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# Book of Abstracts

| Session I: Smart Grids | |
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| I-1 | Johannes Stöckl<br>**Introduction to the Session with a Presentation of the Austrian Institute of Technology** |
| I-2 | Jovana Gluščević, Žarko Janda and Jasna Dragosavac<br>**Comparison of the Response of Grid Forming and Grid Following Inverters Connected to a Real Grid**<br><br>**Abstract:** The increasing penetration of wind and solar power sources in power networks has led to the need for advanced inverter technologies to support the integration of these renewable energy sources into the grid. Inverters play a critical role in power networks, and understanding the benefits and limitations of different inverter types can facilitate the effective management of renewable energy sources and contribute to a more stable and sustainable power system. New types of power grid instabilities are field recorded as it is resonance instability. Several inverters connected to grid can have multiple resonances (range from low-medium high).<br>The main goal of this paper is to explore the differences between grid-following and grid-forming inverters in power networks with high penetration of wind and solar power sources. These inverters have the main difference in output voltage electrical angle control circuit design. The paper aims to provide insights into the advantages and disadvantages of each type of inverter control and their impact on grid stability and the management of intermittency in renewable energy sources. Additionally, the paper aims to discuss the challenges associated with integrating grid-forming inverters into existing power networks and the potential for future developments in inverter technology to address these challenges.<br>The research methodology of this paper involves a comprehensive literature review and analysis of existing literature on grid-following and grid-forming inverters. The literature review examines the benefits and limitations of each type of inverter, including their impact on grid stability, power quality, and management of |

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| | intermittency. Additionally, the literature review explores the challenges associated with integrating grid-forming inverters into existing power networks and the potential for future developments in inverter technology.<br>These differences and features of each inverter are compared by simulations results using Matlab/Simulink environment. The control is realized with varying the virtual moment of inertia and the damping factor for the purpose of achieving a better response to network disturbances. The output variables that change according to control actions are active and reactive power. Several scenarios were tested to compare the response of grid forming and grid following inverters: grid disturbance, change of reference value and change in grid load. The obtained results were compared.<br>Additionally, the results of the paper discuss the challenges associated with integrating grid-forming inverters into existing power networks and the potential for future developments in inverter technology to address these challenges. In conclusion of the paper, means to mitigate the discussed problems are highlighted and coordinated control of inverters proposed. |
| I-3 | Florian Strebl and Bharath-Varsh Rao<br>**Impact of large-scale Deployment of Energy Communities on Distribution Grids**<br><br>**Abstract:** The presented work shows a master thesis aimed to investigate the impact of a large-scale deployment of Renewable Energy Communities (REC) on low voltage (LV) as well as medium voltage (MV) distribution grids.<br>A REC represents a citizen-driven, economic and legal entity, destined to enforce the further installation of renewable energy sources (RES) by, first of all, enhancing acceptance of the broader public. This shall be accomplished by letting citizens benefit from local RES production which then increases the attractiveness of local RES investments leading to further RES rollout, letting citizens benefit from it even more [3].<br>While RECs have been legally introduced within the "Clean Energy for all Europeans" package back in 2019 [4, 2], large-scale real world implementations are still the missing piece.<br>In general, the intrinsic behaviour of RECs regarding optimal capacity management and integration of RES as well as market design have been well researched within the past years [5]. Due to the mentioned lack of real-world implementations and therefore the negligible overall capacity of RECs, the impact of these communities on the outer LV/MV grid has not been well researched so far.<br>The aim of this work is to address the gap between RECs and distribution grids. Questions to be researched are if there is a way to locally operate RECs in a matter so they support the outer LV/MV grid, at which point in time or installed REC capacity they have to be accounted for from a grid operation viewpoint and if there is a conflict of interest between local, economic optimization and overall grid stability and capacity management.<br>Expected results are a certain REC capacity value in respect to the observed outer grid at which theyr behaviour has to be accounted for. Also, a sensitivity analysis regarding local optimization versus global grid operation parameters is wished. Finally, recommendations on REC design and control, so that it aids the grid, will be given. |
| I-4 | Dayanne Peretti Correa, Luis Miguel Blanes Restoy, Paulo Lissa and Marcus Keane<br>**Clustering Analysis to Support Demand Response Programs**<br><br>**Abstract:** Demand side management applied in the residential sector has a high |

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| | potential in assisting the achievement of the balance between generation and demand in the electricity grid. For instance, increasing the self-consumption of local renewable energy sources using demand response techniques can avoid the need of importing electrical energy from the grid during peak consumption hours. One of the challenges in balancing demand and energy consumption in the grid, which is also one of the main issues faced nowadays by the grid stakeholders, is that residential energy consumption is hard to predict in terms of human behaviour and renewable energy sources. In this regard, there are characteristics of this type of energy user that may help the grid management stakeholders to understand the best type of demand response technique to be applied. These users may be classified based on the type and quality of the data that is being collected in the residence, for example.<br>This paper aims to create an objective way to analyse the demand response capability of a group of buildings by classifying them using clustering techniques. A study about the most common techniques for clustering residential consumers will be performed with the objective of assessing the best one for this application. The state of the art will be studied, and a benchmark to understand the work already done in this field will be performed. These techniques will be applied in a database of the residential participants of the REACT H2020 project - an Irish pilot located in the Aran Islands.<br>Preliminary analysis identified that the most common clustering technique applied nowadays is K-means. However, other solutions may achieve a more accurate result depending on the data distribution. As an example, a technique that is based on density known as DBSCAN can be more suitable compared to K-means when the dataset does not have spherical clusters. The test case analysis should demonstrate categories that will enable a more accurate applicability of demand response techniques. For instance, if there is no equipment suitable for autonomous or remote control of loads, implicit demand response would be a good option for these buildings. On the other hand, if a database with high accuracy is available and also remotely controllable devices, buildings may be categorized into a group where more advanced explicit demand response techniques can be applied, and this way automated actions would be a suitable solution. |
| I-5 | Patxi Hernandez, Nekane Hermoso and Valentina Janev<br>**Towards Positive Energy Districts: Data Requirements and Use of Tools for Development of Energy Transition Scenarios**<br><br>**Abstract:** This paper presents a case study of development of energy transition scenarios for a small area in Belgrade, where Institute Pupin buildings are located. The data requirements for undertaking this type of model include detail accounting of hourly electricity and heat loads in the current situation. An understanding of the Serbian electricity system, and of its future planned evolution, is needed to understand the potential benefits of the interaction of the buildings with the national electricity grid. The paper presents an example of a preliminary scenario that can be used as part of a scenario-based prospective evaluation of transition solutions. This approach uses available monitored data, together with future projections of the buildings' demands, and a prospective evaluation of the electricity mix. The use of this type of model should serve to support decision-making towards a Positive Energy District, and for devising optimum management strategies. |
| I-6 | Luka Ivanović, Djordje Stojić, Slavko Veinović, Dušan Joksimović, Jasna Dragosavac and Ilija Klasnić<br>**Voltage Stability of Microgrid With Grid-Connected Wind Farm**<br><br>**Abstract:** In this paper, we present a robust algorithm for tuning the parameters of |

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| | a PID controller for automatic voltage regulator (AVR) of synchronous generator (SG). Our motivation for this work originate from the increased penetration of intermittent renewable energy sources (RES), which can cause voltage disturbances in the grid to which they are connected. Our goal is to develop a regulator that can mitigate disturbances in the grid resulting from renewable sources fluctuations while also remaining robust to errors in system modeling. The objective is to minimize the integral absolute error index (IAE) while taking into account predetermined values for Ms and Mp. Ms represents the maximum sensitivity function modulus, which is the transfer function of the coupled system from the output disturbance to the output. Mp represents the maximum complementary sensitivity function modulus, which is the closed-loop transfer function from the reference to the output. This guarantees sufficient reserves of stability for the entire system while also facilitating effective response to reference changes, as will be demonstrated and explained in the paper. The problem is analyzed and its solution is implemented using Matlab Simulink model. |
| I-7 | Valentina Timčenko and Slavica Boštjančič Rakas<br>**Cyber Security Issues of Cloud-based Dynamic Line Rating**<br><br>**Abstract:** The introduction of the Dynamic Line Rating (DLR) is crucial for the implementation of the smart grids. It represents continuous assessment of the thermal and other operating conditions of the overhead transmission line in real-time to estimate maximum transmission line's load. In this paper we have addressed private, public and hybrid cloud services and cyber security concerns of cloud-based DLR systems. We have also proposed a secure DLR architecture based on a hybrid cloud. |

| Session II: Energy Management Systems | |
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| II-1 | Branislav Dobrosavljević<br>**How to Ensure Cyber Security Deep in Your Supply Chain**<br><br>**Abstract:** In this paper, we presented one of the possible solutions how to provide a comprehensive, flexible, high-quality Cyber security solution not only for large systems in the public and private sectors, but also for small and medium-sized enterprises (SMEs).<br>This solution, based on open software and completely developed in Serbia, includes the use of the unique combination of the ARMADA integrated Cyber security platform and various services based on it.<br>It is shown how this approach allows Cyber security risks to be addressed throughout the entire supply chain in the Smart grid, including its smallest elements.<br>It is shown how this approach makes it possible to respond to cyber security risks throughout the entire supply chain in the Smart grid, including its smallest elements. |
| II-2 | Željko V. Despotović, Ilija R. Stevanović, Jovan Šumarac and Aleksandar Rodić<br>**Hybrid and Uninterruptible Power for Irrigation on Agriculture Smart Land**<br><br>**Abstract:** The paper presents the realization of a hybrid and uninterruptible power system (HUPS) based on renewable energy sources (solar and wind) which is used for irrigation of vegetable crops on the "smart land" at the location of the village "Belegiš". Within the power system are realized the solar power plant with an output power of 8 kW, the wind generator system with a power of 0.5 kW and battery bank of 48V/720Ah, as primary power sources and a diesel electric generator (DEG) with a power of 7.5 kW as an auxiliary power source. In addition to this hybrid power, a system for remote management of irrigation and smart management of land has been implemented. At the end of the paper will be present the experimental results obtained during the exploitation tests on the smart land. |
| II-3 | Marija Radmilović, Uroš Ilić, Željko Despotović, Jelena Kljajić, Jovan Šumarac, Aleksandar Pavlović, Predrag Đešnić<br>**Sustainable and Automated Production Process of Seedlings Using Robotic Systems**<br><br>**Abstract:** The aim of this paper is to present the sustainable and automated process of growing any kind of seedling using the collaborative robot UR5 without human involvement. The automation process is presented within one work cell where the robot, using additional devices, performs all the necessary steps of plant care and cultivation, following the cycle of its development from seed to seedling. Custom robot gripper components were developed to enable the robot to manipulate devices for watering, feeding, and spraying the plant and detecting parasites on plant leaves. The key advantages of this approach are sustainable production of any type of plant and food without human involvement. |

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| II-4 | Gavin Larkin, Luis Miguel Blanes Restoy and Marcus M. Keane<br>**Simulation-based Evaluation of Air-Source Heat Pump Retrofit to Phase-out Condensing Gas Boilers. Case Study of Campus Building in Ireland**<br><br>**Abstract:** The Áras DeBrún building, situated on the University of Galway campus, underwent energy retrofit works financed by the Energy Efficiency and Decarbonisation Pathfinder Programme, a government retrofit grant towards 2030 climate targets. A key focus of the retrofit works was the replacement of the condensing gas boilers with an air-source heat pump. To assess the performance of the retrofitted building, a significant quantity of data and measurements were collected to evaluate indoor environmental characteristics and the operational profiles of the installed energy systems. Using a systematically developed whole building energy model that was calibrated using IPMVP option D hourly energy consumption assessment and ASHRAE 140 criteria, this paper draws contrasts between the pre-retrofit and post-retrofit building performance, from the perspective of occupant comfort and energy usage. The primary goal of this whole building energy model is to optimise energy consumption associated with the operation of the building. The building energy model was implemented to analyse the building operation at a high-resolution time step, specifically at quarter-hour intervals, and conduct scenario analysis to propose methods of improving building operation. The investigation revealed significant scope for improvements in building energy consumption and occupant comfort with the implementation of the operation strategies developed. This study presents proposals for improved building operation and the development of optimal operation strategies under various scenarios investigated. |
| II-5 | Anđela Marković, Valentina Janev, Nikola Tomašević and Marko Batić **Approach to Energy System Modelling for Supporting Decarbonization Scenarios in Energy Communities**<br><br>**Abstract:** This research paper explores the approach to energy system modelling for supporting decarbonization scenarios in energy communities. Energy communities, comprising small-scale distributed energy systems, are increasingly being considered as a viable solution to achieve decarbonization goals. The paper discusses the steps involved in the energy system modelling process, including data collection, model development, and scenario analysis. The paper emphasizes the importance of energy system modelling in designing and implementing energy communities and highlights its potential to reduce carbon emissions, lower energy costs, and improve energy security. The paper concludes by emphasizing the critical role of energy communities in the transition towards a sustainable energy future. |
| II-6 | Igor Jovanovic, Marko Jelic and Nikola Tomasevic<br>**Multi Objective Energy Management System and Sizing Optimization with Load Shifting**<br><br>**Abstract:** One of the steps towards the modern world of technology refers to the field of energy, especially when it comes to smart homes. With an increasing rate of |

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| | digitalization, the need for efficient use of electricity as well as a controlled environmental impact is becoming greater. This leads to development of multi-criteria systems that takes into account several optimization types. Accordingly, a key problem to consider is implementing a model that receives the amount of energy produced data as an input, considering solar panels and wind turbines as energy sources, as well as the energy demand profile. Where the desired system outputs are the optimal energy dispatched to various energy assets with an assumed resolution of one hour, as well as determining the energy assets size. Consequently, two optimization aspects are of importance. The optimal amount of energy withdrawn from the grid, sold to the grid, stored in batteries or withdrawn from them is the first of two mentioned aspects. This optimization becomes multi-objective by considering the environmental impact through CO2 emissions. The second aspect is the sizing optimization, which refers to the optimal system configuration and design. Finally, demand-side management and the overall optimization process at the community level is analyzed in this paper. Moreover, the obtained results contribute to substantial electricity savings, which is directly correlated with financial aspects, as well as the recommendation to users towards the optimal use of appliances. |

| Session III: Building Energy Management Systems | |
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| III-1 | Marcus M. Keane<br>**Introduction to the Session with a Presentation of the University of Galway** |
| III-2 | Luis Miguel Blanes Restoy, Dayanne Peretti Correa and Marcus M. Keane<br>**Simulation-based commissioning of Control Loops for Heat Pump Integration and High Temperature Systems**<br><br>**Abstract:** Integration of heat pumps with existing heating systems brings challenges for its design and operation. In these situations, concurrent heat sources are available and is important to carefully consider the different source temperatures and load response times to maximise the use of renewable sources and heat pumps in retrofitting projects. Different hydronic integrations are possible and it is crucial to understand their implication, in terms of responsiveness and performance, of the control loops associated. Orchestrating this operation is usually not possible without understanding the associated load profiles and thermal inertia also on the consumption side of the system, hence the use of simulation-based techniques as helpful resource to plan the commissioning and to optimise the operation of the BMS controllers.<br>In this paper we present the approach followed to address this problem during the commission of a a heat pump retrofit as part of a EU H2020 project GEOFIT. A dual source air-ground heat pump was installed that provides process water heating to a campus swimming pool. The approach described in this paper aims to use simulation to assess the tuning of two concurrent PID controllers and their corresponding setpoints by using systems identification techniques and simplified resistance-capacitance models (RC models) within the MATLAB environment as a quick shortcut to provide commissioning guidelines to the engineering teams involved. The expected optimised results will be tested and further assessed during the operational stage of the project using real monitoring data. |
| III-3 | Mariya Chukkiriyan Joy and Marcus Keane<br>**Energy Flexibility Assessment for Buildings in Ireland**<br><br>**Abstract:** Globally, the energy sector is going through several shifts. The most important development is the uptake of renewable energy sources becomes near to primary electricity generation and the introduction of the smart grid provides the facility for demand response. Unconventional sources have traditionally been a major factor, but the impact these sources have on the ecosystem and people has been a hot topic of discussion. The advantages of green energy sources also encouraged people to research them. As a result, electricity is now produced using renewable energy sources like solar, wind, and others. This change in energy networks has made the topic of energy flexibility more crucial than ever. Because the building industry consumes more energy than other industries, energy flexibility in buildings is more crucial. Therefore, the benefits make continue to be the subject of research. To evaluate a building's implementation flexibility, a four-step approach is suggested. |

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| | This has opened a new avenue for buildings to become more energy efficient. Additionally, flexible structures have the advantages of penetration of renewable sources and grid stability. By using more cleaner energy in buildings, the carbon footprint is consequently decreased. Future energy grids powered solely by renewable energy may benefit from the energy flexibility provided by buildings. The building's performance will be enhanced in the future by an ICT platform that has access to real-time data. Moreover, a designed load dispatch Centre and an energy storage facility will provide buildings with a wide range of alternatives for acting intelligently and flexibly. According to the research, energy flexibility in a building will undoubtedly lower energy expenses and emissions. In Addition, it will Provide support will for the uptake of renewable energy sources. As a result, this type of building helps the grid to maintain stability. Additionally, it provides an opportunity to meet EU goals to produce electricity from renewable sources. |
| III-4 | Thi Kim Bich Pham, Bharath Varsh Rao and Wilhelm Süßenbacher<br>Peer-to-peer **Energy Market Incentivizing Energy Efficiency for Local Energy Communities in Austria**<br><br>**Abstract:** Local communities are increasingly embracing peer-to-peer energy trading as a workable approach to facilitating direct energy trade, advancing renewable energy integration, and democratizing the energy market. An overview of previous studies' findings on performance enhancement, the impact on the physical energy network, and the development of energy-exchange systems has been made available. However, there is little discussion of pricing competence and energy efficiency in peer-to-peer trading in local energy communities, which this paper aims to do. The implementation requirements of Austrian rules for peer-to-peer energy accounting are especially examined in this article. It investigates the effects of adopting peer-to-peer trade in local communities on the grid parameters and offers analysis and insights into this effect. The need of efficient trading algorithms for maximizing the potential of peer-to-peer energy trading is also highlighted in the article. |
| III-5 | Mojgan Sami and Francisco Sierra<br>**The Evolution of Heat Transfer Coefficient (HTC) Calculation Methods: A Critical Analysis**<br><br>**Abstract:** The Heat Transfer Coefficient (HTC) is a vital parameter used to assess heat transfer efficiency of the fabric of the buildings. HTC is a key parameter to understand what the right measures are to enhance and control heating demand. The use of inaccurate HTC values of the fabric often leads to wrong decisions during the analysis of solutions to improve the fabric to reduce heating demand. Over the years, researchers have developed various methods to calculate HTC, leading to significant advancements in the field. However, these methods have limitations, necessitating their effectiveness evaluation.<br>This paper explores recent methods used to calculate HTC, including analytical, experimental, numerical, and machine learning techniques. Analytical methods such as the LMTD and effectiveness-NTU are commonly used but have limited |

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| | accuracy in complex heat transfer systems. Experimental methods such as heat flux and temperature gradient methods provide accurate results but are time-consuming and costly. Numerical methods such as Finite Element Method (FEM) and Computational Fluid Dynamics (CFD) can analyse complex systems but require substantial computational resources. Recent advances in machine learning techniques, such as Artificial Neural Networks (ANNs), have demonstrated efficiency and accuracy in HTC prediction.<br>This article critically evaluates recent HTC calculation methods, analysing their effectiveness in different applications, their limitations, and main findings from recent studies. It provides insights into the evolution of HTC calculation methods and highlights areas for further research and development. |

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| III-6 | Zhuoqun Sun, Francisco Sierra and Colin Booth<br>**Real-time Occupancy Estimation Using Carbon Dioxide Concentration in Higher Education Institutions Buildings**<br><br>**Abstract:** In 2011, most HEIs failed to meet the carbon reduction target of 43% set by the Higher Education Funding Council for England by 2020. To help HEIs to meet the target, this research presents the concept of an algorithm for estimating real-time indoor occupancy. The information provided by this algorithm will allow the HVAC configuration to be updated with accurate live occupancy data. Thus, improving the operational and energy efficiency of HEI buildings and the comfort of their occupants. This tool applied a variation of the Extreme Learning Machine algorithm to estimate indoor occupancy using existing carbon dioxide (CO2) sensor data. By adding an additional feature such as room area in a layer between the input and hidden layer in a standard Extreme Learning Machine, this algorithm resolves the issue of CO2 detection delay caused by larger indoor space addressed in the previous research. The proposed algorithm was tested in a lecture room with 32 open seats. The result shows an accuracy of 94.3%. |
| III-7 | Spiros Chadoulos, Sotirios Athanasoulias, Stelios Kalogridis, Nikolaos Ipiotis, Odyssefs Diamantopoulos Pantaleon, Iordanis Koutsopoulos and George C. Polyzos<br>**Energy Optimization of Building IoT infrastructures in a Stratified Way**<br><br>**Abstract:** According to EU sources, three out of four buildings in Europe do not consume electricity in an efficient manner, leading to energy waste and significant carbon emissions. Hence, Energy Management Systems (EMS) constitute a prominent tool for optimizing the energy consumption of building facilities. Such systems provide insights regarding energy usage in buildings, however, simple monitoring does not suffice to increase energy efficiency. The project "energy oPtimization of building Internet Of Things Infrastructures in a Stratified way" presented a holistic approach for an AI-enabled EMS for building-level energy management and maximizing the available renewable energy sources utilization.<br>The project's scope was to develop and extend the data analytics tools and the interoperability layer of the PLATOON reference architecture by offering a holistic EMS for stratified energy optimization, from the asset level (e.g. HVAC), up to the building and district level. Specifically, the solution integrated a PV generation |

forecasting module, a building energy demand forecasting module, and an energy task scheduling and optimization component. This paper presents the methodology and preliminary results regarding the PV generation forecasting and energy task scheduling modules tested both for the premises of Institute Mihajlo Pupin and several buildings managed by Plegma Labs. Namely, the PV generation forecasting module utilizes a neural network to conduct hourly solar irradiance predictions based on hourly weather forecasts. Then, the forecasted solar irradiance for a specific location is utilized to calculate the energy generation of any PV plant, based on its characteristics (e.g. panel efficiency, number of panels, etc.) regardless of its type and size. In addition, the energy task scheduling module incorporates the PV forecasts to maximize the utilization of solar generation by providing the optimal device activation schedule based on user preferences.
Experiment results showed that the proposed methodology outperforms other approaches in terms of forecasting error, while the utilization of the available PV generation is maximized.

| Session IV: Knowledge Management and ICT Tools | |
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| IV-1 | Enrique Iglesias, Ahmad Sakor, Philipp D. Rohde, Maria-Esther Vidal and Valentina Janev<br>**KatanaG: Fragmenting Data Strategies to Enhance Knowledge Graph Creation from Large Datasets**<br><br>**Abstract:** In recent years, the amount of data being generated has increased exponentially. Thus, a unified schema is needed to bring multiple data sources under a single format. For that reason, the use of knowledge graphs (KGs) has become commonplace. However, the problem of generating KGs efficiently has become a new problem. When creating a KG, multiple factors affect the creation process, like the size and heterogeneity of the input data and the complexity of the input mapping. When managing large data sources, a new problem arises: how much memory will be needed? We propose $\mathcal{K}$atana$\mathcal{G}$, a framework that encloses partition techniques to scale up the process of KG creation to complex scenarios, i.e., large data sources and complex mapping assertions. As a result, memory usage and execution time are optimized. It is used alongside different knowledge graph creation engines to demonstrate that data source partitioning improves the knowledge graph creation process. The results indicate savings in execution time of one order of magnitude. |
| IV-2 | Miloš Nenadović<br>**Leveraging APIs and Knowledge Graphs for Efficient Data Access and Interoperability in the Energy Domain**<br><br>**Abstract:** Efficient data access and interoperability are critical factors in the energy domain with the orchestration of many different services requiring seamless communication. Streamlining data access and manipulation requires the presence of an interface that facilitates interaction between the various services on one side and energy-related data on the other. In this case, standardization is achieved by reusing standardized vocabularies, which are deployed in a centralized repository of knowledge. The creation of an ontology is the first of the two main aspects of this paper, involving use-case analysis, conceptualization, instantiation of the knowledge graph, and integration. The second aspect focuses on the design and implementation of an API serving as a bridge between services/users and the energydomain ontology, highlighting its role in improving data interoperability and enabling efficient data retrieval. Real-world use cases demonstrate the benefits of the API and the ontology, showcasing enhanced integration, data sharing, and simplified data management processes. Furthermore, challenges and future developments are discussed, paving the way for future research in optimizing API functionality and extending support to additional services or data sources. |
| IV-3 | Óscar Cabrera Redondo, ~~and~~ Mónica Aragüés Peñalba and Sara Barja-Martinez<br>**Medium-term Electrical Demand Forecasting of Residential Activity**<br><br>**Abstract:** Electrical power generation and demand forecasting are essential for guiding power systems operations which are facing uncertainties due to the increasing participation of prosumers and the larger number of flexible loads installed, among others. Because of the change in the demand profiles and the increase in uncertainty, forecasting the demand becomes a bigger challenge. The |

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| | present study focuses on medium-term forecasting of aggregated residential consumption. Machine learning models will be developed and compared to derive the most significant variables to predict aggregated residential demand. |
| IV-4 | Sasa Mitrovic and Neven Vrcek<br>**Automated M achine Learning Methods for Efficient Prediction of Carbon Dioxide Emissions in Building Sector**<br><br>**Abstract:** The research carries out the usage of automated machine learning methods for development of a methodological framework for predicting carbon dioxide (CO2) emissions in buildings using intelligent methods for data analysis. Research purpose is to conduct an intelligent analysis of data on the building sector in Croatia and offer automated machine learning methods for a methodological framework for intelligent data analysis on carbon dioxide emissions in buildings and offer models that would enable a high rate of forecasting of CO2 emissions annually in buildings and thus reduce the consumption of human time in the decision-making process and provide decision support for effective management of carbon dioxide emissions for public building managers. Research results are of global importance because from a problematic and practical point of view they may serve as a tool to reach binding targets for CO2 reduction in the world. |
| IV-5 | Lazar Berbakov, Valentina Janev, Marko Jelić, Dea Pujić and Nikola Tomašević<br>**Towards a SGAM-Compliant Platform for Next-Generation Integrated Energy Services**<br><br>**Abstract:** This paper describes a SGAM (Smart Grid Architecture Model) compliant collaborative platform including its logical components in terms of functionalities and interfaces and their relationships. It aims to facilitate the service deployments, establishment and management of a Citizen Energy Community (CEC) by stakeholders along the energy value chain (consumers, energy managers, grid operators, service providers). Its foundation is based on standard-enabling technologies and practices and recommendations from EU projects (NEON and SINERGY). Unified Modeling Language (UML) is used to illustrate potential scenarios of CEC pilots. |
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