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IEA PVPS Final report Task 14

Activities 2018



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Agent:

Planair SA Crêt 108a, CH-2314 La Sagne www.planair.ch

Author:

Marine Cauz, Planair SA, <u>marine.cauz@planair.ch</u> Lionel Perret, Planair SA, <u>lionel.perret@planair.ch</u>

SFOE head of domain:Stefan Oberholzer, stefan.oberholzer@bfe.admin.chSFOE programme manager:Stefan Nowak, Stefan.nowak@netenergy.chSFOE contract number:SI/501599-1

The author of this report bears the entire responsibility for the content and for the conclusions drawn therefrom.



Summary

Experiences with grid integration of renewable energy sources (RES) are being made around the globe. Many countries run their own grid research programmes. In the Task 14 of the Photovoltaic Power Systems Programme (PVPS) of the International Energy Agency (IEA) experiences are shared. In several subtasks and activities information is collected and discussed and distributed back to the individual countries.

This year the Task 14 started its 3rd phase for the period from 2018 to 2022. Since PV is now already deployed in many locations, the T14 experts decided to focus this term on the next challenge which is to increase the amount of PV to reach 100% of RES. The main goal of the Task is to think how to make this possible. Therefore, the Task name was changed from *"High penetration of PV Systems in Electricity Grids"* to *"Solar PV in 100% RES based on power system"*.

This report aims to summarize the T14 activities in 2018 and to describe the organisation and the objectives of the new term.



Contents

Sum	mary	3
Contents		4
		5
1	Introduction	6
2	Context	6
2.1	Completion of the 2 nd term	6
2.2	Objectives of the 3 rd term	6
2.3	Approach and research method	8
3	Swiss participation	8
4	Dissemination in Switzerland	8
5	Results	9
6	Conclusions and outlook	9
7	Publications [within the project]	10
8	References	10

List of abbreviations

IEA	International Energy Agency
PVPS	Photovoltaic Power Systems Programme
T14	Task 14 of PVPS
RES	Renewable energy sources

1 Introduction

The Task 14 of the Photovoltaic Power Systems Programme (PVPS) of the International Energy Agency (IEA) has started in 2010 with information gathering and exchange under the name of "*High Penetration of PV Systems in Electricity Grids*". From the beginning, Task 14 has focused on the development of technologies and methods enabling the widespread deployment of distributed PV technologies into the electricity grids.

In 2018, the T14 experts finalised the second term of the task and started the 3rd phase for the period of 2018 to 2022. Based on the experience of the past years and the strong network which evolved during the course of the project, the focus will now be changed to "*Solar PV in the 100% RES Power System*". Several technical aspects of the required behaviour of an inverter based generator in a power grid will be investigated. Thereby in Task 14 no basic research is carried out, but the research results of other projects are collected and presented in comprehensive reports. It is the main focus of the project to let countries benefit of the experiences which were made in other countries.

2 Context

2.1 Completion of the 2nd term

To complete the 2nd term (2014 - 2018), the last reports related to it have been finalised this year.

- The report on the "*Role of the DSO as a Service Provider to the TSO*" was published in October 2018.
- A draft is now available for the report on "Taxonomy of Distribution Feeders with high PV Penetration".
- A draft will be available before end of the year for "Report and Case Studies on PV Interconnection Screening Techniques".
- A draft will be available before end of the year for "Requirements for PV power converters in PV and RES dominated power systems".

2.2 Objectives of the 3rd term

Following the expansion of the overall scope, the main goal for the third phase of Task 14 will "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.

The 3rd term of Task 14 is organised in three subtasks having the following objectives:



Figure 1: Task 14 Phase 3

• Subtask A: Dissemination and outreach

- Coordinate dissemination and outreach activities (workshops, publications, others)
- Prepare materials for dissemination for non-power-system-specialist audience
- Enhance Task 14 as global forum for PV grid integration (workshops, presentations...)
- Coordinate collaboration with other initiatives (IEA WIND, IEA-ISGAN, GIVAR...)
- Outreach to emerging economies, new PVPS members
- Subtask B: Operating and planning power systems with high penetration of Solar PV and RES
 - Address key questions related to operational and long-term planning with large amount of PV (and other RES) in a 100% RES scenario
 - Address value/cost, market design and operation aspects
 - Develop solutions for power systems in emerging countries
- Subtask C: PV in the Smart Grid
 - PV and smart grid concept standards
 - Overview of communication technologies, protocols, interfaces
 - Special focus on IT-related aspects (incl. cyber security)
 - PV as enabling technology for smart grids

The main research question of the Task can be formulated in the following general way: What measures must be undertaken both on the grid side as on the generator side to ensure a safe operation of a 100% renewable power grid with a high share of solar PV?

2.3 Approach and research method

The approach of Task 14 is described in the following graph:



3 Swiss participation

Planair is responsible for the project management and coordinates the Swiss contribution to Task 14. With the support of Basler & Hofmann, Planair takes part in the Experts meetings organized twice a year. Depending on the topic, the work packages are carried out by either Planair or Basler & Hofmann independently.

For this 3rd term, Basler & Hofmann will be more involved in the activities B5 and C4, with its knowledge of the evolution of the normative framework.

Planair will organize the activity B6, based on Swiss project like Neyruz, Scierie Zahn and Bois de Bay. Also, Planair will participate to the activity C1, based on the pilot project Camille Bloch using technical and communication capabilities of inverters to compensate local reactive consumption.

Several projects in Switzerland related to local energy management were already reviewed and assessed for a case study collection report. These international case study discussion allow to Swiss projects to benefit of the experiences which were made in other countries.

4 Dissemination in Switzerland

In order to share the knowledge and lessons learned with the Swiss community, a Swiss outreach event was organised on 7th September 2018 in attendance of the Operating Agent (Roland Bründlinger) and the Swiss utilities. The purposes of this event were, in a first part, to sum up the activities of T14 with an



Also thanks to the Swiss involvement in Task 14, different national projects benefit from international experiences in the field. For example, in collaboration with Group E, a large-scale demonstration project of microgrid started in Neyruz. The goal is to optimize the consumption of a large self-consumption community (18 buildings). The activities of Task 14 will allow us to benefit from international experience, particularly from Germany, which has been authorizing collective installations since the summer of 2017.

5 Results

The main impacts of the Swiss participation in the task 14 can be summarize as below.

- The international collaboration in grid integration of renewable power sources is strengthened.
- Swiss utilities and stakeholders of power grids in Switzerland have better access and awareness of international development and experience with power grids with high share of renewables.
- On the other hand, innovative Swiss projects in the field of PV and Grid have a new national and international dissemination platform
- Swiss utilities have more confidence and security in the application of new technologies in the power grid.
- Task 14 benefit directly from feedback from several utilities in Switzerland
- The strategic objective of new term PVPS Task 14 to be more closely connected to ISGAN TCP is reached in Switzerland thanks to the direct reporting to the grid energy research.

6 Conclusions and outlook

As in many other countries, the PV market in Switzerland is growing thanks to new subventions and lower PV prices. Currently less than 4% of the electricity is supplied by PV whereas the Energy Strategy plan aims for 20% of PV supplied electricity by 2050. To achieve this challenge, the international collaboration of the Task 24 is an important asset.

In Task 14, relevant international information and experience concerning grid planning and operation with high shares of renewable energies are collected in order to draw up a list of good practices and recommendations. Thanks to Swiss involvement in T14, these knowledges and lessons learned are share with the various stakeholders of power grids in Switzerland.

To conclude, the Swiss involvement in T14 is an important feature to help and to promote the innovation related to energy management in Switzerland. By pursuing this participation, the Swiss community has the guarantee to remain informed of the last developments and to enable the widespread of its innovation.

7 Publications [within the project]

Network Driven demand side management

Role of the DSO as a Service Provider to the TSO D.Marcel, J. Fahrni, L.Perret, J. Von Appen, D.Hidalgo : Report of IEA PVPS Task 14 Activity 2.7, Publication April 2017

M. Kraiczy, Report of IEA PVPS Task 14 Activity 2.7, Publication October 2018

8 References

IEA-PVPS Task 14 Phase 3 Task Work Plan for IEA-PVPS Task 14, Roland Bründlinger and Gerd Heilscher

9 Annexes

Kuching meeting report L. Perret, November 2018