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Renewable Energy and Smart Grids: Prospects for effective deployment

Continuous and expanded growth of the share of renewables in centralised and decentralised grids requires an effective new approach to grid management, making full use of “smart grids” and “smart grid technologies”. Existing grid systems already incorporate elements of smart functionality, but this is mostly used to balance supply and demand. Smart grids incorporate information and communications technology into every aspect of electricity generation, delivery and consumption in order to minimise environmental impact, enhance markets, improve reliability and service, and reduce costs and improve efficiency.

For developing and emerging countries such as India, smart grid technologies are essential to avoid lockin of outdated energy infrastructure, attract new investment streams, and create efficient and flexible grid systems that will be able to accommodate rising electricity demand and a range of different power sources.

Smart grid technologies can act as an enabler for renewables, largely by reducing the negative impacts of renewables’ variability. However, smart grid technologies also offer many additional benefits. Two particularly noteworthy benefits are providing a path for private investment into electricity systems and allowing for better/optimal use of existing electricity infrastructure. These two benefits can be of great value to financially constrained electricity systems. Also, smart grid technologies can help ease the transition to sustainable electricity systems. These technologies, however, are continually evolving and improving. A flexible and thoughtful smart grid implementation strategy that balances risk and reward, coupled with openness to private sector direct investment in the electricity system, is the most promising approach.

One key challenge of smart grids is that their benefits are undeniable but diffused and challenging to define. Therefore, one critical policy response is to devise a regulatory framework that clarifies these benefits, and helps ensure that they flow to the entities providing the upfront investment. For example, a utility can be expected to invest in smart grid technologies only if they are quite confident that the benefits of that investment (notably enabling higher renewable penetration) come with financial benefits. Therefore, regulators must put in place financial incentives structures that appropriately reward smart grid investments.