What’s next for distributed generation?

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Planning for growth beyond net metering

Distributed generation (DG) - also called on-site generation, dispersed generation, embedded generation, decentralized generation and distributed energy - generates electricity from small energy systems, at or near the point of consumption. Placed on roof-tops or ground-mounted, grid-connected distributed generators are typically used to offset an electricity customer’s own energy consumption, provide grid support through peak shaving, load shifting and ancillary services or sell power to a third party.

Motivated by the environmental benefits and other advantages of distributed generation (DG) technologies (including the potential to mobilize private finance, reduce network losses and decrease transmission investments), many countries have adopted compensation mechanisms, such as Feed-in-Tariffs (FITs) or net metering, and other types of incentives to promote DG. Coupled with rapidly falling technology costs, these incentives have catalysed rapid growth in global DG investments. In 2019, nearly $52 billion were invested worldwide in distributed solar PV systems of less than 1 MW, adding more than 30 GW to global DG installed capacity.

The net-metering experience in Pakistan

Pakistan adopted comprehensive net metering regulations in 2015 (Alternate and Renewable Energy, Distributed Generation and Net metering Regulations, 2015) to establish DG as a viable technology in the country. Although growth in net metered installations was initially slow, the market for net metered DG has picked up pace recently. According to NEPRA, approximately 47 MW of net metered DG was installed in 2019 compared to 10 MW added in 2018 and 15 MW installed since the start of the program in 2015.

The net metering program has clearly supported the local market for DG. With the compensation available through net metering, the un-discounted payback period for a 5 kW residential solar system is approximately 3 years and could decrease further if panel prices fall or electricity tariffs rise. The payback period for typical commercial and industrial systems varies between approximately 3 and 6 years.

However, the economics of DG in Pakistan gain more from excellent solar irradiation in most of the country, falling costs of solar PV technology and the fact that electricity from distributed solar PV costs significantly less than un-subsidized grid-supplied power in the country. According to the Renewable Energy Policy (2019), more than 2500 MW of solar panels were imported to

Pakistan between 2015 and 2019, far more than the approximately 700 MW of net metered and grid-scale installed solar capacity reported by NEPRA in the same period. The Solar PV import figures provide evidence of considerably more off-grid DG installed in Pakistan compared to grid-connected DG systems and substantiate the economic viability of the local DG market under the present power market dynamics.

The government expects renewable energy to be a key part of Pakistan's decarbonisation strategy and has recently announced national renewable energy targets mandating a 20% share for renewables in the country's installed power generation capacity by 2025 and 30% by 2030. Given the strong economics of DG in Pakistan and the rapid growth in net metering since 2019, DG could make a significant contribution to the national RE targets, provided policy makers act now to plan for sustained growth in the DG market.

Key elements of a distributed generation roadmap for Pakistan

As the DG market in Pakistan evolves, policy focus must shift to developing a comprehensive roadmap to sustain the economic viability of DG beyond net metering. A pre-defined roadmap will not only identify a clear path to connecting high levels of DG on the network, it will also support power system stakeholders in taking timely actions to maximize the upside potential and limit the downside risk of DG technology.

Building on the experience of the country's net metering program, an effective DG roadmap would address these key considerations related to increasing the share of DG in power generation:

- **Establish a reliable evidence base to inform future DG policy and aid context specific and market-relevant planning.** A DG roadmap will only be effective if is tailored to the local market context including supply and demand volume, nature and level of risks and institutional and administrative capacities. In addition to documenting this information, the roadmap should also provide a clear indication of market size (estimated industrial, commercial and residential

DG capacity that can potentially be installed by 2025 and 2030) and report on the costs and benefits of leveraging DG for power sector reform (for instance, using government funded DG systems to reduce electricity subsidies or promoting wheeling of renewable energy from DG installations). As the DG market evolves, the roadmap should be periodically updated to reflect changes in market dynamics.

- **Identify and address current or future constraints that can hinder growth in DG.** Technical, financial and institutional barriers that can derail the DG market must be identified and clearly addressed in the roadmap.
- **Review effects of increasing levels of DG on energy network performance.** An upfront review of the technical impacts of DG on low-voltage distribution networks allows systematic development of policy frameworks, reducing risks to distribution companies and investors, and providing stability over the investment time frame. Technical impacts that need to be analysed and quantified include the impact of DG on network harmonics, the potential for reverse power flow from the low-voltage to the medium-voltage network, impact on load curves and the increase in demand for spinning reserves or balancing services and grid storage.
- **Quantify financial impacts on DISCOs and electricity consumers without DG installations.** Although net metering can benefit all power system stakeholders, increasing levels of DG on grid-networks can also induce costs that have an adverse impact on DISCO customers without DG. DISCOs stand to lose revenue as consumption from the grid is replaced by self-generated power, without the DISCO receiving any compensation for the storage and balancing service it must continue to provide to net metered customers. In most cases, this revenue loss translates into tariff increases with a disproportionate impact on DISCO customers without DG.
- **Propose reforms to the power sector monitoring and planning system to ensure integration of higher levels of DG.** The Integrated Generation Capacity Expansion Plan (IGCEP) 2018-2040 does not account for DG systems in the power demand projections and supply planning. Although grid-connected and off-grid DG currently adds little capacity to the grid, DG has the potential to contribute significant generation capacity by 2040. Excluding DG from the long-term generation capacity expansion plan will undermine the effectiveness of the generation planning process and hinder the DG market expansion.
- **Extending DG polices beyond roof-top solar.** Solar PV is currently the only viable DG technology in Pakistan, however electric vehicles (EVs), combined heat and power generators and micro wind turbines all have the potential to make bigger contributions to DG in the future. The DG roadmap should reflect this capacity and provide a plan incorporating multiple DG technology options.
- **Clearly define a strategy and next steps for achieving sustained, long-term growth in the DG market.** The roadmap must provide long term certainty for investors through a managed transition from net metering and a comprehensive strategy for continuing market growth. The choice and complexity of individual interventions should be coordinated with conditions in both the energy market and the wider economy.