

IEA PVPS Task 8 :
Study on Very Large Scale
Photovoltaic Power Generation Systems

IEA PVPS Workshop at PVSEC-19
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ENERGY

FROM THE DESERT



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What's Task8 ?

☀ Objectives

- ☀ 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-MW to GW**
- ☀ To develop practical project proposals toward implementing VLS-PV systems in the future

☀ Participating countries

- ☀ Japan (**OA**), Canada, France, Germany, Israel, Italy, Korea, the Netherlands, U.S.A., Mongolia (observer) and China (observer)

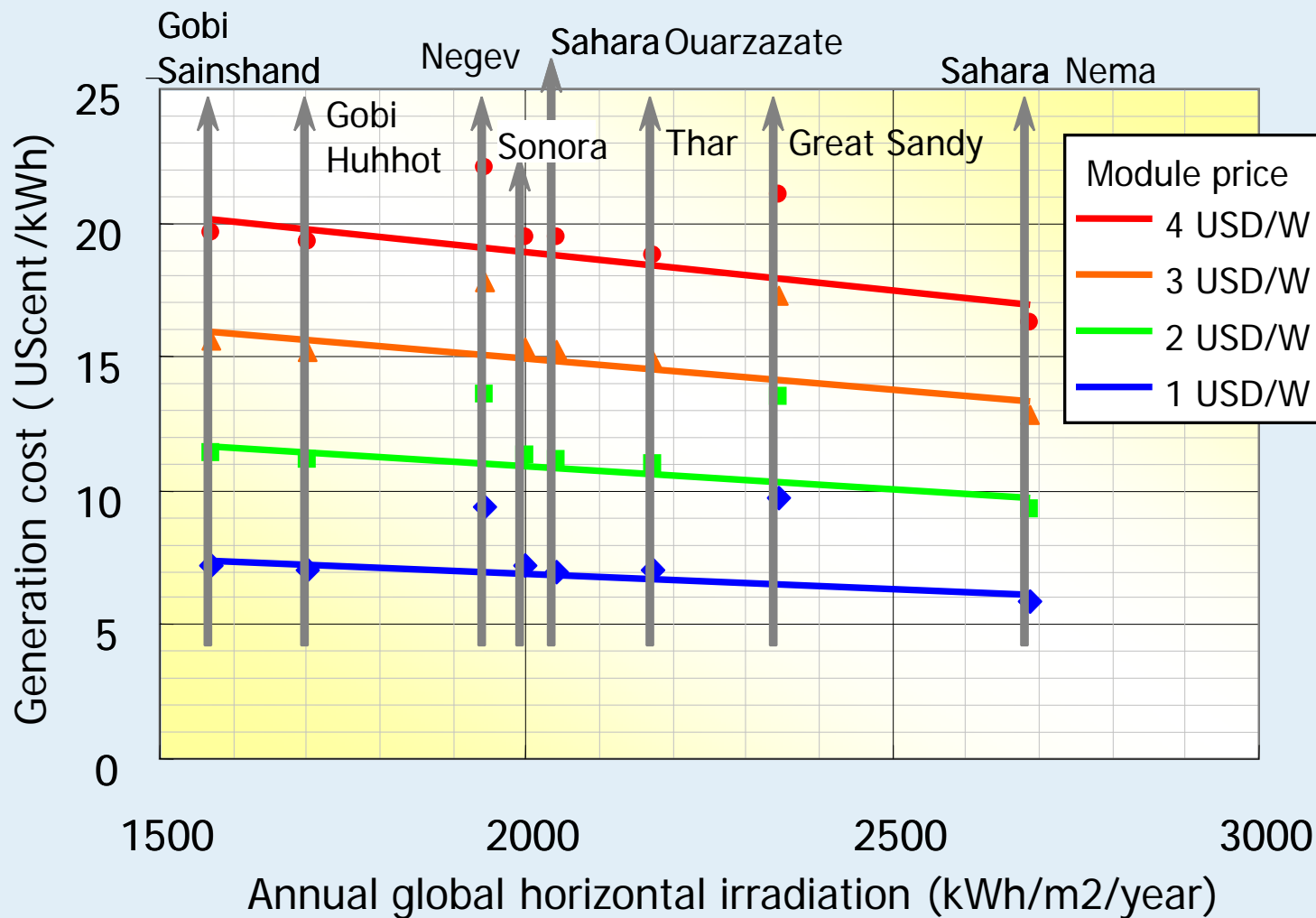
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Indicative generation cost

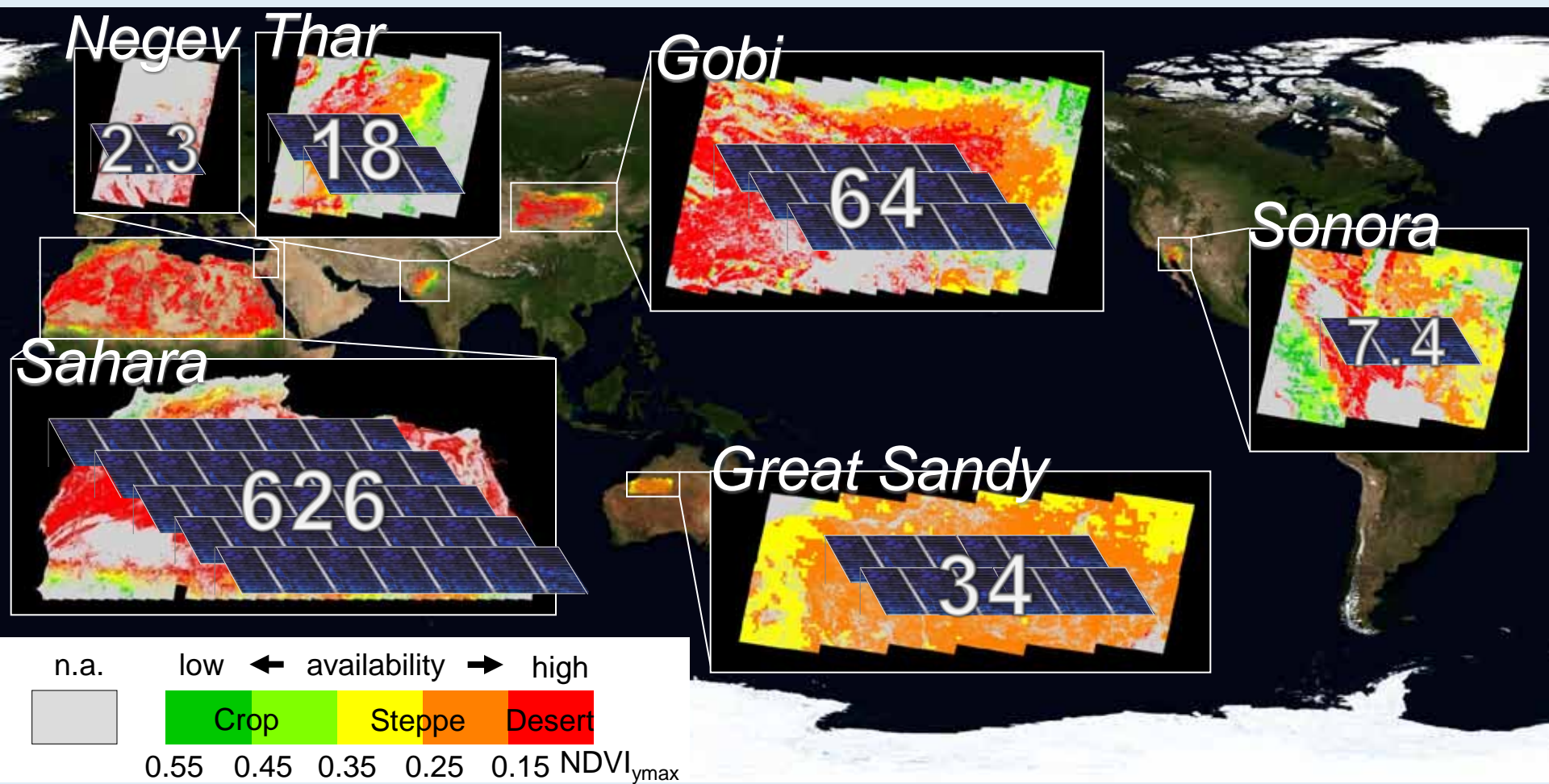


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Solar resource of world six deserts



752 PWh: 5.2 times of world energy demand in 2010

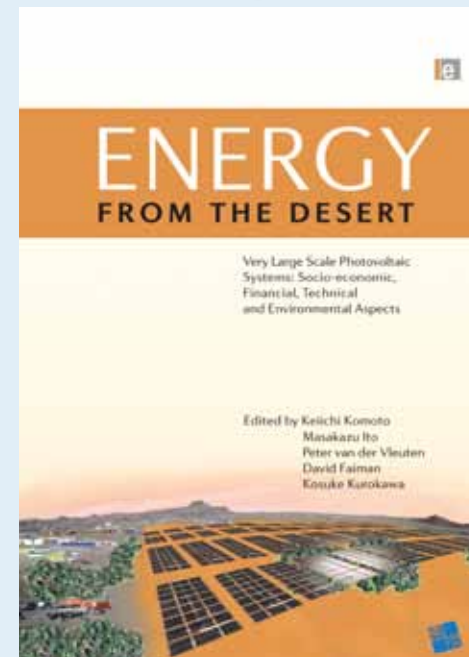
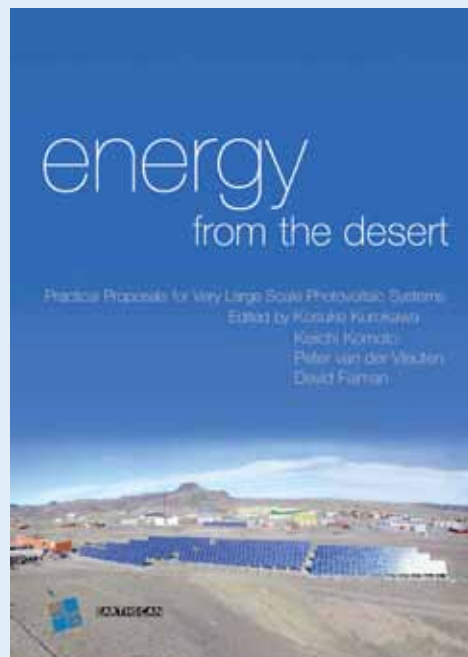
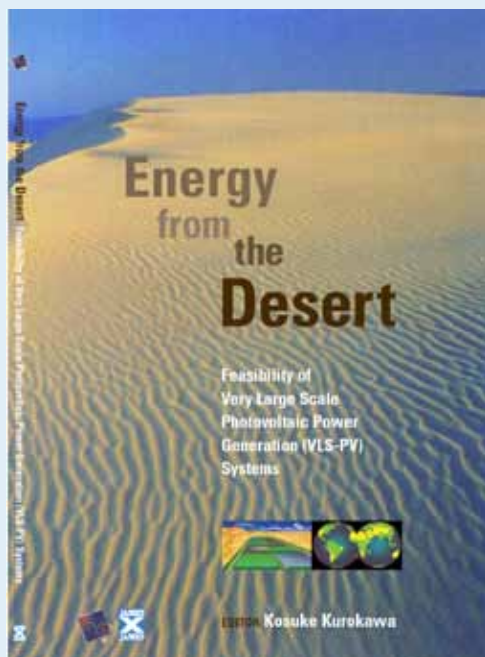


Energy from the Desert

**Feasibility of Very Large Scale Photovoltaic Power Generation (VLS-PV) Systems:
Published in 2003**

**Practical Proposals for Very Large Scale Photovoltaic Systems:
Published in 2007**

**Very Large Scale Photovoltaic Systems, Socio-Economic, Financial, Technical and Environmental Aspects:
Published in September 2009**



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New publication, *published in Sep. 2009*

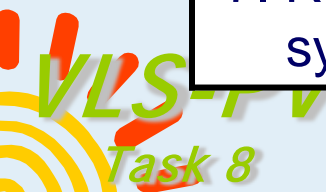
Title

Energy from the Desert: Very Large Scale Photovoltaic Systems, Socio-Economic, Financial, Technical and Environmental Aspects

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| 5. Financial aspects | 12. Case study on the Gobi desert |
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| 7. Recent trends in MW-scale PV system Installation | 14. Conclusions and recommendations |

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Opportunities for desert countries (1)

- ☀ **Very Large Scale PV solar electricity generation can provide:**
 - ☀ Economic, social and environmental benefit
 - ☀ Security of electricity supply
 - ☀ Fair access to affordable and sustainable energy solutions

- ☀ **Major stakeholders are:**
 - ☀ Renewable energy institutes
 - ☀ Energy companies
 - ☀ Government institutions
 - ☀ Financing institutions
 - ☀ Educational institutes

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Opportunities for desert countries (2)

- ☀ **The generated electricity can be used for:**
 - ☀ lighting, communication, entertainment, domestic use, education, etc
 - ☀ irrigation/agriculture
 - ☀ clean water production, sanitation, etc.
 - ☀ export
 - ☀ hydrogen production

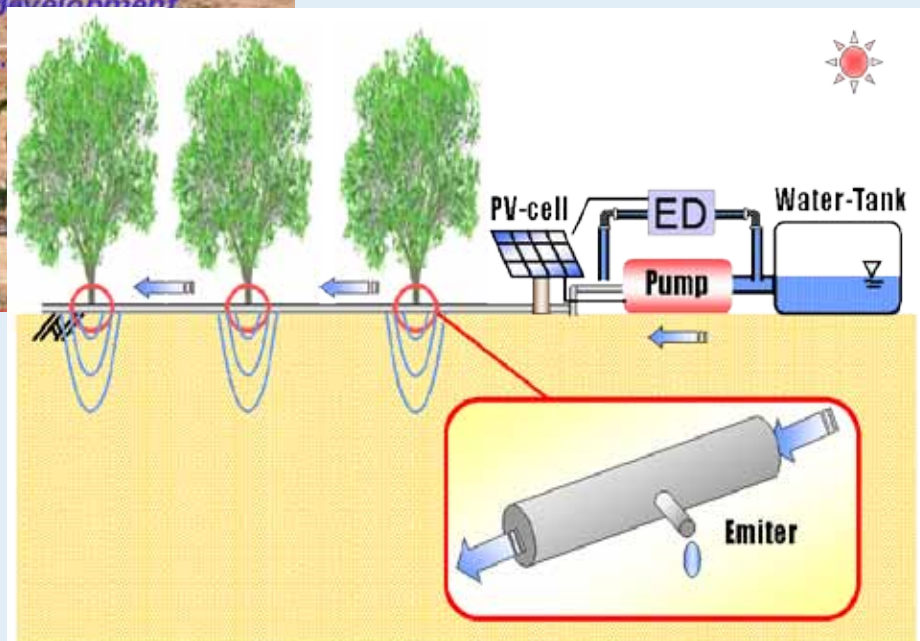
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Connected area for VLS-PV development

☀ Irrigation / Agriculture



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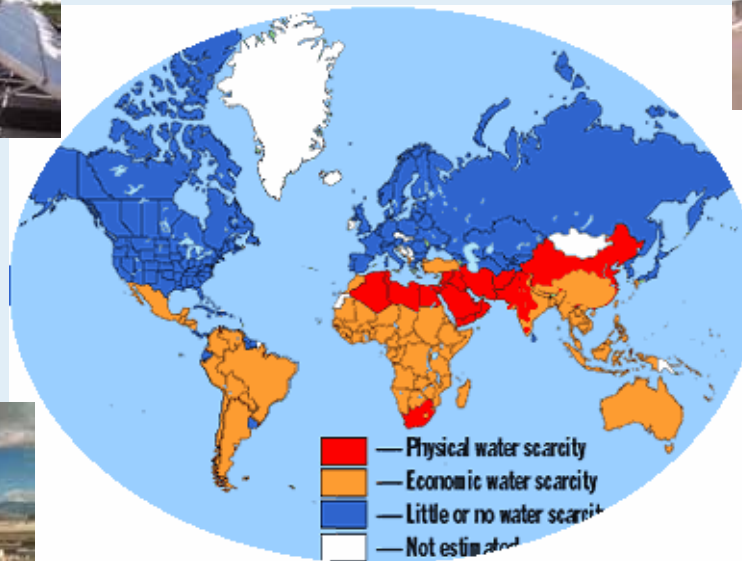
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Connected area for VLS-PV development

☀️ Seawater desalination

- Desalination is one option to extend drinking water resources



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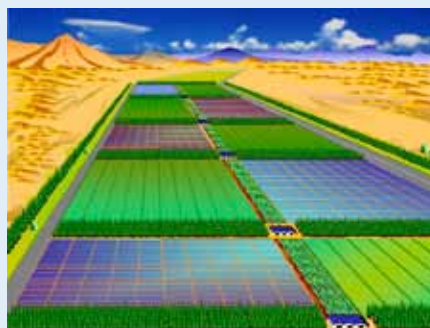
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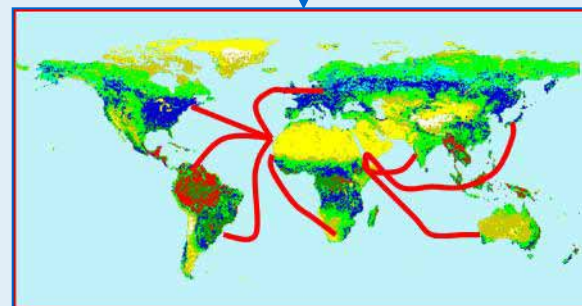
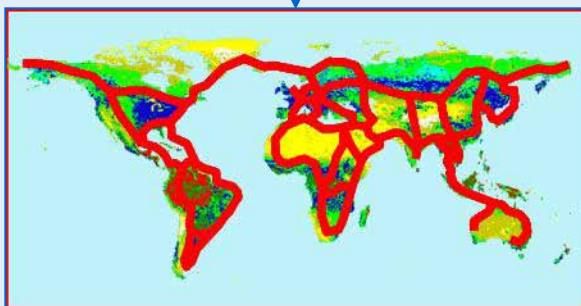
Connected area for VLS-PV development

☀️ Transmission networks



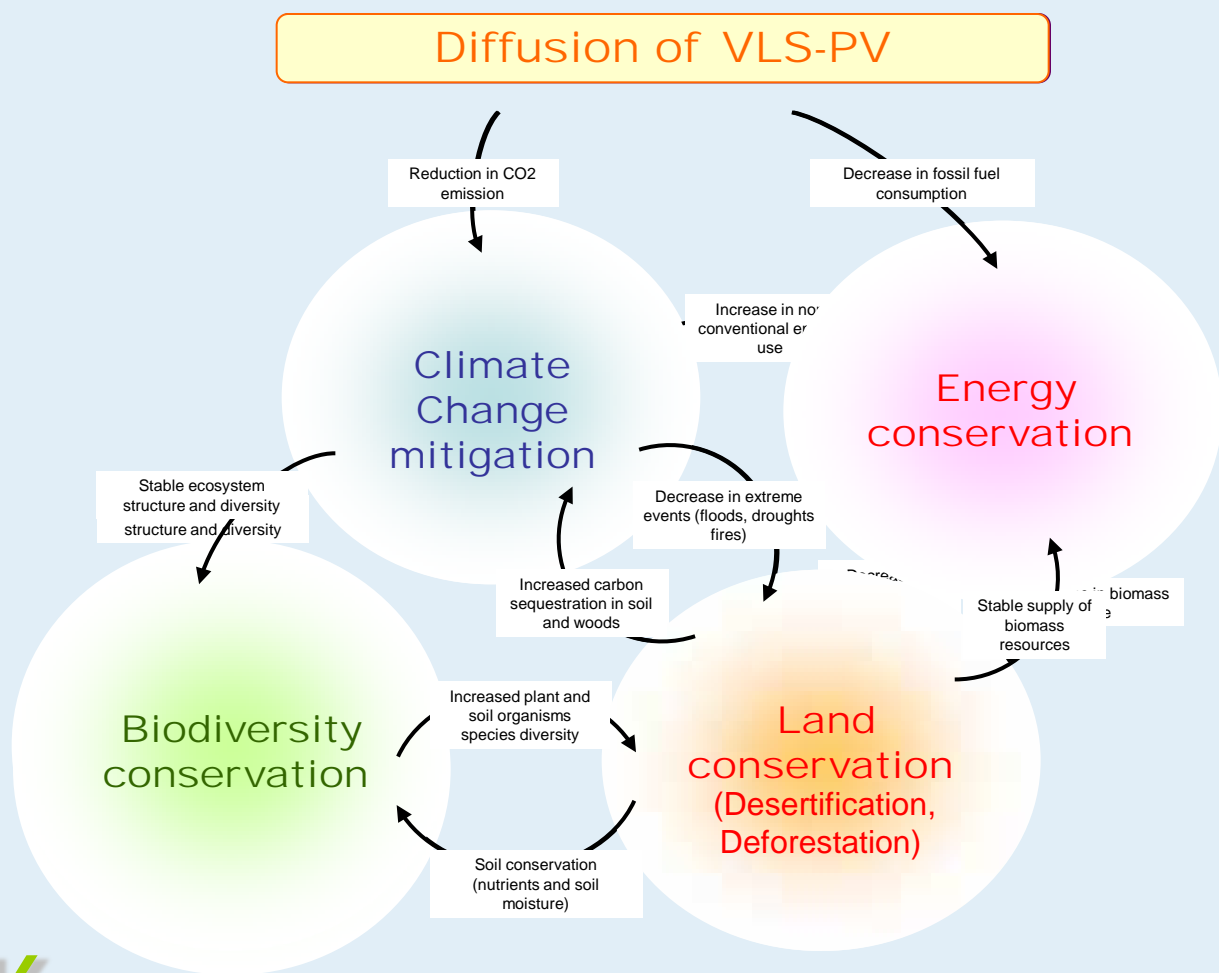
Solar electricity
for local use
and export

Hydrogen
for local use
and export





Expected environmental impacts

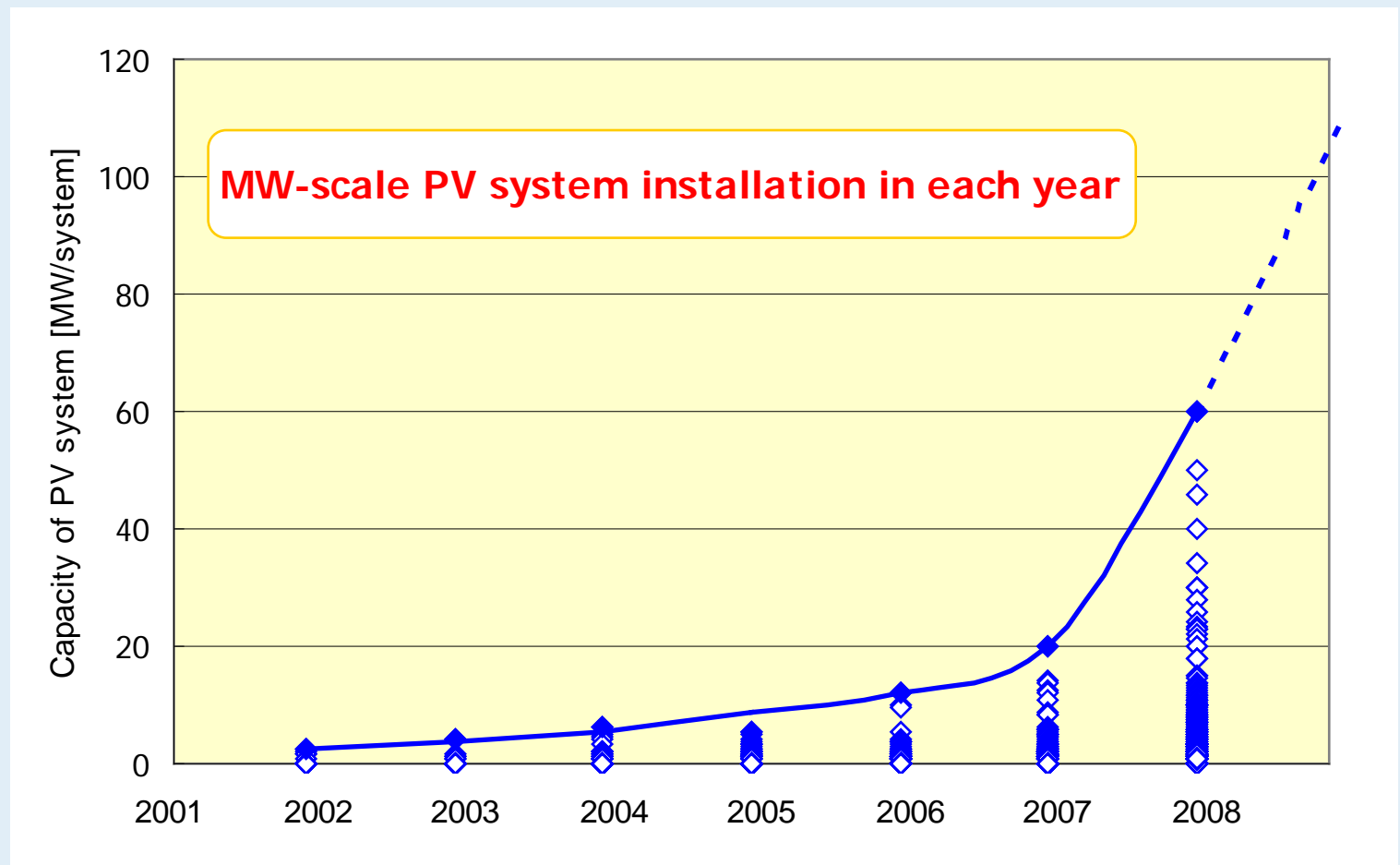


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Trends in a capacity of MW-scale PV



(Data source: <http://www.pvresources.com>, Resources Total System Co., Ltd., Mizuho Information & Research Institute)

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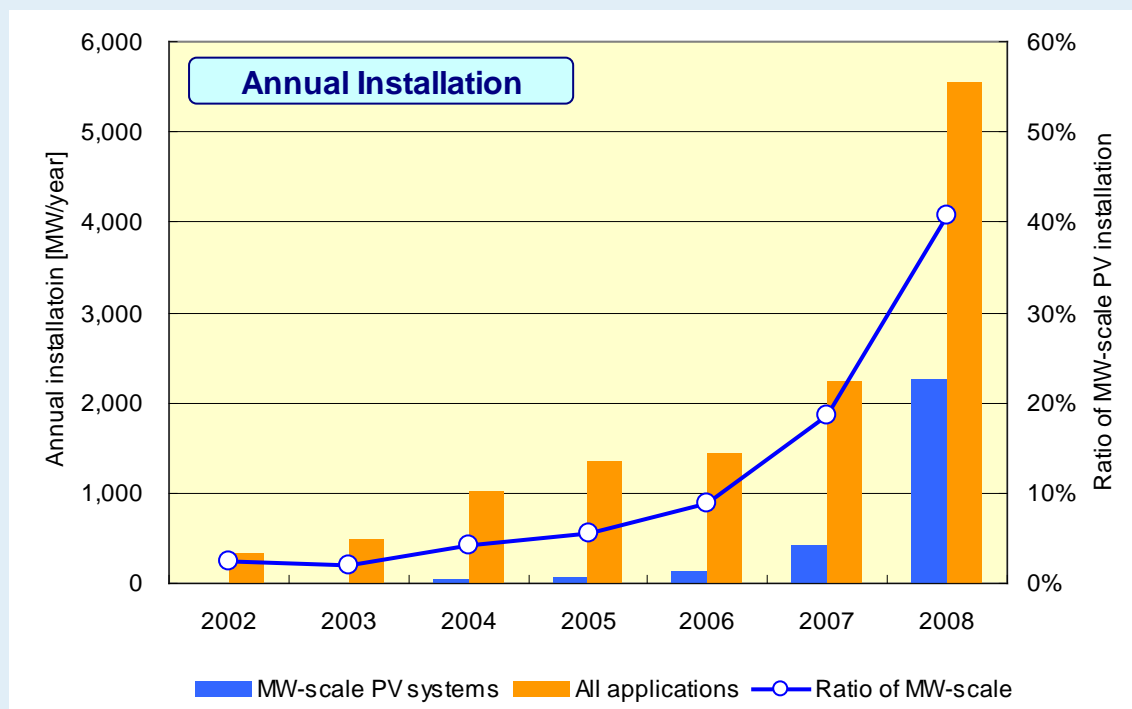
MW-scale PV installation annually

☀ In 2002 *(as of our 1st edition)*

☀ **3%** of all PV application in IEA-PVPS countries

☀ Nowadays

☀ **> 2 GW** : **40%** of all PV application in 2008



(Data source: IEA PVPS, etc.)

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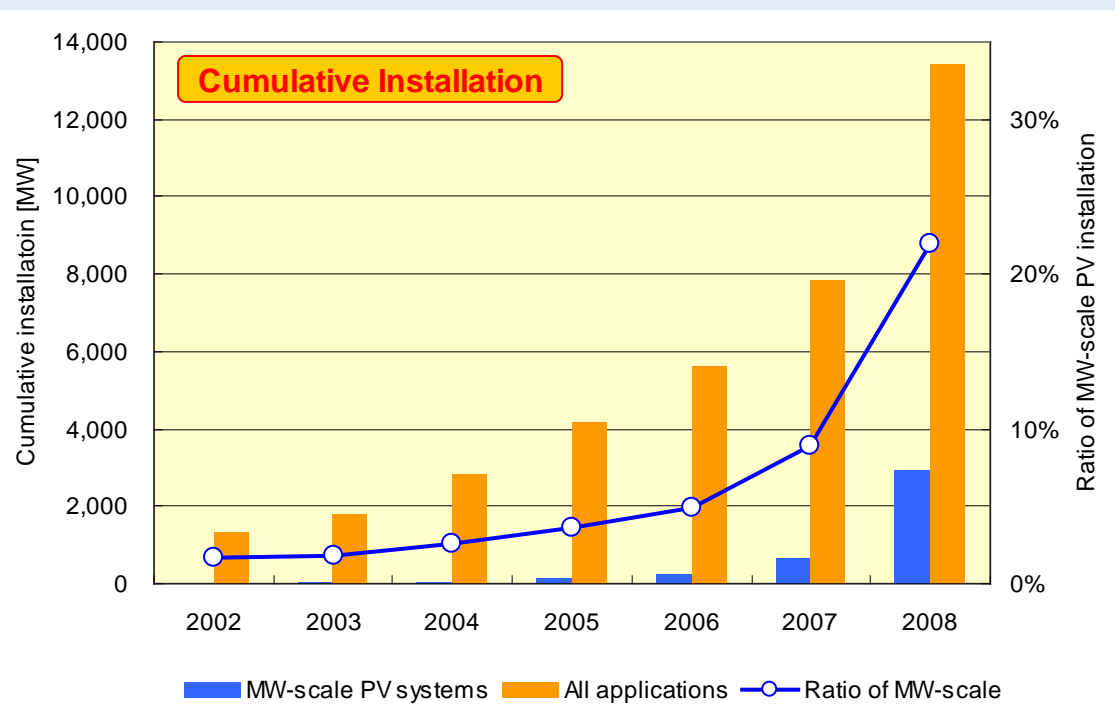
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Cumulative MW-scale PV installation

As of the end of 2008

3 GW: >20% of all PV application in IEA-PVPS
(Over 1 GW by 10MW-scale PV)



(Data source: IEA PVPS, etc.)

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Road to VLS-PV

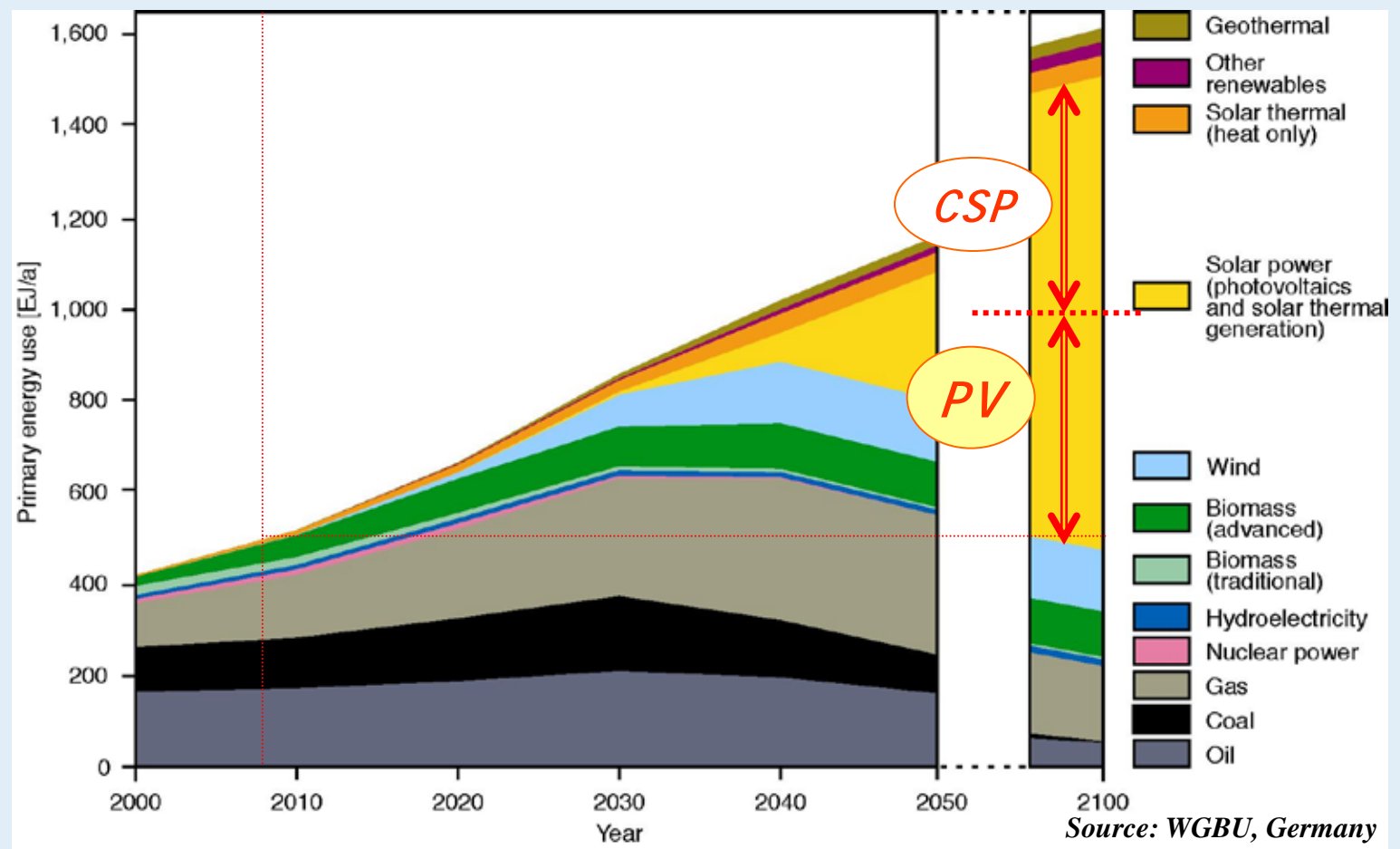
- ☀ MW-scale PV system: *already 'major application'*
- ☀ 100 MW PV system : *coming soon!*
- ☀ GW-scale PV plant : *within a decade!?*
 - ☀ Promising option for mass-deployment of PV system
 - ☀ Basic load of production capacity for PV industry
 - ☀ New 'conventional' power plant in remote and desert region



VLS-PV roadmap



Future Energy Scenario

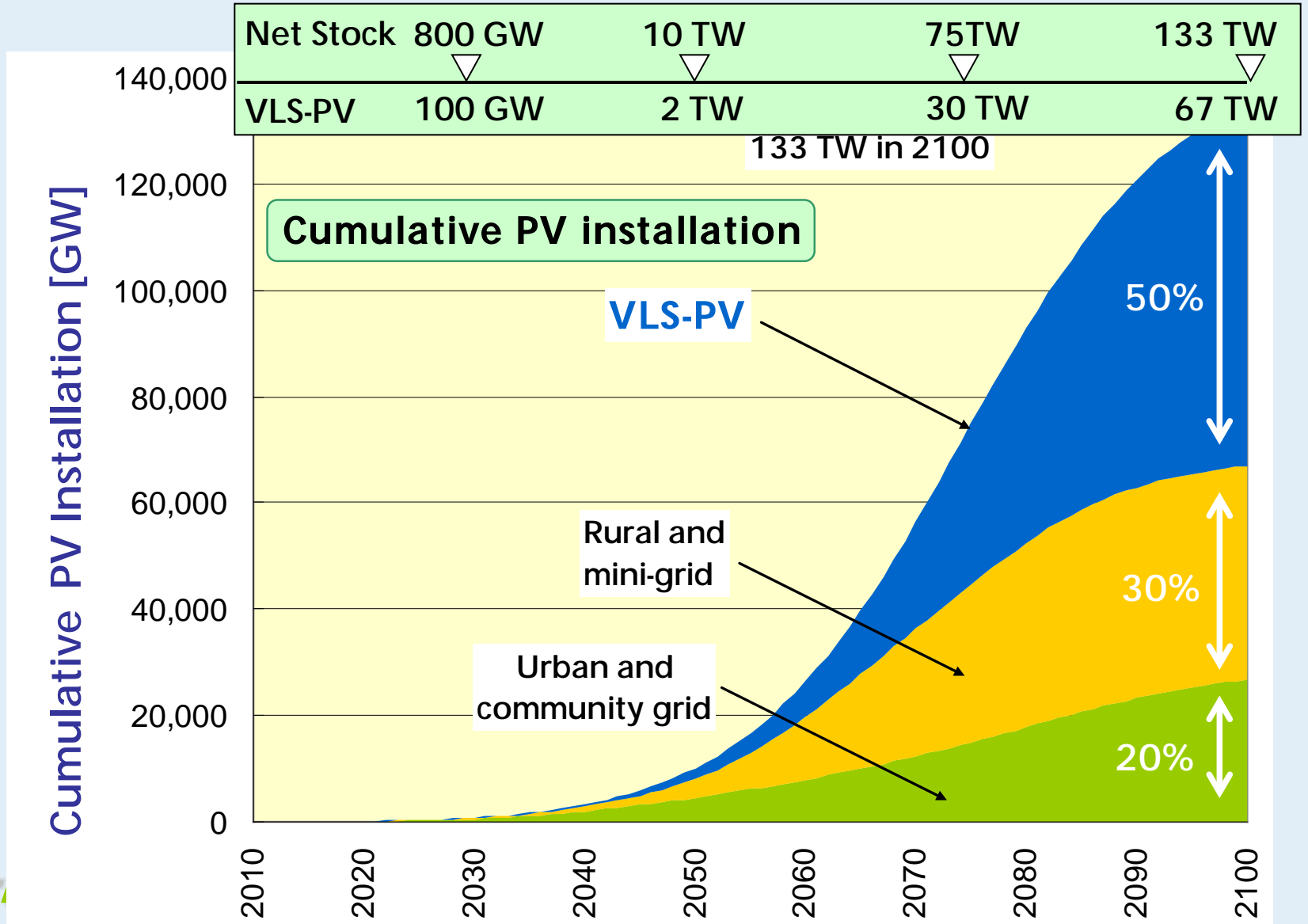


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Cumulative PV installation toward 2100

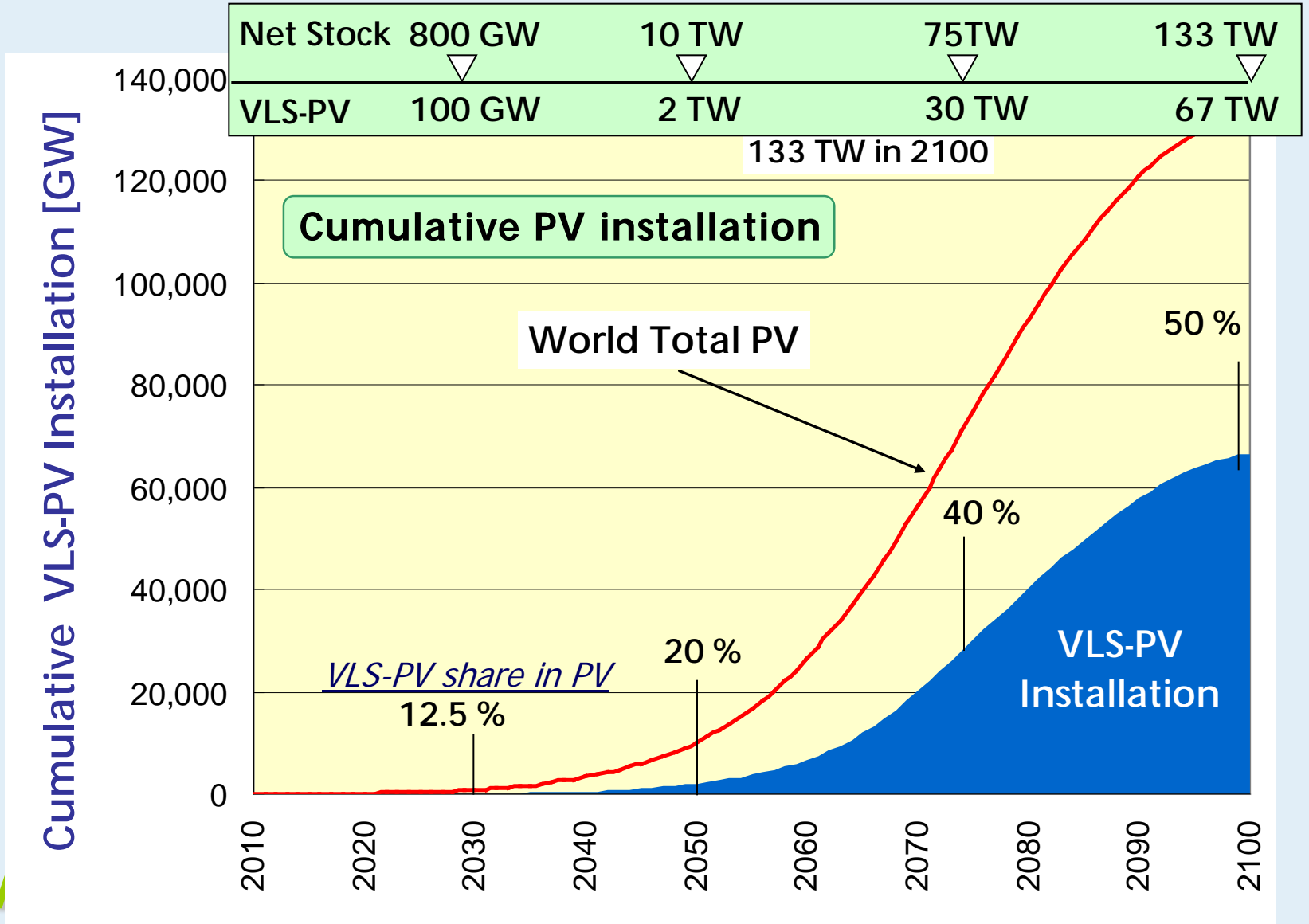


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Cumulative VLS-PV installation

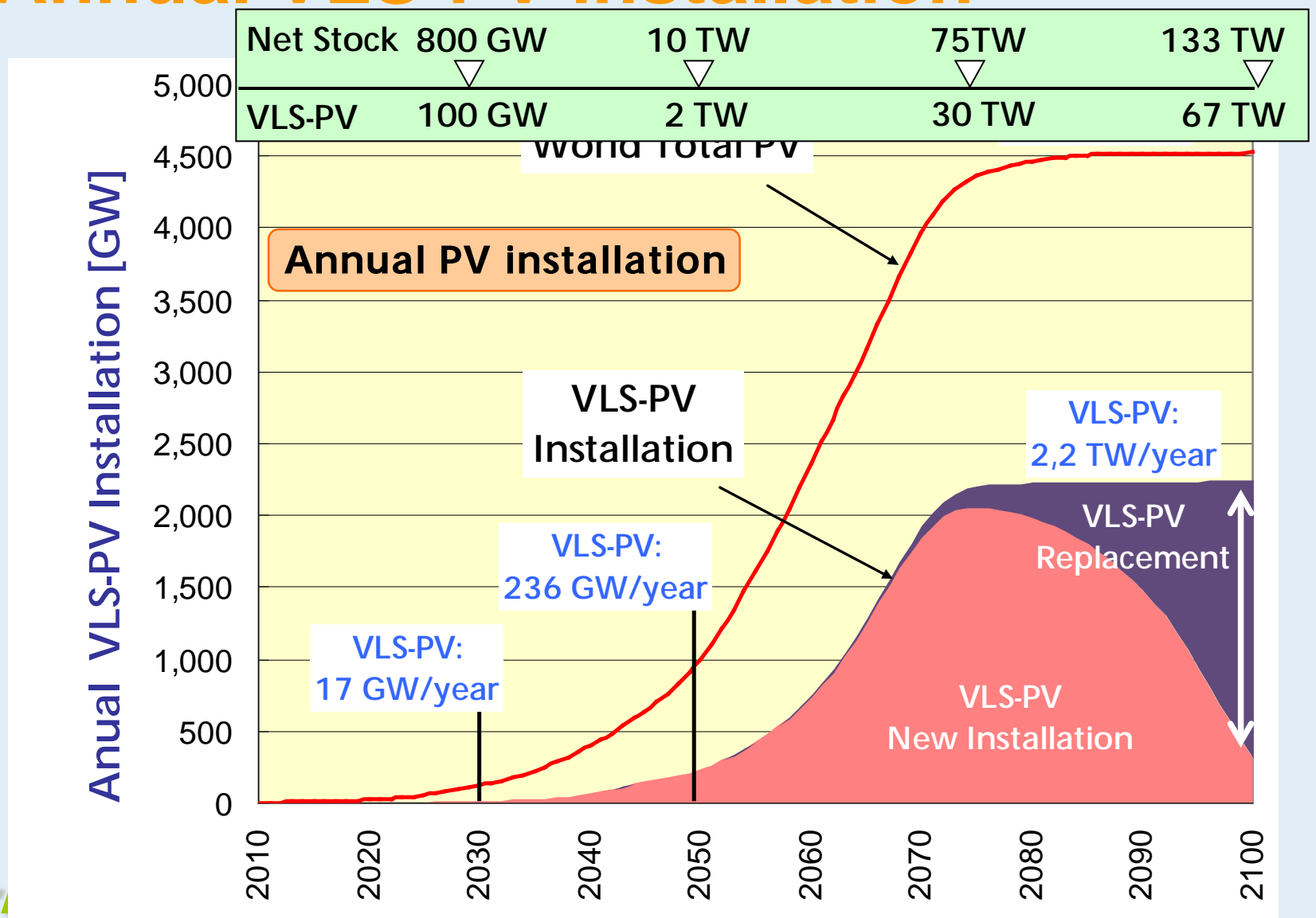


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Annual VLS-PV installation

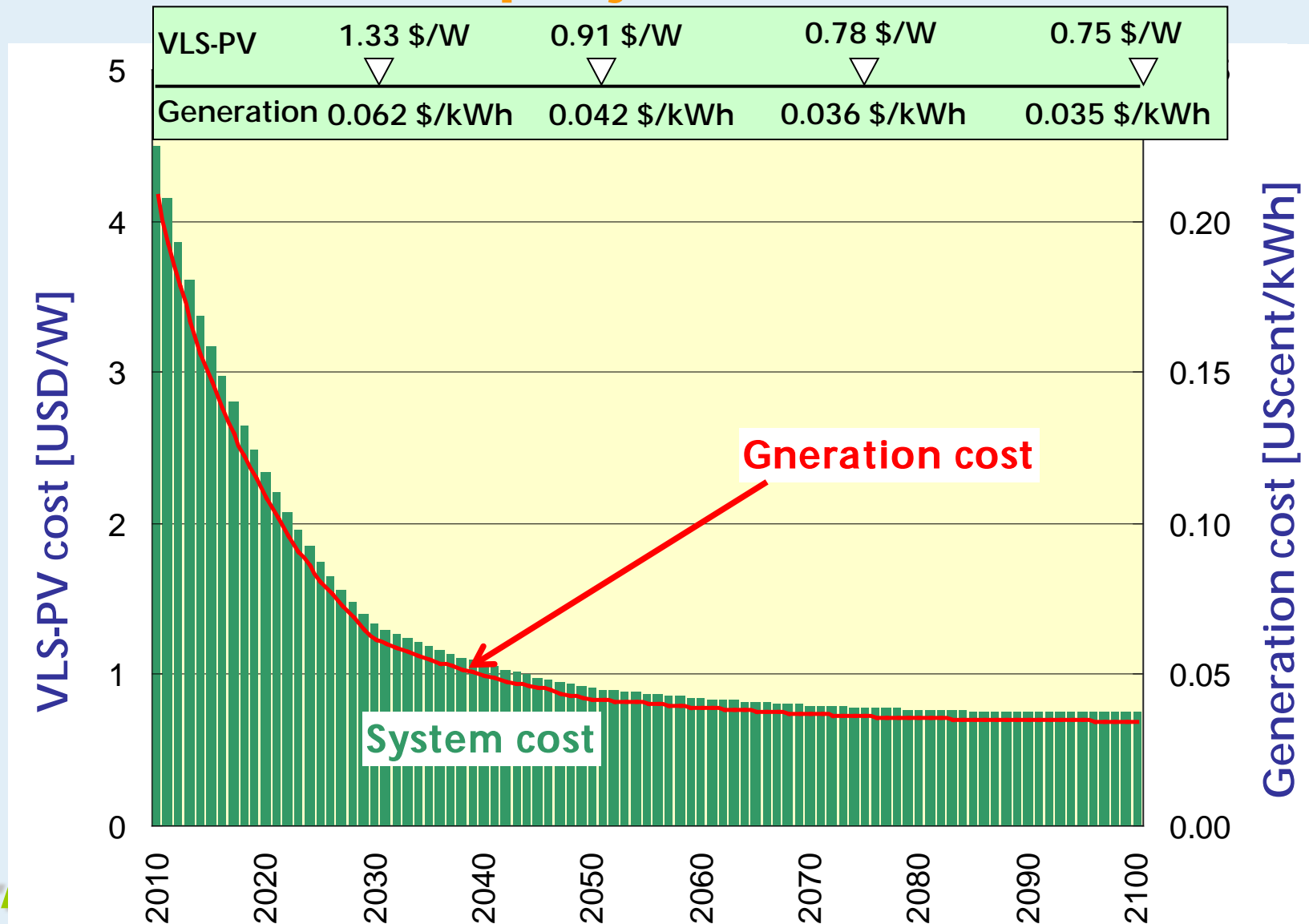


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VLS-PV cost projection toward 2100

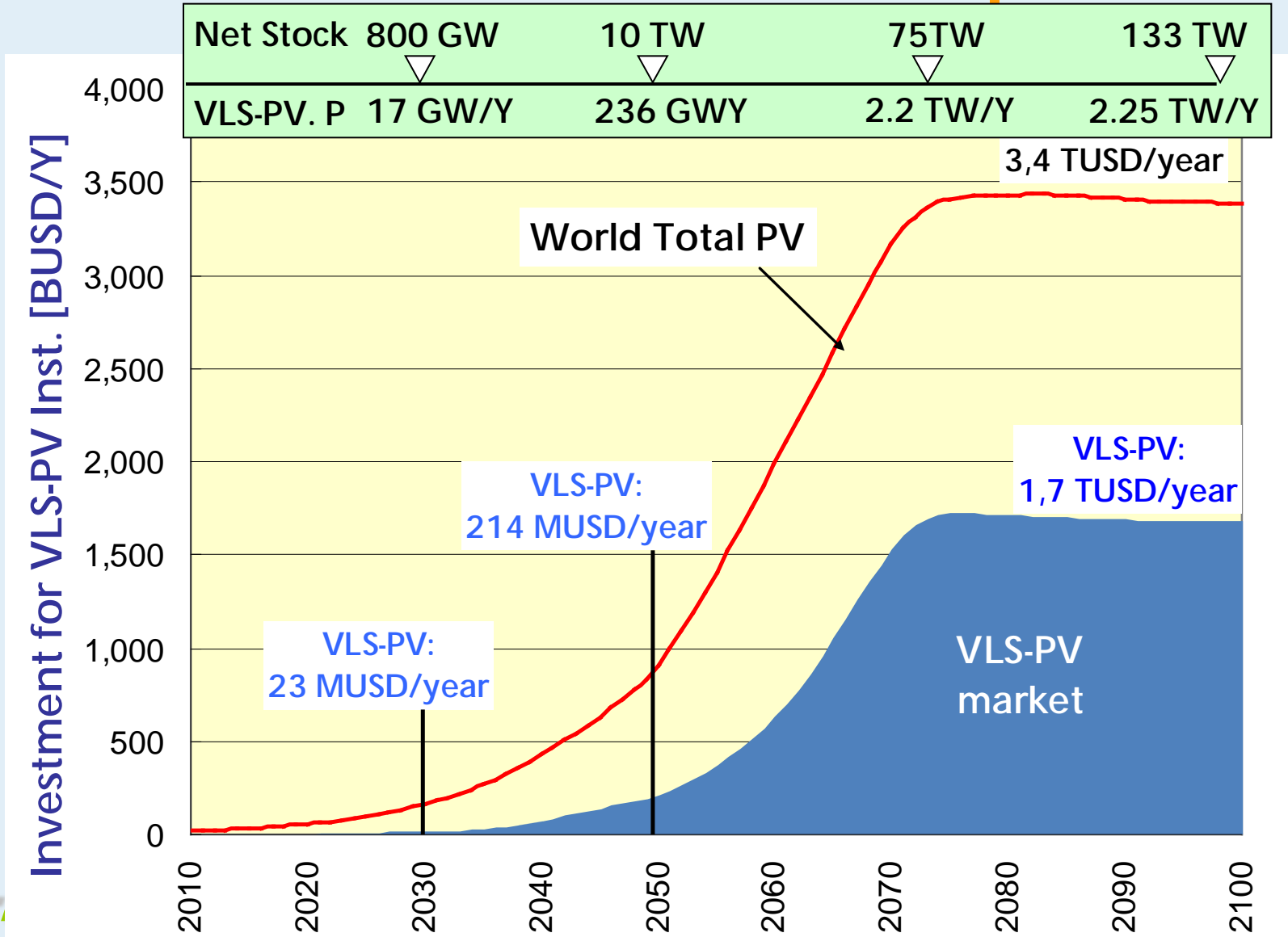


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Annual VLS-PV market incl. replacement



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Concluding remarks (1)

- ☀ ***VLS-PV on the road*** is a promising option for mass-deployment of PV in the world.
- ☀ Desert regions contain abundant and inexhaustible sources of clean energy.
- ☀ Very large scale solar electricity generation provides economic, social and environmental benefits, security of electricity supply, fair access to affordable and sustainable energy solutions.
- ☀ Connected areas are power storage and transmission, irrigation, agriculture, water desalination and hydrogen economy.

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Concluding remarks (2)

- ☀ PV systems with a capacity of more than 10MW already constructed and operated demonstrate that VLS-PV systems are already feasible.
- ☀ To launch VLS-PV projects in the near future, VLS-PV roadmap toward 2100 is proposed.
- ☀ Task8 will focus on implementation of VLS-PV strategies in desert regions.

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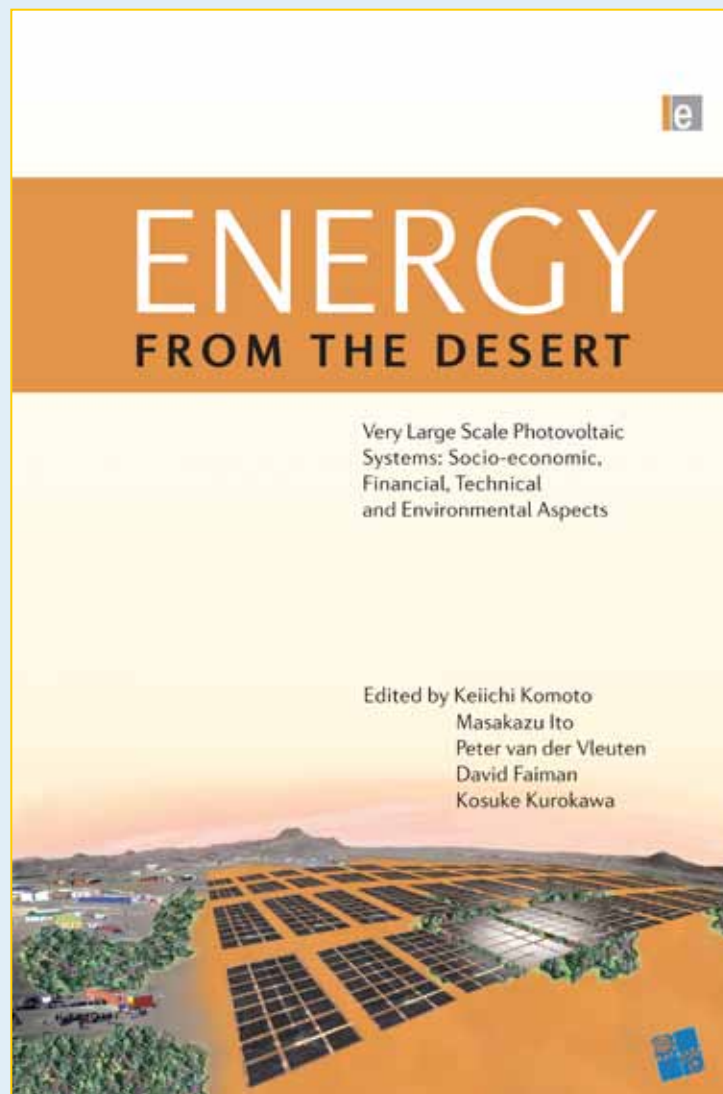


Concluding remarks (3)

- ☀ Main challenge:
 - ☀ to make excellent project proposals
 - ☀ to convince local governments, energy companies and financing institutions to be positively involved in realising ambitious projects for the large scale solar electricity
- ☀ Project evolution:
 - ☀ **Original focus**
 - Technology based, scientific approach
 - ☀ **Previous focus**
 - Socio-economic approach, VLS-PV roadmap proposal
 - ☀ **Next step**
 - Implementing strategy
 - Action for implementation



Thank you for your attention!



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