Support to Upgrade the Jawa Madura Bali (JAMALI) Control Center

Session Topic: 3.3 - Upgrade and Expansion of Electricity Transmission and Distribution Grids

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STRATEGIC OUTCOMES

**SO1: Aligning Policies with Climate Commitments**
- Provision of high level technical advisory support to improve RE and EE policies, regulations and laws
- Aligning energy policy targets with climate action commitments

**SO2: De-risking Energy Efficiency and Renewable Energy Investments**
- Aiming to unlock large-scale renewable energy investments by national and international financial institutions
- Increasing de-risking of projects and making them bankable

**SO3: Extending Smart Grids**
- Provision of technical solutions to expand smart grids
- Enabling evidence-based planning for national grid systems
- Provision of capacity building for grid operators

**SO4: Knowledge, Awareness and Capacity-building**
- Developing a comprehensive platform to foster knowledge
- Building technical and technology expertise through education programmes
- Establishing a state-of-the art centres of excellence
Interconnected Electrical Systems

Power grids are one of the most complex machines in existence, with millions of components making up the supply chain. Their operating conditions change, every second, minute, hour, day.... Load and VRE. They are open-ceiling factories exposed to all kinds of disturbances (climatic, human, vegetation and animals).

In 2001 the American Academy of Engineering voted (by majority) and recognized that the electrical grid was the greatest engineering achievement of the 20th century.
The Challenges of Variable Renewable Energy (VRE)

- Intermittency and Variability
- Grid Balancing and Flexibility
- Grid Congestion and Transmission Challenges
- Grid Integration Costs
- System and Operational Planning
- Grid Stability and Frequency Control
- Curtailment of Renewable Energy
- Ancillary Service Provision
Conventional VS Smart Power Grid
Project Aim and Support

ETP is providing multi-disciplinary analysis and specifications to modernize the Jawa-Madura-Bali (JAMALI) Control Centre:

- **Phase 1: October 2021 - December 2023**
  - Supporting the development of a detailed engineering design for the JAMALI Main Control Center (MCC)
  - Merging existing five regional control centers into a single Disaster Recovery Center (DRC).
  - Supporting systems, including technical, operational and organizational aspects

- **Phase 2: January 2024 - December 2025**
  - Advisory services for technology installations, training and capacity-building for staff.
Background

- The JAMALI Control Center, established in the early 1980s, manages 70% of Indonesia's generator capacity.
- It supplies electricity to 160 million people in the region.
- Managed by PT PLN (Perusahaan Listrik Negara), a state-owned key player in Indonesia's electricity sector.
- Aims to integrate renewable energy into the grid by 2030:
  - Manage up to 9.6 GW of renewable energy.
  - Include 3.2 GW of variable renewable energy sources.
Existing Condition

- Consists of a single control center and five regional control centers
- Slow system recovery from large disturbances
- Existing technology has reached End of Life
- Limited database capacity
- No variable renewable energy forecasting
- No features to support voltage stability, transient security and Wide Area Monitoring System
Lead Consultant

Member Consultants

In-house Technical Consultant
Envisioning the New PLN JAMALI Control Centre

Main Control Centre

Disaster Recovery Control Centre
Supervisory Control and Data Acquisition (SCADA) systems are widely employed in control centers to monitor and control the electric grid. They collect real-time data from various devices (sensors, meters, and control equipment) and provide operators with a visual representation of the grid's status. SCADA systems enable operators to monitor critical parameters, detect abnormalities, and control devices remotely.
Grid Management Tools - EMS

- Energy Management Systems (EMS) is a comprehensive software solution that integrates real-time data from SCADA systems, generation units, transmission lines, and other grid components.

- It provides advanced analytics and decision-making capabilities to optimize grid operation and manage energy flows.

- EMS tools enable operators to monitor grid performance, analyze system stability, and optimize power dispatch.
PLN Control Center Facts

- Designed to satisfy PLN network observability, control and economy requirement for PLN Java-Bali service region
- Only proven technology with the latest released market development is applied
- Only world class vendor with high reputation are participating in the tender
- VRE has driven the selection and specification of most new applications and enhancements for existing application
Benefits of the New JAMALI Control Centre

- Increased VRE
- Enhanced System Reliability and Stability
- Improved Operational Efficiency
- Enhanced Data Analytics and Decision Making
- Improved Integration with Renewable Energy Sources
- Enhanced Cybersecurity
- Cost Savings
- Increased System Reliability
- Scalability and Flexibility
- Compliance and Reporting
- Environmental Benefits
With these features, it is expected that the new JAMALI Control Center will create operational benefits through efficiency and effectiveness in optimizing control functions and a fast recovery system.

It could also address other challenges:
- system development
- technology disruption
- VRE integration
- power market regulation

PLN with the MCC and DRC is paving the road to effectively support all foreseen changes.
THANK YOU

Questions and discussion

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