

Digitisation and Decarbonisation of Power Distribution Networks in Pakistan

Powering Pakistan's renewable energy transition

The Challenge

Pakistan's updated Nationally Determined Contribution (NDC) as of October 2021 sets a binding greenhouse gas (GHG) reduction target of 15 per cent compared to the 2015 baseline. In the energy domain, the goal is to achieve GHG reduction primarily by increasing the share of renewable energies (RE) from the current 30 per cent (25 per cent hydropower, 5.4 per cent wind, solar and biomass) to 60 per cent by 2030. However, Pakistan's targets for expanding renewable energies pose numerous technical challenges for transmission and distribution system operators regarding expansion planning, distribution operations and connection compliance requirements as per the grid code. The main areas requiring expertise include developing forecasting methods for RE electricity yields across various locations and ensuring grid connections without compromising grid stability or causing large-scale power outages and management of high share of renewable energy in the power network specifically the distribution side. In addition to this, high technical and commercial losses in the distribution network contributes not only toward financial burden in the form of circular debt, but it also increases the carbon emissions through the use of excess energy through inefficient means. This requires digital solutions to be implemented in the distribution network to monitor the network on real time basis.

Our Approach

The project aims to address the issue of Decarbonisation at the national planning level, at the organisational level and at the field level. At the national level, the project seeks to support the Government of Pakistan (GoP) in the Integrated Energy Planning (IEP) to develop long term carbon emission free scenario. At the organisational level the project has the objective to strengthen the network integration competencies of specialists and managers, trans-

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fer of know-how to digital solutions to reduce grid losses. The project specifically addresses the actors who play a key role in Renewable Energy integration, i.e., the transmission and distribution system operators through in-depth capacity building program. Through the further development of strategic capacities and the introduction of innovative digital solutions for power grid operation and management, the capacity of the power grid operators to actively shape the energy transition will be increased at the organisational level. At the field level, the project takes an implementation-oriented approach and develops scalable digital solutions for distribution grids to overcome energy losses, improve operational efficiencies and enhance control for managing increased RE share in the power network.

Expected Results

Regulatory Guidelines

Efforts are underway to support Pakistan's energy sector institutions in adopting regulatory guidelines for implementing renewable energy strategy and enhancing the regulatory framework for



Pg. 1, Left: Local people trained in Chitral overseeing the operation of a small hydro-power plant.

Right: Assessment session with Energy Planning and Resource Centre (EPRC) on Integrated Energy Planning (IEP) framework.



Stoyanka Stich
stoyanka.stich@giz.de

Pg. 2, Left: Local engineers trained on improving energy efficiency of electricity transmission & distribution in Lahore, Pakistan.

Right: Ghazi Road Substation, Lahore, Pakistan.

integrating a high share of renewable energy in collaboration with key players in the electricity sector. Identification of necessary framework, guidelines, regulations, and subsequent support in formulating them is the major aim of the project. The project supports in formulation of policy instruments.

Long Term Energy Planning

The project aims to assist the GoP for the Long-Term Energy Planning for Pakistan which shall provide the guidance and necessary steps to be taken for meeting the demand and supply of energy sector through low carbon intensive fuels. The project cooperates with experts from the Department of Integrated Energy Planning of the Pakistan Planning Commission and provides technical expertise for the calculation of possible energy scenarios. The scenarios depict different time horizons and options. A scenario with a time horizon up to 2050 will be developed to show the relevant actors the consequences of a largely decarbonised electricity market (net zero scenario).

Building Network Integration Capacities

The focus of the project is on strengthening the capacities of transmission and distribution system operators for the

integration of variable Renewable Energies. This involves both improving the skills of the experts and equipping them with the necessary digital tools through the institutionalising of the capacity building program. The project aims to develop a methodology for RE-forecasts, as a key element of operational grid operation planning, in order to be able to forecast the availability of wind and solar energy and to align grid operation accordingly. In addition to the introduction of digital forecasting tools, the methodology also includes recommendations for adapting or optimising dispatching (deployment planning of power plants) for the integration of wind and sun.

Showcasing Digitalisation

The project will demonstrate the technical and financial feasibility of automation and digitalisation measures for distribution grids. It provides technical expertise to develop a concept for a holistic digitalisation concept together with the experts of the distribution system operators, which highlights the technology used and the expected effects on the reduction of grid losses and the increase in efficiency in grid operation.



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GIZ Country Office, Level 2, Serena Business Complex,
Khayaban-e-Suhrawardy, Sector G-5/1, Islamabad,
Pakistan

Phone +92 51 111 489 725

www.giz.de

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Faiza Batool, Communication Advisor

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Text

Jens Brinkmann, Project Manager
Faiza Batool, Communication Advisor

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