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PV GRID

Challenges and Technical Solutions for PV Grid Integration

Integration of PV with Storage

PV Grid Forum Portugal
May 9th 2013

Rainer Brohm,
Director Policy and
International Affairs

BSW SOLAR

German Solar Industry Association (BSW-Solar)

The German Solar Industry Association

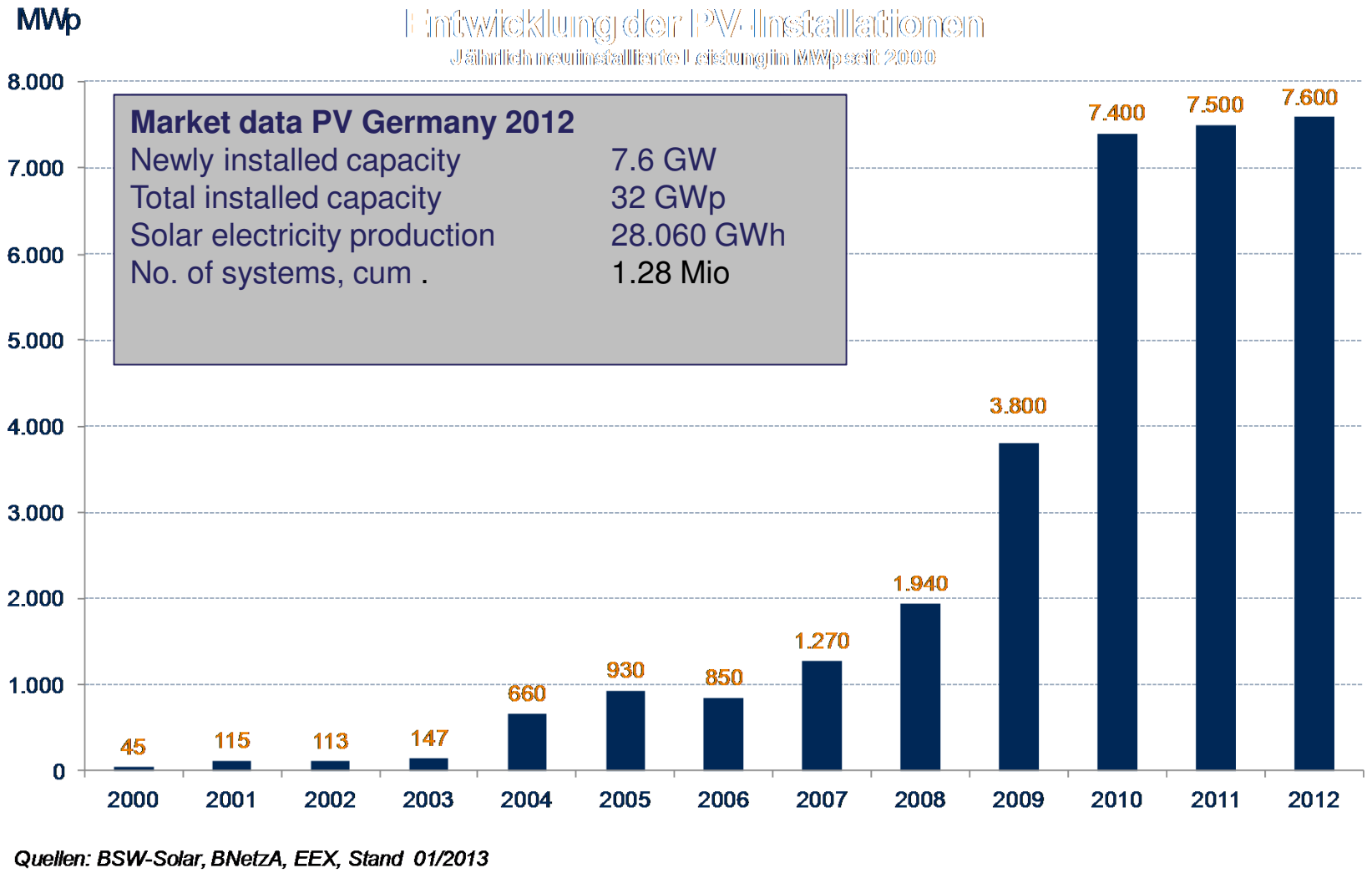
TASK	To represent the German solar industry in the solar thermal and photovoltaic sector
VISION	A global sustainable energy supply provided by solar (renewable) energy
ACTIVITIES	Lobbying, political advice, public relations, market observation, standardization
EXPERIENCE	Active in the solar energy sector for over 30 years
MEMBERS	More than 850 solar producers, suppliers, wholesalers, installers and other companies active in the solar business
HEADQUARTERS	Berlin

Agenda

1. Challenges and technical solutions for PV grid integration - first project results
2. Integration of PV with storages – experiences from Germany

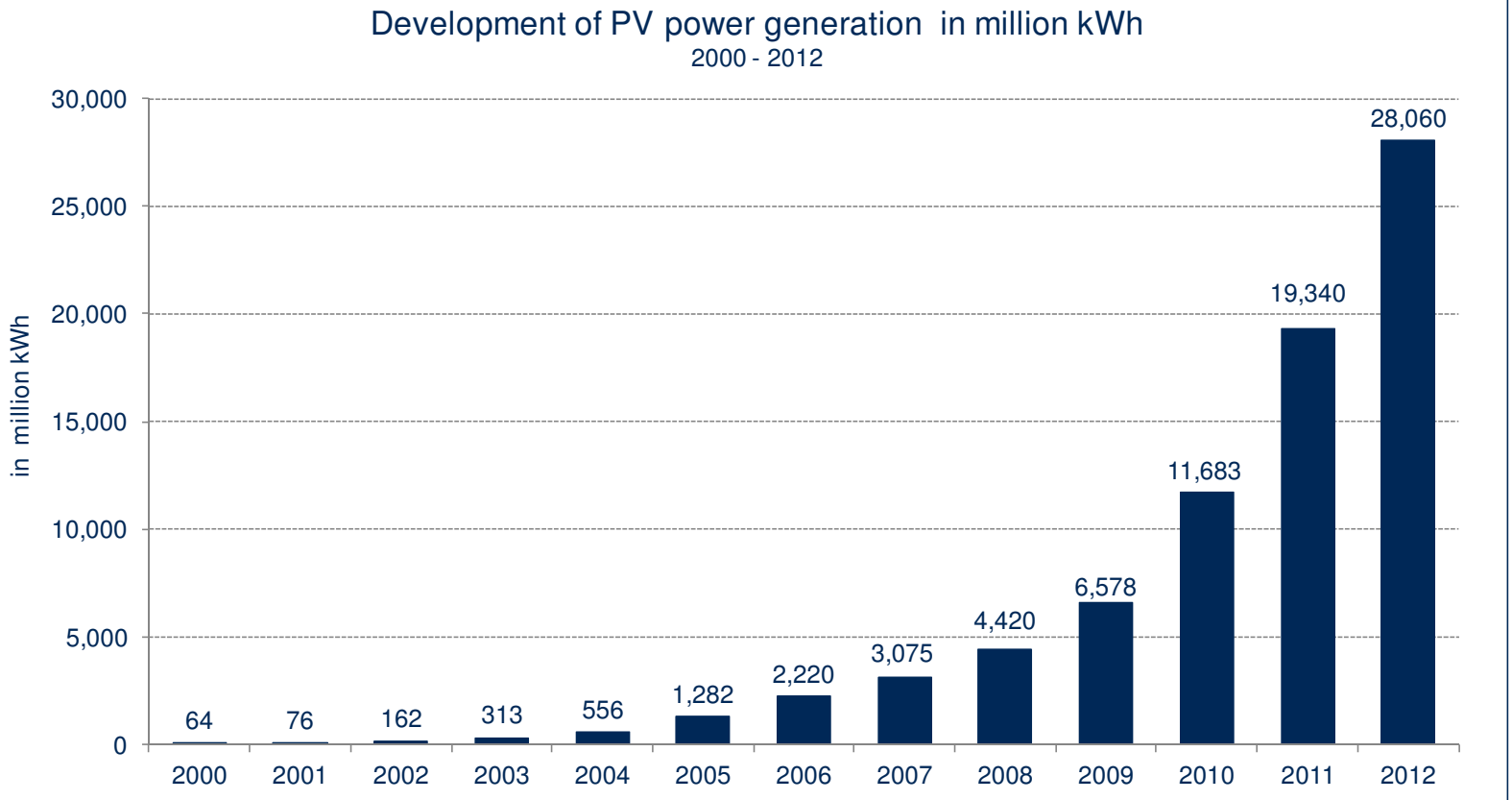
Challenges

The challenge for distribution grids: Development of the German PV market



Quellen: BSW-Solar, BNetzA, EEX, Stand 01/2013

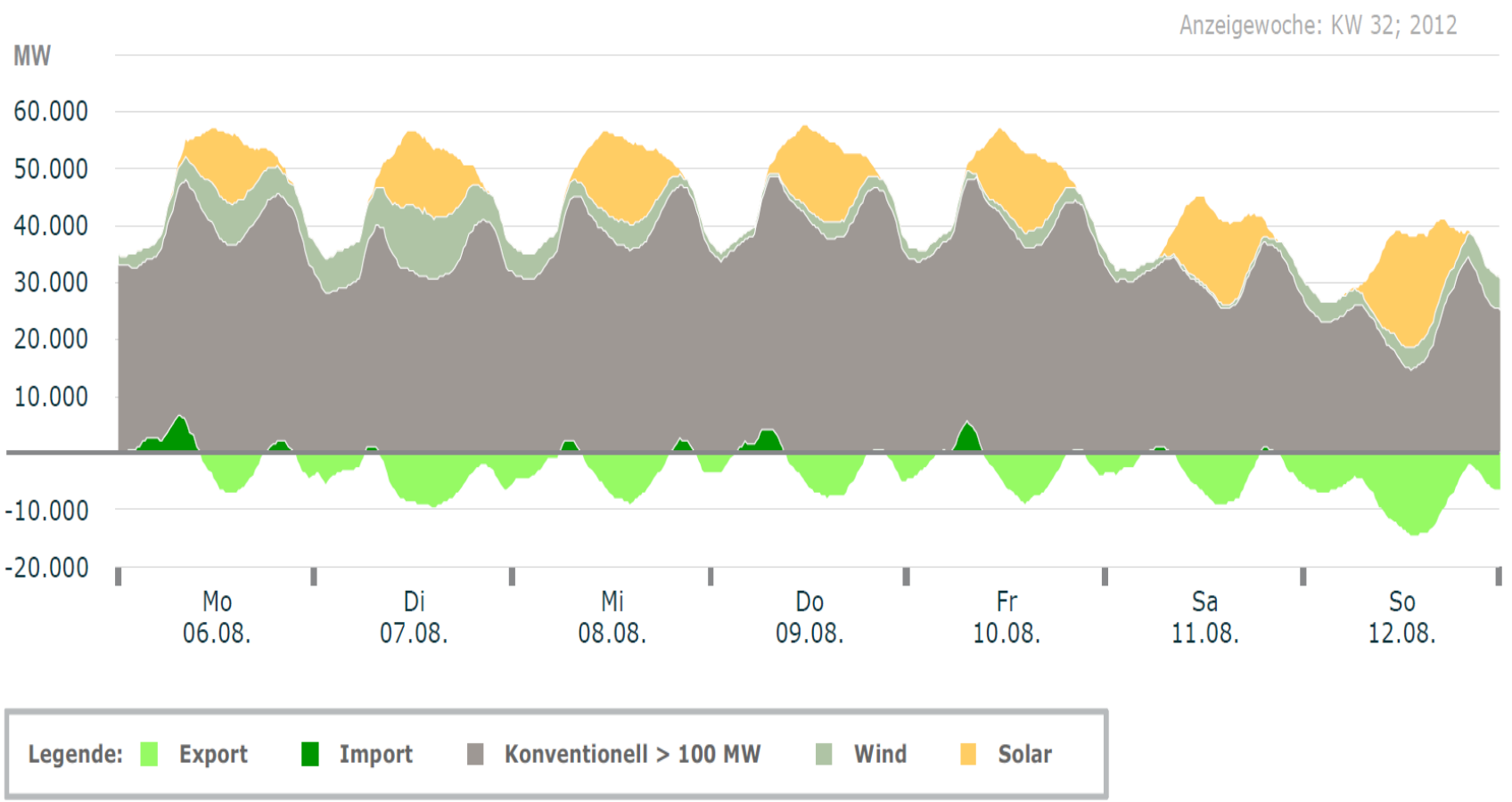
The challenge for distribution grids: PV power production grows 45% yoy



Source: BMU, ÜNB, EEX, 2012 preliminary estimation BSW-Solar 1/2013

➲ 28 TWh have been produced in 2012

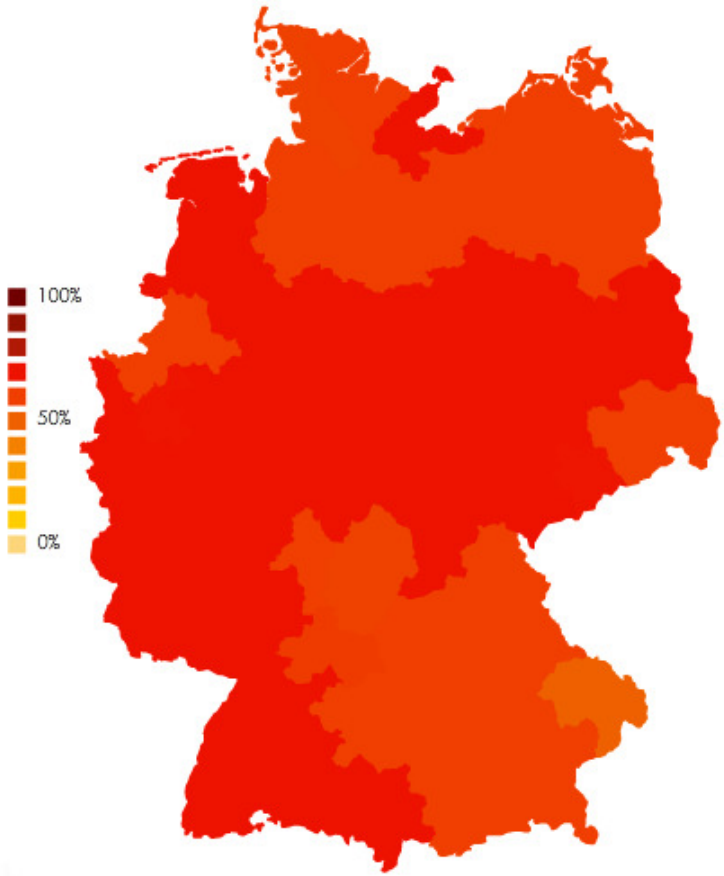
The challenge for distribution grids:
Germany 2012: 5% of annual demand but up to 50% power to demand ratio on weekends/holydays

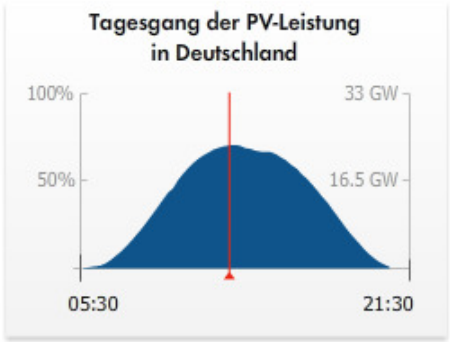


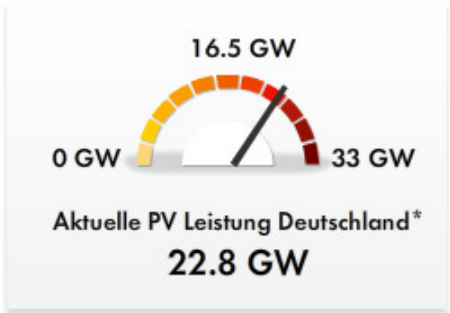
Source: Fraunhofer ISE

The challenge for distribution grids:
Last Sunday: 23 GW PV at mid day (50% of demand)

Relative Leistung vom 05.05.2013 - 12:45 Uhr



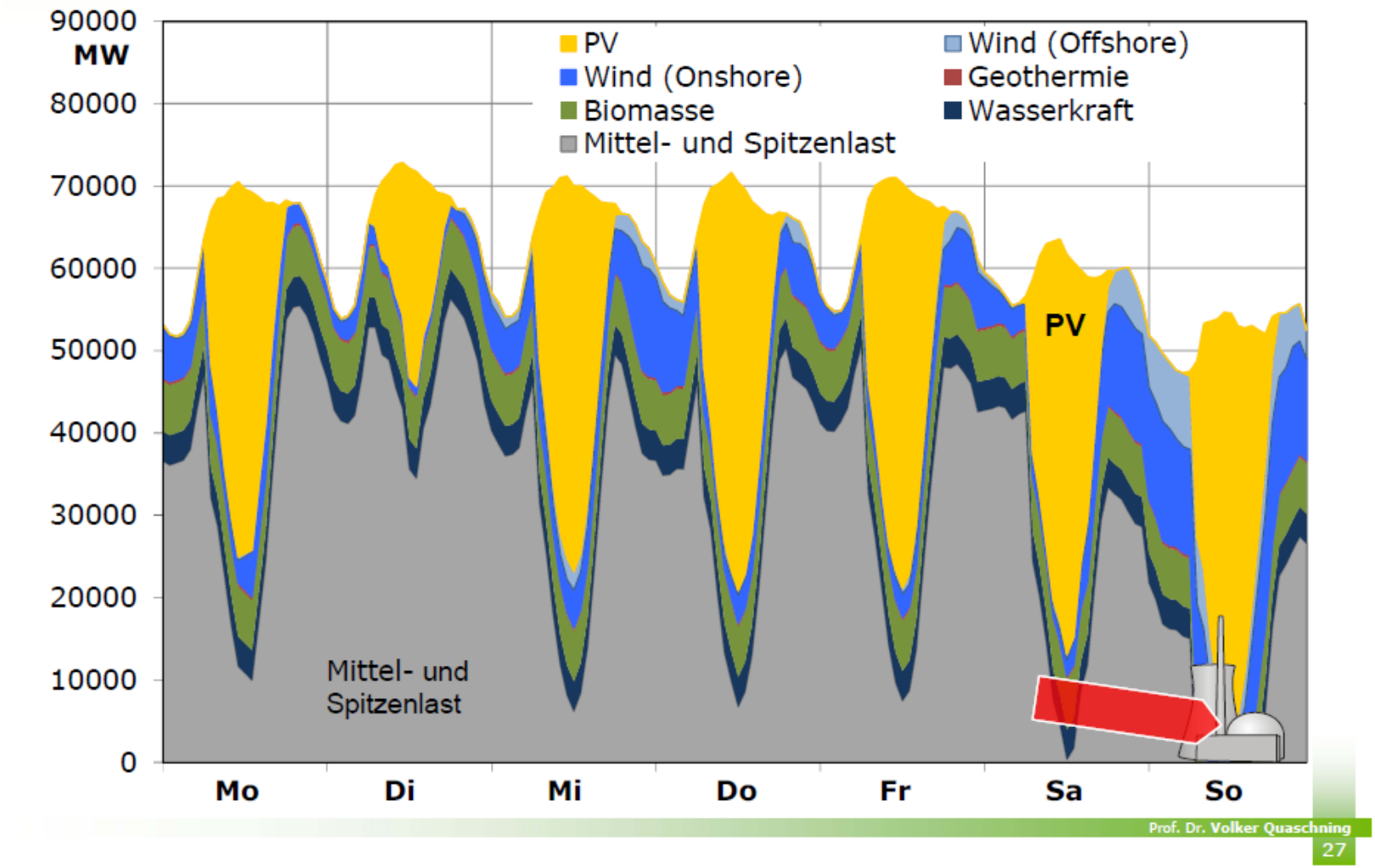




*Hochgerechnete Leistung aller lt. Bundesnetzagentur am Stichtag 28.02.2013 installierten PV-Anlagen mit insgesamt 32.92 GW Nennleistung.

Source: SMA Techology AG

The challenge for distribution grids:
Massive raise in power to demand ratio in the future



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Technical solutions

PV Grid – project objectives technical solutions for PV integration

1. Identify key technical solutions
2. Evaluate the solutions with common criteria (cost, technology readiness, impact on grid hosting capacity, applicability within existing regulations)
3. Prioritise the technical solutions (4 grid types: LV/MV, rural/suburban and 2 performance indicators: techno-economic and regulatory priority)
4. Deliver report on: "**Prioritization of technical solutions available for the integration of PV into the distribution grid**" (WP 3)

Technical solutions for PV grid integration

Category	No	Technical solution
DSO	1	Network Reinforcement
	2	On Load Tap Changer for MV/LV transformer
	3	Advanced voltage control for HV/MV transformer
	4	Static VAr Control
	5	DSO storage
	6	Booster Transformer
	7	Network Reconfiguration
	8	Advanced Closed-Loop Operation

Technical solutions for PV grid integration

Category	No	Technical solution
Prosumers	9	Prosumer storage
	10	Self-consumption by tariff incentives
	11	Guaranteed self-consumption
	12	Direct voltage control by PV inverter Q(U) P(U)
	13	Indirect voltage control by PV inverter Q(P)
Category	**No**	**Technical solution**
Interactive	14	Demand response by market price signals
	15	Demand response by local price signals
	16	SCADA + direct load control
	17	SCADA + PV inverter control (Q only)
	18	SCADA + PV inverter control (Q and P)
	19	Wide area voltage control

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