



Editorial

Our common future – 25 years later: Sustainable development WHATs, HOWs and WHOs of energy, water and environment systems

The eighties of the previous century mark a point in the history when awareness was growing about the risk for overstepping global environmental limits, the need to adapt the use of natural resources to the long-term carrying capacity of the planet, as well as about the fact that unequal opportunity and unequal distribution of resources were at the heart of the problem. The predominant thinking at that time was: It is either the environment you can protect or it is the economy you can develop, but not both at the same time.

The Brundtland Commission faced this setting with a new political idea: A sustainable development is how it is recommended to face the challenge of meeting the needs of present generations without compromising the ability of future generations to meet their needs. This political concept includes equity and justice, within and between generations, and clear idea of developing a shared understanding of the long-term goals for human life on earth, new governance instruments and collective action.

Twenty-five years later, UNFCCC (United Nations Framework Convention on Climate Change) Parties are negotiating the new, potentially legally binding, treaty replacing the Kyoto Protocol, to be signed by the industrialized and developing countries by 2015 and put into effect by 2020. On its way towards carbon free power sector in 2050 [1], the EU is pondering 2030 ambition level for GHG reductions in view of this treaty and how to support the progress towards a competitive economy and a secure energy system [2].

In celebration of the 25th anniversary of the “Report on Our Common Future” – the most important point in turning the world towards a more sustainable future, the 7th SDEWES Conference was aimed at looking into sustainable development WHATs, HOWs and WHOs of energy, water and environment systems and providing responsive scientific support to the emerging international, European, regional and national challenges. Being held in Ohrid, the pearl of Macedonia and another UNESCO world heritage site, this was the first in the series of SDEWES conferences organized outside Dubrovnik, and served as a venue for more than 200 world-wide scientists and specialists and those interested in learning about the sustainability of development, coming from 45 countries to present research progress and to discuss the state of the art, the future directions and priorities in the various areas of sustainable development.

This special issue includes 26 selected SDEWES papers which cover a variety of energy issues, starting from biomass, wind and solar, coal, synthetic fuels, through storage and power system operation at energy supply side, as well as, buildings, district heating, transport, heat exchangers and energy efficiency at demand side.

Specifically, optimal utilization of various forms of biomass as energy resources was addressed in Lam et al. [3], proposing a green strategy for systematic design of waste-to-energy supply chain which includes efficient resources management and reduction of carbon footprint. Furthermore, environmental and energy performance of combined cooling heating and power systems based on biomass combustion were analysed and compared to conventional generation in Maraver et al. [4]

As far as solar and wind energy are concerned, Ban et al. [5] conducted a mapping of the high altitude wind energy in Southeast Europe, while Bjelić et al. [6] studied the potential impacts of an increased wind power penetration in the case of energy system of Serbia. Calling it a looming revolution, Haas et al. [7] explained how the photovoltaics will change electricity markets in Europe. A specific application of photovoltaics was also considered (Uche et al. [8]), testing a small batch electro dialysis unit fed by a photovoltaic array used to desalt brackish water.

As to the coal, cases of retrofitting of the existing power plants were presented, such as modifications of control systems (Mikulandrić et al. [9]) and carbon capture upgrades (Zhu & Fan [10]).

Essential for matching the demand and meeting the criteria of a 100% renewable energy system in transport sector, potential pathways for producing synthetic fuels were identified in Ridjan et al. [11], with a specific focus on solid oxide electrolyser cells combined with the recycling of CO₂.

The energy storage technologies were considered in light of their capacity to manage the variable renewable generation and to align non-dispatchable renewable energy generation with load demands. Hence, Díaz Lobera & Foley [12] examined the impacts of a compressed air energy storage facility in a pool based wholesale electricity market in a power system with a large renewable energy portfolio, while Marino et al. [13] analysed energy, economic and environmental aspects of a self-sufficient system for energy production in buildings which uses hydrogen for energy storage.

At last, to the end of power system operation, Scharff et al. [14] quantified the value of shifting of larger parts of the balancing responsibility from the transmission system operator to the power generating companies, with a case study based on the Nordic electricity market. In addition, Kanevce et al. [15] modelled the long-term dynamical evolution of Southeast European power transmission system, looking at the system as an evolving grid, which is continually upgrading in order to satisfy the increasing load demand and certain reliability requirements.

Buildings remained the topical issue at the energy demand side. Annunziata et al. [16] considered the pathways towards nearly zero buildings in Europe, while Ó Broin et al. [17] examined the role of improved efficiency for energy savings in EU 27 buildings.

An approach for minimization of the capital costs and energy consumption in a district heating network is presented by Pirouti et al. [18], using a case study based on a district heating network in South Wales, UK.

Scarpellini et al. [19] propose a methodology for measuring eco-innovation in the transport sector, including analyses of the employment potential of the sustainable transport sector. Transport sector was dealt with also in Puksec et al. [20], where a bottom-up model was created for long term forecasting of energy demand and used on the case of Croatia. Furthermore, in Dedinec et al. [21], the analytical framework for assessment of climate change mitigation potential of transport sector in developing countries was adapted in order to incorporate the expected vehicle fleet increase with used vehicles and applied to assess the climate change mitigation potential of the Macedonian transport sector.

A number of papers addressed the heat exchangers, focussing on optimization approach for improving energy recovery in retrofitting heat exchanger network (Pan et al. [22]), influence of plate corrugations geometry (Arsenyeva et al. [23]), heat transfer intensification for shell and tube heat exchangers (Pan et al. [24]), optimization of entire life economy of heat exchanger network (Nemet et al. [25]), as well as on simultaneous synthesis of process water and heat exchanger networks (Ahmetović & Kravanja [26]).

The issue of energy efficiency was also tackled through consideration of instruments for influencing the behaviour of electric utilities in the market, corresponding to both impositions and stimuli, such as defining savings targets or decoupling profits from energy sales (Sousa et al. [27]).

Finally, Ortas & Moneva [28] measured the financial performance of 21 primary Clean Techs equity indexes, covering the primary energy markets worldwide.

Conclusions and acknowledgements

This Special issue, devoted to energy at the Conference on Sustainable Development of Energy Water and Environmental Systems – SDEWES 2012, provided an overview of several topics related to sustainable development. The Guest editors believe that the selected papers and addressed issues will be of interest to the readers of ENERGY journal.

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