

# Communication and Control for High PV Penetration under Smart Grid Environment

Overview on Control Strategies and  
Communications Technologies



## Task 14 Solar PV in the 100% RES Power System

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## Contents of the Report:

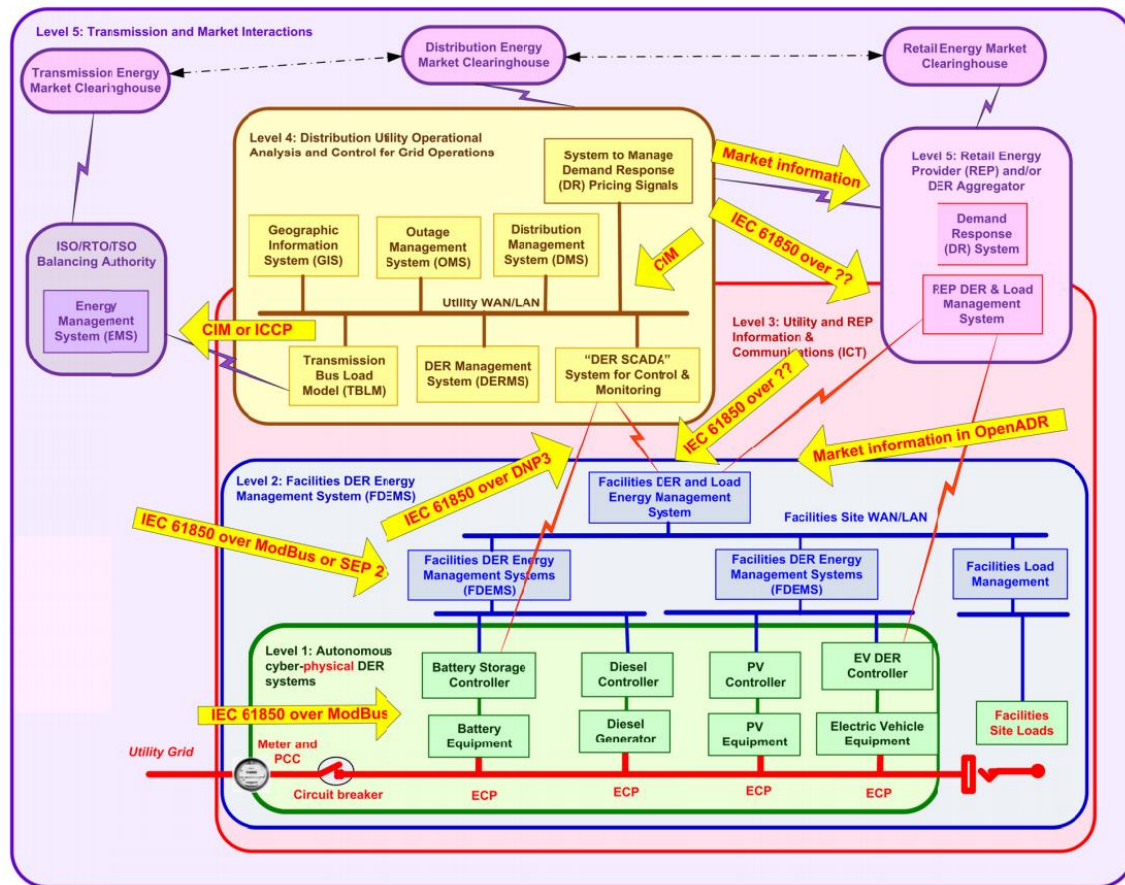
- Definition of Terminologies
- Architecture of Distributed Energy Resources (DERs) Including PVs under Smart Grid Environment
- Communication Technologies and Protocols for Integration Distributed PVs
- Existing Concepts of Integrating Distributed PVs
- Existing Communication and Control Practice for PV Integration: Survey Results
- Conclusions

# Task 14 – Subtask 5.1 Report: Highlights



Mapping of the Distributed Energy Resource (DER) including PV to the **Smart Grid Architecture Model (SGAM)** framework

**Source:** IEC: 62357 Second Edition. TC 57 Architecture - Part 1: Reference Architecture for TC57 - Draft (2009)

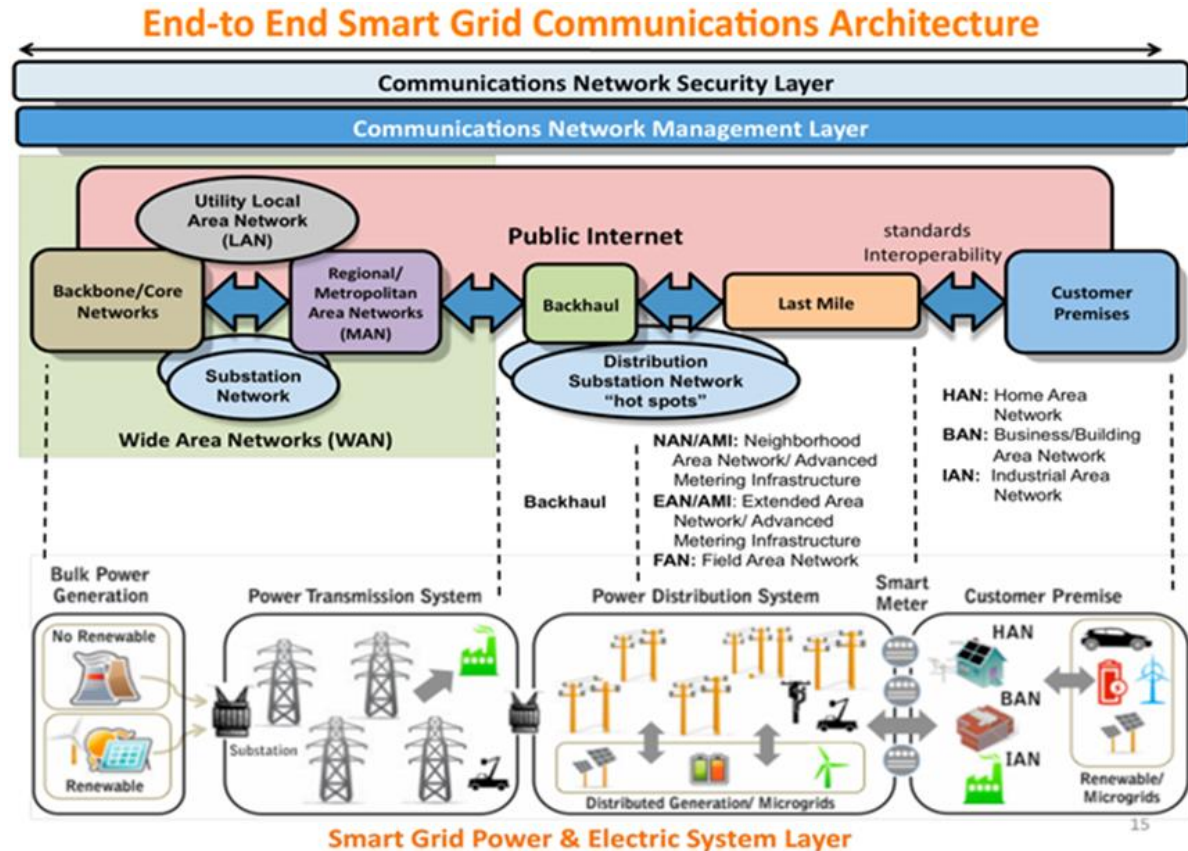


# Task 14 – Subtask 5.1 Report: Highlights



## Smart grid communication architecture

**Source:** IEEE P2030/D5.0, “Draft Guide for Smart Grid Interoperability of Energy Technology and Information Technology Operation With the Electric Power System (EPS), and End-Use Applications and Loads,” IEEE SA Standards Board, February 2011

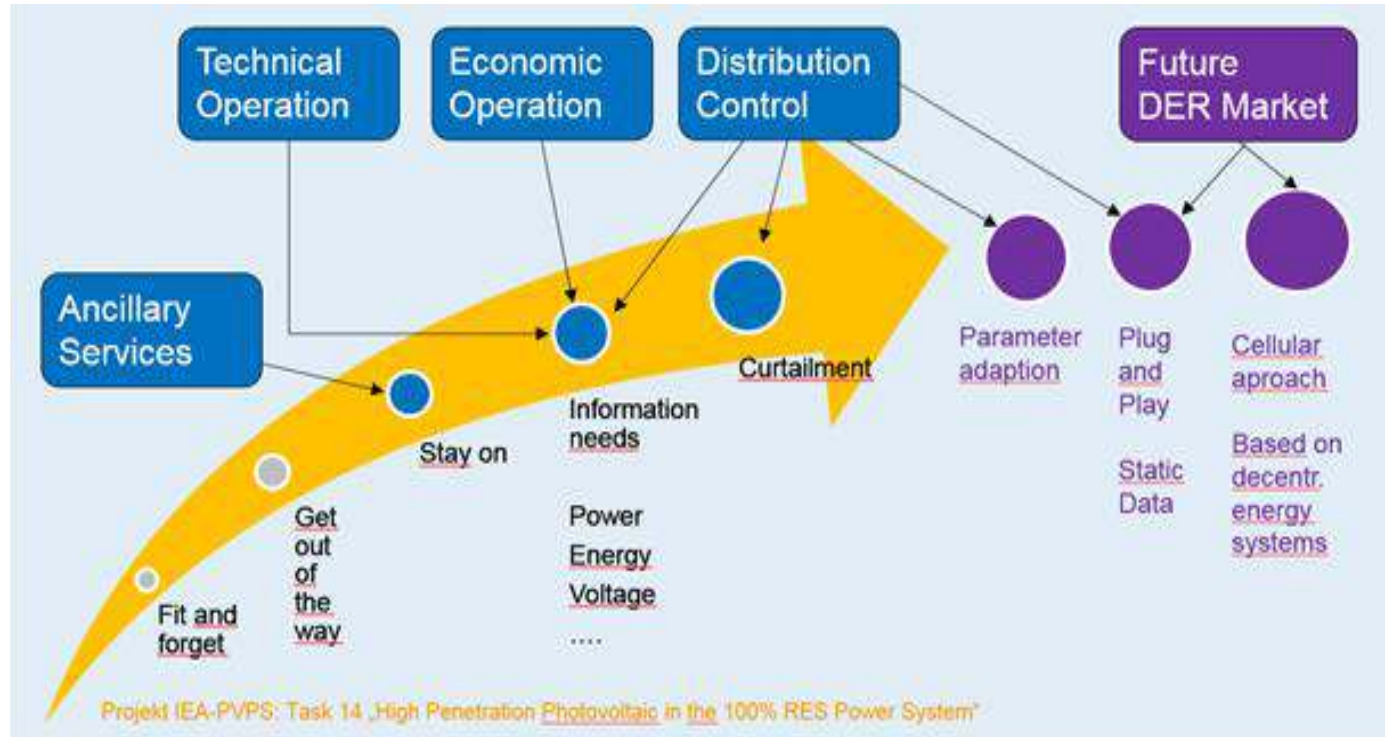


# Task 14 – Subtask 5.1 Report: Highlights



Evolution of communication needs for PV integration into smart grids

Source: THU



# Task 14 – Subtask 5.1 Report: Highlights



## Existing Communication and Control Practice for PV Integration: Availability in the Report

	Germany	Greece	Danmark	USA	Japan	Switzerland	Austria
Existing and planned Smart Grid projects	X	X	X	X	X	X	X
Existing PV projects with PV Communication & Control	X	X	X	X	X	X	X
Existing PV projects with PV Communication & Control	X	X	X	X	X	X	X
Expectations for PV communication and control	X	X	X	X	X	X	-
Communication media	X	X	X	X	X	X	-
Requirements data availability	X	-	X	X	X	X	-
PV communication standard	-	X	X	X	X	-	-
Data security	X	X	X	X	X	X	-

# Task 14 – Subtask 5: Conclusions



- **Present:**

- Control paradigm of current electrical power system is slow, open-looped, centralized, human-in-the-loop, deterministic and, in worst-case, preventive
- At transmission level, the energy management system (EMS) coordinates system-wide decisions based on SCADA data
- At the distribution level, traditional Volt/VAR control is designed mainly to cope with the slow variations

- **Future:**

- The future control must be real-time and closed-loop
- The large-scale deployment of sensing, two-way high-speed communication infrastructure and the advanced PV inverters have provided the platform
- The survey results show that deployment of communication and control systems for distributed PV systems is increasing
- Many communication and technologies and control functions for distributed solar PV systems are still under experimental and demonstration phase.

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