Making the Photovoltaic Industry

‘Double Green’
MAKING THE PHOTOVOLTAIC INDUSTRY ‘DOUBLE GREEN’

PV CYCLE: A Voluntary Take-Back and Recycling Scheme for EoL PV modules

Presentation European Economic and Social Committee
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PV CYCLE
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Introducing PV Cycle

Who We Are:

- Founded in July 2007
- Established and staffed office in Brussels in April 2008
- Today representing around 70% of European PV market
Mission

Strive to map all end-of-life photovoltaic modules and to stimulate their collection and recycling.
Objective

To assume, without profit, the responsibility of the voluntary take-back and treatment of the EOL-modules in all members states of the European Union and the European Free Trade Area based upon the environmental agreement with the European Union.
PV CYCLE obtains the objective by:

• In the name of their members organizing the collection and treatment of EOL-modules as described in the Environmental Agreement.

• In the name of their members meeting the needs of the reporting obligation as described in the Environmental Agreement.

• In the name of their members representing as spokesperson of the local, the national and the European authorities and third parties.
Ahead of time

"The industry is strongly committed to act today ahead of the first large scale series of end-of-life modules"

Karsten Wambach, PV CYCLE President

<table>
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<tr>
<th>First PV installations</th>
<th>25+ years of clean &amp; renewable energy</th>
<th>Full scale end of life recycling</th>
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<tbody>
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<td>Early 1990</td>
<td>1990 - 2015</td>
<td>as of 2015</td>
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PV Cycle take-back and recycling programme

Offering a truly sustainable energy solution today to help prevent climate change tomorrow
PV Cycle Circle

Generating energy

End-of-Life

Recycling

Collection

European Association for Voluntary Take Back and Recycling of Photovoltaic Modules
PV Cycle Network

European Commission National Authorities

Producer, Importer, Retailer

Operator (Transport, Recycling)

Installer

Dismantler

New Modules

End-of-life-Modules

Market B2B, B2C

Audit

Monitoring Committee

Logistic Flow

Information Flow

\[ \frac{N}{D} = \% \]
Status of activities

• Two-phase programme
• Activities 2008
• Current activities
PV Cycle two-phase programme

**Phase 1**
- **Preparatory work**
  - Generating reliable baseline data by:
    - Research
    - Structuring of best practice collection system & methodologies for end-of-life management of PV modules
  - Define specific collection & recycling targets, taking into account the conclusions of the PV CYCLE working group for a take back scheme
- **Aim**
  - To create a voluntary, industry-wide take-back and recycling programme for end-of-life modules in Europe and in doing so to establish an exemplary business model

**Spring 2008**

**Phase 2**
- **Implementation and monitoring**
  - Gradual implementation of the PV CYCLE voluntary programme across Europe
  - Introduction of annual auditing to monitor compliance and progress of the PV CYCLE programme through independent contractors

**Spring 2009**
Phase 1

2008

Spring 2008: PV producers representing about 70% of the EU PV market join PV Cycle

Summer 2008: PV Cycle members identify fundamental dimensions of voluntary take-back and recycling programme

Autumn 2008: KPMG to deliver independent overview of the amount and composition of PV modules installed in Europe throughout 2007

Winter 2008: PV Cycle members to define the specific objectives and targets via a voluntary agreement
Activities 2008

I. PV CYCLE Study

II. New English Website in July: [www.pvcycle.org](http://www.pvcycle.org)

III. First Market Research & RfQ concerning adequate Service Providers for Collection in Germany (May 2008)

IV. New brochure PV CYCLE EN – 1 September 2008

V. Brochure PV CYCLE DE – 15 October 2008

VI. Data Declaration by members in cooperation with KPMG to determine the Denominator (D)
Activities 2008 (2)

VII. Meeting European Commission

VIII. Meeting BundesMinisterium Umwelt and Umweltbundesamt

IX. Executive search for new members

X. Preparatory work: Key Questions, identifying approaches, drafting concepts, defining system boundaries

XI. Start of the Working Group „Take-Back & Recycling Scheme“

XII. First Newsletter - October 2008
Activities 2008 (3) – Working Group

- Meetings 2008
  16 – 17 September
  9 – 10 October
  5 – 6 November
  10 – 11 December

- Meetings 2009
  20 January
  12 February
  17 March
  30 April

Conclusions → PV CYCLE Take-Back & Recycling Scheme
Activities 2008 (4) – Declaration Europe & PV CYCLE

19th December 2008

Declaration signed by the Members of PV CYCLE with the support of European Commissioner Mr. S. Dimas and the President of the European Council, French Minister of Environment Mr. J-L Borloo.

Promise to conclude a Environmental Agreement and open the discussions with the European Union by April 09.

Guiding benchmarks:
- 65% collection target
- 85% recycling target
- free of charge
Voluntary Agreement – PV CYCLE & Europe

Benchmark criteria for deciding Community interest

• Compatibility with Community environmental policy: e.g. Environmental Action Plans
• Cost-effectiveness of administration (Commission side)
• Representativeness: %wise (EU, not global) and also organised.
• Quantified and staged objectives; long periods possible but only if interim and clear targets
• Involvement of civil society
• Monitoring and reporting: independent verification
• Sustainability: not just environmental protection, also economic and social dimension.
Current activities

I. Finalizing PV CYCLE Take-Back & Recycling Scheme
   - Logistics
   - Data Declaration
   - Recycling
   - Costs & Financing

II. New German website – February 2009 – www.pvcycle.de

III. Finalizing draft Environmental Agreement

IV. Dismantling and Recycling of the Chevetogne (BE) PV Generator
    Build in 1983
    Out of order since 2003
    2,000 EOL-modules
Pellworm Generator – Positive result

By using recycled wafers only 1/3 of the energy needed to produce a module of completely new material is required.

The energy return time at the same power is at 30 % of a new product.

→ Production of wafers, cells, modules: 459 kWh
→ Recycling, processing of cells, fabrication of modules: 196 kWh
Today’s PV Recycling Processes

Thin-Film Recycling Process

Silicon Recycling Process
“Double use” of PV modules

Materials contained in PV modules can be recovered and re-used for

New PV modules

Other new products

End-of-Life- PV-Module
Recycling Process
Silicon
Glass
Membership

2007: 6 Founding member-companies
      2 Founding member-associations

2007: 13 New Members

2008: 8 New Members

2009: 14 New Members

36 Full members

7 Associated members
New Members 2009

Johanna Solar Technology

New Associate Member 2009

SCHÜCO

abound solar

SUNPOWER

SUNTECH

Siliken renewable energy

VIPiemme

solairedirect

EUROPEAN ASSOCIATION FOR VOLUNTARY TAKE BACK AND RECYCLING OF PHOTOVOLTAIC MODULES
Thank you for your attention!

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