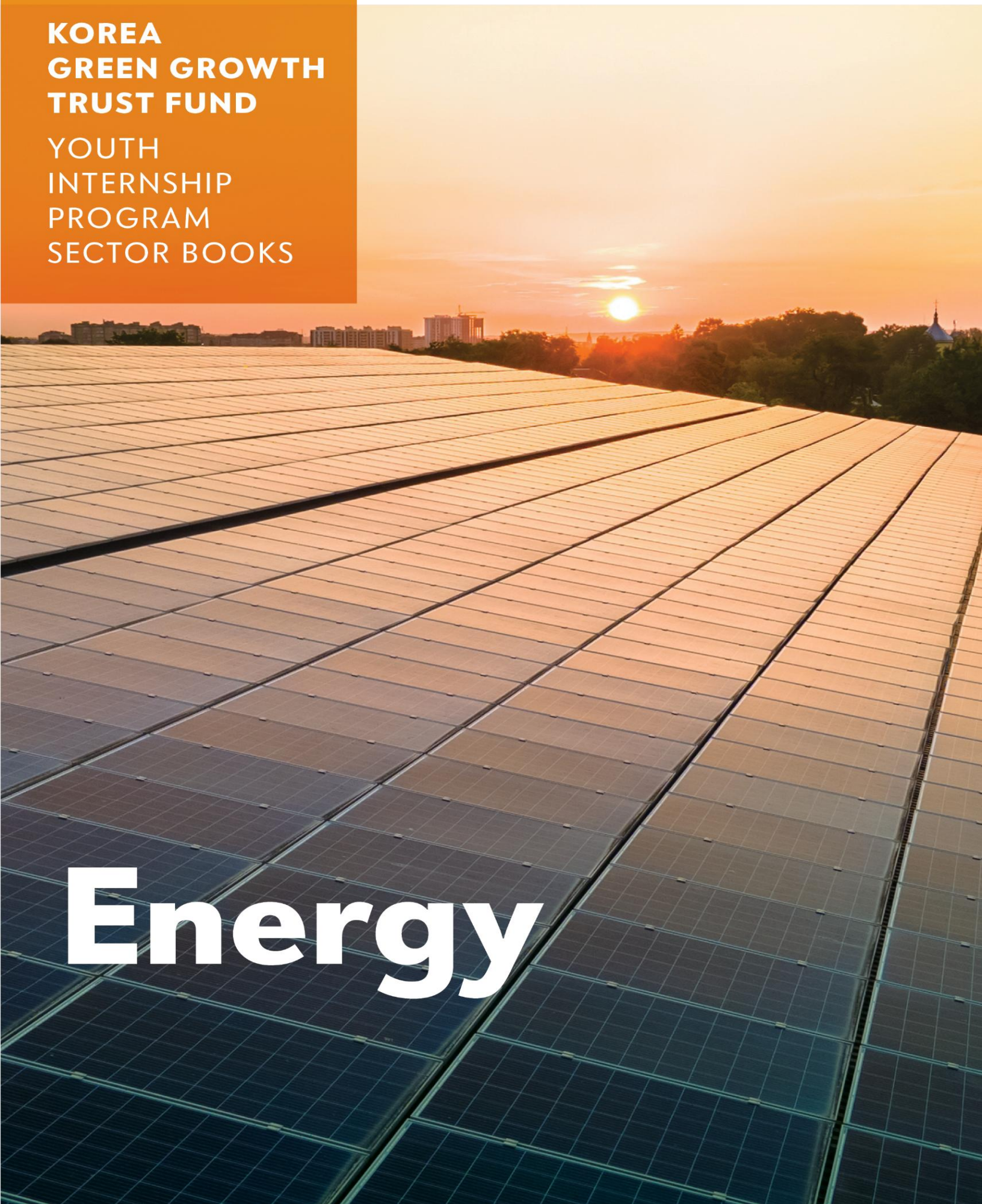
WORLD BANK GROUP

KOREA GREEN GROWTH TRUST FUND

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YOUTH INTERNSHIP PROGRAM SECTOR BOOKS



Energy

The original draft of this sectoral portfolio book was authored by the second internship cohort (**Nayim Lee, Sejin Kim, Geunhee Kim**) and later revised and updated by the third (**Hangyeol Kim, Juwon Keum**) cohort.

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Korea Green Growth Trust Fund (KGGTF)

Energy Portfolio Book

Introduction

The energy sector is fundamental to sustainable development, economic opportunity, and climate resilience. It powers industries, sustains livelihoods, and enables essential services in healthcare, education, and transportation. Expanding access to reliable and affordable energy raises living standards, creates jobs, accelerates digitalization, and fosters inclusive growth. Yet 675 million people still live without electricity, while another 450 million experience unreliable power, constraints that perpetuate poverty and heighten economic vulnerability.

The World Bank Group is one of the largest financiers of energy development globally, supporting countries in delivering affordable, reliable, and sustainable solutions. Over the past decade, it has committed nearly $100 billion to the energy sector and provided access to electricity for 171 million people globally in FY24. Through initiatives such as Mission 300, the Bank Program Goals to connect 300 million people across Africa by 2030, working with governments, the private sector, and development partners to expand access, strengthen utilities, and mobilize investment for clean energy.

Despite this progress, major challenges remain. Outdated infrastructure, limited financing, and regulatory hurdles slow the energy transitions in many countries. Continued reliance on fossil fuels worsens environmental pressures, while rising exposure to extreme weather events threatens energy security. At the same time, developing countries capture only a small share of global energy investment, leaving millions in energy poverty and slowing momentum toward universal access and decarbonization.

Looking ahead, key priorities include scaling up renewable energy, improving efficiency, and modernizing power systems to meet rising demand while reducing emissions. Investment in smart grids, battery storage, and distributed generation will be essential for advancing clean transitions. Equally critical are regulatory frameworks deeper regional integration, cross-border power trade, and digital innovations for demand management, all central to building resilient and sustainable energy systems.

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Korea Green Growth Trust Fund's Role

The Korea Green Growth Trust Fund (KGGTF) serves as a catalyst for advancing energy solutions. Its grants drive innovation, build institutional capacity, and enable systems-wide reforms that expand electricity access, scale renewable energy, and promote integrated energy planning. By leveraging Korean expertise and fostering regional knowledge exchange, KGGTF accelerates clean energy transitions, supporting inclusive growth and more resilient energy systems in client countries.

Why Korea?

Korea's remarkable transformation from aid recipient to a global innovation leader is a powerful testament to what can be achieved with bold vision and effective policies. In just a few decades, the country lifted itself from poverty to prosperity by harnessing science, technology, and human capital to drive inclusive growth and sustainability. This journey, anchored in strategic policymaking and relentless innovation, offers a compelling blueprint for countries seeking to leapfrog development challenges and build resilient, future-ready economies.

Through the Korea Green Growth Trust Fund (KGGTF), Korea now shares this experience with the world—connecting proven policies innovative technologies, and institutional expertise with World Bank teams and client countries.

KGGTF Energy Strategic Priorities

The Korea Green Growth Trust Fund (KGGTF) has continually evolved its energy sector strategy to reflect global trends, national priorities, and technological advancements. In its early years, the focus was on foundational needs: expanding electricity access, scaling renewable generation (solar, wind, hydropower), and reinforcing grid infrastructure in countries grappling with energy poverty. These investments laid the groundwork for cleaner energy systems that reduced emissions, boosted productivity, and improved quality of life.

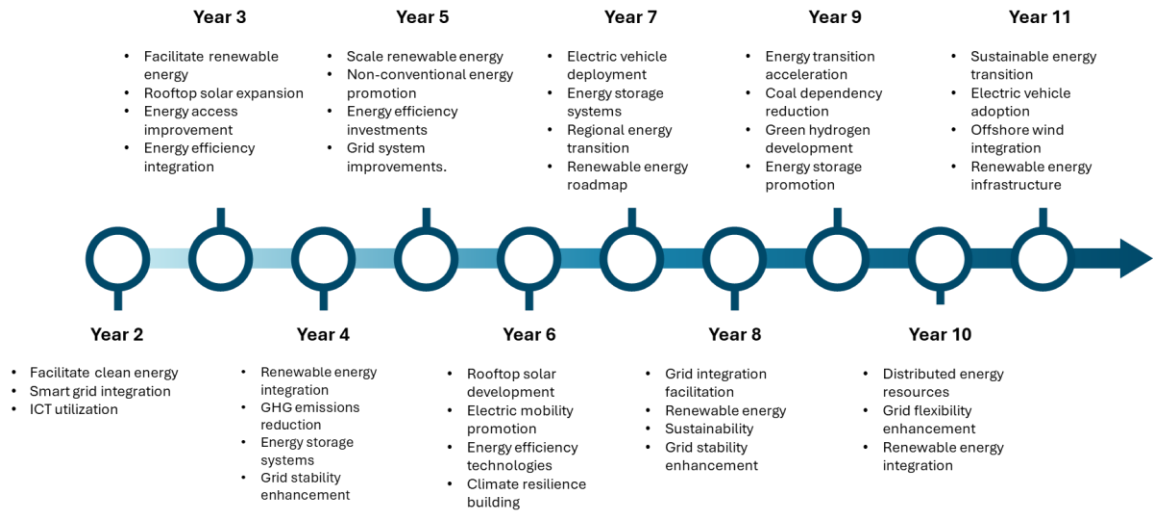
As the global energy transition accelerates—driven by sustainability imperatives, digital disruption, and the demand for resilience—KGGTF has shifted toward integrated and future-ready solutions. Its current energy grants focus on five core priority areas:

- **Decentralized and Resilient Energy Systems**: Expanding mini-grids, off-grid technologies, and distributed renewables to enhance access and strengthen energy security in underserved regions.
- **Smart and Digital Infrastructure**: Advancing energy management systems, smart grids, and real-time data tools to enhance efficiency, reliability, and demand-side responsiveness.
- **Storage and Grid Flexibility**: Investing in battery systems, pumped hydro, and grid-balancing mechanisms to support the integration of variable renewables and adaptive grid capacity.

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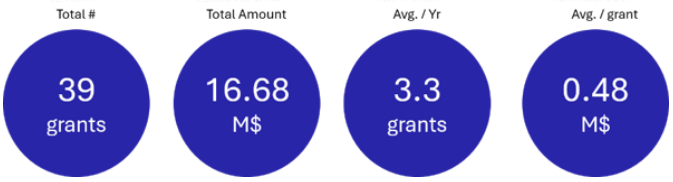
- **Low-Emission Mobility and V2G**: Accelerating electric vehicles adoption and vehicle-to-grid innovations to reduce transport emissions while enhancing grid stability.
- **Emerging Clean Technologies**: Exploring green hydrogen, advanced fuels, and sector-coupling innovations to support deep decarbonization and industrial transitions.

Together, these priorities underscore KGGTF's commitment to building energy systems that are resilient, inclusive, and future-focused. By connecting Korea's innovation with country-led development goals, KGGTF continues to catalyze energy transitions that are scalable, equitable, and transformative—contributing directly to the Sustainable Development Goals, especially SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action)



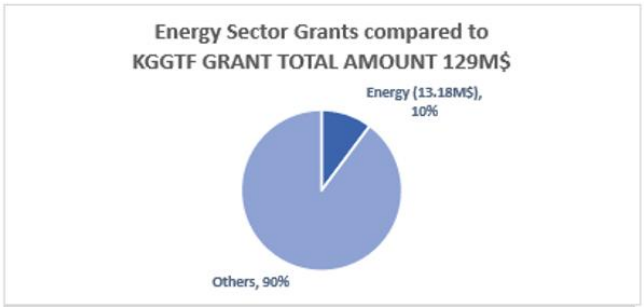
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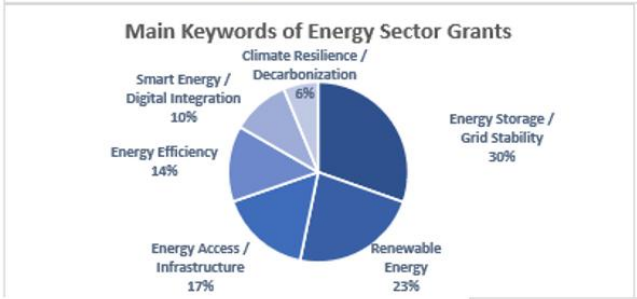
KGGTF Energy Portfolio Snapshot

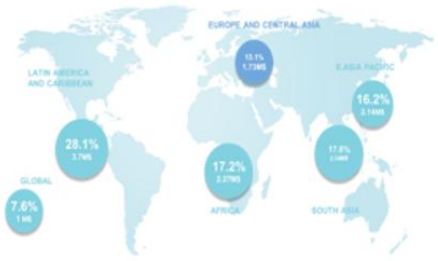


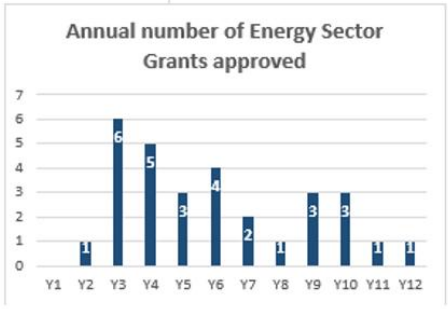
List of Client Countries / Region

Bangladesh
Benin
Burkina Faso
China
Cote d'Ivoire
Ecuador
El Salvador
Ethiopia
Gambia
Ghana
Global
Guatemala
Guinea
Guinea Bissau
Haiti
Honduras
India
Indonesia
Liberia
Mali
Moldova
Mongolia
Nicaragua
Niger
Nigeria
Palau
Panama
Pakistan
Peru
Philippines
Senegal
Sierra Leone
Sri Lanka
Togo
Turkey
Ukraine
Uzbekistan
Vietnam









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How KGGTF Supports Bank Teams

KGGTF energy grants contribute directly to the global energy transition by tackling some of the sector's most urgent challenges—from modernizing grids and integrating renewables to expanding access and driving institutional reform. These efforts combine policy development, technical assistance, capacity building, and pilot implementation to enable scalable, resilient, and sustainable energy solutions.

1. Strengthening Institutions and Enabling Policy Reform

KGGTF has supported governments and utilities in developing robust regulatory frameworks, strengthening institutions, and building stakeholder engagement. Through technical training, feasibility assessments, and advisory services the Trust Fund equips policymakers and practitioners with the tools needed to plan, implement, and sustain long-term energy reforms.

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Case Study: Regional E-mobility and Battery Storage Technical Assistance for Pacific Island Countries (AR 2022)

Pacific Island Countries (PICs) face some of the world's highest electricity prices—ranging from 20 to 80+ US cents per kWh—driven by reliance on imported fuels, outdated systems, and limited energy planning capacity. With small and isolated grids, integrating renewable energy poses risks of instability unless paired with battery storage and advanced system management. At the same time, shifting to cleaner transport is critical to reduce fuel imports and achieve sustainability targets.

To address these dual challenges, the KGGTF supported a regional programmatic technical assistance (TA**)** combining e-mobility adoption with battery storage integration. Implemented with the Pacific Power Association (PPA) the program strengthened energy planning, identified bankable investment pathways, and introduced policy and regulatory frameworks to guide greener and more sustainable development across the Pacific.

Key Activities

- **Knowledge Exchange Program**s: 27 participants from 10 PICs (including Palau, Samoa, Vanuatu, Tonga, Tuvalu) engaged with 8 Korean organizations such as Korea Electric Power Corp. (KEPCO), Jeju Research Institute (JRI), and Korea Institute of Energy Research (KIER), learning practical lessons from Korea's energy transition.
- **Jeju Living Case Study:** Delegations studied Jeju Island EV deployment, battery storage, and carbon-free island initiatives, through site visits to the KEPCO ESS/RE Control Center, Tamla offshore wind farm, Gphilos hydrogen facility, and local e-bus charging sites.
- **Regional Policy Development**: Drafting of a regional e-mobility policy framework and technical guidelines for BESS deployment tailored to small island grids, including financing approaches and PPP structures.
- **Capacity Building Workshops**: Training sessions during the 25th Micronesian Island Forum highlighted how IPPs and PPAs can modernize outdated systems and attract private investment in renewable energy.
- **Research and Publications**: A reference study, *Battery Energy Storage System Development in Pacific Island Countries*, was produced with the Coalition for Our Common Future, incorporating Korean case studies.

This program significantly advanced the understanding of e-mobility and storage solutions in the Pacific, enabling countries to design policies and frameworks that support renewable energy expansion. It also mobilized partnerships between local utilities, Korean agencies, and the World Bank, creating a regional knowledge

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platform for future investment. Inspired by this program**,** Mongolia is now exploring a similar approach, demonstrating the program's broader influence.

Most importantly, the initiative demonstrated how integrated approaches—linking clean transport, battery storage, and renewable energy—can reduce dependency on imported fuels while strengthening energy security and affordability for vulnerable island economies.

"The in-person learning exchange on Jeju Island provided us with a comprehensive overview of how to transition both the energy and transport sectors. The lessons on battery storage and EV deployment are directly relevant to the Pacific context." — *Regional Energy Committee, Micronesian Island Forum*





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Case Study: Green Jobs through Resource Efficiency, Renewable Energy, and Waste Management in Haiti's Industrial Parks (AR 2024)

Haiti's industrial parks—particularly those supporting the garment sector—play an important role in the national economy, contributing significantly to exports, employment, and GDP. However, prolonged political instability, gang violence, and regulatory constraints have severely disrupted industrial operations. Many firms have reduced working hours, increased security expenditures, or suspended activities altogether, resulting in prolonged inactivity and job losses across industrial parks and free trade zones.

In this context, the KGGTF supported a programmatic initiative aimed at strengthening sustainability and resilience in Haiti's industrial parks through enhanced resource efficiency, renewable energy deployment, and improved waste management. The program focused on stabilizing industrial activity, promoting green job creation, and supporting the adoption of more sustainable industrial practices.

Key Activities

- **Resource Efficiency Improvements:** Promotion of renewable energy solutions within industrial parks, alongside improvements in water resource management, wastewater treatment systems, and solid waste management practices to reduce environmental impacts and operational costs.
- **Transition to Eco-Industrial Parks (EIPs):** Support for sustainable infrastructure upgrades and strengthened park management systems aligned with international Eco-Industrial Park standards, aimed at improving operational efficiency and resilience.
- **Policy and Regulatory Support:** Provision of technical assistance and policy recommendations to strengthen regulatory frameworks and improve the investment environment for sustainable industrial development.
- **Application of International EIP Frameworks:** Utilization of the Practitioner's Handbook for Eco-Industrial Parks, developed by the World Bank, MOTIE (Korea), UNIDO, and GIZ, to guide the integration of cleaner production methods, risk management practices, and high social and environmental standards into industrial park operations.
- **Targeted Action Planning:** Development of action plans for the Parc Industrial de Caracol (PIC) and the Metropolitan Industrial Park (PIM), including the identification of priority investment opportunities and supporting cash-flow analyses.

Through the program, a comprehensive assessment of Haiti's industrial parks was conducted, and targeted action plans were prepared for priority sites. These efforts identified concrete opportunities for renewable energy deployment, improvements in

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water and wastewater systems, solid waste management solutions, enhanced building resilience, and job training initiatives. Capacity-building activities and knowledge-sharing efforts further strengthened collaboration among government agencies, industrial park operators, and private stakeholders.

Most importantly, the program demonstrated that transitioning to Eco-Industrial Parks can help safeguard existing employment, create new green jobs, and improve investment attractiveness, even in a fragile and conflict-affected context. By aligning with the World Bank's PSJET project and supporting micro, small, and medium-sized enterprises (MSMEs) through improved access to sustainable practices, business development services, and financing, the initiative is contributing to a more resilient, inclusive, and sustainable industrial economy in Haiti.



2. Piloting Innovation and Demonstrating Viability

By funding high-impact pilot projects, KGGTF enables countries to test advanced technologies and reduce the risks of early adoption. These proof-of-concept initiatives drive innovation in battery storage, distributed generation, and digital energy management—creating the foundation for replication and scale-up through national programs and World Bank financing.

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Case Study: Transforming Mobility and Energy Storage for a Sustainable Future in Mongolia (AR 2024)

Mongolia's power system faces urgent challenges in meeting peak demand, integrating renewable energy, and reducing dependence on coal. With support from KGGTF, the country launched an initiative to accelerate e-mobility adoption and advance battery energy storage systems (BESS), laying the foundation for a more sustainable, resilient, and diversified energy future.

The program combined two complementary grants: one to develop an E-Mobility Strategy for Ulaanbaatar and another to assess the potential of Battery Energy Storage Systems (BESS)**.** Together, they delivered technical analysis, policy guidance, and international partnerships to modernize Mongolia's transport sector and strengthen its power system for renewable integration.

Key Activities

- **E-Mobility Readiness Assessment** identified barriers to EV uptake and conducted multi-criteria analysis across vehicle segments.
- **E-Mobility Roadmap** delivered 31 actionable recommendations, covering market development, regulatory reforms, charging infrastructure, and smart tariff design.
- **BESS Potential Assessment Report** evaluated tariff frameworks, investment incentives, and technical options to stabilize the grid.
- **Feasibility Studies and Knowledge Exchanges** benchmarked best practices from Korea and Australia, while training 50 policymakers on BESS and EV integration.
- **International Collaboration** connected Mongolia with Korean institutions including National Institute of Green Technology (NIGT), Korea Transport Institute (KOTI), KEPCO, and Korea Power Exchange (KPX), providing policy and technical insights for long-term reforms.

One of the most transformative outcomes was the mobilization of major World Bank and government investments. **The KGGTF grants influenced the $100 million Ulaanbaatar Sustainable Urban Transport Project**, improving urban mobility through integrated corridors, sustainable public transport, and institutional reforms. The program also **shaped the $47 million Third Energy Sector Project**, which expands Mongolia's transmission grid to support large-scale renewable energy integration.

Korean partners played a pivotal role by sharing advanced experiences in smart grids, low-carbon transport, and BESS tariff design**,** directly informing Mongolia's policy frameworks. Insights from Jeju's energy transition initiative and Australia's

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competitive energy model provided critical business case benchmarks for scaling investment.

The KGGTF grants were catalytic, mobilizing $47 million in World Bank lending and $840,000 in co-financing**,** with a leverage effect of $235 for every $1 of grant support**.** By embedding e-mobility and energy storage into Mongolia's development agenda, they positioned the country to advance sustainable urban transport, enhance grid reliability, and strengthen long-term energy security.

Quotes

"The study on Battery Energy Storage Systems (BESS) for Mongolia, funded by the KGGTF initiative, was highly informative and useful to the client. BESS play a crucial role in Mongolia's energy transition, ultimately playing a role in meeting their nationally determined contributions (NDCs)." — *Barsha Pandey, Energy Specialist, World Bank*

"The KGGTF also supported developing tariff structures for BESS dispatch. Properly designed tariffs can incentivize the adoption of BESS by making it economically viable for both utilities and consumers." — *Mr. Gansukh Myagmar, Sr. Expert, Ministry of Energy of Mongolia*

3. Informing and Leveraging World Bank Lending

KGGTF grants often serve as upstream enablers for World Bank lending, providing the technical groundwork, policy diagnostics, and stakeholder engagement necessary to design and de-risk large-scale investments.

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Case Study: Leveraging Korea's Expertise in Battery Storage for Ukraine's Energy Sector (AR 2023)

The war in Ukraine has caused catastrophic damage to the country's energy system with estimated losses now reaching over $10.6 billion, a 61% drop in generation capacity, and 12 million people left with limited or no access to electricity. With 22 of the country's 36 power plants compromised and heating infrastructure severely affected, Ukraine faces an urgent need not just to rebuild, but to create a more resilient, sustainable, and EU-aligned energy future.

The Korea Green Growth Trust Fund (KGGTF) is helping meet this challenge by channeling Korean expertise in battery energy storage systems (BESS) and renewable integration. The program aims to strengthen Ukraine's power system resilience by expanding renewable energy, introducing BESS, refining regulatory frameworks, and developing business models that mobilize private investment, all while advancing Ukraine's synchronization with the European grid.

Key Activities

- **Business Model Assessment**: Expert studies to identify viable investment cases for battery storage to attract private sector participation.
- **Knowledge Exchange**: 14 officials from the Ministry of Energy, Ukraine, and Ukrhydroenergo visited Korea to engage with KEPCO and other institutions, gaining practical lessons on advanced battery storage technologies, transformers, and grid integration.
- **Workshops and Training**: Series of capacity-building activities on energy storage regulations, market design, and operational best practices.
- **Technical Assistance to Ukraine hydroenergo** (UHE)**:** Guidance on battery recycling, equitable HR policies, grievance redress mechanisms, and environmental and social safeguards.
- **Feasibility Analysis**: Studies on BESS applications for grid stability, e-mobility integration, and heating options.

The KGGTF program directly influenced $215–250 million in World Bank lending and $38 million in co-financing, for BESS and solar PV plants integrated with energy management systems (EMS). These investments will expand ancillary services, strengthen Ukraine's transmission capacity for enable renewable integration while also supporting e-mobility adoption.

Collaboration with Korea has been pivotal. Institutions such as KEPCO and Korea's Ministry of Trade, Industry and Energy (MOTIE) shared expertise on tariff design, scaling battery storage, and transitioning from nuclear and coal toward renewable systems. Lessons from Korea's large-scale BESS deployment and Australia's

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competitive energy markets provided critical benchmarks for Ukraine's reconstruction planning.

By embedding modern energy storage solutions and building institutional capacity, KGGTF has laid the groundwork for Ukraine's green recovery and integration into the European power grid. Beyond restoring electricity access for millions, the program is helping create the technical, financial, and policy conditions for long-term energy independence.

"This is one of the most innovative projects that the World Bank is launching in the Europe and Central Asia region. It will help Ukraine integrate its power system with the European power grid, reduce the influence of vested interests, and contribute to the achievement of a more energy independent Ukraine." — *Arup Banerji, World Bank Regional Country Director for Eastern Europe*





4. Accelerating Cross-Regional Learning and Collaboration

KGGTF facilitates knowledge exchange between countries, regions, and technical institutions, fostering a shared understanding of best practices in energy transition and low-carbon development. These efforts help replicate successful models and accelerate adoption.

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Case Study: Strengthening Utility Capabilities through Capacity Building and Peer Knowledge Exchange

In Sub-Saharan Africa, millions still lack access to reliable electricity, and many existing networks often operate below design capacity due to insufficient technical expertise. Renewable plants and battery systems are often curtailed, while transmission and distribution assets deteriorate from limited maintenance. These gaps undermine the integration of clean power, weaken resilience, and constrain growth.

To address these systemic challenges, KGGTF supported a grant aimed at strengthening the operational and planning capacity of utilities. The program embedded green growth principles into system operations, ensuring utilities were better prepared to expand renewable energy while maintaining reliable supply. It responded directly to the urgent need for skilled engineers and planners to modernize Sub-Saharan Africa's grids.

Key Activities

- **Technical Training for Utilities**: Hands-on training for utility staff and regulators across West African Power Pool (WAPP) member countries, introducing modern approaches to system planning, grid resilience, and round-the-clock reliable supply.
- **Operational Capacity Building**: Workshops demonstrated how to maximize existing infrastructure, manage renewable integration, and operate networks efficiently, drawing on international best practices such as ultra-high voltage transmission.
- **Policy and Strategy Development**: Supported reforms at both the utility and regional level, shifting procurement and planning practices toward more efficient, and resilient operations.
- **Knowledge Exchange** Partnerships with the Korea Power Exchange (KPX) and Korean National Committee of International Council on Large Electric Systems (CIGRE) exposed operators to cutting-edge approaches to loss reduction, system reliability, and grid economics.

Outcomes

Utilities across the WAPP region adopted new planning and procurement policies, while operators began incorporating resilience and reliability into daily decision-making. Training created a pool of skilled engineers immediately capable of tackling utility-scale challenges, while shifting mindsets: participants increasingly recognized how uninterrupted supply boosts businesses and how network redundancies can prevent costly outages.

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KGGTF's support also mobilized approximately $60 million in World Bank lending, including for the Côte d'Ivoire, Liberia, Sierra Leone and Guinée (CLSG) Interconnector and the North Core Regional Interconnector, which will now be managed by trained operators applying resilient and green principles. The training curriculum developed through this program is replicable and will continue through KPX and other partners, even beyond World Bank support.

By embedding Korean expertise in advanced grid management and strengthening local institutional capacity, the program has positioned Sub-Saharan utilities to integrate renewable power, reduce losses, and expand reliable access—laying the foundation for inclusive and sustainable growth.

"Deep change of mind of the participants at the training made us dream and comfort us in the 'Yes, we can'." — *Dr. Sirandi Moraogue, Director of Electrical System Operations, HV Transport Networks, SONATREL*







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Notable Innovations and Delivery Methods

KGGTF's energy portfolio features a range of innovative technologies and delivery approaches tailored to the complex challenges of decarbonizing and modernizing energy systems. These innovations prioritize digitalization, decentralization, resilience, and climate-smart integration, enabling countries to build sustainable and adaptive energy infrastructure.

Notable Innovations

• Smart Grid and Digital Energy Management Systems: Enable real-time system monitoring, automated load balancing, and enhanced grid stability through digital controls and analytics.

• Battery Energy Storage and Vehicle-to-Grid (V2G) Technologies: Improve grid flexibility and support renewable integration by storing excess energy and feeding it back during peak demand.

• Decentralized Energy Systems and Microgrids: Provide localized, low-carbon power solutions that reduce transmission losses and increase energy access in rural and off-grid areas.

• Data Analytics and Geographic Information System (GIS) Tools: Support evidence-based energy planning by forecasting demand, mapping infrastructure, and assessing climate risks.

Types of Delivery Approaches

• Knowledge Exchanges: Facilitate peer learning through policy dialogues, technical workshops, and peer collaboration to strengthen institutional capacity.

• Technical Assistance and Advisory Services: Deliver tailored guidance on energy system design, regulatory reform, and technology deployment to support policy and implementation readiness.

• Pilot Projects: Allow for testing and refinement of emerging energy solutions such as smart grids, storage systems, and decentralized generation.

• Regional Learning Platforms and Digital Training: Promote continuous learning and cross-country exchange through online courses, toolkits, and practitioner networks.

By pairing frontier technologies with flexible delivery models, KGGTF enables countries to implement scalable solutions that strengthen resilience, meet local priorities, and align with global development goals.

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Case Study: Renewable Energy Scale-Up to Support Green Growth in Pakistan (KGGTF K-113)

Pakistan faces rapidly growing electricity demand while relying heavily on imported fuels and new coal-fired power plants. Although the country has vast renewable energy potential, inadequate technical standards, weak institutional capacity, and grid integration challenges pose significant barriers to scaling solar PV. Without intervention, early solar projects risk inefficiency and curtailment, undermining long-term support for renewable deployment.

The Korea Green Growth Trust Fund (KGGTF) supported a comprehensive technical assistance and capacity building program to help the Government of Pakistan establish a clear strategy for solar expansion. The grant focused on preparing large-scale solar PV investments, piloting distributed renewable solutions, and strengthening institutions to implement policies that support sustainable energy growth.

The grant's activities included:

• Utility-Scale Solar PV Preparation: Designed two projects demonstrating conjunctive use with hydropower and wind, leveraging Pakistan's diverse resources and available land.

• Rooftop PV Pilot Program: Prepared a grid-connected rooftop initiative in Karachi, in collaboration with K-Electric, to institutionalize distributed solar adoption.

• Off-Grid Rural Electrification: Developed a renewable-based rural program with the Agha Khan Development Network (AKDN), targeting energy access in underserved communities.

• Technical Assistance and Capacity Building: Strengthened siting, interconnection, technical design, and operational standards while training government officials, utilities, and engineers.

The outcomes have been significant. By addressing early-stage risks of poor siting and integration, the program ensured higher efficiency and reliability of solar deployment, particularly in Sindh province. It enhanced Pakistan's resilience by diversifying the energy mix away from hydropower dependency and imported fuels, protecting against climate risks and fuel price volatility. The initiative also improved

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competitiveness by reducing emissions, creating new jobs, lowering healthcare costs from air pollution, and laying a foundation for inclusive green growth.

Collaboration was central to the program. Korean partners including The Export-Import Bank of Korea (KEXIM), Korea Hydro and Nuclear Power Co. Ltd. (KHNP), and Korea South-East Power Co. (KOEN) shared expertise alongside Pakistan's Ministry of Water and Power, Sindh Department of Energy, Water and Power Development Agency (WAPDA), Alternative Energy Development Board (AEDB), the City Government of Karachi, K-Electric, and AKDN. Together, these institutions advanced a bankable renewable energy pipeline for both utility-scale and distributed solar.

By embedding institutional knowledge and mobilizing partnerships, KGGTF's support positioned Pakistan to accelerate renewable energy investment, strengthen resilience, and deliver sustainable growth through a diversified and low-carbon power sector.

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Collaboration with Korean Partners (K-Partners)

Key Institutions and Roles

A cornerstone of the KGGTF energy portfolio is its strong collaboration with Korean institutions. Drawing on Korea's remarkable energy transition experience and deep technical expertise, KGGTF has forged impactful partnerships with leading Korean agencies and industry associations. These **K-Partners** provide critical support across energy efficiency, smart grid deployment, renewable integration, and industrial decarbonization—ensuring that grant-funded projects are both technically robust and aligned with global best practices.

Key K-Partners and their Contributions

- **Korea Energy Agency (KEA)**
  A leader in clean energy policy and deployment, KEA supports KGGTF projects through energy audits, capacity building, and design of policy incentives. It brings deep expertise in **renewable energy integration, energy efficiency**, and climate-aligned planning.

- **Korea Electric Power Corporation (KEPCO)**
  As Korea's power utility, KEPCO plays a central role in shaping the country's energy landscape, from power generation and transmission to grid modernization. Through its collaboration with the KGGTF and the World Bank, KEPCO has actively contributed to global knowledge exchange, particularly through hosting Bitgaram International Expo (BIXPO), its annual flagship event, where it has co-organized the energy forum with the World Bank.

- **Korea Industrial Complex Corporation (KICOX)**
  KICOX offers strategic support for greening industrial zones. It contributes to projects by improving **energy management systems, resource efficiency**, and promoting **low-carbon manufacturing** across industrial parks.

- **Korea Institute for Advancement of Technology (KIAT)**

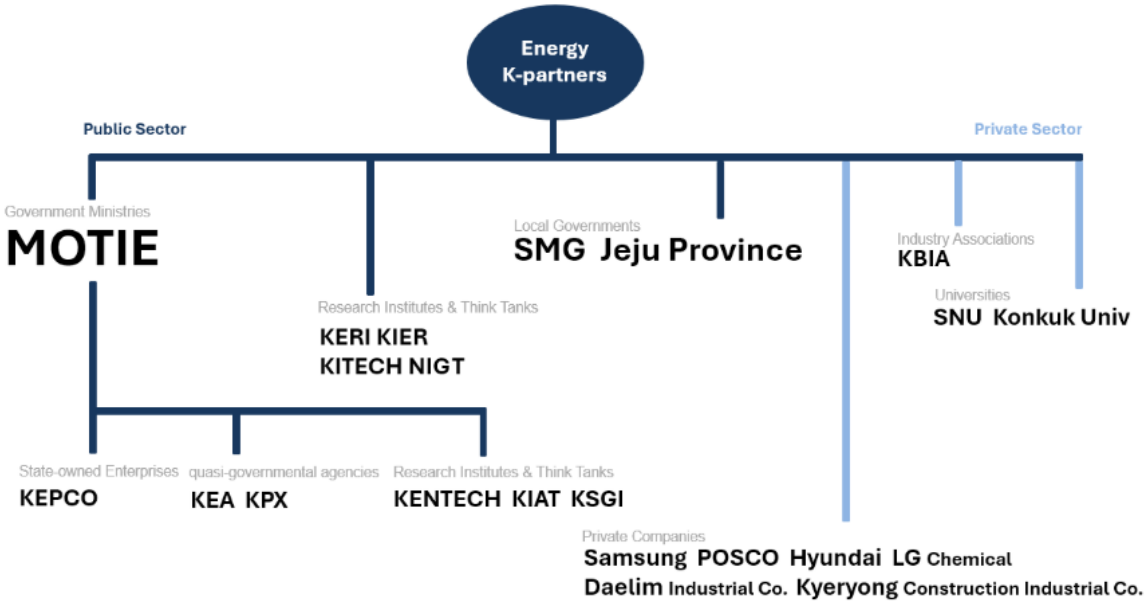
  As Korea's hub for industrial R&D and technology commercialization, KIAT helps projects bridge innovation and implementation. It contributes to **smart grid development, energy storage**, and **digital energy systems** by linking research outputs to scalable applications.

- **Korea Battery Industry Association (KBIA)**
  Representing one of Korea's most advanced sectors, KBIA supports projects focused on **battery innovation, electric mobility**, and **energy storage system**

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(ESS) commercialization—essential for grid flexibility and transport decarbonization.

- **Korea Smart Grid Association (KSGA)**
  KSGA brings cutting-edge expertise in **smart grid technologies and digital energy platforms**. It plays a key role in helping countries deploy real-time energy management systems, improve grid stability, and integrate variable renewable sources.



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Case Study: Scaling Up Rooftop Solar PV in Türkiye (KGGTF K-124)

Türkiye's solar energy market has grown rapidly, from 40 MW in 2014 to nearly 3,500 MW by the end of 2017. However, most of this capacity came from small-scale, ground-based projects under the unlicensed feed-in tariff scheme, while rooftop solar PV (RSPV) lagged at only 200 MW, concentrated in industrial and commercial buildings. In comparison, mature solar markets like Germany, the US, and Japan generate a significant share of capacity from rooftop systems. With an estimated 4 GW potential over the next decade, scaling up RSPV is critical for Türkiye's energy transition.

The Korea Green Growth Trust Fund (KGGTF) supported the Government of Türkiye to address key barriers to RSPV deployment and to prepare for a potential World Bank lending operation. The grant focused on technical standardization, financial scheme design, policy incentives, and knowledge exchange with Korean partners to ensure safe, efficient, and bankable rooftop solar investments.

The grant's activities included:
- Technical Standards Development: Created standards for panels, inverters, installation, grid interconnection, and roof stability testing, reducing costs and improving system resilience.
- Financial Product Design**:** Identified viable financial instruments (loans, blended products) tailored to residential, commercial, and industrial segments, unlocking private financing.
- Industrial Incentive Assessment: Evaluated subsidies and incentive structures to expand rooftop deployment in industrial facilities.
- Knowledge Sharing with Korean Partners: Brought in lessons from Korea on business models, support mechanisms, energy storage systems (ESS), and building energy management systems (BEMS).

The outcomes demonstrated a clear impact. Technical standards reduced permitting bottlenecks and ensured compliance with international safety and quality norms, enhancing resilience against seismic and extreme weather risks. Financial schemes informed the design of prospective IBRD lending operations, supporting scalable business models across multiple segments. Industrial incentives provided a pathway for competitive energy cost reduction, while capacity building for local banks and EPC firms increased their ability to deliver reliable RSPV services.

Collaboration was critical. Korean institutions such as MOTIE, KEA, and the Seoul Metropolitan Government shared practical insights that shaped Türkiye's roadmap for rooftop solar. By aligning technical, financial, and policy frameworks, the grant laid the foundation for long-term lending operations and positioned RSPV as a driver of efficiency, resilience, and competitiveness in Türkiye's clean energy transition.

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Conclusion

KGGTF's contributions to the energy sector have been instrumental in advancing climate-smart, digitally enabled, and resilient energy systems. By supporting renewable energy integration, smart grid infrastructure, and advanced storage solutions, the Fund has helped client countries strengthen energy reliability while aligning with global climate and sustainability goals. Strategic collaboration with Korean institutions has further enabled innovation, regulatory reform, and institutional capacity building across diverse contexts.

Looking ahead, KGGTF will continue to prioritize:

- **Scaling decentralized and digital energy systems to** improve grid flexibility, access, and reliability
- **Integrating climate resilience** into energy infrastructure planning and operations
- **Advancing low-carbon technologies** including energy storage, hydrogen, and mobility electrification
- **Expanding co-learning and technical exchange** with Korean partners to foster innovation and policy alignment, and cross-regional collaboration.

Through these priorities, KGGTF remains committed to supporting the transition toward inclusive, low-carbon, and future-ready energy systems--contributing to long-term energy security, economic opportunity, and sustainable development for all.

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Annex 1. Total Grant List

Approval Year	K#	Grant Name	Country	Amount Approved by Donor	K-partner	Linked P-Code
2025	246	Digitization of Power Transmission and Distribution Operation in Kyrgyz Republic	Kyrgyz Republic	$ 600,000	KEPCO	P178286
2024	236	Solar Energy Scale-up and Access Project (SESAP)	Guinea Bissau	$ 600,000		P174576
2024		Accelerating Green Growth through Electric Mobility in Europe and Central Asia	Turkey	$ 600,000		
2023	205	Supporting Offshore Wind Development in Vietnam	Vietnam	$ 500,000	MOF, KMI	P181165
2023	203	Developing E-mobility and Energy Efficiency programs in the Pacific Island Countries	Palau, Tonga	$ 500,000	KEA, PCREEE, SPC, PPA	P180641
2022	191	Distributed generation and grid flexibility for an efficient energy transition in Peru	Peru	$ 500,000	NRERC, KEPCO, KIAT	P179029
2021	172	Ukraine energy storage and ancillary services market development support	Ukraine	$ 500,000	KEPCO	P178169
2021	171	Supporting Ecuador's Energy Transition through an Energy Storage Program	Ecuador	$ 600,000	KEPCO	P179029, P178636
2021	170	Programmatic Technical Assistance (TA) on Energy Transition in the East Asia and Pacific (EAP) region	China; Indonesia; Mongolia; Philippines; Vietnam	$ 600,000	KEPCO, KEA, K-BIA, SNU, KENTECH	P176829, P178172, P178190
2020	151	Grid Integration of Variable Renewable Energy in Ethiopia	Ethiopia	$ 300,000	K-ECDF, KEXIM Bank,	P176731
2019	136	Capacity building and technical Learning workshops on Energy storage to Accelerate energy Transition (CLEAN)	Global	$ 700,000	KEPCO, KPX, LG Chemical	P171010
2019	135	Regional E-mobility and Battery Storage Programmatic Technical Assistance (TA) for Pacific Island Countries and Territories	Pacific Island Countries and Territories	$ 300,000	KEPCO, SMG, KOTI, WRI, ICCT, C40, SLoCaT	P152653
2018		Mexico Eco-Industrial Parks	Mexico			IFC-00603669
2018	125	Hydropower climate change resilience guidelines development	Global	$ 300,000	KOEN	P169085
2018	124	Scaling Up Rooftop Solar PV	Turkey	$ 300,000	MOTIE, KEA, SMG	P169221
2018	123	KGGTF - Improving readiness for energy efficiency investment in Vietnam's industries	Vietnam	$ 350,000	MOTIE, KEA	P151086, P164938
2017	114	Greener Manufacturing in Turkey	Turkey	$ 450,000	NRERC	IFC-00600641
2017	109	Ethiopia Green Industrialization Support program	Ethiopia	$ 550,000	GGGI, KEA, DOHWA Engineering Co. Ltd,	IFC-00602203
2017	122	KGGTF Sri Lanka Energy	Sri Lanka	$ 400,000	KOICA	P165133, P163864

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2017	121	Strengthening Utility Capabilities by Capacity Building and South-South KE (SUCCESS-KE)	Benin, Burkina Faso, Cote d'Ivoire, Gambia, The Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, Togo	$ 600,000	IEEE Korea Council, CIGRE Korea, KEPCO, KSGI, Jeju Province	P161015
2017	113	Renewable Energy Scale-Up to Support Green Growth in Pakistan	Pakistan	$ 747,021	KEXIM, KHNP, KOEN	P159712, P169313
2016	89	Energy Storage application studies and knowledge exchange framework for Sustainable Green Growth in WAPP	Ecowas member countries (Benin, Cote d'Ivoire, Burkina Faso, Ghana, Gambia, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, Togo)	$ 765,000	KEPCO, LSIS, Kokam	P113266
2016	88	Scaling-Up Rooftop Solar in Vietnam	Vietnam	$ 350,000	Hanwha Group, SolarPark Korea, KT Group, Shinsung Solar Energy, KIER, KERI, KITECH	P162510
2016	87	Sri Lanka Renewable Energy Integration	Sri Lanka	$ 300,000	KOICA	P159789, P159789
2016	86	Greening Peru's Energy System: promoting clean energy for a resilient power system	Peru	$ 600,000	NRERC	P161420
2016	85	Sustainable Green Growth in Central America	Central America: Guatemala, Honduras, Nicaragua, El Salvador, Costa Rica and Panama	$ 700,000	KEPCO, KEA, KOICA	P155068
2015	58	An efficient, resilient, and green grid for the Bangladesh power system	Bangladesh	$ 500,000	Konkuk University, KERI, KSGI, K-MEG	P150086, P164015
2015	56	Haiti Green Growth Through Renewable Energy Integration	Haiti	$ 250,000	NRERC	P153043
2015	55	Tackling Power Sector Barriers for Green Growth in Honduras	Honduras	$ 450,000		P156991
2015	53	Support the Development of A National Industrial Energy Management Program in Uzbekistan	Uzbekistan	$ 400,000	KEA	P156670
2015	52	Energy Efficiency Transformation in DH	Moldova	$ 530,000	KEA	P157735
2015	51	Scaling-Up Rooftop Solar in Vietnam II	Vietnam	$ 91,379		P162510

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2015	57	Smart Technology and Energy Efficient Production (STEP Phases 1 & 2)	Egypt	$ 700,000	KEMCO, KETEP	IFC-00600329
2015	50	Transforming Cities through Public Space	Sri Lanka, Bangladesh, India	$ 600,000	AURI, LH, KRIHS, SMG, SI	P156477, P158509
2014	30	Towards Green Growth in DVC through use of ICT and Investment in Clean Energy Generation	India	$ 600,000		P154283

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Annex 2. Grant Summary

K246. Digitization of Power Transmission and Distribution Operation in Kyrgyz Republic

Grant Title	Digitization of Power Transmission and Distribution Operation in Kyrgyz Republic
Region	Europe and Central Asia
Countries	Kyrgyz Republic
Sector	Energy
Program Year	20245
Amount	$600,000
Status	Active
Program Goal	The program aims to support the efficient and sustainable digital transformation of grid operations in the Kyrgyz Republic to improve reliability and efficiency of the power system and facilitate renewable energy integration. This proposed activity will be linked to the Kyrgyz Renewable Energy Development (KRED) Program designed to follow a Multiphase Programmatic Approach (MPA) to increase renewable energy generation and promote private sector participation in alignment with the Government's vision for renewable energy development by 2030.
Key Result	-Direct contribution to the conceptualization and design of new lending operation under the KRED MPA program, and client's strategies/roadmap for modernization and digitization of power transmission and distribution networks. - Enhanced technical and operational capacity of the client for deployment and management of grid digitalization solutions, supporting and informing the digitalization and modernization of power network operation to improve the efficiency and reliability of the power system in the Kyrgyz Republic.

K236. Solar Energy Scale-up and Access Project (SESAP)

Grant Title	Solar Energy Scale-up and Access Project (SESAP)
Region	Western and Central Africa
Countries	Guinea Bissau
Sector	Energy and Extractives
Program Year	2024
Amount	$600,000
Status	Active
Program Goal	The program aims to expand access to reliable and sustainable electricity in Guinea-Bissau by scaling up off-grid solar energy solutions and strengthening renewable energy infrastructure. It deploys standalone solar systems and green mini-grids to electrify rural and remote areas, enhances

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	energy security by integrating variable renewable energy (VRE), and reduces dependence on fossil fuels. The initiative supports long-term sustainability through Off-Grid Development Policies, technical assessments, and feasibility studies, while fostering public-private partnerships and leveraging Korean expertise to promote investment, policy development, and capacity building toward a resilient, inclusive, and low-carbon energy future for Guinea-Bissau.
Key Result	Produced a comprehensive off-grid solar electrification report for Guinea-Bissau, identifying optimal solutions for rural access through standalone systems and green mini-grids based on geographic and demographic factors. Developed an off-grid policy framework to guide implementation, regulation, and scaling of electrification projects. Conducted technical assessments and feasibility studies on project locations and VRE integration to ensure economic and technical viability. Prepared an infrastructure execution plan and investment strategies, mobilizing resources to enable sustainable deployment of solar energy systems and strengthen long-term energy resilience.

K205. Supporting Offshore Wind Development in Vietnam

Grant Title	Supporting Offshore Wind Development in Vietnam
Region	East Asia and Pacific
Countries	Vietnam
Sector	Energy and Extractives
Program Year	2023
Amount	$500,000
Status	Active
Program Goal	The program aims to accelerate offshore wind development in Vietnam by integrating sectoral planning into the National Marine Spatial Planning (MSP), developing investment strategies, and strengthening stakeholder engagement. It seeks to leverage Vietnam's vast offshore wind potential to expand capacity, enhance energy security, and support decarbonization and net-zero goals. Through technical assessments, spatial data analysis, and regulatory alignment, the initiative identifies optimal development zones and fosters transparent, inclusive planning. By designing financing strategies, piloting investment models, and mobilizing public-private and concessional funding, it advances the offshore wind sector while improving governance and cross-sector coordination. Ultimately, the program supports Vietnam's Just Energy Transition Partnership (JET-P), driving sustainable economic growth and aligning with global best practices in offshore wind development.

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Key Result	Integrated offshore wind planning into National Marine Spatial Planning (MSP) by identifying development zones through GIS-based assessments and producing a detailed report on viable locations for fixed and floating structures. Conducted stakeholder workshops to align government, industry, and community priorities while promoting awareness of offshore wind opportunities. Developed an investment strategy and financial model for a pilot project, outlining funding mechanisms and public-private partnership options. Produced provincial marine use zoning plans to balance renewable energy development with economic and environmental goals, supporting coordinated, sustainable offshore wind expansion.

K203. Developing E-mobility and Energy Efficiency programs in the Pacific Island Countries

Grant Title	Developing E-mobility and Energy Efficiency programs in the Pacific Island Countries
Region	East Asia & Pacific
Countries	Tonga
Sector	Energy
Program Year	2023
Amount	$500,000
Status	Active
Program Goal	This program goals to support Pacific Island Countries in developing and implementing effective policies and programs for energy efficiency and e-mobility. By establishing an enabling environment, identifying viable investment projects, and delivering tailored advisory support, the program strengthens the foundation for sustainable energy sector development in the region. It also facilitates knowledge sharing and regional coordination through partnerships with Korean and Pacific institutions, ultimately Program Goaling to increase energy affordability, resilience, reliability, and sustainability in Tonga and neighboring countries.
Key Result	Produced an e-mobility feasibility report providing country-specific analyses on the viability, economics, and environmental impact of e-mobility in Pacific Island Countries (PICs). Organized a regional knowledge workshop in partnership with the Korea Energy Agency (KEA) to share insights, exchange best practices, and foster regional cooperation on e-mobility adoption. Provided policy advisory support and technical assistance to PIC governments for developing e-mobility strategies and identifying energy efficiency projects, strengthening institutional capacity and laying the groundwork for scaling up sustainable transport solutions across the region.

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K191. Distributed generation and grid flexibility for an efficient energy transition in Peru

Grant Title	Distributed Generation and Grid Flexibility for an Efficient Energy Transition in Peru
Region	Latin America & Caribbean
Countries	Peru
Sector	Energy
Program Year	2022
Amount	$500,000
Status	Active
Program Goal	This program goals to support Peru's energy transition by accelerating the deployment of renewable energy resources, enhancing power system flexibility, and promoting distributed energy solutions such as DER and V2G technologies. By providing targeted regulatory support, strategy design, and stakeholder engagement, the program strengthens the Peruvian government's capacity to implement policy reforms and market structures that foster clean, resilient, and cost-efficient electricity systems. Through international and regional partnerships, including Korean technical cooperation, the program informs national policy, stimulates investment, and enables the development of innovative business models in renewable energy and e-mobility.
Key Result	Produced a distributed generation policy report with regulatory proposals and business model designs to scale distributed energy resources (DER). Developed a grid flexibility services report outlining technical and economic criteria for ancillary services and tariff design to enhance system reliability. Prepared an electromobility strategy report presenting a V2G integration strategy and business cases for vehicle charging and flexibility services. Conducted dissemination workshops with technical stakeholders for each report, fostering collaboration with KEPCO, NRERC, and KIAT. These efforts informed regulatory reforms, strengthened institutional capacity, and laid the foundation for accelerating DER deployment, grid flexibility, and electromobility integration.

Kxxx. E-Mobility Strategy Development for Ulaanbaatar

Grant Title	E-Mobility Strategy Development for Ulaanbaatar
Region	East Asia & Pacific
Countries	Mongolia
Sector	Energy
Program Year	2021
Amount	$250,000
Status	Active
Program Goal	The program aims to support Mongolia's transition to electric mobility by developing a strategic framework for the adoption of electric vehicles (EVs), with a particular focus on Ulaanbaatar. It seeks to

	enhance the flexibility and sustainability of the power system while addressing severe urban air pollution and growing transport demand. By assessing e-mobility readiness, identifying suitable vehicle segments, and developing a comprehensive e-mobility roadmap, the program supports policy coordination, market development, and institutional capacity building. Ultimately, the program contributes to decarbonization of the transport sector, improved energy system resilience, and a more sustainable and accessible urban transport system in Mongolia.
Key Result	The program conducted an electric mobility readiness assessment, identifying key barriers to e-mobility adoption in Mongolia and providing an in-depth analysis of EV suitability across major vehicle segments. Based on this analysis, a comprehensive e-mobility roadmap was developed, presenting 31 policy recommendations to stimulate and guide EV market development through regulatory coordination and targeted engagement with priority vehicle segments. The program also strengthened institutional capacity by training 50 Mongolian policymakers and facilitated knowledge exchange through two international study visits in Kuala Lumpur and Seoul, in partnership with the Korea Energy Agency and four Korean partner institutions.

Kxxx. Battery Energy Storage Assessment in Mongolia

Grant Title	Battery Energy Storage Assessment in Mongolia
Region	East Asia & Pacific
Countries	Mongolia
Sector	Energy
Program Year	2021
Amount	$200,000
Status	Active
Program Goal	his program goals to support Mongolia's clean energy transition by advancing the deployment of battery energy storage systems (BESS), enhancing power system flexibility, and enabling the integration of renewable energy and electric mobility. It addresses key challenges in Mongolia's energy transition, including peak demand supply constraints and limited grid flexibility. Through a combination of analytical research, capacity building, and international partnerships, the program strengthens Mongolia's capacity to scale up clean energy investments and to develop a more secure, sustainable, and resilient energy system.
Key Result	Delivered a comprehensive BESS potential assessment report evaluating Mongolia's technical potential and system requirements, supported by feasibility analysis including renewable energy integration simulations and international business model benchmarking. Strengthened stakeholder capacity through knowledge exchange and workshops in Ulaanbaatar, and facilitated international learning

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	through participation in Korea Green Innovation Days (KGID) 2024, informing Mongolia's clean energy investment and policy discussions.

K172. Ukraine energy storage and ancillary services market development support

Grant Title	Ukraine Energy Storage and Ancillary Services Market Development Support
Region	Europe and Central Asia
Countries	Ukraine
Sector	Energy
Program Year	2021
Amount	$500,000
Status	Active
Program Goal	The program goals to enhance the flexibility and decarbonization of Ukraine's power grid by enabling the deployment of energy storage technologies. It focuses on facilitating private-sector investments through policy and regulatory measures to support synchronization with the European electricity grid, promote sustainable development, and foster resilience in the energy sector. By addressing key regulatory challenges, improving ancillary services, and developing an e-Mobility roadmap, the program seeks to create a robust energy storage market that contributes to post-pandemic recovery, job creation, and economic growth in Ukraine.
Key Result	Developed a business model assessment report with recommendations to increase private sector participation in Ukraine's energy storage development. Produced an expert assessment report reviewing international best practices and drafting inputs for energy storage regulations and secondary legislation. Contributed to an ancillary services monitoring methodology and provided inputs for an e-mobility roadmap as a market option for energy storage integration. Conducted training workshops and study trips in collaboration with KEPCO, NEURC, USAID, and UkrHydroenergo, strengthening institutional capacity and informing Ukraine's regulatory framework to accelerate energy storage deployment and e-mobility adoption.

K171. Supporting Ecuador's Energy Transition through an Energy Storage Program

Grant Title	Supporting Ecuador's Energy Transition through an Energy Storage Program
Region	Latin America & Caribbean
Countries	Ecuador
Sector	Energy

Program Year	2021
Amount	$600,000
Status	Active
Program Goal	The program goals to strengthen Ecuador's electricity grid by integrating renewable energy storage solutions to enhance resiliency and support decarbonization efforts. This includes developing large-scale battery systems and green hydrogen, which will help reduce fossil fuel dependency and improve grid reliability. The program also focuses on facilitating private-sector investments and addressing regulatory reforms to foster a sustainable energy transition and support post-COVID-19 economic recovery. By promoting the adoption of energy storage and green hydrogen, the program will ensure the stability and sustainability of Ecuador's energy system, positioning the country for a greener and more resilient future.
Key Result	Conducted an assessment and recommendation report on developing large-scale battery storage systems in Ecuador, engaging key technical stakeholders through participatory workshops. Developed a green hydrogen strategy paper to support the country's decarbonization goals and NDC targets by 2030, complemented by workshops and dissemination events to share findings. Produced a policy recommendation report identifying regulatory reforms to enable private-sector investment in renewable energy and storage solutions. Collaborating with KEPCO and Ecuadorian public institutions, the initiative strengthened institutional capacity, informed national energy strategies, and laid the groundwork for scaling up clean energy investments and green hydrogen development.

K170. Programmatic Technical Assistance (TA) on Energy Transition in the East Asia and Pacific (EAP) region

Grant Title	Programmatic Technical Assistance (TA) on Energy Transition in the East Asia and Pacific (EAP) region
Region	East Asia & Pacific
Countries	China, Indonesia, Mongolia, Philippines, Vietnam
Sector	Energy
Program Year	2021
Amount	$600,000
Status	Active
Program Goal	This program goals to support the energy transition in the East Asia and Pacific (EAP) region by facilitating the shift from coal to clean, reliable, and affordable energy sources. The program focuses on (1) technical assistance for ASEAN regional energy transition, (2) assessment of energy storage potential in China and the Philippines, (3) evaluation of smart grid and grid digitalization in the Philippines, and (4) knowledge sharing and capacity building among EAP countries. By providing analytical work, policy

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	recommendations, and capacity-building initiatives, this program seeks to enhance energy efficiency, integrate renewable energy, and promote sustainable development across the region.
Key Result	Hosted annual regional energy transition conferences (FY22–24) with China, Indonesia, Mongolia, the Philippines, Vietnam, and the ASEAN Secretariat, facilitating knowledge exchange on transport and industry decarbonization, regional energy integration, and carbon market development. Conducted techno-economic analyses, feasibility studies, and produced policy recommendations on energy storage and green mobility. Partnered with Korean institutions, including KEPCO, KEA, and KENTECH, to deliver capacity-building programs for government officials and utility engineers, strengthening institutional expertise and shaping strategies for accelerating the energy transition in East Asia and the Pacific.

K151. Grid Integration of Variable Renewable Energy in Ethiopia

Grant Title	Grid Integration of Variable Renewable Energy in Ethiopia
Region	Africa
Countries	Ethiopia
Sector	Energy
Program Year	2020
Amount	$300,000
Status	Active
Program Goal	This program goals to strengthen Ethiopia's capacity to integrate variable renewable energy (VRE) into its national grid by delivering targeted technical assistance, building institutional capabilities, and fostering strategic partnerships. Through in-depth analytical support, capacity-building workshops, and access to advanced planning tools, the program will help Ethiopian Electric Power (EEP) improve the reliability and sustainability of the national power supply. The goal is to support Ethiopia's energy transition by enabling a diversified energy mix, expanding access to affordable electricity in underserved regions, and increasing climate resilience. By connecting national efforts with regional power system planning through collaboration with organizations like the East Africa Power Pool and Korean ECDF, the program also Program Goals to enhance regional energy cooperation and long-term system stability.
	Delivered grid integration analyses including VRE potential assessments, grid impact studies, and transmission upgrade recommendations to support renewable energy deployment. Designed a system planning toolkit with specifications for planning and operations tools and a tendering process framework. Conducted capacity-building programs through workshops, formal trainings, and technical advisory outputs, strengthening institutional capabilities in energy system planning and integration.

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K136. Capacity building and technical Learning workshops on Energy storage to Accelerate energy Transition (CLEAN)

Grant Title	Capacity Building and Technical Learning Workshops on Energy Storage to Accelerate Energy Transition (CLEAN)
Region	Global
Countries	Global
Sector	Energy
Program Year	2019
Amount	$700,000
Status	Closed
Program Goal	The program aimed to accelerate global renewable energy deployment by enhancing technical and institutional capacity for battery storage integration. Through regional workshops and technical exchanges, the initiative sought to build knowledge on storage technologies, regulatory frameworks, financing mechanisms, and operational applications, enabling client countries to overcome barriers to renewable energy scale-up and advance power sector decarbonization.
Key Result	Organized four regional workshops and knowledge exchanges that trained hundreds of officials from Asia, Africa, and ECA on battery storage technology, policy, and financing. Strengthened institutional and technical capacity to integrate storage for efficient, resilient, and renewable-ready grids. Collaborated with KEPCO, KPX, and LG Chem to share Korean expertise and industry solutions. The program informed future World Bank operations, positioning energy storage as a critical enabler of global energy transition and green growth.

K135. Regional E-mobility and Battery Storage Programmatic Technical Assistance (TA) for Pacific Island Countries and Territories

Grant Title	Regional E-mobility and Battery Storage Programmatic Technical Assistance (TA) for Pacific Island Countries and Territories
Region	EAP
Countries	Pacific Island Countries and Territories
Sector	Energy
Program Year	2019
Amount	$300,000
Status	Closed

Program Goal	The Program goaled to design a roadmap for deploying Electric Vehicles (EVs) and Energy Storage Systems (ESS) across the PICs in collaboration with the Pacific Power Association (PPA). The program's primary objective was to create a scalable and regionally integrated framework for EV and ESS deployment to address the unique challenges faced by these islands. This included assessing battery storage applications, designing technical guidelines, and building institutional capacity to manage energy systems effectively. The program also leveraged the Korean example of EV and ESS deployment on Jeju Island, which provided a successful model for integrating renewable energy and e-mobility solutions in isolated regions. The grant supported a pilot EV project in the Republic of the Marshall Islands (RMI) to generate feedback and inform strategies for the broader region. By promoting knowledge exchange, enhancing resilience, and reducing dependency on fossil fuels, the grant laid the foundation for sustainable energy transitions across the Pacific.
Key Result	Developed a **regional e-mobility policy framework** and conducted a **battery storage study** to strengthen renewable energy integration in Pacific Island Countries. Leveraging lessons from Korea's EV and ESS deployment on Jeju Island, the project informed **World Bank lending operations** and provided strategies for scaling up e-mobility and grid-connected storage. These efforts enhanced **institutional capacity**, improved **energy system reliability**, and laid the foundation for **sustainable, low-carbon transport and power solutions** across the region.

K125. Hydropower climate change resilience guidelines development

Grant Title	Hydropower Climate Change Resilience Guidelines Development
Region	Global
Countries	Global
Sector	Energy
Program Year	2018
Amount	$300,000
Status	Closed
Program Goal	The program aimed to operationalize and pilot the Hydropower Climate Resilience Guidelines developed with KGGTF support, ensuring their practical application in hydropower planning and investment decisions. By embedding resilience principles into project design, the initiative sought to strengthen climate risk management, improve efficiency, and support long-term sustainable hydropower development across multiple regions under the World Bank's green growth agenda.
Key Result	Piloted the Hydropower Climate Resilience Guidelines in selected country projects, producing final implementation reports that validated their practicality for sector-wide adoption. Strengthened

	client capacity to integrate resilience into hydropower design, ensuring robust, cost-effective, and climate-ready investments. Collaborated with KOEN, Daelim, and Kyeryong Construction to share Korean expertise, while engaging ICOLD, IHA, and EBRD for global alignment. The project mainstreamed resilience into World Bank operations, positioning hydropower as a competitive, future-proof driver of green growth.

K124. Scaling Up Rooftop Solar PV

Grant Title	Scaling Up Rooftop Solar PV
Region	Europe and Central Asia
Countries	Turkey
Sector	Energy
Program Year	2018
Amount	$300,000
Status	Closed
Program Goal	The program goaled to support the development of Turkey's RSPV market by addressing key barriers to large-scale adoption. It focused on creating technical standards, designing financial instruments, and evaluating incentives to enhance market attractiveness. Additionally, it sought to improve institutional capacity through knowledge sharing and training, ensuring that Turkish stakeholders could implement RSPV projects efficiently. By leveraging international expertise, particularly from Korea, the project Program goaled to establish a sustainable framework for RSPV expansion, ultimately reducing Turkey's reliance on fossil fuels and enhancing energy security.
Key Result	Developed technical standards and financial products for rooftop solar PV (RSPV) deployment in Turkey, directly shaping regulatory frameworks and incentive mechanisms. Findings informed the design of a potential World Bank lending operation and mobilized funding from international sources like GEF 7 to accelerate RSPV adoption. Strengthened institutional capacity, streamlined permitting, and enhanced private sector participation, laying the groundwork for large-scale rooftop solar expansion.

K123. KGGTF - Improving readiness for energy efficiency investment in Vietnam's industries

Grant Title	Improving Readiness for Energy Efficiency Investment in Vietnam's Industries
Region	East Asia & Pacific
Countries	Vietnam

Sector	Energy
Program Year	2018
Amount	$350,000
Status	Closed
Program Goal	The program aimed to accelerate industrial energy efficiency in Vietnam by demonstrating viable technologies and business models, building a pipeline of EE projects, and catalyzing ESCO participation. It sought to reduce the country's energy intensity, strengthen resilience against fossil fuel dependency and volatile energy prices, and enhance competitiveness through cost-effective efficiency gains and long-term energy savings for industries.
Key Result	Generated a pipeline of EE projects and business models, piloted ESCO participation, and organized stakeholder knowledge sharing to strengthen Vietnam's EE sector. Enhanced efficiency through scalable investment mechanisms, reducing risks for industrial enterprises and financial institutions. Collaborated with MOTIE, KEA, and Korean companies (Samsung, Hyundai, POSCO) to transfer policy and technical expertise. Directly linked to a $101.7M World Bank lending operation, the project advanced industrial EE as Vietnam's lowest-cost energy security option.

K122. KGGTF Sri Lanka Energy

Grant Title	KGGTF Sri Lanka Energy
Region	South Asia
Countries	Sri Lanka
Sector	Energy
Program Year	2017
Amount	$400,000
Status	Closed
Program Goal	The program aimed to help Sri Lanka achieve its renewable energy targets—20% NCRE by 2020 and energy self-sufficiency by 2030—by addressing grid integration, regulatory reforms, and institutional capacity gaps. It sought to improve efficiency, resilience, and competitiveness in the power sector by preparing implementation-ready plans for renewable energy and LNG development, while reducing fossil fuel dependency and attracting private sector investment.

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Key Result	Delivered grid integration studies for NCRE and prefeasibility assessments for LNG, alongside regulatory consultations that informed Sri Lanka's long-term generation expansion plan (2017–2036). Enhanced efficiency through advanced control systems and storage options, strengthened resilience against fossil fuel dependency and climate risks, and improved competitiveness by stabilizing energy costs for key industries. Collaborated with KOICA, GCF Korea, and GGGI, and linked directly to a $25M World Bank lending operation, positioning Sri Lanka to scale renewable energy sustainably.

K121. Strengthening Utility Capabilities by Capacity Building and South-South KE (SUCCESS-KE)

Grant Title	Strengthening Utility Capabilities by Capacity Building and South-South KE (SUCCESS-KE)
Region	Africa
Countries	Benin, Gambia, Guinea, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, Togo
Sector	Energy
Program Year	2017
Amount	$600,000
Status	Closed
Program Goal	The program aimed to build a cadre of skilled utility experts across Sub-Saharan Africa by embedding climate resilience and green growth principles into utility planning and operations. Through training modules, institutional frameworks, and knowledge exchanges, the initiative sought to address capacity gaps in integrated resource management, strengthen resilience to climate change, and support utilities in delivering clean, reliable, and sustainable power systems.
Key Result	Delivered training workshops, operational templates, and study tours that strengthened the planning and operational capacity of utilities across nine African countries. Built a pipeline of engineers equipped with least-cost planning tools and resilience-focused approaches, enhancing institutional knowledge beyond project lifecycles. Collaborated with KEPCO, Korea Smart Grid Institute, IEEE Korea Council, CIGRE Korea, and Jeju Province to transfer technical expertise. Directly linked to a $60M World Bank lending operation, the project embedded inclusive green growth principles into utility decision-making across the region.

K113. Renewable Energy Scale-Up to Support Green Growth in Pakistan

Grant Title	Renewable Energy Scale-Up to Support Green Growth in Pakistan
Region	South Asia
Countries	Pakistan
Sector	Energy
Program Year	2017
Amount	$747,021
Status	Closed
Program Goal	The program aims to facilitate large-scale renewable energy adoption by overcoming regulatory, technical, and financial barriers. It sought to demonstrate the feasibility of solar PV in conjunction with existing hydro and wind resources, prepare a rooftop PV pilot, and support rural electrification through off-grid renewable solutions. Capacity-building activities equipped government officials and utility engineers with skills to implement green growth strategies, ensuring sustainable long-term energy development in Pakistan.
Key Result	Conducted feasibility studies for utility-scale solar PV projects and developed a rooftop PV pilot and off-grid electrification strategy, directly shaping Pakistan's renewable energy policy and investment planning. Strengthened regulatory frameworks and informed future World Bank lending, enabling utility-scale solar deployment, hybrid renewable solutions, and grid integration while fostering private sector participation in the energy transition.

K89. Energy Storage application studies and knowledge exchange framework for Sustainable Green Growth in WAPP

Grant Title	Energy Storage Application Studies and Knowledge Exchange Framework for Sustainable Green Growth in WAPP
Region	Africa
Countries	Benin
Sector	Energy
Program Year	2016
Amount	$765,000
Status	Closed
Program Goal	The program aimed to strengthen the West Africa Power Pool (WAPP) by integrating energy storage solutions to improve renewable energy reliability, stabilize grids, and promote sustainable green growth. It focused on feasibility studies, financial assessments, and policy

	frameworks while building technical and institutional capacity through training and international knowledge exchange to prepare WAPP member states for large-scale renewable energy deployment and inter-regional electricity market integration.
Key Result	Produced feasibility and financial studies on energy storage applications that informed strategies for grid stability and renewable integration in WAPP countries. Developed a training and knowledge exchange framework, enhancing the capacity of utilities and policymakers to plan and operate ESS solutions. Collaborated with KEPCO and Korean ESS firms to transfer frequency regulation expertise, providing the foundation for future World Bank lending and pilot projects, and positioning energy storage as a catalyst for sustainable and competitive regional power systems.

K88. Scaling-Up Rooftop Solar in Vietnam

Grant Title	Scaling-Up Rooftop Solar in Vietnam
Region	East Asia & Pacific
Countries	Vietnam
Sector	Energy
Program Year	2016
Amount	$350,000
Status	Closed
Program Goal	The program aimed to accelerate Vietnam's solar energy transition by preparing a citywide rooftop PV pilot in Danang or Ho Chi Minh City and laying the groundwork for utility-scale PV plants through PPPs. It focused on resource assessment, grid integration, and regulatory improvements, while strengthening institutional and technical capacity to diversify the energy mix, reduce import dependence, and attract private investment for resilient green growth.
Key Result	Completed rooftop PV resource mapping, grid upgrade assessments, and prefeasibility studies for utility-scale PV, enabling PPP models and regulatory reforms. Strengthened EVN and government capacity through technical support and policy development, while improving resilience against fuel price volatility and climate risks. Collaborated with Hanwha, SolarPark Korea, Korea Telecom, Shinsung Solar Energy, and Korean research institutes to transfer solar and ICT expertise, leveraging World Bank and IFC support to catalyze Vietnam's renewable energy market growth.

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K87. Sri Lanka Renewable Energy Integration

Grant Title	Sri Lanka Renewable Energy Integration
Region	South Asia
Countries	Sri Lanka
Sector	Energy
Program Year	2016
Amount	$300,000
Status	Closed
Program Goal	The program aimed to support Sri Lanka's 2030 energy self-sufficiency goal by enabling large-scale renewable energy integration. It focused on strengthening technical capacity for grid stability, advancing ICT and smart grid solutions, and creating an enabling policy and regulatory framework. The project also supported PPP readiness by developing standardized PPAs and bidding documents to mobilize private investment in renewable energy.
Key Result	Developed policy and regulatory frameworks, technical studies, and PPP instruments that enabled Sri Lanka to scale up variable renewable energy and attract private investment. Enhanced capacity of the Ceylon Electricity Board through adoption of forecasting tools, grid control systems, and international best practices. Collaborated with KOICA to support renewable energy deployment, complementing World Bank and ESMAP assistance. The project laid the groundwork for future lending operations, advancing Sri Lanka's energy security and climate goals.

K86. Greening Peru's Energy System: promoting clean energy for a resilient power system

Grant Title	Greening Peru's Energy System: Promoting Clean Energy for a Resilient Power System
Region	Latin America & Caribbean
Countries	Peru
Sector	Energy
Program Year	2016
Amount	$600,000
Status	Closed
Program Goal	The program aimed to support Peru in building a greener, more resilient, and competitive power system by integrating renewables, improving energy efficiency, and strengthening resilience against

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	climate change. Through integrated planning of hydro and gas resources, VRE integration studies, EE action planning, and innovative financing mechanisms, the project sought to advance Peru's renewable targets, reduce GHG emissions, and enhance energy security.
Key Result	Developed integrated planning studies, a VRE assessment, and a national EE action plan that improved Peru's energy efficiency, resilience, and competitiveness. Identified financing mechanisms to strengthen sub-transmission and distribution, enhancing service quality. Increased government awareness of climate risks, including El Niño, and informed strategies to build resilient infrastructure. Collaborated with the New and Renewable Energy Resource Center of Korea (NRERC) to transfer renewable technology expertise, supporting Peru's green growth and GHG reduction goals.

K85. Sustainable Green Growth in Central America

Grant Title	Sustainable Green Growth in Central America
Region	Latin America & Caribbean
Countries	Guatemala
Sector	Energy
Program Year	2016
Amount	$700,000
Status	Closed
Program Goal	The program aimed to enhance energy security and sustainable growth in Central America by preparing countries to meet rising electricity demand with renewable energy and energy efficiency solutions. Through analytical studies, regulatory reform, ICT-enabled integration, and capacity building, the initiative sought to create an enabling environment for scaling variable renewable energy (VRE), promoting energy efficiency, and catalyzing private and public investments to accelerate the region's green growth.
Key Result	Produced national and regional studies on VRE integration, ICT, and regulatory reforms, enabling future RE and EE programs across Central America. Strengthened government capacity through forums and technical exchanges, while collaborating with KEPCO, KEA, and KOICA to share ICT-based grid and efficiency expertise. Informed pilot initiatives and de-risked investments, leveraging IFC, MIGA, IBRD, and others to catalyze regional green energy growth.

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K58. An efficient, resilient, and green grid for the Bangladesh power system

Grant Title	An efficient, resilient, and green grid for the Bangladesh power system
Region	South Asia
Countries	Bangladesh
Sector	Energy
Program Year	2015
Amount	$150,000
Status	Closed
Program Goal	The program aimed to strengthen Bangladesh's energy resilience and economic growth by developing a smart grid that integrates renewable energy, improves dispatch efficiency, and reduces dependence on costly oil and gas. By introducing automated dispatch, standardized mini-grids, and advanced ICT solutions, the initiative sought to deliver affordable, reliable, and greener electricity, expanding access for households, businesses, and agriculture, while supporting long-term green growth.
Key Result	Designed grid-compatible renewable mini-grids and a smart grid roadmap that improved dispatch automation, reducing fuel costs and enhancing system reliability. Developed geo-spatial planning tools and technical solutions for VRE integration, enabling Bangladesh to prepare for 1–1.5 GW of new renewable capacity. Strengthened institutional and technical capacity through workshops, technical tours, and knowledge transfer with Korean partners including Konkuk University, KERI, KSGI, and K-MEG, alongside ESMAP support. The project provided scalable models for rural electrification and irrigation, directly informing future World Bank investment operations and advancing Bangladesh's low-carbon energy transition.

K56. Haiti Green Growth Through Renewable Energy Integration

Grant Title	Haiti Green Growth Through Renewable Energy Integration
Region	Latin America & Caribbean
Countries	Haiti
Sector	Energy
Program Year	2015
Amount	$250,000
Status	Closed

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Program Goal	The program aimed to accelerate Haiti's green growth by supporting the government's target of 25% renewable energy by 2020. By assessing the technical and economic feasibility of variable renewable energy (VRE) integration, exploring interconnection with the Dominican Republic, and analyzing the economic impacts of renewable expansion, the project sought to improve electricity access, enhance energy security, and enable sustainable, low-carbon development.
Key Result	Conducted VRE integration and interconnection feasibility studies that clarified technical limits and economic viability for expanding renewables in Haiti's grid. Quantified the growth and job creation potential of renewable energy and provided policy recommendations through dissemination workshops with national stakeholders. Collaborated with the New and Renewable Energy Resource Center of Korea (NRERC) to apply advanced technical expertise on VRE integration, and engaged Korean firms on smart grid solutions. Informed follow-up investment planning and future World Bank support, positioning Haiti to leverage renewable energy for economic resilience and green growth.

K55. Tackling Power Sector Barriers for Green Growth in Honduras

Grant Title	Tackling Power Sector Barriers for Green Growth in Honduras
Region	Latin America & Caribbean
Countries	Honduras
Sector	Energy
Program Year	2015
Amount	$450,000
Status	Closed
Program Goal	The program aimed to help Honduras achieve its target of 80% renewable energy generation by 2022 by tackling systemic barriers in the power sector. Through analytical studies, renewable energy integration assessments, and energy efficiency evaluations, the project sought to inform green growth strategies, reduce dependence on aging and polluting thermal plants, and build institutional capacity for sustainable and inclusive energy sector reforms.
Key Result	Produced comprehensive studies on variable renewable energy integration and energy efficiency that informed the design of a green growth component for a forthcoming World Bank lending operation.

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	Strengthened government capacity through training, peer learning, and international knowledge exchange, including collaboration with Korean renewable energy and efficiency firms to transfer advanced technologies and practices. Enabled the Government of Honduras to plan future RE and EE programs, laying the groundwork for displacing inefficient thermal generation and supporting the country's long-term renewable energy targets.

K53. Support the Development of A National Industrial Energy Management Program in Uzbekistan

Grant Title	Support the Development of a National Industrial Energy Management Program in Uzbekistan
Region	Europe and Central Asia
Countries	Uzbekistan
Sector	Energy
Program Year	2015
Amount	$400,000
Status	Closed
Program Goal	The program aimed to strengthen Uzbekistan's industrial energy efficiency by developing a national framework for energy-saving agreements and piloting energy management systems (EnMS) in line with ISO50001 standards. By fostering policy reforms, institutional capacity, and financing mechanisms, the initiative sought to reduce the country's high energy intensity, improve industrial competitiveness, and support Uzbekistan's green growth and 2030 development goals.
Key Result	Established a national framework for Energy Savings Agreements and piloted an ISO50001-based EnMS in industrial enterprises, laying the foundation for large-scale industrial energy efficiency improvements. Strengthened institutional and regulatory capacity through training seminars and stakeholder consultations, while significantly increasing EE investment flows. Collaborated with the Korea Energy Management Corporation (KEMCO) to deliver specialized training in the building materials and food processing industries, ensuring knowledge transfer and sustainable capacity building. These efforts anchored long-term mechanisms for industrial EE within Uzbekistan's green growth agenda.

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K52. Energy Efficiency Transformation in DH

Grant Title	Energy Efficiency Transformation in DH
Region	Europe and Central Asia
Countries	Moldova
Sector	Energy
Program Year	2015
Amount	$530,000
Status	Closed
Program Goal	The program aimed to modernize Chisinau's outdated district heating system to reduce Moldova's dependence on imported gas and improve energy efficiency. By shifting from supply-driven to consumer-demand-based operations, the project sought to cut energy losses, introduce ICT-enabled billing and monitoring, and pilot renewable and biofuel integration. The ultimate objective was to demonstrate an inclusive, efficient, and sustainable model for urban heating transformation.
Key Result	Enabled the design of sustainable rooftop solar models for Ho Chi Minh Power Corporation and Central Power Corporation, improving their capacity to integrate PV into distribution systems. Strengthened regulatory and technical frameworks for grid stability and advanced ICT application, while enhancing financing pathways for scale-up. Collaborated with Korea Energy Agency to share technical expertise, which expanded institutional capacity and informed national strategy implementation. Leveraged outcomes to accelerate Vietnam's clean energy transition.

K51. Scaling-Up Rooftop Solar in Vietnam II

Grant Title	Scaling-Up Rooftop Solar in Vietnam II
Region	East Asia & Pacific
Countries	Vietnam
Sector	Energy
Program Year	2015
Amount	$91,379
Status	Closed
Program Goal	The program aimed to accelerate Vietnam's energy transition by scaling rooftop solar deployment at the city level. Building on the national solar PV strategy from Phase I, it sought to address grid

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	integration and regulatory gaps, explore battery storage and ICT solutions, and develop sustainable business models for utilities. The objective was to strengthen technical, financial, and institutional readiness for large-scale rooftop solar adoption.
Key Result	Enabled the design of sustainable rooftop solar models for Ho Chi Minh Power Corporation and Central Power Corporation, improving their capacity to integrate PV into distribution systems. Strengthened regulatory and technical frameworks for grid stability and advanced ICT application, while enhancing financing pathways for scale-up. Informed national strategy implementation and expanded Vietnam's institutional capacity to pursue low-carbon growth, leveraging rooftop solar as a core driver of the country's clean energy transition.

K30. Towards Green Growth in DVC through use of ICT and Investment in Clean Energy Generation

Grant Title	Towards Green Growth in DVC through use of ICT and Investment in Clean Energy Generation
Region	South Asia
Countries	India
Sector	Energy
Program Year	2014
Amount	$600,000
Status	Closed
Program Goal	The program aimed to support Damodar Valley Corporation's transition from a 100% coal-based utility toward renewable energy generation by leveraging ICT and smart grid technologies. By piloting solar, hybrid, and storage solutions, and sharing international expertise, the initiative sought to create a roadmap for sustainable energy growth, strengthen regulatory and institutional capacity, and enable large-scale clean energy investments aligned with India's green growth agenda.

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Key Result	Developed a comprehensive smart grid and renewable energy roadmap that positioned DVC to diversify beyond coal and integrate innovative technologies such as floating solar and wind-solar hybrids. Strengthened policy and regulatory frameworks for grid stability under India's solar mission, while enhancing institutional capacity through training and international exchanges with Korea. Leveraged $220M in World Bank lending to accelerate large-scale solar investments, establishing DVC as a demonstration case for India's renewable energy transition.

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