From the Guest editors of Part one

ENERGY TRANSITION IN SOUTH EAST AND CENTRAL EUROPE

There is an energy transition going on in Europe. In some parts of Europe we are witnessing things that were unimaginable few decades ago. As one of the cradles of industrial revolution, Scotland, mainly powered by coal, in March of this year permanently stopped using coal in electricity production after 115 years. The high cost resulting from combination of old age, rising transmission costs and higher carbon taxes brought to what can be seen as the end of an era. The missing energy in their case will be covered by nuclear and gas plants, as well as renewable energy, particularly wind.

Even as Europe has recently lowered its investments in renewables, a trend is clearly evident. The share of renewable sources is increasing, despite the fact that the use of renewable energy temporarily decreased in 2011 "due to effect of warm weather, slower progress by Member States in implementing the Renewable Energy Directive and Europe's faltering economic situation" [1]. The share of renewable sources in gross final consumption of energy did increase, since the consumption of fossil fuel energy fell more than that of renewables. Afterwards, the share of energy from renewable sources in gross final consumption of energy continued to increase and by 2014 it reached 16%. It is most likely that EU will meet its target of 20% renewable energy in the overall energy supply by 2020. The new targets defined in the climate and energy framework for 2030 [2] are continuation of the previous (and still actual) 2020 climate and energy package: a 40% cut in greenhouse gas emissions to 2030 compared to 1990 levels, at least a 27% share of renewable energy consumption and at least 27% energy savings compared with the business-as-usual scenario.

As regarding the rest of the world, the International Energy Agency in its 2015 Medium-term report [3] predicts that the share of renewable energy in global power generation will raise to over 26% by 2020 from 22% in 2013, what, they conclude, is "a remarkable shift in a very limited period of time". And continuing the IEA adds that "by 2020, the amount of global electricity generation coming from renewable energy will be higher than today's combined electricity demand of China, India and Brazil".

Such a rapid rise in renewable energy shares is not only due to intentions to make the air cleaner or to reduce greenhouse gases but primarily due to a huge reduction in costs of renewables especially in the recent case of solar photovoltaics.

Although the region of South East and Central Europe still much relies on fossil fuels, coal predominately, there are already visible changes. Despite not dealing with this region a paper of Kjarstad (in this issue, p. 1023) can serve as a good example of developments in the European energy and transport sectors. The authors consider biomass as a replacement for fossil fuels in a regional energy system at the example of West Sweden. The aim was to investigate how to meet regional CO_2 emission reduction targets up to year 2050 in two counties in the west of Sweden by using biomass. By modelling of the electricity sector they indicate "that bio-based electricity generation in CHPs could almost triple between 2012 and 2050" in that region. At the same time their modelling results show "that heat for district heating in cogeneration plants could potentially double by 2050 while at the same time replacing fossil generation with biomass and waste". They also discuss a fuel shift in the transport sector for which they state “that the region could reach zero CO_2 emissions by 2050 through a series of actions to significantly reduce demand in combination with use of electricity and biofuels”, but they also add “that this transformative process is strongly linked to an overall transformation of the European transport sector”.

The fact is that fossil fuels are gradually being replaced by renewable fuels and energy, namely biomass, waste, as well as solar and wind energy sources. Not only electricity production is affected by that change but equally the sector of heating (and less cooling) of which especially district heating systems. The EU is putting a particular emphasis on the sector of central and district heating recognizing that “heating and cooling is the largest single source of energy demand in Europe and the majority of Europe’s gas imports are used for these purposes” [4]. Furthermore, they add that “huge efficiency gains remain to be captured with regard to district heating and cooling, which will be addressed in a Commission strategy”. The Heat Roadmap Europe initiative [5] estimates that nearly 50% of heat demand can be covered by district heating (DH). Also across the Europe, there is a great potential of waste heat (exhaust flue gases and other sources of heat) that can be captured from industry, power plants and waste to energy plants and used in DH.

Furthermore a transport sector, notoriously known for its thirst for oil derivatives, should not be left from sustainable energy analyses since its transformation remains one of the biggest challenges of modern society.

Integration of sustainable energy into existing systems is a topic of many papers presented at the 10th SDEWES conference in 2015 in Dubrovnik. The authors Matak (in this issue, p. 1037) investigate how to apply an integrated approach to sustainable energy to small neighbouring municipalities on the example of a Croatian island of Korčula. This work is in connection to the previous work on the integration of renewable energy sources and electric vehicles into the power system of the Dubrovnik region [6].

Similar, but different in respect to climatic conditions and the sort of renewables, is the paper of Javier (in this issue, p. 1049) in which he examines possibility of integration of solar energy into the district heating system of the city of Velika Gorica. The aim of this paper was to evaluate and design an integrated central solar heating plant with seasonal storage into the DH system of the city. An economic assessment for ground and roof mounted collectors together with a pit thermal energy storage as the seasonal storage was done. The system was modelled as a low-temperature district heating system with the real thermal demands of a district heating plant.

The paper of Urbancl (in this issue, p. 1061) is on the same track but here the authors evaluate (economically) geothermal heat potential for heating greenhouses in two different locations in South-eastern Europe, one in Slovenia and the other in Serbia.

Proper planning of systems with high penetration of intermittent renewable energy sources is the most important segment of development of future electricity production if we do not want to jeopardize the stability of our electricity networks, and if we want to maintain or even increase security of supply and supply competitiveness. In that respect the works of Falkoni (in this issue, p. 1073), ex. Šare *et al.* [6] could be of interest of many researches as they analyse complementarity between solar and wind potential and electricity demand for a southern region of Croatia – the Dubrovnik region. They perform linear regression and correlation between solar radiation, wind speed, air temperature and electricity demand in order to integrate high share of solar and wind power into the power system and at the same time to ensure its stability and flexibility. The authors Barbarić (in this issue, p. 1091) tackle the problem from the other side. In order to ensure the supply-demand balance under the conditions of higher variability they propose the micro-grid concept of active distribution networks as a promising one. In their study they compare different energy management strategies with respect to cost effectiveness, in which the hypothetical residential micro-grid comprises of photovoltaic modules, thermal energy storage system, thermal loads, electrical loads as well as combined heat and power plant. The authors conclude that taking into account predicted data on the demand and renewable generation when making decision on the system operation at current time step may considerable increase overall operation efficiency, even if there are certain errors in the forecasts of demand and renewable generation.

Getting back to a role of district heating as a part of future energy systems, DH systems are increasingly discussed in the context of the further development of the EU energy system and represent one of the ways in which the EU is trying to reach set goals of reducing primary energy consumption, reducing pollution and increasing diversification of energy sources. DH systems allow the use of different energy sources including local energy sources such as waste and biomass. The paper of Tomić (in this issue, p. 1105) provides economic viability assessment of using these fuels in the district heating system. As an efficient waste management is one of the biggest environmental problems the EU is facing today, one of the possibilities for disposal of municipal solid waste (MSW) is its energy recovery. By doing that the principles of circular economy [7] and waste management hierarchy should be strictly respected, in which first priority has re-use, then material recovery and recycling and only then, for this material that cannot be used otherwise, energy recovery [8, 9]. Likewise, only the available biomass, which is not suitable for food production from any reason, should be considered. In that sense the Tomić's paper analyses influence of recent legislation conditioned changes in waste management on economic viability of biomass and MSW-fuelled district heating systems applied on a case study of the city of Zagreb. That article builds partially on the papers presented at the previous SDEWES conferences [10, 11].

Heating but also cooling is the topic of the next paper of Buonomano (in this issue, p. 1121) who presented a model of a novel solar heating and cooling system based on innovative high temperature flat plate evacuated solar thermal collector. The dynamic model is tried at a simulated plant for the space heating and cooling and the domestic hot water production of a small building, in the vicinity of Naples (South Italy).

Another southern climatic region was a place of investigation of the paper of Gašparović (in this issue, p. 1135) who explored the integration of building-integrated photovoltaic renewable energy sources at the case of campus and community micro grids in Split 3 area, (South Croatia). Their results indicate that building-integrated photovoltaic (BIPV) and roof top mounted photovoltaic (PV) can cover about 17% of the needed electrical demand of both areas (campus and community).

All of the previous mentioned papers dealt with renewable and alternative fuels and energy but, as it was said, the present power systems in Europe and particularly in the region of South East and Central Europe still heavily rely on fossil fuels especially coal and gas. Therefore, the efforts to make their use more efficient or cleaner in the production of energy have an important place in this special volume.

The use of coal has high environmental impact while natural gas is considered as more environmentally friendly with high methane content and lower emission factors. In order to calculate and critically compare their environmental impacts the authors Pikon (in this issue, p. 1147) conducted an analysis of the whole life cycle associated with combustion of coal and natural gas at all stages from *cradle to grave*, where hard coal is combusted in combined heat and power plants equipped with flue gas treatment (FGT) while natural gas is burned in small domestic installations with no additional FGT systems. Moreover, the authors brought the results of the life cycle analysis (LCA) into relation with a comprehensive thermo-ecological cost index, which is a cumulated exergy consumption of non-renewable resources. One of important conclusion was that there is a significant influence of transportation of natural gas (presented in LCA) which, due to the distance of transmission of gas from gas fields, for instance located in Siberia, can be associated with high diffuse emission of methane (because of large leakages of gas from pipelines).

Integration of high shares of renewable energy into existing power systems would not be possible without more traditional fossil fuel-based thermal power plants, but with a changed role they play in the power system. Traditionally base load plants, particularity powered by coal, are now forced to operate as peaking plants. That is the issue that Marušić (in this issue, p. 1161) address in their paper on increasing flexibility of coal power plant by control system modifications, in which they identified two possible *bottlenecks*: thermal stress in super heater header, and achievable ramping rate considering operational limitations of coal feeders, firing system and evaporator dynamics.

Another paper that deals with operation of existing coal power plants under new circumstances is work of Hodžić (in this issue, p. 1171) who analyse multi fuel concept for future coal-based power plants, demonstrated on example of co-firing Middle-Bosnia brown coal with waste woody biomass and natural gas. Apart from experimental and analytical work (using laboratory and operational data) they provide a single criteria analysis and a multicriteria sustainability assessment which give an advantage to co-firing coal with woody biomass and natural gas, at least in the case they demonstrated (the case study of TPP Kakanj unit 6 in Bosnia and Herzegovina).

Coal is also a topic of next paper of Sciazko (in this issue, p. 1185) who investigate how to improve the combustion process, which will foster the efficient utilization of lignite from the Belchatow deposit in the central Poland. Lignite-fired coal power plants suffer from a significant heat loss due to the high moisture content. The authors state that water removal from this type of fuel is an indispensable treatment for which they applied superheated steam fluidized bed drying. They analysed drying kinetics of lignite to reinforce design process of the fluidized bed dryer. The authors conclude that by applying such drying treatment the combustion process of lignite can be improved resulting in higher power generation efficiency.

The work of Anweiler (in this issue, p. 1199) can help in the efforts to design an efficient fluidized bed reactor. The authors describe a novel method for two-phase gas-solid flow structure validation in fluidized bed reactors by application of stereology techniques.

Coming back to renewables, particularly biomass and biofuels, we find the paper of Gvero (in this issue, p. 1209) who analyse details of biomass combustion process, specifically pyrolysis that has a dominant role in development of the combustion process, as well as on final products and the process efficiency, and which should be taken into consideration during the design of any reactor or combustion system using biomass. Using biomass as a fuel is also a subject of research of the paper of Artiukhina (in this issue, p. 1223) who investigate different type of thermochemical conversion of biomass – torrefaction. Torrefaction is a low temperature pyrolysis that shows as a promising pre-treatment technology for conversion of biomass into a solid biofuel with enhanced properties in terms of lower moisture and volatile matter content, hydrophobicity and increased heating value, and so in that respect overcomes some of the big shortcomings of using biomass pellets as a fuel. The authors add that such form of biofuel is more suitable for efficient thermochemical conversion by pyrolysis, gasification, combustion or co-firing with conventional solid fuels.

Natural gas as one of the world's key energy resources is in the background of research in the paper of Klimanek (in this issue, p. 1233) who discuss modelling of a thermoelectric generator designed for reliable (and maintenance-free) island-mode power supply. The generation of electricity in such generator is based on the Seebeck effect, a type of the thermoelectric effect in which there is a conversion of heat directly into electricity at the junction of different types of material. The purpose of the analysed gas-fired thermoelectric generator is to provide electricity for remote natural gas pressure reduction stations in order to power the control and automation equipment. Although in this case a small share of chemical energy of transported natural gas is used as a heat source a thermoelectric generator can be also applied to harness available waste heat and to convert it to additional electricity.

Utilization of waste heat is a subject of research of Dolianitis (in this issue, p. 1245) whose paper deals with waste heat recovery at a conventional natural gas fired container glass furnace. They use the heat of the exhaust gases downstream the air regenerators by means of batch and cullet preheating to reduce the specific energy consumption and CO_2 emissions. The authors conclude that there is potential towards achieving significant energy savings of 12-15% and respective CO_2 emissions reduction so that the European Glass industry may support the goals imposed by the 2050 European Low Carbon Economy Roadmap while maintaining its competitiveness.

The last paper in this special volume of the journal *Thermal Science* dedicated to the 10^{th} SDEWES Conference is the paper of Haida (in this issue, p. 1259) who numerically investigated an R744 liquid ejector applied to a supermarket refrigeration system. They conducted sensitivity analysis of the liquid ejector geometry parameters (the pre-mixer, mixer and diffuser dimensions) in order to improve the energy efficiency of the refrigeration system.

Looking back to past SDEWES conferences we can find the most important problems and see how they were developed in years. The papers were published in special issues with one or more of the partner journals. The papers were selected and recommended by the Scientific Advisory Board for publication.

Three main steps allowing the definition of the sustainability of a wind power plant (WPP) are described in detail by Ouammi *et al.* [12]. Traditional wind statistical estimations based on the identification of the Weibull probability density function on specific sites; and an innovative Kriging approach based on artificial neural networks to reconstruct the profile of the mean wind speed of the territory were analysed. Given technical details, the energetic sustainability of a WPP installation is assessed according to a model computing the wind energy production per year, as well as the details of its efficiency. Finally, a cost/benefit evaluation on the overall reduction in CO_2 emissions with respect to traditional fossil fuel energy plants is reported. From a wind speed characterisation viewpoint, the case study is referred to the overall Moroccan territory. From a WPP model viewpoint, the case study is referred to the installation of a specific WPP, which would allow the production of more than 2 GWh per year in the south Atlantic coast and of nearly 1 GWh per year in the Mediterranean coast in the neighbourhood of Tangier.

Newly built (greenfield) power plant offers the advantage of optimised integration measures to reduce the efficiency penalty associated with the application of a post-combustion CO_2 capture process by wet chemical absorption. Especially, the integration of waste heat from the desorber overhead condenser of the CO_2 capture unit (CCU) and from the CO_2 compressor into the water-steam-cycle of the power plant offers optimisation potential. Pfaff *et al*. [13] evaluated the adaptation of pressure levels in the water-steam-cycle regarding the steam requirements of the CCU. Particular focus is put on waste heat integration by condensate pre-heating and combustion air pre-heating for minimisation of the overall net efficiency loss. The efficiency potential of the available options as well as the limits of integration, especially with respect to a power plant in commercial operation, are discussed.

Later, Schneider *et al.* [11] determined that around 1 million tons of CO_2 can be avoided in 2020, which is 2.7% of projected GHG emissions in Croatia, while the energy that could be recovered from waste is 8.3 PJ in 2020, which represents about 3% of the total final energy consumption in 2008. The measures utilization of landfill gas for electricity production and landfill gas flaring showed the greatest economic benefit.

Cool thermal energy storage (CTES) may play also an important role in the management of peak loads and solve the intermittency problem of RES, especially when cooling storage is integrated into district cooling systems. A simple mathematical model of a system with integrated RES and CTES has been developed by Ban *et al.* [14]. Hourly system analyses have been conducted for one building, a group of buildings connected to the district cooling system and a region represented by a mixture of different demands for cool thermal energy. The results for the overall energy efficiency, cost effectiveness and environmental impact of the systems were analysed.

Pukšec *et al.* [15] focuses on various mechanisms influencing future energy demand scenarios. Important would be to quantify this influence, whether positive or negative, and see which mechanisms would be the most significant. Energy demand projections are based upon bottom-up approach model which combines and processes a large number of input data. The model was compared to Croatian National Energy Strategy and certain differences and conclusions were presented. One of the major conclusions is significant possibilities for energy efficiency improvements and lower energy demand in the future, based on careful and rational energy planning.

To reduce emissions in the process industry, much emphasis has been put on making step changes in emission reduction, by developing new process technologies and making renewable energy more affordable. However, the energy saving potential of existing systems cannot be simply ignored. Zhang *et al*. [16] tried to improve the environmental performance of existing facilities with operational changes. An industrial project was carried out to demonstrate the importance and effectiveness of exploiting the operational flexibility for energy conservation. By applying advanced optimisation technique to integrate the operation of distillation and heat recovery in a crude oil distillation unit, the energy consumption was reduced by 8% without capital expenditure.

Kazagić *et al.* [17] in 2014 provides guidelines and principles for power utilities to reach specific energy and decarbonisation targets. Method of power generation portfolio optimization, as function of sustainability and decarbonisation, along with appropriate criteria, has been proposed. Application of this optimization method has been demonstrated on a real power system – power utility JP Elektroprivreda B&H d.d. – Sarajevo (EPB&H), a typical example of South East European power system. Results show that, considering the EPB&H generation portfolio planned under the HIGH RES scenario, 49% CO_2 emissions cut in 2030 compared to 1990 is possible along with further increase of overall energy efficiency of the system.

Carbon emissions pinch analysis (CEPA) and Energy return on energy investment (EROI) analysis are combined by Walmsley *et al.* [18] to investigate the feasibility of New Zealand reaching and maintaining a renewables electricity target above 90% through to 2050, while also increasing electricity generation at an annual rate of 1.5% while allowing for a 50% switch to plug in electric vehicle transportation for personal use vehicles. Under this scenario NZ's electricity demand is anticipated to reach a maximum of between 70 and 75 TWh by 2050. If NZ is carbon emissions constrained to 1990 levels, to minimise energy expended, electricity growth will predominantly come from wind (18 TWh) and geothermal (13 TWh), and hydro (5.6 TWh) to a lesser extent. Renewables resources will produce nearly 95% of electricity generation.

Lira-Barragan *et al.* [19] presented a novel approach for designing sustainable trigeneration systems (*i. e.*, heating, cooling and power generation cycles) integrated with heat exchanger networks and accounting simultaneously for economic, environmental and social issues. The trigeneration system is comprised of steam and organic rankine cycles and an absorption refrigeration cycle. Multiple sustainable energy sources such as solar energy, biofuels and fossil fuels are considered to drive the steam rankine cycle. The model is aimed to select the optimal working fluid to operate the organic rankine cycle and to determine the optimal system to operate the absorption refrigeration cycle. The residual energy available in the steam rankine cycle and/or the process excess heat can be employed to run both the organic rankine cycle and the absorption refrigeration cycle to produce electricity and refrigeration below the ambient temperature, respectively.

Guzović *et al.* [20] executed energy and exergy analysis of Organic Rankine Cycle (ORC) and kalina cycle for the most prospective geothermal field, Velika Ciglena (175 °C). In case of the Geothermal Power Plant Velika Ciglena, a dual-pressure ORC has slightly lower thermal efficiency (13.96% *vs*. 14.1%) but considerably higher both exergy efficiency (65% *vs*. 52%) and net power (6,371 kW *vs*. 5,270 kW).

Process integration using the pinch analysis technique has been widely used as a tool for an optimal design of heat exchanger networks (HEN). The composite curves and the stream temperature versus enthalpy plot (STEP) are among the graphical tools used to target the maximum heat recovery for a HEN. However, these tools assume that heat losses and heat gains are negligible. Wan Alwi *et al.* [21] presented an approach that considers heat losses and heat gains during the establishment of the minimum utility targets. Several rules to guide the proper location of pipe insulation, and the appropriate procedure for stream shifting have been introduced in order to minimise the heat losses and maximise the heat gains.

Boldyryev *et al.* [22] delivered a further development of methodology for decreasing the capital cost for total site heat recovery by use of different intermediate utility levels. Heat transfer area is reduced by selection of appropriate temperature of intermediate utility. This approach allows estimating the minimum of heat transfer area for heat recovery on total site level. Case study is performed for fixed film heat transfer coefficients of process streams and intermediate utilities. It indicates that the total heat transfer area of heat recovery can be different up to 49.15% for different utility temperatures.

A robust computational methodology for the synthesis and design of flexible HEN having large numbers of uncertain parameters was presented by Pintarič *et al.* [23]. The methodology combines several heuristic methods which progressively lead to a flexible HEN design at a specific level of confidence. A significantly reduced multi-scenario model for flexible HEN design is formulated at the nominal point with the flexibility constraints at the critical points. The optimal design obtained is tested by stochastic monte carlo optimization and the flexibility index through solving one-scenario problems within a loop.

Another one main problem connected to the transportation sector, which is one of the major energy consumers in most energy systems and a large portion of the energy demand is linked to road transport and personal vehicles. Because of their higher efficiency, a modal switch from conventional internal combustion engines (ICE) to electric vehicles (EV) has the potential to greatly reduce the overall energy demand of the transport sector. Novosel *et al.* [24] made a model of the hourly distribution of the energy consumption of EV and use the calculated load curves to test their impact on the Croatian energy system.

Somogyi *et al*. [25] modeled the effects of geothermal heat pump systems installed to shallow geothermal reservoirs in sedimentary formation based on the results of a real system in order to show the magnitude of the thermal affected zone. The results show that if two systems are to be installed on the same reservoir the minimum distance should be 55 m. That indicates that in case of designing systems installed to similar hydrogeological environment should consider the change in the water table and increased thermally affected zone if other groundwater heat pumps are in the area.

Dominković *et al.* [26] provides a solution for managing excess heat production in trigeneration and thus, increases the power plant yearly efficiency. An optimization model for combining biomass trigeneration energy system and pit thermal energy storage has been developed. Furthermore, double piping district heating and cooling network in the residential area without industry consumers was assumed, thus allowing simultaneous flow of the heating and cooling energy. As a consequence, the model is easy to adopt in different regions. Degree-hour method was used for calculation of hourly heating and cooling energy demand. The system covers all the yearly heating and cooling energy needs, while it is assumed that all the electricity can be transferred to the grid due to its renewable origin. The savings are potentially large and can be used for supporting other renewable energy projects.

Mikulčić *et al*. [27] analyse the emergy and ecological footprint of different cement manufacturing processes. There are several mitigation measures that can be incorporated in the cement manufacturing process to reduce the demand for fossil fuels and consequently reduce the CO_2 emissions. The mitigation measures considered were the use of alternative fuels and a more energy efficient process. The results show that emergy, due to the high input mass of raw material needed for clinker production, stays at about the same level. However, for the ecological footprint, the results show that by combining the use of alternative fuels together with a more energy efficient process, the environmental impact of the cement manufacturing process can be lowered.

An optimization formulation for designing residential water networks involving harvested rainwater and reclaimed wastewater was presented by Garcia-Montoya *et al*. [28]. The design problem is posed as a multi-objective optimization formulation that seeks to balance the objectives of total annualized cost, fresh water consumption, and environmental impact. A life cycle assessment approach is undertaken for estimating the environmental impact. The seasonal dependence of the rainwater is considered in the optimization model. The design approach is applied to a case study for the city of Morelia in Mexico. The results show that significant economic, fresh water consumption, and environmental benefits can be obtained as a result of the proposed approach.

Benchmarking the performance of cities across aspects that relate to the sustainable development of energy, water and environment systems requires an integrated approach. Kilkis [29] benchmarks a sample of 12 Southeast European cities based on a composite indicator that consists of 7 dimensions and 35 main indicators. The composite indicator is namely the sustainable development of energy, water and environment systems (SDEWES) city sustainability index. Data entries are normalized based on the min-max method and aggregated for a final ranking. Zagreb, Bucharest (District 1), and Ohrid are the top three cities. An average city receives a composite score of 2.69. Best practices are identified to allow cities to adopt well-rounded efforts to improve future performance. The SDEWES index is useful to trigger learning, action, and collaboration among cities to transition to a more sustainable future.

The energy consumption associated with domestic hot water supply services correspond to a significant portion of the total energy consumption of the urban water cycle. The performance of systems was investigated by Vieira *et al*. [30] undertaking a multi-parametric analysis, in which energy efficiency indicators (*i. e.* energy intensity and power peaks) were combined with level of service indicators (*i. e.* compliance rate with minimum temperature thresholds for end use points and hot water tanks). The operation of water heaters was modelled using the software EnergyPlus. Results demonstrate the need for a more holistic approach for the design and assessment of domestic water heaters taking into account not only the technology type to heat water, but also site specific aspects.

Hanslik *et al.* [31] analyse dependence of water quality parameters on flow rates in several profiles in the Vltava River catchment in The Czech Republic in the period 1997-2013. The influence of low flow rates on the water quality is assessed on several examples of river profiles, tributaries and outflow of the Orlik Reservoir, which is located at the Vltava River in The Czech Republic. The assessed period was 1997-2013. The results show that in the monitored profiles, there is a direct relationship with flow rate in case of N-NO_3^-, suspended solids and O_2. Temperature shows an inverse relationship with the flow rate. Other parameters show different relationship with the flow rate in individual monitored profiles or do not show statistically significant relation.

The 10th Conference on Sustainable Development of Energy, Water and Environment Systems – SDEWES Conference, held in Dubrovnik in 2015, was dedicated to the improvement and dissemination of knowledge on methods, policies and technologies for increasing the sustainability of development by de-coupling growth from natural resources and replacing them with knowledge based economy, taking into account its economic, environmental and social pillars, as well as methods for assessing and measuring sustainability of development, regarding energy, transport, water, environment and food production systems and their many combinations. Sustainability being also a perfect field for interdisciplinary and multi-cultural evaluation of complex system, the SDEWES Conference has at the beginning of the 21st century become a significant venue for researchers in those areas to meet, and originate, discuss, share, and disseminate new ideas.

The 10th SDEWES Conference was very successful, attracting authors from 65 countries with 545 presented papers (of which 89 posters) at 48 regular sessions (including one online session), 17 special sessions (which was the greatest number ever) and five poster sessions, five invited lectures, three panels and four special events.

This special issue of papers presented at the SDEWES Conference will try to help energy and environment researchers and experts in the region as well in the world to improve the insight into the problems and solution of the things to come.

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References

[1] ***, Eurostat, Energy from Renewable Sources, http://ec.europa.eu/eurostat/statistics-explained/index.php/EnergyFromRenewableSources
[2] ***, 2030 Climate & Energy Framework, Climate Action, European Commission, http://ec.europa.eu/clima/policies/strategies/2030/index_en.htm
[3] ***, IEA, Medium-Term Renewable Energy Market Report 2015 Report, http://www.iea.org/topics/renewables/
[4] ***, EC, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank a Framework Strategy for a Resilient Energy Union with a Forward-looking Climate Change Policy, COM/2015/080 Final
[5] ***, European Heat Atlas, http://www.heatroadmap.eu/
[6] Šare, A., *et al.*, The Integration of Renewable Energy Sources and Electric Vehicles Into the Power System of the Dubrovnik Region, *Energy, Sustainability and Society, 5* (2015), 1, pp. 1-16
[7] ***, EC, COM/2015/0614 Final – Closing the loop – An EU Action Plan for the Circular Economy, http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0614
[8] Schneider, D. R., *et al.*, Recycling and Incineration, Contradiction or Coexistence? (Editorial), *Waste Management & Research, 33* (2015), 8, pp. 693-695
[9] Ragoßnig, A., *et al.*, Impact and Limitations of Recycling (Editorial), *Waste Management & Research, 32* (2014), 7, pp. 563-564
[10] Schneider, D. R., *et al.*, Biofuels from Waste (Editorial), *Waste Management & Research, 31* (2013), 4, pp. 339-340
[11] Schneider, D. R., *et al.*, Cost-effectiveness of GHG Emission Reduction Measures and Energy Recovery from Municipal Waste in Croatia, *Energy, 48* (2012), 1, pp. 203-211
[12] Ouammi, A., *et al.*, Sustainability of a Wind Power Plant: Application to Different Moroccan Sites, *Energy, 35* (2010), 10, pp. 4226-4236

[13] Pfaff, I., *et al.*, Optimised Integration of Post-combustion CO_2 Capture Process in Greenfield Power Plants, *Energy, 35* (2010), 10, pp. 4030-4041
[14] Ban, M., *et al.*, The Role of Cool Thermal Energy Storage (CTES) in the Integration of Renewable Energy Sources (RES) and Peak Load Reduction, *Energy, 48* (2012), 1, pp. 108-117
[15] Pukšec, T., *et al.*, Potentials for Energy Savings and Long Term Energy Demand of Croatian Households Sector, *Applied Energy, 101* (2013), Jan. 2013, pp. 15-25
[16] Zhang, N., *et al.*, Sustaining High Energy Efficiency in Existing Processes with Advanced Process Integration Technology, *Applied Energy, 101* (2013), Jan. 2013, pp. 26-32
[17] Kazagić, A., *et al.*, Power Utility Generation Portfolio Optimization as Function of Specific RES and Decarbonisation Targets – EPBiH Case Study, *Applied Energy, 135* (2014), Dec. 2014, pp. 694-703
[18] Walmsley, M. R. W., *et al.*, Minimising Carbon Emissions and Energy Expended for Electricity Generation in New Zealand Through to 2050, *Applied Energy, 135* (2014), Dec. 2014, pp. 656-665
[19] Lira-Barragan, L., *et al.*, Optimal Design of Process Energy Systems Integrating Sustainable Considerations, *Energy, 76* (2014), Nov. 2014, pp. 139-160
[20] Guzović, Z., *et al.*, The Comparision of a Basic and a Dual-pressure ORC (Organic Rankine Cycle): Geothermal Power Plant Velika Ciglena Case Study, *Energy, 76* (2014), pp. 175-186
[21] Wan Alwi, S. R., *et al.*, Targeting the Maximum Heat Recovery for Systems with Heat Losses and Heat Gains, *Energy Conversion and Management, 87* (2014), Nov. 2014, pp. 1098-1106
[22] Boldyryev, S., *et al.*, Minimum Heat Transfer Area for Total Site Heat Recovery, *Energy Conversion and Management, 87* (2014), Nov. 2014, pp. 1093-1097
[23] Pintarič, Z. N., *et al.*, A Methodology for the Synthesis of Heat Exchanger Networks Having Large Numbers of Uncertain Parameters, *Energy, 92* (2015), 3, pp. 373-382
[24] Novosel, T., *et al.*, Agent Based Modelling and Energy Planning – Utilization of MATSim for Transport Energy Demand Modelling, *Energy, 92* (2015), 3, pp. 466-475
[25] Somogyi, S., *et al.*, Thermal Impact Assessment with Hydrodynamics and Transport Modeling, *Energy Conversion and Management, 104* (2015), Nov. 2015, pp. 127-134
[26] Dominković, D. F., *et al.*, A Hybrid Optimization Model of Biomass Trigeneration System Combined with Pit Thermal Energy Storage, *Energy Conversion and Management, 104* (2015), Nov. 2015, pp. 90-99
[27] Mikulčić, H., *et al.*, Environmental Assessment of Different Cement Manufacturing Processes Based on Emergy and Ecological Footprint Analysis, *Journal of Cleaner Production, 130* (2016), Sep. 2016, pp. 213-221
[28] Garcia-Montoya, M., *et al.*, Environmental and Economic Analysis for the Optimal Reuse of Water in a Residential Complex, *Journal of Cleaner Production, 130* (2016), Sep. 2016, pp. 82-91
[29] Kılkıs, S., *et al.*, Sustainable Development of Energy, Water and Environment Systems Index for Southeast European Cities, *Journal of Cleaner Production, 130* (2016), Sep. 2016, pp. 222-234
[30] Vieira, A. S., *et al.*, Optimising Residential Water Heating System Performance to Minimise Water-Energy Penalties, *Journal of Sustainable Development of Energy, Water and Environment Systems, 4* (2016), 2, pp. 161-172
[31] Hanslik, E., *et al.*, Dependence of Selected Water Quality Parameters on Flow Rates in River Profiles in the Czech Republic, *Journal of Sustainable Development of Energy, Water and Environment Systems, 4* (2016), 2, pp. 127-140

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