



IEA-PVPS

Towards a smart & flexible power system

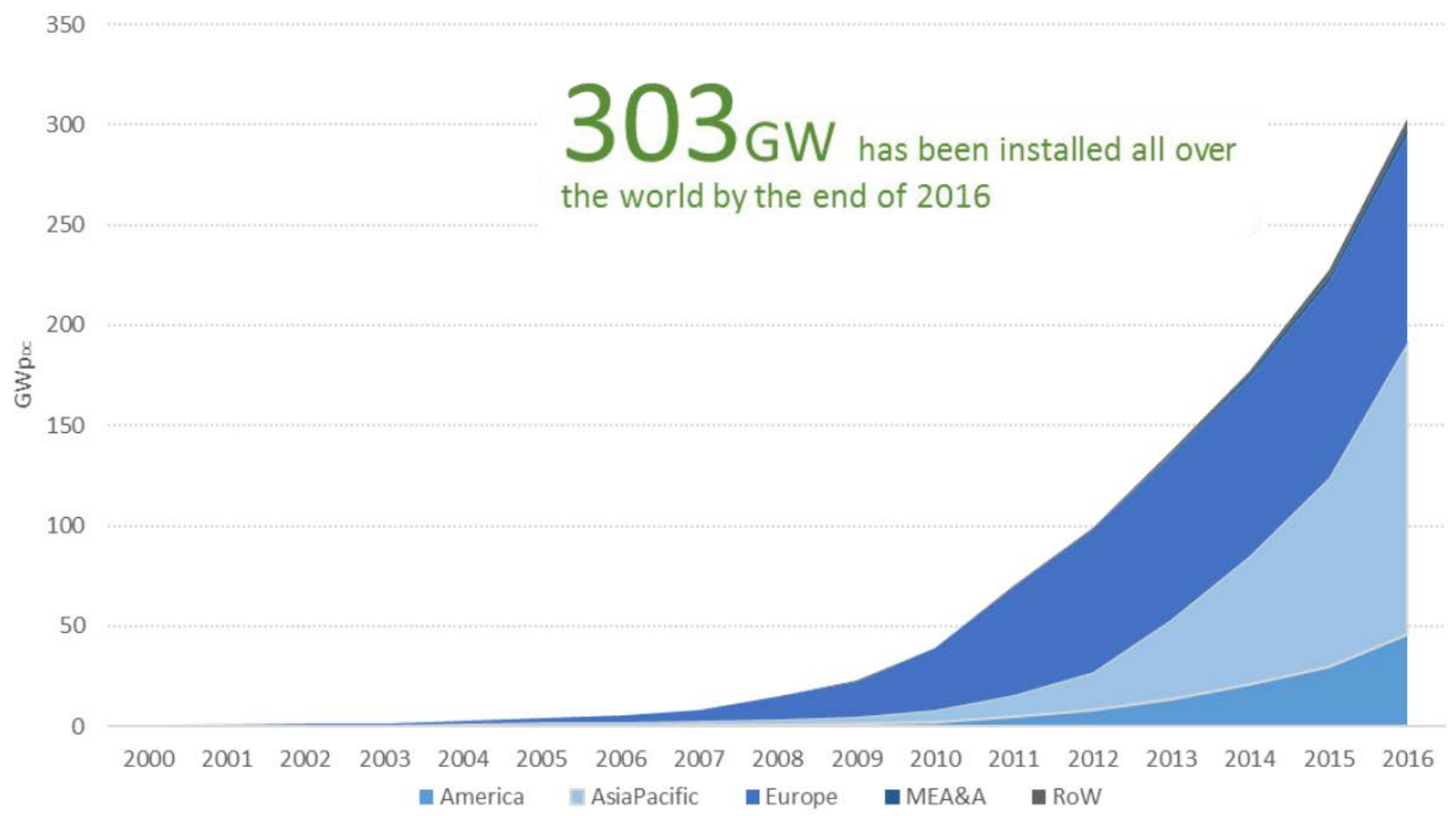
Roland Bründlinger, IEA-PVPS Operating Agent Task 14

PVPS





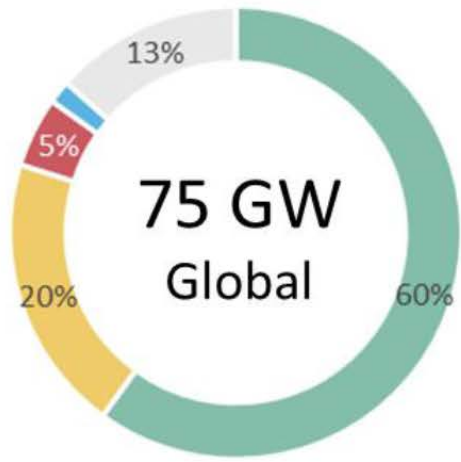
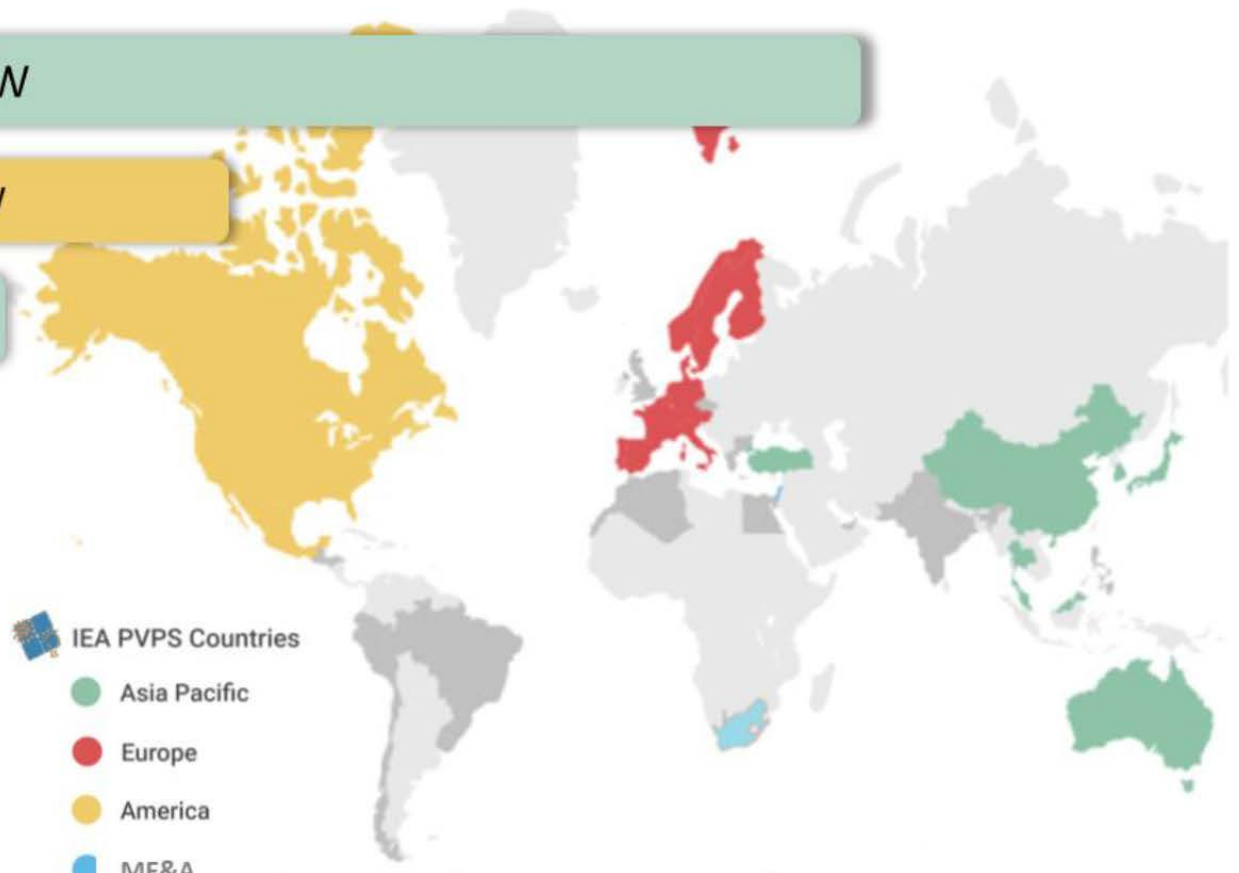
FIGURE 3: EVOLUTION OF REGIONAL PV INSTALLATIONS (GW - DC)



PVDC



TOP PV MARKETS 2016

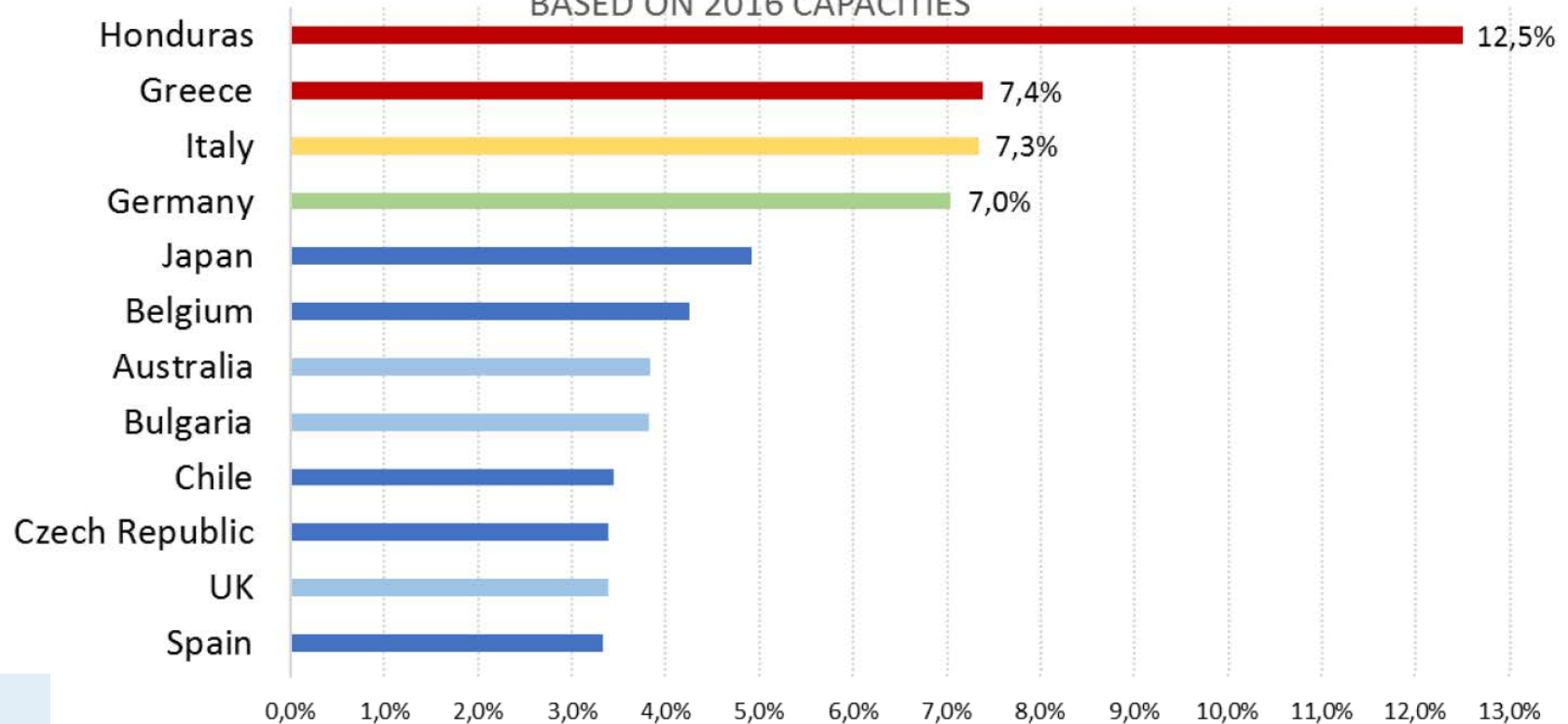


Non IEA PVPS Countries Others Countries Main Markets



Relevance of PV in the national electricity supply

FIGURE 4: NATIONAL PV PENETRATION IN % OF THE ELECTRICITY DEMAND
BASED ON 2016 CAPACITIES



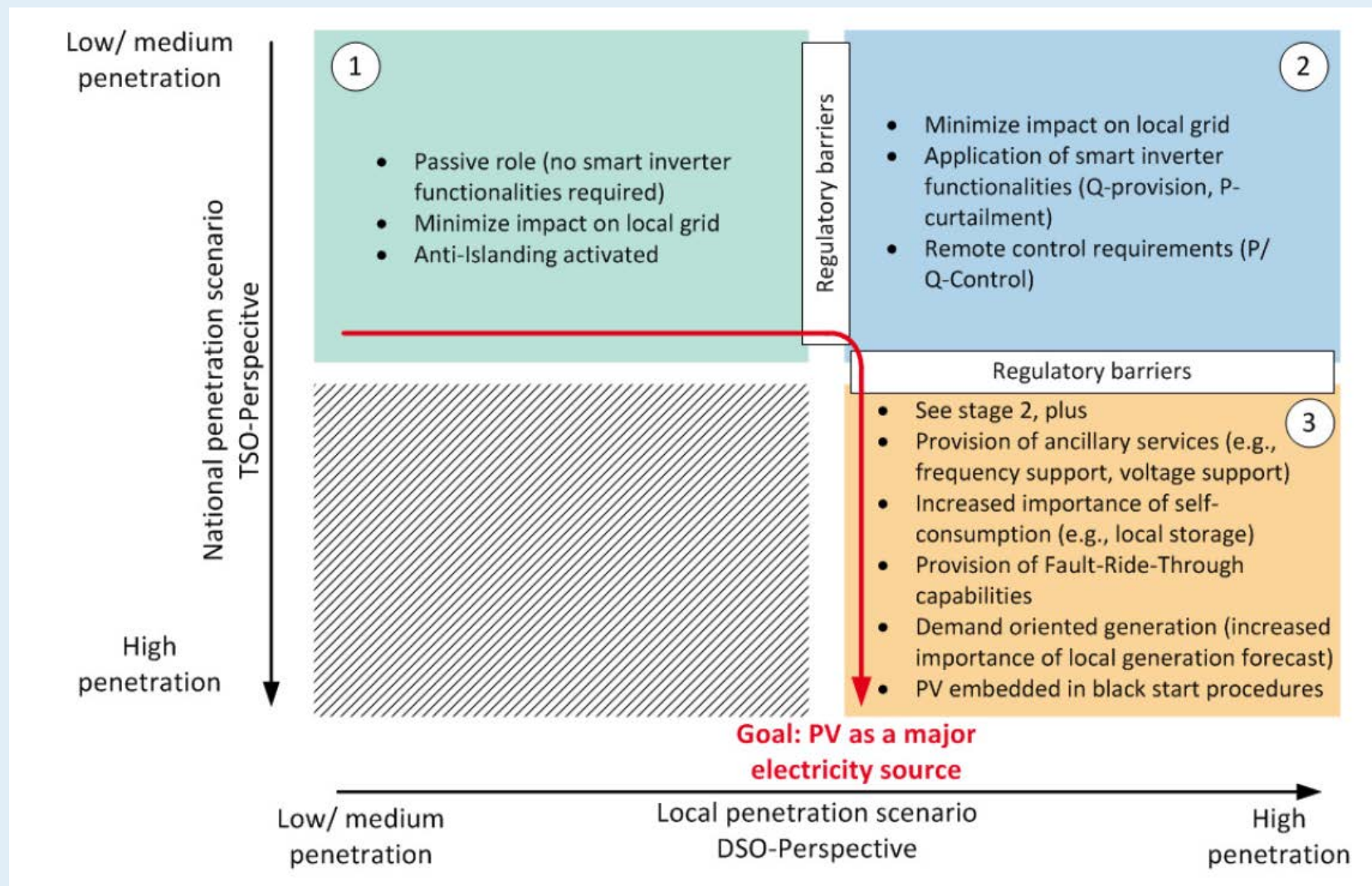


Key measures to integrate PV into the electricity system

- State of the art – PV systems today are
 - Delivering local grid support (P/Q/U control)
 - Riding through (not-disconnect) during wide-area disturbances (frequency and voltage)
 - Responding to critical frequency conditions (primary frequency regulation)
 - Limiting power output on-demand (“curtailment”)
- Future
 - Substituting inertia today provided by rotating generation
 - Scheduling PV power output through forecasting, integration with local storage and upward reserve provision
 - ➔ Replacing variability with flexibility



Changing role of PV in the electricity system





IEA PVPS basics



- 30 members: 25 countries, EC, SolarPower Europe, SEPA, SEIA, Copper Alliance
- Activities are carried out collaboratively on a country basis along a number of **technical** and **non-technical** subjects
- Currently, 7 projects (Tasks) are active





Present IEA PVPS Tasks

- Task 1 - Strategic PV Analysis and Outreach
- Task 9 - Deployment of PV technologies: co-operation with developing countries
- Task 12 - PV environmental, health & safety activities
- Task 13 - PV performance, quality and reliability
- Task 14 - High-penetration of PV systems in electricity grids
- Task 15 - Accelerating BIPV
- Task 16 - Solar resource for high penetration and large scale applications (new)



PVPS summary

- IEA PVPS: 90% of global R&D, production and market
- High prospects for PV technology and markets (with strong regional differentiation)
- Competitiveness to further increase
- Business models and financing modalities to evolve
- Market evolution and regulatory framework strongly interrelated
- New electricity market design and models needed
- Energy system integration becomes relevant – addressing the value of PV and flexibility needs
- Becoming a mainstream power source means realizing the benefits and sharing the responsibilities!



Relevant IEA-PVPS Publications

- “Transition from Uni-Directional to Bi-Directional Distribution Grids” <http://iea-pvps.org/index.php?id=294> Report T14:03-2014
- “Network Driven Demand Side Management” <http://iea-pvps.org/index.php?id=425>
- “Characterization of the spatio-temporal variations and ramp rates of solar radiation and PV” <http://iea-pvps.org/index.php?id=336>
- Upcoming: “Flexible resources for flexible transmission system operation” Report IEA-PVPS T14-09:2017 (to be published in November 2017)



Thank you for your attention !

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IEA-PVPS Task 14

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