Workshop on
PV Life Cycle Management and Recycling
at the 29th EU-PVSEC

Developments on PV Recycling in Japan

Amsterdam, the Netherlands, 23 September 2014

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Overview of Japanese PV market

- Creation of residential PV market in 1990s
- Consistent market growth in 2000s
- Now, booming under the Japanese FIT

-> The FIT law is requesting to consider the management of EOL equipment

NEDO R&D for PV module recycling

- Research and development on recycling and reuse technology of PV systems
  - **Period**: FY2001-2005
  - **Key Player**: NEDO, PVTEC, Sharp Co., Showa Shell K.K., Asahi Glass Co. Ltd., AIST
  - **Features**: Research on social system, Development of recycling technique and reuse treatment for c-Si modules, Recycling process for CIS modules, Glass recycling process, Recyclable PV modules
NEDO R&D for PV module recycling

Development of the PV recycling technology for various kinds of PV modules

- **Period**: FY2010-2014
- **Key Player**: NEDO, FAIS, Showa Shell K.K. – Solar Frontier, Shinryo
- **Features**: Sequential dry processing

Development of an advanced recycling treatment system for PV modules with novel EVA strippers

- **Period**: FY2011-2012
- **Key Player**: NEDO and Yokohama Oils & Fats Industry Co.Ltd.
- **Features**: Wet processing
Development of the PV recycling technology for various kinds of PV modules

**Objectives**
- Establishment of PV recycling technology for treating large quantities of the End-of-Life PV modules

**Schedule**
- 2010~2012: Development and evaluation of individual equipment
- 2012~2014: Construction and evaluation of the sequential processing pilot line

**Target**
- 5 JPY/W, under 200MW/year treatment
Development of the PV recycling technology for various kinds of PV modules

Source: provided from NEDO/FAIS
Development of the PV recycling technology for various kinds of PV modules

EVA heating/combustion equipment (pre-heating-> heating (400-500 C))
- 12 MW/year for single-glass module
- 7 MW/year for double-glass module

Source: provided from NEDO/FAIS
New R&D for PV recycling, by NEDO

**Objectives**
- In order to contribute to establishment of social scheme for PV recycling, low-cost recycling technologies for EOL PV modules are developed and effective methods for removing, taking back and separating PV system equipment are discussed.

**Period**
- FY2014-2018

**Items/Areas & schedule**
- Study on low-cost technologies for removing, taking back and separating PV system equipment (FY2014)
- Study and demonstration of low-cost recycling technologies for EOL PV modules (FY2014: Feasibility study, FY2015-2018: RD&D)
- Survey on trends in PV recycling (FY2014-2018)
New R&D for PV recycling, by NEDO

Study themes selected (as of July 2014)

- Study on low-cost technologies for removing, taking back and separating PV system equipment
  - Issues on stable implementation of recycling EOL PV modules
  - Issues on effective take-back and separation of wasted PV modules

- Feasibility study on low-cost recycling technologies for EOL PV modules
  - Development of recycling technology for c-Si modules
  - Development of practical recycling technology for c-Si module by wet approach
  - Development of low-cost disassembling technology for c-Si modules
  - Development of technology for recovering materials from EOL PV modules by solubilisation method
Survey research by METI and MOE

- **METI** and **MOE** started a research for proper treatment of PV and other RE wastes:
  - Understanding a current-flow of treating end-of-life RE equipment, and potential risks caused by hazardous materials, as well as potential values of rare metals.

- **Findings on PV in FY2013**
  - Amount of wasted PV modules will be small at this moment. It seems that most of them are wasters at the manufacturing companies.
  - Currently, considerable players for treating wasted PV modules will be waste disposers, metal scrap dealers and metal refining companies, rather than house/building wreckers and PV installers.
  - There will be potential of elusion of hazardous materials when PV modules contain those, even if the amount will not exceed regulated limitation. Further researches on potential risks, proper testing methods, etc. will be required.

*Source: MOE/METI, “Investigation on recycling, reuse and proper treatment of used renewable energy equipment”, March 2013 (only in Japanese)*
Concluding remarks

Why proper waste management?
- Saving energy, CO₂ and air pollutant emission
- Saving and effective use of resources
- Reducing land-filled solid wastes
- Protecting influences by hazardous materials

Approaches for proper waste management: 3R
- Reduce: reduction of weight/volume, such as higher efficiency, using light materials, etc.
- Reuse: possible secondary market under the certification/warranty scheme
- Recycle: recovering materials as much as possible, and hopefully as high-value resources

PV should be ‘CLEAN’, not a cause of a lot of waste.
Thank you for your attention!

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