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Review

Toward an Efficient and Sustainable Use of Energy in Industries and Cities

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Received: 3 July 2019; Accepted: 14 August 2019; Published: 16 August 2019

Abstract: Several countries have recently realized that the present development paradigm is not sustainable from an environmental and energy point of view. The growing awareness of the population regarding environmental issues is pushing governments worldwide more and more to promote policies aiming at limiting harmful effects of human development. In particular, the rapid increase of the global temperature, especially in the polar regions, and the management of human wastes, mainly plastic in seas, are some of the main points to be addressed by these novel policies. Several actions must be implemented in order to limit such issues. Unfortunately, the recent COP 24 Conference was not successful, but hopefully an agreement will be established in 2020 at the COP 26 Conference. The effort performed by policymakers must be mandatorily supported by the scientific community. In this framework, this paper aims at showing that countries worldwide are trying to negotiate an agreement to increase energy efficiency and reduce greenhouse gas (GHG) emissions. In addition, in this paper all the researchers reported can provide quantitative measures of the actions to be implemented in order to address a sustainable and efficient use of energy. Here, innovations in terms of novel efficient and environmentally friendly technologies mainly based on renewable energy sources have been also investigated. The study also highlights different sectors that have been involved for this aim, such as energy conversion systems, urban areas, mobility, sustainability, water management, social aspects, etc. In this framework, specific conferences are periodically organized in order to provide a forum for discussion regarding these topics. In this area the Sustainable Development of Energy, Water and Environment Systems (SDEWES) conference is the most ordinary conference. The 13th Sustainable Development of Energy, Water and Environment Systems Conference was held in Palermo, Italy in 2018. The current Special Issue of Energies, precisely dedicated to the 13th SDEWES Conference, is based on three main topics: energy policy and energy efficiency in urban areas, energy efficiency in industry and biomass and other miscellaneous energy systems.

Keywords: sustainable development; renewable energy; biomass; energy efficiency in industry

1. Introduction

On 18 June 2018 negotiators from EU Parliament, Commission and Council reached a new agreement, focused on the development of a climate-friendly, affordable and secure energy system for the EU countries. With respect the previous proposals, which negotiated on the Energy Performance in Buildings Directive and on the revised Renewable Energy Directive, the new agreement is based on considerably strong goals from the energy efficiency and emissions point of view: an increase of 32.5% of the energy efficiency for 2030 and an emissions reduction of 40%. Considering the revision of Energy Building Performance Directive and 32% renewable energy target for the EU for 2030 (see STATEMENT/18/4155), the defined targets will allow EU countries to obtain the goals set by the Paris Agreement and a clean energy transition. Furthermore, these targets could lead to several advantages for EU citizens, such as an enhanced security of the energy production systems, a more efficient energy market, a more healthy and comfortable environment, a considerable reduction of energy bills [1]. To reach such ambitious aims, industry and academia must focus on the analysis and design of novel energy conversion systems and on the coupling of conventional and renewable energy systems [2]. Particularly, in this area numerous academics have been involved [3], analysing the sustainable development initiatives by considering the economic, environmental and energy aspects [4], and developing novel solutions for definite sectors [5–8]. Sustainable development involves extremely numerous different disciplines (renewable, water, energy, electrical and control engineering, etc.). At the beginning of this century, to approach this issue, the succession of the Sustainable Development of Energy, Water and Environment Systems (SDEWES) conferences was established.

In 2018, the 13th SDEWES Conference (SDEWES 2018) was held in Palermo, Italy. The conference brought together 400 scientists, researchers, and experts in the field of sustainable development from around 50 countries. The conference is based on nine special sessions, one special event, three invited lectures and two panel debates with some of the most distinguished specialists of the sector. 80 posters and 330 papers were presented.

The papers in this Special Issue (SI) are based on articles presented at SDEWES 2018 Conference, including different research issues, namely economic, technical, social and environmental studies, including works analysing the sustainability of energy, water, transport, food and environment production systems and their integration and interconnection. From 330 accepted manuscripts, 24 were selected for this SI of *Energies* in a continuation of an ongoing fruitful cooperation between *Energies* and SDEWES. The papers within the present SI can be classified into three main research fields: energy policy and energy efficiency in urban areas (seven papers), energy efficiency in industry (10 papers) and biomass and other miscellaneous energy systems (seven papers).

2. Background

Numerous publications under other and this journal's special sections or volumes dedicated to the SDEWES conference series are examined in this section. The studies included in this section are classified into the following research fields: energy policy and energy efficiency in urban area, energy efficiency in industry, biomass and other miscellaneous energy systems.

2.1. Energy Policy and Energy Efficiency in Urban Areas

During the previous SDEWES conferences, several papers investigated the topic of energy policy and energy efficiency in urban areas. Regarding this topic, numerous studies are available in the previous SDEWES SIs, adopting different approaches. Table 1 lists the topics, methodologies and main outcomes of the papers analysed in this subsection.

Table 1. Topics, methodologies and outcomes of the previous SDEWES papers dealing with energy policy and energy efficiency in urban areas.

Reference	Topic	Methodology	Main Outcomes
[9,10]	Energy security	Numerical model	Energy Security indicators
[11]		EnergyPLAN	Drought impacts on the future Finnish energy system
[12]		Quantitative geo-economic approach	Geo-economic Index of Energy Security
[13]		Literature review	Classic energy security concepts and energy technology changes.
[14]	Clean mobility sector	EnergyPLAN	Renewable energies optimization
[15]		Literature review	Electrification and biofuels
[16]		Life cycle analysis	Decision-makers support
[17–19]	Urban energy sustainability	Comprehensive benchmarking	SDEWES Index
[20]	Metropolitan areas sustainability	Analytic hierarchy process	Multi-criteria decision-making technique
[21]	Local water-energy-food nexus	Quantitative analysis	Relations between the food and water sectors
[22]	Water-energy nexus	Life cycle analysis	Renewable heating and solutions lighting
[23]	District heating systems	Data analysis	Main factors of the consumption
[24]	Nearly zero greenhouse city	Dynamic simulation—EnergyPLAN	Electricity and thermal energy costs
[25]	District analysis	Dynamic simulation	District sustainability indicators and new strategies for retrofitting
[26]	District heating and cooling networks	Dynamic models	Real dynamic controls
[27]		Techno-economic analysis	Energy saving-targeted support mechanisms
[28]	Sustainable and efficient waste management	Numerical model	Optimal selection and location
[29]	Tri-generation: municipal solid waste gasification	Numerical model	Positive economic performance

For example, many studies focused on the problem of energy security becoming a critical issue in several EU countries [30,31]. In this framework, several works investigated the fuel poverty vulnerability of urban neighbourhoods [32], or the energy poverty for vulnerable households or the elderly [33] through the definition of several energy poverty indices, including the evaluation of the security of supply as well as the environmental and social components [34]. The topic of energy sources security in EU countries is also investigated by Matsumoto et al. [9]. In their work, the authors aim at understanding how the EU countries energy security has changed from the energy supply point of view between 1978 and 2014. The highest improvement of the overall energy security is identified in Denmark and Czech Republic due to their diversity of the origins of imports and primary energy sources. Through the calculation of special indicators, three kinds of countries were identified: (I) Countries with significantly high levels of moderate improvements and energy security over time; (II) countries with medium levels of energy security and moderate improvements; and (III) countries with significant improvements and low energy security levels. In particular, countries of the Groups

I and III were interesting because they show exemplar practices while the policies of Groups III, in leading to improvement, represent a guides for other countries.

The energy security on the future Finnish energy system is investigated by Jääskeläinen et al. [11]. By considering that Nordic energy system is particularly dependent on hydropower production, the generation inadequacy in case of a severe drought is analysed by using the EnergyPLAN simulation tool. The indirect impacts of a drought in Finland's neighbouring countries are also considered. During winter peaks an extreme drought shows relatively limited impacts on generation adequacy due to available hydropower storage. Anyway, by considering that Finland's electricity market strongly depends on Sweden and Norway, the Finnish energy system would be affected more strongly by an extreme drought via cross-border electricity trade. A novel geo-economic approach to quantitatively measure the energy security is proposed by Radovanic et al. [12]. By means of this new technique, based on the combination of sovereign credit rating and conventional indicators, authors defined a different Geo-economic Index of Energy Security for the measurement of the political, economic and financial stability. The performed measures of this new index are significantly different from the simple indicators evaluated by the conventional approach. The main conclusions of the authors highlight that the renewable energy production and energy dependence least affect the energy security. Therefore, it is required to examine further the sovereign credit rating and to review the significance and type of the impact of the Energy Dependence indicator as a measure of energy security in general. Other paper regarded the energy security are reported in references [10,13].

Numerous papers focused on a clean transition of the mobility sector [35], in order to reduce emissions and energy demand. In fact, in the EU this sector covers about one third of the total energy consumption, so that important energy measures must be implemented. For example, Dorotić et al. [14] modelled a novel solution to obtain a carbon neutral island, which uses 100% intermittent renewable energy sources and 100% share of smart charge vehicles, by means the integration of the vehicle-to-grid concept, power, heating and cooling sectors and renewable energy sources. The electrical marine transportation is also considered. The EnergyPLAN tool is adopted for this goal, in order to implement an optimization procedure aiming at selecting the power supply capacities of solar and wind technologies for the Croatian Island of Korčula. Results show that the least-cost solution is based on an arrangement including 40 MW of wind and 6 MW of installed solar capacities. The combination with 22 MW of wind capacity and 30 MW of solar capacity shows the lowest quantity of total electricity import and export.

Dominkovic et al. [15] performed a comprehensive literature review aiming at investigating a sustainable clean energy transition in the transportation sector. In this work, the authors state that to reduce the emissions of pollutants four fundamental solutions could be implemented, such as electricity, hydrogen, biofuels and synthetic fuels (electrofuels). The results show that in the EU the most important reduction of both energy demand and emissions can be obtained through the electrification of 72.3% of the transport energy demand. The authors estimated that biofuels could cover the remaining 3069 TWh. In addition, for the replacement of the fossil fuels, by renewable electrofuels, an additional demand of heat and electricity, equal to 925 TWh and 2775 TWh, is estimated. A novel method to support decision-makers in evaluating the uncertainty of the life cycle impacts of different bus technologies is developed by Harris et al. [16]. The advanced Technology Impact Forecasting method, integrating a life cycle model, allows the analysis of eleven scenarios including different combinations of battery technologies—lithium-titanate (LTO)-lithium nickel-ithium-iron phosphate (LFP) and cobalt-manganese (NMC)—charging infrastructure and well-to-tank pathways. Results show that scenarios including electric technologies mitigate the GHG emissions by 58–10% compared to the baseline diesel bus, although their high life cycle costs, ranging from 129–247%. LTO systems are the most effective batteries for the mitigation of GHG emissions. Electric vehicles are investigated also in previous SDEWES SIs: (i) Vialetto et al. [36] performed a thermodynamic study of a shared cogeneration system for Northern Europe climate; (ii) Del Moretto et al. [37] compared diesel and electric tourist trains from environmental, energy and socio-economic points of view in a novel sustainable mobility connection for campsites; (iii) Novosel et al. [38] modelled the energy planning of the Croatian transportation system; (iv) Firak et al. [39] investigated the Croatian future transportation sector based on hydrogen infrastructure and fuel-cell vehicles; (v) Briggs et al. [40] analysed and simulated an inner-city diesel-electric hybrid bus; and (vi) Knez et al. [41] considered policies for the commercialization of low emission electric vehicles.

Numerous papers dealing with energy efficiency in urban areas were involved in SDEWES SIs [42], specifically focusing the trends of European research on district heating and cooling networks [43] and the energy management in municipalities [44]. In this framework, a comprehensive benchmarking of sustainability of urban energy, water and environment systems investigating 120 cities is performed by Kılkış [17] by the definition of the Sustainable Development of Energy, Water and Environment Systems city index (SDEWES Index [18]). The index, considered a useful benchmarking tool, aims at comparing the cities sustainable performance, and includes seven dimensions: (i) renewable energy potential and utilisation, (ii) penetration of energy and CO_2 saving measures, (iii) CO_2 emissions and industrial profile, (iv) water and environmental quality, (v) research and development, innovation and sustainability policy, (vi) city planning and social welfare and (vii) energy consumption and climate. By proposing a scenario where the use of residual energy among near cities, improvements of the index indicators on 60 cities are detected. The benchmarking results can be used by urban planners and local decision-makers to motivate policy-learning opportunities.

A similar work is presented also in [19], where the SDEWES Index is calculated for 26 significantly different cities from around the world, from Europe, Latin America and Africa as well as new cities in Asia. The higher values of the index are detected for cities including effective urban management in environment and water and efficient district energy networks. Copenhagen obtains the highest value of the index. A multi-criteria decision-making technique is implemented by Carli et al. [20] in order to evaluate the sustainability of metropolitan areas by considering their energy, water and environment systems. In this work, the authors aim to demonstrate the novelty and robustness of their approach, based on analytic hierarchy process with respect to the well-established method, such as the above mentioned SDEWES Index. This work covers the research gap concerning the assessment of the sustainability of metropolitan cities and provides their specific improvements, by means of the estimation of qualitative indicators. Their approach, applied to the four metropolitan areas Bitonto, Bari, Molfetta and Mola in South Italy, show the strategic and overriding interventions to obtain sustainable metropolitan cities. The limitation of the proposed approach is due to the vagueness and genuine uncertainty typical of the human decision making.

The role of the water-energy-food (WEF) nexus at local level, as recognised as a factor in implementing the sustainable development goals in small-scale energy projects in developing countries, is investigated by Pfaff et al. [21]. The authors systematically analysed the relations between the food and water sectors, by quantifying and identifying the critical links. The analyses show that the energy needs are indirectly due to the provision of energy to the agricultural sector and directly due to agricultural activities or food. The optimization of the provision of water and energy in two school buildings in order to promote sustainable municipalities is proposed by Gamarra et al. [22]. School buildings are selected due to the high energy consumption, mainly in hot weather conditions, lacking of energy efficiency measures and water scarcity complications. A life cycle assessment is performed in order to evaluate the impacts of the school activities per student. Moreover, different improvement measures, including the integration of the renewable energies or lighting technologies replacement are calculated. Results show that renewable heating solutions and lighting replacement measures can reduce the fossil energy demand by between 64.06% and 78.98% and 12.05% and 9.54%, respectively.

Valuable findings are obtained by Gianniou et al. [23] on the design and optimization of strategies for demand management towards energy-efficiency policies for district heating systems. They analysed the residential heating consumption of 8293 Danish single-family households in Aarhus. Sufficiently constant load profiles with peaks in the evening and in the early morning are obtained and that the most relevant factors of the consumption are the building area, age and family size.

De Luca et al. [24] analysed the potential transition of an Italian city to a zero GHG city by 2030. To this end, several technologies are proposed and modelled in the TRNSYS environment: photovoltaic and thermal solar panels, wind turbines, heat pumps and biogas cogeneration. Subsequently, to carry out their analysis, TRNSYS results are taken as inputs of the EnergyPLAN. The calculated thermal and electric energy prices, equal to 0.12 €/kWh$_t$ and 0.11 €/kWh$_e$, respectively, are very profitable. Sözer and Kükrer [25] evaluated design strategies of retrofitting activities by defining specified district sustainability indicators in order to improve the existing energy condition of a district. The key aim is to recognise the current conditions of the investigated district to develop new strategies for retrofitting. The district consists of three buildings with 20,000 m^2 conditioned area. To assess energy indicators, taking into account GHG emissions, indoor comfort and return on investment, an hourly dynamic simulation software is used. The most relevant result of this work is that by calculating the sustainability indicators with this method, a 5.16 years return on investment and a 69 kg/m^2 year GHG emission reduction are achieved.

Arce et al. [26] developed district heating and cooling networks component models (hot water storage, distribution pipe and network) aiming at representing the real dynamic operation of these components for control purposes. Beccali et al. [27] proposed an analysis aiming at assessing the techno-economic feasibility of the retrofit of existing power plants when the heat recovery is used for district heating and cooling purposes for tertiary and residential buildings. Six different Italian small islands, featured by different weather and demographic conditions, are investigated. Due to the irregular load profiles and low heat density, this solution can be economically profitable only if energy saving–targeted support mechanisms (as white certificates for cogeneration) are considered.

Conversely, the obtained discounted payback time ranging from 17.4 year up to 30 year. The weather conditions do not affect the obtained results. Additional papers were published on this topic in the previous SDEWES SIs, dealing with: the energy-economic analysis by a dynamic simulation model of a district cooling, heating, and domestic hot water plant based on solar and geothermal energy [45], the hourly optimization model of a district heating system based on electric heaters, heat pumps, boilers, solar thermal collectors and thermal energy storage units [46], the evaluation of the economic and thermal efficiency of a coal-fired municipal plant coupled to a district heating system in case of repowering with a gas turbine [47]. The topic of the sustainable and efficient waste management to increase the quality of human life in urban area is also addressed in numerous papers [48]. For example, Santibañez-Aguila et al. [28] developed a mathematical model aiming at planning a sustainable waste management system among multiple different neighbouring cities. The considered waste management system model is general and takes into account different landfills, processing facilities and technologies, processing, utilized raw materials and manufactured products. The model, applied to a suitable case study located in the west region of Mexico, is able to define the optimal location and selection of the waste management system. This model is also used to define the material flows to be sold, stored, processed and transported.

Katsaros et al. [29] designed and modelled a novel tri-generation system consisted of an ammonia-water absorption chiller, municipal solid waste gasification and a solid oxide fuel cell. Such plant is suitable to provide electricity, heating and cooling in hotels and hospitals buildings. They performed a sensitivity analysis aiming at identifying the variation of the air equivalent ratio and the operating temperatures of the gasifier and desorber on the system efficiency. Results show that the developed tri-generation plant could completely cover the cooling and electricity demand and up to 55% of the heat demand. The payback period and net present value were 4.5 years and 5 million euros, respectively. The overall system performance can be enhanced for high gasification temperatures and low air equivalent ratios. Other papers on the efficient waste management regard the definition of a primary energy return index, used for comparing different municipal solid waste management scenarios [49]; the coupling of renewable energy source in a wastewater treatment plant consisted of conventional activated sludge systems [50]; and a novel methodology applied to evaluate urban wastewater treatment plants in terms of energy efficiency [51,52].

This topic was dealt with comprehensively in previous SDEWES SIs focusing on different aspects, namely: the influence of urban form on the performance of road pavement solar collector system [53]; the energy management in a smart municipal energy grid including combined heat and power plants, solar photovoltaic and wind technologies [54]; the analysis of the future energy scenarios on the Danish municipality of Helsingør to obtain a cost-optimal combination between individual heating, district heating and heat savings [55]; a study on the management of dust to ensure that urban environment and industry can coexist in a sustainable and beneficial manner [56]; the adoption, in urban water distribution systems, of energy storage systems to meet the water demand [57]; the evaluation of carbon emissions in highly polluted European cities [58]; the replacement of bituminous roofs as green roofs to make cities more 'future proof' and resilient [59]; the integration of the renewable energy resources to enhance the regional energy efficiency and sustainability [60]; and many other papers concerning the analysis of energy efficiency targets of the member countries of the EU [61–63].

2.2. Energy Efficiency in Industry

Generally, the industry sector covers about one-third of energy and process-related GHG emissions [64]. Therefore, energy measures aiming at increasing the energy efficiency of the involved different processes in this sector represent a pivotal topic. The numerous papers dealing with this topic in previous journal SIs dedicated to the SDEWES conferences are summarised in Table 2 and described as follows.

Table 2. Topics, methodologies and outcomes of the previous SDEWES papers dealing with energy efficiency in industry.

Reference	Topic	Methodology	Main Outcomes
[65]	Heat recovery for the hydrocarbon processing industry	Numerical model	Thermoeconomic and environmental performance
[66]	Energy efficient industrial applications	Simulation model	Prediction of material and energy flows
[67]	Cogeneration in the industrial sector	Energy and economic analysis	Indicator to choose the best cogeneration technology
[68]	Heat production in the pulp and paper industry	Second-law and operating costs analysis	Flexible power production
[69]	Ceramic dust powder as sorbent for heavy metals	Experimental analysis	Sorption capacity of Cu, Pb and Zn
[70]	Marine sediments for the brick industry	Experimental analysis	Suitable additives
[71]	Plybamboo industry	Life cycle assessment	Low environmental impact
[72]	Ruths steam accumulator in industrial processes	Numerical model	Storage improvement by phase change materials
[73]	Energy retrofits in aluminum industry	Life Cycle Assessment and Cost	Energy and environmental indicators
[74]	Optimization of operational aspects of the industry sector	Simulation	Biomass, biogas and renewable gas for fossil fuel reduction.
[75]	Preventing summer overheating in metal processing factory	Dynamic simulation model	Energy efficient measures

Varga and Csaba [65] proposed low-temperature heat recovery to supply an ORC to improve the energy efficiency in the hydrocarbon processing industry. In particular, the ORC was applied as a condenser linked to the main distillation column of a vacuum residue processing unit. The ORC evaporator condenses and cools down vapours from 140 °C to 50 °C. The authors evaluated the thermoeconomic and environmental performance of the proposed system by selecting appropriate working fluids. With isobutane, isopentane and pentane, the obtained ORC power ranges varied between 452 and 678 kW. The highest power was obtained with isobutane and the related avoided CO_2 emissions were 1085 t/y. From an economic point of view, the minimum payback period was 3.4 years, and butane provided the best result regarding this criterion.

Smolek et al. [66] developed an interdisciplinary simulation model applied to energy efficient industrial applications. All aspects of the industry are taken into account, classified into the energy system, building, logistics and production and equipment. The production durations, energy consumption of the overall system by varying operating strategies, production schedules and environmental settings (time of year, climate, etc.) are taken into account. They applied the model to a real production facility producing baked goods, fresh as well as frozen by comparing two different scenarios. In scenario 1, production occurs during summer at temperature between 31 °C and 16 °C. Scenario 2 considers the same production settings during the winter the ambient temperature varying between −14 °C and −6.5 °C. The authors stated that their model is useful to predict material flows and energy demand of any factory.

Gambini and Vellini [67] developed an analysis aiming at selecting and optimally designing cogeneration units in the industrial sector in the light of the new high-efficiency cogeneration regulatory context. A comprehensive characterization of industrial sectors to evaluate the thermal and electric energy consumption, annual production, as well as an analysis of each cogeneration technology is provided. They define a performance indicator suitable to choose the best cogeneration technology suited to an industrial process, and provide the following useful guidelines: (i) internal combustion engines represent an appropriate technology for almost all investigated industrial processes by reaching the best performance for small electric sizes; (ii) combined cycle power plants with condensing turbine are suitable for heat demand and large annual production industrial processes; and (iii) steam power plants attain worse energy, economic and environmental performances, therefore, they are recommend for few industrial processes.

Wolf et al. [68] focused on the performance evaluation of three different heat production processes for supplying industrial processes in the paper and pulp industry. The aim of these processes—a gas turbine equipped by a heat recovery boiler, a high-temperature heat pump recovering waste heat and a gas and steam turbine combined cycle process—is the production of heat as 4 bar (abs) saturated steam. The thermodynamic and economic efficiency of three processes are compared based on costs of heat and exergy flows. The results show that the heat pump (working with a COP of 4) provides a share of between 45% and 76% of the heat and it has higher exergetic efficiency and the best economic technology in case of the natural gas price is 25 €/MWh and the electricity price is lower than 45 €/MWh. The authors state that the quantitative results of this paper can be helpful to industrial plant and electricity grid operators, in order to obtain a flexible power production. In particular, the electricity can be produced during the high electricity prices hours and purchased from the grid to supply heat pumps during low electricity prices, thereby balancing out supply and demand mismatches in the electricity grid.

Keppert et al. [69] dealt with the utilisation of red clay-based ceramic dust powder, generated as a waste product in the production of hollow bricks, as a sorbent for heavy metals (Cu, Pb and Zn). The experiments show a decreased sorption capacity with this sequence: Cu > Pb > Zn. The waste ceramic powder resulted in a very efficient cement substitute although the adsorbed metals, mainly in the case of Cu, significantly reduces the rate of setting and strengthening of concrete.

Baksa et al. [70] tested the marine sediments of the Port of Koper as appropriate raw materials for the brick industry, particularly for the production of clay blocks, roofing and ceramic tiles. They carried out various analyses to determine if the marine sediments are suitable and environmentally friendly for their use in the brick industry. From their tests, aiming at verifying the mechanical properties and the frost-resistance of the materials, the authors showed that without any additives, marine sediments exhibit too much shrinkage in drying and firing (about 12% vs. 3–4% of the usual shrinkage of brick clay), as well as higher water absorption than the normal values of 20%. However, by adding suitable additives, such as clay, marine sediments are suitable for producing clay brick products.

Chang et al. [71] presented a study concerning the environmental benefits/impacts and the carbon storage of the plybamboo industry in Taiwan. They compared several materials, by means a life cycle assessment (LCA), obtaining the following main results: the low environmental impact is reached by plybamboo, but its impact is higher than the concrete one, having the lower environmental impact and higher global warming index.

Dusek and Hofmann [72] modelled the integration of a Ruths steam accumulator with phase change materials and electrical heating elements to increase the efficiency of industrial processes, applying steam as heat transfer medium. In particular, phase change materials surround the Ruths steam accumulator, storing the excess steam in order to consume it subsequently at high charging and discharging rates. After about 50 min the stored energy significantly increases with respect to the Ruths steam accumulator one, 0.34 vs. 0.45 MWh.

Royo et al. [73] proposed different retrofitting scenarios for improving the environmental and energy efficiency in aluminum industry. They focused on the manufacturing of an aluminum billet, namely alloy production, heating, extrusion and finishing, by proponing and comparing a novel technology based on direct current (DC) induction with the reference standard techniques, such as natural gas heating and alternating current (AC) induction heating system. Four typical European electricity country mixes were taken into account (Greece, Spain, Italy and France) to highlight their effect on the environmental impact when DC induction solution is adopted. The novel technology showed a lower impact (up to 23%) in most indicators. Reductions of up to 8% of GHG emissions are obtained in every country. With regard to the conventional global warming indicator, in France (the best-case scenario), the global warming indicator notably decreases about 80% and increases 50% in Greece.

Wiese and Baldini [74] proposed a simulation method to optimize in detail operational features of the industry area. They applied their model to a Danish case study, concentrating on the structure of the energy use by considering the end-use processes (drying, heating/boiling, space heating, lightning), to the geographical mapping of industrial energy consumption, and measures for fossil fuels (electricity, gasoil, kerosene, natural gas) and CO_2 emissions. To cut fossil fuels they recognized the following options: electrification (heat pumps due to their flexibility to combine electricity to provide heat at different temperature levels), energy cascading, biogas, biomass and renewable gas. The potential end-uses to reduce the adoption of fossil fuels are space heating, low temperature and electricity processes. Particularly, excess heat and savings can possibly contribute up to 9 PJ and 38, respectively. Biogas (35–170 PJ), biomass (75–315 PJ) and renewable gas can also represent a great opportunity for fossil fuel reduction. Gourlis and Kovacic [75] developed a dynamic thermal simulation model proposing several passive measures for avoiding summer overheating in an existing single-story metal processing factory in Berndorf, Austria. The examined passive measures were night natural ventilation, the adoption of a water-based elastomeric cool roof coating on the existing roof, with 0.87 infrared emittance and 0.87 solar reflectance, white venetian blinds on the south oriented façade windows, exterior solar shadings and light grey roller shades on the south side of the saddle shaped roof skylights over the main hall, the thermal improvement of the building fabric. Both the exterior shading and cool coating on the roof improved thermal environment with overheating occurring less than 1% of the time.

Other papers presented in the SDEWES SIs concerning this topic were: the recovery of valuable industrial metals from household battery waste [76], the optimal operating strategy of a trigeneration layout for an engine manufacturing facility [77], the exergy-energy analysis of geothermal energy-assisted milk powder production line [78], the waste-heat recovery for low-temperature applications in an electric steelmaking industry [79].

2.3. Biomass and Other Miscellaneous Energy Systems

Biomass is the most promising renewable energy source to obtain a sustainable development as assessed by the several studies concerning this topic included in the previous SDEWES SIs.

In this field, the replacement of the conventional fossil fuels with biofuels (biogas, bioethanol, biodiesel, etc.) represents the most promising solution to reach the decarbonization targets. Consequently, a lots of papers investigating this topic are included in previous SDEWES SIs and summarised in Table 3.

Table 3. Topics, methodologies and outcomes of the previous SDEWES papers dealing with biomass and other miscellaneous energy systems.

Reference	Topic	Methodology	Main Outcomes
[80]	Liquid and gaseous bioethanol	Modelling and experimental analysis	Lower NO_X emissions compared to diesel oil
[81]	Napier grass for bioethanol in heavy metals contaminated soil	Experimental analysis	Sustainable solution
[82]	Biofuel in Finland transportation	Multi-objective dynamic biofuel cycle model	Decrease in fossil fuel consumption for heavier vehicles
[83]	Energy recovery from manure of different livestock farms	Numerical model	Biogas and syngas for cogeneration, waste minimization
[84]	Wood biomass microcogeneration	Experimental analysis	Syngas chromatograph characterization and efficiency evaluation
[85]	Bioethanol production rice paddies and forest sector	Numerical evaluation	Bioenergy supply and carbon sequestration from biomass wastes
[86]	Agroindustrial waste for the biosorption of chromium and lead ions from aqueous solutions	Experimental analysis	Comparative analysis
[87]	Microalge into Fischer–Tropsch liquids, hydrogen, electricity, and thermal energy	Numerical model	Carbon emissions reduction per ton of microalgae
[88]	Microalge into biogas	Experimental analysis	Suggestions for enhancing biogas production
[89]	Spent coffee grounds into bio-oil	Monodimensional model and experiments	Bio-oil production peak at 500 °C
[90]	Poultry wastes into biofuel	Experimental analysis	Pyrolysis processes for enhancing bio-oil production
[91]	Urban rain gardens and herbaceous plants into bioethanol and solid biofuels	Dynamic simulation model	Carbon sequestration evaluation
[92]	Electricity, bioethanol and gasoline vehicles	Life cycle assessment	Carbon emissions reduction

Balog et al. [80] analysed the contaminant emissions of various aqueous bioethanol solutions in gaseous and liquid forms for the combustion in swirl burners. Liquid hydrous ethanol combustion is featured by 56% lower NO_X emissions with respect to the diesel oil combustion. Anyway, diluted alcohols increase production costs.

The Napier grass phytoremediation for bioethanol production is investigated by Chun et al. [81]. In particular, they evaluate the use of soil artificially contaminated with heavy metals (Zn, Cd, and Cr) for biomass production. For biomass containing heavy-metal the fermentation ethanol concentration was higher than the control biomass: 8.69–12.68, 13.03–15.50 and 18.48–19.31 g/L in Zn, Cd, and Cr environments, respectively. Results show that the heavy metals had a positive effect on bacteria fermentation. Thus, for bioethanol production the Napier grass phytoremediation has a positive effect on the sustainability of environmental resources.

Palander et al. [82] investigated the energy performance of road freight transportation in Finland, with the increase of the local biofuel cycles in a 100% carbon-neutral wood procurement. They examined three end-user scenarios of advanced liquid biofuels with a 5%, 15% and 30% decrease in fossil fuel consumption and different heavier vehicles (60, 68 and 76 t) in wood transportation. Due to the fossil fuel decrease, the energy ratio of the total renewable wood energy input divided by the fossil-fuel energy input to drive the system, increased 43% with wood-based transportation.

Milani and Montorsi [83] developed a numerical tool for the efficient exploitation of biomass by applying their model to a suitable reference case. In particular, the energy recovery from manure of different livestock farms in Modena, Italy, is analysed. Different waste to energy technologies, such as anaerobic digestion, gasification and incineration and several vegetable and animal biomasses, are considered, to produce biogas and syngas for a cogeneration producing electric and thermal power. The annual electric production from the animal farming manure proved to exceed by 195.7% the energy requirement of the whole agricultural industry in the province. The system minimizes the amount of waste that has to be disposed to 3–6%.

Villetta et al. [84] present an experimental analysis of a gasifier coupled to a micro internal combustion engine (20 kW_e), supplied by wood biomass. The gas chromatograph characterization of the produced syngas revealed that the main system inefficiency occurs in the gasifier. Due to the lower heating value of the produced syngas (equal to 3731 kJ/Nm^3), the combustion engine's electrical efficiency does not exceed 22.5%, and the global electrical efficiency of the plant is about 13.5%.

Chang et al. [85] presented a case study regarding the utilisation of waste biomass derived from an enhanced production from rice paddies and from the forest sector in Taiwan. They aim to replace gasoline by the bioethanol production from biomass. The authors evaluate that biomass wastes from rice paddies and forest sector could generate 31.69 PJ and 222.37 PJ annually, respectively, when bioethanol is used.

Boeykens et al. [86] experimented the adoption agroindustrial waste as low-cost alternative method for the biosorption of lead ions and chromium from aqueous solutions. The evaluated agroindustrial materials were sugarcane bagasse, peanut shell, avocado peel, wheat bran, banana peel and pecan nutshell. Wheat bran obtained the highest percentage of lead removal (89%). For all tested biosorbents, a percentage of chromium generally much lower compared with lead is obtained, the banana peel being the most efficient with a 10% removal.

Graciano et al. [87] developed a model based on the thermochemical conversion of microalgae biomass into Fischer-Tropsch liquids, hydrogen, electricity, and thermal energy via polygeneration. This kind of plant presents better energy performance for the microalgae conversion into liquid transportation fuels compared with conventional biomass-to-liquid-fuels and therefore reduced equivalent CO_2 emissions. In particular, it is obtained microalgae can displace fossil fuels at a rate of 0.23 m^3 of liquid fuels, 16 kg of hydrogen and 430 kWh of electricity per ton of microalgae. The displaced fossil fuels would reduce carbon emissions at a rate of 560 kg of carbon dioxide per ton of microalgae.

Marques et al. [88] developed a method to enhance the biogas production by means the pre-treatment of the microalgal biomass. They detected that the best biogas yields (compared to fresh biomass without hydrolysis) is obtained with the thermochemical hydrolysis during the anaerobic digestion with biomass acidification using CO_2. For fresh biomass and biomass hydrolysed for 60 min and 120 min, the resulted biogas yields were of 97.5, 146.4 and 61.3 mL/L day, respectively. This work proves that the substitution of sulphuric acid with CO_2 as acidification agent and the use of waste energy from flue gas result in an additional potential of CO_2 utilisation.

Codignole et al. [89] developed a monodimensional model for the prediction of spent coffee grounds bio-oil production through the fast pyrolysis in a screw reactor. The obtained oil yields are in the order of 56% with the peak of bio-oil production is obtained experimentally at the intermediate temperature of 500 °C.

Kantarli et al. [90] examined the potential of poultry wastes as feedstock in non-catalytic and catalytic fast pyrolysis processes for their conversion into biofuel. Pyrolysis of poultry meal showed high amounts of bio-oil, while pyrolysis of poultry litter high amounts of solid residue owing to its high ash content. All bio-oil samples from the pyrolysis of poultry wastes contained relatively high amounts of nitrogen (9 wt% in the case of poultry meal and ca. 5–8 wt% in the case of poultry litter) compared with bio-oils from lignocellulosic biomass.

Chan et al. [91] introduced a new dynamic model to simulate the carbon sequestration potential from urban rain gardens with woody and herbaceous plants. They investigated the conversion of carbohydrates into bioethanol and lignin into solid biofuels. The simulation results suggested that the maximum carbon sequestration potential of the studied urban rain garden can increase from 6.7 kg/m^2 to 14.7 kg/m^2 through harvesting and converting the plant-derived biomass into biofuels.

Picirelli et al. [92] performed a comparative environmental life cycle assessment of conventional vehicles with different fuel options (electricity, bioethanol, gasoline), for a sustainable transportation system in Brazil. The replacement of 50% of the internal combustion engine gasoline vehicles fleet by bioethanol vehicles would decrease annually the carbon emissions around 45.8 Mt CO_2-eq. (33% of the total emissions).

Szulczewski et al. [93] investigated a novel method for the estimation of biomass yield of *Miscanthus giganteus* in the course of vegetation. They modelled the biomass growth by simple measurements of the shoot length, mass and diameter. On the basis of experiments data, a correlation of two features of *Miscanthus* shoot volume index and shoot mass was determined. The number of shoots per plant was estimated by shifted Pascal distribution. The accuracy of estimation of is strictly dependent on the number of shoots on which biometric measurements are performed. The authors concluded that the best trade-off is obtained for 10 shoots of *Miscanthus*.

Many papers were presented in the previous SDEWES SIs concerning this topic, namely: hybrid biomass-solar systems [94], marine vehicles supplied by biofuels [95], analysis of active solid catalysts for esterification of tall oil fatty acids with methanol [96], biogas production by an integrated system for sewage sludge drying through solar energy [97], multi-criteria and principal component analyses in soybean biodiesel production [98], hydrothermal conversion for lignocellulosic biomass for the production of lignin, syngas or bio-oil [99], animal waste from tanneries as fuel and for biogas production [100] and valorisation of agroindustrial wastes to produce hydrolytic enzymes by fungal solid-state fermentation [101].

3. Research Topics Represented in This Special Issue

After the review process, 24 papers from 13th SDEWES Conferences were selected for this SI. The main ideas of these papers that are among the best articles presented at the conference are briefly reviewed in the following subsections.

3.1. Energy Policy and Energy Efficiency in Urban Areas

Weiler et al. [102] presented a novel methodology for the design of central energy generation and supply scenarios, including district heating systems. The tool is based on a 3D urban modelling approach. This paper aims at significantly contributing to the development of suitable tools to be used to improve energy and environmental issues in urban areas. In fact, cities are responsible for more than 60% and 70% of the energy demand and of CO_2 emissions, respectively. In particular, according to EU targets, CO_2 emissions must be reduced by 80% by 2050 with respect to the levels of 1990. To achieve this goal, cities' energy demands must be first estimated and then reduced. Several tools are presently available for the simulation of district-scale energy systems. Such systems are considered crucial for the future transition toward a fully renewable energy system. In this framework, heat pumps powered by renewable electricity and cogeneration plants supplied by renewable gas are considered extremely promising to achieve the goals in terms of energy efficiency and reduction of CO_2 emissions.

The present study presents calculation models for district heating systems including both the above-mentioned devices. The model was developed within the simulation engine INSEL 8.2, under development at the University of Applied Sciences Stuttgart. Suitable building simulation models are employed to model the buildings included in the district under investigation. Building heat demand analysis is performed using the German standard DIN 18599. In addition, a special procedure, according to the German standard VDI 4710, is employed to transfer monthly data into hourly ones, required to perform a dynamic simulation of the system under investigation. As for the heat pump, this device is modelled using a data-lookup approach. In particular, a polynomial fit curve is used in order to calculate output data as a function of source and sink temperatures. A similar simplified approach is used to simulate the performance of the combined heat and power (CHP) system. Suitable models are also used to simulate a central storage system and the district heating network.

A case study is developed for a small town in the South of Germany, close to Stuttgart, where the local government aims at achieving climate neutrality by 2050. In particular, the town of Walheim in the district of Ludwigsburg was selected. It includes 3200 inhabitants and it is located next to the River Neckar. The developed 3D CityGML model includes 1610 buildings. Therefore, the size of the CityGML file is relatively small, determining limited calculation times. Authors assumed a future scenario achievable around 2050, when all buildings will be refurbished according to the present German legislation EnEV 2016. Therefore, all the buildings are featured by low-temperature heating devices and they can be supplied by low-temperature district heating systems. As mentioned before, the model first evaluates the monthly heating energy demand and then such data are reported on an hourly basis using VDI 4710. Then, PV systems were suitably designed taking into account roof area availability, their shape, and their orientation. A nominal power of about 6.4 MW was calculated. The CHP unit nominal power was 2.0 MW and it runs for about 4000 h per year.

Results show that the scenario including the heat pump, HP, powered by photovoltaic panels, PV, suffers for the winter operation due to the low solar availability, determining a solar fraction close to 15%. This is due to the fact that PV electricity is mainly available in summer, whereas HP electrical and thermal demand mainly occur in winter. As for the CHP unit, it seems very attractive only when supplied by renewable energy sources (e.g., biogas or gas from P2G). Authors also concluded that a suitable mixture of renewables must be designed (e.g., wind, solar, biomass, etc.) in order to achieve a good match between demand and generation. In this framework, the appropriate selection of different storage management schemes is crucial in order to achieve the above mentioned matching. This paper proved that the development of accurate urban energy simulations models is crucial for building authorities or municipalities in order to calculate user demands and to evaluate possible future scenarios including energy efficiency and renewables.

Dominkovic et al. [103] focused on the selection of the optimal capacity of storage systems in district cooling systems. They started from the same energy policy scenario pointed out in the previous paper. Cities are responsible for the largest amount of total CO_2 emissions. Therefore, all the actions aiming at reducing CO_2 emissions in cities are major drivers for achieving the recent goals established by the Paris Agreement in terms of energy and environment. In addition, cities also suffer for a dramatic problem related to the air pollution which is instrumental in the premature death of about 6.5 million people per year. Once again, both CO_2 and pollutant emission problems may be limited by reducing the amount of fossil fuels converted in different forms of energy. The authors of this paper performed a detailed literature review analysing the recent papers investigating the problem of CO_2 emission reductions in cities. They showed that a number of recent papers analysed different aspects of this problem, such as: energy planning, use of renewables, matching between production and demand, novel and advanced energy storage systems. This last was especially important for the authors who noticed that only a few authors focused on the problem of cold storage in district cooling systems, whereas the problem of heat storage in district heating system is widely investigated. On the basis of the literature review, this paper aims at analysing the optimal selection of storage technology and capacity, while also including socio-economic costs. The calculations are performed using an energy planning model previously developed by the authors.

A suitable case study is presented for the case of Singapore due to its high degree of urbanization. In addition, in Singapore, the space cooling demand is extremely high and district cooling systems are a common selection and the large population density and the high GDP results in a dramatically high energy use per capita. Several different technologies were analysed by the optimization tool: solar thermal collectors, absorption chillers, heat pumps using the waste heat from datacentres as heat sources, thermal energy storage systems, geothermal energy, electrical storage, combined heat and power plants powered by natural gas or renewables, wind turbines, photovoltaic panels, vehicle-to-grid technology, gas and hydrogen storage, fuel cells and solid-oxide electrolysers, syngas, individual chillers and reverse osmosis desalination of seawater. Several optimizations are performed to calculate the optimal configurations. In particular, the authors aimed at calculating the difference the optimal configurations of the energy systems without and with the large-scale energy storages. Similarly, the optimization tool was used in order to calculate the optimal capacities of the components, based on different shares of individual and district cooling. Results show that the optimal district cooling share for the case of Singapore was 30% when PV capacity is selected on the basis of the spatial constraints. A similar result is also obtained when unconstrained PV capacity is considered, assuming nearby space outside of the city borders.

The problem of the limitation of CO_2 and pollutant emission in cities was also addressed by Smajla et al. [104] investigating the use of liquefied natural gas (LNG) in heavy truck traffic. In particular, they focused on the possible benefits achievable by the use of LNG rather than diesel in heavy-duty vehicles for the EU market. They analysed the papers available in the literature investigating this topic, presenting a detailed literature review of the works considering different energy, economic and environmental aspects of the LNG utilisation in vehicles. In this paper the authors also analysed in detail the main characteristics of LNG in terms of physical and chemical properties and they presented the main technique of production and storage along with the main economic data. They focused on the various fields of application of LNG and they also analysed all the financial aspects of the fuel switch. In fact, LNG trucks are about 30–40% more expensive than conventional diesel trucks. However, LNG trucks present a fuel cost of 0.306 USD/km, which is much less than the 0.444 USD/km for diesel trucks.

The authors also analysed the environmental aspects related to the use of LNG in vehicles. They concluded that GHG emissions may be reduced by 67%. From a safety point of view, LNG shows similar features with respect to the other fuels. It is only worth mentioning that LNG is cryogenic and it may be harmful for skin or eyes. Thus, visor, gloves and other forms of protection must be mandatorily used when handling LNG. The authors also performed an investigation of the LNG filling infrastructure in EU and they found that several EU countries—mainly the UK, The Netherlands and Spain—present a reasonable number of LNG filling stations. The technology of those filling stations along with the LNG heavy trucks was also analysed in detail.

A case study was presented for a region in Croatia that has a great geostrategic position. Here, no LNG fuel infrastructure exists and no LNG vehicles are registered in the country. Some prototypical project related to LNG are going to be founded by the Croatian government and a series of legislation acts are going to promote this LNG technology. A specific proposal for the case of Croatia was included in the present work. In summary, the authors show that LNG use in transportation sector is extremely profitable from both environmental and financial points of view. On the other hand, LNG is still scarcely used due to lack of infrastructures. The poor availability of LNG filling stations dramatically limits the use of LNG vehicles, and vice versa. The authors conclude that significant measures must be implemented by EU countries in order to stimulate LNG market.

Testi et al. [105] focused on the optimal operation of microgrids in a cluster of buildings located in a campus combining cogeneration and renewables. In fact, renewable energy sources are often unpredictable whereas cogeneration plants can be dispatched. This technology is also highly supported by EU government, also suggesting combining cogeneration with: decentralized systems based on renewables, district heating and cooling and heat pumps. Several studies are available in the literature analysing this topic, addressing several problems, such as optimal selection of synthesis/design variables, optimal operation and control strategies according to energy, economic and environmental objective functions. In this work, the authors present a novel configuration for smart multi-energy microgrids. These systems include distributed energy units and a centralized cogeneration supplying thermal energy to a micro-district heating network. For this system, the authors investigate the benefits of integrating reversible heat pumps in buildings included in such systems. The heat pumps are crucial in the thermal/electrical balance between production and demand, since they can shift space heating demand from heat to electricity and they can significantly enhance the operative flexibility of the microgrid as well as promote the renewable energy technologies integration.

The authors considered a complex system layout including a plurality of devices, namely: gas-fired boilers, solar thermal collectors, cogeneration unit, photovoltaic panels, wind turbines, electrical grid, thermal storage, electrical chillers and heat pumps. The system supplies space heating and cooling energy, domestic hot water and electrical energy to the users. In order to perform the calculations a suitable simulation model was implemented. A case study was analysed for a campus located in Trieste, Italy. The campus includes: classrooms, offices, dining halls, gyms and dormitories. The optimization was performed aiming at reducing the total annual energy cost. The results proved that the utilisation of heat pumps is beneficial from several points of view. In fact, heat pumps significantly improve the flexibility and cost-effectiveness of the considered energy system. In summary, the proposed system exhibits an 8% total-cost saving, 11% carbon emission reduction and 8% primary energy saving with respect to the centralized reference case. The novel proposed system also allows a 40% reduction in the electricity exchange with the grid.

Kona et al. [106] presented a study related to the analysis of the role of the local authorities and cities as one of the main driver for the energy transition toward a more sustainable system. This paper is a part of the Covenant of Majors initiative and it aims at proposing a new method for indirect accounting of emissions in cities. In fact, in the last few years several local authorities adhered to several different initiatives aiming at mitigating the issues related to the climate change. In particular, the Covenant of Majors initiative aimed at reducing the CO_2 emissions levels by at least 20% by 2020 or at least 40% by 2030. This goal will be achieved through so-called Sustainable Energy Action Plans (SEAP). SEAP has been also combined with climate risk assessment in Sustainable Energy and Climate Action Plans (SECAPs). This paper, analyses in detail climate mitigation action plans for 2020. The CoM is a unique feature of multilevel polycentric governance that goes far beyond transnational city networking [11]. This initiative is supported by the European Commission and the last goal was established at a reduction of 27% of the GHG emissions by 2020, starting from a 23% overall reduction already achieved. A suitable calculation procedure, also based on techniques available in literature, has been implemented in order to calculate indirect emissions. In particular, authors analysed both the location-based method, the market-based method and the efficiency method. Then, authors also presented a detailed overview of the EU energy and climate policies and urban energy and climate government to support sustainable energy and climate actions plans. In this framework, the authors analysed the key measures to be implemented to achieve the above-mentioned goals. They found that those goals could be achieved by a variety of technologies, namely: photovoltaic, solar thermal, wind energy, hydroelectric power, bioenergy, geothermal energy, combined heat and power systems, district heating and cooling, smart grids and waste water management.

Hammad et al. [107] focused on smart cities, presenting an optimization of zoning, land-use and facility location. Once again, the authors start from the analysis of energy consumption in the world, pointing out that the majority of this consumption is due to the urban regions where almost 55% of the overall world population lives. In this framework, this paper focuses on location planning in smart cities. The authors considered three aspects: (i) the guidelines for the construction of a smart city from scratch, considering zoning and land use; (ii) the location of buildings in smart cities; and (iii) the determination of the effects of the selection of such locations. The authors considered appropriate social, environmental and economic cost objective functions. As a consequence, the work provides suggestions regarding the allocation of zones and the assignment of buildings to locations in the region, the expansion decisions related to the road structure of the city and the expansion of the capacity of existing links in the network (if one already exists). In this paper, several mathematical optimisations are implemented in order to model key strategic decisions in smart city design and planning.

The authors first analysed in detail the papers available in literature analysing this topic, pointing out the novelty of their approach with respect to the main techniques previously presented. In fact, the authors aim at providing useful guidelines for the planning and design of city zoning, including the selection of building location and transport networks in smart cities. The model implemented in this work was used for a case study related to the design of the urban structure of a smart city. A lexicographic approach showed that the variations in cost can be up to 52% when the objective function is based on carbon emissions. Considering, the e-constraint method a trade-off cost of up to 471% is obtained when the considered objective functions are simultaneously optimised. In order to examine the computational performance of the proposed approach, a total of 350 instances were solved. The authors also tested computational times, showing that the proposed model was able to solve about 72% of the proposed instances within the 1000 s. The authors also compare GA and PSO algorithms, showing that GA was the fastest, even if its accuracy was about 68% lower with respect to the exact approach.

In the framework of sustainability, Hoehn et al. [108] focused on food loss management strategies. The authors point out that the food supply chain is extremely inefficient and is responsible for a significant amount of pollution. This circumstance is due to the industrial procedures, to the chemical products used in agriculture, to the excessive use of packaging and to the huge transportation costs. All these factors cause significant energy and environmental costs. These costs must be reduced using a different objective functions, also including the environmental one, in order to improve the efficiency and reduce food losses. The approach is based a food waste-to-energy-to-food approach. The authors proposed an empirical index to quantify food losses nutritional energy. They considered different scenarios of utilisation of these food losses: (i) biogas production by landfill; (ii) incineration recovering energy, (iii) anaerobic digestion. The authors found that the production of 1 kJ of nutritional energy requires about 8.7 kJ of primary energy. Such consumption is mainly due to the distribution and agricultural production stages. The authors analysed 11 categories, showing that fish and seafood, vegetables, meat and pulses presented the lowest values of the developed index. In addition, the embodied energy losses are mainly due to the consumption stage, which accounts for more than 66% of the total. The consumption stage is responsible of the highest food energy. The highest primary energy demand is due to the distribution stage, although this stage produces the lowest food energy losses. The authors concluded that the efficiency of the food supply is highly affected by the food category under study. In addition, they also found that anaerobic digestion is the best option for biogas production. Finally, this process maybe further beneficial for the generation of different additional by-products, such as hydrogen or methane recovery.

3.2. Energy Efficiency in Industry

Sakamoto et al. [109] analysed the water reuse in a cooling tower. The water consists of an oil refinery effluent. This study aims at facing the problem of water scarcity by obtaining water using an effluent stream. Several research articles investigate water reuse in different applications, using a variety of different approaches. The novelty of this paper lies in the application of LCA for the evaluation of available technologies for water reuse in a closed-loop process. Thus, the paper calculates the environmental performance of different systems to be used as effluent treatment plant from an oil refinery located in Brazil. The analysis is performed using a 'cradle-to-gate' approach. In particular, the methodology implemented in this paper consists of the following procedures: definition of the quality of the effluent entering the wastewater treatment plants of the refinery; selection of the process which will use the treated water; selection of water recovery strategies; analysis of the operational conditions and technological approach; calculation of emissions and resource consumption; design of mathematical models; application of the LCA technique for each scenario; and critical analysis of the results.

As mentioned before, different arrangements are analysed, including reverse osmosis, evaporation and crystallization. The lowest impacts indices are achieved by the scenario using waste heat to drive the evaporation process. Nevertheless, because the operation of other refinery sectors affects the operation of this arrangement, the alternative is not recommended. Therefore, authors concluded that the scenario including coprecipitation as a pre-treatment technique for reverse osmosis-fed effluent and steam recompression driving the evaporator shows the lowest impact scenario. Finally, the authors noted a certain variability among the observed scenarios. However, the results clearly showed that desalination is an efficient alternative in the reduction of effluent discharge and water consumption. Such results can be further enhanced by using less environmentally aggressive for salts removal in the pre-treatment plant.

Gambini et al. [110] presented a case study for a cogeneration system for a paper industry in Italy. Cogeneration is a very mature and efficient technology which allows one to simultaneously produce thermal, cooling and electrical energy. This technology has been significantly supported by EU governments over the past years since cogeneration allows one to significantly reduce the consumption of fossil fuels thereby simultaneously reducing CO_2 emissions. In particular, the financial support significantly depends on the overall efficiency of the system, in turn depending by the amount of available heat consumed by the user. A case study is developed for the pulp and paper industry, specifically referring to an Italian industry. A suitable simulation model was developed in GateCycle software. The authors analysed different cogeneration systems to be used in the paper mill and pulp industry. The calculations were performed using real data regarding time-dependent energy consumptions. The analysis is performed from thermodynamic, economic, and environmental points of view, comparing different cogeneration technologies, namely: steam power plants with condensing turbine, steam power plants with backpressure turbine, gas turbines, combined cycle power plants and internal combustion engines. High-efficiency cogeneration, defined according to the guidelines issued by the European Commission, has been considered in the economic calculations. Results show that a gas turbine is the best technology for this sector.

Another possible method to save energy is the utilisation of waste heat for different purposes. This possibility was investigated by several authors in this SI. In particular, Xu et al. [111] presented the optimization of waste heat recovery in a sinter vertical tank by a numerical simulation. They focus on the generation of the waste heat in the production process of the steel industry. The authors analyse two different aspects—heat transfer quantity and heat quality—and implement a multi-objective optimization, based on a genetic algorithm. The optimization procedure includes a back-propagation (BP) neural network. This is a feed-forward neural network trained using the error back-propagation algorithm. This method uses the gradient descent method in order to evaluate the minimum of the square of the network error. This technique is applied considering as objective functions exergy destructions caused by heat transfer and heat flows. An appropriate CFD numerical model is implemented to perform the calculations. This model consists in continuity equations, momentum equations, k-equations and ε-equations. In addition, energy equations are also implemented for both gas and solid phases. Once the thermodynamic conditions are obtained, a suitable exergy model allows one to calculate exergy flows and exergy destructions for the simulated systems. The developed model shows good performance in the simulation of the heat recovery of the sinter. The authors also found that the higher the sinter particle diameter, the lower the outlet air temperatures and the higher the outlet sinter temperatures. The exergy analysis shows that with an increase of the air mass flow rate, the exergy destruction due to the fluid flow and the heat transfer both gradually increase. In addition, the higher the sinter flow rate, the lower the exergy destruction due to the fluid flow and heat transfer.

Another paper dealing with heat recovery is presented by Kilkis [112]. Kilkis focused on the possible recovery of waste heat by the flue gases of power plants. This recovery must be performed using forced-draught fans in order to avoid affecting the performance of the power plant. Additional parasitic loads are due to the circulating pumps. Thus, the useful effect is the thermal recovery and the "fuel" is represented by the parasitic electrical loads. This problem was analysed using an exergy analysis. The paper performs a comparative analysis of four technologies for electricity generation: thermoelectric generators; organic-rankine cycle with or without a heat pump. These technologies are further compared with the direct use of the thermal exergy. A new optimization method based on exergy analysis is developed in order to calculate the optimum control strategies. A case study was performed for one of the presented methods, showing that the proposed method provides a number of additional results which cannot be achieved by conventional techniques.

Another numerical study was performed by Wang et al. [113]. They focused on packed beds, which are diffusely used in industrial applications in order to enhance heat transfer. This problem is very difficult from the numerical point of view since the flow structure inside the packed bed is very complex, due to the different distribution paths. This circumstance dramatically depends on the tube-to-particle ratio. Several studies are available in the literature addressing this problem using a variety of different methodologies. Even if several papers focused on this topic, only the analysis of multi-size particle mixing and its distribution are still under debate. Therefore, authors implemented a CFD-DEM method to perform a full numerical simulation is developed for packed beds with low tube-to-particle ratios. The work aims at restraining wall effects, reducing the porosity near the wall, and strengthening the heat transfer in the core area. Entransy dissipation is used as objective function. The authors found that the radial distribution of the particle size dramatically affects the bed velocity and temperature distribution. They also concluded that the heat transfer performance can be enhanced by filling small particles in the near wall region. The increase of distribution thickness can improve the heat transfer reducing the equivalent thermal resistance.

Haflzan et al. [114] analysed a heat exchanger network from both energy and economic points of views. This topic has been widely investigated in literature using many different approaches, including pinch analysis, exergy analysis, thermo-economic optimizations. This paper discusses a technique to manage temperature disturbances in the design of heat exchanger networks, maximizing heat recovery. The paper investigates the impact of the supply temperature variations on heat exchanger sizing, utility consumption and bypass placement. The authors also aim at reducing the consequent fluctuations on downstream heat exchangers. The authors implemented the plus-minus principle for process changes and new heuristics methods for the heat exchanger sizing and bypass placement. The novel methodology proposed by the authors is divided in several steps: stream data extraction with disturbances, maximization of heat recovery at the rated conditions using pinch analysis, construction of the grid diagram, management of temperatures disturbances. This methodology was applied for two case studies and the results show that the configuration of the heat exchanger network is maintained for all the cases. Furthermore, the exchanger areas are designed at the maximum capacity, including a suitable bypass to manage some critical operating conditions. The proposed methodology improved the annualised utility cost by up to 89%.

Kuczyński et al. [115] focused on energy recovery in natural gas regulation stations by using suitable turboexpanders. In fact, natural gas regulation stations feature a significant energy dissipation, due to dissipative pressure reduction. The idea is to use a suitable expander to reduce the pressure, by simultaneously producing electricity. It is worth noting that a certain preheating is required before the expansion in order to limit the possible hydrate formation inside the pipes. Several system layouts were developed and investigated by a suitable model based on energy balances, suitable models for the calculation of fluid properties and an experimental correlation for the performance of the expander. The authors concluded that this technology is extremely profitable, but it suffers for a remarkable seasonal operation. In addition, the expander efficiency significantly decreases at part load conditions which occur for the majority of the operation of the system. The authors also developed some simplified formulas to be used as guidelines for energy and economic feasibility analyses of those systems.

Several ancillary topics were also investigated in this area. Ligus et al. [116] presented an experimental analysis aiming at optimizing the two-phase fluid flow in an airlift pump. These devices are used for the vertical transport of liquids using a gas. The paper focuses on the hydrodynamic effects of this device and the experiments are based on optimal image technique, using image grey-level analysis to identify two-phase flow regimes. The authors aim at evaluating the void fraction and pressure drops, and present a new technique for evaluating the optimum operating regime which can be used to detect stability and efficiency of liquid transport and to evaluate the correlation between the required gas flux and the total lifting efficiency.

Sapinska-Sliwa et al. [117] focused on borehole heat exchangers. They developed a new method based on thermal response tests based on resistivity equations. The study was also supported by experimental analyses to support the robustness of the developed methodology. Martinelli et al. [118] investigated a wave energy converter. This device is used for energy harvesting simultaneously protecting the coast erosion. Lab-scale tests were performed in order to evaluate the efficiency of the developed device. Under short regular waves, such experiments showed a 35% efficiency. On the other hand, the devices show a small effect in terms of coastal protection.

3.3. Biomass and Other Miscellaneous Energy Systems

The topic of the different possible utilisation of biomass for the reduction of primary energy consumption is also diffusely investigated in this SI. Pawlak-Kruczek et al. [119] analyse gasification and torrefaction processes. In particular, they focus on sewage sludge that is a residue of wastewater processing. This stream must be stabilized since it includes a number of pathogens and organic matter and it can be used for energy purposes. In some cases, in order to reduce the costs related to the management of the sewage sludge and to achieve the above-mentioned goals, it is dried by a suitable thermal treatment. An example of these treatments is torrefaction which is performed at high temperature, typically in anaerobic conditions. Oxygen is used only when flue gases are directly used as heat source. The torgas obtained by this process mainly includes hydrocarbons, water and carbon monoxide. As the authors point out in this paper, several works are available in literature presenting different analyses of torrefaction systems. A similar process is gasification which consists in the conversion a solid fuel in a mixture of gases. This process produces a syngas rich in hydrocarbons. However, a large amount of contaminants are produced by the gasification process. In fact, the typical value of tar ranges from 1 to 10 g/m^3. Dozens of papers are available in literature presenting different investigations of gasification processes, including thermodynamic, economic and environmental analyses. The literature review performed by the authors shows that there is a lack of knowledge in terms of the effects of the sewage torrefaction on the successive gasification process. The present study is performed using an experimental approach. In particular, a suitable experimental setup was manufactured in order to analyse the above-mentioned effect. This equipment includes a multistage tape dryer/torrefier, air blowers, pressure regulators, a combustion chamber in ceramic refractory, an allotermal gasifier. The tests showed that torrefaction is a viable solution to decrease the tar content of syngas. However, authors also concluded that a further research must be performed in autothermal gasifiers and that further tests should be performed in a pilot-scale gasifier to confirm the initial results obtained in the present work. Finally, the process must be further optimized in order to enhance its efficiency.

Gliński et al. [120] studied the utilisation of biomass in micro combined heat and power (mCHP) units for power peak shaving. This device will be used in order to mitigate the fluctuations of the electrical system, due to the massive use of unpredictable renewable energy sources. The authors focus on mCHP units fed by biomass-derived fuels such as methanol or externally heated devices (ORC or Stirling) powered by biomass fuels. The paper aims at developing a methodology to design a mCHP control strategy in order to reduce its power consumption. The proposed control strategy was compared with the conventional scenario, the heat and power production of a biomass-fired mCHP unit operating in an exemplary house. The calculation is performed using the data of a boiler powered by wood pellets coupled with a Stirling engine, manufactured by ÖkoFEN. Once again, the authors performed a detailed literature review aiming at showing the novelty of their approach with respect to the methodologies presented in previous papers. A case study was analysed for a 250 m^2 house located near Warsaw showing an energy performance coefficient equal 110 kWh/m^2. For this case study, electrical, heating and domestic hot water demands were experimentally evaluated. The simulations of the system were performed using the energyPRO 4.0 software. Results show that using the new algorithm, the mCHP supplies 71% of the total demand for energy during the morning peak and evening peak. The new control strategy allows one to minimize electricity exchange with the grid. This effect is higher in the mid seasons when mCHP unit was able to provide up to 100% of the total morning peak energy demand and up to 83% of the total evening peak. In the summer, mCHP power production is lower than the demand to the low simultaneous demand of heat.

Hossain et al. [121] investigated the utilisation of nanoadditives on the energy and combustion performance of neat jatropha biodiesel. One of the main drivers to be implemented in order to achieve the decarbonization goals may consist in the utilisation of biomass-based fuels in the transportation sector. In this framework, biodiesel is a very attractive possibility. It can be used in a variety of blends in internal combustion engines. Biodiesel can be either produced by edible or non-edible crops. As pointed out by the authors of the paper, several studies are available in the literature investigating many aspects related to the production, conversion and utilisation of biodiesel. The performance of the biodiesel may be significantly enhanced when suitable nanoparticles are added to the fuel. In particular, in the present work two nanoparticles are considered: cerium oxide and aluminium oxides. The authors produced jatropha biodiesel in the lab in two stages, esterification and transesterification. Nanoadditives-J100 fuel blends are tested in a multi-cylinder engine. The results of the experimental campaign showed that Ce = 2 nanoparticles failed to fully amalgamate with the jatropah biodiesel. In order to achieve such amalgamation, suitable surfactants must be used. The authors also found that the proposed fuel exhibited better performance in terms of CO, UHC and NO_x emissions. In addition, such fuel also shows a better combustion performance by lower smoke opacity values. Finally, the full load and part load thermal performance was comparable with the one achieved for other types of fuel.

Restrepo-Valencia et al. [122] analysed the utilisation of bio-energy with carbon capture. They also included suitable storage systems and they focused on a sugarcane mill in Brazil. This kind of technology is considered by the authors one of the key factors to achieve the recently established goals, in terms of control of global average temperature. In fact, the combined use of biomass-based fuels and the simultaneous utilisation of carbon capture technologies will significantly contribute to achieve the above-mentioned goals. The carbon capture technology includes several subprocesses: conditioning, which separates CO_2 into a pure stream, carbon capture, compression and storage. The authors applied carbon capture and storage technology to a sugarcane mill, presenting both technical and economic analyses. In particular, they focused on a representative Brazilian sugarcane mill, equipped with a cogeneration unit. A non-commercial software is adopted to model the system integration into sugarcane mills. The system was modelled in Suitable models are included for all the components of the system. The analysis showed that both from fermentation and combustion, CO_2 capture is technically feasible. However, in case of combustion, the energy efficiency is limited by the management of the surplus electricity. The authors concluded that other carbon capture technologies must be evaluated in order to limit the amount of electricity sold to the grid. Conversely, carbon capture from the fermentation seems very promising due to the low impact on the mill, the benefits on the ethanol carbon footprint and the moderate capital cost. The authors also show that biomass-based cogeneration units suffer for a lower electrical efficiency when compared to gas-fired engines. Finally, for the produced electricity, the authors suggest to first consider carbon capture technologies and then selling electricity.

Finally, in this research area, another paper is presented by Tanczuk et al. [123]. They analysed the use of chicken manure in the energy industry. They focused on the case of Poland, which is one of the main producer of chicken manure in EU area. The authors aimed at evaluating the technical feasibility of using this material for energy purposes and at evaluating the related energy potential. The goal is to reduce the costs of managing poultry manure as a waste by converting it into energy. The analysis is performed by a simplified approach on the basis of the data available for the case of Poland, in terms of production, composition and other properties of this material. The authors evaluated the heating value of the chicken manure at high moisture as come from the farms. The results of their analysis show that the yearly theoretical energy potential in Poland was about 40.38 PJ. Yearly technical potential of chicken biomass depends on the selected conversion technology and it varies from 27.3 PJ to 9.01 PJ. The highest energy degradation can be obtained when heat and electricity is produced via anaerobic digestion. Finally, the authors also concluded that fluidized bed combustion shows the highest energy efficiency.

In this special session a considerable number of papers also analysed an interesting topic, hydrogen, usually scarcely investigated within SDEWES SIs. Moser et al. [124] analysed the possibility to produce hydrogen, using solar energy and using thermo-chemical cycles. In particular, they focused on concentrated solar power system producing heat to be supplied to a two-step thermochemical cycle. Two different redox materials are used in this cycle: cerium dioxide and nickel ferrite. Once again, this study is developed in the framework of the recent policies aiming at mitigating the effects of climate change and at promoting a full decarbonized energy system. To this end, the production of hydrogen using solar energy is extremely promising since it is a carbon-free fuel, produced by renewable energy sources. Moser et al. present a detailed literature review related to the production of hydrogen, using solar energy, paying special attention to the solar thermolysis, capable to convert water in hydrogen and oxygen. The process consists of two steps. The first one is an endothermic thermal reduction step, the second one is exothermic water splitting. In this paper, they present a simplified model for the comparative analysis of different two-step thermochemical cycles. The model considers both technical and economic aspects. The components are modelled using a simplified 0-D approach, based on energy and mass balances, also including suitable kinetic models for nickel-ferrite and ceria. A case study is presented for a 90 MW solar hydrogen production plant. The authors aimed at minimizing the dumping of solar power. For both cases, the optimum reactors number per module has been calculated. The comparison of the two analysed scenarios showed that nickel-ferrite achieves lower efficiency than ceria (6.4% instead 13.4%). From an economic point of view, the feasibility of the system is limited by the high capital cost of the solar subsystem.

Kuczyński et al. [125] evaluated the possibility to use existing transmission pipelines to transport hydrogen and/or methane/hydrogen-rich gases. In fact, as mentioned in the previous study, hydrogen is a very attractive and promising fuel due to its scarce environmental impact. However, hydrogen infrastructure is still missing and extremely expensive. Therefore, several researchers are investigating the possibility to adopt existing pipelines of natural gas to transport mixtures of hydrogen and methane or hydrogen. The properties of hydrogen, however, are extremely different from those of methane. Therefore, hydrogen pipelines are much more complicated than natural gas pipelines. The authors developed an apposite hydraulic model to evaluate the practicability of transporting hydrogen in natural gas pipelines. The model calculates pressure drops, temperature changes and heat transfer also using a real gas model. The authors assumed an outlet pressure equal to 24 bar (g). The authors also found that the change in temperature depends on the pipeline length; the supposed temperatures were 25 °C and 5 °C. Another important issue is the hydrogen impact on natural gas transmission. The calculations showed that the maximum hydrogen share in natural gas should be lower than 15–20%, in order to preserve natural gas quality.

4. Comments

At the 13th Sustainable Development of Energy, Water, and Environment Systems Conference held in 2018 in Palermo, Italy, interesting topics concerning sustainable development and energy efficiency were discussed and presented. This SI presents some of this work within the following main topics: energy efficiency and energy policy in urban areas, energy efficiency in industry and biomass and hydrogen. The editors of this SI of *Energies*, dedicated to 13th SDEWES Conference, believe that the above reported papers are focused on topics considered pivotal for the *Energies* journal. Such studies can be considered as fundamental and potentially practical tools to promote and disseminate the energy sustainability in different sectors: industries, metropolitan and urban areas, waste heat recovery, waste materials, water-energy nexus, etc.

Information on the future SDEWES Conferences and related activities are available on the website of the International Centre for Sustainable Development of Energy, Water, and Environment Systems (SDEWES Centre).

Author Contributions: F.C. and M.V. prepared an initial draft of the manuscript, which was completed, corrected and reviewed by M.C., N.D., Q.W. and P.A.Ø.

Funding: This research received no external funding.

Acknowledgments: The guest editors thank the authors of the papers that submitted their manuscripts to this special issue for the high quality of their work. We also thank all the reviewers who provided valuable and highly appreciated comments and advice, and the managing editors of *Energies* for their patience and excellent support.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Berardi, U.; Tronchin, L.; Manfren, M.; Nastasi, B. On the Effects of Variation of Thermal Conductivity in Buildings in the Italian Construction Sector. *Energies* **2018**, *11*, 872. [CrossRef]
2. Urbaniec, K.; Mikulčić, H.; Wang, Y.; Duić, N. System integration is a necessity for sustainable development. *J. Clean. Prod.* **2018**, *195*, 122–132. [CrossRef]
3. Olawumi, T.O.; Chan, D.W.M. A scientometric review of global research on sustainability and sustainable development. *J. Clean. Prod.* **2018**, *183*, 231–250. [CrossRef]
4. Halati, A.; He, Y. Intersection of economic and environmental goals of sustainable development initiatives. *J. Clean. Prod.* **2018**, *189*, 813–829. [CrossRef]
5. Kono, J.; Ostermeyer, Y.; Wallbaum, H. Investigation of regional conditions and sustainability indicators for sustainable product development of building materials. *J. Clean. Prod.* **2018**, *196*, 1356–1364. [CrossRef]
6. Scordato, L.; Klitkou, A.; Tartiu, V.E.; Coenen, L. Policy mixes for the sustainability transition of the pulp and paper industry in Sweden. *J. Clean. Prod.* **2018**, *183*, 1216–1227. [CrossRef]
7. Stoycheva, S.; Marchese, D.; Paul, C.; Padoan, S.; Juhmani, A.-S.; Linkov, I. Multi-criteria decision analysis framework for sustainable manufacturing in automotive industry. *J. Clean. Prod.* **2018**, *187*, 257–272. [CrossRef]
8. Xia, B.; Olanipekun, A.; Chen, Q.; Xie, L.; Liu, Y. Conceptualising the state of the art of corporate social responsibility (CSR) in the construction industry and its nexus to sustainable development. *J. Clean. Prod.* **2018**, *195*, 340–353. [CrossRef]
9. Matsumoto, K.I.; Doumpos, M.; Andriosopoulos, K. Historical energy security performance in EU countries. *Renew. Sustain. Energy Rev.* **2018**, *82*, 1737–1748. [CrossRef]
10. Chung, W.-S.; Kim, S.-S.; Moon, K.-H.; Lim, C.-Y.; Yun, S.-W. A conceptual framework for energy security evaluation of power sources in South Korea. *Energy* **2017**, *137*, 1066–1074. [CrossRef]
11. Jääskeläinen, J.; Veijalainen, N.; Syri, S.; Marttunen, M.; Zakeri, B. Energy security impacts of a severe drought on the future Finnish energy system. *J. Environ. Manag.* **2018**, *217*, 542–554. [CrossRef] [PubMed]
12. Radovanović, M.; Filipović, S.; Golušin, V. Geo-economic approach to energy security measurement—Principal component analysis. *Renew. Sustain. Energy Rev.* **2018**, *82*, 1691–1700. [CrossRef]
13. Proskuryakova, L. Updating energy security and environmental policy: Energy security theories revisited. *J. Environ. Manag.* **2018**, *223*, 203–214. [CrossRef] [PubMed]

14. Dorotić, H.; Doračić, B.; Dobravec, V.; Pukšec, T.; Krajačić, G.; Duić, N. Integration of transport and energy sectors in island communities with 100% intermittent renewable energy sources. *Renew. Sustain. Energy Rev.* **2019**, *99*, 109–124. [CrossRef]
15. Dominković, D.F.; Bačeković, I.; Pedersen, A.S.; Krajačić, G. The future of transportation in sustainable energy systems: Opportunities and barriers in a clean energy transition. *Renew. Sustain. Energy Rev.* **2018**, *82*, 1823–1838. [CrossRef]
16. Harris, A.; Soban, D.; Smyth, B.M.; Best, R. Assessing life cycle impacts and the risk and uncertainty of alternative bus technologies. *Renew. Sustain. Energy Rev.* **2018**, *97*, 569–579. [CrossRef]
17. Kılkış, Ş. Benchmarking the sustainability of urban energy, water and environment systems and envisioning a cross-sectoral scenario for the future. *Renew. Sustain. Energy Rev.* **2019**, *103*, 529–545. [CrossRef]
18. Kılkış, Ş. Sustainable Development of Energy, Water and Environment Systems (SDEWES) Index for policy learning in cities. *Int. J. Innov. Sustain. Dev.* **2018**, *12*, 87–134. [CrossRef]
19. Kılkış, Ş. Application of the Sustainable Development of Energy, Water and Environment Systems Index to World Cities with a Normative Scenario for Rio de Janeiro. *J. Sustain. Dev. Energy Water Environ. Syst.* **2018**, *6*, 559–608. [CrossRef]
20. Carli, R.; Dotoli, M.; Pellegrino, R. Multi-criteria decision-making for sustainable metropolitan cities assessment. *J. Environ. Manag.* **2018**, *226*, 46–61. [CrossRef] [PubMed]
21. Terrapon-Pfaff, J.; Ortiz, W.; Dienst, C.; Gröne, M.-C. Energising the WEF nexus to enhance sustainable development at local level. *J. Environ. Manag.* **2018**, *223*, 409–416. [CrossRef] [PubMed]
22. Gamarra, A.R.; Istrate, I.R.; Herrera, I.; Lago, C.; Lizana, J.; Lechón, Y. Energy and water consumption and carbon footprint of school buildings in hot climate conditions. Results from life cycle assessment. *J. Clean. Prod.* **2018**, *195*, 1326–1337. [CrossRef]
23. Gianniou, P.; Liu, X.; Heller, A.; Nielsen, P.S.; Rode, C. Clustering-based analysis for residential district heating data. *Energy Convers. Manag.* **2018**, *165*, 840–850. [CrossRef]
24. De Luca, G.; Fabozzi, S.; Massarotti, N.; Vanoli, L. A renewable energy system for a nearly zero greenhouse city: Case study of a small city in southern Italy. *Energy* **2018**, *143*, 347–362. [CrossRef]
25. Sözer, H.; Kükrer, E. Evaluation of Sustainable Design Strategies Based on Defined Indexes at a District Level. *J. Sustain. Dev. Energy Water Environ. Syst.* **2018**, *6*, 609–630. [CrossRef]
26. del Hoyo Arce, I.; Herrero López, S.; López Perez, S.; Rämä, M.; Klobut, K.; Febres, J.A. Models for fast modelling of district heating and cooling networks. *Renew. Sustain. Energy Rev.* **2018**, *82*, 1863–1873. [CrossRef]
27. Beccali, M.; Ciulla, G.; Di Pietra, B.; Galatioto, A.; Leone, G.; Piacentino, A. Assessing the feasibility of cogeneration retrofit and district heating/cooling networks in small Italian islands. *Energy* **2017**, *141*, 2572–2586. [CrossRef]
28. Santibañez-Aguilar, J.E.; Flores-Tlacuahuac, A.; Rivera-Toledo, M.; Ponce-Ortega, J.M. Dynamic optimization for the planning of a waste management system involving multiple cities. *J. Clean. Prod.* **2017**, *165*, 190–203. [CrossRef]
29. Katsaros, G.; Nguyen, T.-V.; Rokni, M. Tri-generation system based on municipal waste gasification, fuel cell and an absorption chiller. *J. Sustain. Dev. Energy Water Environ. Syst.* **2018**, *6*, 13–32. [CrossRef]
30. Li, W.; Bao, Z.; Huang, G.H.; Xie, Y.L. An Inexact Credibility Chance-Constrained Integer Programming for Greenhouse Gas Mitigation Management in Regional Electric Power System under Uncertainty. *J. Environ. Inform.* **2018**, *31*. [CrossRef]
31. Guo, Y.; Wang, Q.; Zhang, D.; Yu, D.; Yu, J. A Stochastic-Process-Based Method for Assessing Frequency Regulation Ability of Power Systems with Wind Power Fluctuations. *J. Environ. Inform.* **2018**, *32*. [CrossRef]
32. März, S. Assessing the fuel poverty vulnerability of urban neighbourhoods using a spatial multi-criteria decision analysis for the German city of Oberhausen. *Renew. Sustain. Energy Rev.* **2018**, *82*, 1701–1711. [CrossRef]
33. Okushima, S. Gauging energy poverty: A multidimensional approach. *Energy* **2017**, *137*, 1159–1166. [CrossRef]
34. Radovanović, M.; Filipović, S.; Pavlović, D. Energy security measurement—A sustainable approach. *Renew. Sustain. Energy Rev.* **2017**, *68*, 1020–1032. [CrossRef]

35. Valero-Gil, J.; Allué-Poc, A.; Ortego, A.; Tomasi, F.; Scarpellini, S. What are the preferences in the development process of a sustainable urban mobility plan? New methodology for experts involvement. *Int. J. Innov. Sustain. Dev.* **2018**, *12*, 135–155.
36. Vialetto, G.; Noro, M.; Rokni, M. Thermodynamic Investigation of a Shared Cogeneration System with Electrical Cars for Northern Europe Climate. *J. Sustain. Dev. Energy Water Environ. Syst.* **2017**, *5*, 590–607. [CrossRef]
37. Del Moretto, D.; Colla, V.; Branca, T.A. Sustainable mobility for campsites: The case of Macchia Lucchese. *Renew. Sustain. Energy Rev.* **2017**, *68*, 1063–1075. [CrossRef]
38. Novosel, T.; Perković, L.; Ban, M.; Keko, H.; Pukšec, T.; Krajačić, G.; Duić, N. Agent based modelling and energy planning—Utilization of MATSim for transport energy demand modelling. *Energy* **2015**, *92*, 466–475. [CrossRef]
39. Firak, M.; Ðukić, A. Hydrogen transportation fuel in Croatia: Road map strategy. *Int. J. Hydrog. Energy* **2016**, *41*, 13820–13830. [CrossRef]
40. Briggs, I.; Murtagh, M.; Kee, R.; McCulloug, G.; Douglas, R. Sustainable non-automotive vehicles: The simulation challenges. *Renew. Sustain. Energy Rev.* **2017**, *68*, 840–851. [CrossRef]
41. Knez, M.; Obrecht, M. Policies for promotion of electric vehicles and factors influencing consumers' purchasing decisions of low emission vehicles. *J. Sustain. Dev. Energy Water Environ. Syst.* **2017**, *5*, 151–162. [CrossRef]
42. Kılkış, Ş. A Nearly Net-Zero Exergy District as a Model for Smarter Energy Systems in the Context of Urban Metabolism. *J. Sustain. Dev. Energy Water Environ. Syst.* **2017**, *5*, 101–126. [CrossRef]
43. Sayegh, M.A.; Danielewicz, J.; Nannou, T.; Miniewicz, M.; Jadwiszczak, P.; Piekarska, K.; Jouhara, H. Trends of European research and development in district heating technologies. *Renew. Sustain. Energy Rev.* **2017**, *68*, 1183–1192. [CrossRef]
44. Wagner, O.; Berlo, K. Remunicipalisation and Foundation of Municipal Utilities in the German Energy Sector: Details about Newly Established Enterprises. *J. Sustain. Dev. Energy Water Environ. Syst.* **2017**, *5*, 396–407. [CrossRef]
45. Carotenuto, A.; Figaj, R.D.; Vanoli, L. A novel solar-geothermal district heating, cooling and domestic hot water system: Dynamic simulation and energy-economic analysis. *Energy* **2017**, *141*, 2652–2669. [CrossRef]
46. Pavičević, M.; Novosel, T.; Pukšec, T.; Duić, N. Hourly optimization and sizing of district heating systems considering building refurbishment—Case study for the city of Zagreb. *Energy* **2017**, *137*, 1264–1276. [CrossRef]
47. Tańczuk, M.; Skorek, J.; Bargiel, P. Energy and economic optimization of the repowering of coal-fired municipal district heating source by a gas turbine. *Energy Convers. Manag.* **2017**, *149*, 885–895. [CrossRef]
48. Feil, A.; Pretz, T.; Jansen, M.; Thoden van Velzen, E.U. Separate collection of plastic waste, better than technical sorting from municipal solid waste? *Waste Manag. Res.* **2016**, *35*, 172–180. [CrossRef]
49. Tomić, T.; Schneider, D.R. Municipal solid waste system analysis through energy consumption and return approach. *J. Environ. Manag.* **2017**, *203*, 973–987. [CrossRef]
50. Brandoni, C.; Bošnjaković, B. HOMER analysis of the water and renewable energy nexus for water-stressed urban areas in Sub-Saharan Africa. *J. Clean. Prod.* **2017**, *155*, 105–118. [CrossRef]
51. Di Fraia, S.; Massarotti, N.; Vanoli, L.; Costa, M. Thermo-economic analysis of a novel cogeneration system for sewage sludge treatment. *Energy* **2016**, *115*, 1560–1571. [CrossRef]
52. Di Fraia, S.; Massarotti, N.; Vanoli, L. A novel energy assessment of urban wastewater treatment plants. *Energy Convers. Manag.* **2018**, *163*, 304–313. [CrossRef]
53. Nasir, D.S.N.M.; Hughes, B.R.; Calautit, J.K. Influence of urban form on the performance of road pavement solar collector system: Symmetrical and asymmetrical heights. *Energy Convers. Manag.* **2017**, *149*, 904–917. [CrossRef]
54. Batas-Bjelic, I.; Rajakovic, N.; Duic, N. Smart municipal energy grid within electricity market. *Energy* **2017**, *137*, 1277–1285. [CrossRef]
55. Ben Amer-Allam, S.; Münster, M.; Petrović, S. Scenarios for sustainable heat supply and heat savings in municipalities—The case of Helsingør, Denmark. *Energy* **2017**, *137*, 1252–1263. [CrossRef]
56. Koval, S.; Krahenbuhl, G.; Warren, K.; O'Brien, G. Optical microscopy as a new approach for characterising dust particulates in urban environment. *J. Environ. Manag.* **2018**, *223*, 196–202. [CrossRef] [PubMed]

57. Sutherland, S.H.; Smith, B.T. Resilience Implications of Energy Storage in Urban Water Systems. *J. Sustain. Dev. Energy Water Environ. Syst.* **2018**, *6*, 674–693. [CrossRef]
58. Kucbel, M.; Corsaro, A.; Svédová, B.; Raclavská, H.; Raclavský, K.; Juchelková, D. Temporal and seasonal variations of black carbon in a highly polluted European city: Apportionment of potential sources and the effect of meteorological conditions. *J. Environ. Manag.* **2017**, *203*, 1178–1189. [CrossRef]
59. van der Meulen, S.H. Costs and Benefits of Green Roof Types for Cities and Building Owners. *J. Sustain. Dev. Energy Water Environ. Syst.* **2019**, *7*, 57–71. [CrossRef]
60. Liew, P.Y.; Theo, W.L.; Wan Alwi, S.R.; Lim, J.S.; Abdul Manan, Z.; Klemeš, J.J.; Varbanov, P.S. Total Site Heat Integration planning and design for industrial, urban and renewable systems. *Renew. Sustain. Energy Rev.* **2017**, *68*, 964–985. [CrossRef]
61. Knoop, K.; Lechtenböhmer, S. The potential for energy efficiency in the EU Member States—A comparison of studies. *Renew. Sustain. Energy Rev.* **2017**, *68*, 1097–1105. [CrossRef]
62. Moser, S. Overestimation of savings in energy efficiency obligation schemes. *Energy* **2017**, *121*, 599–605. [CrossRef]
63. Pleßmann, G.; Blechinger, P. Outlook on South-East European power system until 2050: Least-cost decarbonization pathway meeting EU mitigation targets. *Energy* **2017**, *137*, 1041–1053. [CrossRef]
64. Norman, J.B. Measuring improvements in industrial energy efficiency: A decomposition analysis applied to the UK. *Energy* **2017**, *137*, 1144–1151. [CrossRef]
65. Varga, Z.; Csaba, T. Techno-economic evaluation of waste heat recovery by organic Rankine cycle using pure light hydrocarbons and their mixtures as working fluid in a crude oil refinery. *Energy Convers. Manag.* **2018**, *174*, 793–801. [CrossRef]
66. Hybrid Building Performance Simulation Models for Industrial Energy Efficiency Applications. *J. Sustain. Dev. Energy Water Environ. Syst.* **2018**, *6*, 381–393. [CrossRef]
67. Gambini, M.; Vellini, M. On Selection and Optimal Design of Cogeneration Units in the Industrial Sector. *J. Sustain. Dev. Energy Water Environ. Syst.* **2019**, *7*, 168–192. [CrossRef]
68. Wolf, M.; Detzlhofer, T.; Proll, T. A Comparative Study of Industrial Heat Supply Based On Second-Law Analysis And Operating Costs. *Therm. Sci.* **2018**, *22*, 2203–2213. [CrossRef]
69. Keppert, M.; Doušová, B.; Reiterman, P.; Koloušek, D.; Záleská, M.; Černý, R. Application of heavy metals sorbent as reactive component in cementitious composites. *J. Clean. Prod.* **2018**, *199*, 565–573. [CrossRef]
70. Baksa, P.; Cepak, F.; Kovačič Lukman, R.; Ducman, V. An Evaluation of Marine Sediments in Terms of their usability in the Brick Industry: Case Study Port of Koper. *J. Sustain. Dev. Energy Water Environ. Syst.* **2018**, *6*, 78–88. [CrossRef]
71. Chang, F.-C.; Chen, K.-S.; Yang, P.-Y.; Ko, C.-H. Environmental benefit of utilizing bamboo material based on life cycle assessment. *J. Clean. Prod.* **2018**, *204*, 60–69. [CrossRef]
72. Dusek, S.; Hofmann, R. A Hybrid Energy Storage Concept for Future Application in Industrial Processes. *Therm. Sci.* **2018**, *22*, 2235–2242. [CrossRef]
73. Royo, P.; Ferreira, V.J.; López-Sabirón, A.M.; García-Armingol, T.; Ferreira, G. Retrofitting strategies for improving the energy and environmental efficiency in industrial furnaces: A case study in the aluminium sector. *Renew. Sustain. Energy Rev.* **2018**, *82*, 1813–1822. [CrossRef]
74. Wiese, F.; Baldini, M. Conceptual model of the industry sector in an energy system model: A case study for Denmark. *J. Clean. Prod.* **2018**, *203*, 427–443. [CrossRef]
75. Gourlis, G.; Kovacic, I. Passive measures for preventing summer overheating in industrial buildings under consideration of varying manufacturing process loads. *Energy* **2017**, *137*, 1175–1185. [CrossRef]
76. Ebin, B.; Petranikova, M.; Steenari, B.-M.; Ekberg, C. Recovery of industrial valuable metals from household battery waste. *Waste Manag. Res.* **2019**, *37*, 168–175. [CrossRef] [PubMed]
77. Calise, F.; Dentice d'Accadia, M.; Libertini, L.; Quiriti, E.; Vanoli, R.; Vicidomini, M. Optimal operating strategies of combined cooling, heating and power systems: A case study for an engine manufacturing facility. *Energy Convers. Manag.* **2017**, *149*, 1066–1084. [CrossRef]
78. Yildirim, N.; Genc, S. Energy and exergy analysis of a milk powder production system. *Energy Convers. Manag.* **2017**, *149*, 698–705. [CrossRef]
79. Chinese, D.; Santin, M.; Saro, O. Water-energy and GHG nexus assessment of alternative heat recovery options in industry: A case study on electric steelmaking in Europe. *Energy* **2017**, *141*, 2670–2687. [CrossRef]

80. Kun-Balog, A.; Sztankó, K.; Józsa, V. Pollutant emission of gaseous and liquid aqueous bioethanol combustion in swirl burners. *Energy Convers. Manag.* **2017**, *149*, 896–903. [CrossRef]
81. Ko, C.-H.; Yu, F.-C.; Chang, F.-C.; Yang, B.-Y.; Chen, W.-H.; Hwang, W.-S.; Tu, T.-C. Bioethanol production from recovered napier grass with heavy metals. *J. Environ. Manag.* **2017**, *203*, 1005–1010. [CrossRef] [PubMed]
82. Palander, T.; Haavikko, H.; Kärhä, K. Towards sustainable wood procurement in forest industry—The energy efficiency of larger and heavier vehicles in Finland. *Renew. Sustain. Energy Rev.* **2018**, *96*, 100–118. [CrossRef]
83. Milani, M.; Montorsi, L. Energy Recovery of the Biomass from Livestock Farms in Italy: The Case of Modena Province. *J. Sustain. Dev. Energy Water Environ. Syst.* **2018**, *6*, 464–480. [CrossRef]
84. La Villetta, M.; Costa, M.; Cirillo, D.; Massarotti, N.; Vanoli, L. Performance analysis of a biomass powered micro-cogeneration system based on gasification and syngas conversion in a reciprocating engine. *Energy Convers. Manag.* **2018**, *175*, 33–48. [CrossRef]
85. Chang, K.-H.; Lou, K.-R.; Ko, C.-H. Potential of bioenergy production from biomass wastes of rice paddies and forest sectors in Taiwan. *J. Clean. Prod.* **2019**, *206*, 460–476. [CrossRef]
86. Boeykens, S.P.; Saralegui, A.; Caracciolo, N.; Piol, M. Agroindustrial Waste for Lead and Chromium Biosorption. *J. Sustain. Dev. Energy Water Environ. Syst.* **2018**, *6*, 341–350. [CrossRef]
87. Graciano, J.E.A.; Chachuat, B.; Alves, R.M.B. Enviro-economic assessment of thermochemical polygeneration from microalgal biomass. *J. Clean. Prod.* **2018**, *203*, 1132–1142. [CrossRef]
88. Marques, A.d.L.; Pinto, F.P.; Araujo, O.Q.d.F.; Cammarota, M.C. Assessment of Methods to Pretreat Microalgal Biomass for Enhanced Biogas Production. *J. Sustain. Dev. Energy Water Environ. Syst.* **2018**, *6*, 394–404. [CrossRef]
89. Codignole Luz, F.; Cordiner, S.; Manni, A.; Mulone, V.; Rocco, V. Biomass fast pyrolysis in screw reactors: Prediction of spent coffee grounds bio-oil production through a monodimensional model. *Energy Convers. Manag.* **2018**, *168*, 98–106. [CrossRef]
90. Kantarli, I.C.; Stefanidis, S.D.; Kalogiannis, K.G.; Lappas, A.A. Utilisation of poultry industry wastes for liquid biofuel production via thermal and catalytic fast pyrolysis. *Waste Manag. Res.* **2019**, *37*, 157–167. [CrossRef] [PubMed]
91. Chan, K.-L.; Dong, C.; Wong, M.S.; Kim, L.-H.; Leu, S.-Y. Plant chemistry associated dynamic modelling to enhance urban vegetation carbon sequestration potential via bioenergy harvesting. *J. Clean. Prod.* **2018**, *197*, 1084–1094. [CrossRef]
92. de Souza, L.L.P.; Lora, E.E.S.; Palacio, J.C.E.; Rocha, M.H.; Renó, M.L.G.; Venturini, O.J. Comparative environmental life cycle assessment of conventional vehicles with different fuel options, plug-in hybrid and electric vehicles for a sustainable transportation system in Brazil. *J. Clean. Prod.* **2018**, *203*, 444–468. [CrossRef]
93. Szulczewski, W.; Żyromski, A.; Jakubowski, W.; Biniak-Pieróg, M. A new method for the estimation of biomass yield of giant miscanthus (Miscanthus giganteus) in the course of vegetation. *Renew. Sustain. Energy Rev.* **2018**, *82*, 1787–1795. [CrossRef]
94. Hussain, C.M.I.; Norton, B.; Duffy, A. Technological assessment of different solar-biomass systems for hybrid power generation in Europe. *Renew. Sustain. Energy Rev.* **2017**, *68*, 1115–1129. [CrossRef]
95. Davis, G.W. Addressing Concerns Related to the Use of Ethanol-Blended Fuels in Marine Vehicles. *J. Sustain. Dev. Energy Water Environ. Syst.* **2017**, *5*, 546–559. [CrossRef]
96. Kocík, J.; Samikannu, A.; Bourajoini, H.; Pham, T.N.; Mikkola, J.-P.; Hájek, M.; Čapek, L. Screening of active solid catalysts for esterification of tall oil fatty acids with methanol. *J. Clean. Prod.* **2017**, *155*, 34–38. [CrossRef]
97. Di Fraia, S.; Figaj, R.D.; Massarotti, N.; Vanoli, L. An integrated system for sewage sludge drying through solar energy and a combined heat and power unit fuelled by biogas. *Energy Convers. Manag.* **2018**, *171*, 587–603. [CrossRef]
98. Interlenghi, S.F.; de Almeida Bruno, P.; Araujo, O.d.Q.F.; de Medeiros, J.L. Social and environmental impacts of replacing transesterification agent in soybean biodiesel production: Multi-criteria and principal component analyses. *J. Clean. Prod.* **2017**, *168*, 149–162. [CrossRef]
99. Özdenkçi, K.; De Blasio, C.; Muddassar, H.R.; Melin, K.; Oinas, P.; Koskinen, J.; Sarwar, G.; Järvinen, M. A novel biorefinery integration concept for lignocellulosic biomass. *Energy Convers. Manag.* **2017**, *149*, 974–987. [CrossRef]

100. Lazaroiu, G.; Pană, C.; Mihaescu, L.; Cernat, A.; Negurescu, N.; Mocanu, R.; Negreanu, G. Solutions for energy recovery of animal waste from leather industry. *Energy Convers. Manag.* **2017**, *149*, 1085–1095. [CrossRef]
101. Marzo, C.; Diaz, A.B.; Blandino Caro, A. Valorization of agro-industrial wastes to produce hydrolytic enzymes by fungal solid-state fermentation. *Waste Manag. Res.* **2019**, *37*, 149–156. [CrossRef] [PubMed]
102. Weiler, V.; Stave, J.; Eicker, U. Renewable Energy Generation Scenarios Using 3D Urban Modeling Tools—Methodology for Heat Pump and Co-Generation Systems with Case Study Application. *Energies* **2019**, *12*, 403. [CrossRef]
103. Dominković, D.F.; Krajačić, G. District Cooling Versus Individual Cooling in Urban Energy Systems: The Impact of District Energy Share in Cities on the Optimal Storage Sizing. *Energies* **2019**, *12*, 407. [CrossRef]
104. Smajla, I.; Karasalihović Sedlar, D.; Drljača, B.; Jukić, L. Fuel Switch to LNG in Heavy Truck Traffic. *Energies* **2019**, *12*, 515. [CrossRef]
105. Testi, D.; Conti, P.; Schito, E.; Urbanucci, L.; D'Ettorre, F. Synthesis and Optimal Operation of Smart Microgrids Serving a Cluster of Buildings on a Campus with Centralized and Distributed Hybrid Renewable Energy Units. *Energies* **2019**, *12*, 745. [CrossRef]
106. Kona, A.; Bertoldi, P.; Kılkış, Ş. Covenant of Mayors: Local Energy Generation, Methodology, Policies and Good Practice Examples. *Energies* **2019**, *12*, 985. [CrossRef]
107. Hammad, A.W.; Akbarnezhad, A.; Haddad, A.; Vazquez, E.G. Sustainable Zoning, Land-Use Allocation and Facility Location Optimisation in Smart Cities. *Energies* **2019**, *12*, 1318. [CrossRef]
108. Hoehn, D.; Margallo, M.; Laso, J.; García-Herrero, I.; Bala, A.; Fullana-i-Palmer, P.; Irabien, A.; Aldaco, R. Energy Embedded in Food Loss Management and in the Production of Uneaten Food: Seeking a Sustainable Pathway. *Energies* **2019**, *12*, 767. [CrossRef]
109. Sakamoto, H.; Ronquim, F.M.; Seckler, M.M.; Kulay, L. Environmental Performance of Effluent Conditioning Systems for Reuse in Oil Refining Plants: A Case Study in Brazil. *Energies* **2019**, *12*, 326. [CrossRef]
110. Gambini, M.; Vellini, M.; Stilo, T.; Manno, M.; Bellocchi, S. High-Efficiency Cogeneration Systems: The Case of the Paper Industry in Italy. *Energies* **2019**, *12*, 335. [CrossRef]
111. Xu, C.; Liu, Z.; Wang, S.; Liu, W. Numerical Simulation and Optimization of Waste Heat Recovery in a Sinter Vertical Tank. *Energies* **2019**, *12*, 385. [CrossRef]
112. Kılkış, B. Development of an Exergy-Rational Method and Optimum Control Algorithm for the Best Utilization of the Flue Gas Heat in Coal-Fired Power Plant Stacks. *Energies* **2019**, *12*, 760. [CrossRef]
113. Wang, S.; Xu, C.; Liu, W.; Liu, Z. Numerical Study on Heat Transfer Performance in Packed Bed. *Energies* **2019**, *12*, 414. [CrossRef]
114. Hafizan, A.M.; Klemeš, J.J.; Wan Alwi, S.R.; Abdul Manan, Z.; Abd Hamid, M.K. Temperature Disturbance Management in a Heat Exchanger Network for Maximum Energy Recovery Considering Economic Analysis. *Energies* **2019**, *12*, 594. [CrossRef]
115. Kuczyński, S.; Łaciak, M.; Olijnyk, A.; Szurlej, A.; Włodek, T. Techno-Economic Assessment of Turboexpander Application at Natural Gas Regulation Stations. *Energies* **2019**, *12*, 755. [CrossRef]
116. Ligus, G.; Zając, D.; Masiukiewicz, M.; Anweiler, S. A New Method of Selecting the Airlift Pump Optimum Efficiency at Low Submergence Ratios with the Use of Image Analysis. *Energies* **2019**, *12*, 735. [CrossRef]
117. Sapińska-Sliwa, A.; Rosen, M.A.; Gonet, A.; Kowalczyk, J.; Sliwa, T. A New Method Based on Thermal Response Tests for Determining Effective Thermal Conductivity and Borehole Resistivity for Borehole Heat Exchangers. *Energies* **2019**, *12*, 1072. [CrossRef]
118. Martinelli, L.; Volpato, M.; Favaretto, C.; Ruol, P. Hydraulic Experiments on a Small-Scale Wave Energy Converter with an Unconventional Dummy Pto. *Energies* **2019**, *12*, 1218. [CrossRef]
119. Pawlak-Kruczek, H.; Wnukowski, M.; Niedzwiecki, L.; Czerep, M.; Kowal, M.; Krochmalny, K.; Zgóra, J.; Ostrycharczyk, M.; Baranowski, M.; Tic, W.J.; et al. Torrefaction as a Valorization Method Used Prior to the Gasification of Sewage Sludge. *Energies* **2019**, *12*, 175. [CrossRef]
120. Gliński, M.; Bojesen, C.; Rybiński, W.; Bykuć, S. Modelling of the Biomass mCHP Unit for Power Peak Shaving in the Local Electrical Grid. *Energies* **2019**, *12*, 458. [CrossRef]
121. Hossain, A.K.; Hussain, A. Impact of Nanoadditives on the Performance and Combustion Characteristics of Neat Jatropha Biodiesel. *Energies* **2019**, *12*, 921. [CrossRef]
122. Restrepo-Valencia, S.; Walter, A. Techno-Economic Assessment of Bio-Energy with Carbon Capture and Storage Systems in a Typical Sugarcane Mill in Brazil. *Energies* **2019**, *12*, 1129. [CrossRef]

123. Tańczuk, M.; Junga, R.; Kolasa-Więcek, A.; Niemiec, P. Assessment of the Energy Potential of Chicken Manure in Poland. *Energies* **2019**, *12*, 1244. [CrossRef]
124. Moser, M.; Pecchi, M.; Fend, T. Techno-Economic Assessment of Solar Hydrogen Production by Means of Thermo-Chemical Cycles. *Energies* **2019**, *12*, 352. [CrossRef]
125. Kuczyński, S.; Łaciak, M.; Olijnyk, A.; Szurlej, A.; Włodek, T. Thermodynamic and Technical Issues of Hydrogen and Methane-Hydrogen Mixtures Pipeline Transmission. *Energies* **2019**, *12*, 569. [CrossRef]