from 200 MW to 150 MW, allocated 100 MW to the industrial sector to be tendered separately, and cancelled the wind tender for 100 MW. Furthermore, a moratorium on any future RES development (excluding distributed solar below 1 MW) has been imposed. Currently, some previously-awarded concessions for solar development are slowly proceeding.
Therefore, although the Bank's support for both projects was closely aligned with the country's (and the Bank's) strategy, one can assert that it (unintentionally) contributed to surplus electricity generation, which resulted in the financial of the offtaker and the moratorium on new RES developments.

Despite this, in EvD's view, the long-term relevance of these projects (together with the Bank's additionality) was strong and it is rated **fully satisfactory**. They brought Jordan closer to achieving its strategic objectives in respect of the share of RES in its generation capacity and they will benefit the country in the longer term, when its grid is balanced. Moreover,

EvD notes that in this particular case the Bank foresaw these problems and launched a TC to assess the Jordanian electricity system's capacity to accommodate new solar investments, as well as a TC supporting the development of a regulatory framework for electricity storage. The aforementioned grid capacity study and its recommendations were utilised by the authorities in the formulation of the Jordanian 2020-2030 Energy Strategy, however the recommendations from the electricity storage study were not implemented (see the next section on policy dialogue results). There is some evidence that the improved grid balance could be achieved in the not too distant future. In 2020-21 Jordan signed agreements to export electricity to the West Bank and Lebanon and to develop inter-connections with Iraq. Moreover, feasibility studies for electricity storage (under two alternative technologies) are being finalised and related investments will start in 2022-23.

However, there are important lessons stemming from the situation, which arose following these projects - namely, while supporting RES generation capacity development, pay increased attention to ensuring the system's flexibility through parallel support to electricity storage development and cross-border interconnections. Moreover, incorporation of a decommissioning strategy for old, inefficient thermal generation units (e.g. in the Master Plans or Decarbonisation Pathways, which the Bank helps develop for selected countries), could be another way to ensure that RES projects financed by the Bank will meet actual demand.

Effectiveness

On the **output** level, the two solar PV plants have been constructed and are operational. However, both plants faced delays. COD on Al Mafraq was delayed by eight months (completed in September 2018 instead of January 2018) due to initial delays in the procurement of trackers that led to late signing of supply and related contracts. The project was signed based on a total project cost of US$ 95.4 million (5% lower than the budget in the Board report) due to a reduction in EPC costs. After initial delays, construction was completed as planned with minor budgetary savings due to lower interest during construction (US$ 95.2 million vs. US$ 95.4 million at signing). Al Mafraq started commercial operations on 24th September 2018 (slightly delayed, compared to planned mid-2018 commencement).

For Al Safawi, the issuance of its Provisional Acceptance Certificate (PAC) was delayed by two years (it was issued only in April 2021). Following a storm, a technical flaw was identified in some of the trackers (which pivot solar panels to follow the path of the sun). The EPC Contractor, TSK, reinforced the trackers to address this issue, primarily through the installation of additional dampeners on the trackers' support structure. This was to help mitigate dynamic-stress instabilities and minimise equipment fatigue. Whilst the PAC was delayed as these corrective measures were assessed by an independent engineer, the plant was able to start operating as originally planned in April 2019. More recently, the Project was able to achieve Technical Completion Declaration in February 2022. Notably, this milestone was achieved later than anticipated as a result of delays in meeting the TCD conditions due to the aforementioned tracker-related issue following the 2018 windstorm.

Both solar plant used panels manufactured by JA Solar, a major Chinese solar panel manufacturer. Researchers have suggested that there are credible reports of forced labour within JA Solar's polysilicon supply chain. However, there was no data or evidence linking JA Solar to forced labour when these projects were approved.

In terms of **outcomes**, the projects have been supplying renewable energy to the national grid at the price agreed through the competitive tender process. Output has been around the P90 level, which is ca. 7% below the P50 base case assumed at Board. Al Mafraq's first year generation was 138 GWh and in the second year was 141 GWh (versus a baseline of 137 GWh P90), whilst Al Safawi generated 144.5 GWh in 2020 - its first full year of operation (against a baseline of 143 GWh P90).

Project	Total Generation in GWh from January 2020 to December 2020		
	Actual	P50 Base Case	Delta to P50
Al-Mafraq	139.85	148.5	-4.86%
Al-Safawi	144.45	152.2	-5.9%

2021 H1 production at Al Mafraq was 9% above H1 2020 level.

The projects did support local employment and skills development (an important component of the Board reports for both projects). Al Mafraq provided 500 jobs, mainly to local workers, during about a year of the construction phase, and subsequently six permanent jobs for O&M. Al Safawi supported 240 jobs during construction, and similar a number of permanent jobs as Al Mafraq. All employees have been provided with technical and health and safety training. There are women among the control engineers (two at Al Mafraq).

There is also some evidence of ongoing local employment effects in the community, including job creation for refugees. At Al Mafraq, the project developer has subcontracted the cleaning of solar panels to a local company. As part of this process, said developer supported the subcontractor's formal business registration, and ensured they had the appropriate health and safety processes. The cleaning takes a few days each month and requires a team of 10 people. The project developer has also provided two fully funded scholarships for a university course in Spain, with eligibility restricted to the local community.

In addition, for 1-2 months each year the Al Mafraq project developer hires circa 60 Syrian refugees (a large refugee camp is located nearby) to clear vegetation. They stated that they typically pay a salary of UDS$470 per month for each refugee employed on the project. The main impact of these projects was CO_2 savings, targeted at 180,000 tonnes annually, the potential demonstration effects of a successful private sector investment within the Jordanian renewable energy sector, contribution to Jordan's renewable energy targets, and local economic development.

On the **impact** level, the two projects have generated power in line with the original forecasts, and therefore are reducing CO_2 emissions by at least 180,000 tCO_{2e} per year (the actual reduction from Al Mafraq was estimated at 96,250t of CO_2 emissions in 2020 and from Al Safawi 99,950t of CO_2 emissions in 2020). These projects also contributed towards Jordan reaching its target of generating 20% of RES in its energy mix by 2020 (they accounted for 4.6% of the total RES capacity in Jordan). There is also some evidence of a demonstration effect, with multiple additional RE projects having been commissioned since these projects, one of which involved financing from a local commercial bank.

Policy Dialogue:

The Bank has also engaged in extensive policy dialogue in the Jordanian energy sector. The focus of this policy dialogue has primarily been on the integration of renewable energy into the national grid. The components of the Bank's policy dialogue included:

- **Renewable Energy Capacity Technical Study**, which was concluded in September 2020 by CESI consultants. This was slightly behind schedule (the original target date was 31st March 2020). The study was highly relevant and urgently needed. It assessed the grid's capacity to accommodate further renewable energy generation, including solar, and contained recommendations on how to strengthen grid capacity going forward. Some recommendations were included in the Government of Jordan's 2020 Energy Strategy. This study also identified mitigants for grid imbalances and trained NEPCO (the offtaker) staff on how to use them. There is some evidence that the new investment programme for NEPCO is part of the grid imbalance mitigation strategy. However its results will only be known in the future.
- **Training and advice to NEPCO on HR and financial modelling** was provided by Nestor consultants and PwC. Several workshops took place with over 30 senior staff members attending. Nestor's training focused on HR capacity building, including performance appraisals, developing Terms of Reference for specific roles, compliance, and recruitment processes. PwC helped develop financial modelling templates for NEPCO's investment plans, which are currently under review by NEPCO. Training on how to use these templates is to be provided in the future.
- **Development of a non-discriminatory regulatory framework for electricity storage** (as the government issued a tender for electricity storage in 2018 and this assignment was to complement it). A study recommending such a framework was completed in 2018 by Mott MacDonald consultants However, in the opinion of the Energy and Minerals Regulatory Commission (EMRC), in 2018 Jordan was not yet ready for it to become operational (bid prices were deemed unaffordable and the tender was cancelled). Moreover, EMRC noted their objective of introducing regulation to allow for NEPCO or the transmission company to have the ability to own storage assets as these institutions have the capacity to provide ancillary services. It should be noted that this aspect was reviewed by the consultants during the Mott MacDonald study, which introduced this window to NEPCO. However, technologies have now changed and in EMRC's view this study could be a good base for the preparation of an updated version. This is becoming urgent as in recent years Jordan has been cooperating with JICA on battery storage options and with GiZ on a pump-hydro battery storage system. Feasibility studies for both options are being finalised and investments in storage are to start in 2022-23.
- **Support for the development of a competitive tender process and bid evaluation methodology** was provided by the Banking department. This assistance yielded good outcomes in terms of a more structured and transparent approach to the evaluation of bids under RES auctions. The Bank's assistance in this field was particularly appreciated by the Jordanian authorities. However, the country currently has no intentions of launching a new round of renewable energy projects due to projections of supply surplus and weak demand for electricity (partially due to the pandemic).

Further growth and development of the solar sector in Jordan has been delayed due to a mix of political and technical barriers. As explained in the previous section, in 2019 Jordan experienced an electricity generation surplus, which resulted in new RES auctions being put on hold and very slow PPA negotiations with the two winning bidders under the

third solar auction. Importantly, subsequent to this auction, the government removed the sovereign guarantee to NEPCO's payments under the PPA, to reduce the pressure on the state balance sheet. This reduced the attractiveness of the PPA and has led to protracted negotiations with both winning bidders. EvD understands that one bidder is close to signing an agreement under the revised terms, while talks with the other have not proceeded far. The lack of storage for intermittent energy production and a decommissioning plan for old thermal power units, as well as limited cross-border interconnections, imply that sectoral growth in the short-to-medium term will be at best moderate.

The EBRD foresaw these constraints and designed policy dialogue to address them. The study funded by Mott MacDonald highlighted potential storage solutions, but unfortunately it was premature and had some gaps. Policy-makers stressed that a lack of storage options was hindering the development of the solar sector, a point that is also clearly made in the Jordanian government's Energy Sector Green Growth National Action Plan 2021-2025. Further capex investments into the national grid (following the study conducted by CESI) could also help increase capacity in the sector.

In EvD's view, although effectiveness of these projects has been fully satisfactory, outcomes of some components of the Bank's associated policy interventions in this sector are not yet clear. However, in aggregate the effectiveness of these projects and the policy dialogue is rated ***fully satisfactory*** as several outcomes of the Bank's policy dialogue have a good chance of being achieved, particularly in the longer term. The Bank's policy dialogue was clearly designed to address critical areas of need (e.g. grid capacity, corporate governance at NEPCO, and energy storage options). Some recommendations from these interventions have broadly been adopted by the Jordanian government and NEPCO, and there are emerging signs of follow-on activity. JICA and GiZ are working with the Ministry of Energy on storage options, which should start addressing key problems hampering the development of RES in Jordan. Also, the recently signed electricity export agreements with neighbouring countries should help relieve network pressure.

Efficiency

In February 2020 the offtaker, NEPCO, cited COVID-19 as a Force Majeure, and only settled 75% of invoices for a five month period between February and July 2020. However, these arrears have now been fully settled and full payments at the price determined by the competitive tariff have resumed. The Bank contributed to this settlement by its policy dialogue with NEPCO and the government.

Al Mafraq:

Output in 2020 has been around 5% below the P50 base case assumed at Board. However, that could just reflect random annual variations in levels of irradiation. Even with this, the project has made all debt service payments in full and on time (apart from a one day technical delay) and is it is expected that all future debt service obligations will be met and financial covenants will be complied with. Due to the partial settlement (75%) of invoices by NEPCO between February and June the CAFDS in 2020 below the original projected figure. The matter has now been resolved with NEPCO and all arrears were settled in 2021. The client told EvD that the Bank played an important role in negotiating a compromise agreement between NEPCO and power producers, and the final settlement agreement was largely prepared by the EBRD and its advisors.

Unlike the first round projects in Jordan where the tariff was ca. 16 $c/kWh the tariff here is a more reasonable 7.66 $c/kWh which is less likely to be unilaterally reduced. The FiT is 85% indexed to USD and the Jordanian Dinar (JOD) is

pegged to USD. In 2020, the project companyreported revenues slightly below the 2019 levels (due to COVID-19) and 6% lower than the Board approved projections at P50. In 2021 H1, the project company's revenues were in line with forecast under both the 2021 updated projections and those approved by the Board under P50. In 2021 H1, EBITDA and net profit margin weree largely in line with the Board approved projections at P50. Also in 2020 the borrower reported a net profit higher than recorded in 2019, and higher than what was projected at Board, assuming P50 yields.
FRV are in the process of acquiring the 30% non-voting stake owned by Hareon Swiss Holding. The acquisition will have no impact to the borrower's financial health or capacity to service its debt obligations.

Al Safawi:

The project company's 2020 performance was in line with the P90 forecast in terms of energy generated. As mentioned, NEPCO temporarily paid only 75% of invoices for a five month period in 2020. NEPCO has subsequently settled all arrears from that period in full.

The Al Safawi plant achieved total revenues in 2020 that were higher than the 2020 total revenues presented at Board approval due to DLDs received under the EPC contrarct. While the project's operating profitability outperforms the 2020 updated projections under P90 scenario, it was forecast that the project would report a marginal net loss in 2020 primarily relating to a high depreciation expense. The Borrower recently advised that the estimate of the useful life for depreciation was revised (the auditor approved the revised estimate of 35 years for depreciation, instead of 20 years for FRV Projects).

In 2020 and despite NEPCO's partial settlement, DSCR was higher than the debt dizing level at P90 and Board approved DSCR assuming P50. NEPCO's full arrears settlement will contribute to the 2021 DSCR, which is expected to also exceed the debt sizing level at P90 and Board approved DSCR at P50.
The FiT is 85% indexed to USD and the Jordanian Dinar (JOD) is pegged to USD. All payments have been on schedule.

Efficiency of these projects is rated ***fully satisfactory***. Although NEPCO temporarily cut payments during the initial phase of the COVID pandemic, with the EBRD's support payments were resumed and NEPCO has fully settled all arrears. The plants have been generating revenue in line with initial expectations and have made all payments.

Overall rating

Overall, these two projects and the Bank's associated interventions are rated ***Good***. The projects were closely aligned with the Bank's strategy for Jordan, as well as national government priorities (although in the short-term they contributed to an electricity surplus). However, this situation is expected to improve in the coming years as Jordan starts exporting electricity, develops storage capacity and proceeds with the decommissioning of old thermal power plants (two 130 MW thermal units were decommissioned in 2021). The EBRD demonstrated strong additionality through the provision of long-term financing and mobilisation of additional finance, coupled with extensive policy dialogue.

The construction of both solar plants was slightly delayed, but not to the extent that there was a material effect on their operational or financial results. Both solar power plants now have a track record of generating energy in line with original expectations. There is some evidence of wider local community effects. Although permanent employment opportunities have been few, the plants employ local casual labour, including Syrian refugees.

The Bank's policy dialogue was well designed to address the key constraints on RES sector growth. It was successfully delivered on the outputs level and some good results were achieved. However, there is limited evidence as of yet that the key components of the policy dialogue resulted in the desired outcomes.

Nevertheless, the support to NEPCO, and particularly the study implemented by CESI, has highlighted important capacity issues in the system and the market (although it did not prevent Jordan from electricity generation surpluses in recent years). Mott MacDonald's study on electricity storage and its regulatory framework was also completed, however Jordan was not yet ready to implement its recommendations. This study might be updated (or a new intervention initiated under the Bank's electricity storage framework), contributing to the development of electricity storage in Jordan. Also, the Bank's advice on improved evaluation methodology for RES competitive bids was adopted, however RES auctions have been put on hold. Whilst it is challenging, in most cases, to see concrete evidence of the impact of the Bank's policy dialogue, there are some promising follow ups, such as the GiZ and JICA projects on storage, which build on the EBRD's work in this field.

Key findings:

- Solar power projects are relatively simple (compared with other types of RES) in terms of construction and operation but the electricity they generate is difficult to balance in the network (as it is produced mainly during the day/summer with peak demand during the night/winter). Fast development of solar power can result in an energy network imbalance and cause financial distress to the offtaker;
- Beyond a certain point of RES/solar market development, electricity storage development, cross-border interconnections and old thermal power plants decommissioning, become critical for its further expansion;
- Policy interventions still have a chance of achieving the desired outcomes (even a few years after the completion of their deliverables), if appropriately followed up, even by other IFIs or organisations (e.g. the Bank's storage study);
- The EBRD can play the role of an "honest broker", in the event of disputes between private investors and the government, bridging the divide between stakeholders. In Jordan's case, the Bank leveraged its relationship with NEPCO and with RES developers to negotiate a solution after the former partially suspended payment as a result of the COVID-19 pandemic.

Operational considerations:

- When considering support for solar/RES generation capacity development, pay increased attention to ensuring system flexibility through parallel support to electricity storage development and cross-border interconnections;
- Pay attention to possible impacts of uncontrolled growth in distributed solar power, which can tip the balance, adding to electricity oversupply;
- In countries with very high rates of RES growth and network constraints, prioritise support to solar generation projects incorporating electricity storage development, to mitigate the lack of flexibility in this type of RES and the risk of a system imbalance;
- In countries experiencing an electricity surplus, consider helping the relevant authorities to prepare a decommissioning plan for the least efficient thermal power plants, to unblock generation capacity for RES.

2. Infinity / IB Vogt Solar 1 and 2, Egypt (49211 and 49302)

Background

The Bank provided project financing to two separate solar PV projects in Egypt. Both were led by Infinity, and both were located within the Benban solar complex. They were funded under the Egypt Renewable Energy Framework, and offtake was via a Feed-in-Tariff. They were presented to the Board jointly, and therefore EvD has assessed them together.

For Infinity / IB Vogt Solar 1, the EBRD provided a US$ 16.27 million A loan with 18 year maturity, alongside a US$ 5.02 million loan mobilised from the GCF, and a US$ 11.32 million B-loan mobilised from the FMO, which financed a 30MW Solar PV plant. For Infinity / IB Vogt Solar 2, the EBRD provided a US$ 27.35 million loan, with mobilised financing also provided by FMO (US$ 18.23 million) and GCF (US$ 9.12 million), which financed a 50MW solar power plant. GCF and FMO loans were pari passu with those of the EBRD and were not concessional.

It is understood that at the time of evaluation IB Vogt was in the process of selling its shares at Benban operations to a joint-venture owned by Infinity and Masdar (Masdar is the Bank's client under the Nur Navoi project evaluated in this report).

The Bank also engaged in extensive policy dialogue as part of the Egypt Renewable Energy Framework. Key activities included support in drafting the Solar Grid Code, financing Strategic Environmental and Social Assessments for solar PV sites, and policy dialogue on the development of a bankable PPA and the transition to a competitive auction framework.

Subsequent to these projects, the Bank made an equity investment into Infinity, acquiring 20% of the company.

Relevance

The relevance of these projects was assessed under the Egypt 2016 Country Strategy. That strategy prioritised support to "Egypt's Green Economy Transition", and called for the Bank to "support Egypt's efforts in diversifying its energy mix by financing renewable energy projects" and to "complement these investments with policy dialogue, including supporting the regulatory and contractual framework for renewable energy investments". Clearly, these projects are relevant and in line with that strategy.

Support to the solar sector was also relevant to the Government of Egypt's strategy, as initially encapsulated in the Egyptian Solar Plan (covering the period 2012-2027) and in 2016 with the 2035 Integrated Sustainable Energy Strategy (covering 2019 to 2035). The Egyptian Solar Plan outlined an ambition to add 3.5GW of solar energy by 2027. The Integrated Sustainable Strategy calls for an expansion of renewable energy to 20% of electricity generation by 2022 and 42% by 2035 (updated by the government at COP26 to 2030). Although the Egyptian government's energy policy has been going through some changes, it is expected that solar power will play an important role in achieving this ambitious target as it will require an additional 10 GW of new RE capacity in the coming decade (assuming no decommissioning). In this context, support to solar PV, as well as policy dialogue to develop a bankable PPA is clearly relevant. However, EvD notes that following the COVID 19 pandemic, demand for electricity in Egypt diminished. Egypt currently has a 20 GW overcapacity of installed and available electricity generation. The focus of the Egyptian government's RE strategy has shifted to wind, although some solar projects are still under development, e.g. the 200 MW Kom Ombo project (for which financing was recently signed by the Bank) and a 500 MW solar project awarded to AMEA Power. The latter (along with another 500 MW wind) were awarded in order to replace a coal project that was under development..

The additionality of these projects was based on the limited availability of long-term USD project financing, the wider policy dialogue engagement on the development of the FiT and competitive auction process, and the EBRD's support to the ESAP at Benban.

Other solar PV projects within Benban have broadly failed to attract commercial financing (the development was planned for 2GW but due to lack of financing it was reduced to 1.5 GW), which does provide some evidence for the Bank's additionality, at least with respect to commercial financing. During interviews with EvD the client confirmed that commercial banks in Egypt rarely offer project finance and EGP's loan tenor typically does not extend beyond 10 years, significantly shorter than the investment available through the EBRD. Moreover, interest rate for EGP loans was seen as excessive due to very high base rate. Interviews with the client and the transmission company confirmed that local banks were not able to offer USD-denominated loans with tenors beyond 5-7 years. This does suggest convincing financial additionality.

The Bank also engaged in extensive policy dialogue, particularly in the development of an Egyptian FiT programme, as well as support in drafting the solar component of the national grid. During an interview with EvD, the transmission company stated that the EBRD led a consortium of IFIs in negotiating the contractual arrangements for the FiT and the PPA, and confirmed that the Bank was one of the most helpful development institutions in their support for expanding RE.

The EBRD also provided specific TC funding for the ESAP at Benban, which therefore also offered additionality. Overall, the EBRD financed 16 (out of 32) projects in the Benban complex, which is the largest solar park in Africa and the fourth largest in the world. Given the high profile and publicity of this project, it is also clear that the Bank wanted to play a major role in its financing to cement its reputation as the primary RES financier and hoped it would a demonstration effect on other countries (and indeed the EBRD is the largest financier of the Benban programme in terms of capacities and amounts).. Finally, there are clear examples of the Bank's engagement in policy dialogue, and in particular the development of a bankable PPA, which demonstrates additionality. Relevance is rated ***excellent.***

Effectiveness

As for **outputs**, the two solar PV plants were constructed on time and under budget (Infinity / IB Vogt 1 and Infinity / IB Vogt 2 reached COD in early 2019). The planned COD was not stated in either the Board report or the annex on project implementation; however one of the "success indicators" was project completion by the end of 2019, thus it is deemed to be completed on time.

In terms of **outcomes**, irradiation levels have been broadly in line with expectations. The plants' capacity factor has exceeded the baseline assumption of 100%. The plants have been generating energy slightly above P90 case and largely in line with P50, as per the table below:

Project	Total Generation in kWh from January 2020 to December 2020			
	Actual	P90 Base Case	Delta to P90	P50
Infinity 1 (MMID 30MW)	89,841,714	82,907,890	+8.4%	91,600,000
Infinity 2 (BSEP 50MW)	160,865,940	139,303,871	+15.5%	155,300,000

The latest grid emission factor estimation for Egypt suggests that each kWh of renewable energy produced in Egypt generates 483g of CO_2 savings, which implies that in 2020 the two plants combined led to more than 120,000 tCO_2 savings. This is higher than the initial forecast of 110,0000 tCO2e per year.

The ESAP has also been implemented in line with expectations. The client emphasised the importance of the ESAP in helping to introduce clear contracts in line with international labour standards, as well as in the development of a community action plan. The latest PMM dated 19th April 2020 stated "the EHSS organisational structure of the Project observed on site and the current EHSS monitoring arrangements in place for the O&M phase continue to be considered adequate. No high or medium risks were identified during the monitoring period, which is commendable. Based on our monitoring observations, the Project poses low risk in relation to EHSS management onsite". EvD has reviewed the E&S annual monitoring report and found it to be satisfactory.

With respect to local economic development, the construction across all Benban Solar Complex projects created 10,000 jobs, and there is some suggestion that this built enough momentum and capacity to stimulate investment into other renewable energy projects in the region (e.g. at Fares and Kom Ombo, if and when they eventually take off). The two plants currently employ 34 O&M employees, all of whom are male.

The Infinity projects were funded via the Egypt Renewable Energy Framework, which set monitoring indicators at the framework level. A summary of results against these monitoring indicators (which are primarily sector-wide rather than specific to the two projects under evaluation here) is set out below:

-At least 1,000 MW of renewable capacity is commissioned by private sponsors under the FiT by YE 2019. This is considered **achieved**. As of YE 2019, the entire Benban solar park had reached commercial operation, generating 1,465MW.

-At least 500 MW of additional privately sponsored renewable capacity outside the Egypt Renewable Energy Framework is commissioned in Egypt by YE 2019. **Not achieved**. Only 250MW windfarm was commissioned by YE 2019. Following the Benban project, due to installed overcapacity, new RE projects proceeded slowly. EvD notes however that another 250 MW project - Lekela windfarm (financed by the EBRD but outside of EREF) was commissioned in November 2021.

- At least one renewable energy project in Egypt reaches financial close with commercial bank financing by YE 2020. **Not achieved**. However, the Kom Ombo solar project was signed in 2021 with the participation of the Arab Bank.

- At least 200 MW of tender-based renewable energy capacity reaches financial close by YE 2020: **Achieved**.

On the broader **impacts,** macro level, Infinity contributed 80 MW (2.2%) and Benban contributed 1.65 GW (47%) to Egypt's achievement of 3.5 GW solar power generation target by 2027. However, following the COVID pandemic, Egypt has reportedly has 20GW of electricity generation overcapacity, which is the main reason for the current deceleration of solar and other RE projects. This situation might change as old thermal plants are decommissioned (the government plans decommissioning of 5-7 GW of thermal generation capacity over the next 5-7 years), although this might progress very slowly.

EETC confirmed that the Benban project resonated strongly in the MENA region and Africa with many potential investors and government officials from different countries visiting this complex. There are reports that a large scale solar power complex development is planned in Morocco. Although transmission networks in most countries in this region are weak

and large projects might not happen immediately, Benban's role in promoting solar energy in developing countries cannot be underestimated.

In respect of the **policy dialogue and TCs**, the Bank supported the drafting of the Solar Grid Code, the preparation of SESAs for Benban and for the East Side of the Nile project, policy dialogue on developing a bankable PPA (*prior* to the establishment of the framework), and policy dialogue on the transition to competitive auctions.

The EBRD contracted Mercados-Aries, an energy consultancy, to draft the Solar Grid Code in coordination with the EETC. This relatively small (€10,000 budget) assignment implemented by the Mercados consultant was completed in December 2015 and the Code has subsequently been finalised and adopted by the Egyptian Authorities in 2016. Interviews with Infinity's management suggest that the Code has helped to set up a clear and transparent framework to enable the sale of solar energy to the grid. The client noted that prior to the issuance of this code, utility scale solar energy projects like this would not have been possible due to the lack of regulation regarding connections to the grid. Similarly, EETC reported that they were very satisfied with the support they received with drafting the Solar Grid Code, and confirmed that it was critical in helping to attract more investments by clearly assigning responsibilities to both the EETC and the developer. EETC has rigorously verified that each proposed solar plant is in compliance with the Code, and required changes to designs that were found to be incompliant.

The Bank has also supported SESAs for Benban and the East Side of the Nile project. These were conducted by EcoConServ and by a consortium comprising Lahmeyer International and Ecoda Environmental Consultants respectively. The client emphasised the importance of the complex-wide SESA that was developed for Benban, which formed the basis of the site-specific Environmental and Social Impact Assessments, and which facilitated the investment process. The East Side of the Nile project is currently on hold, due to over-supply of electricity following the COVID-19 pandemic.

The Bank has also been engaged in supporting the development of a bankable PPA, prior to the financing of the Infinity projects. It is clear that this was a critical first step; the first round of Egypt's FiT scheme attracted limited interest, including from other IFIs, because of "lender concerns about some aspects of the contractual framework". The Bank led extensive engagement alongside other IFIs, including IFC, to address some of the issues within the original FiT. This included revising the dispute settlement mechanism, such that it is now enforceable through an international arbitration mechanism rather than local courts. The client stated that international arbitration has added significant value to the bankability of projects, and increased the number of banks which were interested in financing such investments. During interviews with EvD, EETC reported that the EBRD played a significant role in developing the PPA, and led negotiations on behalf of a consortium of international financial institutions in order to improve bankability.

The revised PPA was launched in the second round of Egypt's FiT, which attracted significant interest from investors and IFIs. Over 1.7GW of capacity has thus far been commissioned under the revised PPA. However, the PPA has not yet succeeded in attracting investment from commercial financers. Within the Bank, this workstream has been led by Banking and OGC/LTT.

Subsequent to financing these projects, the Bank has also supported the transition from FiT to competitive tenders. The Bank co-funded a US$ 3.6 million TC assignment alongside the Green Climate Fund to provide support to the EETC on Egypt's first renewable energy auction (200 MW). This assignment was implemented by a consortium comprising Synergy, Baker McKenzie, and Sargent and Lundy, and included support to the bid evaluation report, negotiations with the preferred bidder, and preparation of a standstill document. The tender has now been awarded (Kom Ombo) and the EBRD is providing financing to the preferred bidder (AWAC, signed in 2020 but implementation has been on hold for a year). The prices achieved via reverse auction are significantly lower than the FiT - the Kom Ombo auction received bids of 2.47c per KWh, compared to the FiT rate of 14c per KWh.

Effectiveness of Infinity projects is rated ***fully satisfactory*** as the plants have been generating electricity slightly above the forecast level, while the Bank's policy dialogue was timely and critical for developing solar investments in Egypt, including the fourth largest solar park in the world. Two of the EREF's TI benchmarks were not achieved during the ambitious timeframe, however they were achieved in the following years. The plants partially contributed to the electricity generation overcapacity in Egypt (although this has been precipitated by the COVID pandemic, which was unexpected and should change when thermal plants are decommissioned and the Egyptian economy grows). This is also why some new solar projects in Egypt are delayed (including the East Side of the Nile development for which the Bank funded a SESA).

Efficiency

Financial performance of the two Infinity Benban projects as in line with its operational results, which have been above expectations. The one exception was that the EBRD had originally set forecasts on the assumption that the power plants would be fully operational in 2019, whilst the plants came online in early 2019.

Infinity (together with all other Benban investors) entered into a CSA with EETC (an off-taker) following a dispute with them regarding cost-sharing arrangements for grid connections. It has been now resolved as EETC and all Benban developers have settled for the payment of an additional EGP 1.6 billion (US$ 103 million in total, US$ 3.6 million per 50 MW project), with 50% payable upfront and 50% over five years with interest accruing over the last three years of instalments (first two years free of interest). This covers the cost of four transmission stations and all plant connections to the grid. Both Infinity project companies have made payment on the 50% upfront fee from excess cash available in their companies' accounts. The dispute was precipitated by the devaluation of the Egyptian Pound in 2016/2017, which had a significant impact on the cost of the transmission stations (for which equipment is imported).

The creditworthiness of EETC – the sole electricity off-taker - is of key importance for Infinity's operations. EETC has started a reform trajectory that should allow a gradual improvement of its financial situation. While end-user tariffs have historically been well below cost-recovery level, especially if the full cost of the gas required for generation is considered, in 2016 the government issued a statement outlining a plan to cut energy subsidies in order to phase out subsidies by 2021-22. In July 2016 electricity tariffs increased by an average of 30% in EGP terms and by July 2017 there was a further 40% increase, contributing to ca. US$ 1 billion in avoided subsidies. Tariffs have increased annually since then.

Moreover, the projects are exposed to regulatory risk as they rely on a comprehensive and long-term contractual relationship with EETC, as the feed-in tariff for the Round 2 solar programme is higher than the subsidised cost of conventional thermal generation in Egypt, exposing the projects to the risk of retroactive change in the tariff. This risk is somewhat mitigated though robust provisions in the PPA, including protection against change in law and expropriation;

the PPA is, in turn, backed by a government guarantee. EETC have also clearly stated that they are committed to paying invoices on time and in full, and that they consider the regulator and the government to be strongly committed to honouring PPA and not contemplating a retrospective tariff cut.

In December 2019 the EBRD became one of Infinity's main shareholders after purchasing 20% of its shares.

Although the plants' performance was well below projections for the first year of operation, it appears this was mainly due to a forecasting glitch (which assumed a full first year of operation). The plants have been performing as planned in 2020. Revenues in 2021 are also expected to be in line with the forecast. Underlying performance has been strong, while the CSA has resolved the outstanding issue. Efficiency of the projects is rated ***fully satisfactory.***

Overall rating

The Infinity projects formed part of one of the largest solar energy developments in the world (of which the Bank was the largest financier). They had strong relevance for the Bank, cementing its reputation as a prime financier of RE projects, as well as for Egypt, demonstrating its leading position as an RE-friendly country in the MENA region. The Bank's additionality was also strong due to the absence of long-term funding for RE projects locally (evidenced by the ongoing lack of commercial bank involvement in RE projects).

Project implementation went well and the investments have been generating electricity slightly above the projections. However, the most important aspect of the Bank's involvement in these and the whole Benban development was its contribution to ensuring the bankability of PPA. Further support for SESAs was also important (although the one for the East Side of the Nile might not have been needed as this development is on hold now). Importantly, the Bank assisted in the development of competitive bidding for solar contracts, which resulted in at least 3x lower tariffs than those under the original FiT, producing substantial savings for consumers and the Egyptian government.

The financial performance of both projects (in USD) in 2020 was largely in line with projections. Overall the Infinity projects are rated ***Good +***, the "+" reflecting the uniqueness of the Benban project and the Bank's critical contribution to wider legal and policy improvements, which helped bring this remarkable development to fruition.

Key findings:

- Transition of RE contract award from standard FiT to competitive bids usually brings considerable benefits for the government and consumers, with substantially lower tariffs payable to electricity generators;
- The Bank's early policy engagement towards improved bankability of contractual agreements for RES can yield substantial benefits and incentivise investors to participate in large scale projects;
- RE investors may substantially underestimate the cost of connecting RES power plants to the national grid, particularly for large developments with many investors and in remote locations;
- A boom in RE investments can lead to electricity generation surplus/overcapacity and result in the new RE projects being delayed or put on hold as thermal generation assets are not being (or only slowly being) decommissioned;
- RE projects in countries with weak local currency and only partial indexation of tariffs to hard currency may experience revenue shortfall, which can have a detrimental impact on profitability if combined with other adverse developments.

Operational considerations:

- Enhance due diligence regarding the cost of connecting RES projects to the transmission grid, particularly in cases of large developments, where costs are to be shared among many developers;
- Make allowance for revenue shortfall in projections for RE operations in countries with weak local currencies where tariffs are only partially indexed to a hard currency;
- In countries with large electricity generation overcapacity where large new RES projects are planned, consider engaging in policy dialogue on the preparation of a decommissioning plan for old, inefficient thermal power plants;
- Pay attention to the projected COD (and allow for some delays) when preparing financial projections for initial years of operation of RE projects.

3. CYPV Solar and TPT Solar, Cyprus (47520 and 47697)

Background

This operation consisted of two separate projects and two separate loans (approved jointly under the DFF facility):

- €6.7 million loan to CYPV – an SPV established to construct three smaller solar power plants with a total capacity of 7.4MWp located in Famagusta and Nicosia districts. The sponsor is a Russian ICT and RES entrepreneur, teamed with a local partner.
- €4.1 million loan to TPT Solar – an SPV established to construct two solar power plants with total capacity of 4.5MWp: Paliometocho (1.5 MW) and Malounta (3 MW), both located in Nicosia region. Both power plants were sold in 2019 - the Paliometocho tranche was fully prepaid before the plant was sold to a new owner. The Malounta tranche was sold to a Polish investor and remains in the EBRD's portfolio.

Both projects sell electricity to the National Grid under a fixed FiT, ranging from € 0.082 to 0.099/kWh, depending on the plant. The Bank conducted policy dialogue prior to the project (as per below).

Relevance

Both projects were financed under the Small Business Initiative, therefore there was no formal assessment of relevance at approval stage. EvD has assessed relevance referring to the Cyprus 2015 Country Strategy, which called for the Bank to "focus on sustainability improvements including…expansion of the renewable energy sector". Under that strategy, these projects were clearly relevant.

The Cypriot Government had also prioritised the growth of the renewable energy sector; the RES Directive 2009/28/EC set a target of reaching 13% energy generation from renewable energy by 2020, against a baseline of 5.9% in 2009. This target was reached in 2018, supported by a dramatic increase in solar energy generation (mainly roof-mounted), from 3.8GWh in 2009 to 200GWh achieved in 2019. Based on that significant growth, the Government has set a revised target of 750 MW capacity for solar to be achieved by 2030, compared to the 2020 target of 288 MW. In that context, support to solar PV is clearly in line with Government priorities. On a more macro-level, Cyprus had targeted a reduction of 55% of greenhouse gases by 2030 compared to 1990 as part of their Nationally Defined Contribution (NDC), which these projects also contribute towards.

Likewise, the additionality of these projects was not assessed at approval stage as they were approved through the Small Business Initiative. According to officials of the regulator CERA, interviewed by EvD, there is limited competition in the Cypriot banking sector, with three dominant banks, operating a semi-cartel, keeping margins very high. In addition to

uncompetitive pricing, RE investors are required to provide at least 40% equity. In the opinion of CERA, the EBRD pulled out of Cyprus too soon as financing for RE there remains inadequate. This opinion was confirmed by private investors. The CYPV project was leveraged 75%, and TPT 70%. The EIB is active in the country but this type of projects is too small for its financing.

EvD notes that CERA stressed that in aggregate, Cyprus power plants have been able to generate electricity at about 20% above demand, however this was needed as a reserve as the country's energy system is totally isolated from those of other countries (there are no cross-border interconnections to the island). Based on WorldData, in 2018 Cyprus generated 13% more electricity than it used (i.e. 5 bn KWh vs 4.36 bn kWh used). The gap was on a par with that in Ukraine and Egypt, however the latter exported its surplus, while Cyprus did not. This database also indicates that Cyprus's installed overcapacity was 15.5 bn kWh or 72% (relatively high and on a par with that of Ukraine). However, as explained by CERA, this figure included several large oil-fuelled units which, although not formally decommissioned, have not been operational for years. Decommissioning is planned for six Dhekelia power plant units in 2023 (60MW each).

Although there has been some criticism of the Bank's lengthy and burdensome procedures (see below), investors agreed that its financing was very helpful, and in fact the only option for them to pursue these projects. In view of strong relevance and additionally this category is rated ***excellent***.

Effectiveness

In terms of **outputs**, the plant construction was achieved slightly under budget, but was delayed by about one year. CYPV commissioned three plants in Nisou, Dhali and Frenaros during 3-7.2017 and they began generating energy from 5-10.2017 (their completion was planned for Q3 2016 at the time of Bank approval). CYPV's actual project costs amounted to €9.5 million or €0.6 million below the projected costs (estimated at the time of signing (€10.1 million). The Bank has disbursed almost all of its loan - €6.25 million (€6.7 million committed).

For TPT, construction was completed and the plants connected to the grid in 4-5.2017. There were some minor delays in connecting to the grid. The costs were €5.2 million, i.e. €0.6 million lower than the estimated €5.8 million. The Bank has disbursed €3.6 million (€4.1 million committed).

Given that the tender for these plants was in 2012, it took a relatively long time to complete these investments. According to the client, the reason for this long gestation was the protracted licensing and other permitting procedures, as well as the Bank's lengthy due diligence and loan approval. Moreover, it took the client (relatively inexperienced in this process) a long time to ensure compliance with all covenants precedent to the first disbursement. EvD notes that the projects were processed under the Small Business Initiative framework – DFF (presumably to speed-up such processing), with CRM in March 2015 and FRM approved by SBIC in March 2016. The loan agreements were signed in June that year and the first disbursement under CYPV took place in December 2016 and under TPT in January 2017. This is fairly slow for private, relatively small projects (although fast by the Bank's energy infrastructure project standards).

The PV panels used in these projects are mono-silicon and were produced by RECOM Technologies of France (at the time of project approval it was headquartered in Germany). RECOM is one of the largest European PV panel producers with manufacturing in France, Germany, Poland, Belarus and Armenia. RECOM is not referred to in the context of forced labour allegations in the Xinjiang province in China in any of the publicly accessible reports.

In terms of **outcomes**, CYPV's energy yields have consistently been in line with, or above the energy simulation models (P50) performed by the LTA. In 2019 electricity generation reached 12,6 GWh, or 4.6% above P50 estimates, while in 2020 it was 12.3 KWh, largely in line with P50 forecast. Similarly, for TPT (Malounta only, as Paliometocho was prepaid) FY2019 electricity generation reached 4,9 GWh, fully in line with P50 estimates at approval.

In aggregate, the four plants supplied 17.2 - 17.5 GWh of renewable energy annually in 2019-2020 (versus 17.0 GWh projected at the P50 - 12.1 GWh per annum for the CYPV plants and 4.9 GWh for Malounta plant). As the Paliometocho plant is still in operation (reportedly generating the planned amount of electricity), therefore based on the generation level of five plants (19.4 GWh/annum), they have saved approximately 13,140 tonnes of CO_2 annually as planned, also progressing the achievement of the DFF facility's two "Green" TI benchmarks – power generation volume from RES and CO_2 emissions reduction.

In terms of backward linkages, the project had limited impact. About 100 workers were employed in their construction. Currently teams of 7-8 contractors serve each of them. Due to the high level of automation, less manpower is needed than in similar plants elsewhere (e.g. panel washing is done on small tracks by two people). The contractor teams also periodically remove vegetation and there is a team of (usually) two engineers making periodic visits to the plants. The plants' security systems are based on cameras, rather than guards. The companies pay land lease charges to municipalities, which amount to about €500-1000 per month for each plant.

A for **broader impact**, the plants accounted for 8% of the total electricity generated from solar in Cyprus in 2019 (which was 218 GWh), while the plants' combined installed capacity accounted for 12% of the country's total solar capacity at the time of their launch (or 6% today). The operation of the plants reduced Cyprus's total CO_2 emissions by 2.6%. Moreover, the goal stipulated in the Cyprus 2020 national RE strategy (and its EU commitment) of 13% energy consumption from RES, was achieved in 2018, with both projects contributing to that.

The project was also expected to demonstrate the viability of private RES investments in Cyprus, resulting in their increase. However, no new tenders for solar power capacity have been held since the project. The government promoted subsidised PV schemes for households, from which most of the solar capacity growth has come in recent years (e.g. 90% of Cypriot households have solar water heaters). Industrial-scale solar power capacity in Cyprus has been added mainly by the state-owned EAC company (which recently entered into an agreement with the Cypriot Archbishopric to build a 66MW solar plant, the largest on the island). The government has been progressively reforming its RES system, switching to competitive (day-ahead) wholesale market. It plans to complete this reform in October 2022, when Cyprus will have a fully liberalised electricity market, compatible with the EU Target Model. It is expected to result in very competitive tariffs. In anticipation of this new system, the government has launched RE schemes, issuing licences first for wind and biomass and only recently for solar (for 259 MW), which are under construction and are expected to start generating electricity in 2022 (under competitive regime). The sponsors of CYPV have obtained a license for a wind park and are currently preparing a 20 MW investment, which Astro Bank of Greece expects to finance.

The EBRD was also engaged in **policy dialogue** to improve the bankability of renewable energy projects and to support the Cyprus Energy Regulatory Authority (CERA) with an assessment of the new electricity market arrangements and associated rules to promote renewable energy.

The Bank's consultant – Council of European Energy Regulators (CEER) produced a report (2018) with recommendations on improving the functioning of the Cypriot RES market, as well as making it easier for international investors to access this market.

According to CERA, the CEER report (with its recommendations) was useful and well-structured but its advisory value was limited as CERA was implementing most of its recommendations well before it was completed. Indeed, there is evidence that part of the CEER's recommendations were implemented, such as:

- Increased independence of the transmission company (EAC). The company was formally unbundled in February 2020 and its independence legally established. However, market participants note that it continues working closely with the Ministry of Energy and the latter still exercises some influence over this company.
- Removal of technical barriers to the investment into and operation of RES. In February 2021 a temporary suspension of environmental assessment requirements for solar power projects was enacted. This measure aims to reduce the administrative burden related to the preparation of solar projects (nevertheless, some other barriers still exist, as described below);
- Measures to increase transparency and liquidity in the forward and day-ahead markets (while at the same time mitigating the market power of EAC). The Cypriot authorities have been working on this recommendation for some time and a fully competitive, day-ahead market is scheduled to be fully operational in October 2022. However, there are some doubts about the effectiveness of mitigating EAC's market power, given that in recent years it has been pretty much the only entity permitted to realise larger solar investments in Cyprus. In the opinion of market participants, CERA should be more determined and stringent in its regulation of EAC.

There is no evidence of some other recommendations being implemented, such as:

-appointment of an expert team to identify and designate in the spatial development plans the locations available for the solar power projects;

- establishment of a Rapid Activity Mechanism, to reduce the bureaucracy and speed up administrative processes, including a single point for company registration, registration in the social insurance registry, VAT and Income Tax registry etc., as well as to provide information and guidance for business licensing, facilitating the issuance of residence and employment permits to persons from third countries. CERA admitted that administrative barriers for solar/RE investments in Cyprus still exist with particularly cumbersome licensing, construction permits and land registry processes.

Independently, the Bank's project team has worked with CERA, recommending amendments to the PPA and Support Agreement to make them more bankable, in particular introducing step-in rights for lenders. These recommendations were accepted, enabling the projects.

Under more recent project in the energy sector (FSRU), the Bank planned to engage with CERA and EAC to assess the suitability of the new electricity arrangements and associated market rules being proposed in Cyprus under new market model, in particular their alignment with EU Target Model. However, CERA was not aware of this initiative and it expressed the view that its new electricity market is fully aligned with the EU Target Model. Moreover, as the Bank has now terminated its operations in Cyprus, it is unlikely that this TC/policy dialogue will take place.

According to CERA, the Cypriot authorities' RES priorities are now:

- Introduction of the competitive, fully liberalised electricity market (as explained above);
- Ensuring flexibility of electricity supply and balancing demand – this is to be achieved by developing electricity storage, as well as by adding new generation capacity from natural gas. For example, starting next year, licences for new solar developments will be issued only for projects integrating generation and storage;
- Interconnections to other countries (again, to ensure balancing of the market, as Cyprus' energy system has been totally isolated, which is the reason for its high electricity prices), pursuing plans to interconnect to Greece, Egypt and Israel.

International community support in addressing the flexibility and interconnection issues would be appreciated, although Cyprus is cooperating closely with EU institutions on that.

Overall, the projects were realised under budget but with a one year delay and, in the client's opinion, it took a long time to process them and disburse. However, since then they have been operating in line with, or slightly above the forecast. The Bank's policy dialogue ambitions were low - limited to sponsoring one report which, according to the beneficiaries, was of limited value, while the Bank's improvement of PPA's bankability was useful but mainly self-serving (with the benefit of hindsight, the Bank's support in addressing more strategic issues, such as improving the balance of supply and demand and/or cross-border interconnections, would have been more relevant). The projects (and PPA improvement) have not had the expected demonstration impact as there has not been any follow up in terms of private, industrial-scale solar projects in Cyprus. However, overall, the projects made quite a significant contribution to Cypriot solar generation (8% last year and more when they were first put into operation). Overall effectiveness of the Bank's intervention under these projects has been on the border of fully and partly satisfactory, mainly due to the relatively low ambition and weak impact of its policy dialogue. However, in view of both projects' pioneering and unique nature in this country and in a sector dominated by the state, effectiveness is rated ***fully satisfactory*** (with a minus added to their overall rating to reflect some clear weaknesses of the Bank's intervention).

Efficiency

At the end of March 2020, the Borrowers received letters from the Cypriot Distribution System Operator (DSO) designated by EAC, informing them that, due to lower electricity demand given the Covid-19 outbreak, they could at any time disconnect the PV parks to protect the grid's stability and ensure that it operates smoothly. Despite this precautionary letter and the continued spikes of the pandemic, no curtailment has taken place to date.

Energy yields for both projects have consistently been in line with, or above the energy simulation models (P50). In 2020, CYPV generated revenues 6% higher than projected at final approval, and EBITDA 21% higher than projected at final

approval resulting in an EBITDA margin of 81%. The net loss was fully explained by the Borrower's accelerated depreciation for tax reasons. Cash flows remained strong

A year earlier, in 2019 CYPV generated a lower EBITDA margin of 53.8% (vs. 82.1% in 2018 and 71% projected for 2019) on the back of certainone-off impairments related to licencing expenses of other projects owned by the Borrowers' shareholders (before being transferred to new SPVs). Despite this, CFADS remained strong, resulting in a healthy DSCR, comfortably above the covenanted level.

The "tax-efficient" structure of the project has been designed so that it is expected to achieve profitability only in 2031.

In 2020, TPT generated an EBITDA of 87.3% overshooting like-for-like (i.e. excluding the 1.5MW Paliometocho plant, which was pre-paid) approval projections of 78% EBITDA margin. Cash flows remained strong, bringing DSCR to comfortably above the covenanted level.

Under PPAs, each plant sells 100% of its electricity output to the Electricity Authority of Cyprus (EAC) for 20 years and receives a fixed price of €0.082-0.099 per KWh (level of tariffs is different for each plant). EAC funds a fraction of that price not higher than EAC's "avoidance cost" (AvC, a proxy to EAC's actual costs of power production from thermal sources). When EAC's AvC is lower than the offtake price guaranteed to each plant, then the Support Scheme Special Fund (SSSF) covers the price difference. When it is higher, then EAC pays the SSSF the price difference to help fund the country's RES support scheme. The plants receive all due payments directly from EAC, which settle the above price differences with the SSSF directly without the involvement of the power producers. AvC is typically €0.07-0.15 per KWh. According to CERA, average avoidance cost in late 2021 was about €0.14, while it was half of that in 2020. Therefore the solar plant's exposer to EAC's creditworthiness is limited.

In terms of efficiency of work between the Bank and the RE investors in Cyprus, in the interview with EvD the latter expressed its appreciation of the Bank's financing and regrets for its recent departure from the island. However, the client has also highlighted the Bank's burdensome due diligence and approval procedures (in their view more appropriate for a €100 million loan than one for €6 million), as well as reporting requirements, whose frequency and content are again, in the client's view, more appropriate for very large loans.

The plants are operating and generating cash as forecast. Despite some threats of curtailment (which did not materialise) and some complaints from the investors regarding the Bank's bureaucracy, efficiency of the projects is rated ***fully satisfactory***

Overall rating

Gestation of these relatively small projects took a long time, while their implementation was delayed by one year. However they have been performing as planned or slightly better, generating electricity and reducing CO_2. Due to the high level of automation, the plants have had a limited impact on employment and backward linkages to the local economy. The outputs of the Bank's policy dialogue were achieved, however its overall usefulness for the Cypriot authorities has been limited. Nevertheless, the reforms of the Cypriot energy market progressed well and its full liberalisation is envisaged in 2022, when new solar generation capacity will also come on line and licensing of new solar plants should restart.
Financial performance of all solar plants under these projects has been largely in line with the forecast, except for the 2019 margin, due to a one-off impairment. The client has appreciated the Bank's financing, however it perceives the

EBRD's due diligence and reporting requirements as excessive for a small loan. Overall, the CYPV and TPT projects are rated ***good -*** (with a minus reflecting the Bank's low policy dialogue ambitions in this sub-sector).

Key findings:

- Opportunities for meaningful policy dialogue in RES in advanced (particularly EU-member) countries are generally limited, especially in respect of regulatory and legal reform (usually completed within the EU framework and without IFI support). Nevertheless, more strategic issues often exist (e.g. related to cross-border interconnections or electricity storage technology options), where the Bank's assistance could be still appreciated;
- The Bank's provision of RES financing may be still needed in some advanced countries, which have underdeveloped domestic banking systems, with limited competition;
- Sponsors of RES plants may account for extraordinary expenses related to other, new solar projects (e.g. licensing costs) under the borrower SPV, resulting in a substantial reduction of EBITDA and cash available for debt service.

Operational considerations (general for RES projects as the Bank's operations in Cyprus have been terminated):

- In advanced countries, consider focusing RES-related policy dialogue on more strategic issues, with a particular view to support regional integration of energy systems among COOs, as well as facilitating the introduction of new technologies and innovation;
- When planning exit/graduation from a country, consider temporarily extending engagement for priority sectors, e.g. RE, if there is still strong demand for such Bank financing;
- For projects with RES SPVs, ensure there are strong covenants, limiting the use of cash generated by the borrower for financing other operations.

4. Nur Navoi, Uzbekistan (51454)

Background

The Bank provided a US$ 60 million equity bridge loan (EBL) with a six year tenor and bullet repayment, to finance the equity component of a 100MW solar PV plant in Navoi, Uzbekistan. Senior loans of US$ 52 million were provided by IFC and ADB (including US$ 26 million of concessional financing at an interest rate of 0.85-1.4%). The loan was provided to an SPV registered in the UAE and channelled to an SPV incorporated in Uzbekistan. The project sponsor and the owner of both SPVs was Masdar, a large international developer of RES projects, and a Bank client in multiple COOs. Masdar, which provided a guarantee for the EBRD loan, is owned by an Abu Dhabi government global investment holding (Mubadala). This was Masdar's first project in Uzbekistan, as well as one of the first industrial-scale solar power plants and the first renewable energy project launched through the Uzbek government's new competitive auction scheme.

The transition impact from this project was to be derived from the Green and Competitive transition qualities. The Bank's loan was to support one of the first private sector renewable energy generators in Uzbekistan, whilst also contributing to the scale up of renewable energy and the mitigation of CO_2 emissions. Prior to the project, the Bank engaged in extensive policy dialogue in Uzbekistan, in support of the energy sector reforms.

Relevance

The relevance of Nur Navoi was assessed against the Uzbekistan 2018 Country Strategy, as well as the Energy Sector Strategy. The Country Strategy prioritised "promoting green energy", and the country results framework outlined "financing renewable energy investments in solar…with related policy engagement to develop the regulatory framework" as a key activity. Clearly, support to solar PV was relevant under that strategy. Through supporting the transition to renewable energy, Nur Navoi is also in alignment with the Bank's Energy Sector Strategy, which committed the EBRD to supporting "decarbonised economies, electrified by mainly renewable energy sources".

Uzbekistan's own strategy for the development of their energy sector and the expansion of green energy is set out in the Low Carbon Pathway, which was developed with support from the EBRD. The Pathway targets generating 9% of energy from solar by 2030 (5 GW of solar capacity to be installed but the government is considering increasing this to 7 GW), and also sets out plans for reforms to improve tariff policies to attract international investors. Uzbekistan has also pledged to reduce the carbon intensity of GDP by 35% by 2030 (compared to a baseline of 2010), as part of the Paris Agreement (the national commitment increased from 10% to 35% in October 2021). Furthermore, as the newly established RE offtaker does not have payment history with regard to independent renewable energy power producers, the government provides sovereign guarantees for such payments. In providing financing for solar energy, as well as the support to policy reform, this project has clearly been aligned with national government priorities.

The Nur Navoi project is among the first two industrial-scale solar power plants in Uzbekistan, while the country has been experiencing a high growth in demand for electricity (about 10% per annum) in recent years. Therefore it is unlikely that the Bank-financed investment would contribute to an electricity generation surplus and consequent financial distress for the offtaker (as has been the case in some other countries), at least in the medium-term. Moreover, to mitigate this risk, the Bank took a very wide view of the sector and its support for RES in Uzbekistan, with due attention given at an early stage to support for electricity storage development and decommissioning of inefficient thermal plants (the Bank's loan under the VISP Response project contains covenants requiring the government to decommission 450MW of old thermal units, and the Bank's Syrdarya Power project refers to the government's commitment to decommissioning 1,170 MW of old thermal units). Importantly, the Deputy Minister of Energy confirmed in an interview with EvD, that the government has a plan to decommission an additional 4.5 GW of inefficient thermal units in the coming years and that the IFIs have been actively assisting the government in this workstream (the EBRD is focusing on developing guidelines to mitigate the environmental and social impact of decommissioning, while IFC is to finance an employee transfer programme). The underlying idea is to replace the most inefficient and polluting thermal electricity generation units with RES and more efficient natural gas turbines and to mitigate the risk of a network imbalance caused by a rapid scale up of RES.

The Bank's financial additionality in this transaction is more debatable. The Board report suggested that Nur Navoi was additional because an equity bridge loan was an innovative instrument, to be introduced in the Uzbek market, the client was interested in the political risk mitigation provided by an IFI, while the long-term equity bridge would allow Masdar to continue investing in RES elsewhere, scaling up its renewables portfolio.

In EvD's view these justifications were slightly overstated as none of the innovative financing instruments have been introduced to the Uzbek market (nor they were actually intended to be introduced from the start) under this transaction.

The Bank's EBL was extended to Masdar (UAE) and not to its Uzbekistani SPV (this structure was indeed correct and fully justified from the credit point of view, based on the loan's nature and the parent company's strong creditworthiness). It was then channelled to the local SPV. The Banking team explained that it was the project structure, which was innovative for the market in this type of transaction. However, EvD remains unconvinced of this "innovativeness" (it wasn't the first EBL provided to an UAE company, while transfer of funds to Uzbekistan can hardly be seen as innovative). Importantly, the client is a large international developer, backed by a cash-rich wealth fund of the one of the richest countries in the world[29].

The Bank's financial additionality was also subject to enquiries and a debate during the Board approval discussions. The DAQs questioned why Masdar was not able to secure such financing internationally or fund the project internally, given its size and the guarantee provided by the sovereign wealth fund. In response, Management stated that providing financing rather than sourcing it internally would enable Masdar to continue scaling up its renewables portfolio internationally.

EvD notes that according to the Banking team's own calculations, Masdar invested US$ 255 million in RES during 2019-2020. In 2020 alone it added 1460 MW RE capacity in aggregate. However, so far these projects have been in UAE, Saudi Arabia and Australia and only one in a Bank COO (the 200MW Baynouna solar plant in Jordan). Nevertheless, Masdar may indeed realise more RE investments in the COOs in the near future. Its current RES development pipeline includes projects in Egypt, Morocco, Poland, Uzbekistan, Azerbaijan and Armenia. In 2021 Masdar won solar power tenders and signed PPAs for 897 MW in Uzbekistan. It also continues to work on the prospective 500 MW wind project in Uzbekistan (concept-cleared by the Bank, with a planned equity injection of US$ 200 million). Moreover, Masdar signed project agreements for a 230 MW solar power plant in Azerbaijan and was awarded rights to develop 200 MW solar power capacity in Armenia. Finally, Masdar has established a joint venture to invest in renewables in Egypt and beyond. In aggregate, these projects costs amount to about US$ 2 billion, therefore according to the project team's calculations (leverage of 60-75%), if all these projects go ahead, Masdar would need to invest about US$ 0.5 to 0.8 billion in equity to realise them.

The Board report referred to the "Bank's participation in the Project provides comfort to the client" as another reason for additionality. The client did confirm that their historical relationship with the EBRD and the Bank's engagement with the Uzbek authorities did help to mitigate initial risk and was a key reason why the Bank was approached. However, EvD is sceptical as to whether "EBRD attributes" provided comfort above and beyond joint IFC and ADB financing following an auction process, which was heavily supported by the World Bank. In EvD's view there was enough MDB involvement in this project, without EBRD attributes to provide additional comfort to the investor. Any incremental "comfort" the EBRD could offer would have been minimal. Moreover, EvD notes that according to some government officials, Uzbekistan's current President and the Abu Dhabi royal family maintain very good and close relations. Therefore, it is likely that, if needed, Masdar would be able to address any political issues through its own channels more effectively, than with the assistance of any IFI.

[29] The project team explained that raising debt at the corporate level to fund equity has recently been a standard business model for renewables developers across the world. EBL as such is a corporate loan for a specific project. Moreover, Masdar has a specific policy to use EBLs to optimize the capital structure appropriate for Masdar's global strategy for its investments into renewables. It is therefore doubtful whether Masdar would have proceeded with this project without an EBL.

Finally, one additional argument in support of the Bank's additionality was the active participation of its ESD in the preparation of the ESAP, including a biodiversity plan and assistance provided to the sponsor in complying with the environmental standards. However, again, questions remain as to whether the IFC's and the ADB's environmental departments would have not been able to deal with these tasks satisfactorily.

However, EvD recognises the importance EBRD participation in this project (as the first competitively tendered RES operation in Uzbekistan), to demonstrate its credentials as a "green" bank and to serve as a platform for continuing its policy dialogue in the RES sector. The Bank has been a critical player in policy dialogue in the Uzbek energy sector, contributing to a number of important sector reforms, including the Electricity Law, regulation and decarbonisation. The project certainly has the potential to open the door for further Bank involvement in this sub-sector (already materialised by the provision of financing to Samarkand solar and the government's request for assistance in several new areas of RES policy formulation). It is expected that financing a substantial volume of RES projects will demonstrate the Bank's commitment to this sector in Uzbekistan, which in turn should facilitate further policy dialogue. Moreover, there is also some evidence that in the near future, some of the equity "saved" by Masdar due to this EBL may be invested in RE in COOs. Relevance of the Bank's financing is rated ***fully satisfactory*** on the basis of a strong alignment with the Bank's and national strategic priorities. Whilst the Bank's financial additionality was limited, its involvement in cofinancing this landmark project was important for the Bank's long-term engagement in the RES sector in Uzbekistan, both as a financier and policy development supporter.

Effectiveness

Given that the Nur Navoi solar PV plant was put into operation only in August 2021, EvD has assessed its potential to achieve long-term goals based on short-term operational data. For the purposes of completeness, all of the subsequent outcomes and impacts are listed here, even though in some cases it is too soon to reach a conclusive judgment.

The Bank's EBL was fully disbursed at the beginning of 2021. In terms of **outputs**, the construction of the 100MW solar plant was 95% completed in August 2021 and it was connected to the national grid on August 26th. This was quite an achievement, given COVID-19 related disruptions and trade/movement limitations, which delayed other similar projects elsewhere. The importance of Nur Navoi has been highlighted by the fact that the country's President came to open it that month. The plant was fully completed and achieved COD by the planned date of December 11th (during the August – December period, the plant was selling electricity to the grid whilst also running optimisation tests and finalising equipment installation). Masdar's engineers commented that the plant could have been put into operation even sooner, had it not been for very cumbersome plant approval standards and procedures. This is because such standards and procedures for solar plants in Uzbekistan are lacking and the authorities still apply those developed for thermal and hydro plants during the Soviet era. In their view, Uzbekistan urgently needs to develop technical standards and procedures specific to solar power plants.

The Sponsor selected SEPCO III of the PRC as the EPC Contractor for the project following a competitive tender process with prequalification in accordance with its Procurement Policies and Procedures Manual. The Bank had a detailed discussion over Masdar's procurement policy and the selection of SEPCO III as an EPC contractor at the time of project approval, when it was assessed as satisfactory by the Bank. In addition, the team proceeded with an integrity check of

SEPCO III and the findings were discussed with OCCO. EvD notes that one of the Board Directors raised concerns on the cybersecurity risk related to the proposed equipment (inverters). Equipment selection and contractors were discussed with relevant officials from the Uzbek transmission operator and all parties confirmed sufficient comfort. During the site visit, the client confirmed that the plant operated on a 'closed loop' system, which mitigates cybersecurity risks.

The solar panels used in Nur Navoi were manufactured by JA Solar, a major Chinese solar panel manufacturer. Researchers have suggested that there are credible reports of forced labour within JA Solar's polysilicon supply chain. However, there was no data or evidence linking JA Solar to forced labour when these projects were approved. Masdar are aware of the forced labour allegations and are developing a strategy to strengthen their solar panel procurement policy in the future.

It is also noted that Masdar received US$ 11 million in development cost reimbursement and development premium.

On the **outcomes** level, initial results suggest that the plant is operating as planned, with 15 GWh of energy produced in October 2021 (12 GWh in September). Annually, the plant is expected to supply 252.2 GWh of renewable energy to the national grid, which should result in CO_2 savings of 154,000 tonnes per year. Given the timely completion of the plant and its electricity generation outputs attainted so far, there are good prospects for the achievement of these targets.

The construction of the plant generated 1000 - 3000 temporary jobs (some lasting for about a year), most sourced locally, although managed mainly by EPC contractor's Chinese staff. The plant's O&M team consist of about 20 employees, most of which are locally hired (including two women among the engineering team). The EPC contractor is currently training local electrical engineers. As there is no vegetation, no outside contracting is needed for its removal. Also, panel cleaning is mainly undertaken by the contractor's own staff (and mechanised, i.e. on trucks). Other backward linkages to the local economy have been relatively weak so far. The biggest investment (of about US$ 45,000), which also benefited the local community, was for a road connecting the main highway to the plant, as it is also used by local residents and businesses. Furthermore, a complaints mechanism was agreed with the local administration. After the plant's completion, the O&M team ran a week-long education campaign on benefits of RES for local schools. The plant also sponsored events during Ramadan.

As the first industrial-scale solar power plant, the project demonstrated the viability of RES operations in Uzbekistan and enabled the country to tender almost 1GW of additional RE capacity in recent years – an important step towards achieving its national targets. This has been evidenced by some interest in the development (so far there have been no site visits from other companies, however the client reported several international investors calling with questions about Masdar's experience), as well as slightly increased participation of international investors in subsequent solar and wind power auctions:

Nur Navoi Solar Power Plant (100 MW): 11 pre-qualified investors
Sherabad Solar Power Plant (457 MW): 11 pre-qualified investors
Samarkand and Jizzakh Solar PV Plants- 220 MW each (Scaling Solar 2 programme): 15 pre-qualified investors
Karakalpakstan Wind Power Plant (100 MW): 12 pre-qualified investors

Masdar won the second wave of solar auctions with record low tariffs (Sherabad: USDc 1.8045/kWh, Jizzakh: USDc 1.8230/kWh, Samarkand: USDc 1.7910/kWh). According to Masdar's executives, the company would not have been so bold without a successful pilot engagement under the Nur Navoi project.

It is too soon to identify any **broader impacts** on the macro level from this project, however its large size ensures good visibility. It is also certain that it contributed 2% to the government's original 5,000 MW target for solar capacity by 2030 and should contribute to CO_2 emission savings, as well as the reduction of the country's current high reliance on thermal power generation. Importantly, this successful pilot paved the way for subsequent auctions of almost 900 MW of solar and 100 MW of wind power in Uzbekistan. It also encouraged Masdar to bid on new RE projects in the country.

Policy dialogue

The EBRD's operations in Uzbekistan were suspended for some years until 2017, while some other IFIs remained active. But after political changes in Uzbekistan, the Bank reengaged quickly on several fronts. However from the start, support for the energy sector reforms have been a critical area of Bank activities in this country. Although it was not formally part of the Nur Navoi project, it is included within this evaluation given it helped facilitate the transaction.

The EBRD signed an MoU for strategic cooperation in the energy sector in 2018, under which the Bank engaged on unbundling and a sector reform to establish a new market structure, which was a prerequisite for private sector participation (as described below); the Bank also supported the drafting of the PPP law, which was enacted in 2019. The World Bank in turn, funded a consultancy implemented by Baker McKenzie on the development of the Renewable Energy Law, which was enacted in May 2019. Competitive tendering system for RES in Uzbekistan was developed as part of the IFC's Scaling Solar program, while it was agreed that the EBRD would support the wind power tenders. Accordingly, the first tender under new rules for solar (Nur Navoi) was prepared with the World Bank's/IFC's support and generated high interest from intentional investors and resulted in the record low tariffs.

Initially the Bank developed the Roadmap for Attracting Investment in the Power Sector, focused on corporate and structural reform (Phase 1 completed). In the view of the Ministry of Investment and Foreign Trade, it helped the government improve the investment climate in the sector (including the provision of payment guarantees to the offtaker) and target international RES companies, 11 of which participated in the first solar auctions. Following this, and in coordination with the World Bank and ADB on reforms in this sector, the EBRD contributed to a number of measures within the reform process. Key activities and achievements included:

- The development of a Low Carbon Pathway strategy for the Energy Sector, based on RES targeting the achievement of 8GW installed variable RES capacity by 2030 and climate neutrality by 2050 goal – the pathway was prepared by the Bank's consultant and presented to the main government actors. In February 2021 the Bank signed an MoU to support its implementation. The report has been published on the Ministry of Energy website. In August 2021 the Ministry of Energy indicated it is considering increasing its 2030 variable RES capacity target from 8 GW to 12 GW. At COP 26, the Bank agreed a Memorandum of Understanding with the Government of Uzbekistan for a follow-on project developing a "Decarbonisation Strategy and Transition to Green Economy" for

the entire economy. It also includes development of a National Methane Emissions Inventory and Reduction Programme.

- Support for the unbundling of vertically integrated Uzbekenergo. The EBRD supported this process by assisting capacity building in the power sector market structures and unbundling. Another part of the EBRD's cooperation focused on creating a compliance function, via a dedicated TC to support setting up the compliance function at unbundled generation and transmission companies. The Bank's OCCO was involved in drafting the TC ToRs and supervising the consultant. The compliance office and its functions were established at the new generation company – JSC Thermal Power Plants and the new transmission company (also functioning as a single buyer) - JSC National Electric Grid of Uzbekistan (NEGU). Interviews with the Ministry of Investment and Foreign Trade, as well as with the NEGU, confirmed the importance of this TC, i.e. by demonstrating their compliance and transparency, the new entities were better able to attract international investment into the sector. With support from the Bank, NEGU became the first major public entity in Uzbekistan to be awarded with an international anti-corruption ISO certificate. The state-owned JSC Thermal Power Plants (in charge of thermal power generation) achieved the same certification in December 2021, also following the Bank's support with setting up compliance function. In the longer-term, the government expects that the attainment of high corporate governance standards by NEGU, will enable its credit rating and ultimately its entry onto the capital markets. This, in turn, should enable RES financing without sovereign payment guarantees (currently provided by the government to NEGU's payments under each PPA signed with RES investors).
- Promoting renewables, and subsequent support in the implementation of the first wind auction – the Bank organised workshops, as well as a site visit of Uzbek officials involved in RES development, to the Bank-financed 100MW Burnoye SPP in Kazakhstan. An MoU on cooperation in developing wind auctions was signed and the comments on the first wind auction concept were provided. The Bank provided additional assistance for the preparation of wind auctions, such as modelling of energy yields, analysis of site options and support for E&S work, including bird fly-paths monitoring (phase 2 of this assignment, now ongoing, aims at identifying additional locations suitable for wind farms and undertaking wind measurements). This stream of work was highly praised by the Ministry of Energy, as it enabled the government to jump-start the wind power auctions. The first such auction was organised in April 2020 and generated 70 initial expressions of interest, with ACWA Power awarded the tender in late 2021. In the view of the Ministry of Energy, the Bank's consultant (Synergy) was very helpful and professional, however it took the consultant relatively long time to prepare the tenders and to evaluate the bids. The Bank's team subsequently clarified that this might have been a misperception, as initial delays were due to some inconsistencies in local laws, which required amendments (beyond the consultants' control), while the bid evaluation was done very quickly (in 10 days, compared to up to two months it took other consultants under other IFIs' management, to evaluate solar bids).
- Drafting of a new Electricity Law – this followed up on Uzbekenergo's unbundling, which required an adjustment of the legal framework. The Bank's consultant (NERA company of UK) working with the Bank's EPG, drafted the new Electricity Law, which is currently under review by different Uzbek government units. Stakeholders interviewed by EvD, including representatives from the Ministry of Energy and the Ministry of Investment and Foreign Trade, were very positive about the draft law and the potential impact it could have on the further development of the sector. However, they stressed that this Law is unlikely to be adopted before an independent energy regulator has been established (currently the Ministry of Energy is regulating the market). EvD

understands that the Bank and the Uzbek government have already agreed upon TC support for the establishment of such a regulator (TORs for the consultant have been prepared by EPG).

- Pandemic-related stress-tests for the power generation sector. The Bank's consultants performed stress-tests in the wake of the pandemic and the results presented to the Uzbek decision-makers, making them better aware of the risks and possible mitigations. As a direct result, thermal generator tariffs were raised and it is expected that NEGU's tariffs will be raised in 2022. The government officials also stated that it helped the government to realise the poor financial state of some thermal generators (this being a systemic problem, rather than related to the pandemic). This data may feed into the government's decommissioning strategy. As for impact from the pandemic, NEGU stated that it was limited to a marginal drop in demand during a 3-4 month period (a pandemic relief-related loan of $14 million, offered by the World Bank, was rejected by NEGU).

More recently the Bank hosted a discussion to introduce carbon markets and carbon pricing instruments as part of the on-going technical assistance on the matter. The Government of Uzbekistan has been receptive; during interviews, the Deputy Minister for Energy confirmed that they plan to approach the Bank for further support in establishing the regulator and developing a carbon market. Moreover, in March 2022, the Bank and the Government of Uzbekistan signed an MoU expanding the Bank's support for wind auctions from 1GW to 2GW.

Importantly, there is evidence that the Bank has taken a broad view of the Uzbek energy sector and designed its support accordingly, with due attention given at an early stage to supporting electricity storage development and decommissioning inefficient thermal plants, in parallel with support for electricity generation. This may help mitigate some risks associated with expected fast growth of solar power generation, which in some other COOs resulted in network imbalances and caused financial distress to the offtaker (NEGU estimates that it may accommodate up to 1,3 GW of RES without storage but it will have serious technical problems beyond this level). In addition to storage, NEGU is actively investing in the electricity grid, with the Bank's support (the Bank is also considering financing a new transmission line in Uzbekistan, concept approved). Moreover, the Bank's RES sector-related activities in Uzbekistan, agreed with the government for the coming years, include discussion of a roadmap for the reforms in the gas sector (critical for balancing RES), guidance on mitigating the environmental and social impacts of decommissioning (key considerations in decommissioning plans for old thermal units – important for releasing generation capacity for RES), as well as capacity building on climate-related financial disclosure and compliance with the the EU's Industrial Emissions Directive (important for benchmarking of thermal plants and helpful for decommissioning strategy). It is understood from NEGU, that it would also appreciate the Bank's assistance in modelling the impact of RES on the transmission system, dispatch management, and modelling of cross-border energy trading with neighbouring countries (according to NEGU's estimates, importing electricity from Tajikistan or Turkmenistan during the summer would be cheaper/comparable with purchasing domestic solar, even at record low tariffs).

The Bank has closely coordinated its policy dialogue activities with the many actors present in this field in Uzbekistan, including the World Bank, IFC and ADB, effectively avoiding duplication and contributing to key components of the sector reform process. The Government of Uzbekistan agreed that the IFC and ADB would lead on providing assistance for solar auctions, whilst the EBRD would provide support for wind. This was an effective split of responsibilities. Dedicated

donor coordination meetings are organised by the Ministry of Investments and Foreign Trade and take place regularly where all stakeholders provide updates on the progress of their activities and coordinate further actions.

Effectiveness of this project is currently rated ***excellent*** (subject to the confirmation of Nur Navoi solar plant achieving its operational annual targets in the future) reflecting the Bank's extensive and well thought-through policy dialogue. However, as the plant has been completed ahead of schedule and has been generating energy in line with expectations, the likelihood of such targets being achieved is high. Importantly, despite being absent from Uzbekistan for a long time, the Bank was able to reengage quickly and take up an important role, supporting critical policy areas not yet addressed by other IFIs. The Bank's policy dialogue, such as the development of the Low Carbon Pathway, helped to mobilise political support for solar power/RES in Uzbekistan. Furthermore, the EBRD's support to the unbundling of the state energy company was critical for transferring Uzbekistan energy system's structure into one aligned with international standards. This ultimately enabled Uzbekistan to attract experienced international investors into its burgeoning RES sector. Importantly, despite solar, and RES in general, still providing a low share of Uzbekistan's energy generation, the Bank took a broad view of the energy system there, supporting fast growth in RES but also mitigating the risks associated with the same, by supporting the decommissioning of old thermal plants.

Efficiency

As this plant started operating in Q3 and its full completion is planned only in Q4 2021, it does not yet have a full year track record of generating revenues. However, it has received initial payments for the first quarter of operation from the offtaker in full and on time (the Bank's projections are made on an annual basis). The payment obligations of the offtaker are sovereign-guaranteed. Power generation has been in line with expectations, and construction was completed on time and within the budget. The Bank's loan was provided to Masdar's dedicated SPV (UAE) and channelled to its SPV in Uzbekistan to finance the project. It was guaranteed by Masdar. Therefore, the Bank has no recourse to actual solar plant operation (although such operations are being monitored by the Bank, including use of proceeds, E&S compliance, etc).

Masdar's (the guarantor) financial performance has been largely in line with the Bank's projections (for 2020 and 2021 expected revenues at about US$ 180 - 200 million and adjusted EBITDA in the range of US$ 150-160 million, with a cash balance at the end of 2020 at US$ 250 million). Masdar was broadly in line with these projections, posting for 2020 FY revenues at US$ 173.3 million, and cash balance of US$ 334 million on the back of increased debt amount. In September 2020 Moody's and Fitch following extensive due diligence assigned Masdar long-term ratings of A2 and A+ respectively, both with a stable outlook. The Bank's loan repayment will be by a bullet repayment, due in 2026 from Masdar's cash balance.

Efficiency is rated ***fully satisfactory***, although with the caveat that there is a limited track record at this point. However, EvD would note that power generation has been as forecast, construction was completed on time, and Masdar's wider corporate business is performing robustly.

Overall rating

Nur Navoi is the first solar project tendered competitively in Uzbekistan. The IFC and the ADB had a clear competitive advantage over the EBRD as the senior loan providers as they were able to offer concessional blended finance package. The Bank's equity bridge loan provided limited financial additionality, but the Bank's participation in this project sent an important signal and constituted a platform to engage in further policy dialogue in the sector. The Bank has been a key player and often a leader in policy dialogue in the energy and RES sector in Uzbekistan, and its participation in the financing of this landmark project was of paramount importance for the Bank to uphold its position as one of the leading institutions in promoting RES in this country.

The project has been completed on time and within the budget, and it is operating well. It has very good potential to achieve all its operational targets, however its operations and financial results should be reassessed after at least one year of full operation. The Bank's policy dialogue in Uzbekistan has been well-targeted and brought concrete results in the form of Low Carbon Pathway, which is under implementation, improved corporate governance at unbundled energy companies, RES tender rules (which are being applied) and the new Electricity Law (which although yet to be adopted has clear potential to have a significant impact). The Bank's role as the principal support institution for wind power auctions has been established, while the future policy dialogue objectives agreed with the government clearly address priority issues such as establishment of an energy regulator, development of electricity storage and guidelines on mitigating the impacts of decommissioning of old thermal power plants.

Despite multiple donors and IFIs active in this sector in Uzbekistan, the EBRD effectively coordinates its policy dialogue avoiding duplication. Overall the project is rated ***Good,*** with future potential to become ***Outstanding*** if and when the achievement of its operational targets and financial results is verified.

Key findings:

- The Bank can effectively contribute to policy dialogue even in fields crowded by other IFIs, by coordinating closely and choosing specific policy components to support, where it has best expertise and competitive edge;
- Despite limited financial additionality, the Bank's participation in a project may be justified if it supports effective policy dialogue and the long-term strategic objectives of the Bank and the host country;
- Involvement of relevant Bank units in policy dialogue and TCs can add value and contribute to high quality results (e.g. OCCO's engagement in setting up the compliance function at unbundled Uzbekenergo units);
- The EBRD suffers from a "competitive disadvantage" in the RES sector vis a vis other IFIs as it is unable to offer blended financing.

- For RES financing in ETCs, explore the possibility of sourcing some concessional financing, in order to offer blended finance and to match offers from other IFIs, which are able to provide such financing;
- Continue with well-focused TC support, particularly for an independent energy regulator and a thermal power decommissioning strategy. Consider also closer cooperation with NEGU on specific issues, such as cross-border electricity trading, modelling impact of RES on the transmission system or dispatch management;
- Consider improving communication with the beneficiaries of key TCs, better explaining the nature of any delays or limitations of the Bank-sponsored consultancy assignments, aiming at effectively addressing any impediments to their timely completion;

- Consider providing assistance for the development of technical standards and procedures for the approval of completed solar plants (those currently applied are for thermal plants and significantly delay the approval process).

5. Risen Solar and Chulakkurgan, Kazakhstan (50002 and 50218)

Background

The Bank financed two separate solar PV projects in Kazakhstan - Risen Solar (2018) and Chulakkurgan (2019). Both were developed by the same project sponsor, Risen Energy Co. LTD (China), processed and financed under the Kazakhstan Renewable Energy Framework (KAZREF I, approved in November 2016) and benefited from the same FiT and PPA arrangements. Given these confluences, these projects have been evaluated jointly.

The Risen Solar project was a 40MW Solar PV plant constructed in Gulshat, on the northern shore of lake Balkhash in Karaganda region. The EBRD provided a US$ 22 million 14 year (with a two year grace period) loan in KTZ alongside two concessional loans – a US$ 4.16 million loan from the GCF and a €4.9 million loan from the CTF (both GCF and CTF tranches are administered by the EBRD), in addition to the sponsor's equity of US$ 13.5 million. GCF loan's structure was pari-passu with the EBRD's, while CTF was for 20 years with a nine year grace period. The interest rate of both loans was about half of that of the EBRD's margin.

Under **the Chulakkurgan Solar project**, the EBRD had planned to provide a US$ 40.4 million loan in KZT, along with a US$ 10 million loan from the Green Climate Fund (GCF), in addition to US$ 21.6 million in sponsor's equity. However, the plant was subsequently downsized along with financing from each party. The EBRD ended up financing a US$ 32 million loan of 14 years (with a two year grace period) in KZT, and the size of the solar plant was reduced from 63 MW originally planned to 50MW. The GCF's loan was granted for the same term as the EBRD's but with a lower interest rate.

Both projects' TI benchmarks were defined under the KAZREF I framework. These included commercial viability, power generation, CO_2 savings, and a sponsor's participation in training workshops. The transition qualities for both projects were Green and Competitive, from generating CO_2 savings and supporting private sector developers in the state-dominated energy generation market. In order to achieve the Framework objectives, the Bank was planning to engage in wider policy dialogue as part of the KAZREF I. Key planned activities included the development of a strategy to strengthen the national grid, integrating renewable energy projects into the Kazakhstan Emissions Trading Scheme, review of the FiT system, capacity creating and building at the Financial Settlement Centre (FSC) by developing a telemetry and monitoring system, as well as transitioning to an auction-based mechanism. At approval, the estimated budget for the KAZREF I TC and policy dialogue was up to €10 million. Although these broader policy objectives were set at facility level (KAZREF I), this evaluation examines the results from the Bank's PD-related activities conducted during the facilities life span (11.2016 - 8.2019 when it was replaced by KAZREF II), particularly during the period when both Risen projects were approved and implemented (2018 - early 2019).

Relevance

Both projects were approved under the 2013 Kazakhstan Country Strategy, which targeted "low-carbon growth" and concluded that the Bank should develop a "dedicated lending facility for small-/medium renewable energy projects, as well as pursue large-scale renewable energy projects". Clearly, these projects were relevant and in line with that strategy. Moreover, the KAZREF I facility provided a framework, under which to process a larger number of small-medium RE projects.

Support to the solar sector also aligns well with the Kazakh Government's strategy, as set out in the country's Green Economy Plan. The Government has been targeting ambitious increases in energy generation from renewable sources, with the objective of achieving 10%[30] of energy generation from renewable sources by 2030 (or 30% "clean energy" including nuclear). Kazakhstan has also committed to reducing greenhouse gas emissions from 1990 levels, by 15% (unconditional reduction) to 25% (conditional on additional international investments, access to low carbon technology transfer mechanisms, green climate funds and flexible mechanisms suitable for an economy in transition). This is to be achieved by 2030, as per their NDC submitted as part of the Paris Agreement.

The additionality of these projects rested on three core principles: lack of long-term local project finance in Kazakh tenge, policy dialogue, and the implementation of an ESAP. The client confirmed that, at the time of project approval, the EBRD was the only financing institution ready to provide reasonably priced long-term financing to private RE projects. In the following years more lenders became active in this market and began to offer long term financing (although not always in local currency), including ADB, EDB, AIIB, ICBC and the Development Bank of Kazakhstan, which allegedly has a strong preference for projects with substantial local content. The Bank also developed an ESAP, including a Stakeholder Engagement Plan, both of which were implemented. As to policy dialogue (which was part of the overall Kazakh Renewables Framework and not project specific), there is evidence that various Bank teams have been engaged in relatively intense and continuous policy dialogue since 2009. However, based on the available evidence, TC-supported policy activities took place mainly before and after the KAZREF I facility period (see more on this in the next section) largely explained by KAZREF 1's shorter timeframe (due to faster than expected utilisation of financing) and the lengthy process for providing GCF funding (see more on this in the next section). Nevertheless, in the interview with EvD, the Head of the RE Department at the Ministry of Energy expressed his appreciation for the Bank's work on improving the bankability of the PPA template for renewables (supported by Trinity International) and the provision of feedback to the Ministry on the FiT structure, as well as more recent assistance in developing the RE auction system. This confirms the Bank's additionality through policy dialogue.

Risen confirmed that it was also attracted to the Bank's financing due to its strong presence in the country (Risen had no prior experience in Kazakhstan), involvement in policy dialogue and the EBRD's potential ability to mitigate political risk (e.g. if changes to the RE law and tariff levels were to occur). GCF and CTF concessional loan tranches were appreciated, but not critical for the client (Risen would have proceeded with this investment without them, provided the full amount of financing was made available by some other lender, which was not the case at the time).

[30] Subsequently increased to 15%

Relevance is rated ***excellent*** as these projects were very well aligned with the EBRD's strategic priorities for Kazakhstan and coincided with the Government's priorities. There was also significant additionality through the provision of long-term local currency financing. Moreover, despite the modest use of TC funds during the KAZREF I years (2017-2019), during which both Risen projects were approved, there is sufficient evidence of highly beneficial outcomes derived from policy dialogue conducted by the Bank's own staff.

Effectiveness[31]

Project development proceeded well, supported by KAZREF's project preparation TC, funded 50/50 by the sponsor and the Bank (legal due diligence was particularly challenging as it incorporated Kazakh, Chinese and English laws). The projects' primary **output** was the successful construction of two solar PV plants. In both projects the EPC contractor was Risen (Hong Kong) and the panels installed were produced by Risen Energy. The EPC contract prices per MW (US$ 0.9 million for each plant) were within international standards, indicating that the contract was granted at arms' length.

Before construction started, the capacity of Chulakkurgan was reduced from 63MW to 50MW due to an ambiguity in the PPA with respect to the type of current to be off-taken (alternative - AC, versus direct - DC). The Kazakh law did not provide a clear definition of AC/DC capacity, while the PPA referred to generic MWs, without specifying AC or DC. While it is not uncommon internationally to optimise the DC capacity, while limiting actual delivery to the grid at the AC level (thus complying with PPA terms and connection conditions), the Kazakh authorities indicated that they would be looking to address this grey area and were not in favour of oversizing the DC side. Thus the Borrower decided to take a cautious approach and downsize the plant from 63 MW to 50 MW prior to initiating construction but after securing EBRD financing, which was reduced accordingly. EvD understands that this ambiguity has now been clarified and the new PPAs refer to DC.

The Gulshat plant Commercial Operation Date (COD) was achieved as planned (under the Risen project) in March 2019. The Chulakkurgan construction was completed in March 2020 and the plant started generating electricity three months ahead of the June 2020 COD target. However, due to the COVID-19 crisis, the COD could not be certified as travel was not permitted. In June 2020, one of the transformers suffered a technical fault (leaking oil), which led to power production for the year falling below the P90 forecast (see table below). The malfunction was repaired, and the project sponsor received remedial damages from the EPC contractor ($1 million for lost revenue due to this delay).Since the transformer was repaired, power generation have been in line with the original P90 forecast. The COD was formally achieved in August 2020 (a two month delay) and certified by the Bank as of 1 December 2020.

Risen Energy, the sponsor for both projects, is a Tier 1 PV panel manufacturer (the fifth largest in the world) and it is not surprising that it used its own panels. The potential exposure of the solar panel industry supply chain to allegations of forced labour in the Xinjiang province of China emerged only recently (in 2021) and was unknown when the two Risen projects were approved and implemented; thus it is not formally incorporated in this evaluation. Nevertheless, EvD attempted to gather information available in public domain on the relevant companies and asked clients about their approach to, and policies (if any) in respect of this issue, as well as to their supply chain traceability.

[31] For the purpose of assessing results, EvD has adjusted the targets for Chulakkurgan from those set within the Board Memorandum, as the project was smaller than originally conceived.

Based on the discussions between the Banking department and Risen Energy, EvD understands that Risen is now able to trace all its raw material and sub-component manufacturers (through barcodes), however Risen Kazakhstan SPV's CEO (interviewed by EvD) was unable to provide more information on the provenance of these components. Risen highlighted recent developments, i.e. the acquisition of a silicon production site in Inner Mongolia and current supplies coming from subsidiaries based in Changzhou, Jiangsu and the Yangtze River Delta region. However, EvD notes that the report on the forced labour issue ("In Broad Daylight – Uyghur Forced Labour and Global Solar Supply Chains") published jointly in May 2021 by Sheffield Hallam University and Helena Kennedy Centre for International Justice, makes the following references to Risen Energy:

"*Risen has no known direct investments in Xinjiang, nor is there any evidence of employing forced labour in its manufacturing. However, Risen Energy's supply chain is potentially affected by their relationship with Wuxi Shangji Automation Co. Risen Energy has a three-year contract to purchase silicon wafers from Wuxi Shangji, 301 who purchases polysilicon from Daqo, Xinte, and GCL-Poly."* The report further points to all three companies (Daqo, Xinte, and GCL-Poly) being among those which have some facilities in the Xinjiang province and have been allegedly implicated in participating in "forced labour transfers" in respect of their silicon production facilities. It is noted however, that due to the concentration of polysilicon suppliers in Xinjiang province, this issue affects most large PV panel manufacturers. Risen Kazakhstan SPV's CEO was unable to provide more information on this matter. EvD understands that the Banking team remains in contact with Risen (China) in order to obtain more information on their supply chains.

The **outcomes** of both projects in terms of technical performance, have been monitored and reported to the Bank quarterly by Tractabel. The Gulshat plant has been generating electricity in line with the original expectations, i.e. 51.4 GWh in 2019 compared to 51.1 GWh under the P90 scenario. The generation for 2020 was 65.6 GWh (18% above base case scenario) and generation in the first six months of 2021 amounted to 33.6 GWh. The latest technical report for Q2 2021 indicates that electricity generation for that period was 8.8% above the base case.

The Chulakkurgan plant generated 60.8 GWh in the 10 months from March 2020 when it started operating (as compared to 70 GWh target under P90), the shortfall being due to the aforementioned transformer fault. Moreover, lower energy generation in April and May was due to delays in tracker commissioning at the plant because of supply chain issues caused by the COVID-19 pandemic and mobility restrictions. However after this fault was repaired, Chulakkurgan generated 47 GWh in in the first six months of 2021 (42 GWh in the base case). Based on the latest (2Q21 report), which indicates electricity generation 13.5% above the base case in that quarter, it is expected that the target will be achieved or exceeded this year.

Good electricity generation results were due to slightly better than expected irradiation levels for the Gulshat and Chulakkurgan plants (6.5% and 11.5% above the base case respectively), as well as 100% plant availability and no curtailment.

Project	Total Generation		
	Actual	P90 Base Case projection	Actual to projection (P90)
Risen Solar (40MW) 2020	65.6 GWh	54.9 GWh	18%
Chulakkurgan (50MW) 10 months March-Dec 2020	60.8 GWh	70 GWh	-13%

Both projects made a substantial contribution to advancing the status of two main monitoring benchmarks set for the KAZREF I framework: 20% contribution to the 600,000 ton CO2 reduction target (or 118,800 t of CO2 reduction, estimated after the Chulakkurgan capacity reduction) and 30% or 90MW contribution to the 300MW new RE capacity target.

In terms of transition impact, the projects contributed to advancing private sector participation and projects financed on a non-recourse basis. Moreover, the first Risen project supported the entry of a new investor into the Kazakh RE market.

The projects also made some contribution to the KAZREF benchmark "Favourable regulatory framework for RES projects and improved local business capacities to develop RES projects", which called for (i) regulatory reform conducive for RES projects implemented (at least three major improvements achieved) and (ii) Training for local businesses in developing bankable RES projects implemented (at least 50 local developers trained). In reference to the latter, the Risen project's SBIC Memorandum indicated that "The Borrower will participate in the Bank-led trainings/workshop sharing its experience as a new entrant". In July 2019 one of Risen's executives participated in Solar Fest, an event organised with the EBRD's support, where she shared her experience from Risen's investments in Kazakhstan with the international and local business community. This engagement may be considered as a fulfilment of the commitment under this benchmark, at least at the output level, as there is no clear evidence of large numbers of Kazakh investors following in Risen's footsteps.

Also, Risen representatives took part in several events in China, showcasing the projects and sharing their experience from working in Kazakhstan with Chinese investors. For instance, in November 2020 Risen took part in an EBRD-AIIB sponsored webinar on Chinese companies' outbound renewable energy investments. Moreover, in July 2021 the Bank's representative participated in a conference *"Adaptability of Project Finance to Chinese Outbound Green Projects"*, organised by Dentons, a legal firm in Beijing, promoting investments in the Kazakh RES sector, presenting Risen projects. Over 80 participants from around 50 energy and construction enterprises took part in this conference, including PowerChina, China Gezhouba Group Corporation, Sungrow, CPIH, China Energy Investment Group, China Huaneng Group, etc. This certainly helped promote investments in Kazakhstan among Chinese companies, however this was not what had been intended under the project benchmark, i.e. targeting local developers.

The client was unaware of visits by any other potential solar developers, or attempts to follow Risen's specific example, although other Chinese investors, such as CPIH, Universal Energy and Sungrow subsequently entered the Kazakh RE market including under the Bank's projects. Despite this positive development, there is no clear evidence of a link between Risen's projects and subsequent investments in Kazakh RE. Nevertheless, EvD notes that KAZREF I and II have been generally successful, with the Bank financing 13 solar projects with an aggregate capacity of 688 MW – two thirds of the total solar capacity installed in Kazakhstan to date.

Risen implemented the ESAP and the Stakeholder Engagement Plans for both plants. At Gulshat it entailed a renovation of the town water supply system, i.e. 30 km of water supply pipelines were replaced and one pumping station was renovated at a cost of over US$ 100,000, in two phases (spending more than required up front).

In terms of wider **impacts** and backward linkages, the construction of both projects (including sub-contractors) provided employment to about 250 local workers and the plants currently employ 17 staff, including four women. Reportedly, plant

staff are provided with regular training related to technical, business and other matters. No other backward linkages have been identified as operations are relatively small and Kazakhstan doesn't have any solar power-related manufacturing industry.

The Kazakhstan Renewable Energy Framework I Board report (under which both projects were financed) set out an ambitious scope for potential **policy dialogue** activities, to help achieve the Framework's objectives. The envisaged policy dialogue activities included the development of a strategy to strengthen the national grid; integrating renewable energy projects into the Kazakhstan Emissions Trading Scheme; reviewing the FiT system; building capacity at the Financial Settlement Centre (FSC), including the development of a telemetry and monitoring system, as well as supporting the transition to an auction-based mechanism. The estimated budget for TC projects (including project-specific due diligence work) under KAZREF I was up to €10 million (as per the financing plan in the Board report), with the first €400,000 to come from the SRI Policy Framework – Energy and Integrated Resources Window. The rest of the TC funds were to be obtained from GCF. The provision of these funds took more than 18 months, which partially explains the amended scope, and why the amount spent on policy dialogue TCs was considerably less than anticipated during this framework's lifetime and prior to the introduction of KAZREF II.

However, the scope and objectives of the Bank's PD subsequently evolved significantly, as summarised in the table below. In general, EvD notes that policy dialogue was conducted by the Bank's staff, rather than through dedicated TCs. The Banking team presented evidence confirming that policy dialogue under KAZREF I was conducted through participation in:

- meetings with government officials (including the Prime Minister, Ministers, Vice-Ministers, MPs, etc) at different levels, communicating the Bank's recommendations and sharing experiences from other countries of operations;
- working groups organised by the Kazakh government, which provided the Bank with an opportunity to comment on the draft legislative acts and frameworks, as well as to express an opinion on different topics to decision makers;
- meetings of the Foreign Investors Council, American Chamber of Commerce and Green Economy Donors coordination, dedicated to RE development;
- conferences and events organised by the EBRD and other institutions and market participants.

According to the Banking team, the key results of the policy dialogue during this period were:

- introduction of foreign exchange indexation of the FiT tariff in the event of KZT devaluation against USD (70% of the tariff's total value);
- improvement of the bankability of payment arrangements to RE producers by the creation of the Financial Settlements Center (FSC) and the provision of sovereign payment guarantees to FSC;
- improvement of PPA bankability by the introduction of international arbitrage at the AIFC, creditor step-in rights, force majeure and adverse regulatory changes, as well as other international standards;
- improvement of PPA sustainability by ensuring its long-term applicability;
- gradual transfer of the Kazakh RE system from FiT-based to auction-based;
- revocation of the requirements for local content (and some other proposals harmful for RE investors).

The Bank's policywork in the broadly-understood Kazakh energy sector also resulted in the improvements introduced to the country's NDC's, an updated Environmental Code, and increased ambitions under the Green Energy Concept.

Several of these activities culminated or were concluded during the preparation and implementation of the Risen projects, thus it can be considered that they contributed to the achievement of KAZREF's benchmark of "regulatory reform conducive for RES projects".

As mentioned, TC-supported policydialogue was less pronounced than planned under KAZREF I. EvD obtained evidence that €61,000 was spent on policy dialogue-related TC (for the legal firm, Trinity, which analysed and recommended changes to the RE PPA, in order to improve its bankability). There is also evidence in the Bank's system of a consultancy contract for scoping the development of a carbon trading system ($83,000), as well as "institutional capacitybuilding" TC (for $702,000) and a gender equality TC ($150,000). However EvD was unable to obtain any information about the nature and results of these assignments (and whether they took place). The remaining TC assignments implemented under KAZREF I (€4.2 million contracted and €1.6 million paid) appear to be transaction-related (financial, legal, and to a lesser extent environmental due diligence).

In any event, the Bank spent less than €1 million on PD activities, substantially below the initially envisaged budget of €10 million. The primary reasons for this divergence was the Bank's realisation that it would be able to conduct more effective, timely policy dialogue, responsive to the government's ad hoc requests, by using its own staff, rather than consultants (whose selection, contracting, etc. takes time). Another reason for preferring to use its own staff for such dialogue (and for the much lower TC budget) was the long period (about eighteen months) required to obtain the GCF grant to cofinance TCs supporting policy dialogue. Moreover, during that time, other IFIs and donors (primarily the World Bank and USAID), became increasingly active in the Kazakh renewable energy sector, offering their assistance in addressing priority issues. This development, combined with the rapid evolution within the RE and solar sector at this time, made some of the issues considered earlier obsolete, while creating an opportunity to address new needs. Ultimately, Kazakhstan's RE-related investment climate and regulatory framework improved faster than expected (which was evidenced by the exponential increase in the installed RE installed). In these circumstances the demand for some of the Bank's TC-supported policydialogue turned out to be much less than expected.

Accordingly, some potential PD activities outlined in the Board Memorandum for KAZREF I were dropped entirely. The Banking team explained that, at the time of framework approval, the description of PD activities was broadly indicative to achieve the Framework's quantitative objectives (which were achieved), as the Government of Kazakhstan had not yet prioritised specific policy measures when KAZREF I was approved. EvD also notes that there is evidence that, prior to KAZREF I, the Bank engaged with the Kazakh authorities, supporting early development of the country's RE legal and institutional framework, with a TC budget of €2.1 million for policy-related TCs. An additional €3.1 million was spent on policy dialogue activities as part of KAZREF II (from August 2019). This included funding for activities integral to the development of the RE sector, such as preparation of the wind power auctions and development of Kazakhstan's carbon market. Given that the KAZREF 1 timeframe was shorter than envisaged (less than three years vs. five years assumed at approval due to faster than expected utilisation of financing), the TC policy work done under KAZREF II effectively covers some of the scope outlined in the KAZREF I Board document.

The Director of the Ministry of Energy RE department confirmed that the Ministry and the Bank have engaged in RES-related policy dialogue since 2010, contributing to the revision of the RES law, introduction of improved FiT calculation, development of by-laws, and the creation of the FSC payment centre.

KAZREF I PD and TC Activities planned	Actual Implementation
Further reviewing of the feed-in tariff system and development of a calculation mechanism for the feed-in tariffs;	The Bank was involved in FiT development in the early stage. Later on, following GoK's agreement to transition to competitive auctions sooner than expected, the Bank concluded the review of the FiT mechanism was no longer necessary.
Mapping the need in electricity grid balancing capacities development/upgrading grid and cascade system;	This task was completed by USAID as part of the Power the Future Programme.
Reviewing how the RES sector will be dealt with under the Kazakh Emissions Trading System (K-ETS) and carbon market related policy engagement, on best strategies to integrate the RES projects/programmes	This component proceeded and resulted in the development of a subsequent TC project with well-defined objectives, financed under KAZREF II's TC (part of its €3 million TC budget) and it is currently being implemented. It supports integration and the alignment of the domestic carbon market with international markets and certification of renewable energy projects.
Supporting development of the Monitoring, Reporting and Verification (MRV) system	The World Bank financed and implemented this component.
Capacity building support to the FSC, including the development of telemetry requirements regarding remote monitoring of projects	The Bank decided not to proceed with this activity, as USAID were providing support in this area. However, according to the MoE, the Bank contributed (earlier on, at the conceptual stage) to the establishment of the FSC.
Introduction of an auction based system for RES projects	Improvement of PPA and the legal framework for auctions were implemented. Subsequently, a larger TC was prepared to support wind auctions (implemented under KAZREF II's TC) In addition, the Bank provided direct feedback to the Ministry of Energy via formal letters and active participation at working group meetings, with specific guidance on how to set up a successful auction mechanism and to draft a set of auction rules. This was coordinated closely with the World Bank and USAID, who led this work in relation to solar auctions.

It is clearly good practice that the Bank coordinates with other IFIs and donors, and doesn't spend TC funding on activities, which are being supported by other actors. EvD understands that for many years the EBRD has been the sole IFI supporting RE in Kazakhstan. However, this changed shortly after the approval of KAZREF I (late 2016), when other IFIs

and development agencies became engaged in this sector. Although the Bank did not lead on some PD activities during this period, in reality Kazakhstan has progressed meaningfully towards the Bank's key PD objectives, most significantly transitioning its RES system from FiT-based to an auction-based system. Kazakhstan has now launched renewable energy auctions, conducting 28 of them in 2018 and 2019 and 13 in 2020-2021. These auctions attracted prices significantly lower than the historical FiT; i.e. the 2019 solar auctions attracted bids priced 66% lower than the FiT (KZT 12.4/kWh, compared to the project's initial FiT of KZT 34.6/kWh). They were also lower for wind power, i.e. in the range of KZT 15- 22.6/kWh. The EBRD contributed significantly to that process, working mainly on wind auctions, while the World Bank was leading IFI support for solar auctions.

There also has been an important ongoing EBRD-funded TC assignment to support the development of Kazakhstan's emission trading system and the carbon market in general (funded by GCF). In the longer-run, this offers potential for solar power producers to generate additional revenue through the sale of carbon credits. However, currently there are only five projects nationwide that have been certified to sell carbon credits, and none of them are solar power producers. Therefore the impact of this TC on the growth of the Kazakh solar sector is currently limited, although it is possible that it could contribute more in the future. Whilst the solar sector will be one beneficiary of this TC assignment, it was designed to contribute to the growth of the RE sector in general, including wind power (under KAZREF II, the EBRD is to specifically support three new wind auctions).

Moreover, as an example of staff-led policy dialogue achievement, the EBRD's advice contributed to Kazakhstan's decision to abandon policies that would have provided financial incentives for, or mandated the use of locally made components in new renewable energy projects. A Bank-initiated report found that these provisions would not help develop the renewable energy industry or the wider economy and suggested alternatives that do not distort the market. In more recent developments, the EBRD signed an MoU in March 2021 to develop a Decarbonisation Roadmap for the power sector, in partnership with USAID. The outcome of these work streams is expected in March 2022.

However, the table above does suggest some weakness from a design perspective. Most of the PD activities set out in the Board report (even if only indicative) were either not implemented or were implemented only under KAZREF II or by other donors. During the duration of KAZREF I, the Bank spent only a very small proportion of the funds indicated in the Board report on policy dialogue (less than 10%, although substantially more - €4.3 million - was spent on project-related/preparatory activities). This could suggest that there was inadequate scoping of the role that the EBRD could play, given the policy landscape and the presence of other major stakeholders. Ultimately, if the Board approves a framework with associated TC of €10million, there is a reasonable expectation that there is clear demand for that level of engagement; in reality, that has not been the case in Kazakhstan so far. It is understood that the RES sector is dynamic and crowded with donors willing to help, and that the Bank did the right thing dropping TC activities undertaken by other donors. However, EvD is of the view that this constituted a material change and the Board should have been informed relatively early that TC-supported policy dialogue of the magnitude described in the original Board report would be much reduced. This information was contained only in the Board report requesting approval to extend the programme (KAZREF II) in September 2019.

This Board report stated that "as part of the Bank's recent policy dialogue (under KAZREF I) at least five legislative/regulatory improvements have been introduced in Kazakhstan's RES sector":

1) Creation of the Financial Settlement Centre ("FSC") reserve fund (January 2017): The reserve fund's size amounts to 3% of the FSC's total annual payments to RES producers under the effective PPAs and is aimed at covering the FSC's unforeseen short-term liquidity needs.
2) Partial FX indexation law statute (May 2017): According to the amendments, an RES developer is entitled to partial indexation of the FiT provided that the project costs include liabilities in hard currencies in the event of at least a 25% devaluation of Tenge against the USD.
3) Following the Bank's active policy engagement, in early 2018, the Ministry of Energy announced a series of competitive tenders for renewable generation capacity (auctions).
4) In May 2018, the Ministry of Energy announced a change to the tariff indexation formula: under the new auction regime, the tariff levels for electricity generated from renewable sources will be indexed 70% to movements in the USD/KZT exchange rate, and 30% to movements in the domestic CPI.
5) In Q2 2019 the Ministry of Energy introduced a new form of PPA for renewable energy projects to be auctioned this year which includes a provision of: a) step-in rights and b) international arbitration at the Astana International Financial Centre (AIFC) platform.

Although EvD identified only one TC assignment related to the above-mentioned activities – a relatively modest €61,000 related to the last point – PPA improvement), there is evidence that most policy dialogue was conducted by the Bank's staff and in response to the GoK's ad-hoc demands.

The Director of the MoE's RES department, interviewed by EvD, confirmed that the Bank contributed to all these achievements. While some of the above statements could have been more precise (e.g. the primary law on partial FX indexation was adopted by the Kazakh Parliament well before KAZREF's I was approved, while the Bank's policy dialogue was focused on the secondary legislation, which described in more detail how this indexation would work), it is beyond doubt that over the years the Bank made an important contribution to improving the bankability of Kazakh RE contractual arrangements, as well as to the transfer from FiT to an auction system. Also, the work on the Kazakh ETS market has started in earnest, with a substantial team of consultants deployed as of 2021, and it is expected to materially contribute to further increasing the attractiveness of the Kazakh RE system to private investors.

On the **macro level**, by end-2020 Kazakhstan had achieved 3% (or 1.6 GW) of energy generated from RES as planned. It also overshot its solar target of 500MW by almost 100%, achieving 960MW of installed solar capacity. This compares with the base of 1.6% or 300MW RES in 2017. Risen projects contributed 90MW (5.6% to this target), while all 13 Bank-financed solar projects of aggregate 688 MW accounted for 71% of installed solar capacity. Although the Kazakh RES sector seems to be on the ascendancy, with the legal and institutional framework established and the auction system introduced, there are reports of events that could potentially alter the current development path. EvD understands that there are indications that the government intends to enter into directly awarded deals with selected RES investors, which could introduce significant additional RES capacity but the associated terms and cost may not be the best value to the consumers. The Bank has already pre-emptively engaged with authorities through a webinar, sharing international

developers' experience, including Bank clients, to demonstrate the low cost of the sought renewables, as well as hybrid solutions for storage. Moreover, a debate on the introduction of local content requirements coupled with a local content premium is still ongoing. Therefore, it is of utmost importance for the Bank to continue its policy dialogue in this sector.

In respect of two Risen projects, despite some shortcomings their effectiveness has been relatively strong. A technical fault at Chulakkurgan led to lower than expected energy generation in the first year of operation, however this has been now addressed and in 2021 both plants have been generating electricity slightly above projections. There have been tangible outcomes from the Bank's policy dialogue, although most of it had evolved differently from the set of PD activities initially proposed in the Board report for KAZREF I. Although no dedicated workshop, showcasing Risen projects, was organised for local investors, Risen's executive participated in an event where experiences from such projects were shared, including with Kazakh businessmen. The projects were also showcased in China. Despite some weaknesses, in view of both projects being operational and given the Bank's substantial contribution to the transition of the Kazakh RES system to one based on competitive auctions, project effectiveness is rated ***fully satisfactory***.

Efficiency

The off-take risk of both projects is mitigated through the Project Support Agreement (PSA), signed between the Bank, the Ministry of Energy and an off-taker (FSC), as well via its structural ownership, where the off-taker's parent, KEGOC (national transmission and system operator with an established reputation as a reliable infrastructure company) closely controls FSC. The PSA prevents the government from reducing the agreed FiT levels.

Risen's Gulshat solar plant has been operating in line with expectations, and the project has made all payments as planned from June 2020 onwards. The Tenge depreciation (in Q1 2020) has affected the calculation of DSCR, but has not materially affected the borrower as the loan had already been fully disbursed and the plant's revenues are in Tenge. Whilst the Bank does have a cash sweep mechanism in place, this has not yet been activated; however, this is in line with the Bank's modelling predictions for the early stages of the power plant's operation.

In FY 2019, the Gulshat SPV company generated KZT 1.77 billion (US$ 5.0 million) of revenue. Less cost of sales, the EBITDA was KZT 1.38 billion (78% margin), while the gross profit for FY19 was KZT 1.1billion (US$ 3.2 million), and following other expenses, the company reported net income of KZT 398.22 million (US$ 1.1 million). These results were very close to the base case, as demonstrated below.

	Audit report (KZT mm)	Base case model (KZT mm)
Revenue	1,768	1,667
Cost of sales	-386	-278
EBITDA	**1,382**	**1,389**

In 2020, Gulshat SPV generated KZT 2.4 billion revenues and achieved EBITDA of KZT 1.8 million. These results were 20% and 5% above the base case model (KZT 2 billion revenues and 1.7 billion EBITDA). This indicated the sustained good performance (and even over-performance in respect of the revenues) of this plant.

The Chulakkurgan project began generating revenue following the completion of the plant in March 2020. For FY2020 (10 months) revenues stood at KZT 2.1 billion (US$ 5 million), with operating profits at KZT 1.2 billion (US$ 2.9 million). The revenue level was 43% below the KZT 3.7 billion projected at approval, due to a faulty transformer in June, during which time the plant could not generate revenues, as well as lower energy generation in April and May due to delays in tracker commissioning at the plant because of supply chain issues caused by the COVID-19 pandemic and mobility restrictions. This impacted EBITDA, which was KZT 1.8 billion, almost half of the projected KZT 3 billion. Profits for the year were negatively impacted by currency fluctuations in 2020, due to the COVID-19 macroeconomic turmoil – felt especially in Kazakhstan – and the Borrower faced FX losses of KZT 168.7 million (US$ 0.4 million) in FY2020. The tariff was indexed from 1 July 2021, to 37.03 KZT (7% above the unindexed breakeven tariff). 2021 generation has been on track, and 15% above P90 scenario. KZT devaluation in 2020 amounted to 10.7%, while tariffs for both projects are subject to 30% adjustment in the event of KZT devaluating by more than 25%. The tariffs are also adjusted annually for inflation.

Part of the Chulakkurgan loan (US$ 4.2 million) was cancelled because of KZT devaluation (since the available commitment is expressed in the KZT equivalent of USD, thus a smaller loan amount can be serviced while maintaining the same risk profile). The Bank has been delaying the disbursement of the final commitment of US$ 1.8 million. This will only be disbursed once the project has a clear track record of generating revenue in line with expectations in 2021 (which is likely to happen), and if the project sponsor provides prepayments under the cash sweep mechanism.

Efficiency of both projects in aggregate is rated as ***partly satisfactory***. The Gulshat plant has been performing in line with the projections; however, Chulakkurgan's financial performance in 2020 was well below expectations. This improved only in 2021, achieving 83 GWh vs. 78 GWh under revised (downsized) base scenario. The technical faults in Chulakkurgan have affected its revenue generation, however the project company was compensated US$ 1 million for liquidated damages from the EPC contractor (Risen's subsidiary which, however, is still waiting for compensation from the original manufacturer of the faulty transformer), so the negative consequences of underperformance were mitigated in a timely manner by the project's structure. As for the Bank's profitability, the Banking team explained that despite a portion of the Chulakkurgan loan being cancelled., the Bank received the full amount of fees (related to the original loan amount) and the same margin on the reduced loan (as presented at OpsCom for approval) Therefore, although the Bank's return in absolute terms will be slightly lower than expected at approval, its return on capital should be higher.

Overall rating

Both projects were highly relevant to the EBRD's strategic priorities, and aligned well with the Government of Kazakhstan's vision for the renewable energy sector. There was also significant additionality, through the provision of long-term local currency financing.

Outcomes related to the physical construction and power generation of the solar power plants have been achieved, although in the case of Chulakkurgan COD was delayed, while the plant suffered lower electricity output due to a technical fault. However, current data suggests that both plants are generating electricity in line with original expectations. An initiative to develop the capacity of local developers through showcasing the projects and involving the sponsors have not been realised.

The Bank's policy dialogue in Kazakhstan was intensive and resulted in several notable achievements. Most importantly, the Bank made a significant contribution to the transition from the FiT to an auction-based system, which resulted in better value for the government and the users. Most of the Bank's policy dialogue has been conducted through its own staff, rather than TC consultants, as originally planned. On one hand, this is proof of the Bank's agility and ability to quickly adapt to the changing needs of the Kazakh authorities. However, EvD also believes that the Board should have been informed about this change at a relatively early stage given that very little of the planned TC-supported policy dialogue (estimated at up to €10 million at KAZREF I approval) would actually take place.

In terms of financial performance, Chulakkurgan SPV has been below the 2020 forecast due to the technical issues (now resolved). However, it has been exceeding base case forecasts since the fault was repaired, while Gulshat SPV has been generating revenues and EBITDA in line with the 2020 expectations and slightly overshooting the 2021 targets. Overall performance of both projects is rated ***good -*** .

Key findings:

- Whilst the Bank has achieved important policy-related results in the Kazakh RE sector, they were attained mainly through dialogue conducted by its own staff, rather than though the large TCs initially planned. This reflects a broader characteristic of engagement in the renewable energy sector, which is evolving rapidly, often requiring fast, ad hoc policy advice, rather than elaborate TCs involving external consultants. Moreover, it indicates that this sector has been attracting particularly high interest from other IFIs and donors. In that context, it is clearly more challenging to plan PD activities in advance.
- Lack of clarity in the PPA in respect of the technical characteristics of electricity to be off-taken, may result in the clients' decision to reduce the capacity of a solar project to that unequivocally guaranteed to be off-taken;
- PV panels producers are increasingly branching out into solar power development, through vertically integrated structures (panel manufacturing, EPC contracting, plant development and operation). If contracts in such a chain are granted at arms' length and at competitive prices, the arrangements can be advantageous, particularly for the solar plant operator/Bank client in the event of faulty equipment (as it is easier to obtain compensation from a subsidiary than an independent company);
- There are difficulties in identifying the results of policy dialogue, conducted by the Bank's staff and on an ad hoc basis, particularly when the team members change.

Operational considerations:

- In cases where a multicomponent policy dialogue programme (with a multimillion dollars budget), constituting an integral part of a large financing facility, is significantly changed and scaled down from that presented in the Board report, the Bank should inform the Board as soon as it becomes clear, stating the new size and objectives of the revised programme;
- A substantial reduction of electricity generation capacity (under approved projects) must be processed under the Material Change Policy in cases where the change 'threatens achievement of an operation's key objectives', i.e. be subject to a Board memorandum (for information or approval, depending on the size of the reduction). In the case of SBIC-approved projects (processed under facilities), information about such a change should be provided to the Board as part of reporting on a given framework;

- Where developers, panel producers and EPC contractors are subsidiaries of the same company, pay attention to procurement and ensure contracts are being granted on an arms' length basis (as was the case with the Risen projects);
- Consider developing a "Policy Dialogue Record Depository" at the Bank, to enable continuation, learning from and evaluation of such activities.

6. Yavoriv 1 and 2, Ukraine (49664)

Background

The Bank provided two loans (and arranged cofinancing) to two SPVs created by Eco-Optima, a local developer, to finance the construction in two phases of a solar plant in Yavoriv near Lviv, western Ukraine:

In 2017, to finance the first 36 MW plant (Phase 1):

- €16.9 million EBRD loan
- €6.7 million parallel loan from Clean Technology Fund (CTF), provided on slightly better terms than the EBRD's loan
- €3.9 million of sponsor's equity
- €1.7 million NEFCO's subordinated loan

In 2019, to finance the second 36 MW plant (Phase 2):

- €5.9 million EBRD loan
- €12.5 million B-loan funded by Triodos
- €3.4 million sponsor's equity
- €2.5 million NEFCO's subordinated loan

The project sponsor was a local developer, who previously had developed two windfarms in Ukraine with support from the EBRD.

Both phases were supported through the Ukraine Sustainable Energy Lending Facility (USELF). Offtake was via the state enterprise Energorynok and then a Guaranteed Buyer, through a FiT of €0.15/kWh.

The project targeted Green and Competitive transition qualities, stemming from the project's contribution to reducing CO2 emissions and the support to a private sector-led project in an electricity generation sector dominated by state-controlled power plants.

Whilst this project was supported under a FiT, the Bank also agreed a policy dialogue programme under USELF aiming to assist Ukrainian authorities in transitioning to a competitive auction process for RES. This included support for drafting legislation, technical capacity building, and marketing opportunities. In addition, the Bank's policy dialogue aimed to engage with the government to remove local content premiums within solar procurement. Prior to these projects, the Bank had been engaged in extensive policy dialogue to develop a bankable PPA. Both Yavoriv projects were agreed under the resulting PPA.

Relevance

The Yavoriv project was clearly closely in line with both the Bank's Ukraine Country Strategy 2018 (BDS/UK/18-01/F) and the Energy Sector Strategy (Strategy (BDS-18-237/F). Whilst it does not mention solar explicitly, the Ukraine Country Strategy identified as a strategic priority "strengthening energy security through effective regulation, market liberalisation, diversified and increased production, and energy efficiency", with specific objectives around increasing the share of renewable energy and promoting reform of the regulatory framework. Through supporting the transition to renewable energy, Yavoriv is also in alignment with the Bank's Energy Sector Strategy, which committed the EBRD to supporting "decarbonised economies, electrified by mainly renewable energy sources".

Support to the solar sector is also in line with the Ukrainian Government's National Economic Strategy, which calls for achieving 25% of electricity production from RES by 2030. Ukraine has also committed to an ambitious target of reducing greenhouse gas emissions by 65% compared to a 1990 baseline, as part of their NDC made under the Paris Agreement.

To support RES development, the government offered very generous FiT tariffs to investors (initially €0.36 per KWh, then gradually decreased to €0.15 per MWh for solar, one of the highest in the Bank's COOs). This resulted in an exponential increase in solar power (it grew 250% in 2019 alone). In mid-2021 the share of RES in installed electricity generating capacity in Ukraine was 15.7% (8.5 GW excluding hydro). Solar (including rooftop PV panels) accounted for 85% of that capacity with 7.3 GW.

In the interview with EvD, Ukrenergo confirmed that generous FiT, combined with the relatively technical simplicity of constructing plants from panel modules, resulted in a boom in solar power projects, which attracted professional RES developers, as well as amateur investors, inexperienced in this sector (allegedly including some politicians behind generous tariffs). In effect, this rapid growth in solar power generation created a "solar bubble, which has been difficult to digest, both financially for the offtaker and for the network as a technical threshold for solar has been now reached". This threshold is not only related to the grid capacity, as that capacity, including numerous sub-stations, has increased in recent years (also with the Bank's support), but rather to the ability to effectively balance demand (mostly in winter and at night) with the fast growing solar power supply (during the day and peaking in summer).

This balancing has been very challenging, particularly as Ukraine has insufficient electricity storage and cross-border interconnections, while it has a sizable nuclear power sub-sector, which is also difficult to balance. It is easier to regulate output in the coal-fired plants, however many of them are old and inefficient and should be decommissioned if growth of solar/RES is to continue. But decommissioning has not been taking place as many of the plants are run by oligarchs, who until recently exerted considerable influence over the government. This has been changing recently, as in 2020 the regulator approved a Generation Adequacy Report, which includes a decommissioning plan, envisaging decommissioning of up to 12 GW of coal-fired generation capacity.

Faced with a RES bubble and an inevitable financial collapse of the offtaker, in early 2019 the government proposed retroactive reduction of FiTs, which was carried through in 2020, with solar FiT cut by 15% and wind FiT cut by 7%. By the end of that year the solar FiT programme was terminated altogether. New RES licences have been granted only for a few wind developments, which would operate under the liberalised market rules. The Ministry of Energy stated that if

FiT support had not been terminated, an additional 11 GW of solar power (in the pipeline in 2019) would have been built, resulting in a serious network balancing issue and the financial collapse of the offtaker.

Although the Yavoriv projects contributed to the electricity system imbalances and the offtaker's financial distress, EvD considers the relevance of Yavoriv 1 to be relatively strong, as it was implemented well before the "solar bubble" emerged. It was clearly in line with the government's (and the Bank's) strategies and will support attainment of their goals in the long-term.

However, EvD considers the relevance of Yavoriv 2 to be questionable. By the time the Board approved it (June 2019) and more so by the time of its signing (October 2019), it was clear that there was an oversupply of solar power in Ukraine, both the offtaker and the networks were under strain and the government was open about its intensions to reduce FiT. The scheme became clearly unsustainable, however the Bank proceeded with financing more solar power projects, i.e. €59 million was financed after the government signalled its intention to decrease FiT and an additional €127 million after the Bank itself recognised (in a letter to the Parliamentary Energy Committee) that the scheme was unsustainable. Moreover, the Board report for USELF III Extension (July 2018) stated that the risk of tariff reduction was indeed "high".

In terms of the Bank's additionality, the financing offered to both Yavoriv investments is considered additional because of prohibitively high provisioning requirements for Ukrainian banks providing project-type finance, which effectively prevents it. The Bank's policy dialogue and implementation of an ESAP to raise standards complemented the Bank's additionality.

Based on information gathered by EvD, the local banks in Ukraine are still unable to take on construction risk and issue loans longer than 6-8 years (and at this tenor they can be very expensive, with an interest rate of about 12%). Whilst in the period 2017/2019, given very attractive FiTs, there was no shortage of sponsors willing to invest seed equity in solar projects, there was a shortage of institutions available to offer long-term project financing. Local Ukrainian banks have to provision at 100% of project loans until construction is finished; in practice, this means that financing is not available. However, even without this, there was significant funding going into the solar sector in Ukraine in this period from a wide range of sources, as the prevailing regulatory structure made it a very attractive investment proposition.

The Bank budgeted €4 million for policy dialogue under USELF and it has been indeed engaged in such policy dialogue, although it was forced to change its focus, i.e. instead of promoting the transition to competitive auctions as planned, the objective of the Bank's main activity has been increasing liquidity and improving governance of the Guaranteed Buyer – the sole offtaker of electricity generated by RES, which in April 2020 stopped payments to RES producers (see more in the next section).

Relevance of both projects in aggregate is rated ***partly satisfactory*** as on one hand they have been well aligned with Ukraine's and the Bank's strategic objectives, however on the other hand, Yavoriv 2 was signed at the time when the Bank was already well aware of the unsustainability of the FiT scheme in Ukraine. Financial additionality of both projects has been fully verified.

Effectiveness

Yavoriv-1 benefited from a project preparation TC, provided by the USELF framework consultant, who prepared the project feasibility and the project investment memorandum, and carried out the initial environmental due diligence. The solar plant was located on the waste backfill of the former Yavoriv sulphur plant – an excellent example of land reclamation. In terms of **outputs**, the construction and commissioning of the Yavoriv Phase 1 and Phase 2 power plants were completed on schedule and on budget (phase 1 started energy sales in October 2018 and phase 2 in October 2019). NORDIK BUD, a related party civil contractor owned by the sponsor/shareholders was the EPC contractor installing these panels and according to the client it performed well. The installed capacity of the plants is 71.1 MW.

The client selected TRINA Duomax TSM-PEG5 PV panels due to their hardy climate-resistant and low degradation characteristics. TRINA of the PRC is one of the four largest PV panel producers in the world. Researchers have suggested that there are credible reports of forced labour within TRINA's polysilicon supply chain. However, there was no data or evidence linking TRINA to forced labour at the point at which these projects were approved. Eco-Optima (the Bank's client) are aware of the possible links to forced labour and are waiting for advice from the IFIs on how to address this issue in their future projects (although currently no solar projects are planned in Ukraine).

In **outcome** terms, the irradiation has been reportedly higher than the Bank's P50 forecasts, and average energy generation has slightly exceeded the project target of 66,180MWh (for the full year of operation). In 2019, the plants produced 47 MWh (mostly Yavoriv 1 only) and in 2020 both plants produced 83MWh (therefore currently averaging 66.5MWh annually). Energy production kept exceeding P50 estimates by 13% and the Bank's P75 base case by 19%, with total production over the 12-month period ending on 1Q2021 standing at 79,538 MWh. The client's full 2021 year projections are for 72,000 MWh, largely in line with the Bank's forecast. The difference between 2019 and 2020 was due to phase 2 being put in operation later in the year 2019 and due to a higher than expected irradiation in 2020. On the basis of this production it has been calculated that the two projects together generate annual savings of 141,000 tCO2 emissions (as projected based on P75 forecast).

However, since April 2020 the offtaker (the Guaranteed Buyer) has been in arrears on payments to all renewable energy producers in Ukraine, and the government has retrospectively reduced the FiT rate by 15% (more in the next section). These developments have undermined the demonstration effect that Yavoriv was intended to provide. The attractiveness of the Ukrainian solar sector has fallen significantly. According to the market participants, virtually all international financing has ceased and most new RES projects have been put on hold (with only a few wind power projects proceeding).

Eco-Optima implemented an ESAP as agreed. As mentioned, both phases of the project are uniquely located on a former industrial waste landfill. It was a good example of land reclamation for renewable energy installation, however under ESAP the client strengthened the field's drainage system with concrete canals. Also special equipment was installed to prevent birds mistaking the plant for the nearby lake.

The project had some impact, although generally limited, on the economy of local community. About 100 workers were employed in its construction, with about half from the sponsor's subsidiary company. There are about 30 people employed in the plant's operation, with four engineers (two women). About 10 additional persons are employed seasonally for panel

cleaning. The company has been paying about UHA 2 million per annum to the local community. However there were no major investments (except for slightly improving the connecting road and lighting around the plant).

In terms of broader **impacts**, although (due to the offtaker's payments failure) Yavoriv has not yet had any demonstration effect on the RES market, it remains the largest solar plant in north-west Ukraine. Therefore as the market returns to normal (the payment arrears have been partially settled recently), one can expect its importance as an example of a large, successful solar plant, to increase. On the national level, as of mid-2021, the installed capacity of ground mounted solar PVs in Ukraine totalled 6,058 MW and about 7,300 MW including small rooftop PV panels. This indicated that the end-2020 target of 2,300 MW has been overshot by more than 3x. The Yavoriv projects contributed 72MW, i.e. 1% to overall national solar capacity installed to date (although they also contributed to a "solar bubble" as earlier explained).

Policy dialogue

The Bank had supported the Ukrainian authorities in RES development well before this project, for instance, through the preparation of a new PPA. Its bankability was substantially increased by introducing international arbitration, step-in rights for lenders, etc. The new PPA was introduced in 2017, and significantly strengthened the attractiveness of solar power, as investors could now leverage their equity more easily with debt. It can be asserted that the improved PPA contributed to the boom in RES, which Ukraine experienced between 2017 and 2019 (with its good and bad consequences).

The Bank also has a long track record of providing support to Ukrenergo, the country's incumbent energy company, which was first unbundled with the Bank's assistance. Following this process, the corporate governance of one of the companies created during the unbundling process (energy transmission), has been substantially improved, including the introduction of independent Board members, selected with IFI participation. The Bank has also supported Ukrenergo's network synchronisation with that of EU and provided it with four loans to strengthen its transmission network and refurbishment of substations, which directly contributed to the development of RES in Ukraine. More recently, the EBRD contributed to the revision of NDC by Ukraine.

However, the focus of policy dialogue planned at the time when the Yavoriv projects were agreed, was the transition of the Ukrainian RES system from FiT to competitive auctions. The Bank has funded a TC project to support that. Outputs from this TC and policy dialogue were to include:

- A report with recommendations on how to enable RE auctions
- Training of auctioneers
- A report on developing transparent procedures for approval of RE projects
- Agreement with the government to review local content premiums
- A Strategic Environmental Review of Renewable Energy Technologies

The consultants for this assignment were selected and contracted, however they were not able to do much work. At the beginning of 2020, prompted by the pandemic, the sole offtaker – Guaranteed Buyer, stopped paying its invoices to all RES producers, while the government seized on the opportunity to finally push with the retroactive reduction of FiT tariffs, which had been planned since early 2019. Arguably, the sudden drop in demand resulted in a severe liquidity crisis at

the Guaranteed Buyer, while Ukrainian FiTs were indeed very generous. Nevertheless, the liquidity challenges of the Guaranteed Buyer and the revision to the FiT has in practice rendered competitive auctions unfeasible for the near-future.

The Bank has instead engaged with the Ukrainian authorities over the FiT revisions and the governance structure of the Guaranteed Buyer, with mixed success. The Guaranteed Buyer is still in considerable turmoil; during its field visit to Ukraine, EvD was unable to meet anybody at the Guaranteed Buyer as all senior leadership had been replaced immediately before in the preceding week. More importantly, the Guaranteed Buyer remained in substantial payment arrears to all RES producers until November 2021, when about 65% was repaid, partly thanks to the EBRD-supported Ukrenergo bond issue (the Bank invested €75 million in this bond). However, the Guaranteed Buyer did not make up any back payments to Ukraine's largest renewable energy producer, DTEK, which again raises corporate governance concerns.

The Bank had also mixed success as a participant during FiT reduction mediations. Both internal and external stakeholders suggested that it was not a consultative or fair negotiation, and the initial agreement that renewable energy producers were targeting (exchanging a cut in the FiT for an extension of the term of their PPAs under FiT) was not achieved. Furthermore, the government's track record of compliance with the agreement made in 2020 has been mixed, with payments to renewable energy producers falling below what was agreed. In the opinion of some Ministry of Energy officials, the Bank has "fought very hard for the interests of solar energy generators", however this was understood as the Bank defending its own interests, as they were EBRD clients. The Bank's active participation in this dispute did not prevent the tariff reduction, however it might have contributed to limiting it to 15% (the government's original proposal called for 30% reduction).

The targeted outcomes from the policy dialogue component, around the launch of competitive auctions, have not been achieved, as the Bank was forced to change its focus. Whilst there is primary and secondary legislation in place for the launch of competitive auctions, given the ongoing uncertainty and market turmoil the prospects for launching auctions in the near-future are limited. Moreover, not all market participants believe that auctions will be needed. In Ukrenergo's view, the current, market-based model (day-ahead, in line with the EU's Third Energy Package) works fine, yielding RES tariffs at about USDc 5 – 10 per KWh depending on the season, which still seems attractive for developers, as well as offering better value for the authorities than FiTs and possibly tariffs resulting from auctions. Also, the Ministry of Energy official in the interview with EvD was of the opinion that reactivating the auctions TC was unnecessary. However, EvD notes that the experience of other COOs indicates that auctions may be able to secure even lower tariffs, while larger projects, without a guaranteed long-term tariff level, would be difficult to finance. However, the prospects for auctions to be on the agenda again are rather slim, at least in the medium-term.

The Bank did achieve some desired results from its engagement with the government on addressing the liquidity concerns of the Guaranteed Buyer. As noted above, whilst the Bank did support an agreement made in 2020 to address liquidity concerns, the Ukrainian government has not comprehensively honoured this agreement. However, the Guaranteed Buyer has settled most of its arrears, largely due to the Bank-supported bond issued by Ukrenergo. However, difficulties in the Bank's policy dialogue reflect the prevailing political instability in Ukraine and entrenched interests in other industrial sectors currently benefiting from low cost energy.

As for local content premium, it has not been removed and is still applied to Ukrainian RES projects. However, according to market participants, it has marginal or no impact on the economics of such projects. As PV panels, converters and other more valuable equipment is not manufactured in Ukraine, very few solar developers take advantage of it (Yavoriv project does not benefit from it).

Other IFIs, especially the World Bank, have been very active in Ukraine's energy sector. The EBRD has been closely cooperating with them, the recent Ukrenergo's corporate bond being one of the tangible results of this cooperation. The IFIs are also presenting a united front in pushing for cost-recovery electricity user tariffs, however this is progressing slowly. In the opinion of several interviewees, the EBRD has been the most effective IFI active in the Ukrainian energy sector, especially RE. The World Bank's advantage is that it can offer large financing to state companies, which could improve the energy system's ability to accommodate RES (e.g. planned loan to Ukrenergo to restructure its US$ 2 billion debt).

The physical implementation of this project went well and it has been performing as planned. However, the policy dialogue component has not been a success (although mostly due to developments beyond the Bank's control). The Bank's support for competitive auctions has made little headway, whilst attempts to mitigate the impact of FiT cuts have been only partially successful. The Bank contributed to the settlement of the offtaker's debt, although so far this has been partial and some of the generators did not benefit from it. The Bank should also get credit for its earlier policy dialogue, which resulted in an improved PPA template, under which most Ukrainian RES projects have been signed (although this also helped an unsustainable scheme to flourish). Moreover, the Bank's long-term support to Ukrenergo enabled it to "isolate itself from the country's instability" (as put by its CEO) and develop a strong grid network, fit to support rapid growth of RES. However, the solar sector in Ukraine is unlikely to grow quickly again, with large generation capacity still prevailing with limited storage options, investor confidence damaged and no political consensus for the direction of the sector. Effectiveness of this project is rated ***partly satisfactory***.

Efficiency

Production was in line with the forecast and the company reported revenues of €11 million and EBITDA of €10.1 million for FY2020 exceed the Bank's P75 forecasts by 17% and 19% respectively (EBITDA in 2019 was €6.9 million as only phase 1 was in operation). Revenues for the three months ending at 1Q2021 decreased 30% YoY, reflecting both the 15% reduction in the FiT enacted on 1 August 2020 as well as abnormally high irradiation a year earlier.

However, the project has faced two significant issues, which affected its cashflow:

(i) Since April 2020 (prompted by the Covid-19 pandemic), the offtaker has been persistently behind in payments, and has subsequently fallen behind the agreed schedule to settle arrears, which amounted to €6.8 million as of 2020YE. Fortunately, following the issue of Ukrenergo's bond (supported by the Bank), most of its arrears were settled in November 2021 (equivalent of about €4.7 million), with the equivalent of €2 million still outstanding. It is expected to be settled by January 2022.

(ii) Furthermore, in July 2020 the Ukrainian Government adopted a new law instituting a cut of 15% on the FiT rate for solar power plants. This effectively implies a 15% fall in headline revenue for the Yavoriv projects until the PPA ends 1st January 2030. However, this will not invoke a breach of DSCR, and should continue to enable the project sponsor to continue repayments.

Due to the issues mentioned above, in July 2020 the project was placed in Corporate Recovery.

The retroactive regulatory change – reduction of FiT was prompted by the fact that FiTs have been highly-subsidised (i.e. €150/MWh, so 2.5x above average electricity wholesale market price at €60/MWh). Industrial customers pay €57/MWh while retail prices are €38/MWh (25% and 69% less than the EU average rates, respectively).

Despite these issues, the project has been highly liquid. The financial statements as of 1Q2021 show €4.2 million of unrestricted cash available to the borrower, as well as additional DSRA funding of €3.5 million held on reserve accounts. Net Debt (excluding DSRA) to EBITDA equalled 3.0x. Around €4 million of debt was prepaid by the Borrower via cash sweep in August on IPD, significantly reducing the senior debt burden.

The sponsor appreciated the Bank's engagement with the Ukrainian authorities over the change in tariff, and even though the project has been placed in Corporate Recovery there is still a good relationship. The Bank identified the risk of regulatory changes to the FiT at appraisal, and had run careful sensitivity analysis demonstrating that with the proposed leverage, FiT would have to fall by 34.5% in order for DSCR to fall below 1. The introduction of a stronger cash sweep mechanism as part of Yavoriv 2 was also an effective way of reducing risk and promoting sound banking principles.

The Yavoriv project was exposed to regulatory risk, which materialised, and its revenues have been reduced by 15%, resulting in a breach of the DSCR. Although the project revenues and EBITDA are expected to drop below those projected at approval, the robust project structure ensures fairly comfortable repayment of the Bank's loans. Efficiency is rated ***partly satisfactory***.

Overall rating

Both phases of the project were well aligned with the Bank's and Ukraine's strategies, however the second phase was signed when it was clear (also for the Bank) that there was a dangerous "solar bubble" in Ukraine and its FiT scheme would not be sustainable.

Both phases of the project were also well executed and the solar plant has been generating electricity at the planned level. As a relatively sizable plant, it made a 3% contribution to the Ukrainian government's 2,300 MW solar target (by 2020) and 1% to its actual 7,300 MW installed by now. Operational (energy production) and financial results (EBITDA) of the project company in both full years of its operation have been above the projections, however the cash flow suffered due to delayed payments from the offtaker. Going forward, the revenues and EBITDA are expected to be lower than projected due to the 15% reduction of the FiT tariff. As these tariffs have been 2.5x above wholesale electricity prices, they have been exposed to a very high political risk from the start of the project. However, the robust project structure ensured that the client has generated enough cash to service its debt (although defaulting on the DSCR). Upheavals related to the pandemic and subsequent tariff reduction changed political dialogue priorities, i.e. the transfer to the auction system is now seen as a less urgent priority. The Bank demonstrated flexibility and changed the focus of its policy dialogue, advising on the governance of the offtaker. However, the results of the policy dialogue have been modest so far. There is a relatively good chance that despite serious problems the project will continue generating RE and service its debt (even with reduced tariffs). However, as RE sector development has stalled, the immediate prospects for an effective policy dialogue appear less promising, except for some niche areas (see operational considerations), designed to ease the "solar bubble" there. The project is rated overall ***Acceptable***.

Key findings:

- Highly subsidised FiTs are particularly susceptible to retroactive reduction. Solar operators are particularly exposed to such FiT reduction risk at a time of economic crisis (like the one prompted by the Covid-19 pandemic) or following political changes;
- The relatively technical simplicity of constructing and operating solar plants, combined with generous FiT, attracts professional, as well as less experienced investors, creating a boom in solar power generation, which in turn may result in network imbalances and cause financial distress to the offtaker;
- A robust project structure, e.g. conservative leverage and long loan tenor, which can withstand tariff reduction by about one third, helps maintain the project company's creditworthiness at times of distress (reduced payments, tariff reduction, etc).
- Access to technical support for project preparation is particularly helpful for local RES investors. It has been successful in scaling up such investments under USELF and should be considered for other Bank RES frameworks;
- By financing RES projects under unsustainable subsidy schemes, the Bank exposed itself to tariff reduction risk and prolonged the existence of such schemes.
- Although the Bank may view the application of a local content premium as undesirable in principal, in practice it is very rarely applied to solar power projects, as no PV panels or auxiliary equipment are produced in most COOs.
- Governmental officials (counterparts of the Bank's policy dialogue) in the RE sector often have high professional mobility – they are poached by private companies or leave after a political reshuffle. Lack of continuity and "corporate memory" constitutes an impediment for effective evaluation of such policy dialogue;

Operational considerations:

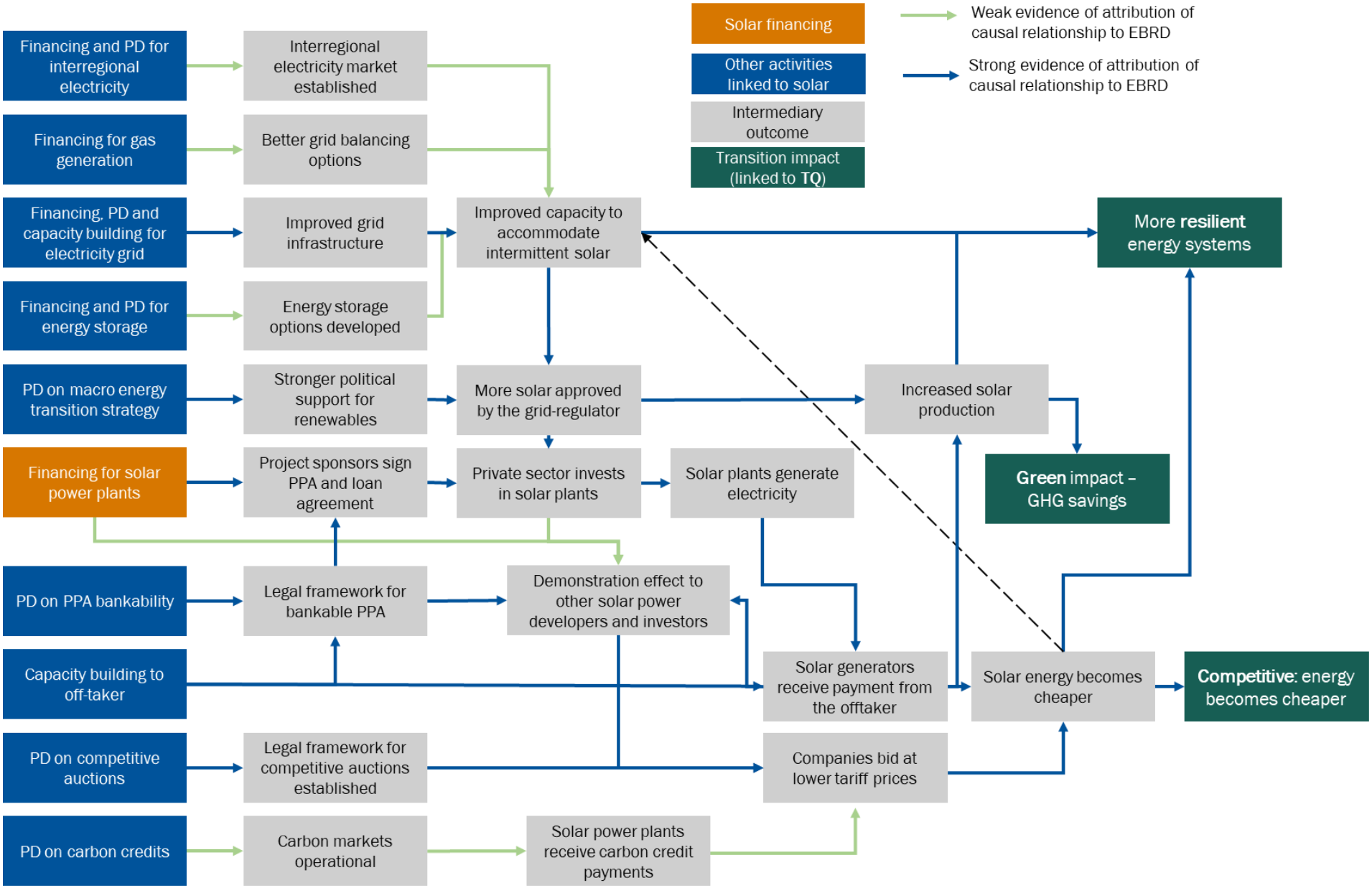
- When considering financing RE, be very wary of highly generous support schemes, particularly when RE generation has already reached a threshold difficult to balance, while the offtaker is on the verge of financial collapse. Be very selective in supporting generation under such schemes and ensure that projects have a robust financial structure;
- The Yavoriv project was a good example of land reclamation for renewable energy installation (the plant was located on the waste backfill of the former sulphur plant). Consider showcasing it to encourage a similar approach by other regions/municipalities in Ukraine and beyond;
- Consider including preparatory technical support for RE project development in the RE frameworks for other Early and Intermediate Transition countries;
- Consider offering assistance to Ukraine in (i) preparing a decommissioning strategy for coal power plants; (ii) developing a legal and regulatory framework for electricity storage; (iii) preparing a master plan for the development of green hydrogen (with a substantial solar sector, abundant water resources and good pipeline system linking it to the EU, in the opinion of many interviewees Ukraine has great potential in this new field).

Table 1. Summary of evaluation rating[32] of 6 cluster projects

Cluster Project, Country	Relevance and additionality	Results	Efficiency	Overall Performance
Infinity / Ib Vogt Solar PV 1 &2, Egypt	*Excellent*	*Fully satisfactory*	*Fully satisfactory*	***Good+***
FRV Al Mafraq & Al Safawi, Jordan	*Fully satisfactory*	*Fully satisfactory*	*Fully satisfactory*	***Good***
CYPV and TPT Solar, Cyprus	*Excellent*	*Fully satisfactory*	*Fully satisfactory*	***Good-***
Yavoriv Solar I & II, Ukraine	*Partly satisfactory*	*Partly satisfactory*	*Partly satisfactory*	***Acceptable***
Risen and Chulakkurgan Solar, Kazakhstan	*Excellent*	*Fully satisfactory*	*Partly satisfactory*	***Good -***
Nur Navoi, Uzbekistan	*Fully satisfactory*	*Excellent (potential)*	*Fully satisfactory (potential)*	***Good+ (current)*** ***Outstanding (potential)***

[32] Ratings for each category are based on the following scale of: Excellent – Fully Satisfactory – Partly Satisfactory – Largely Unsatisfactory - Unsatisfactory. The overall performance rating scale is: Outstanding – Good – Acceptable – Poor – Very Poor ("-" or "+" may be added to the overall performance rating).

Annex 4: Theory of Change for the Bank's interventions in the solar power sector



Annex 5: Relationship between solar and the Country Strategies

This annex summarises the relationship between the relevant country strategies for the projects evaluated in this assignment and solar investments. In addition, it also analyses four additional country strategies (Turkey, Morocco, Greece and Tunisia), where the Bank has explored the viability of investing in the solar sector.

Egypt

Infinity/IB Vogt Solar PV1 and Infinity/IB Vogt Solar PV2 were both approved under the 2017 Egypt Country Strategy. Priority 3 under that Country Strategy was to "Support Egypt's Green Economy Transition". The Strategy called for the Bank to "support Egypt's efforts in diversifying its energy mix by financing renewable energy projects….[and] the Bank will complement these investments with policy dialogue, including supporting the regulatory and contractual framework for renewable energy investments". The country results framework included the activity "Finance renewable energy projects (solar/wind) supported by policy dialogue on investment framework", as well as the associated tracking indicator "Change in renewable energy generated with the Bank's support in MWh/y". A core component of the approach to financing renewable energy, including solar, was through building partnerships with other development banks and exploring co-financing options.

The Strategy also clearly outlined the rationale underpinning the Bank's support for renewable energy and solar in Egypt. The country's economy is in urgent needing of 'Greening', with an energy intensity (relative to GDP) six times higher than the EU-28 average. Egypt's "large renewable potential" in solar and wind was also underexploited, "with only 1 per cent of electricity generation stemming from non-hydro renewables".

At the time the Country Strategy was developed, there was also political momentum in support of solar energy. This was demonstrated by the 2014 Renewable Energy Law, which enabled feed-in tariffs for purchasing electricity from solar power plants. The Government has also committed to ambitious targets as part of its 2035 Integrated Sustainable Energy Strategy (launched in 2015), which calls for renewable energy to provide 20% of electricity by 2022 and 42% by 2035 (against a baseline of 9% in 2014).

The identification of risks to solar investments primarily related to political support for reform of the "politically sensitive energy sector". In particular, the Strategy notes that the "Bank's engagement in the renewable sector will be linked to the continuation of the Government's support for the regulatory and contractual framework such as the feed-in-tariff and/or competitive tendering mechanism".

Jordan

The Al Mafraq and Al Safawi Solar projects were both approved under the Jordan 2014 Country Strategy. This featured energy prominently under Theme 1, and called for the Bank to ""Enhance energy sustainability and energy efficiency: supporting Jordan to meet growing demand while reducing the country's energy import dependence i.e. the development of renewable sources for electricity generation". In particular, the Strategy said the Bank should provide "sustained support for Jordan's plans to develop a significant volume of renewable energy capacity (particularly solar and wind)", whilst also "focus its policy dialogue and technical assistance on fostering a conducive and sustainable investment environment in these areas".

The results framework for Theme 1 captured the focus on renewable energy. This included tracking

indicators for the "increase in share of electricity generated from renewables" and "Qualitative account of successful creation/strengthening of relevant legal and regulatory framework [for sustainable energy] based on TIMS benchmarks and TC results".

The Strategy also provided the reasoning behind the Bank's prioritisation of renewable energy, including solar. Jordan relies heavily on imported energy, which exposes the country to price fluctuations and political economy risks in key suppliers (e.g. Egypt). This has significant implications for the state's fiscal and current accounts, putting both under pressure. Furthermore, the economy is energy intensive, with energy relative to GDP double the EU-28 average.

As detailed in the strategy, Jordan's government are also committed towards expanding renewable energy, having targeted generating 10% of their energy from renewables by 2020. The 2012 Renewable Energy and Efficiency Law also provided an initial set of incentives for attracting private sector investment to the renewable energy sector, although the Strategy suggests further regulatory support is still needed.

Risks to solar investments related to ongoing politically sensitive reforms in the energy and electricity sector. In particular, the Strategy notes that the "envisaged electricity tariff increases do not enjoy unanimous support throughout the society, but will be a pre-condition to advance the transition to a more sustainable economy". The Strategy also outlines the challenge of mobilising finance for solar "given the current near-zero level of penetration".

Jordan Country Strategy 2020-2025

Green energy, including solar, also features prominently in the Jordan Country Strategy 2020-2025. Priority 3 of the Jordan 2020 Strategy calls for the Bank to support "further developing sustainable municipal infrastructure and green energy". Specific activities in the results framework linked to that priority included providing ""direct and intermediated finance to further develop and integrate renewable energy projects", as well as supporting "the electrical grid's capacity to absorb renewable energy through investments in transmission and redistribution networks". The Strategy also defines a tracking indicator measuring "Renewable energy capacity added to the network". Potential areas of collaboration with other IFIs cited in the Strategy include "co-finance additional renewable energy projects with IFC to promote private sector investment in RE".

The Country Strategy and the accompanying Diagnostic Paper explain the commitment to renewable energy in the context of supporting improvements in the Transition Qualities "Green" and "Resilience". As the Country Strategy notes with reference to the "Green" Transition quality, "Jordan has the highest energy intensity in the region…the potential for solar and wind energy is promising, with important progress in the last few years". The link to resilience reflects both the energy insecurity that Jordan currently faces, with an overreliance on hydrocarbon imports, as well as the challenge of developing a robust energy system supported by intermittent power generation from renewables.

The risks to the expansion of solar energy in Jordan relate to the challenges of developing an electricity network that can manage intermittent and decentralised power generation. This is both political and infrastructural; building a robust network will entail a "corporatized and substantially unbundled National Electric Power Company (NEPCO)…and will require a build-up in NEPCO's technical capacities, commercial mind-set, and transparency", as well as further investments in energy storage and transmission. In addition, the Government is committed to introducing local

content requirements for solar PVs. The Diagnostic Paper concludes that these local content requirements "are misaligned with the relatively limited manufacturing capacity currently available in Jordan…thereby reversing some of the significant earlier gains [in solar]".

Kazakhstan

The two Kazakhstan projects, Risen Solar (signed 2018) and Chulakkurgan (signed 2019), were both financed under the Kazakhstan Renewable Energy Framework (agreed in 2016). Curiously, the relevance of both projects were assessed against the Kazakhstan 2013 Country Strategy, rather than the Kazakhstan 2017 Country Strategy, even though the Board of Directors approved the latter in July 2017. This was presumably in order to ensure consistency with the Kazakhstan Renewable Energy Framework.

The Kazakhstan 2013 Country Strategy prioritised "promoting low-carbon growth and energy efficiency", and called for the Bank to "develop a dedicated lending facility for small-/medium renewable energy projects, as well as pursue large-scale renewable energy projects", with the objective of building a "vibrant group of private sector developers for renewables". In addition to financial support, the Bank also committed to "assist in implementing key aspects of the [Green Economy] strategy through projects in energy [and] renewables", including support to development of "feed-in tariffs and secondary regulations and legislation for renewable energy sources". The strategy does not explicitly mention solar, but given the focus on renewable energy, it is reasonable to assume that incorporates solar.

The rationale for the Strategy's focus on renewable energy is based primarily on environmental concerns. As the Strategy notes, the "prevailing low energy tariffs, which are not fully cost-reflective, do not include environmental costs", and as a result "Kazakhstan's [economic] output remains highly energy-intensive and carbon intensive".

Despite the focus on supporting renewable energy, the Strategy also clearly outlines several challenges to wider expansion and adoption, drawn in particular from the Bank's experience in Kazakhstan's energy sector in the preceding period. Even though "the Government's recently announced Green Economy Strategy is a top national priority" and "the Bank [had] made some headway towards bridging the wide gap between international best practice and Kazakhstan's renewable energy and energy efficiency legislation….the Government's inconsistent approach prevented the Bank from making greater progress towards developing a functioning generation market". The Strategy identifies the "low energy prices driven by the ready availability and low prices of fossil fuels" as a constraint towards renewable energy investment, as well as "persistent regulatory shortcomings".

Kazakhstan Country Strategy 2017

The Kazakhstan Country Strategy launched in 2017 also prioritised "promoting Green Economy Transition", and stated that "the Bank will continue to prioritise financing of resource efficiency and renewable energy projects, including wind, solar…[and] will also continue to support the development of a regulatory framework for sustainable energy projects with a focus on renewables". The focus on renewable energy and solar was reflected in the results framework, which outlined key activities including "direct and intermediated financing of resource efficiency and renewable energy projects, including wind, solar, hydro and biomass", and "advice to develop the legal/regulatory regime to incentivise sustainable energy investments". The accompanying tracking indicators were "Change in renewable energy generated by private sector led projects

supported by the Bank" and "Evidence of targeted legal/regulatory/institutional reforms facilitating sustainable energy investments".

The Bank's support for renewable energy was based on the both the environmental and economic benefits of Greening Kazakhstan's economy. As the Strategy notes, Kazakhstan is "the largest emitter of greenhouse gases (GHG) in Central Asia", yet "remains vulnerable to climate change impacts". Furthermore, as Kazakhstan's partners and competitors become green, "it will be critical for the country to implement a green economy framework for creating a more competitive private sector under the new 'greener' reality".

The Strategy also identified clear risks to renewable energy investments. These were mainly political, and related to the tariff policy and support to the Financial Settlement Centre, the organisation responsible for paying renewable energy providers. Despite the Kazakhstan's support for Green Economy Transition, and their ambitious target to increase the share of renewable energy in power generation to 3% by 2020 and 50% by 2050, "any fundamental change in policy…could have a dramatic effect on the pipeline of potential projects".

Ukraine

The Board approved Yavoriv 1 in 2017, under the Ukraine Sustainable Energy Lending Facility (USELF). USELF was first approved in 2009, but the 4th amendment to the framework was approved by the Board in 2017. The Board approved that iteration against the Ukraine 2014 Country Strategy update. Yaroriv 2 was approved in 2019, under USELF Phase 3 (approved in 2018). Both USELF Phase 3 and Yaroriv 2 were approved under the Ukraine 2018 Country Strategy.

Ukraine 2014 Country Strategy Update

The Ukraine 2014 Country Strategy Update does not mention renewable energy explicitly. The Board Memorandum for USELF justifies the Bank's support for renewable energy investments by "supporting the diversification of the sources of energy, improving energy security and energy efficiency, and the development of renewable energy". Those themes do not appear in the Ukraine 2014 Country Strategy Update, which instead states "smaller energy projects will be developed under the new USELF", and "potential new, specific instruments will be explored in the…infrastructure/energy sectors (e.g. power sector transmission". However, the Ukraine Country Strategy 2011-2014 did commit the Bank to supporting the "development of renewable energy generation".

Ukraine 2018 Country Strategy

The Ukraine 2018 Country Strategy identified as a strategic priority for the Bank "strengthening energy security through effective regulation, market liberalisation, diversified and increased production, and energy efficiency". Specific objectives under that priority included building a "sustainable energy market structure" and increasing the share of renewable energy. This was captured in the results framework, which included the activity "finance on-site co-generation and renewable energy projects, while promoting reforms of the regulatory framework, including transparency rules for connection to grid, conducive to sustainable markets". The associated tracking indicator was "Total Renewable electricity produced". The Strategy does not mention solar explicitly, although given the focus on renewable energy and diversified energy production it clearly falls within the scope of the Strategy.

Support to renewable energy was mainly centred on strengthening Ukraine's energy security, and

diversifying energy sources to move Ukraine away from the current oligopolistic energy market structure. This would contribute towards building a more resilient economy. In addition, the Strategy noted the importance of promoting renewable energy to contribute to the Transition Quality Green, particularly given that Ukraine's "energy intensity is among the highest in the world". There is also some political support for promoting renewable energy in Ukraine, and one of the reform areas agreed between the Government and the EBRD was "implementation of the new Renewable Energy framework". The Government has also committed towards increasing the share of renewable energy in electricity generation to 11% by 2020, from a baseline of 5% in 2018.

The Strategy identified political risk as the main barrier towards investments in the energy sector: "low political consensus, vested interests and political stability could derail the all-important energy reform, thus affecting the Bank's strategic focus on enhancing Ukraine's energy security".

Ukraine 2015 Crisis Response Package

The other Country Strategy guiding the Bank's investment decision-making in this period was the Ukraine 2015 Crisis Response Package. It is not clear why the USELF amendment approved in 2017 was assessed against the Ukraine 2014 Country Strategy, rather than the 2015 Crisis Response Package. The latter identified as a strategic priority "fundamental reform of the energy sector", and stated the Bank should focus on "financing on a project finance/corporate finance basis the development of renewable energy projects".

Uzbekistan

The Board approved Nur Navoi in 2020, assessing relevance against the Uzbekistan 2018 Country Strategy. The Country Strategy identified "Promoting Green energy and resource solutions across sectors" as a strategic priority. This priority was captured within the country results framework, which outlined as a key activity "finance renewable energy investments in solar, wind and hydropower, with related policy engagement (e.g. development of ETS) to develop the regulatory framework". The corresponding tracking indicator was "renewable energy capacity installed".

The strategy suggests the Bank's support for renewable energy reflected how Uzbekistan's "volatile electricity supply…has negatively impacted SME competitiveness". That volatility stemmed from "transmission bottlenecks and aging and increasingly unreliable electricity generation plants". As a result, the Country Strategy suggests there is a strong relationship between renewable energy investment sand increasing Uzbekistan's resilience and competitiveness, in addition to contribution to the Green Transition Quality.

The 2016 diagnostic paper elaborated further on the connection between Uzbekistan's unreliable power supply and support to renewable energy, including solar; "to ensure energy system resilience, diversification fo supply sources is important. This could best be done through increasing the share of renewable generation". The paper also noted Uzbekistan's "significant untapped potential in solar and wind energy".

Cyprus

The two projects in Cyprus (Famagusta and Nicosia) were both financed under the Bank's Small Business Initiative (SBI). The SBI does not specifically mention renewable energy or solar. As the projects did not have to through a Board Approval process, the Final Review did not explicitly assess their relevance against the Cyprus Country Strategy 2015-2020.

The Cyprus Country Strategy does not explicitly incorporate renewable energy investments within

its three principal themes (support for financial sector restructuring; support for privatisation and support for corporate restructuring). However, the operational response for each of these three themes does include scope for support for renewable energy projects, as outlined below:

- Under support for financial sector restructuring, the Strategy calls for the Bank to provide "Dedicated credit lines, for instance for SMEs, energy efficiency, and renewable power generation".
- Under support for privatization, a Bank objective included addressing "institutional barriers to unlock potential for renewable energy and enhanced energy efficiency".
- Under support for corporate restructuring, "The Bank will focus on sustainability improvements (including energy efficiency improvements, expansion of the renewable energy sector, upgrading of power infrastructure critical to support renewable energy generation, and better water management), and investments in new sources of energy to increase the competitiveness of local enterprises". The results framework for this theme also included a tracking indicator monitoring the "number of renewable and energy efficiency investments reaching commercial operation with the Bank's support".

Support for renewable energy also included a policy dialogue component, with the Strategy outlining the Bank's intention to "engage with the competent authorities of the Republic of Cyprus, in co-ordination with the SGCY, to provide support to enable private investments that improve energy efficiency and promote renewable energy">

The rationale for the Bank's support for solar energy is also clear. The Strategy notes that in Cyprus "solar power is more available than in almost all of the rest of Europe although the current uptake is limited", and the Government has targeted generating 10% of their energy through solar power by 2020 (from a baseline of 5%). Furthermore, "energy security is a paramount issue for a small and isolated energy system like Cyprus", implying that support to new sources of power generation can contribute to resilience. Finally, the Strategy also suggests that investments in renewable energy are necessary to support business competitiveness: "high energy costs are further undermining private companies and significant investments in energy efficiency improvements as well as alternative sources of energy are urgently needed to increase competitiveness".

Turkey

The Turkey Strategy covering the period 2019-2024 identified as a priority "Accelerating Turkey's Green Economy Transition and Regional Energy Connectivity". Under that priority, the Bank targeted "increased renewable energy capacity and a more diversified energy mix" as well as "improved energy resilience and tangible progress towards competitive energy market with increased private sector share". The accompanying narrative linked these goals to both the Green Transition Quality and the Resilience Transition Quality, the latter reflecting how "Turkey's resilience is impacted by its dependence on energy imports to meet its growing energy needs".

The results framework for that Priority reflects the emphasis on renewable energy, including solar. It included the activity "provide direct and intermediated financing for renewable energy projects (wind, solar, hydro, geothermal, biomass and distributed generation)", with an accompanying tracking indicator monitoring "total renewable energy installed".

The critical risk to investments in renewable energy, including solar, was around the regulatory environment for renewable energy. In particular, the Turkish government is introducing local

content preferences, a "de facto market access barrier" that "limit opportunities for the Bank's engagement".

Greece

The Greece Country Strategy, launched in 2020, prioritises "Supporting sustainable energy and infrastructure, including through further regional linkages". Under that priority, the Strategy lists the Bank's key objective as "increased renewable energy and a more diversified energy mix to promote decarbonisation". The focus on renewable energy is also captured within the results framework, which includes tracking indicators measuring "total renewable energy capacity installed". The Strategy also emphasises coordinating with the EU on supporting the development of renewable energy projects.

Morocco

Whilst the Morocco Country Strategy, approved in 2015, does not focus on renewable energy as one of the headline priorities, the detail on the Bank's operational plans clearly identifies support for renewable energy, including solar. In addition to financial support, the Strategy outlines that a plan for policy dialogue, and in particular "continue to engage with the Moroccan authorities on enhancing private sector investment in medium voltage renewable energy". The Results Framework captured the policy dialogue component, with an indicator tracking "key regulatory changes achieved as a result of the Bank's energy reform policy dialogue (e.g., establishment of an independent regulator, framework for private sector investment in medium voltage renewable energy)".

Tunisia

A strategic priority outlined in the Tunisia Country Strategy 2018-2023 was "Support to Tunisia's Green Economy Transition", under which the Bank was targeting "increased renewable energy capacity, more diversified energy mix and greater private sector participation in the energy sector". In addition to "financing for Tunisia's renewable energy programme (wind and solar)", the Bank also committed to "support the domestic SMEs renewable energy value chain through advisory services and co-financing grants" as well as to "policy dialogue to increase private sector participation in the renewable energy sector". A tracking indicator included within the results framework assessed "total renewable electricity installed".

Annex 6: Approach to solar taken by other IFIs

- There is broad consensus support for renewable energy and the development of the solar sector, including financing infrastructural upgrades to accommodate intermittent power generation from solar producers;
- One clear difference is that other IFIs approach the sector in terms of widening energy access and the importance of energy access in poverty alleviation. EBRD's support is predicated on transitioning to market-orientated low-carbon energy;
- Eight out of ten projects within the evaluation sample were cofinanced with other IFIs. On seven of these, the EBRD was the lead financer;
- The Bank broadly demonstrated good levels of cooperation with other IFIs on policy dialogue, although there were occasional challenges;
- Other IFIs have access to more concessional financing to support solar, and this has created challenges for the Bank to stay competitive.

The importance of other IFIs both within the evaluation sample projects and in the development of the solar sector more widely necessitates a brief analysis of how other IFIs approach the sector and their role on EBRD-financed projects. At a project-level, focusing on the activities of other IFIs generates some insights on how the EBRD has coordinated with other IFIs, particularly with respect to policy dialogue. On a more macro-level, comparing the approach to the solar sector employed by the EBRD with other IFIs both helps to identify the role the EBRD should play within the sector, and illuminates some important differences, which the Bank could consider addressing in future sectoral and country strategies.

EvD has also conducted a brief review of evaluations conducted by other IFIs to identify lessons pertinent to this solar evaluation.

Approach to solar by other IFIs

Unsurprisingly, the IFIs reviewed for this analysis were all proponents of investing in solar energy. This support reflected both the significant fall in the cost of solar energy over the past decade, and the urgent necessity of switching to renewable energy to address climate change. IFIs also widely recognised the role of the private sector both in the development and in the financing of solar generation.

The table below summarises the approach to solar taken by other IFIs active in the Bank's Countries of Operation. Every IFI had clear examples of major utility-scale solar investments, and some IFIs had also provided significant support to off-grid solar as well.

Country	Relevant strategy priority	Example solar projects	Estimated volume of investments in solar (where data is available)
African Development Bank	Help African countries develop their energy sector in a socially, economically and environmentally sustainable manner.	Leading investor in Benban solar power plant in Egypt, as well as the Noor Ouarzazate complex in Morocco.	Invested 0.78bn UA in renewable energy 2016-2018
Asian Development Bank	Promoting Energy Efficiency and Renewable Energy	Has supported both utility and off-grid solar projects. Major projects include the India Solar Rooftop Investment Programme.	Invested circa $1bn in RE in 2015.
Asian Infrastructure Investment Bank	Reduce the carbon intensity of energy supply	Utility scale solar projects in Oman, India and Egypt.	$405mn approved solar investments, across 5 projects.
European Investment Bank	Decarbonising the supply of energy	Has supported utility scale projects in both Europe and elsewhere, as well as off-grid solar in Africa	Invested EUR 4bn in renewable energy in 2019 (unclear about allocation between solar and other renewables)
Islamic Development Bank	Sustainable Energy for Empowerment and Prosperity Through Renewable Energy	Has supported utility scale projects in Benban solar park in Egypt, as well as utility solar plants in Turkey	No data available.
World Bank	Expand renewable energy	Significant support for both utility-scale and off-grid solar (e.g. support to the 750 MW Rewa Ultra Mega Solar Project in India, as well as the Regional Off-Grid Electrification Project in West Africa.	The WBG committed $1,9 billion to solar in the FY 2018 and the FY 2019, across 87 projects.

In addition to providing support for direct investments in solar generation, some IFIs, along with the EBRD, also noted the critical importance of investing in grid and energy storage infrastructure to accommodate intermittent solar generation. This reflects the challenge of incorporating variable energy generation, but also represents an area of opportunity for IFIs; both the EBRD and other IFIs have recognised the potential of improving regional integration through projects in infrastructure to facilitate solar investments, including within the EBRD's CoOs.

As an example, the World Bank aims to "enhance efforts aimed at regional integration" and cites

as an example of their involvement in this area their support to the "connection of Mashreq electricity systems with those of Turkey and the European Network of Transmission System Operators for Electricity to develop the region's vast solar and wind power potential". Similarly, the IsDB also aims to "extend regional cooperation between Member countries, especially in solar energy".

There is also general agreement on the enabling environment to support the development of the solar sector. The IFIs assessed as part of this analysis noted the importance of cost-reflective consumer tariffs, and transitioning to market-based mechanisms such as competitive auctions. Similarly, although not explicitly mentioned within the energy strategies, in other reports, IFIs have noted the "potentially negative impact" of local content requirements, which has been an ongoing challenge faced by the EBRD.

However, underneath this broad consensus, there are some differences in how the EBRD approaches the sector versus other IFIs. At an overarching level, support to the energy sector at other IFIs is widely framed in terms of energy access for consumers and as a critical mechanism in poverty alleviation. As an example, the World Bank's first priority for the sector is "Focus on the poor – Universal access", the AfDB's strategic objective is "Universal Access" to end "poverty in all forms", and the AIIB's Principle 1 is to "Promote energy access", reflecting how accessibility "to energy services deprives the most vulnerable people of economic and other opportunities". In comparison, the EBRD's support to the energy sector is not centred on access and poverty. This reflects the more advanced state of the EBRD's COOs, in which average energy access is >99%. This difference is illustrated in how IFIs measure the results of solar projects. The EBRD uses total RE capacity installed (see Annex 5 on Country Strategies, as well as the sector strategy), whilst other IFIs such as the AfDB, AIIB and the ADB use both that indicator and the number of households connected to electricity.

Following on from that focus on energy accessibility, other IFIs often concentrate on distributed, off-grid, and household solar as an important tool to increase access, particularly in poorly connected rural communities. The Energy Sector Strategies for the World Bank, AfDB, AIIB, and IsDB all outline plans to support solar projects unconnected to National Grids, primarily as a mechanism to improve energy accessibility and reliability. In contrast, the EBRD's Energy Strategy does not prioritise support for distributed solar solutions.

Lessons from evaluations conducted by other IFIs

EvD has conducted a brief review of evaluations conducted by other IFIs to identify lessons pertinent to this solar evaluation. In addition to project-level validations, the main sources for these findings are:

- Increasing Penetration of Variable Renewable Energy: Lessons for Asia and the Pacific (Independent Evaluation, Asian Development Bank)
- Evaluation of the AfDB's Assistance to the Energy Sector (1999-2018): Refocusing Support for Improved and Sustained Energy Access in Africa (Independent Development Evaluation, African Development Bank)
- Evaluation of the World Bank Group's Support for Electricity Supply from Renewable Energy Sources, 2000-2017 (Independent Evaluation Group, World Bank Group)

Common across all three of these evaluations was an acknowledgement of the importance of

investing in grid integration of intermittent solar power and associated transmission infrastructure, and the extent to which that was an ongoing challenge for IFIs. The central finding from the IEG evaluation was that the World Bank Group should "prioritise interventions that focus on integrating renewable energy sources into the power systems of client countries". Similarly, the AfDB Evaluation concluded that there had been "insufficient focus on transmission and distribution infrastructure", and that the total "investment amount has not been proportionate to its needs". This also reflects the EBRD's experience; the Bank has emphasised the importance of grid infrastructure, and made several investments in that area in countries with high solar potential (see section 4.2.1). These evaluations have also recognised the central role that the off-taker plays, in providing investors with the security and guarantee that mitigates the large up-front capital investment required.

Finally, there is an interesting evaluation case study of an unsuccessful ADB solar project within an EBRD CoO. The ADB had committed to a $102mn sovereign loan to support a $310mn solar power project in Samarkand, Uzbekistan. The loan was cancelled 3 years after signing, having not been disbursed. There had been an extensive government-run procurement process for a design-build-operate contractor, and whilst that was an ongoing there were both a change in the political approach to solar, and significant developments in the cost and effectiveness of solar PV. Eventually, the Government of Uzbekistan decided to cancel the loan and focus on smaller pilot projects using PPPs via an auction mechanism. The ADB concluded that in the future, the "ADB should continue to engage in the renewable energy subsector in Uzbekistan and explore financing opportunities, particularly non-sovereign financing".

This project highlights several lessons. Perhaps most pertinently to EBRD, it highlights that private sector sponsors can be a more attractive proposition for the construction of solar power plants than sovereign lending. This follows the model primarily employed on Bank solar projects, the overwhelming majority of which are non-sovereign lending. It also illustrates the risk of delays in a sector where costs are falling rapidly, as delays can mean that previously agreed deals are no longer financially attractive.

The role of other IFIs on solar projects within the evaluation sample

There are clear examples of significant IFI involvement in policy dialogue within the evaluation sample. Whilst the Bank broadly demonstrated a good level of cooperation and coordination, there were some challenges in planning out policy dialogue activities and understanding who was doing what. As an example, in Kazakhstan, most of the provisional policy dialogue activities articulated in the Board Memorandum for the Kazakhstan Renewable Energy Framework (and budget with USD 10 million for related TC support), were ultimately implemented by the World Bank and by USAID, rather than by the EBRD. However, once operational, Banking teams focused on coordination and not duplicating the efforts of other IFIs and donors.

There are also some indications that the Bank was not able to compete with other IFIs operating in this sector, who are able to offer more concessional financing. This led to the Bank offering an equity bridge loan for Nur Navoi, rather than project finance, as IFC and ADB were able to offer more attractive senior debt financing, blended with grants.

The table below summarises the role of IFIs and DFIs within the EBRD's evaluation sample, in the projects' co-financing, as well as any wider donor involvement in policy dialogue in the sector.

Project	Co-financing from other IFIs/DFIs (and PD role)
Infinity / IB Vogt Solar PV 1 (Egypt)	GCF, FMO (World Bank, AfDB)
Infinity / IB Vogt Solar PV 2 (Egypt)	GCF, FMO (World Bank, AfDB)
CYPV Solar (Cyprus)	None (EU)
TPT Solar (Cyprus)	None (EU)
Al Mafraq Solar (Jordan)	Proparco (USAID, World Bank, GiZ, JICA)
Al Safawi Solar (Jordan)	CTF, FMO (USAID, World Bank, GiZ, JICA)
Yavoriv 1/2 (Ukraine)	CTF, NEFCO (World Bank)
Risen Solar (Kazakhstan)	CTF (USAID, World Bank)
Chulakkurgan (Kazakhstan)	GCF (USAID, World Bank)
Nur Navoi (Uzbekistan)	IFC, ADB (USAID, World Bank, ADB)

Annex 7: Evolution of the Bank's approach to solar power

The Bank's **early Energy Sector Policies** of 1992 (BDS92-018F) and 1995 (BDS95-004F) did not refer to RES, focusing instead on support to conventional power. Nevertheless, the prevalence of hydropower in selected countries enabled the Bank to sign its first (and for some time the only) *de facto* RES project in 1998 - Enguri Hydro Power Plant Rehabilitation in Georgia (4304).

As the new century dawned and RES technologies started taking hold in developed countries, the Bank launched the **Renewable Energy Resource Assessment of 2003** to analyse renewable energy potential in COOs. It demonstrated potential for wind, hydro and biomass development in selected countries. In parallel, the Bank created a dedicated website to disseminate information about RES to build awareness and support their development in COOs.

In 2006 the Board approved a new Energy Operations Policy (BDS06-093F), which mandated *"the Bank to increase its support for energy efficiency and renewable energy"* It contained a separate section on RES, which argued that RES could be the best way for COOs to achieve energy security, while decreasing environmental impact and potentially the cost of energy generation. Following up on this new Policy, the Bank established the **Sustainable Energy Initiative (SEI)**, which set a target invest a minimum of €1 billion in energy efficiency and renewable energy projects by 2010 (compared to a total of €674 million in energy efficiency projects achieved during the 5 year period 2001 to 2005). The SEI's Board memo stated that:

> *Although RES are not yet always cost-effective (with the exception of hydro generation, they have so far played a minor role in the fuel mix of the region), they are growing in strategic importance as countries try to reduce energy dependence and increase their security of supply. In the long-term a switch to carbon-free technologies is also needed to address the threat of climate change. Under the Sustainable Energy Initiative and in line with its new target for energy efficiency and renewables projects, the EBRD will step up its support for renewable energy.*

Nevertheless, the Energy Operations Policy of 2006 was relatively cautious, noting that even in Western European countries renewables are regarded as "expensive" compared to "conventional" generation and have required subsidies to support development. The policy did note that EU member and candidate countries had to adopt **RES targets under the 2001 Renewables Directive**[33]. This suggested that significant investment in RES would be needed in certain COOs, and that new EU member states should develop comprehensive support frameworks for renewables. The Policy stated that the Bank stood ready to assist. As for solar specifically, the 2006 Policy noted:

> *EBRD approach: The Bank will support all forms of renewable energy technology…[for] solar, good potential exists in many countries of the Bank's Region but the markets are largely undeveloped. In the absence of a high level of regulatory and/or grant support it is unlikely the outlook will improve in the near future*

Following this new policy, the Bank started to provide practical support for RES development,

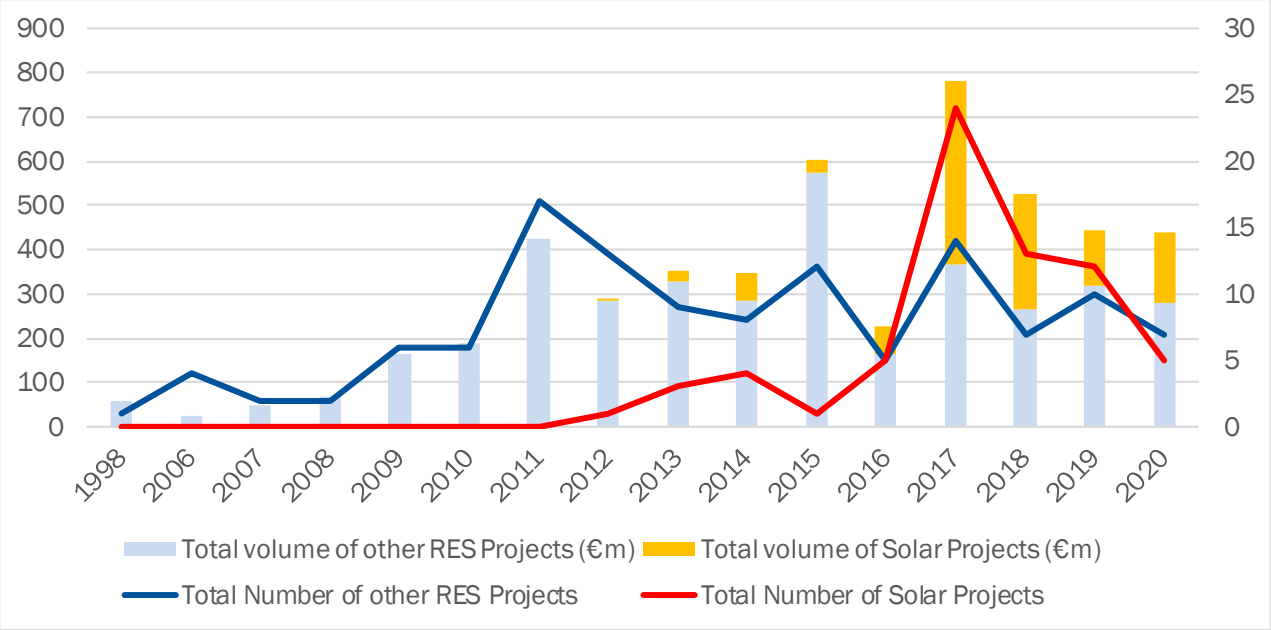
[33] Promotion of Electricity from Renewable Energy Sources in the Internal Electricity Market, 2001/77/EC

focusing on hydro power, mainly in Georgia[34] and the Western Balkans, as well as wind power, principally in the new EU countries[35]. Policy dialogue aiming at enabling bankable RES projects played a key part in EBRD's activities in this period. It concentrated on the development of standard PPAs, acceptable for lenders (e.g. in Ukraine and Kazakhstan), as well as support for the development of FiT or green certificate schemes (e.g. in Kazakhstan, Ukraine, and Poland).

The Copenhagen Accord signed in 2009 was an important milestone in mainstreaming RES. It called for "*deep cuts in global emissions … so as to hold the increase in global temperature below 2 degrees Celsius*". Developed Countries agreed to commit to mobilizing jointly USD100bn annually by 2020 to address the needs of developing countries. This funding would come from a "*wide variety of sources, public and private, bilateral and multilateral*" and be channelled through the Green Climate Fund (GCF). This goal was not met.

By the end of 2010 the Bank had signed 20 RES projects with over €0.5 billion financing, and it then doubled this amount with an additional 30 projects signed during the following two years. The Bank's policy dialogue in Ukraine during early 2010s (focused on improving the bankability of the PPA) paved the way for its first solar power project (Porogi Solar, in 2012, under the **Ukrainian Sustainable Energy Lending Facility (USELF)**) which was followed by two more in 2013. In this early period only one more solar project was signed – EDPR Solar in Romania (2013).

Figure 1: EBRD's Renewable Energy Portfolio



More generally, relatively fast scaling up of the Bank's RES operations in selected countries during this period was possible due to the adoption of "wholesale" and "integrated" approach to RES through financing facilities. For instance, many smaller hydro projects in the Western Balkans were signed under WeBSEDFF framework. USELF was followed in 2015 by the SEMED Private Renewable Energy Framework (SPREF), the Kazakh Renewable Energy Framework (KAZREF) in 2016, the Egypt Renewable Framework in 2017 and the Greek Renewable Framework in 2017.

The Bank's support for RES received a boost in 2011 when countries from the SEMED region

[34] See Hydropower Projects, Georgia Evaluation (SS18-137)
[35] See Four Wind Energy Projects Evaluation (PE15-593)

became COOs. They had abundant solar resources and available land for solar. The introduction of auctions, combined with the drop of PV panel prices contributed to the improved economics of solar power and increased interest from governments and investors in this form of RES.

Box 1: Conclusions from the Evaluation of the Ukrainian Sustainable Energy Lending Facility (USELF)

Policy Dialogue in Ukraine Evaluation, April 2014 (PE13-577S), contained two case studies, one of which related to energy efficiency and covered the Bank's policy dialogue in the RES sub-sector through USELF. Although at the time of this review USELF has financed only three small solar projects, the Bank's contribution to the legal and regulatory framework in Ukraine was critical for paving the way for its more substantial financing of solar projects in the future. The evaluation praised USELF, noting that it "accelerated the development of the renewable energy sector in Ukraine".

However, it also pointed out that "although the Bank's policy advisers/consultants have been doing a great job in building capacity of Ukrainian regulatory bodies, they sometimes too easily succumbed to the demands of the beneficiary to change scope of work without comprehending the real drivers of these changes or analysing their long-term consequences". It cited that the case of "green tariff legislation, where the consultants' efforts, while being generally positive, led to significant changes in the policy context and market configuration. Such changes now limited or precluded the EBRD and other IFIs from working on large-scale RES projects due to integrity issues". However, its overall assessment of the Bank's policy dialogue in the Ukrainian RES sector was positive. It stressed that "an inclusive approach to legal drafting gained trust and support for the EBRD from government beneficiaries and other IFIs/donors, whose approach was different with sometimes mixed results".

The Bank's **2013 Energy Sector Strategy** (BDS13-291F) increased the emphasis on energy efficiency and the role of renewables. It stressed the growing climate challenge and declared that support for renewable energy is "*central to the Bank's approach*". It made numerous references to solar energy, and noted that *"the Bank expects to see major growth in the role of solar power over the Strategy period. This principally reflects the dramatic, and continuing, decline in recent years in solar photovoltaic costs. It also reflects the start of operations in the SEMED countries, where solar resources are exceptional".*

In **2015**, at the **21st Conference of Parties (COP21) of the UNFCCC in Paris** it was agreed to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C. 196 countries signed the UNFCCC and committed to Nationally Determined Contributions (NDC) to limit or reduce carbon emissions, starting in 2020. Soon after COP21, the Sustainable Development Goals (SDGs) for 2030 were agreed. The SDGs included objectives to guide the sustainability and development agenda that had particular relevance to how MDBs should address climate change mitigation and adaptation.

Against this background, in **2015**, the Board approved the Strategic Capital Framework (SCF) for 2016-2021, which aimed to increase the Bank's "green" financing from 25% to 40%. The Bank adopted the first **Green Economy Transition Approach** to operationalise the SCF's target. It noted:

> *There is potential for increased RES financing in the COOs, for instance, there is* ***significant potential for solar energy in SEMED*** *where the Bank can play an important role in supporting both the transition to a lower carbon economy and a higher share of private sector power generation.*

One of the primary features supporting the Bank's approach to RES at that time was access to international concessional climate finance, with EBRD receiving commitments for USD 423mn from the GCF in 2017. The Special Shareholders Fund (SSF) was also an important source of GET funding, providing €29mn in 2017.

The 2018 Energy Strategy for 2019-23 highlighted the fast growth of the solar portfolio in 2017, led by large operations in Egypt and Jordan. The Performance Monitoring Framework tracked the *"share of intermittent solar and wind in electricity generation"* as a key performance indicator.

Box 2: The Bank's Experience with Renewable Energy Auctions

Historically, the EBRD supported the development of FiT or green certificate schemes in several countries to incentivise RES investors. These schemes were similar to those applied in other EU countries at that time. However, the experience of early adopters in 2009-2011 of competitive auctions (e.g. South Africa, Brazil, India), showed that these were better alternatives to FiT – cheaper for the governments and the consumers, while still attractive for the investors.

In 2014 the EU issued the Guidelines on State Aid for Environmental Protection and Energy (2014 200/01) – which stated that from 1st of January 2017 all RES support schemes had to be based on a competitive auction process, rather than on guaranteed FiT. Earliest among the Bank's COOs in adopting auctions was Jordan. The Bank was not formally involved in the auction system preparation there but maintained a dialogue, providing comments to the draft law on auctions as a stakeholder. **Morocco** was another early adopter of the auction system (also without the Bank's involvement).

In **Albania**, the Bank has been supporting auctions but also governance improvements for the offtaker to make the scheme workable and bankable. The Bank has also provided support for RE law compatibility with EU legislation (working with KfW), and advised on balancing provisions.

In **Kazakhstan**, as USAID have been leading the work, EBRD commented on the initial auction guidelines and then it supported the next round of competitive auctions for wind (see more in chapter 4).

In **Lebanon** the Bank started with a small TC on PPAs as the country had already started competitive procurement (round 1 for wind and solar). The Banking team provided support on the contractual framework, while ESD on environmental issues (bird migration). The Bank has also worked to improve transparency of the distribution company (EDL).

In **Serbia**, the Bank provided support for the bidding scheme, PPA, and it is now working on RE Law.

Azerbaijan didn't have any RES legal framework or related contractual documents. These were prepared from scratch under a TC.

When **Greece** was designing its auction programme (2017-18) the Bank participated in the consultation process and advised the regulator on bankability issues. Currently, the Bank is implementing a TC to assist the Greek Ministry of Environment and Energy to develop an Offshore Wind Regulatory Framework.

EvD's **2019 Climate Initiatives' Evaluation** (SS18-115) noted that "*MDBs have been playing a central role in mobilizing and disbursing climate finance and that monitoring, reporting and validation frameworks will underpin assessments of progress on achieving the NDCs and they are expected to play a central role determining the future allocations of climate finance".*

In July 2020 the Board approved **The Green Economy Transition Approach 2021-2025** (BDS20-082, GET 2.1), which singled out solar energy as a particularly promising sub-sector. It also notes

the potential of this sector to have a positive impact on job creation and inclusion in COOs.

In October 2020 the Board of Governors approved the Bank's **Strategic and Capital Framework** (SCF) for 2021-2025 (BDS20-030), in which support for transition to a "green", low carbon economy was one of three central themes. The SCF set targets to raise the share of the Bank's "green" finance to at least 50% and reduce CO_{2e} emissions by 25 to 40 million tonnes by 2025. It noted that the Bank's support for the transition of its COOs' energy systems from high to low carbon-based would be critical for the achievement of these ambitious goals. It will require substantial scaling up of investments into RES, including solar energy generation, which by then would became the lowest cost new energy source in many COOs.

Finally, during the **2021** AGM the Bank's shareholders voted in favour of a resolution that all EBRD activities be **fully aligned with the goals of the Paris Agreement** no later than 31st December 2022. This constitutes another strong incentive to scale up investments into RES, including solar.