How Can Southeast Europe's Energy Distribution Grid Support the Region's Renewable Energy Targets?

11 Key Findings and Recommendations for Leaders to Consider

Adapted from the SEE DSO Report on Distributed Generation (DG)

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This report is an update to a 2015 study focused on the technical challenges DSOs face in integrating increasing amounts of renewable energy into their networks.

Background

Distributed generation (DG) are power generation units connected directly to the distribution network. Prosumers are network users who both produce and consume electricity. They generate, store, consume, and, potentially sell excess power they produce. Most often this is accomplished using increasingly inexpensive solar panels mounted on residential and commercial rooftops. Prosumers and DG technology hold the potential to lower the cost of electricity and help Europe meet its ambitious climate change goals.

Distribution system operators in Southeast Europe responsible for ensuring reliable electricity supply recognize the transformative potential of this technology and seek to enable its widespread adoption. They conducted an exhaustive assessment of the technical, legal, regulatory, economic and commercial policies and practices impeding its adoption, recognizing that distribution networks were not originally designed with the intent to integrate DG. The following summarizes their findings and recommendations, identifying actions for utilities as well as policy makers (regulators and ministries) to unlock the benefits of DG for Southeast Europe.

Key Findings and recommendations

Finding	Recommendation
1. Electricity distribution networks in Southeast Europe (SEE) were not designed to accommodate the scope and quantity of DG's two-way electricity flows that is now envisioned by policy makers, regulators and prosumers, a customer that both produces and consumes electricity. Investment in the distribution grid needed to accommodate DG must be considered in light of competing investment priorities, including smart grid initiatives, smart meter deployment and investment to improve security and quality of supply.	A predictable, stable and transparent regulatory framework must be established, enabling full cost recovery and access to credit and capital markets needed to fund distribution system operator investment priorities.
2. Distribution electricity tariffs are primarily based on the volume of electricity that is passed through the network. With the rise of prosumers DSO revenue will decline, jeopardizing the security and reliability of service.	Distribution network tariffs should be redesigned with a gradual transition toward capacity tariffs or two-part tariffs that will decouple DSO revenue from the volume of electricity passed through its network. These tariffs, which are used in other parts of the world, are better suited to account for the impact of the intermittent renewable energy sources, generation installed for self-consumption purposes, and energy efficiency measures.
3. Net-metering, in which the prosumer pays only for the difference between what they self-produce and receive from the network, is detrimental to utility revenue in the current volumetric tariff formulation. It reduces the amount of funds available for operation and capital expenditures on the grid.	Regulators should avoid net-metering schemes for self-generators in the current volumetric tariff construct. If necessary, net metering may be used in a transitional phase and limited to very small scale residential and commercial installations, with yearly system quotas.
4. Widespread deployment of DG will lead to operational challenges (voltage control, protection settings etc.) and higher network losses, particularly at peak hours when two-way flows of energy will be at their greatest levels.	Consistent with the above, distribution network tariffs should be reformed to encourage network users (consumers, producers, prosumers) to shift their peak energy use to non-peak hours. The change in tariffs to encourage network users to shift their loads can reduce the amount of investment required to accomodate widespread deployment of DG.
5. Under the current regulatory framework and market design, distributed generators connecting to the distribution network do not pay system usage charges. These charges cover ancillary services, network losses, operations and maintenance, administrative, metering costs or other related costs induced by this generator.	Understanding that it is difficult to allocate the additional operating costs to each distributed generator, use of system costs should be: 1) socialized to all network users or 2) (partly) allocated to the generators. SEE DSOs are in favour of the second approach designed to provide clear price signals to the DGs for efficient system use.

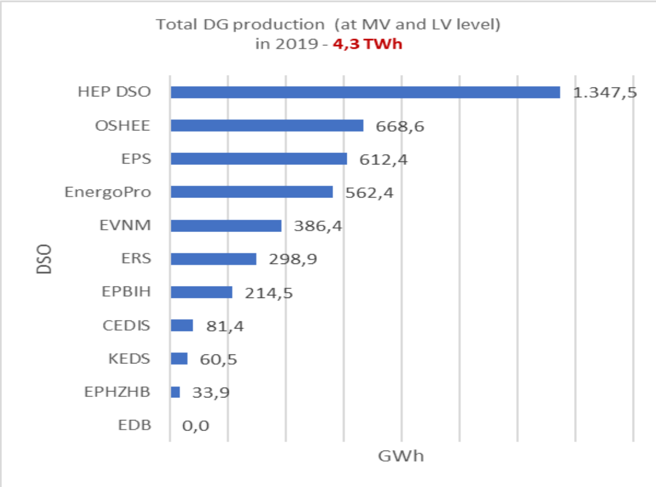
6.	Prosumers remain connected to the network for back-up service in case their generator fails. They are also not charged for their use of the system and the provision of back-up service, instead they are subsidized by other network users.	Prosumers should pay their share of the network and other system costs and not rely on the subsidies provided by non-DG network customers.
7.	Distributed generators, and prosumers that oversize their production capacity to export electricity via the distribution network create network congestion and contribute to network losses, particularly if that excess electricity produced is not consumed in the neighborhood (locally).	Network tariffs should be designed to encourage the most technically and economically efficient use of the existing infrastructure to avoid excessive investment in the network. For example, tariff should encourage rooftop generation to follow consumption pattern.
8.	DG requires the provision of new network services and a more active management strategy to compensate for greater uncertainty on the distribution grid. Adoption of active network management strategies will help mitigate network costs caused by widespread deployment of DG.	SEE DSOs should embrace an active role in the implementation of these new network management strategies, but require confidence and incentives to deploy new technologies and services such as smart grids, active role of network users, widespread SCADA systems etc. needed to manage a more complex distribution network.
9.	In SEE, distributed generators do not pay for their use of the network (system charges). The connection charge is a one-time payment primarily based on the situation in the existing network.	Understanding that connection costs can easily be allocated to each user, socialization of these costs should not be permitted; i.e. it is fair to pass through all the cost associated with connection of a DG to the DG. Adequately designed „deep" connection charging provides appropriate and harmonized locational signals for efficient investments in generation.
10.	To maintain public safety, security and reliability, prior to connecting distributed generators to their networks, DSOs must conduct a grid connection study to determine the optimal connection point and to determine necessary reinforcements/additions to the network. The study process can be cumbersome and time consuming, driving up the cost of connection for prospective distributed generators.	DSOs must simplify the connection study process and procedures to make it less time consuming and costly for investors. One option may be to cluster grid connection requests to reduce the overall number of studies required. DSOs can also consider simplified methodologies for smaller distributed generators and and transparency and public notice practices.
11.	DSO's are seeing a significant increase in the number of applications from prospective DGs. Once approved, the DSO is certifying that it is able to accommodate the DG onto its network. There is no requirement, however, for the applicant to build the DG in a timely manner, if at all. This can result in unnecessary grid investments to the DSO, backlogs in connection requests, and can impact the acceptance of future DG applicants.	DSO's must be able to impose enforceable deadlines to ensure applicants build their DG faciliites in a timely manner. For example, in [jurisdiction X] projects must be installed withing Y months.

Conclusion

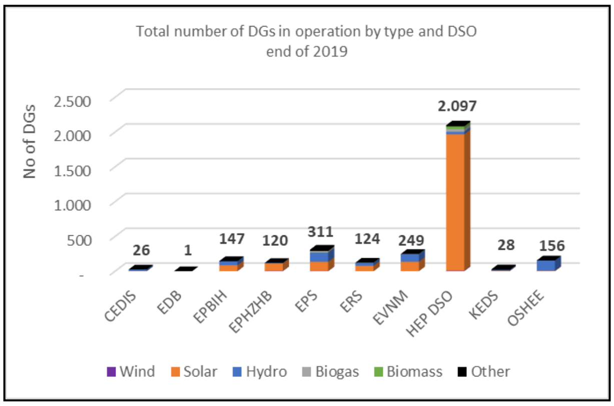
The SEE DSOs fully support the region's efforts to meet renewable energy targets but recognize that there is not full understanding of the cost and reliability impacts of integrating distributed and renewable resources at the distribution level. Following research into the experience and best practices used by distribution system operators in the United States and the European Union, the Working Group suggests that several actions—especially in the areas of connection procedures, legislation, cost transparency, and grid access—to support the region's renewable energy goals. The Working Group encourages DSOs throughout the region as well as policymakers (ministries and regulators), financial institutions, and other stakeholders to consider these findings and recommendations.

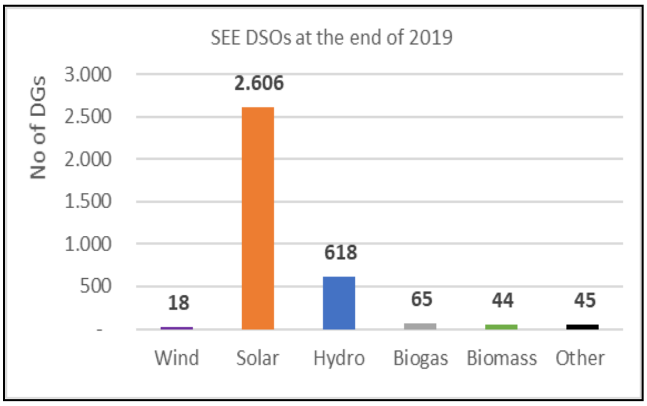
Current status of distributed generation in Southeast Europe

DG systems typically use renewable energy sources, including small hydro, biomass, biogas, solar power, wind power, and geothermal power. DGs increasingly play an important role in the distribution systems for these clean energy sources. However, in the SEE region, renewable energy development at the distribution level is at an early stage. Total annual production of DGs connected to MV and LV distribution networks is approximately 5,6% of total consumption in 2019. For a comparison, in 2018, renewables already generated 32,3% of Europe's electricity.

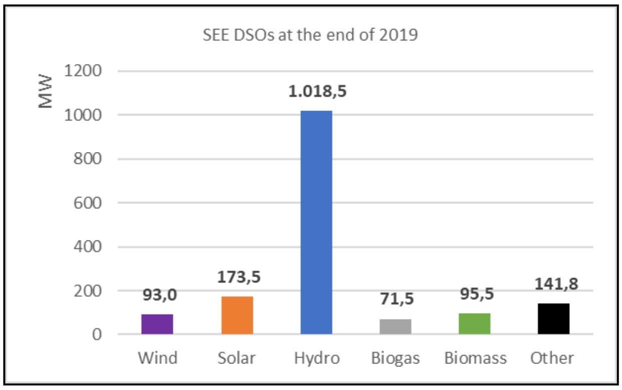


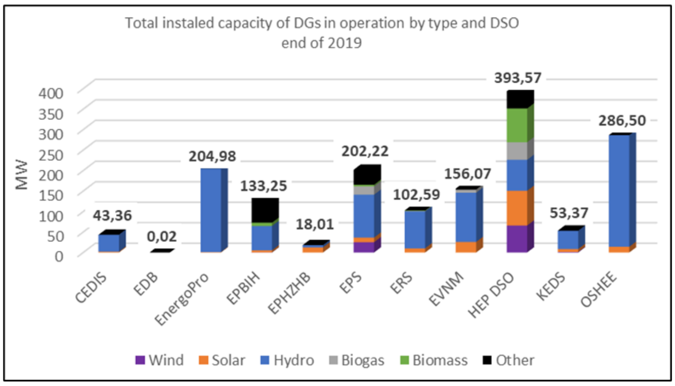
Total DG production at MV and LV level (GWh)





Total number of DGs per DSO and per technology





Total DGs installed capacity by type and per each DSO (MW)

The adoption of EU RES Directive, that introduced binding RES targets for 2020, was a trigger for development of non-hydro technologies. Integration of wind, solar and biomass generation will be required in the SEE region to reach the EU's 2030 RES target.

In fact, renewable energy sources are closer than ever to being a reality in the region, thanks to significant changes in the regulatory frameworks and resource grants, combined with technology cost decreases and newfound cost-competitiveness. Consequently, businesses and households can increasingly produce and consume some or all of their own electricity, either instantaneously or in a deferred manner through decentralized storage, behind the grid connection point (i.e. the electricity meter). Therefore:

- DSOs are (and will be) under increasing pressure to respond to demand for connection and access to the network, and

- DSOs must be well prepared for operation with increased integration of DGs (system renovation in operation, such as new active network management).

As distribution networks were not initially designed and constructed to handle a significant amount of DG, it is going to be necessary for DSOs to make substantial investments to accommodate DGs (support the momentum of the RES deployment).

About the Southeast Europe DSO Working Group

The SEE DSO WG was established in July 2013 by USAID, USEA and the distribution system operators of Southeast Europe to improve the security of supply on the "last mile of service."
The Working Group is demand driven to respond to the needs of the distribution companies in the region, with an emphasis on:

- Smart Grid technology applications to reduce losses, integrate renewable energy and implement asset management programs;
- Utility safety standards;
- Development of business continuity plans to assist electric companies plan for emergency scenarios that may impact their ability to provide reliable electric power to consumers;
- Development of strategies and procedures, including mutual assistance plans where appropriate, for fast restoration of service after a significant outage; and
- Benchmarking utility operational best practices

The Working Group completed a landmark regional benchmarking study of over 100 service quality, financial, and customer service key performance indicators. This analysis is updated regularly and is used as a continuous monitoring tool to assess the progress of the member DSOs in comparison to one another and also to one of the largest electric utilities in the U.S., American Electric Power (AEP).

Most recently, the Working Group completed an analysis to improve distribution system efficiency by identifying common sources of technical losses and recommending solutions to be applied on a regional basis to reduce them.

Members of the Working Group include representatives from the DSOs in Albania, Bosnia and Herzegovina, Croatia, Georgia, Kosovo, North Macedonia, Montenegro and Serbia.

Albania:
- Operatori i Shpërndarjes së Energjisë Elektrike (OSHEE)

Bosnia and Herzegovina
- JP „Komunalno Brčko“ (EDB)
- Elektroprivreda Bosne i Hercegovine (EPBIH)
- Elektroprivreda Hrvatske zajednice Herceg Bosne (EPHZHB)
- Elektroprivreda Republike Srpske (ERS)

Croatia
- HEP – Operator distribucijskog sustava d.o.o. (HEP ODS)

Georgia
- JSC EnergoPro Georgia

Kosovo
- Kosovo Electricity Distribution and Supply Company J.s.c. (KEDS)

North Macedonia
- EVN Macedonia

Montenegro
- Crnogorski elektrodistributivni system (CEDIS)

Serbia
- EPS distribucija