Environmental Labelling of Green Electricity with LCA Key Parameter Models

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Goal and Scope. Since the opening of European electricity markets, utilities are launching green electricity products. In Switzerland the privately initiated ecolabel 'naturemade star' ensures the environmental and ecological quality of electricity from renewable energy sources on a local/ regional scale and from a life cycle perspective. Therefore a simple evaluation method has to be developed.

Methods. For the life cycle perspective, a simplified and partly site-specific life cycle assessment is applied using the Eco-Indicator 99 impact assessment method. In a first step, detailed LCAs case studies are made for power plants and technologies which are candidates for the 'naturemade star' label. Technologyspecific parameters are identified that dominate the outcome of the LCA and for which data are available for the owner or operator of the power plant at issue.

Results and Conclusions. For photovoltaics for instance, key parameters are the annual production, the type of solar cell (single- or multicristalline) and the kind of installation (building integrated or mounted). Based on the knowledge gained with the detailed LCA, parameter models for photovoltaic, wind and hydroelectric power and electricity from biogas have been established on a spreadsheet-basis. They are easy to handle for non-experts. With the help of the parameter models, operators of small and medium size power plants can carry out the required LCA within a few hours. At the same time they can check, whether the plant fulfils the 'naturemade star' threshold or not. The threshold has been set to 50% of the environmental impact in Eco-indicator 99 (hierarchist) points of a gas combined cycle power plant.

Recommendations and Outlook. Within a few months since the introduction of the labelling scheme, utilities successfully applied the parameter models on nearly 50 photovoltaic and on several hydroelectric power plants. LCA is, in combination with other tools, a useful method for the definition of standards for environmental labelling of green electricity.

Keywords: Ecolabel; green electricity; key parameter model; renewable energy; simplified LCA

The Electricity Capacities' Life Cycle Assessment for a Sustainable Development

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Goal and Scope. After 50 years of centralized economy, which represents a turning point in Romania's evolution, Romania, an European country, has faced many challenges related to the internal conditions and to the new trends in electricity markets over the world since 1989, such as:

- the existence of an old park of units with low efficiency and low availability,
- the decentralization of the energy sector – the creation of new structures and entities, the electricity market establishment followed by recently growing to 25% of the opening degree of the free electricity market in Romania,
- the signing and the ratification of different conventions and protocols (among them the Kyoto Protocol), the introduction of some standards similar to the UE standards (referring to environmental aspects).

Based on the fact that the opening degree of the electricity market and the number of suppliers will grow in future, the determination of the global optimum development scenario became more important in order to find the policies, measures and regulations which can lead to the strategies of all of their own companies to result in a sustainable development of the society.

Methods. This paper proposes a methodology and a program called PADEM (Program de Ajutor in Deciziile Multicriteriale – Program for Aid in Multiple Criteria Decisions) to help in the determination of the optimal, long-term development scenarios in electricity and heat capacity systems from a global point of view (technico-economic, environmental and social criteria) integrated in a sustainable development of the Romanian society. In the first step, the methodology transposes the problem of finding the optimum development scenario in a multiatribute problem. In the second step of the methodology, the way to determine the geometrical place of the global optimum scenario between the extreme scenarios is presented. The Romanian optimum development scenario is determined by applying this methodology.

Results and Conclusions. The paper presents the rehabilitation and new capacity types (technology and fuel) considered in different scenarios built for Romania's long-term electricity and heat system development, the order of these capacities by levelized electricity production costs on their life time (including sensitivity analyses), the considerations on environmental protection policy which has to be reviewed in Romania for a sustainable development of the society and also in the context of the Kyoto Protocol and Romania's integration in European Union, and proposed criteria to describe the global optimum scenario (social, economical, technical, environmental, security of supply, uncertainty of the optimal, etc.). By applying the methodology to the Romanian energy system, the optimal medium and long-term electricity and heat capacity development scenario is presented from a global point of view together with technical, economical and environmental implications. The Romanian perspective to framework of the Kyoto Protocol and its capability to participate in the emissions trade will be pointed out. The global, optimum long-term development scenario contains some rehabilitation projects, the most efficient projects which consist of combined cycle units on natural gas (with or without cogeneration), finalizing of Cernavoda Nuclear Power Plant up to 5x707 MW (CANDU) and atmospheric fluidized bed combustion with re-circulation in order to maintain the annual lignite consumption after 2015 to 2025 at 16 million tons.

Recommendations and Outlook. For long-term analysis, a new study is necessary in 3–5 years to review the database and to re-perform the analysis, to see where we are, what options we have for future and what represents the optimum we want to reach, because only the least cost or environmental aspects don't lead alone to a sustainable development.

Keywords: Environmental protection; methodology and Program for Aid in Multiple Criteria Decisions; new electricity capacity types; global optimum development scenario