Project Information Document (PID)

Appraisal Stage | Date Prepared/Updated: 25-Mar-2021 | Report No: PIDA31496

BASIC INFORMATION

A. Basic Project Data

Country	Project ID	Project Name	Parent Project ID (if any)
Ukraine	P176114	Improving Power System Resilience for European Power Grid Integration	
Region	**Estimated Appraisal Date**	**Estimated Board Date**	**Practice Area (Lead)**
EUROPE AND CENTRAL ASIA	15-Apr-2021	31-May-2021	Energy & Extractives
Financing Instrument	**Borrower(s)**	**Implementing Agency**	
Investment Project Financing	Ministry of Finance of Ukraine	PJSC “Ukrhydroenergo"	

Proposed Development Objective(s)

To enhance the flexibility of the Ukrainian power grid to support synchronization with the European electricity grid and decarbonization of power sector

Components

Installation of Battery Energy Storage System (BESS) with solar Photovoltaic (PV) plants, establishment of an Energy Management System (EMS), and Supervision Consultancy
Technical Assistance for UHE

PROJECT FINANCING DATA (US$, Millions)

SUMMARY

Total Project Cost	250.00
Total Financing	250.00
of which IBRD/IDA	177.00
Financing Gap	0.00

DETAILS

World Bank Group Financing

International Bank for Reconstruction and Development (IBRD)	177.00

Non-World Bank Group Financing

Counterpart Funding	38.00
Borrower/Recipient	38.00
Trust Funds	35.00
Clean Technology Fund	35.00

Environmental and Social Risk Classification

Moderate

Decision

The review did authorize the team to appraise and negotiate

Other Decision (as needed)

B. Introduction and Context

Country Context

1. Since 2014, Ukraine has undertaken wide-ranging institutional, political, economic, and social reforms aimed at increasing the role of market forces in the economy and to shift its economic orientation towards Europe. Responding to the economic recession of 2014-2015, fiscal adjustments were made through: (i) energy tariff reforms aimed at closing the quasi-fiscal deficit; and (ii) a nominal freeze on wages, pensions, and social assistance despite high inflation. Consequently, the overall fiscal deficit was reduced from 10 percent of GDP in 2014 to 2.3 percent in 2016 [1]. From 2016 onwards, significant further reforms were implemented in the social sectors to promote fiscal sustainability. As a result, spending on social benefits declined from 16.3 percent of GDP in 2016 to 14.8 percent in 2019. Public and publicly guaranteed debt declined from 81 percent of GDP in 2016 to an estimated 51 percent in 2019. These reforms—difficult in the best of times—have been implemented against a backdrop of continued tensions and human, material and territorial losses on the Eastern border. Gradually, the economy has begun to grow again, following the deep contraction in 2014-15, and poverty and economic vulnerability have begun falling back towards pre-crisis levels. [2]

[1] Reform of energy pricing, primarily for natural gas, being the most important contributor to the reduction of public expenditures between 2014 and 2016.

[2] Tax revenues increased from 33 percent of GDP in 2016 to 34.4 percent in 2019. Fiscal deficit has been maintained at about 2 percent of GDP for the last three years.

2. Although the economic impact from the COVID-19 outbreak appears to be less severe than initially anticipated – GDP declined by 4.4 percent in 2020 (vs 6.5 percent decline 1H2020) – the pandemic has exacted a heavy toll in terms of health and mortality impacts; and undermined the government's commitment to undertake critical reforms. Ukraine's economic recovery in 2021 is expected to be moderate – annual gross domestic product (GDP) growth at just 3.8 percent – given high uncertainty associated with the rollout of the vaccine and the direction of economic policies to address bottlenecks to investment and safeguard macroeconomic sustainability. Strong economic recovery remains constrained by low levels of fixed investment, exacerbated by the COVID-19 crisis. Stronger growth in fixed investment depends on progress with reforms that address structural weaknesses in the financial sector, market distortions from the lack of an agricultural land market, an anticompetitive environment, large numbers of state-owned enterprises (SOEs), and macroeconomic vulnerabilities.

3. While poverty declined significantly in recent years, this trend is likely to be reversed as a result of the economic contraction resulting from the COVID-19 pandemic. Moderate poverty (according to the World Bank's national methodology for Ukraine) declined from a peak of 27 percent during the crisis in 2015 to 20 percent in 2018 and an estimated 18 percent in 2019. Despite the decline, it remains slightly above the pre-crisis level of 14 percent in 2013, with the prospect of increases due to the COVID-19 crisis. With labor incomes, employment, and remittances impacted sharply due to the pandemic, poverty is projected to increase sharply in 2020. Moderate poverty remains higher in rural areas (28.5 percent versus 15.5 percent in urban areas in 2018), where local communities face challenges such as poor living conditions, outdated infrastructure, and limited public services provision. The socioeconomic impact of the COVID-19 pandemic will also vary across the country and will require public health interventions and social assistance for vulnerable households. Decreasing poverty rates and promoting shared prosperity remain significant development challenges that require Ukraine to capitalize on the drivers of growth through structural, policy, and investment reforms and the development of human capital.

4. Ukraine faces sizable public debt repayments in the 2020-2022 period of about 7 percent of GDP (US$10 billion) per year. A budget amendment for 2020 was approved in April with the fiscal deficit revised to 7.6 percent of GDP, up from 2.5 percent. With limited access to international capital markets, authorities need considerable budget support from official creditors. Going forward, in order to raise the necessary external financing on affordable terms, when conditions in international capital markets ease, it will be important to deliver on the reform agenda, bolster investor confidence, maintain prudent macroeconomic management, and secure financing from international development partners.

5. Elections in 2019 provided the new Ukrainian authorities a hopeful mandate and opportunity to address obstacles to economic growth and advance major economic reforms. President Zelensky, elected in April 2019 with a large majority of the vote, was able to further solidify his hold through his party, the Servant of the People Party, winning the majority of the seats in the July 2019 parliamentary election. The new Government that took office in August 2019 presented its 5-year program to the Parliament in October 2019, setting ambitious goals, in particular with regard to GDP growth acceleration, attraction of foreign direct investment, development of infrastructure, job creation, poverty reduction, and improvement in public services. The program also outlined key reform priorities including opening the agricultural land market, de-monopolization by unbundling the two largest state-owned monopolies – Naftogaz and Ukrainian Railways – and making further progress in strengthening nascent anticorruption institutions. Despite the majority held in the Parliament by the Servant of the People Party, the strong progress on reforms has generally slowed down with a few reversals, especially in anticorruption. Lack of

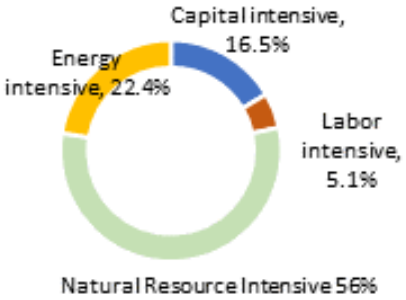
trust in public institutions remains a fundamental concern as surveys reveal a general perception that corruption remains endemic – from financial sector to health care – and that powerful oligarchs still dominate the economy.

6. Ukraine's economic transformation to a full-fledged market economy remains incomplete -- progress in increasing the role of market forces in key factor markets, such as energy and land markets has been particularly slow. Distorted price signals in energy sector provided short-term economic benefits to select industries, but this delayed much needed industrial restructuring. Over-reliance on commodity-based and energy intensive exports has delayed much needed industrial restructuring toward developing high valued-added export-oriented industries. In addition, distorted price signals in input markets have facilitated rent-seeking opportunities to special vested interest groups and to undermine the effectiveness of Ukraine's economic institutions.

7. Distortions in key factor markets can undermine a transition to post-COVID Green, Resilient and Inclusive Development trajectory by undermining incentives to accumulate capital, to attract foreign investment, and to reorient exports away from commodities.

8. Today Ukraine's export structure continues to have a high share of energy intensive exports (see Figure 1 below). Hence, energy sector reforms to create competitive and transparent energy markets are very important for achieving sustained growth. Financing and technical support from the World Bank, as envisioned by the FY17-21 Country Partnership Framework (CPF), in close coordination with the International Monetary Fund, the European Union (EU), the United States, and other bilateral partners, has been central to progressing key reforms in the energy sector. The unbundling of Naftogaz (the national oil and gas company) and liberalization of the gas and electricity markets went a long way towards implementation of the EU Third Energy Package in Ukraine. In the power sector, generous Feed-in-Tariffs (FiTs) for renewables have resulted in 8 GW of privately-owned renewable energy assets being added to the generation mix. However, the rapid increase in renewables capacity has created financial and operational challenges for Ukrenergo (UE) - the Transmission System Operator (TSO), which has accumulated large debts (about $1.2 billion by end-2020). More details on the financial situation of the energy sector are provided below.

Figure 1. Ukraine's export structure



Sectoral and Institutional Context

9. Traditionally, the energy mix in the power sector in Ukraine consisted of coal, nuclear, and hydropower, but a rapid increase in the share of renewable energy has taken place in recent years. Of the total installed power generation capacity[3], estimated at 54.3 GW, about half (27.9 GW) consists of thermal power plants (TPPs), with coal-fired power plants accounting for 90 percent of the TPPs. Nuclear power plants (NPPs) accounts for 26.7 percent (13.8 GW) of the installed capacity, while hydro power plants (HPPs), including pumped storage HPPs, represent 12 percent (6.3 GW) of the total installed capacity. Overall electricity production in 2019 was 154.0 TWh, out of which 150.2 TWh was consumed domestically while electricity exports and imports were 6.5 TWh and 2.7 TWh, respectively. Four nuclear power stations comprising of 15 reactors supply more than half of Ukraine's total electricity.[4] The remaining electricity comes from coal fired TPPs (30 percent), natural gas fired combined heat and power (CHP) plants (8 percent), and HPPs (7 percent).

10. The recent rapid increase in renewable energy sources (RES) within the generation mix is driven by the Government's commitment to decarbonization and pollution reduction,[5] through incentivizing private sector investments. As shown in Figure 2, until 2018 RES accounted for a very small portion of electricity generated. However, the generous FiTs for RES with no capacity caps have resulted in the rapid installation of over 8 GW of RES capacity at the end 2020, with the bulk of these additions occurring in 2019. According to the UE's Generation Adequacy Plan[6], an additional 2–3 GW, would be secured through FiT-based power purchase agreements by the time FiT expires in 2029. Per these government projections, RES would account for 9 percent of the generated electricity in 2021 and 14 percent by 2029. Despite this rapid increase in capacity installed, the results in carbon emission reductions has not been as expected. Due to the lack of flexibility to balance this renewable energy generation, wind and solar generation is often curtailed (while compensated by the take or pay PPAs), and part-loaded thermal power plants to provide the required reserves, which is leading to increased GHG emissions.

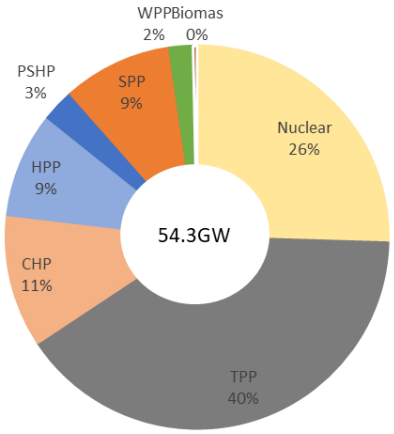
Figure 2. Installed capacity at the end of 2020 and its historical trend

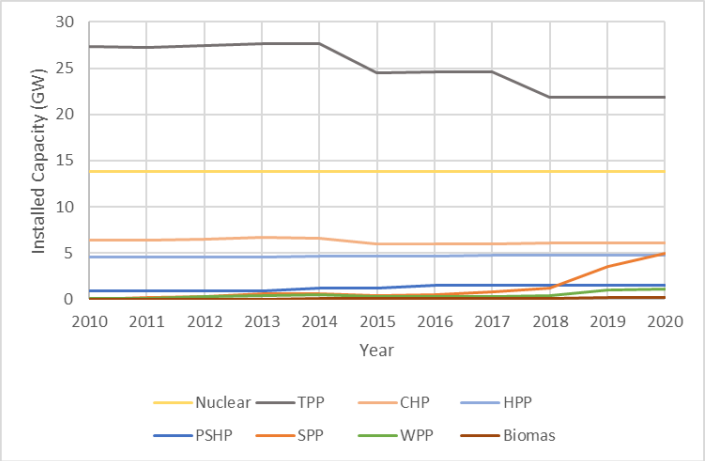
[3] Excluding generating facilities of the Crimean Electric Power System and the Uncontrolled Territory of the Donbas Electricity System.

[4] Development of several nuclear units was put on hold or stopped after the 1986 Chernobyl nuclear accident.

[5] In 2016, Ukraine had the highest mortality rates from air pollution per capita worldwide, according to the WHO data. Annually up to 66,000 people die because of air pollution in Ukraine. It is estimated that the health and mortality costs stemming from air pollution constitute a multi-billion-dollar burden for the national economy.

[6] Generation Adequacy Plan presents Ukrenergo's view on the long-term generation capacity need for the country. UE updates the Adequacy Plan regularly.





11. Ukraine has recently increased its NDC decarbonization targets, and is committed to pursue long-term carbon neutrality, which will require alignment of energy sector legislation with the European Green Deal. Under the Paris Climate Agreement, Ukraine pledged to cut its greenhouse gas (GHG) emissions by 2030 by at least 40 percent from the 1990 levels. However, since emissions had already declined by 64 percent due to the economic collapse following the break-up of the Soviet Union, that target would have allowed for a nearly twofold increase of GHG emissions until 2030. On December 2020 Ukraine announced its intention to update its Nationally Determined Contribution (NDC) target to between 58 to 64 percent reduction below 1990 levels by 2030. This target while a significant improvement from its previous target, still falls short of the ambition level needed to achieve a 1.5°C-compatible goal. It moves the CAT rating from "Critically Insufficient" to "Insufficient." However, President Zelensky stated that Ukraine plans to pursue carbon neutrality as a long-term goal. The 2030 target will be achieved through aligning climate policy and legislation with the European Green Deal, particularly in the areas of renewables, hydrogen, and the transformation of the coal sector. The Government aims to phase out coal-fired power generation and increase the share of renewables in the energy mix. As more renewables are connected to the grid, more energy storage will be needed to enable proper balancing and limit curtailment of renewables.

12. Ukraine's power sector has gone through several stages of reform starting with unbundling and partial privatizations in the 1990s. Power generation, transmission, and Wholesale Electricity Market (WEM) operations are now conducted under separate entities, while the sector is regulated by the National Energy and Utilities Regulatory Commission (NEURC). Electricity distribution and retail were combined in several regional power companies (OblEnergos), most of these are now privatized and unbundled, albeit controlled by a handful of individuals. The State owns and manages all NPPs, which are operated by the state-owned entity, EnergoAtom. Similarly, all major HPPs belong to the fully state-owned joint-stock company, Ukrhydroenergo (UHE). The national transmission network is owned and operated by UE – the state-owned TSO. TPPs in Ukraine are grouped into five regional companies (Donbassenergo, Dniproenergo, Centrenergo, Zakhidenergo, Skhidenergo). Only Centrenergo is still under state ownership while a majority of the shares of the others are now owned by DTEK, a private sector company with interests in power generation, distribution, and coal mining. DTEK controls about 80 percent of the coal production in Ukraine.

13. Functioning of the nascent WEM has been hampered by concentration of market power and an incomplete transition to market-based ratemaking. On July 1, 2019, Ukraine transitioned out of the single-buyer wholesale electricity market model and launched the new WEM, in accordance with the 2017 Electricity Market Law. This made the power market in Ukraine compliant with the legal requirements under the EU's Third Energy Package. The WEM now competitively trades bulk electricity in integral market segments of the day-ahead market (DAM) and intraday market (IDM), which are supplemented by the bilateral contract market.[7] This is further supported by the balancing market (BM) and the ancillary services market (ASM). The World Bank has supported the transition process through the First Power Transmission Project (2007-2016) and the ongoing Second Power Transmission Project (PTP2). The WEM started its operations in a phased manner to enable a smoother transition to the new structure by imposing various restrictions, including constrained bidding in the DAM and bidding caps in the BM and ASM. Additionally, two Public Service Obligation (PSO) mechanisms were introduced: (i) Household (HH) PSO to protect household consumers by keeping electricity tariffs below full cost recovery; and (ii) RES PSO to cover RES obligations under the FiT mechanism, since FiTs are significantly above WEM prices. Under the HH PSO, nuclear and hydro producers are obliged to sell a bulk of their production at low regulated rates to meet residential consumption needs. On the other hand, RES PSO is being funded through UE's transmission tariff. Since end-consumer tariffs – both for households and for industrials (that include TSO Tariff) are regulated by NEURC, there is a disconnect between the legislated HH and RES PSO requirements, and the approved end-user tariffs, leaving a large and growing unfunded gap that is at the heart of the sector's financial stress.

14. Ukraine's power sector continues to suffer from lack of transparent rate-making practices, and an environment where legislation rather than an independent regulation is used to set market rules. The large SOEs that supply 60 percent of electricity are not allowed to participate in the WEM and are obliged to provide power at low prices, that increases their financial stress, particularly as higher priced RES power puts a squeeze on their volumes. These practices result in market distortions and price manipulations in the bulk power prices. In this context, the promotion of institutional reforms, transparency, and expanded competition in the power sector, which has a large footprint of SOEs, can help promote new investments and efficiency in this important area of the economy.

15. The systematic development of Ukraine's ASM is already underway in line with EU market practices. Ukraine's ASM's first auction took place in Spring 2020. The market design is in line with other ENTSO-E markets (see Box 1), including provision of several frequency control services[8]. The ASM conducts short-term auctions for these services in several future timeframes. Frequency reserve needs are bid, and capacity awarded is remunerated on an hourly basis. The accepted price from these auctions is included in the transmission charge that is then covered by all users. UE has evaluated each generating unit in the system from the perspective of providing ancillary services, and processed certifications for participating in the ASM. While UkrES currently has thirteen certified units participating in the ASM, only five units have

[7] DAM and IDM transactions account for up to 30 percent of the total power consumed[7], while the remaining is supplied through long-term bilateral contracts that lack the same level of transparency.

[8] Such as Frequency Containment Reserve (FCR) (the fastest response), automatic Frequency Restoration Reserve (a-FRR), manual Frequency Restoration Reserve (m-FRR) and others

been certified for providing FCR as of February 2021, with a cumulative certified FCR amount of 177 MW.[9] All four of these units use coal (TPPs/CHPs), and must retire as the green agenda picks up strength. Work is ongoing on certifying more units for FCR, including nuclear plants, but at the moment the FCR market is entirely subscribed by existing TPPs. While rules for improving ASM operations are progressing, it must be noted that fast response reserves (FCR and a-FRR) continue to be provided as a default option through the IPS/UPS (and specifically by the Russian power system). In fact, Ukraine routinely fails to meet its FCR requirements and prevailing rules allow for instantaneous cross-border power exchanges and a-FRR provision to fill this gap without any significant financial consequence for UkrES. This reliance in the IPS system has allowed the Government of Ukraine to keep very low pricing caps within ASM, which could not lead to sufficient participation of incumbents or new investments.

Box 1. Various Services in Ancillary Service Markets

A power system must possess certain amount and type of reserves to manage instantaneous fluctuations to ensure balance between demand and supply. Under ENTSO-E rules, power system reserves are classified in the following three categories:

(a) Frequency Containment Reserve - FCR – Active and spinning power (primary) reserves engage automatically (with special equipment) within 30 seconds to contain frequency after occurrence of an imbalance in the system.

(b) Frequency Restoration Reserve - FRR (a-FRR and m-FRR) - (30 seconds -15 minutes) automatically (a-FRR) or manually (m-FRR) engaged spinning power (secondary) reserves to restore system frequency to the set point frequency value. For a synchronous area consisting of more than one load-frequency control area (LFC area), this includes restoring power balance to the scheduled value.

(c) Replacement Reserve - RR - Active (standby, tertiary) power reserves available within 30 minutes to restore or support the required level of FRR preparing for possible additional system imbalances, including generation reserves.

16. The recent rapid increase of RES capacity due to generous FiTs has created financial and operational challenges for UE and for the power sector, including fast accumulation of arrears. The FiT scheme, introduced in 2009,[10] provided tariffs in the range of 15 to 20 US cents/kWh for utility-scale solar and 10 to 11.4 US cents/kWh for wind, much higher than the average recent tariffs awarded in other countries. The FITs are regulated through a mandatory RES offtake by a Guaranteed Buyer (GB).[11] This resulted in the introduction of the previously mentioned RES PSO scheme, that has led to financial deficits incurred by the GB due to insufficient funding from the transmission tariff to cover the FiT prices. Under the additional new responsibilities assigned to UE in 2019, the TSO is obligated to compensate the deficits through the revenues from its transmission tariff, which must be approved by NEURC. NEURC does not consider the RES PSO to be part of UE's mandate, and therefore, this PSO is not fully funded in the transmission tariff calculation. This leads to a large and growing unfunded mandate of UE towards RES

[9] (i) TPP Kurakhivska (±88MW); (ii) CHP5 Kharkivska (±27MW); (iii) TPP Zaporizka (±32MW); (iv) TPP Luhanksa (±20MW); and TPP Burshtinska (±10MW).

[10] The 2009 Renewable Energy Law enshrined the FiT based on the prevailing RE costs and practices. For solar generation, this has significantly changed in the last five years, rendering the FiT highly above the current RE prices.

[11] The Guaranteed Buyer was also created around the opening of the WEM and is tasked with fulfilling both HH and RES PSOs. Thus, the GB purchases electricity from the nuclear utility, Energoatom, and the hydropower utility, Ukrhydroenergo - both SOEs - at regulated tariffs and sells it to household customers at low tariffs. GB is also obliged to purchase electricity from RES producers under the FiT scheme and sell this in the WEM to recover prices that the market will bear.

and SOE power providers. As of December 2020, the accumulated arrears of UE to GB and SOE power suppliers exceeded UAH 34 billion ($1.2 billion). Per UE's estimate, nearly UAH 50 billion ($1.75 billion) will be necessary for RES purchases under FiT in 2021. This is expected to grow to about UAH 104 billion (US$ 3.6 billion) in 2029. The current financial stress at UE has made it difficult for the TSO to perform its core functions, including attracting investments in modern grid resilience capabilities, such as rapid response frequency regulation needed for timely UkrES grid synchronization with the EU, and integration of variable renewable energy (VRE) into the grid. The World Bank is supporting UE and the Ministry of Energy and Coal Industry (MoE) with preparation and implementation of the Financial Recovery Action Plan (FRAP).

17. The COVID-19 crisis has further eroded the financial health of the sector. Power utilities and the TSO, already burdened by the issues mentioned above, are facing significant revenue shortfall due to retracted demand, exacerbated in some periods by reduced collections from residential and commercial users. This also limits available options for refinancing the debt of the utilities on favorable terms. Electricity consumption in UkrES decreased by 4.9 percent compared to the same period in 2019. As a result, several power sector companies face financial stress and are at risk of breaching debt service covenants (particularly those denominated in hard currency). On March 28, 2020, Ukraine's largest private power producer, DTEK, suspended interest payments on Eurobonds and bank loans, and requested creditors to restructure part of its debt, which resulted in a downgrade of the company's credit rating.

18. As, against this backdrop, Ukraine is pursuing integration of its power system with the EU through Synchronization[12] with the ENTSO-E. Ukraine already has electricity interconnectors with Poland, Slovakia, Hungary and Romania. However, only Burshtyn TPP, in the Ivano-Frankivsk region, is synchronized with the European grid and it is capable of exporting up to 650 MW of electricity to Europe from the so called "Burstyn (electric) island" which is disconnected from the rest of Ukraine power grid. As mentioned above, the rest of the Ukrainian power grid is synchronized with Russia, Belarus and Moldova (the IPS/UPS system). This significantly limits Ukraine's electricity trade capacity with its western neighbors. In June 2017, Ukraine and Moldova signed an agreement with the ENTSO-E on conditions for future synchronization, including a catalogue of technological and regulatory measures. These measures include reinforcements of the transmission network, realization of frequency regulation reserves, establishment of a telecommunication network, and studies on future grid stability.[13] Once these are completed, UE would switch from the IPS/UPS system into isolated island mode operations at the end of 2022 before the synchronization with ENTSO-E, planned by end 2023. When UkrES disconnects from IPS/UPS, both in the islanding mode, but also thereafter, the system must be prepared for stable and resilient operations without the free cross-border frequency support from the IPS/UPS system. Without the benefit of more detailed post-synchronization dynamic studies currently being conducted by ENTSO-E[14], planners must be prudent and conservative when assessing their FCR requirements, since current practices are not indicative of the future within ENTSO-E.

[12] In 2018, the Cabinet of Ministers of Ukraine approved an action plan for synchronizing the United Energy System of Ukraine with the ENTSO-E. On March 19, 2019, the European Commission adopted Annex 27 to the Ukraine-EU Association Agreement, allowing for synchronization of the energy markets.

[13] The World Bank and other development partners have supported the implementation of several of these measures, including telecommunication network upgrades and grid studies.

[14] This ENTSO-E study is unlikely to be available before September 2021 and could be delayed beyond that date.

19. Synchronization of the Ukrainian Electricity System (UkrES) with EU's power grid is an important strategic objective for the power sector and a key milestone on the journey to economic recovery and decarbonization as it is expected to lead to very significant benefits for the country. Timely synchronization in 2023 is deemed the most important transformational objective for the power sector by the Government. It is a key strategic plank for building power sector competitiveness and economic resilience that has become even more important for Ukraine in the wake of the global economic crisis resulting from the pandemic. Synchronization with the European power grid is an important commitment mechanism to get the price signals right and reduce the influence of vested interests. Moreover, synchronization implies adherence to the objectives of the European Green Deal that seeks to make Europe the first carbon-neutral continent through employment of new technologies and deep cuts in the use of coal in the energy and industrial sectors. ENTSO-E synchronization comes with very tangible benefits for Ukraine, including: (i) enhanced reliability and security of electricity supply through diversification of energy sources and access to the EU markets under a regional cooperation framework;[15] (ii) creation of competitive and transparent electricity markets aligned with EU market practices; and (iii) decarbonization and renewable energy integration through enhanced system flexibility. UE estimates that the monetizable economic benefits from ENTSO-E synchronization are more than US$1.2 billion annually, while the cost of synchronization is estimated at around $400 million.[16] The Bank also estimates that ENTSO-E synchronization cut GHG emission by 3 million tons per year.

20. Grid-scale battery storage could play a key role in the development of Ukraine's ASM and BM, supporting the transition towards decarbonization. Storage has been widely adopted in a number of countries over the last decade to provide a broad range of grid services. With rapid technological advances and improving battery products, applications of battery storage in the grid have been expanding (see Annex 4 for more information). Thus, while hydropower pumped storage still provides the bulk of the existing storage capacity for electric grids globally, battery storage has experienced rapid growth over the last decade, both in terms of installed capacity and the number of applications, especially as costs have continued to decline. Batteries are modular and allow for fast deployment. In addition, batteries can provide very fast response, enabling optimized frequency regulation, transmission and distribution investment deferral, and support for renewable energy integration by providing balancing services. This could be done through a standalone battery facility or through electric storage embedded in renewable energy facilities, that limit variability in plant outputs and allow the batteries to be used for other applications such as provision of ancillary services or participation in the BM.[17]

21. Battery capacity optimum requirements for Ukraine are estimated to be more than 400MW in 2023, and storage needs in the long-term will increase up to 2,000 MW in 2030, driven by the country's decarbonization objectives. Both UE's Adequacy Plan and Least Cost Plan (LCP) show that batteries are already economically feasible and within the required range of lower cost infrastructure needed to provide several services. Figure 3 below shows a comparison of the battery capacity needs according to

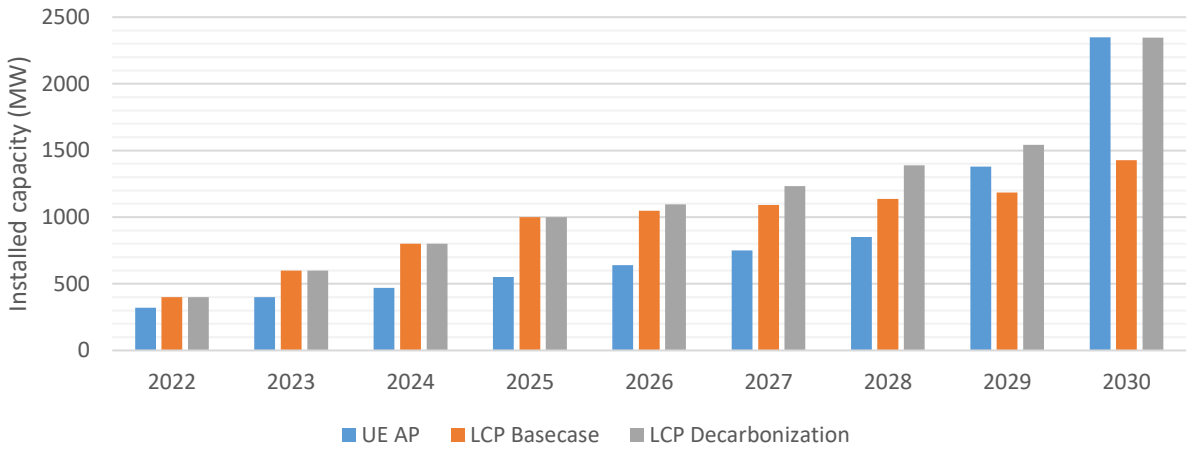
[15] This is expected to increase exports of Ukrainian electricity to European countries. According to Ukrenergo's expectations annual exports could range from 5 bln kWh to 18-20 bln kWh.

[16] Source: Ukrenergo 2017 presentation. UE estimates are not including the proposed Project investment cost.

[17] This is highly relevant for Ukraine where rapid deployment of renewables into the grid is causing grid stability issues and renewable curtailment, and even more, once coal-fired generation is retired, in-keeping with post-synchronization European Green Deal mandates.

UE and the Bank's studies, under several scenarios. Starting with 400 MW in 2022, the needed battery storage capacity increases to 1,000 MW by 2025 and reaches 1,500-2,000 MW by 2030, driven by the need to provide fast response reserves traded in ASM and balancing services in BM for the growing VRE generation in the system. This phased and strategic expansion in energy storage capacity over the next decade assumes anticipated technological advances and conservative cost reductions. The WB LCP base case considers the target of 25 percent of renewable energy including hydroelectric generation by 2035, while the LCP decarbonization scenario aims to cut the CO_2 emission by 80 percent by 2040 compared with 2022.

Figure 3. Battery storage capacity needs towards 2030



22. Moreover, storage will play an important role to meet one of the most critical requirements for ENTSO-E synchronization in the short term. UE will need to pass the island mode operation test that will require UE to have access to sufficient frequency regulation reserves on its own. In preparation for this test, which is expected to start at the end of 2022, UE must secure reserves to withstand the loss of the largest generation unit, and the largest consumer. Specifically, UkrES would have to maintain 1,000 MW of FCR (the fastest reserve) to withstand a potential loss of the largest nuclear unit. This is challenging for Ukraine, given that: (i) UkrES is currently heavily dependent on the Russian power system for provision of FCR and other reserves; and (ii) The certified amount for FCR provision is merely 177 MW, as of today, and of that amount, only a small part is bid in the ASM. With these constrains in mind, UE has collaborated with donors to carry out dynamic stability studies to evaluate the role of battery storage to meet the technical requirements of FCR during the islanding mode operation. The studies were based on some UE inputs and assumptions about availability of different sources of reserves, and about ENTOS-E requirements of during islanding mode operation. To validate these assumptions, and acceptability of ENTSO-E of some of the solutions assumed, the Bank, with the help of and international consulting firm, conducted a risk assessment about the proposed FCR solutions for the island mode operation identified by previous studies. **The risk assessment identified significant risks associated to the assumptions in prior studies and recommended up to 440 MW of battery storage to ensure successful completion of the tests.** The results of this technical review provide evidence that: (i) several assumptions were not

aligned with ENTSO-E framework for isolated mode not with accepted practices for control; (ii) the recommendation to install more BESS capacity can mitigate the risk of an unsuccessful outcome of the "island mode" pre-synchronization testing due to inadequate frequency control capability[18]; (iii) BEES will have a positive economic impact on the system after synchronization.

23. Hence, most of the 400-600MW battery storage identified as economically optimal (under LCP) for 2023 will be required for the provision of FCR during island mode operations and will continue to provide value post-synchronization – albeit for other segments of ASM (such as a-FRR and RR today, and possibly load shifting in the near future to reduce RES curtailment), and the BM with price arbitrage. Adjustment of price signals or procurement methods may be needed to incentivize investments in economical storage. More details of the risk analysis are found in Appendix 4. In absence of adequate and timely battery storage investments, UE may be forced to implement last resort measures detrimental to the economics of the power system[19].

24. In the current undeveloped and constrained market environment of Ukraine, the private sector faces several hurdles which cannot be resolved quickly enough to enable urgently needed investments in battery storage to meet the ENTSO-E synchronization requirements in a timely manner. On one side, the incipient ASM market has been unable to attract new private investments against the backdrop of sectoral financial stress and insolvency of UE (off-taker of ASM services). The ASM price is determined through short term auctions. If the capacity offered at the auction is insufficient to cover the TSO's needs, then NEURC's specific methodology provides the ancillary services tariff that is used to procure the capacity from certified participants. Due to the limited number of participants, and the low price cap by NEURC, the offer of ancillary services by the incumbents has rarely met the demand and the NEURC-specified price cap is used for procuring the needed services.[20] Moreover, while price caps have been recently increased, perceived commercial risk remains high, particularly considering the financial situation of UE. In this context, it is understandable that new investments are not materializing, and new players are not attracted to the ASM market.

25. The Government is keen to bring in both public and private investments in AS through market-oriented approaches, and with this aim in mind, is working to strengthen the policy and regulatory framework to attract quality investments in energy storage and ancillary services – from public and private sectors. The proposed Project includes a public component that addresses a substantial part of the battery storage needs for pre-synchronization island-mode testing, and the remainder must come from private investments. By introducing the use of large-scale battery storage and strengthening the enabling environment for private sector participation, the proposed Project provides critical support to Ukraine in its efforts to meet one of the key technical requirements for synchronization with the European

[18] While the detailed studies from ENTSO-E are needed for determining this, the recent incident of frequency deviation within ENTSO-E (on January 7, 2021) will likely make ENTSO-E very conscious and strict with respect to having adequate fast response frequency reserves.

[19] It would be important to highlight that the use of load shedding as a way to provide control is not contemplated by ENTSO-e. Some alternative options include use of gas peakers, or mandatory provision of reserves by existing thermal power plants.

[20] For example, in October and November 2020, the FCR contracted accounted for only 1.6 and 3.5 percent respectively of UkrES's required 119 MW contribution under IPS/UPS arrangements. Thus, FCR hit the ceiling price of around 800 UAH/MW (approximately 28 USD/MWh) on both occasions.

Network of Transmission System Operator for Electricity (ENTSO-E)[21]. UHE is best placed to introduce the use of green battery storage in the country. UHE is the only renewable generation company which can provide balancing services, unlike the more inflexible nuclear generation and outdated TPPs. UHE has been the traditional provider of system flexibility (a-FRR) in Ukraine and the addition of battery storage will enable UHE's participation in the FCR segment of the market. In addition, the proposed Project will also support the introduction of energy storage as the enabler of e-mobility by providing UHE the experience and head-start in learning about and working with Zinc Air batteries that in the future could also have applications in load shifting and reduction of VRE curtailment. This component will be supported by appropriate technical assistance and capacity building, including collaboration with the World Bank's transport team on business models for eMobility.

26. The battery storage needs call for a joint public and private approach to develop green battery storage in Ukraine, as an alternative to other flexibility sources. Battery storage projects are well suited for private investments, given their modularity and relatively fast deployment, and can be installed as stand-alone projects or as a part of hybrid projects in combination with RE projects. Hybrid projects are seen as more competitive, and a recent Decree No. 35[22] requires installation of battery storage in all new renewable energy projects. While Decree No. 35 is applicable only to new RE assets, Ukraine currently has 8 GW of renewable energy projects that could also provide added energy storage if proper incentives are put in place, which would help increase competition in the market. Over the medium term, there will be a need to retire the coal-fired plants under EU's Green Deal and the decarbonization agenda. Similarly, there will be a focus on the charging of the batteries that are newly installed to provide FCR, with an emphasis on zero-carbon ("green") sources for charging. All these developments provide opportunities for the private sector, provided that the appropriate enabling environment is put in place to spur expanded participation of the private sector and competitive business models that align with the European best practices. An emerging global trend is to have multiple revenue streams contributing towards monetizing new investments in utility-scale batteries.[23] Alongside technology improvements, the optimal deployment of storage technologies requires institution of appropriate business models and an evolving enabling environment that allows for transparent and non-discriminatory market rules and practices. New procurement approaches and business models are emerging globally.[24] As Ukraine looks to integrating with Europe's energy markets, it is important to focus on instituting best practices for the synchronous operation with ENTSO-E.

27. Improvements in the governing ASM rules and in the current legal and regulatory environment are required to help attract larger private investments in battery storage for various services. The

[21] ENTSO-E represents 42 electricity transmission system operators from 35 countries across Europe. ENTSO-E was established and given legal mandates by the EU's Third Legislative Package for the Internal Energy Market in 2009, which aims at further liberalizing the gas and electricity markets in the EU.

[22] On January 29, 2021, the National Security and Defense Council of Ukraine under Decree No 35 mandated all future utility-scale solar and wind power plants to implement at each such generation facility, energy storage systems.

[23] Longer duration battery storage is becoming cost competitive in a growing number of applications such as price arbitrage, load shifting, and peak power supply.

[24] The Regelleistung platform in Germany, where 1.5GW of FCR are jointly procured on a technology-neutral basis by six participating countries (Germany, France, the Netherlands, Switzerland, Austria, and Belgium) is an example of current European trend for the provision of Frequency regulation services. Denmark, Poland and other European countries are expected to join the platform in coming years – indicating a widening acceptance of this approach and its governing rules.

concept of storage does not exist in current regulation, and therefore storage systems are considered as generators by default, which implies certain disadvantages to compete in the market. Current legal and regulatory environment does not facilitate competitiveness of battery participation in the balancing and ancillary services markets. For example, unlike other generators, batteries need time to re-charge after being discharged.[25] In ASM, while certification for different services is provided at plant level, the legal requirements to monitor availability and delivery at plant level does not exist. Another gap is the flexibility currently available to substitute a-FRR in place of unmet FCR volume that will not be available once ENTSO-E rules apply, leading to the need to incentivize FCR over a-FRR in the market. Thus, key required changes include:

(a) Firstly, since battery storage has clear economic and environmental advantages to provide fast response reserves, an amendment to the Electricity Market Law (to make it inclusive of "storage") is needed to define the role of energy storage in the power system and to clarify the procedures for grid connection and rules of participation in different power markets. Additionally, changes allowing for revenue stacking (i.e. simultaneous participation of the same assets in several markets) will allow for adding revenue streams, and thus, making investments in battery storage more attractive while reducing the cost of auxiliary services for the TSO. Linked to this, amendments are needed to the Grid Code to define connection and performance requirements, recognizing the specific technical features that battery storage can provide so that it can compete with flexible thermal power plants.

(b) Secondly, the current ASM short-term market could benefit from design improvements to become more attractive to new players. The trading of the different products in the ASM is restricted by price caps that are similar for all products. This does not appropriately incentivize the limited number of market participants to get certified for FCR since the cost of providing this service is higher than others. Therefore, carefully planned modifications are needed in the current price caps to properly differentiate between ancillary service categories based on the cost of providing the service and the value of individual service categories to the grid.[26] New products, hourly blocks, and new contracting modalities are also being proposed as options to attract new participants. In order to define adequate incentives to guide private investments, the detailed reserves adequacy analysis must be completed. Once defined, the ASM rules will need to be amended to reflect the changes in the procurement processes and the regulatory changes to ensure that the market rules remain clear and consistent.

(c) Thirdly, the current methodology for measurement and monitoring of the provision of services needs to be modified. Monitoring at the busbar level does not give proper remuneration to the services and disincentivizes participation in the ASM. A more granular measurement would give providers proper remuneration for their services. Clear directives

[25] During the charging periods, batteries are not available. Therefore, there are some limitations in availability that need to be considered when defining performance requirements in the market.

[26] This issue has been partially addressed in the recent approval by the Anti-Monopoly Committee of Ukraine of the proposal submitted by NEURC to increase price caps for FCR and a-FRR around 35 percent, while reducing the caps for other reserves, but further work is needed to differentiate between FCR and a-FRR and to evaluate if the current market levels provide enough incentive to attract new investments.

on this aspect will make it possible for providers and off-takers of these services to operate transparently and on a level playing field.

(d) Finally, it is apparent that an analysis of business models with private sector participation is necessary to scale-up battery storage beyond the UHE project. Ukraine's specific needs for ancillary services, proper risk allocation, and considerations linked to market creditworthiness of the off takers should be considered.

C. Proposed Development Objective(s)

Development Objective(s) (From PAD)

To enhance the flexibility of the Ukrainian power grid to support synchronization with the European electricity grid and decarbonization of power sector

Key Results

28. PDO Level Result Indicators are as follows:

(a) Installed capacity of battery storage by public and private players (MW)

(b) Available Frequency Containment Reserve (FCR) amount (MW)

(c) Reduced variable renewable energy curtailment (GWh)

(d) Number of units (power plants/storage units) certified for trading in Ancillary services market (number)

D. Project Description

29. Component 1: Installation of Battery Energy Storage System (BESS) with solar PV plants, establishment of an Energy Management System (EMS), and Supervision Consultancy (estimated cost: US$ 249 million).

30. ***Subcomponent 1.1: BESS with PV plants and EMS for provision of ancillary services:*** This subcomponent will support installation of BESS and solar PV plants, and an energy management system. In total, 197 MW of lithium-ion BESS will be installed at four hydro power plant sites (Kiev, Kaniv, Kremenchuk, and Seredniodniprovska). Additionally, 35.9 MWp of solar PV plants will be installed. All facilities including connection power lines will be installed within the precincts of UHE's HPP territories. These sites are identified based on land availability and transmission capacities. The lithium-ion BESS will provide ancillary services to the grid, particularly FCR and a-FRR. Those BESSs will be under coordinated operation with HPPs through a newly installed EMS so that a wide range of grid services will be provided seamlessly. The total size of the lithium-ion BESS is determined to meet the FCR requirement for ENTSO-E synchronization and then allocated to each site. The proposed BESS will provide the necessary ancillary services to the grid, which will improve flexibility of UkrES. Therefore, the proposed investment will enable synchronization with the ENTSO-E and improve integration of VRE sources and will increase power system

reliability through creating the most reliable source of system flexibility that is not contingent on the availability of resources (water, coal, gas) and the working status (in/out of operation) of the provider. PV plants will be used mainly to supply electricity to the battery storage facilities and also cater to auxiliary consumption within the HPP facility. The PV plants will be developed and operated by UHE and not subject to the FiT scheme.

31. ***Subcomponent 1.2: E-mobility BESS with PV plant:*** This subcomponent will support installation of 15 MW of zinc-air BESS at Dniester HPP together with 28 MWp PV plant. The system will be used for charging of electric public transport vehicles (buses or trams) for the local community. This sub-component is an important tool for testing and progressing e-Mobility options for public transport in Ukraine. It will help prepare UHE and Ukraine's power grid for the upcoming convergence of power and transport sectors through increased use of electric vehicles. This sub-component will increase the knowledge of UHE in Zinc Air batteries that have a 4-hour charge-discharge cycle (unlike the 2-hour discharge cycle for Lithium-Ion BESS being used for the other four UHE project sites). It will give UHE the experience and head start in learning about and working with Zinc Air batteries as Ukraine prepares for EU integration with an increasing emphasis on decarbonization that involves lowering fossil fuel use in the power and transport sectors. The Bank Energy Team is collaborating closely with the WB Transport Practice in preparing the complementary transport work for this sub-component, and the agreement with UHE is to progress charging rates and practices towards the commercial range, once sufficient experience has been built.

32. ***Subcomponent 1.3: Supervision Consultancy:*** This subcomponent will support project supervision, management, coordination, and knowledge sharing activities that will build UHE's capacity and experience in advanced energy management, through hiring a reputable international consultant as an Owner's Engineer. As UHE has no prior experience with BESS, the support will be critical as the technology is new to UHE and evolving quickly.

33. **Component 2: Technical Assistance for UHE (estimated cost: US$ 1.0 million).** This Component will provide technical assistance to UHE on the following aspects: (i) Development of battery storage decommissioning/recycling procedures for UHE; (ii) Gender assessment of HR policies and practices at UHE, aimed at providing baseline understanding of factors influencing gender diversity and inclusion at UHE, and proposing specific recommendations for the company; (iii) Supervision, monitoring and implementation of the Environmental and Social (ES) Management tasks, including establishing and maintaining a Grievance Redress Mechanism (GRM); and (iv) capacity building for UHE.

34. **Disbursement Conditions**: The Project is designed to use Investment Project Financing (IPF) structure alongside some disbursement conditions that would be included in the legal agreement with the Borrower (UHE). UHE will then enter into an implementation agreement with MOE, that will coordinate to support the agreed milestones and report to the Bank on the completion of the disbursement conditions. Some disbursement categories will be linked to the disbursement conditions. Once each disbursement condition is achieved, the Bank will authorize the disbursement associated to the disbursement category. Several regulatory milestones have been discussed with the relevant counterparts, including MoF, MoE, and the regulator (NEURC). The regulatory milestones associated to the DCs will enable access of storage to the grid, its participation in the ASM and improvements in the ASM rules to promote new private investments. Completion of the studies linked to the definition of reserve adequacy using the European methodology could also be considered in order to inform market

incentives. Amounts linked to disbursement conditions are yet to be agreed with the counterparts, and detailed discussions the disbursement arrangements must be completed. The table below describes the disbursement conditions (DCs) agreed with the relevant parties.

35. These disbursement conditions are considered necessary to achieve the development objective of the proposed project. On one side, the legal and regulatory changes, once adopted, will enable the participation of the UHE project in the ancillary service market in a level playfield with other flexibility options. On the other side, the reforms will also enable private investments on storage by eliminating regulatory barriers and providing the key inputs to define future needs for flexibility and incentives for the markets to provide the required price-signals.

Table 1. Disbursement conditions

DC1	Submission to Parliament of the draft amendment of the Electricity law which enables to install and operate energy storage systems.
DC2	Draft "Market Rule" published in MoE website after consultations. Draft "Grid code" published in MoE website[27] after consultations.
DC3	Study on resource adequacy completed and validated by UE and published in UE website.
DC4	Methodology for monitoring ancillary services adopted.

[27] Any other dissemination way could be considered

Box 2. Bank Executed Technical Assistance

In parallel with the Project, the Bank will execute various analytical and advisory services to improve the ASM and facilitate private investments in battery storage. The Bank will support the Government and NEURC to address the regulatory and financial barriers described above. The Bank will also support establishment of the necessary regulatory framework in relation to safety and recycling of battery storage. The component will be executed by the Bank with support from trust funds. Estimated cost of the TA is US$ 1.15 million.

(a) **Support for revision of the draft law/regulation on "energy storage"** to define storage as a subset of generation or a special regulated asset that ensures a clear recognition of its capabilities and limitations (as generator and as load). The regulation should identify clear rules of prequalification to enable stacking of revenue streams for different battery storage applications (energy arbitrage, provision of auxiliary services, balancing services, etc.). This will enable the simultaneous participation of storage in the different segments of the ASM market and ensure adequate transposition of the European Directives to clarify the ownership and operating restrictions of TSO and DSO with respect to storage, and the clarification of the role of distributed storage (including residential, commercial industrial and EV charging infrastructure) in the provision of auxiliary services in the ASM. The regulation would also cover EV charging infrastructure, which would set the foundations for the creation of charging infrastructure networks in the country.

(b) **Assessment of best practices to be implemented for the Grid Code amendments to allow for increased flexibility in performance requirements, so that electric storage can participate in the balancing market**. Amending the Grid Code will provide the additional operational flexibility needed by utility-scale batteries to enable them to participate in the balancing market since, unlike other generators, they need time to re-charge after supplying energy.

(c) **Support ongoing initiatives to improve the performance of the short term ASM,** including defining new services/products, increasing price caps, adding granularity to the market by allowing for hourly blocks, and creating a clearinghouse mechanism to provide greater certainty around supply of services bid. This will allow for the recognition of the higher value of some services, such as fast response, in which batteries are highly competitive. Linked to the ASM performance, support will be provided for the development of a methodology for monitoring provision of ancillary services at the unit level (as against busbar) to properly monitor quantity and quality of the service provision through UE's SCADA and to recognize various services provided from each unit. This will allow for adequate revenue calculations.

(d) **Assessment of suitable business models to increase private sector participation in storage projects at transmission and distribution level**, building on prior analysis by IFC. The IFC analysis shows the potential to use long-term capacity contracts as a way to attract private sector investments in the short term. Further analysis is required to identify the legal and regulatory changes that would enable implantation of such mechanism in a clear and transparent manner, and the adequate risk allocation and risk mitigation measures considering the Ukrainian context. Designs should support the market and be consistent with the European directives and State-aid rules. Other alternatives could involve incentivizing the addition of battery storage project to existing and new RE projects, and its subsequent participation in the balancing and ASM markets.

(e) **Capacity building activities that strengthen regulation and operation of energy storage**, including participation of stakeholders in international conferences linked to ASM development. This will increase the overall understanding of the capabilities of storage and regulatory measures to incentivize its use in a manner consistent with national objectives.

Legal Operational Policies

	Triggered?
Projects on International Waterways OP 7.50	No
Projects in Disputed Areas OP 7.60	No

Summary of Assessment of Environmental and Social Risks and Impacts

The Project will install battery storages and PV generators arrays within current footprint of the UHE facilities (hydro-power plants). The project environmental and social risks are both rated as 'Moderate'.
Although the implementing entity has some experience with working with IFI supported projects, they have no or limited capacity in applying the Environmental and Social Standards. As this is one of the first projects in the energy sector prepared under the Bank's new Environmental and Social Framework (ESF), the Borrower's capacity to deliver an ESF based project is limited; therefore, capacity building training for the client including engaged agencies and contractors will be conducted by the Bank's Environment and Social team during project preparation and implementation.

E. Implementation

Institutional and Implementation Arrangements

36. The Project is structured as an Investment Project Financing (IPF) with disbursement conditions. A loan agreement between Ukraine and the Bank will be signed for the IBRD portion of the loan. A separate legal agreement will be signed for the CTF loan (and up to USD 1 million grant, tbc). Disbursement Conditions will be included in the Loan Agreement with the Borrower and the Disbursement and Financial Information Letter. UHE and MoE will enter into a collaboration agreement. All the relevant stakeholders involved in the regulatory milestones linked to the disbursement conditions should participate in project negotiations.

37. Component 1 will be implemented by the joint-stock state-owned hydro power production company, Ukrhydroenergo. UHE has experience in working with the World Bank and other IFIs, such as EBRD, including on the World Bank's Hydro Power Rehabilitation Project (2005-2016). It has a qualified project manager, procurement specialist, financial manager, environmental and social specialists, project accountants and an OHS specialist. A dedicated Project Management Unit (PMU) will be created with UHE Staff and external consultants to execute the tasks under the proposed Project.

38. Project Operational Manual (POM). To ensure a smooth implementation process, UHE will prepare and adopt a POM. The completion and adoption of the POM will be a condition of effectiveness for the Project. The POM will describe detailed arrangements and procedures for: (a) institutional coordination and day-today execution of the Project; (b) project budgeting, disbursement, and financial management (FM); (c) procurement; (d) monitoring and evaluation (M&E), reporting, and

communication; and (e) any other administrative, financial, technical, and organizational arrangements and procedures that will be relevant for project implementation.

39. Component 2 will also be implemented by UHE. The TA will be implemented by UHE with potential funding support from CIFF and CTF. The Subsidiary Agreement between MoF and UHE will make explicit the responsibilities of UHE to implement Component 1, as well as Component 2.

40. The Bank is proposing to define several regulatory milestones as disbursement conditions. Once each of the milestones is achieved, the project can authorize disbursements against the associated category of disbursement.

41. Responsibility of Disbursement conditions lies with MoE, which can be bound by a collaboration agreement between MoF and MoE to ensure implementation of the measures.

42. The Bank executed TA will support NEURC and MoE to improve the ASM and facilitate private investments in battery storage. This TA will be funded by trust funds, including ESMAP, and implemented by the Bank. The BETF TA will support the power sector stakeholders to meet the disbursement conditions.

CONTACT POINT

World Bank

Silvia Martinez Romero
Senior Energy Specialist

Koji Nishida
Senior Energy Specialist

Sandeep Kohli
Senior Energy Specialist

Borrower/Client/Recipient

Ministry of Finance of Ukraine

Implementing Agencies

PJSC “Ukrhydroenergo"
Ivan Zhdanov
Director of the II stage of Rehabilitation Project
i.zhdanov@uhe.gov.ua

FOR MORE INFORMATION CONTACT

The World Bank
1818 H Street, NW
Washington, D.C. 20433
Telephone: (202) 473-1000
Web: http://www.worldbank.org/projects

APPROVAL

Task Team Leader(s):	Silvia Martinez Romero Koji Nishida Sandeep Kohli

Approved By

Practice Manager/Manager:		
Country Director:		