Rebuilding Energy in Ukraine

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More than half of energy facilities in Ukraine damaged, with largest share in power sector

• As of February 24, 2023, the cumulative damage to power, gas, heating infrastructure, and coal mining has now exceeded US$10 billion.

• Among these sectors, the power sector has borne the brunt of the damage, accounting for nearly US$6.5 billion damages.

• Ukrenergo’s substations targeted, particularly transformers, causing extensive electricity disruptions downstream.

• Damages on Ukrhydroenergo’s Kakhovka HPP dam caused serious economic and environment impacts.
World Bank Group has mobilized $38 billion to support Ukraine, with $29 billion disbursed

• Most of the financial support has been provided for public expenditures through the PEACE project*.

• The multi-donor trust fund, URTF**, has been supporting Ukraine’s recovery and reconstruction and reform particularly in the energy sector among others (transport, health, housing and agriculture).

• WB also support the government’s reforms through the Ukraine Relief and Recovery DPL***.

* Public Expenditures for Administrative Capacity Endurance project
** Ukraine Relief, Recovery, Reconstruction and Reform Trust Fund
*** Development Policy Loan
Ukraine needs large amount of energy storage

**Energy storage systems**

- **+38 GW of new capacities**
- **$25 bn investment**

Construction new **38 GW** of energy storage plants of various capacities

**Increase of capacity** for frequency **maintenance reserve** and automatic **frequency recovery reserve**

A large number of **energy storage systems** is due to a considerable number of solar power plants

Source: Ukraine Ministry of Energy’s presentation at London Ukraine Recovery Conference on June 21, 2023
Technical Assistance Program funded by KGGTF has supported energy storage market development

- Analysis on battery storage use case for grid stability
- Industrial tours to dialogue with Korean partners on energy storage and substation equipment to help Ukraine's restoration and reconstruction
- Assessment of suitable business models to increase private sector participation in battery storage projects
- Capacity building activities on energy storage regulations and business models
- Preparation of sustainable heating roadmap for Ukraine
Grid stability analysis confirmed battery can support further increase in export capacity

- Battery devices with Power Oscillation Damper function can provide improvement in damping of inter-area modes.
- The analysis result was presented by UE to ENTSO-E.
- Together with other countermeasures on generators, it can ensure power export up to around 1.5 GW under light load conditions without compromising inter-area oscillation stability.
Study Trip to Korea conducted in July 2023

The study trip was instrumental for Ukrainian delegation for learning and strengthened cooperation. Particularly the following topics were discussed.

• Technical specifications for procurement and supply chain considerations

• Korean experience with storage and incentives and performance of battery storage

• Opportunities to support Ukraine energy sector during reconstruction phase
WB finances 200MW utility scale battery storage for frequency regulation services for Ukrhydroenergo

<table>
<thead>
<tr>
<th>Plants</th>
<th>BESS Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kyiv HPP</td>
<td>46 MW</td>
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<tr>
<td>Kaniv HPP</td>
<td>66 MW</td>
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<tr>
<td>Kremenchuk HPP</td>
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<td>Seredniodniprovska HPP</td>
<td>25 MW</td>
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Future Collaboration

• Continuous financial and technical support from Korean Government and KEPCO for energy companies in Ukraine
• EPC and manufacturing opportunities on energy equipment including transformers for Ukrenergo and battery storage for Ukrhydroenergo
• Investment opportunities for Korean investors in various developments including energy storage and renewable energy in the reconstruction phase
• Capacity building and training by Korean partners on energy storage, digitalization, renewable, electricity market etc
Conclusion

• Ukraine needs continuous financial and technical support to restore and rebuild the energy infrastructure in view of building back better and green growth.

• Large amounts of renewable energy and energy storage need to be deployed for energy sector decarbonization.

• Many opportunities for Korean partners through technical assistance and financing.
KOREA GREEN INNOVATION DAYS

KGID CAIRO