



## Project Fact Sheet

Updated: November 2009

### Smart Domestic Appliances in Sustainable Energy Systems (Smart-A)

|                         |  |
|-------------------------|--|
| <b>Programme area:</b>  | ALTENER "RES-Electricity"; and<br>SAVE "Innovative approaches in industry"   |
| <b>Status:</b>          | Completed  |
| <b>Coordinator:</b>     | Christof Timpe<br>Öko-Institut e.V., Germany<br>E-mail: c.timpe@oeko.de<br>Tel.: +49-761-45 295 25   |
| <b>Partners:</b>        | University of Bonn, Germany<br>Enervision GmbH, Germany<br>Imperial College, United Kingdom<br>Inter-University Research Centre, Austria<br>The European Association for the Promotion of Cogeneration,<br>(COGEN Europe), Belgium<br>EnBW Energie Baden-Württemberg AG, Germany<br>Miele & Cie. KG, Germany<br>University of Manchester, United Kingdom |
| <b>Website:</b>         | <a href="http://www.smart-a.org">http://www.smart-a.org</a>  |
| <b>Objective:</b>       | To identify synergies from coordinating energy demand of appliances with renewable energy generation and cogeneration  |
| <b>Benefits:</b>        | Improved integration of appliances into energy systems with high shares of renewable energy and cogeneration   |
| <b>Keywords:</b>        | Load management, demand response, smart grid   |
| <b>Duration:</b>        | 01/2007 – 09/2009  |
| <b>Budget:</b>          | € 1.349.551 (EU contribution: 50%)   |
| <b>Contract number:</b> | EIE/06/185/SI2.447477  |

SMART-A



The Smart-A project is a partner in the Sustainable Energy Europe Campaign (SEEC)

#### Short description

The Smart-A project has assessed the overall potential for load-shifting by domestic appliances and has compared it with the requirements from sustainable energy generation both on the local level as well as in larger electricity systems. Based on this, the project has developed strategies how smart appliances can contribute to load management in sustainable energy systems, which include large shares of intermittent generation, e.g. from wind or solar energy.

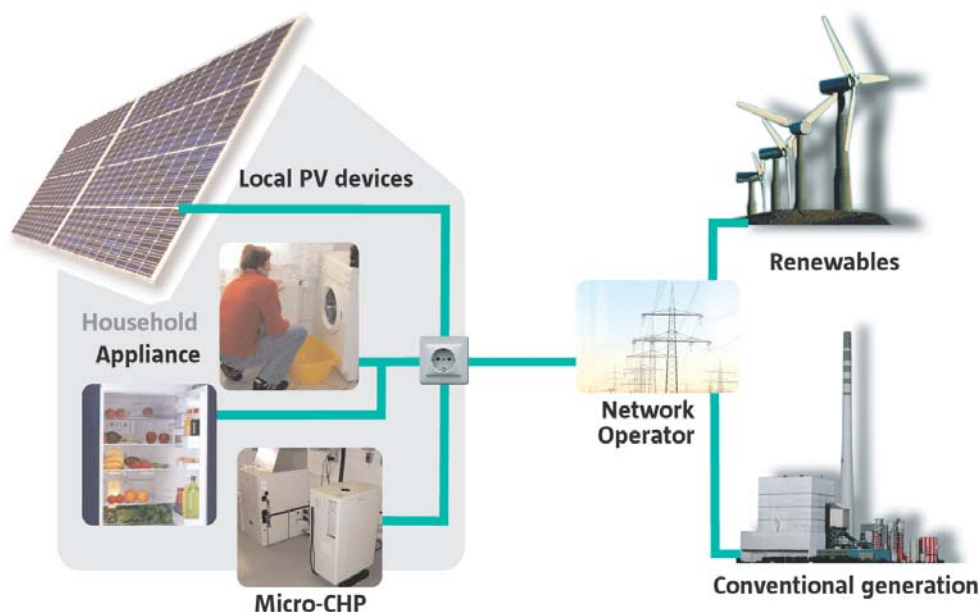
The technical aspects of the assessment include an analysis of potential changes to appliances operation, of characteristics of local energy generation (from renewables and/or cogeneration) and of load management requirements in the larger electricity networks. The economic value of Smart Appliances in stressed electricity systems has been evaluated and compared with the costs of making them operational. The project also features a detailed assessment of the acceptance of a smart appliances operation by consumers, and an evaluation of the usability of available control technologies and communication standards.

The project was conducted in cooperation with manufacturers of appliances and electric utilities. The findings from the analysis have been discussed with experts in regional case studies in selected European countries.

## Achieved results

- A thorough analysis of technological implications, user preferences, the economic costs and benefits and the potential CO<sub>2</sub> reduction of an improved coordination of domestic appliances with energy supply.
- A clear understanding of how appliances should be designed to enable them for smart operation in the larger energy system.
- A thorough assessment of consumer preferences and objections with regard to the Smart-A concept and recommendations how they can be motivated to participate.
- A detailed analysis of the economic benefit of Smart Appliances as a Demand Response option, with a focus on the balancing of high shares of wind generation in future energy systems.
- A supplementary assessment of the interaction of Smart Appliances with local energy generation from renewable energy sources and cogeneration.
- An overall analysis of the potential and the cost-benefit ratio of Smart Appliances in different European countries.
- Recommendations for incentives for Smart Appliances, concrete proposals for implementation models, strategy recommendations for all relevant actors and a roadmap outlining how Smart Appliances could be introduced.

## The Smart-A vision:



## Lessons learnt

The following conclusions can be drawn from the project:

- Domestic appliances can support load management in energy systems and offer a wide range of load shifting options. Consumers tend to accept smart appliance operation if this fits into their daily routines, the service quality and user comfort is maintained and additional costs are compensated by adequate incentives.
- Smart Appliances can deliver a significant economic benefit when used for the balancing of wind generation in electricity systems. The value of Smart Appliances is higher in regions with a low flexibility generation system and with high shares of variable energy generation, e.g. from wind or solar energy.
- The cost-benefit ratio of Smart Appliances is expected to be positive under the conditions mentioned above and if the appliance are produced in sufficiently large numbers in order to allow for low specific additional costs. If the operation of large numbers of Smart Appliances is aggregated and adequate incentives are implemented, the potential of load management through Smart Appliances can be significant in many European countries which will face difficulties in the future in dealing with high shares of wind generation.