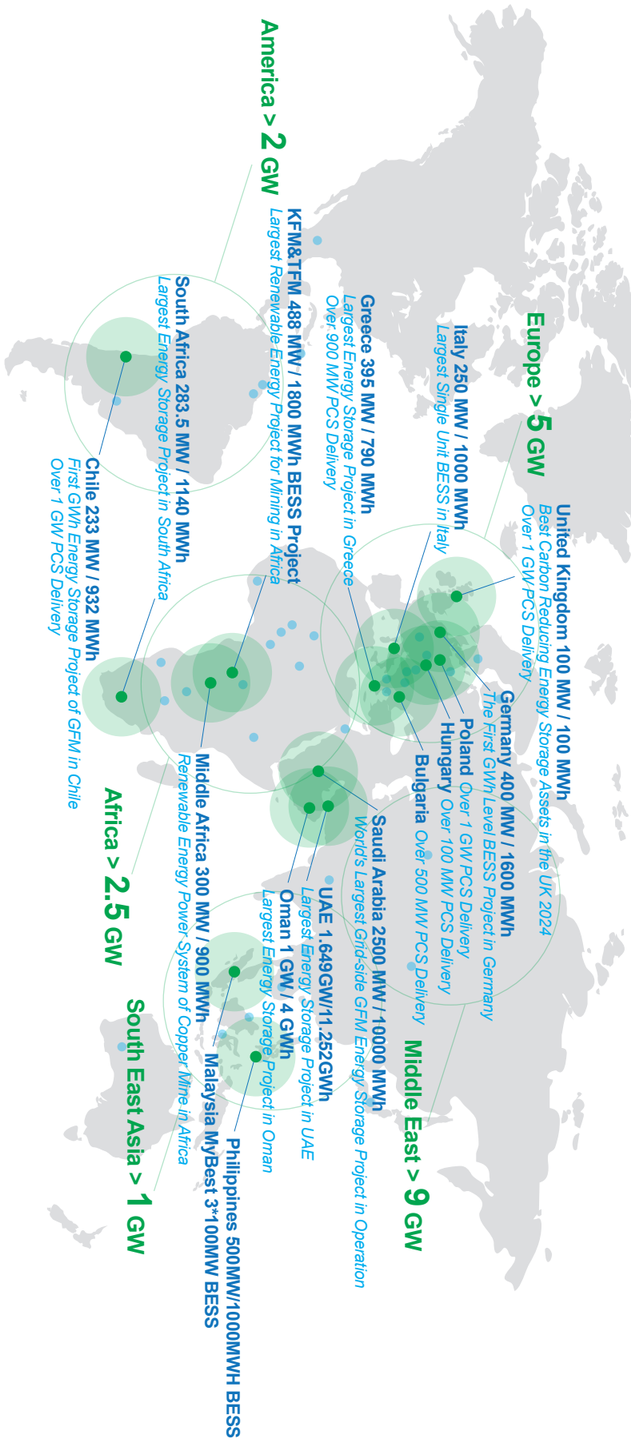
Global References



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KPM Copper Mining
NR-ISGrid Grid-forming BESS Project

Case Study

NR-ISGrid

NR ELECTRIC CO., LTD.

Background

This project is located in the Likasi Industrial Park in the Katanga Province in the southeast of Africa. It mainly produces copper and cobalt. Since June and July 2024 , the power shortage here has been very serious, with an average power outage of more than 10 hours a day, and power rationing is also quite serious. In November 2024 , the power rationing was between 20 and 30MW. The total load in the plant is about 55MW, and the 19 diesel generators of 22MW in Phase I run 24 hours without stopping. At present, the power rationing of the city power is about 3 to 15MW, and in most of the time the power rationing is less than 10MW, and only 1-2 busbars can be brought to the station#1.

It is necessary to plan a set of integrated photovoltaic and storage microgrid systems to deal with it. At the same time, the photovoltaic system has the function of connecting and disconnecting the grid, self-generation and self-use, full consumption, and energy storage as a grid -forming system.

After the city power outage, the energy storage system is set as the main power supply to maintain the 35KV grid with power and operate with the minimum load.

The photovoltaic (PV) + energy storage system was originally designed as a replacement for diesel generators. However, due to the current severe power shortage, the system now operates under a coordinated control scheme integrating PV, energy storage, and diesel generators to ensure maximum production efficiency of the industrial facility.

The first phase will install 60 MWp photovoltaic + 20MW/ 60 MWh energy storage, of which the energy storage adopts a grid-forming PCS, and the whole network is equipped with a source-grid-load-storage coordination management system. Because the city power supply is unstable and the city power quota is relatively low, they basically use solar/energy storage/diesel for off-grid operation.



Principle

As a world-leading energy storage solution provider, NR Electric provided key equipment for this project, including grid -forming power conversion system , active power filter (APF), source-grid-load-storage integrated coordinated control system and power dispatching platform, and led the overall planning and full-station design of the project. By building a source-grid-load-storage integrated smart grid, millisecond-level fault response and precise coordinated control of source-grid-load-storage can be achieved, maximizing the local consumption of renewable energy and helping enterprises reduce costs and increase efficiency.

Implementation of Grid-Forming Concept across all time scale

Implementation Plan: Adopt a "three-layer, two-network" control architecture, which includes three layers of control: grid-forming control, coordinated stability control, and energy optimization scheduling, along with two networks for fast control and dispatch monitoring.

Device Functions

- **Energy Optimization Scheduling System**

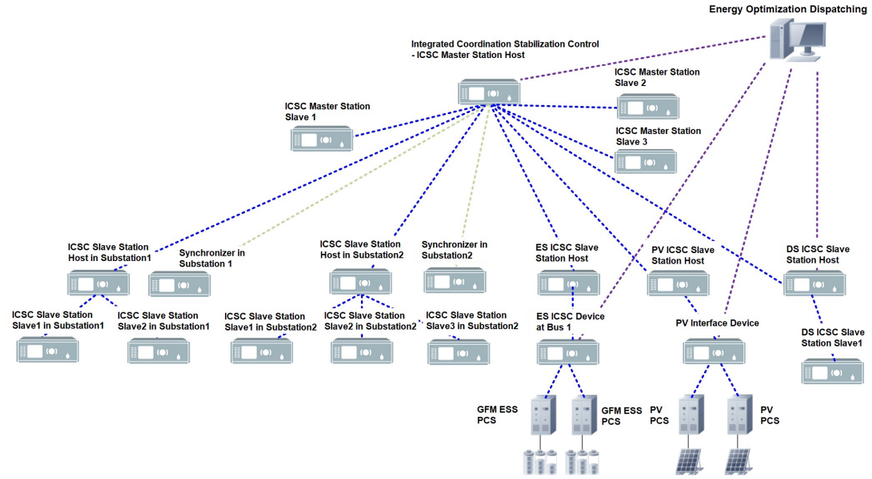
Achieves multi-energy complementarity and source-load interaction through panoramic data acquisition and modeling, solving the energy balance problem in renewable energy dominated systems.

- **Coordinated Stability Control System**

Solves power balance issues in renewable energy dominated systems by using regulation instead of shedding, or a combination of regulation and shedding, based on the degree of system disturbance.

- **NR-ISGrid Grid-Forming Converter**

Provides voltage support, inertia, and damping to ensure the basic strength of renewable energy dominated systems.



Integrated Coordination Stabilization Control Management

Case study

On March 25, 2025, the new energy power system of KPM Copper Mine was successfully put into operation. The successful implementation of this project solved the long-standing power shortage problem faced by the mining area, ensured the production efficiency of the enterprise, and significantly reduced the electricity cost and improved the stability of power supply.

In response to the complex grid structure, variable operation modes, and industrial harmonic pollution of this project, NR used the RTDS real- time simulation platform to reproduce multiple operating conditions in the mining area and completed the logic function verification in advance. During the on-site execution phase, NR further optimized the control plan with the actual conditions. In response to tight schedule, the NR project execution team put all effort to ensure that the system test complete on schedule and the project was successfully put into operation.