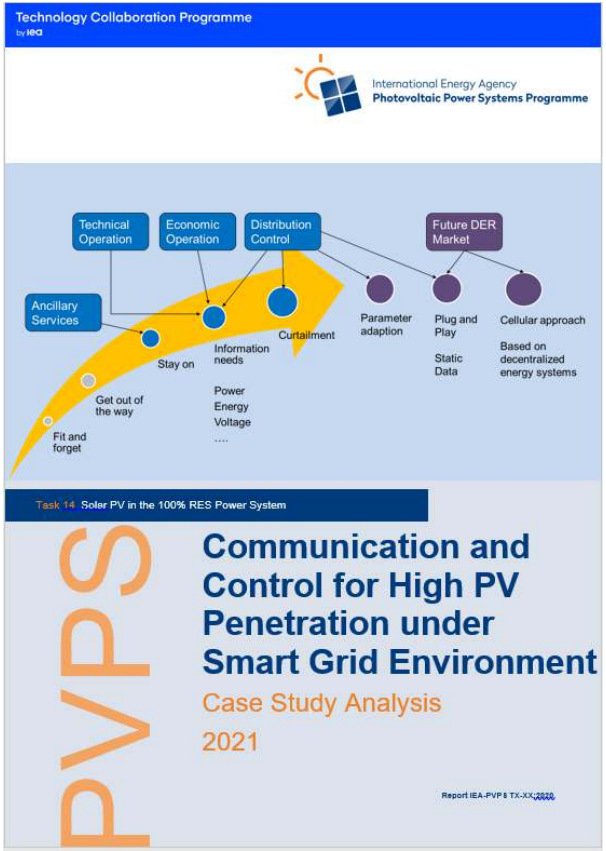
Task 14

Solar PV in the 100% RES Power System



IEA PVPS

Task14 Survey : PV in Smart Grids Short Instruction

Smart Grids Research Group
Technische Hochschule Ulm - University of Applied Sciences

Role of the Survey Editor

Survey Editor

- Please indicate your name or your organization (you could also contribute anonymous)
- Please indicate your country

Role of the Editor

- Facility manufacturer / Monitoring
- Market / service provider
- Utility (TSO/DSO/MPO/ESP)
- Industry (SCADA,…)
- Scientific organization
- Technical / legal commission
- … …

⇒ **You are very welcome to provide independent feedback from several different contributors in your country with different roles!**

Edited by: _____THU, Germany_____

Role of editor:

- ☐ Grid operator
- ☐ Grid regulator
- ☐ Metering point operator
- ☐ PV-system operator
- ☐ PV-system owner
- ☐ Energy market retailer
- ☐ Energy service provider
- ☒ Scientific organization
- ☐ Standardization committees
- ☐ Technical / legal commission
- ☐ PV-system / facility manufacturer
- ☐ IT service provider
- ☐ Other, please specify _____

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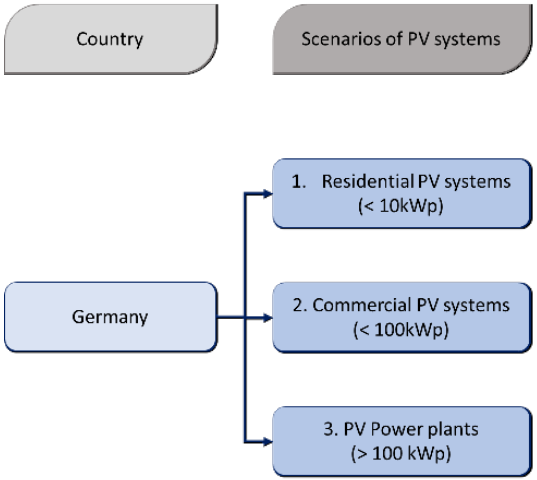
PV Scenarios

Scenarios

Please define your PV application

Possible example for Germany



Survey-Templates

- The template is both in **word** and **pdf** format available. We recommend you to use the word template (.docx) if possible.
- You also find one completed questionaire for the German scenario residential PV.

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Topics in the Questionnaire

Regulatory / Legal Documents

- Explain relevant legal requirements and technical references for the operation of grid-connected PV systems in the scope of concerned scenario; specify possible business models for PV systems, which may have a special demand for PV communication and control.

Grid Connection

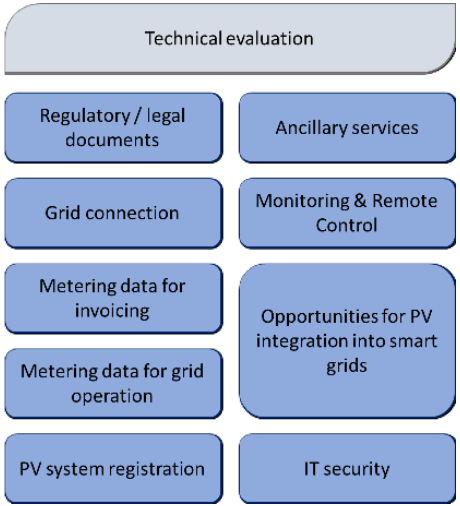
- Give basic information of the typical grid connection schema of concerned scenario, including voltage level and connection topology.

Metering/Communication for Invoicing

- Specify the acquisition of metering data for invoicing, including mandatory/optional query parameter, interval of the data acquisition/transmission as well as the methods used for data collection. If a device is specifically applied to metering and PV communication in your country, please also give a brief description of the device.

Metering/Communication Data for Grid Operation

- The same questions should also be answered from the perspective of grid operators. Which data and information are nowadays obligatory/optional for grid operation, including mandatory/optional query parameter, interval of the data acquisition/transmission as well as the methods used for data collection? If a device is specifically applied to data acquisition and PV communication for grid operation in your country, please also give a brief description of the device.



Topics in the Questionnaire

PV system registration

- The registration in a certain data system or by a certain registry agency is usually a pre-condition of the grid-connected operation of installed PV systems. Please specify the obligation of PV registration in accordance with legal and technical regulations.

Ancillary services

- Specify necessary preconditions required for PV systems to grant the grid-connected operation, as well as possible ancillary services that can be provided by grid-connected PV systems for the grid operator.

Monitoring & Remote Control

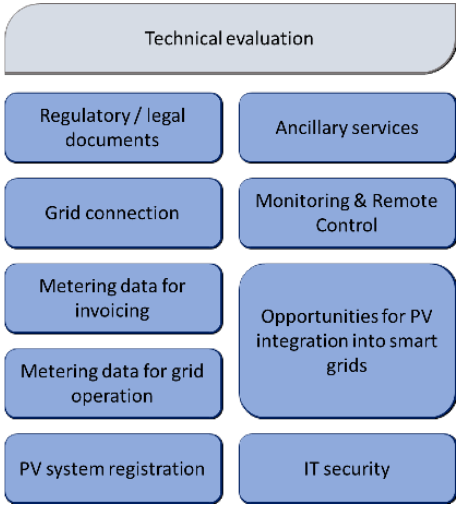
- Give basic information on the implementation of monitoring and remote control for PV systems, including used control strategies, communication protocols & technologies and communication infrastructure.

Opportunities for PV integration into smart grids

- Rate the potential scenarios for PV integration in smart grids according to different criterions. If there are important application scenarios that are not listed in the questionnaire, please complement them at the end of the table.

IT security

- The topic IT security or cyber security is recently intensively discussed, the security issue is also extremely important for the operation of distributed and centralized PV systems.



Tips for Completing the Questionnaire

- Complete **one** questionnaire for **each** PV scenario in your country or from the view of your organization
- Complete the questionnaire by **ticking the checkboxes** and providing specified information as required
- Please also **add references** that might help to understand the situation on PV communication and control in your country, e.g. by inserting an in-line comment or adding it at the end of the table of references

We are looking forward to receiving completed questionnaires in which all sections are ticked, although it is also okay if your only want to fill in some of the sections according to your interest / business area.

Contact Information

Upon finishing the questionnaire of your country, please send it to Stefanie Dennis by e-mail. Stefanie.Dennis@thu.de

After all the questionnaires are collected, THU will try to analyze the commonalities and diversity of PV scenarios in different countries. The evaluation of feedbacks from all contributors will be published and presented as a poster at the 36. PV-Symposium in May 2021 in Freiburg, Germany.

In case of any question, please feel free to contact us:

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Stefanie Dennis

E-mail: Stefanie.Dennis@thu.de

List of abbreviations

ADR	Automated Demand Response
CIM	Common Information Model
CLS	Controllable Local System
DER	Distributed Energy Resources
DSL	Digital Subscriber Line
DSO	Distribution System Operator
EEG	Erneuerbare-Energien-Gesetz (English: German Renewable Energies Act)
EMS	Energy Management System
EnWG	Energiewirtschaftsgesetz (English: German Energy Industry Act)
EV	Electric Vehicle
FIT	Feed in Tariff
FRT	Fault Ride Through
GDEW	Gesetz zur Digitalisierung der Energiewende (English: Law on the Digitization of the Energy Transition)
GSM	Global System for Mobile Communications
HAN	Home Area Network
HV	High Voltage
ICT	Information and Communication Technologies
IEA	International Energy Agency

List of abbreviations

IEC	International Electrotechnical Commission
LMN	Local Metrological Network
LTE	Long Term Evolution
LV	Low Voltage
MDS	Metering Data System
MV	Medium Voltage
NABEG	Netzausbaubeschleunigungsgesetz Übertragungsnetz (English: Grid Expansion Acceleration Act)
PKI	Public Key Infrastructure
PPA	Power Purchase Agreement
P2P	Peer to Peer
PV	Photovoltaic
SCADA	Supervisory Control and Data Acquisition
SMGW	Smart Meter Gateway
TSO	Transmission System Operator
THD	Total Harmonic Distortion
UMTS	Universal Mobile Telecommunications System
VDE	Verband der Elektrotechnik, Elektronik und Informationstechnik (English: Association for Electrical, Electronic and Information Technologies)
WAN	Wide Area Network

Following slides give a short description of IEA PVPS TCP and Task 14

What is IEA PVPS TCP?

The International Energy Agency (IEA), founded in 1974, is an autonomous body within the framework of the Organization for Economic Cooperation and Development (OECD). The Technology Collaboration Programme (TCP) was created with a belief that the future of energy security and sustainability starts with global collaboration. The programme is made up of 6.000 experts across government, academia, and industry dedicated to advancing common research and the application of specific energy technologies.

The IEA Photovoltaic Power Systems Programme (IEA PVPS) is one of the TCP's within the IEA and was established in 1993. The mission of the programme is to "enhance the international collaborative efforts which facilitate the role of photovoltaic solar energy as a cornerstone in the transition to sustainable energy systems." In order to achieve this, the Programme's participants have undertaken a variety of joint research projects in PV power systems applications. The overall programme is headed by an Executive Committee, comprised of one delegate from each country or organisation member, which designates distinct 'Tasks,' that may be research projects or activity areas.

The IEA PVPS participating countries are Australia, Austria, Belgium, Canada, Chile, China, Denmark, Finland, France, Germany, Israel, Italy, Japan, Korea, Malaysia, Mexico, Morocco, the Netherlands, Norway, Portugal, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, and the United States of America. The European Commission, Solar Power Europe, the Smart Electric Power Alliance (SEPA), the Solar Energy Industries Association and the Cop- per Alliance are also members.

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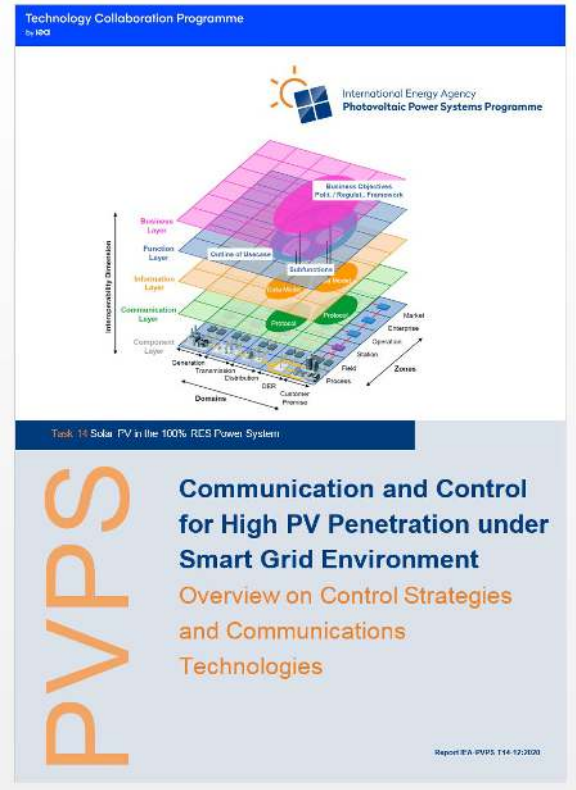
What is IEA IEA PVPS Task 14?

The main goal for the third phase of Task 14 will be “to prepare the technical base for Solar PV as major supply in a 100% RES based electric power system”. To reach this goal, Task 14 will continue its work in order to develop solutions and reduce technical barriers to enable PV to become the main source of power in a future 100% RES power system. In summary, the following key challenges were identified, which will be addressed in the work programme for the third phase:

- With growing PV (and other RES) capacity in transmission systems and ancillary services delivered upstream from distribution to transmission, a more integrated viewpoint on PV integration is needed
- New approaches to the management of power systems with declining inertia need to be developed to ensure system stability
- Operational and long-term planning with large amount of PV (and other RES) remains a key challenge in the future 100% RES scenario
- Value/cost, market design and operation aspects is highly relevant to bring cost reductions on the component side to the market
- Reliability, resilience and PV in micro grids are increasingly “hot topics” to be addressed
- Solutions for expanding power systems in emerging countries are urgently needed, as Solar PV can be the most cost-effective solution on the supply side
- With Smart Grids becoming reality and opening new opportunities, the possible role of PV in a future Smart Grid needs to be discussed
- Considering insular power systems as the most challenging for the future 100% RES scenario, the discussion about how to design the specific role of PV in these systems is needed

Visit us at: https://iea-pvps.org/research-tasks/solar-pv-in-100-res-power-system/

IEA PVPS Task 14 – Report: Communication and Control for High PV Penetration under Smart Grid Environment



Overview on Control Strategies and Communications Technologies

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

https://iea-pvps.org/key-topics/communication-and-control-for-high-pv-penetration-under-smart-grid-environment/