

# **How traditional regulation of Distribution System Operators can be improved to accommodate higher levels of distributed generation**

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## **Abstract-**

The EU's energy policy has three main objectives: environmental sustainability, security of energy supply and economic development. These objectives are the main drivers for the huge development of renewables-based electricity generation (renewable energy sources [RES]) and co-generation of electricity and heat (combined heat and power [CHP]) in Europe.<sup>1</sup> Due to their size and location, these power plants are mainly connected to distribution networks and are known as distributed generation (DG).<sup>2</sup> The integration of DG into power systems has become a real challenge,<sup>3</sup> particularly for distribution system operators (DSOs), due to their impact on the operation of distribution networks and also on the costs and revenues of the DSOs. Electricity distribution is considered a natural monopoly and as such it is regulated in terms of price, entry and other specific aspects (e.g. quality of service).<sup>4</sup> Therefore, regulators ought to realise the impacts of DG and adapt existing regulatory arrangements accordingly. The EU has promoted several research projects with research institutes and industrial partners to investigate the regulatory improvements needed to accommodate DG in power systems, such as the Enhancement of Sustainable Electricity Supply through Improvements of the Regulatory Framework of the Distribution Network for Distributed Generation (DG-GRID) and Coordination Action to Consolidate RTD Activities for Large-Scale Integration of DER into the European Electricity Market (SOLID-DER) projects, among others.<sup>5,6</sup> The impact of DG on DSOs clearly differs depending on the country considered, as each country has different characteristics, for instance DG's share of the market (see Figure 1), DG technology (which depends on the RES potential) and energy and support policies. Below, four key areas affecting the impact of DG on DSOs are presented, and some regulatory recommendations from a European perspective are given. As regulation of electricity distribution is very complex and may differ significantly on a country-by-country basis, these recommendations are given on a very wide regulatory framework.

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