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ABSTRACT

This 38th volume of the International Journal of Sustainable Energy Planning and Management presents some of the newest work within the energy planning, energy systems analyses and district heating area. Articles focus on multi objective optimisation for a community in the Alps, carbon neutrality in Estonia, the prospects of heat pumps combined with thermal energy storage in maximising self-consumption from a photovoltaic field and methods for assessing district heating options. Other works focus on gamification tools for assessing energy efficiency measures, country analyses of economic and environmental indicators, the adaption of alternative fuel vehicles, and the use of waste heat sources for district heating.

Keywords

Optimisation;
EnergyPLAN;
energyPRO;
Indicators;
District heating

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1. Introduction

This issue of the *International Journal of Sustainable Energy Planning and Management* combines special issues dedicated to three conferences all addressing energy systems and the transition towards renewable energy supply. These are the *9th International Conference on Smart Energy Systems*, held in Copenhagen, 12-13 September 2022, the *5th ICEE – Energy & Environment* held at the University of Porto, 2-3 June 2022 and finally the 17th SDEWES conference (*Sustainable Development of Energy Water and Environmental Systems)*, held in Paphos, Cyprus 6-10 November 2022.

The issue follows up on previous special issues in the Smart Energy Systems conference series [1–6], special issues from the ICEE conference series [7–9] and special issues from the SDEWES conference series [10–12]. All three conference series have developed into being main venues for the discussion of sustainable development and for the presentation of research advances into the field.

2. Normal submissions

In this special issue, Viesi and coauthors [13] apply a multi-objective optimization framework based on the EnergyPLAN[14,15] simulation model to an energy community in the Alps, investigating trajectories towards a decarbonised energy system in 2030 and 2050. The work thus places itself in a school of work that transcens the typical gap between simulation models like EnergyPLAN and optimisation models with endogenous system composition optimisation[16,17], as also examplied by Mahbub [18–22], Prina [23–29], Fischer [30], Bellocchi [31], Komušanac [32], Groppi [33,34], Johannsen [17], Laha [35], Vaccaro [36], Herc [37], and Maigret [38].

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3. Special Issue for 9th Smart Energy Systems

The Smart Energy System's conference series took a starting point in work at Aalborg University on smart energy systems, presented in a series of defining and paradigm-setting papers - see e.g. [39,40] – that suggested going from a sector-seggrated smart grid approach to a sector coupled smart energy systems approach.

In the Smart Energy System's Special Issue, Volkova and coauthoors [41] investigate pathways towards carbon neutrality for Estonia using the energyPRO model. In their work, the authors find feasible pathways for the decarbonisation of the heating and electricity sectors, while transportation remains more problematic. Volkova has previously presented work on mobile apps for district heating consumers in this journal [42] as well as research focusing more concretely on district heating case studies in Estonia [43,44]. The model energyPRO[45] has previously been applied by Trømborg to model electricity use in district heating plants [46], by Sneum to investigate flexible district heating [47], by Widzinski to analyse alternative heat production technologies for district heating system in Poland [48] and by Trabert [49] to analyse a river water-based heat pump for district heating in Germany. Beyond the present journal, it has been applied to develop low-carbon pathways for various case studies including Helsingør [50], Helsinki [51], Pécs [52], Matosinhos[53], and Brasov [54].

In Ref [55], Edtmayer and coauthors investigate the thermal energy needs of a district in Graz, Austria, with a focus on developing the tolls and methods for assessing the needs. Similarly, Urquizo et al. [56], Dochev[57] and Möller & Nielsen[58] have previously presented ways of assessing primarily heating needs through the application of geographical information tools. Similarly, Knies [59] applied spatial approaches to the planning of heating system. Outside the journal, Pelda[60] has conducted spatial investigations of German district heating demands, Möller has looked at the spatial distribution of heating demands in Europe [61,62], Nielsen has focused on geographical heating assessment methodology [63,64] and Connolly made an overall assessment of the relevance of district heating in Europe[65].

Pasqui and coauthors [66] investigate the interplay between individual house heat pumps, individual house thermal storage and a collective photovoltaic field supplying electricity for the heat pumps. The objective is to increase overall self-consumption of the community of 10 dwellings. Selfconsumption can increase 12-30% - but partly at the expense of an increased electricity consumption due to higher operating temperatures and thus lower coefficient of performance. Marczinkowski [67] previously compared the effects of such local integration of photovoltaic power with a more system-wise integration finding primarily social benefits of local integration. In another study, Hedegaard found limited fuel demand reductions when combining individual heat pumps with storage[68].

Turnell and coauthors[69] analyse the prospects of using industrial waste heat in what they denote *Smart Local Energy Systems* in a selection of British cases. Drawing on an ambient loop district heating network, heat is distributed from a data centre – but also sharing among buildings based on decentralised heat pumps. They simulated the system using the energy systems simulation model energyPRO.

Finally, in this special issue, Brakovska and coauthors [70] apply a gamification strategy for engaging stakeholders in the consideration of energy efficiency measures in apartment buildings. They develop and test a game/tool, and find positive feedback from its application. Volkova has previously reported on experience with a mobile app[42] within district heating. Where previous generations of district heating were of a simpler radial nature, 4th generation is more complex and has a stronger integration across sectors and supply/demand[71], and following this increase in organisational complexity Krog looked into user engament in 4th generation district heating[72]. Other research on participation/engament in this journal include Bishoge on participation in renewable energy in Tanzania [73], Siregar on renewable energy in Indonesia[74], Butu on rural community projects[75], and Proimakis on marine energy[76]. Outside this journal, Johannsen previously showed how municipal planners are in need of more simple tools to investigate energy system transition pathways[77].

4. Special Issue for 5th ICEE

Teotónio and co-authors [78] take a starting point in the Sustainable Development Goals of the United Nations and investigate whether economic and environmental indicators align or contrast. The authors find, that results diverge among the European Union member states, and also that affordability is an issue in areas – and also particularly among elderly people.

Previously, Razmjoo & Sumper applied a sustainable energy development index method to assess SDGs for developing countries [79] in this journal, and Hernandez-Hurtado & Martin-del-Campo [80] probed into indicators for electricity system assessment. Jemmad[81] looked into indicators to assess energy performance, Szép[82] investigated indicators for assessing energy performance on a wider European scale and Qarnain[83] looked into the social inequality of conservation measures, thus touching on one of the same socioeconomic imbalances that Teotónio [78] also touches upon.

In Ref [84] in this issue, Jesus and coauthors investigate willingness to adopt alternative fuel vehicles. Through a large survey, the authors investigated determinats for prospective buyers' willingness to purchase alternative fuel vehicles, finding a higher willingness among higher income groups than among lower income groups. The survey also showed, that potential incentive schemes have different impacts on different income groups with direct support or cost-lowering measures being important for lower incomes groups while non-economic measures have a larger effect on higher income groups.

Qarnain [83] previously analysed social inequality factors – including racial, gender, ethnic - and the effect on policy development within energy conservation in buildings. Ugulu [85] looked at the adoption of photo voltaic panels in Nigeria, finding capital cost a main barrier. On the other hand, Kurbatova and Sidortsov[86] investigated landfill gas finding a lack of adoption despite favourable economic performance.

The last paper from the ICEE special issue by Dall-Orsoletta [87] was already published in a previous issue of this journal, and addressed in the corresponding editorial [88].

5. Special Issues for 17th SDEWES

Divkovic and coauthors [94] look into district heating systems with a focus on amongst others waste heat resources. Taking a point of departure in Germany, they devise approaches for assessing both resources and demands. One of the main conclusions is an underlining of the benefits of the waste heat – district heating combination[89]. Röder [90] , Trabert [49], Best [91], and Kersten [92] previously addressed different aspects of distruct heating integration and explansion in Germany. Lund [93] compared different low-temperature district heating concepts from a systems perspective.

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