

TASK 8 - STUDY ON VERY LARGE SCALE PHOTOVOLTAIC POWER GENERATION SYSTEM

OVERALL OBJECTIVES

The objective of Task 8 is to examine and evaluate the feasibility of Very Large Scale Photovoltaic Power Generation (VLS-PV) Systems on desert areas, which have a capacity ranging from over multi megawatt to gigawatt, and develop practical project proposals for implementing VLS-PV projects in the future (See Fig. 1).

Since the first half of the 2000s, installation of MW-scale PV systems has been rising substantially year by year, and the capacity of MW-scale PV systems is expanding as well. The capacity would reach 100 MW in the near future, and after this stage, GW-scale PV plants consisting of several 100 MW scale PV systems should be realized toward the mid-21st century. Thus, VLS-PV systems are promising options for large-scale deployment of PV systems.

The work on VLS-PV first began in 1998, under the umbrella of IEA PVPS Task 6, and was officially established as the new Task 8 in 1999. Task 8 started its 3rd phase activity in 2006 under a three year Workplan.

In the 3rd phase activity, three subtasks have been organised:

SUBTASK 2: Case Studies for Selected Regions for Installation of VLS-PV Systems on Deserts

Employing the concepts of VLS-PV and the criteria and other results obtained in the previous phases, case studies on VLS-PV systems for the selected regions are undertaken and the effects, benefits and environmental impact of VLS-PV systems are evaluated. Feasibility and potential of VLS-PV on deserts will be evaluated from the viewpoint of local, regional and global aspects.

SUBTASK 5: General Instruction for Practical Project Proposals to Realise VLS-PV Systems

Detailed practical instructions and a training kit for the development of other practical project proposals, to enable others to sustainably implement VLS-PV systems in the future, will be discussed.

Employing the results developed under Subtask 4, financial and institutional scenarios will be further discussed, and the guidelines for practical project proposals will be developed.

SUBTASK 6: Future Technical Options for Realising VLS-PV Systems

Various technical options for implementing VLS-PV systems, including scenarios for storage and for reliable integration of VLS-PV systems into the existing electrical grid networks, will be proposed and analysed. From the viewpoint of future electrical grid stability, a global renewable energy system utilizing globally dispersed VLS-PV systems as the primary electrical energy source will also be analysed.

SUMMARY OF TASK 8 ACCOMPLISHMENTS FOR 2008

During 2008, Task 8 concentrated on producing a technical report as an integrated result of the 3rd phase activity. Each subtask

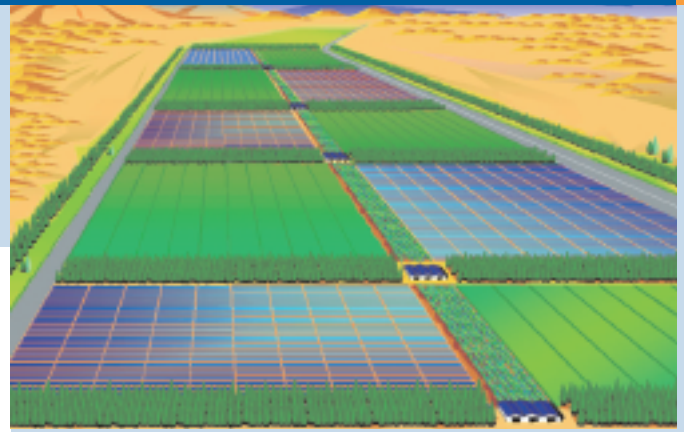


Fig. 1 - Image of a VLS-PV System in a Desert Area.



Fig. 2 - Technical visit to ECN at the 19th Task 8 Experts Meeting.

developed various kinds of outcomes by effective interactions. The draft manuscripts have been completed and the report would be published in Autumn 2009. In parallel, Task 8 actively performed dissemination events.

SUBTASK 2: Case Studies for Selected Regions for Installation of VLS-PV Systems on Deserts

The following case studies were carried out and drafted for a technical report:

Environmental and Ecological Impacts of VLS-PV

- Life-cycle analysis of various kinds of VLS-PV systems;
- Estimation of ecological impacts of VLS-PV development

Global Potential Analysis

- Solar energy potential analysis by using remote sensing

Regional Case Study

- Case study on the Sahara desert;
- Case study on the Gobi desert



Fig. 3 – International Symposium held in Busan, Korea, October 2008, in conjunction with Renewable Energy 2008.

SUBTASK 5: General Instruction for Practical Project Proposals to Realise VLS-PV Systems

The following issues were discussed and drafted for a technical report:

Socio-Economic Considerations

- Potential benefits and considerable socio-economic aspects;
- Desert region community development;
- Development of agriculture system with PV;
- Desalination powered by solar energy

Financial Aspects

- Life cycle cost analysis;
- Requirement for financing VLS-PV;
- Proposal of VLS-PV business model

VLS-PV Roadmap

- Proposal of VLS-PV roadmap toward 2100

SUBTASK 6: Future Technical Options for Realising VLS-PV Systems

The following issues were discussed and drafted for a technical report:

Recent and Future Trends in PV Technology

- PV cell and module technology for VLS-PV;
- PV system technology;
- CPV and tracking technology

MW Scale PV System Installation Technologies Nowadays

- Recent progress of MW-scale PV systems;
- Advanced design of VLS-PV systems;
- System architecture and operation;
- Array structures, civil works and foundations

Future technical developments for VLS-PV Systems

- Matching VLS-PV systems to grid requirements;
- A statistical approach to energy storage;
- Solar hydrogen;
- Expert control systems based on cloud predictions

OTHER ACTIVITIES

International Symposium: "Energy from the Desert – Possibility of Very Large Scale PV Systems in Asia," in Busan, Korea.

As a side event of Renewable Energy 2008 held in October 2008, an international symposium, "Energy from the Desert – Possibility of

Very Large Scale PV Systems in Asia", took place on 13 October 2008 in Busan, Korea. Task members introduced the main results of the 3rd phase activity and invited guests from Korean companies made impressive presentations.

Contribution to the International Conferences

Task 8 made presentations at the following international conferences, as dissemination activities:

- 23rd EU-PVSEC in Valencia, Spain (September 2008)
- Renewable Energy 2008 in Busan, Korea (October 2008)

SUMMARY OF TASK 8 ACTIVITIES PLANNED FOR 2009

Publication of the Technical Report

The final draft of Task 8 activity based on the 3rd phase activity has been completed, which is tentatively entitled, "Energy from the Desert: Very Large Scale Photovoltaic Systems, Socio-economic, Financial, Technical and Environmental Aspects." The report would be published in Autumn 2009.

Starting up 4th Phase Activity

In order to accomplish the VLS-PV activity, Task 8 will start its 4th phase activity in 2009 based on a new three year Workplan.

In the 4th phase activity, participants will discuss the following items. Based on the discussion including previous phases, implementing strategies and engineering designs for VLS-PV projects will be discussed and proposed. Furthermore, various kinds of environmental impacts will be evaluated and feasible technical options will be discussed in depth. Eventually, VLS-PV proposals which would be useful for stakeholders would be developed.

SUBTASK 2: Case Studies for Selected Regions for Installation of VLS-PV Systems on Deserts

- Various kinds of environmental impacts of VLS-PV systems

SUBTASK 5: General Instruction for Practical Project Proposals to Realise VLS-PV Systems

- Instructions and strategies for implementing VLS-PV systems;
- Engineering designs of VLS-PV systems;
- Project proposals for implementing VLS-PV projects

SUBTASK 6: Future Technical Options for Realising VLS-PV Systems

- Future technical options for a global renewable energy system

KEY DELIVERABLES

Internal Publication

Report: A Preliminary Analysis of Very Large Scale Photovoltaic Power Generation (VLS-PV) Systems: Report IEA-PVPS VI-5 1999:1

External Publications

Book: "Energy from the Desert: Feasibility of Very Large Scale Photovoltaic Power Generation (VLS-PV) Systems," James and James, 2003 (ISBN 1 902916 417)

Report: "Summary – Energy from the Desert: Feasibility of Very Large Scale Photovoltaic Power Generation (VLS-PV) Systems," 2003

Report: "Summary – Energy from the Desert: Practical Proposals for

Very Large Scale Photovoltaic Systems," 2006

Book: "Energy from the Desert: Practical Proposals for Very Large Scale Photovoltaic Systems," Earthscan, 2007 (ISBN 1 844073 637)

Book: "Energy from the Desert: Very Large Scale Photovoltaic Systems, Socio-economic, Financial, Technical and Environmental Aspects," (to be published in 2009)

MEETING SCHEDULE

(2008 AND PLANNED 2009)

19th Task 8 Experts Meeting, 17-19 April 2008, Utrecht, the Netherlands

20th Task 8 Experts Meeting, 29-30 September 2008, Valencia, Spain

21st Task 8 Experts Meeting, 24-25 April 2009, Nanterre, France

22nd Task 8 Experts Meeting, September 2009, Germany

LIST OF TASK 8 PARTICIPANTS

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