JAPAN-U.S.-MEKONG POWER PARTNERSHIP (JUMPP)

Action Plan

April 2023

Cooperation under JUMPP is supported by the U.S. Department of State and U.S. Agency for International Development (USAID) for the U.S. Government and the Ministry of Foreign Affairs and Japan International Cooperation Agency for the Government of Japan. JUMPP activities and technical assistance are implemented by the following partners:

U.S. Department of Commerce, Commercial Law Development Program
Deloitte & Touche, LLP (Deloitte)
National Association of Regulatory Utility Commissioners
Pacific Northwest National Laboratory
USAID Southeast Asia's Smart Power Program
United States Energy Association

I. Japan-U.S.-Mekong Power Partnership Background

Launched in 2019, the Japan-U.S.-Mekong Power Partnership (JUMPP) supports the Mekong region's pursuit of energy security while encouraging greater regional power trade, clean energy integration, decarbonization, and resilience. Through JUMPP, the U.S. and Japanese governments partner with Mekong governments to promote a more sustainable electricity sector and quality power infrastructure development. U.S. and Japanese bilateral and regional technical assistance supports Mekong electricity regulatory and power system development by working with national power market authorities on integrating renewable energy, developing competitive power markets, enhancing cross-border power trade, and creating opportunities for private investment.

From November 2021 to July 2022, JUMPP stakeholders met four times to discuss ongoing JUMPP collaboration and develop a JUMPP Action Plan for expanding regional cooperation on power sector development, renewable energy deployment, and regional power trade. To prioritize new technical engagements, the governments established the JUMPP Technical Advisory Group (TAG), composed of officials from the Governments of Cambodia, Lao People's Democratic Republic (PDR), Thailand, Vietnam, Japan, and the United States, as well as implementing partners of JUMPP technical assistance. During meetings, representatives from the governments and state-owned electric utilities presented their priorities, offered input on the draft JUMPP Action Plan, and shared information about their respective goals for scaling up renewable energy and regional electrical interconnectivity. Technical assistance includes: power market analysis, advisory support, technical assessments, capacity building workshops, regulatory exchanges, and roundtables with private energy companies to accelerate the energy transition and cross-border power trade in the region. JUMPP Technical Assistance Activities began in 2019 and will continue through 2025.

JUMPP Pillars and Goals of Technical Assistance

Clean Energy Integration

- Improve grid resilience and reliability
- Enable increased dispatch of renewable energy sources
- Expand ancillary service and capacity regulation for the deployment of renewables
- Support the energy transition toward carbon neutrality and reliable integration of variable renewable energy

Market Development and Investment

- Build Mekong stakeholder capacity in operating electricity markets
- Support power market development and transition from single buyer to competitive electricity markets
- Enable the long-term development of a regional Mekong electricity trading market

Regional Power Trade

- Improve the compatibility of regulatory and technical standards across the Lower Mekong Region
- Increase the number of interconnection lines between countries and maximize use of existing transmission capacity to expand trade
- Facilitate increased regional coordination on long-term grid and energy planning
- Assess economic opportunities for mutually-beneficial bilateral and regional power trade

II. New Mekong Regional JUMPP Technical Cooperation Activities

Through JUMPP, the U.S. and Japanese governments, along with their implementing partners, will seek to achieve JUMPP goals through the following regional activities:

▸ Provide Peer-to-Peer Capacity Building on Energy Storage, Market Development and Monitoring, and Setting Wheeling Tariffs

The National Association of Regulatory Utility Commissioners (NARUC), Deloitte & Touche, LLP (Deloitte), and the Commercial Law Development Program (CLDP) will organize a study tour to the U.S. to build capacity on energy markets and technologies. This study tour will include peer-to-peer engagements with regulators and key stakeholders on their key topics of interest, which may include energy storage, market development and monitoring, setting wheeling tariffs, and regional renewable energy integration considerations.

▸ Provide Leading Practices and Methods for Enabling Regional Trade Using a Pilot Transmission Interconnector

Deloitte will share leading practices and methodologies for developing interconnector transmission codes (ITC) and calculating available transfer capacity (ATC) for transmission interconnectors. Deloitte will also work with Thailand, Cambodia, and Lao PDR to identify a pilot interconnector line and propose recommendations for developing the interconnector based on leading practices for ITC and ATC. This work will complement the Asian Development Bank's (ADB) regional grid code initiative.

▸ Facilitate Roundtables and Peer-to-Peer Capacity Building with Key Stakeholders on Power Pool Planning, Smart Grid Development, Renewable Energy, and Increased Electric Vehicles

The United States Energy Association (USEA) and Deloitte will organize regional workshops for Cambodia, Lao PDR, Thailand, and Vietnam focused on power pool planning. The workshops will feature presentations from international experts on power pool formation. After the power pool workshops, USEA will organize a study tour to the U.S. with a focus on smart grid development, renewable energy integration, and planning for increased electric vehicles.

▸ Provide Technical Assistance and Organize a Workshop on Different Approaches for Financing Interconnector Lines

Interconnectors are an important asset in enabling greater sharing of reserves, generation, and consumption of renewable energy. Deloitte will provide examples of the different financing and operating models other countries have used to build new transmission lines, including cross-border ties. This work will evaluate the advantages and disadvantages of these different approaches and provide considerations for JUMPP countries as they engage in more interconnection opportunities.

▸ Identify Actionable Next Steps for Regulators to Move from Bilateral Power Trade to a Harmonized Regional Power Market

NARUC will develop a roadmap that outlines regulatory developments/progress needed to move from bilateral power trade to a harmonized regional power market. The roadmap will include actionable next steps for each country.

▸ Provide Capacity Building on Key Components of System Optimization and Determining Priority Dispatch

NARUC will organize a virtual capacity building webinar on changes to system optimization and determining priority dispatch when integrating renewable energy and other new technologies.

▸ Provide Capacity Building on Requirements for Ancillary Services and Maintaining Grid Reliability

NARUC will organize a virtual capacity building webinar on requirements for ancillary services and maintaining grid reliability with increased intermittent renewable energy resources. In addition to the webinar, NARUC will provide a written summary of key considerations for ancillary services requirements and maintaining grid reliability with increased intermittent renewable resources.

▸ Provide Capacity Building on Pricing for Utility-Scale Solar and Storage

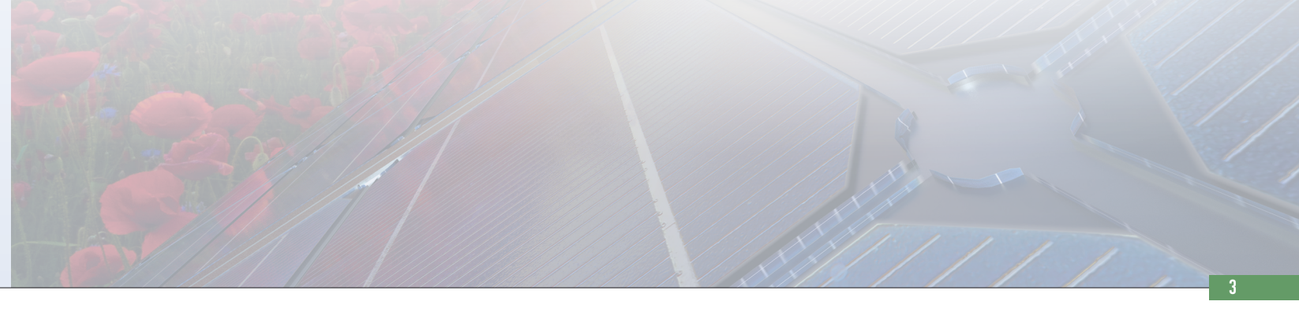
NARUC will organize a virtual capacity building webinar on key components of pricing for utility-scale solar and storage and may include a remote peer review of a related document.

▸ Provide Capacity Building on Regulatory Mechanisms to Incentivize and Integrate Energy Storage

NARUC will organize a virtual capacity building webinar on regulatory mechanisms needed to incentivize and integrate energy storage options. NARUC will provide an outline of regulatory mechanisms that could be developed by each country to regulate and price energy storage.

▸ Provide Capacity Building on National and Regional Transmission Planning and Setting Wheeling Tariffs

NARUC will organize a virtual capacity building webinar on national and regional transmission planning and setting wheeling tariffs. In addition to the webinar, NARUC will provide an outline of action items JUMPP countries need to begin alignment of regional transmission planning.



▸ Support Implementation of ASEAN Interconnection Masterplan Study (AIMS) III Recommendations

The AIMS III study identified 7 potential interconnector/power trading opportunities in the Mekong region, together with grid flexibility recommendations. USAID Southeast Asia's Smart Power Program (USAID/SPP) will support a stakeholder-driven process to identify and support promising power trading opportunities within the Mekong Region as well as recommendations for enhancing grid flexibility (e.g., added fast-responding reserves and coordinated system planning and operation). USAID/SPP will also work with Mekong stakeholders to update the data collected during AIMS III. Through this support, USAID/SPP will provide a Stakeholder Consultation Report, a Priority Interconnector Screening Report, and an Interconnector Business Case Analysis.

▸ Develop Subregionally Acceptable Interconnector Cost Allocation Methodologies

Transmission infrastructure cost allocation can be a barrier to interconnector feasibility determination and financing. USAID/SPP will work with Mekong subregional stakeholders to characterize current cost allocation practices; compare with leading methods in the U.S. and elsewhere; and propose methods that increase transparency, advance the feasibility study and financing process, and improve cost efficiency. USAID/SPP will also support a Mekong subregional consensus building process bringing together regulators, ministries, and utilities to share information and promote a uniform and broadly applicable cost allocation methodology.

▸ Support Mekong Subregion Priority Interconnector Project Feasibility Studies

The AIMS III masterplan identified 7 potential interconnections within the Mekong subregion totaling 2 gigawatts (GW) of power trading potential. USAID/SPP will provide technical assistance and capacity building to support a feasibility study of at least one of these potential interconnections that unlocks new renewable energy resources or otherwise supports power system decarbonization. USAID/SPP will work with potential trading partner countries to map out feasibility study requirements, including financing alternatives, with the overarching goal to promote the commercial viability and expedited development of the interconnection project itself.

▸ Strengthen Competitive Procurement Processes

USAID/SPP is establishing a regional Center for Competitive Procurement (CCP) to build capacity and promote transparent and efficient procurement of clean energy and advanced power technologies/services. USAID/SPP will work with regulators and utilities to strengthen existing public sector procurement practices, including enhancements such as competitive tendering, financing and guarantee options for auction design, direct power purchase agreements, and other types of procurement contracts.

▸ Increase Participation and Elevate the Roles of Women in the Mekong Power Sector

Building off of its own Southeast Asia Gender Equality and Social Inclusion (GESI) analysis, collaborating with USAID Enhancing Equality in Energy for Southeast Asia (E4SEA) and bilateral programs, and in cooperation with ASEAN Center for Energy, USAID/SPP will assess, identify, and prioritize entry points for women's increased engagement and appropriate skill development in Mekong power utilities.

▸ Assess Opportunities to Access Green Finance to Build Out Infrastructure, such as Renewable Energy Deployments, and Lower Greenhouse Gas Emissions

Global investors are increasingly looking for investable products that deliver against both financial and environmental, social, and governance (ESG) metrics. Deloitte will describe opportunities, challenges, and potential solutions for JUMPP countries looking to attract global capital of this nature to build out national and regional power system projects. The work will consider options such as sovereign and sub-sovereign bonds (green bonds), and other types of investment products that could appeal to providers of funds looking for investments with an ESG-positive profile.

▸ Support a Regional Electricity Market Model for Thailand and Lao PDR

Any effort to increase cross-border power exchange and attract private investment to the Mekong Region must establish institutional arrangements that inspire stakeholder confidence in fair, open trading. Deloitte will provide technical assistance to identify potential institutions, as well as their responsibilities, which could inspire stakeholder confidence.

▸ Workshop on Possible Options for Regional Power Market Architectures

The Pacific Northwest National Laboratory (PNNL) will analyze options for regional power markets architectures based on analysis of other existing regional market architectures like the Western Energy Imbalance Market and Mercado Electrico Regional in Central America, as well as the evolution of the market architectures as penetration of variable renewable energy (VRE) increases. Cambodia, Lao PDR, Thailand, and Vietnam could incorporate this discussion and knowledge into their roadmap toward a regional market.

▸ Provide Recommendations for Enhancement of Control Center Practices, Technical Standards, and Operational Procedures for Reliable Operation with High Penetration of Variable Renewable Energy

PNNL and USEA will organize peer-to-peer capacity building focused on leading practices for control center operations and leading practices to support the increased deployment of variable renewable energy resources. The study tour will bring representatives from JUMPP countries to the U.S. to learn about how U.S. grid operators operate control centers, set technical standards, and implement leading operational practices to mitigate voltage and frequency fluctuations caused by variable generation.

▸ Support Technical Capabilities of Women Engineers

PNNL will organize and host workshops on technical and non-technical topics providing opportunities for women to share expertise and experiences in technical roles with one another. This effort will support women engineers in developing technical and non-technical skills to take leadership roles in the electric industry supporting the goals of clean energy integration, electric market operation, and resilient and reliable system operation.

▸ Workshop or Studies on Reliability Planning for High Penetration of VRE, Including Possible Expansion of Cross-Border Transmission and Resilient Operation under Extreme Weather Conditions

PNNL will organize a workshop on technical reliability studies and methodologies to support expansion planning, operational planning, and grid stability evaluations with high penetration of VRE, including possible expansion of cross-border transmission, considering variability and uncertainty from VRE. The workshop will cover studies for resilient operation under extreme weather conditions of interest to the region, such as extended droughts and floods. This activity could include a study depending on data availability.

▸ Workshop on Strategies to Increase Deployment of Various Energy Storage Technologies, Including through Hybrid Solar and Other Innovative Storage Projects

PNNL will provide a workshop on identifying various value streams that help increase energy storage adoption as a solution for integration of VRE. The workshop can include use cases utilizing PNNL's Energy Storage Evaluation Tool (ESET) and its potential application to the Mekong region. ESET is used to model, optimize, and evaluate various energy storage systems such as batteries, pumped storage hydropower, hydrogen, and thermal mass stored in buildings.

▸ Evaluation Framework for Renewable Energy-Based Microgrids Serving Remote Locations

PNNL will develop an evaluation framework to assess the feasibility of a microgrid that incorporates renewable energy generation (wind, solar), energy storage, and localized distribution to serve remote villages that have inadequate or no access to a regional electric system/supply. The framework will include project evaluation criteria to determine the suitability of renewable energy technologies given the characteristics of the surrounding land and its current use, current and anticipated electric loads, and other factors as identified through discussions with local residents. The framework will be validated at one pilot location and will be applicable at other locations across the participant nations.

▸ Market Analysis to Identify Gaps and Solutions for Renewable Energy Power Supply to Rural Areas

PNNL will conduct a market analysis for rural small-scale renewable energy power supply. Exploration of the feasibility of new approaches will consider the local area's renewable resource potential, availability of labor and materials, local technical ability to operate and maintain systems, implementation costs and funding sources, and potential developers/implementation agents.

▸ Utility Strengthening Partnerships

In consultation with the Heads of ASEAN Power Utilities/Authorities (HAPUA) and the Mekong utilities, USAID/SPP will develop assessment criteria reflective of operational requirements and emerging resiliency needs, as well as identify candidate utilities for utility strengthening partnerships. USAID/SPP will apply these criteria to conduct utility strengthening needs assessments, identifying areas for operational strengthening, especially regarding integrating advanced energy technologies and solutions and coordinating power trade. USAID/SPP will also identify opportunities for Mekong utility partnerships focused on sharing knowledge and techniques for maintaining resiliency, meeting performance requirements, and introducing new technologies and functions.

▸ Third Country Training Program: Modernization of Power Distribution Systems (2021-2023)

The Japan International Cooperation Agency will provide technical assistance through a third country training program to build capacity for participants to modernize power distribution systems of ASEAN countries.

▸ Organize JUMPP Regional Clean Electricity Trading Conference

USEA will organize a conference held in the Mekong region that will serve as an effective platform for fostering a better understanding of international clean electricity trading. The conference will include technical presentations, sharing of international leading practices in cross-border electricity trade, and the facilitation of networking opportunities. Conference attendance could also be open to participation from non-JUMPP stakeholders in the region, including ADB, ASEAN, Heads of ASEAN Power Utilities/Authorities (HAPUA), and others.

▸ Organize Executive Exchanges with Leaders in the U.S. to Understand Leading Practices for Operating Electricity Markets

Competitive electricity markets enable the reliable and efficient operation of the U.S. power grid and support the delivery of low cost electricity to customers. USEA will organize a study tour to the U.S. for representatives from Cambodia, Lao PDR, Thailand, and Vietnam to learn about the experiences of U.S. power market operators. The study tour will focus on different types of electricity markets, lessons learned from decades of operating markets, and leading practices that can be applied in the Mekong region.

III. New Bilateral JUMPP Technical Cooperation

Through JUMPP, the U.S. and Japanese governments, along with their implementing partners, will seek to achieve JUMPP goals through the following bilateral activities:

Cambodia JUMPP Technical Cooperation Activities

▸ Provide Inputs on Cambodia's Grid Code and Interconnection Standards

NARUC experts will provide input on Cambodia's grid code and/or interconnection standards and will discuss regulatory tasks needed to update the documents to smooth and incentivize renewable energy integration and to harmonize such documents for bilateral and regional trade.

▸ Variable Renewable Energy Strategy and Roadmap

Deloitte will develop a VRE strategy and roadmap for Electricite du Cambodge (EDC) that identifies methods for the utility to increase its use of, and extract maximum value from, wind and solar resources. The report will draw upon case studies illustrating how utilities in the United States and globally have modified their own planning, infrastructure, and operations to optimize VRE capacity. Deloitte will include information on how new technologies, such as battery energy storage systems (BESS), support VRE growth, and a roadmap to help EDC decide how to sequence these changes.

▸ Battery Energy Storage System Study for Cambodia

USEA will conduct a study on the potential for Cambodia to deploy battery energy storage systems that can store excess energy from solar resources or the grid during periods of low power demand and dispatch the energy to the grid during periods of high demand. The study will provide recommendations on optimal BESS technologies and interconnection points to optimize their grid support potential, with a focus on same-day dispatch.

▸ Project for the Development of a Clean Energy Transition Roadmap Toward a Carbon Neutral Society (2023- 2025)

The Japan International Cooperation Agency (JICA) will provide technical assistance to the Government of Cambodia to develop a Clean Energy Transition Roadmap to guide the transition toward a carbon neutral society. Through this cooperation, JICA will provide advice on how to achieve both carbon neutrality and stable power supply, such as technical advice on the introduction of mitigation measures for C02 emissions from coal power plants in operation (e.g. biomass co-firing technology).

Lao PDR JUMPP Technical Cooperation Activities

- **Study and Analysis on Potential Impacts of Solar and Wind Power Plants when Integrated to the Grid System in Lao PDR**

  Lao PDR is seeking to increase its hydropower, solar, wind, and biomass generation resources to both export power to neighboring countries and to meet internal energy demands. Deloitte will develop a workshop to support Lao PDR with its alternative energy planning and integration.

- **Project for Integrated Energy Master Plan Toward a Sustainable Carbon-Neutral Society (2023- 2025)**

  The Japan International Cooperation Agency will provide technical assistance to the Government of Lao PDR for the development of an Integrated Energy Master Plan to guide the transition toward a sustainable, carbon neutral society. (To be determined)

- **Strengthening Capacity for Renewable Energy Management by Developing Regulations, Processes, Standards, and Grid Interconnection Guidelines**

  USAID/SPP will provide technical assistance to Lao PDR on the development of regulations, processes, standards, and grid interconnection guidelines to improve stakeholder capacity to manage renewable energy resources.

- **Technical Assistance to Develop Regulations and Guidelines for Technical Inspection and Examination of Solar, Wind, and Other Variable Renewable Energy**

  USAID/SPP will provide technical assistance to Lao PDR on the development of regulations and guidelines for technical inspection and examination of solar, wind, and other renewable energy resources.

Thailand JUMPP Technical Cooperation Activities

- **Estimate Future Generation Reserve Needs for Reliable Operation with Higher Variable Renewable Energy**

  PNNL will perform a balancing reserve planning study assessing potentially increased requirements for balancing reserves (reserves for secondary frequency control and intra-day load following). PNNL will model the Electricity Generating Authority of Thailand's (EGAT) operational procedures related to balancing reserves and generation flexibility.

- **Capacity Building on Floating Solar Development and Regulation**

  Based on EGAT's successful development of its floating solar project at Sirindhorn Dam, CLDP will provide additional technical assistance, in the form of written analyses and virtual or in-person trainings, consultations, and workshops with relevant legal experts, on topics related to development floating solar generation resources.

Vietnam JUMPP Technical Cooperation Activities

- **Capacity Building on Offshore Wind Development and Regulation**

  NARUC and CLDP will organize a peer-to-peer study tour with U.S. regulators and other stakeholders focused on offshore wind development and regulation, including related discussions on the integration of other intermittent technologies.

- **Advanced Metering Infrastructure (AMI) in Vietnam**

  Advancements in metering technologies can introduce potential economic and technical benefits to a utility. Deloitte will communicate experiences, lessons learned, and technical advice from leading international utility AMI programs to better equip Vietnam to solve the challenges its current and future AMI programs may present.

- **Project for Capacity Improvement on Power System Operation when Introducing Large Amounts of Variable Renewable Energy**

  JICA will provide technical cooperation with Vietnam focused on power system operations when Introducing large amounts of Variable Renewable Energy. Technical cooperation will include technical advice, training and workshop for capacity building in operating power systems when integrating large proportions of renewable energy sources based on a future detailed planning study (tentative).

- **Technical Cooperation on Enhancing ElectricPower System Flexibility, Energy Efficiency, and the Energy Transition (Tentative))**

  JICA will provide technical cooperation with Vietnam focused on enhancing the flexibility of the electric power system, improving energy efficiency, and navigating the energy transition. Details will be determined based on further consultation with the Vietnamese Government.

IV. Completed and Ongoing JUMPP Technical Cooperation Activities

Since the launch of JUMPP in 2019, the U.S. and Japanese governments, along with their implementing partners, have worked with Mekong governments to accomplish JUMPP goals through over 50 bilateral and regional technical assistance activities. These activities have included training and capacity building on technical, economic, and legal topics; technical, economic, and legal advisory projects; and reports and analyses on technical, regulatory, and commercial topics.

Completed and Ongoing JUMPP Training and Capacity Building Activities

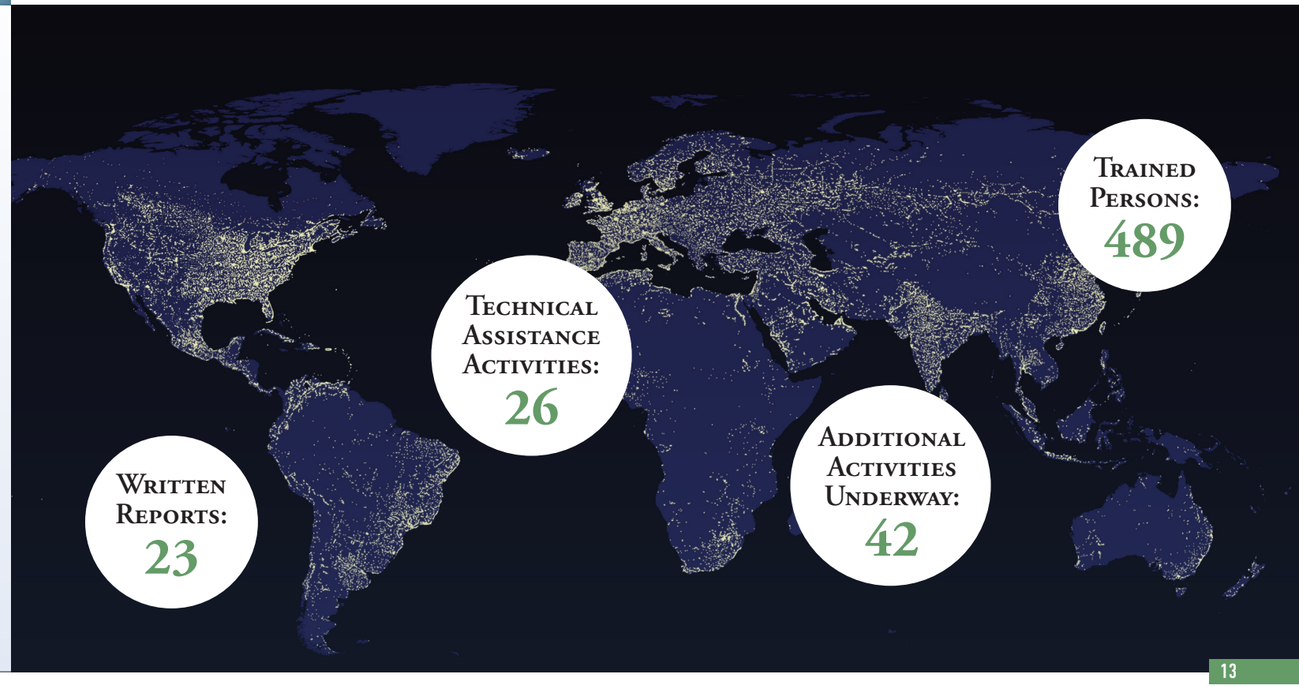
- Competitive power market development and wholesale power market operations;
- Integrating variable renewable energy into power systems;
- Cross-border power trade, wheeling tariffs, and power pool development;
- Regulatory frameworks for distributed energy resources and distributed generation;
- Legal instruments to support investment in power system infrastructure; and
- Power system planning to ensure system stability and reliability.

Completed and Ongoing JUMPP Advisory Projects

- Power and energy market economics and planning;
- Transmission system operation and management;
- Regulatory tools to improve power quality;
- Power policies and development strategies;
- Commercial leading practices for establishing power trading companies and increasing power exports;
- Technologies to enable digitalization of power systems to support renewable energy deployment; and
- Establishment of renewable energy control centers and wholesale power markets.

Completed and Ongoing JUMPP Reports and Studies

- Legal and regulatory frameworks for transparent and competitive power and energy markets;
- Smart grids, energy storage technologies, advanced metering infrastructure, and digitalization tools for power systems to support renewable energy growth;
- Power system modeling, forecasting, and planning for the integration of variable renewable energy resources;
- Power and energy market economics, tariff structures, and accounting systems;
- Power pool operation and cross-border power trade; and
- Power reserves and frequency control measures for power systems with high penetration of variable renewable energy resources.



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