

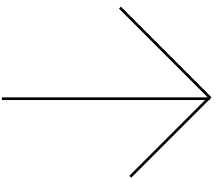
CHALLENGES IN THE INTEGRATION OF RENEWABLE ENERGY SOURCES IN THE PHILIPPINE GRID

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June 8, 2026



CHALLENGES IN THE GRID INTEGRATION OF RENEWABLE ENERGY SOURCES

Intermittency and Reliability

- Solar and Wind Variability
- Grid Stability

Infrastructure

- Timescale Misalignment
- Grid's Readiness for RE Penetration

Economic Factors

- Circular Dilemma
- Access to Financing

CHALLENGES IN THE GRID INTEGRATION OF RENEWABLE ENERGY SOURCES

INTERMITTENCY AND RELIABILITY

The variable output problem in solar and wind farms, caused by weather dependence and seasonal changes, poses challenges to grid stability and requires advanced solutions like energy storage and smart grid technologies for reliable integration.

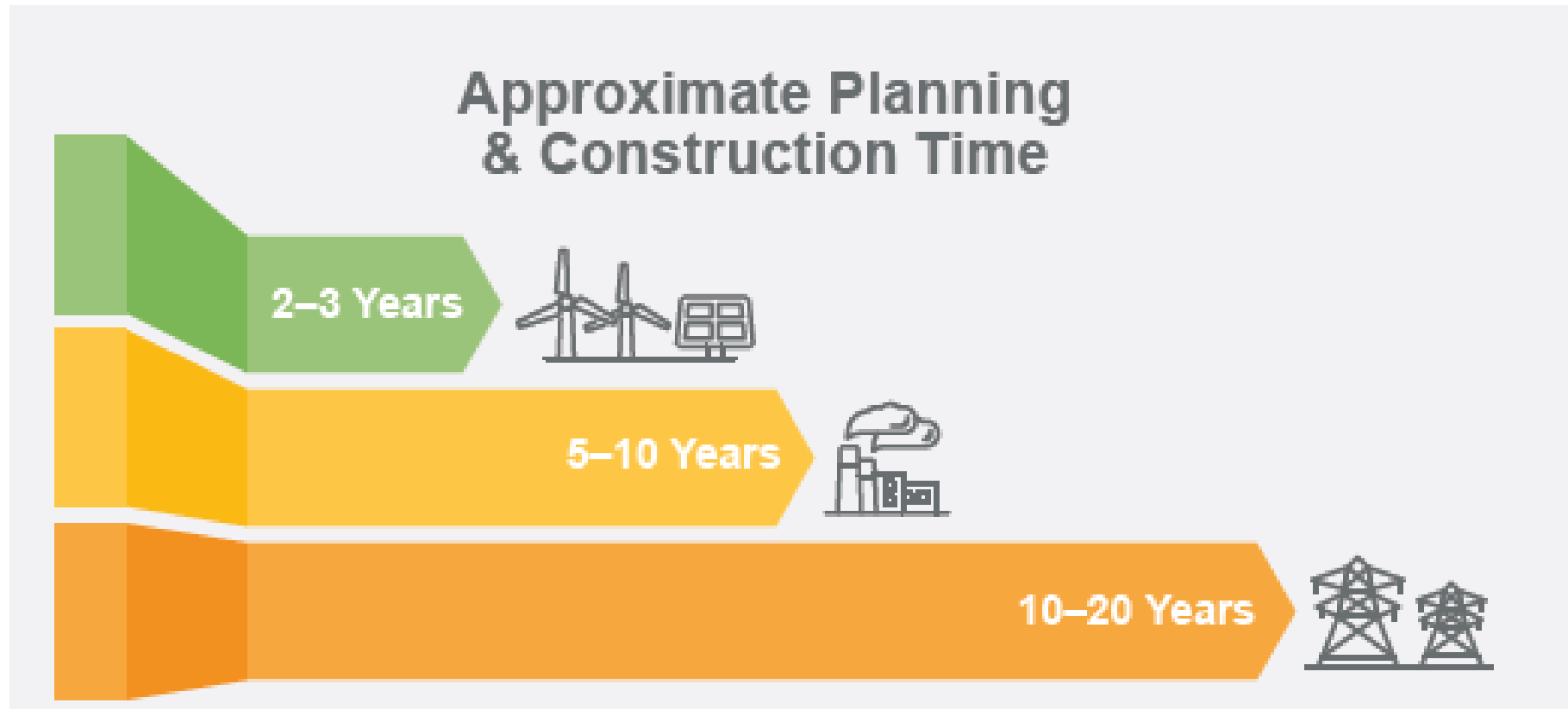
STABILITY ISSUES

- Frequency Fluctuation
- Voltage Stability
- Reduced System Inertia
- Reduced Short Circuit Ratio

CHALLENGES IN THE GRID INTEGRATION OF RENEWABLE ENERGY SOURCES

INFRASTRUCTURE: TIMESCALE MISALIGNMENT

Traditional transmission planning approaches are often misaligned with RE scale up. Deployment of large-scale wind and solar generation may only require a year or less, while transmission planning and development may take 10 or more years.



Source: Grid Planning and Competitive Renewable Energy Zone (CREZ) in the Philippines by USAID, NREL, DOE and NGCP

CHALLENGES IN THE GRID INTEGRATION OF RENEWABLE ENERGY SOURCES

INFRASTRUCTURE: GRID'S READINESS FOR RE PENETRATION

The entry of massive renewable energy resources without adequate transmission lines and congested networks results in significant bottlenecks, limiting efficient power distribution and grid stability.

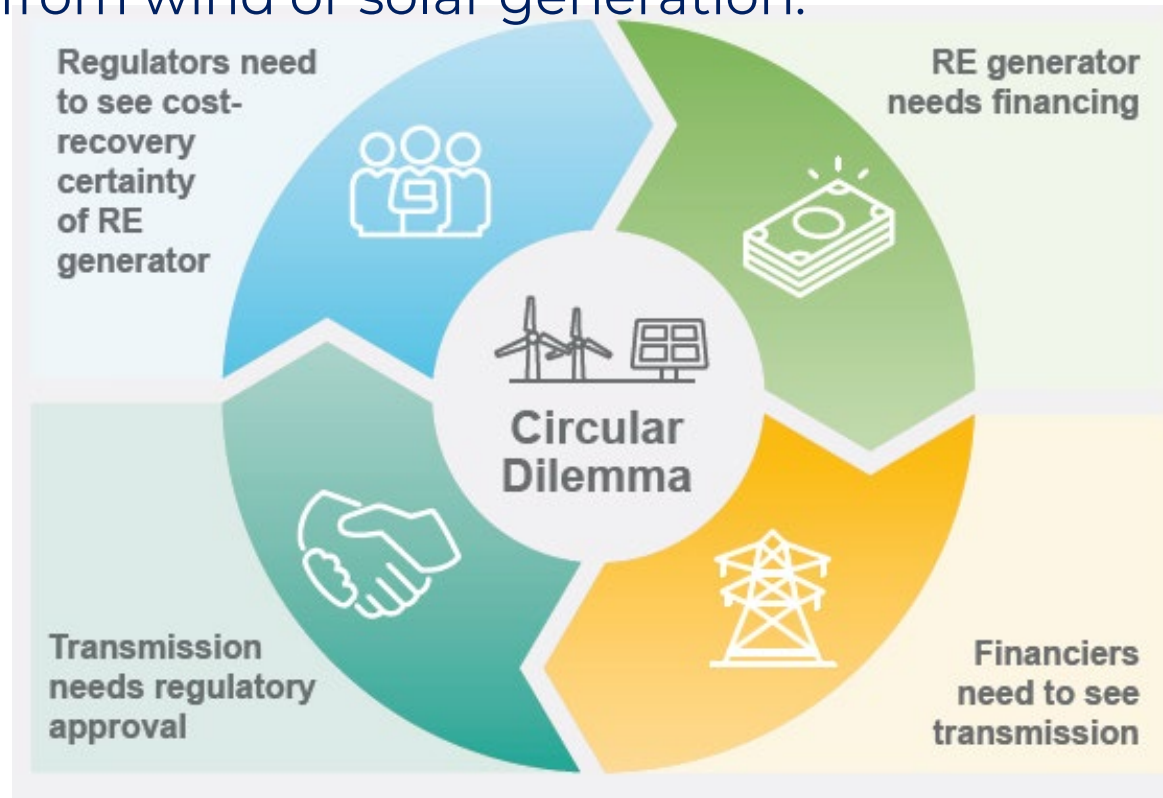


- Line Congestion
- Aging Facilities
- Archipelagic nature of the country

CHALLENGES IN THE GRID INTEGRATION OF RENEWABLE ENERGY SOURCES

ECONOMIC FACTORS: CIRCULAR DILEMMA

RE generator development requires financing, but remote wind or solar resources cannot be financed until transmission access is available; however, transmission lines cannot be built without cost recovery certainty or demonstrated need from wind or solar generation.



Source: Grid Planning and Competitive Renewable Energy Zone (CREZ) in the Philippines by USAI, NREL, DOE and NGCP

CHALLENGES IN THE GRID INTEGRATION OF RENEWABLE ENERGY SOURCES

ECONOMIC FACTORS: ACCESS TO FINANCING



The country's largest banks have mostly financed the RE projects of major developers and industry players, which are often part of conglomerates. Meanwhile, smaller independent power producers are continued to be perceived as risky by funding institutions which limit their access to project finance.

WAYS FORWARD FOR RE DEVELOPMENT



- **Grid Improvement and Modernization**



- **Research and Development**



- **International Cooperation**

Grid Improvement and Modernization: Upgrading the grid infrastructure is crucial for efficiently integrating renewable energy sources. This focuses on developing smart grids and enhancing transmission lines to support a higher share of renewable energy. Also known as the Smart and Green Grid Plan (SGGP) initiative of DOE.

Research and Development (R&D): Focuses on the supports in R&D to advance renewable energy technologies, aiming to improve their efficiency and cost-effectiveness. This includes investing in innovative solutions and fostering technological advancements

International Cooperation: Involves the international partnerships to benefit from global expertise, technology, and funding for renewable energy projects. These collaborations help the Philippines adopt best practices and leverage global initiatives

