



TSO-DSO COOPERATION IN TURKEY

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AGENDA

- ▶ The need for DSO/TSO cooperation
- ▶ Current regulations in Turkey
- ▶ Road Map

THE NEED

Development of distribution connected generation

	2017		2018		2019 -September	
	MW	Ratio(%)	MW	Ratio(%)	MW	Ratio(%)
Solar (PV)	2978	3.52	5017	5.67	5490.7	6.03
Natural gas	86	0.1	154	0.17	240.4	0.26
Biomass	67	0.08	79	0.09	82.7	0.09
Wind	32	0.04	52	0.06	59.6	0.07
Hydro	7	0.01	9	0.01	10.9	0.01
Solar (conc)	1	0.001	0.5	0.001	0.5	0.001
Total	3172	3.75	5311.5	6.00	5884.9	6.46

Total installed capacity: 2017- 84679
(MW) 2018- 88497
2019 Sept- 91051

CURRENT REGULATIONS

- ▶ There is no complete legislation regulating TSO-DSO cooperation
- ▶ **Some partial regulations**
- ▶ Ancillary services supply process - Ancillary Services Regulation
- ▶ Participation of distribution connected solar and wind generation - Network Code
- ▶ TSO/DSO SCADA integration - Network Code

AS Supply Rules

- ▶ Distribution connected generators are only foreseen to provide voltage regulation to DSO in accordance with **Network Code technical provisions**
- ▶ Transmission connected generators are to provide voltage regulation to TSO
 - ▶ TSO and DSO connected generators are to sign AS contracts
 - ▶ TSO allocates reactive power requirements between transmission connected generators
- ▶ Transmission connected generators provide other AS's such as PFC and SFC to TSO

- ▶ FOR VOLTAGE REGULATION CURRENT REGULATION COMPLIES WITH LOCAL AS MARKET MODEL
- ▶ FOR OTHER AS's CURRENT REGULATION COMPLIES WITH CENTRALIZED AS MARKET MODEL

Solar and Wind - Network Code Technical Provisions

- ▶ Technical criteria is laid down for contribution of wind and solar PV in DSO/TSO operations
- ▶ Criteria is applicable for
 - ▶ Transmission connected wind and Solar PV
 - ▶ **Solar PV connected to distribution MV network**
 - ▶ **Wind connected to distribution network (>10 MW)**

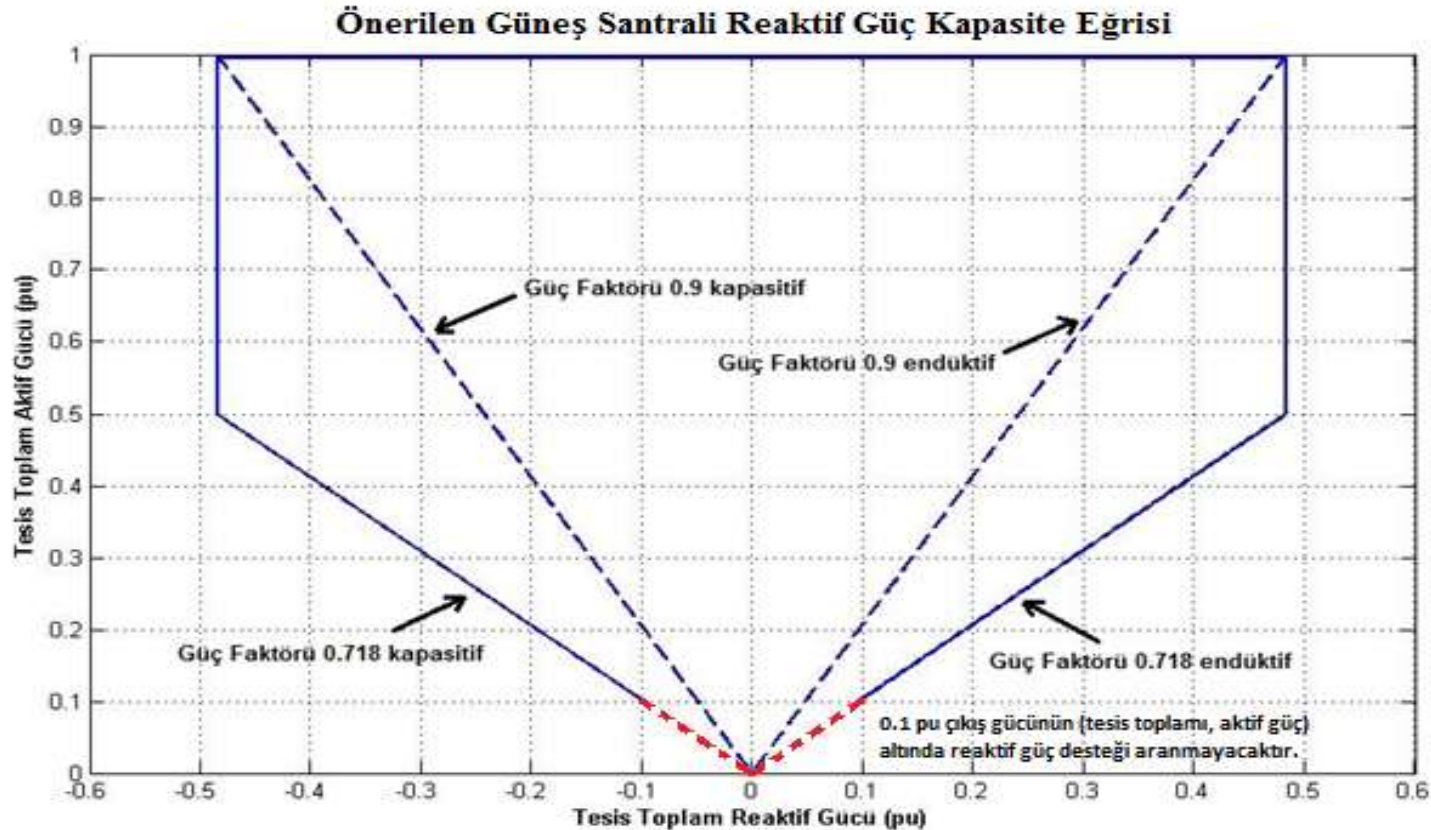
Solar and Wind - Network Code

- ▶ ACTIVE GENERATION CONTROL
- ▶ Aforementioned DER generators are to provide flexibility in active power supply to grid.
 - ▶ The required system installation
 - ▶ allowing production limitation in distribution connected generation facilities upon the set point changes requested by DSO
 - ▶ Compatible with SCADA system,
 - ▶ Responsibility of related user.

Solar and Wind - Network Code

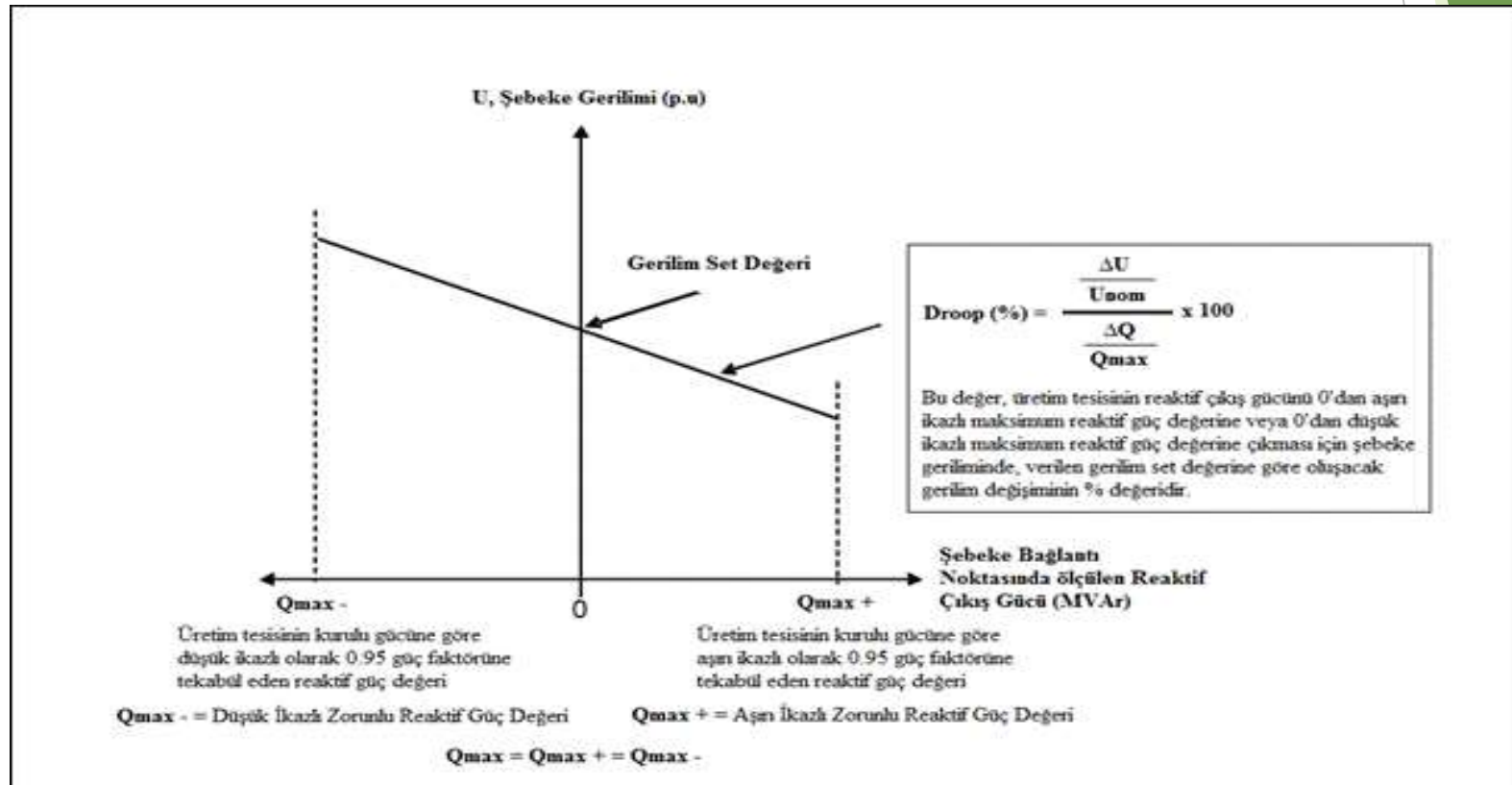
REACTIVE POWER CAPABILITY

Solar PV installations are required to operate in every point inside the bold lines as indicated in the figure.



Solar and Wind - Network Code

- ▶ REACTIVE POWER SUPPORT
- ▶ Transmission connected generators are to contribute voltage regulation by providing reactive power supply as indicated in the figure below



TSO/DSO SCADA integration

- ▶ MW and MVAR data for every generator connected to distribution grid(above 30 MW) is collected by linking to DSO SCADA and shared with TSO SCADA
- ▶ MW and MVAR data for every wind and solar PV generator connected to distribution grid (above 10 MW) is collected by linking to DSO SCADA and shared with TSO SCADA
- ▶ Aggregated MW and MVAR data for wind and solar PV generators (below 10 MW) connected to distribution grid is collected by linking to DSO SCADA and shared with TSO SCADA

SMART GRID ROAD MAP

- ▶ Regulator supported and financed project with the participation of 21 DSO to draw up roadmap for 2020-2035
- ▶ Recommendations for TSO/DSO coordination
- ▶ The choice of the appropriate coordination scheme is dependent on multiple factors
 - ▶ type of ancillary service,
 - ▶ normal operation versus emergency situations,
 - ▶ the state of the grid,
 - ▶ the amount of RES installed,
 - ▶ the current market design
 - ▶ the regulatory framework
- ▶ The feasibility of coordination schemes is very dependent on the evolution of roles and responsibilities of the DSO and vice versa

SMART GRID ROAD MAP

- ▶ Across coordination schemes, there is a gradual increase of the role and responsibilities of the DSO. Dependent on the national evolution, a country can evolve from one coordination scheme to another.
- ▶ Independent of the coordination scheme, the procurement of AS from the distribution grid should be clear, easy to understand, reliable, cost-efficient and fast. In case interaction models are too complex, the value for smaller flexibility providers of DER might not emerge
- ▶ Independent of the coordination scheme, the procurement of AS from the distribution grid, should be *transparent, non-discriminatory* and *neutral*.
- ▶ A closer cooperation between TSOs and DSOs will still require that system operators remain responsible for the operation of their grid and the management of their data in a secure way.

SMART GRID ROAD MAP

- ▶ Proposed steps between 2020-2025 in the «Smart Grids Road Map» report
 - ▶ Identification of flexibility sources in distribution networks and drafting of regulations for DSO participation in AS markets
 - ▶ Use of distribution connected generation capacity for voltage regulation and congestion management
 - ▶ Use of distribution connected generation capacity for frequency regulation
 - ▶ Pilot studies for inclusion of DER control, flexible loads and storage facilities

Thank you

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