Special Report - Session 6
CUSTOMERS, REGULATION, DSO BUSINESS & RISK MANAGEMEN

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Introduction

The business environment and the role of the DSO is substantially changing in the ongoing energy transition.

Session 6 focuses on the evolving business environment and regulation of the DSO to support active customer's and society's energy transition.

This includes a wide variety of topics: digitalization, circular economy, customer flexibility incentives and services, microgrids, integration of storage, e-mobility issues and more – all necessary to ensure a sustainable and efficient electricity distribution infrastructure.

It is important to share experiences and perspectives to better understand the impacts of various strategic choices. Important sources for knowledge are results from demonstration projects and case studies.

Within this changing frame, Session 6 has chosen four blocks of papers:

- Block 1: Regulation, markets, network codes & DSO/TSO coordination
- Block 2: DSO business and risk management
- Block 3: Customers, energy communities and e-mobility, electrification, sector integration
- Block 4: Digitalization, metering, IT-systems and cyber security

The blocks address each important issues related to the DSO business – both today and in the future.

In the review process, Session 6 has accounted for several different stakeholders all the way from governments/regulators, through competitive market players to academia. This variety of stakeholders makes Session 6 unique in the CIRED context – covering a very broad span of stakeholders and interests.

In total Session 6 has accepted 151 papers. In the following each of the blocks of papers are presented, with briefs comments related to the contents of each paper.

Block 1: REGULATION, MARKETS, NETWORK CODES & DSO/TSO COORDINATION

Paper 10113 proposes a multivariate probabilistic modelling with random variables and cumulative distribution function for PV impact analysis in LV utility network and analyses the technical level of losses and power quality for different scenarios. Results show letting PV connection in the user's hands without appropriate regulatory incentives produces high losses and a poor utilization of the network. Modifying traditional radial grid design to better allow DG insertion could be done by a cost plus tariff or by an appropriately calculated price cap tariff.

The contribution of **paper 10240** refers to proposals for the allocation of total costs of the distribution system, and the selection of tariff components for the calculation of individual costs of the distribution network fee. The proposed tariff design aims to create an individual fair calculation and reflect the nature of the cost of the distribution network fee.

The Swedish NRA, the Swedish Energy Markets Inspectorate (Ei), has identified a set of indicators to be used for assessing and monitoring the smart grid development in Sweden. **Paper 10268** describes the indicators that will be used for the assessment of the smart grid development in Sweden and its selection process.

Paper 10317 focuses on agent-based local peer-to-peer flexibility markets with congestion management from a DSO-perspective. The evaluation of the key performance indicators proves that flexibility markets can preventively

reduce grid congestions and thus provide an economic potential for DSOs.

An assessment of regulatory and market frameworks to foster the flexibility provided by multi-energy systems is described in **paper 10391**. This assessment was tailored for the Italian case, however the results emerged can give insights to a wide set of countries. Results show that multi-energy systems are powerful sources of flexibility, their contribution can be greatly increased relaxing symmetric constraints and dropping some cost components from downward flexibility product.

Paper 10393 illustrates the Universal Market Enabling Interface (UMEI), developed in the H2020 EUniversal Project. UMEI is provided as an open-source, universal, and distributed communication standard to overcome system-specific differences and hence to facilitate the interaction between DSOs, Flexibility Service Providers, and Flexibility Market Operators (see Figure 1).

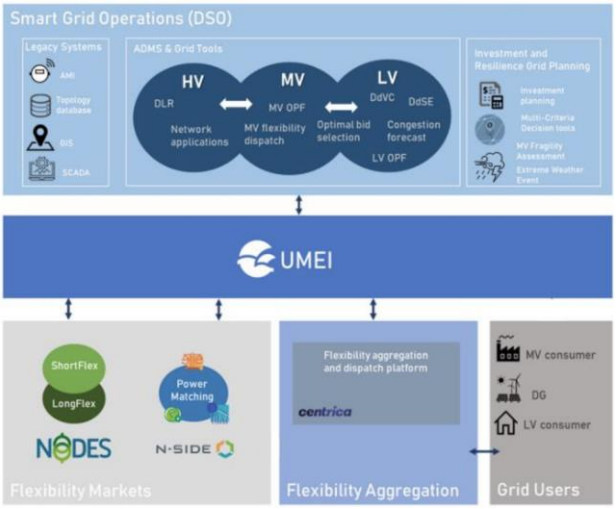

Figure 1: UMEI Reference Architecture

Paper 10407 presents a market-based framework for coupling of electricity and heat sectors at the local level via power-to-heat units. The considered local energy market (LEM) is designed based on an auction-based energy trading process which is settled by the integrated energy system operator with the objective of social welfare maximization. Results also show the mutual impact of the designed LEM on the wholesale electricity market (WEM) and vice versa.

Within the H2020 project EASY-RES advanced controllability of Voltage Source Converters have been developed. In this contribution (**paper 10418**), suggestions for the modification of European grid codes are presented, so that such units are integrated in distribution networks to provide existing and new ancillary services and achieve 100% renewable energy penetration.

Three European projects CoordiNet, OneNet and BeFlexible are playing a key role in developing key solutions to enable the use of flexibility in the electricity network. In **paper 10445** the Spanish DSO i-DE addresses the most relevant elements considered in these projects, and the implementations options made by i-DE (see Figure 2). The need to properly define the new roles, adequately design the new markets and create the incentives for all agents are issues that are present in the conclusions of these projects and must be taken into account for future development of the electricity markets and the related regulations.

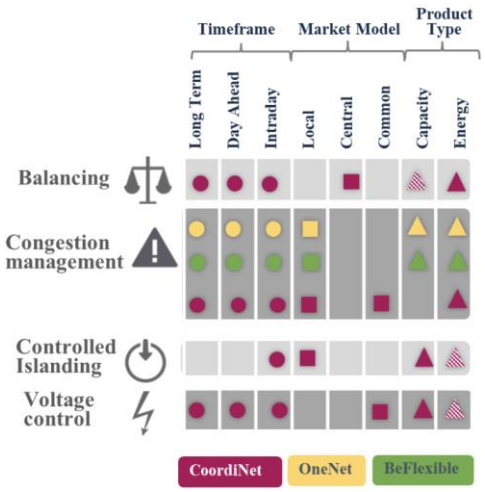

Figure 2: Scope of i-DE participation in CoordiNet, OneNet and Beflexible

P**aper 10465** deals with the flexible operation of battery storage systems, such as stationary home storage systems, which are charged optimally based on real-time pricing electricity tariffs. Therefore, different tariff concepts are discussed, considering market-oriented and grid-oriented incentive options. The results show that combining a flexible electricity load and high electricity tariff dynamization significantly reduces the operators' electricity procurement costs and grid charges. It is also shown to what extent time-variable and dynamic grid charges can provide an incentive to relieve the distribution grid.

Paper 10495 summarises our review of whether the Great Britain energy market is suitable for delivering a customer focused net-zero. The paper explains the policy changes required to enable the energy transition, evaluates the risks surrounding flexibility markets (see Figure 3), and evaluates alternative market archetypes that reduce the barriers for customers to buy low-carbon technologies and use them flexibly.

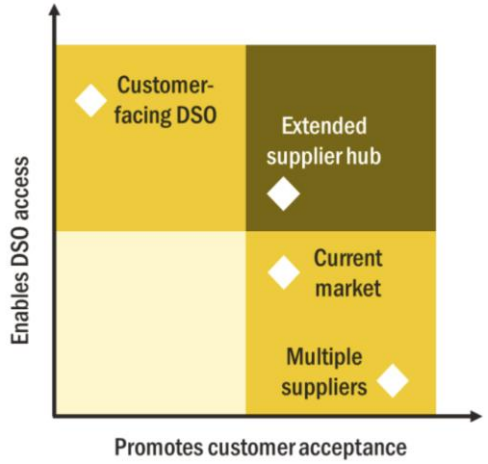

Figure 3: Drivers of flexibility risk

The design of a privacy-preserving market for local energy communities is described in **paper 10569**. Besides achieving a near-optimal solution and preserving the privacy of market participants, the proposed market-clearing mechanism maintains the utility of the market data for statistical releases.

In this work, a comparison between volumetric and capacity-based tariffs is made in a case study based on the tariffs for 2023 and data provided by the Flemish distribution network operator. Special attention in **paper 10576** is given to the impact of this new tariff structure on low-carbon appliances vital to the energy transition, such as electric vehicles, heat pumps and PV installations.

P**aper 10629** shows an analyses of energy measurements of recent years in HV/MV substations by the Italian DSO e-distribuzione. In addition, various causes of the new reactive power scenario in the Distribution System, as well as the countermeasures to be adopted to comply with the new regulation requirements were analyzed. The objectives in terms of cost reduction, loss reduction and efficient management of the electricity grid require an integrated approach in terms of appropriate technical analyses between TSO-DSO and of an updated regulatory context.

Paper 10653 identifies the main barriers and enablers for the implementation of network aware local flexibility markets (LFMs) and presents a discussion on the role of market architecture in the integration of LFMs. The conclusions show that even if network-aware market clearing algorithms will become relevant in the future, the business case for network-aware LFMs is quite uncertain. It currently faces technical and regulatory challenges, and in the future, it might be threatened by the inclusion of distribution grids to power-flow calculations in the Day Ahead market.

This paper (**paper 10682**) presents the business case of a German DSO reducing peak load by utilizing load forecasting techniques and local flexibility. In addition, results obtained from this business case and extend the study to other countries with different DSO-TSO capacity schemes like Sweden, Norway, France and Spain are shown. This approach aims to understand the business opportunities for local flexibility markets as an alternative for DSOs to actively manage their grids, and therefore reduce their capacity costs.

Paper 10697 describes the intended changes in the incentive scheme of the Swedish revenue cap regulation from today (see Figure 4) to the next regulatory period of 2024-2027, focusing on the intended changes to strengthen the incentives for efficient grid utilization and, following article 32 in the Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU (Electricity Directive), the use of flexibility services. To the next regulatory period, the Swedish NRA intends to introduce more balance between CAPEX and OPEX to strengthen the incentives for cost-efficient solutions, as well as to improve the load flow incentive by creating more focus on an even load flow during high-load days.

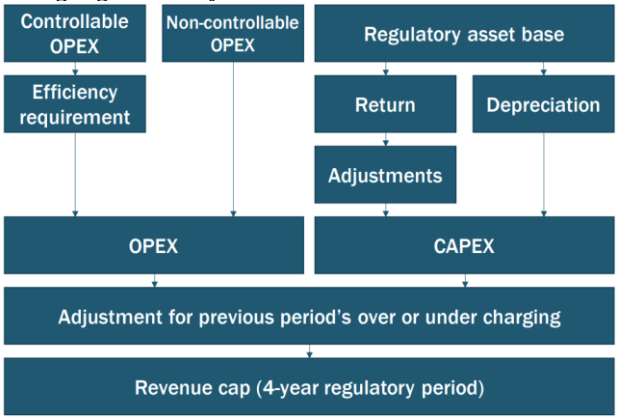

Figure 4: Overview of the Swedish revenue cap regulation in current RP 2020-2023

The work described in **paper 10709** aims to test the performance of three network-tariff structures in combination with a local marginal pricing electricity market. These network tariffs are real-time pricing (RTP), capacity charge, and Paris Metro Pricing. All network tariffs improved the LEMs' capability to reduce congestion, but implementation complexity and synchronization of consumption might make some tariffs a better option than others. All three network tariffs improved the performance, but capacity charge and RTP reduced the peaks further and caused the LEM to be limited less.

The European H2020 demonstration project EUniversal aims to overcome the existing limitations in the use of flexibility. For that purpose, smart grid tools for grid state assessment and active system management are developed.

A demonstration pilot in the LV grids of the German DSO MITNETZ STROM is set up to test the flexibility value chain from congestion detection to market-based flexibility procurement via a local flexibility market, especially examining the use of flexible resources in the LV grid for congestion management. **Paper 10758** describes the set-up of the flexibility value chain (see Figure 5) and shows how all individual parts are integrated into the complete process.

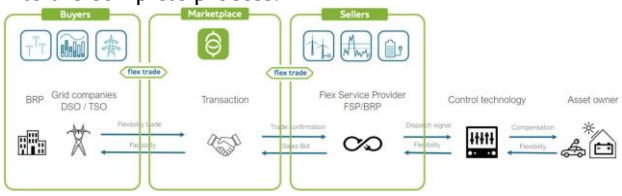

Figure 5: Digital flexibility value chain

Paper 10814 evaluates the decision process of Power-to-Gas (P2G) and Gas-to-Power (G2P) technologies through an optimisation algorithm and analyses the flexibility provided by P2G and G2P hybrid operations in a case study. It is observed that these operations can be effective in resolving generation related bottlenecks technically. Additionally, opportunity costs for P2G-G2P operators are quantified.

The overall objective of the presented project in **paper 10847** is to create local flexibility market platforms that enable the exploitation of network customers' services to other power system stakeholders. The developed platforms operate in real-time, constantly calculating the distribution network node capacity and providing these data to the operator and aggregator platform. This results in the assessment of customers' flexibility according to the available network capacity.

Slovenian national regulator, Energy Agency, already implemented a wide range of new policies in an end-customer and billing area. **Paper 10887** presents parts of them, focused on activities that were done to implement those policies in a daily, activities of the Slovenian DSO Elektro Ljubljana. The paper also presents the meaning of why and what is changing for the data preparation for billing needs, Elektro Ljubljana's approach in a data organization concept and the results of implemented solution.

Paper 10896 describes a proposal for the improvement of the supply continuity regulation in Brazil. The evaluation on new boundaries of grouping of customers based on information about customer density (Consumers per km²) led to reflections about the need to establish a new paradigm for defining goals for the continuity collective indicators (SAIDI and SAIFI).

The work presented in **paper 10898** has studied price developments, as well as the statistical properties in the day-ahead market and has shown that these properties are radically different in 2022 than former years and resemble more chance like properties for which make predicting future peak prices especially hard. It is also shown that by using a multi-variate regression method, it is possible to accurately predict prices in one price zone using information about concurrent prices in other price zones.

The **paper 10990** provides an overview of the results from the first flexibility trial by Northern Ireland Electricity Networks from November 2021 to May 2022. Results highlight the different approaches required when considering the procurement, baselining and dispatch of different service types. The findings of this trial along with other flexibility trials delivered are being taken forward to inform the business as usual utilisation of flexibility services in Northern Ireland.

Flex.on is a Hungarian program led by E.ON distribution system operator which conceptualized a comprehensive flexibility platform and eventually developed an IT system (see Figure 6) . The platform covers all DSO voltage levels with particular challenges. **Paper 11002** outlines the scope of the program, the system being developed and the challenges it poses.

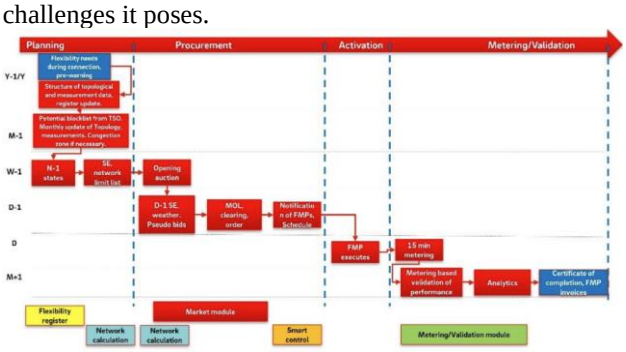

Figure 6: High-level E2E flexibility process

The work described in **paper 11070** looks at existing literature regarding electrical appliances and creates representative load profiles for these. These load profiles are used in a case study to see how load shifting on these appliances can be performed to reduce the demand charge grid tariff. By making use of the flexibility for several electrical appliances in terms of activation, the users can reduce their demand charge cost, leveling their consumption profile.

To address the need to increase resilience at minimal cost, the interplay between the different energy markets, market rules and legislation in the Swedish energy grid for resilience-enabling technologies (RETs), such as batteries, distributed generation and flexible demand is mapped in **paper 11092.** A comparison is made between the profitability of resilience-only, single-market and multi-market participation of example RETs based on historical data and perfect information, where the results indicate a greater return on investment for RET investments when these are used in multiple markets, as opposed to pure grid reinforcements or single markets. They also highlight the

need to update legislation in Sweden regarding islanded operation and energy arbitrage.

Paper 11107 describes the initiative taken by Tata Power towards empowering consumers for meeting their entire demand through 100% green energy. This is a first of its kind in India, enabling all our electricity consumers to opt for 100% RE source power by additionally paying the Green Power Tariff.

Brazil faced the risk of electric shortages provoked by a severe hydro-power crisis in 2021. As a result, emergency measures were adopted by both the supply and demand sides, among them is the incentive Program for the Voluntary Reduction of Electricity Consumption. **Paper 11111** evaluates the program from the perspective of behavioral economics fundamentals and lessons learned.

The **paper 11131** presents developed systems that are involved in procurement and managing of flexibility for DSO needs in Slovenia. The processes from registration of consumer's flexibility and applying on a tender and auction process to delivering flexible power to DSO are listed. It is also described the information exchange between systems (see Figure 7), and when and how the DSO activates consumers and aggregators and how settlement is done.

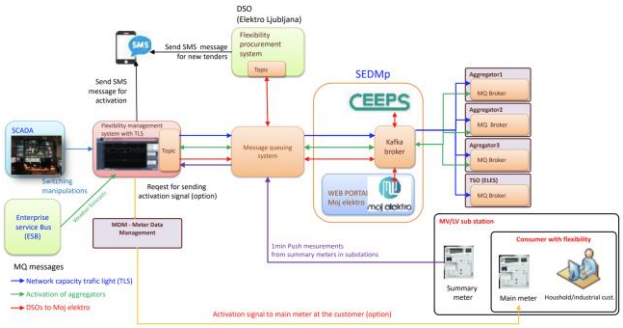

Figure 7: Information exchange between systems

In **paper 11135** some thoughts on new pathways for energy regulation on the distribution side of the network in order to push the adoption of innovation and new technology and, therefore, enhance the performances of quality-of-service are described. It is stated, that there are two different intervention levels: innovation and regulation. Both are described on more detail as well as the implications to the stakeholders involved.

Paper 11136 describes distribution code of countries that have implemented DSO, including the United Kingdom, and proposed a table of the distribution code for the South Korean distribution system. Additionally, the necessary contents of the distribution code were presented by dividing the stages according to the introduction rate of DERs.

This paper (**paper 11150**) compares the efficiency of two increasingly adopted TSO- DSO coordinated flexibility market models, namely: the (joint) common market and the (sequential) multilevel market. The results showcase how (i) the TSO-DSO interface pricing, (ii) the ability of flexibility service providers (FSPs) to bid differently in sequential markets, (iii) the different entry barriers that each of the market models can induce, and (iv) the bid formats and inclusion of partially divisible bids can have a direct impact on the efficiencies of the two markets, driving either their convergence or divergence.

Paper 11155 investigates the impact of aggregation effects due to these price incentives in interaction with the self-consumption optimisation of active grid users. The simulations are analysed regarding grid utilisation in an exemplary German low-voltage grid and include the timing, frequency and duration of load peaks, the voltage profile, phase distribution and the timing of supply and demand over the course of a year.
The effectiveness of a dynamic bandwidth tariff instrument on overloading problems in a low-voltage network containing solar panels, batteries, and heat pumps is assessed and described in **paper 11381**. It was shown that a dynamic bandwidth tariff can successfully resolve forecasted congestion if the associated costs are high enough compared to the day-ahead prices. However, the resulting load shifting can cause new congestion intra-day as well.

Another assessment is described in **paper 11385**: An assessment of the performance of historic methods for flexibility baselining in the UK. In many cases, the error in the baseline estimate is typically small, centered around zero without significant bias. However, this is not consistent for each asset type and large errors are possible. No method performs best in all cases, and therefore careful consideration should be given when deciding with method should be applied for different asset types, service types, and event times.

Paper 11394 surveys the most recent local flexibility markets (LFMs) initiatives in three Nordic countries: Finland, Norway, and Sweden. The analyses assert that the new LFM models express a promising technical and economic vision for increasing flexibility from the costumers' and aggregators' side by delivering grid and system services for both transmission system operators (TSOs) and distribution system operators (DSOs) in a coordinated context.

In **paper 11404**, a method for the assessment of structural parameters to derive distribution grid cost drivers is proposed and showcased (see Figure 8). The results illustrate that two-dimensional functional relationships between line lengths and cost drivers are not capable of making good predictions. Even if the maximum transformer load can give a rough estimate, factors like the power distance or the density of installed load and generation need to be considered.

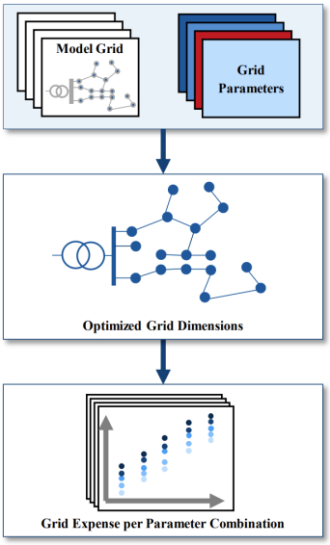

Figure 8: Approach to derive distribution grid cost drivers

Potential scope of discussion

In the current context of regulation, markets, network codes, and DSO/TSO coordination, there is a strong focus on flexibility. In this context, **paper 10445** provides a good overview of experiences and potential scope for further evaluations:

1. It is essential to correctly define roles and responsibilities of all the involved agents to facilitate well-functioning flexibility mechanisms. A framework where DSOs, TSOs, customers, market operators and the rest of participants trading flexibility services should facilitate and provide convergence and standardisation, taking into consideration the different realities across Europe.
2. The rules to be developed should be technology neutral and consider all clean available technologies to achieve a significant participation in the flexibility markets. Market neutrality is a fundamental principle to procure flexibility services in a way that creates a level playing field for all energy technologies and services.
3. The information exchange model between DSO and flexibility resources is key to providing an effective provision of flexibility.
4. Right incentives in their compensation schemes for DSOs to acquire flexibility. The regulatory framework should allow and properly incentivize DSOs to use flexibility when this is the most efficient solution for the grid, taking into account the long-run cost efficiency of the whole system.
5. Traditional customers and generators generally show little appetite for flexibility provision in the early stages: knowing more about customer capabilities, limitations and needs and setting efficient prices is needed to stimulate their participation.
6. Incentives for flexibility providers: The participation of small customers and demand-side resources requires matching the activity, process or needs with the flexibility demands of the electricity system. The delivery of a flexible service should minimize associated costs of flexibility provision in order to make it cost-competitive.

One of the key topics that can be potentially beneficial to facilitate innovation and unlock the flexibility value of flexibility resources is the remuneration of flexibility to DSOs to incentivize use flexibility services on the same footing as investment in traditional network assets. Although the regulation of such elements is complex and should be adapted to the overall national regulations some elements can be considered: 1. Enhance remuneration avoiding biased CAPEX-oriented incentives, considering for instance, the experience in UK based on total expenditures (TOTEX) and mitigating any negative accounting impact. 2. Create incentives to reduce network costs in the long-run and provide incentives for the DSO to use flexibility.

7.

Table 1: Papers of Block 1 assigned to the Session

Paper No. Title	MS a.m.	MS p.m.	RIF	PS
10113: Incentive Regulation For Lower Losses And More Efficient Use Of The Grid When Random Photovoltaic DG Is Connected In Argentinian LV Networks				X
10240: Model and Tariff Design for Multifunctional Distribution Networks				X
10268: Swedish Approach For The Assessment And Monitoring Of The Smart Grid Development	X			
10317: Metrics for the Validation of Agent-Based Local Energy Markets				X
10391: Abilities and Drawbacks in Flexibility Provision from Multi-energy Systems				X
10393: The UMEI - Universal Market Enabling Interface. An Interface to Enable Standard Interaction with Flexibility Markets for Procuring Grid Services	X			
10407: Design of an Auction-based Local Energy Market for Integrated Electricity and Heat Networks Coordinated with Wholesale Market				X
10418: Introduction of Grid Forming Converters in the European Network Codes				X
10445: Regulatory Learnings from EU Funded Flexibility Projects. The i-DE Case: Preparing the Future DSO	X			
10465: Real-Time Pricing Tariffs for Flexible Energy Storage Systems Considering the Market and Grid Conditions				X
10495: An Assessment Of The GB Energy Market's Suitability For Delivering A Customer-Focused Net-Zero				X
10569: Privacy by Design in Local Electricity Markets: A Differentially Private Market Mechanism				X
10576: Volumetric Or Capacity-based Grid Tariffs: A Case Study For Residential Consumers In Flanders	X			
10629: Reactive Power Flows From Mv To Hv Grids				X
10653: Business, Regulatory, and Technical Challenges for Integration of Network Aware Algorithms in Local Flexibility Markets				X
10678: Assessing EUniversal Local Flexibility Markets for Congestion Management and Voltage Control in Distribution Grids: application to a Portuguese case study				X
10682: Business Case of DSO Peak Shaving to Reduce Capacity Payments to Upstream Network Operators				X
10697: Incentive Scheme for Efficient Grid Utilization and Use of Flexibility Services in the Swedish Revenue Cap Regulation From 2024				X
10709: Performance Comparison of Three Distribution Grid Tariff Structures in Combination with a Local Marginal Pricing Market				X
10738: Baseline Performance Method for Local Electricity Market Performance Comparison				X
10758: Market-Based Flexibility Services For Congestion Management - A Comprehensive Approach Using The Example Of German Distribution Grids	X			
10814: Remuneration And Coordination Aspects Of Flexibility By Power-to-Gas And Gas-to-Power Technologies In Distribution Networks				X
10822: Experience from Implementing the Flexibility Market in Poland - OneNet Project				X
10825: Delivering a DSO in GB				X
10847: DN-FLEX: Local-flexibility Market Platforms For Distribution Networks				X
10887: Dynamic Network Tariffs for Efficient Distribution System Utilization				X
10896: Proposal For Improvement Of The Supply Continuity Regulation In Brazil				X
10898: Predicting Peak Prices in the Current Day-Ahead Market				X

10990: FLEX - Winter Trial Of Flexibility Services In Northern Ireland				X
11002: Local flexibility market development at E.ON Hungary				X
11070: Investigating the Role of Flexible Electrical Appliances in a Demand Charge Grid Tariff Scenario - A Norwegian Case Study				X
11075: Impact of Fairness on Network Allocation via Dynamic Operating Envelopes				X
11092: Market Participation of Resilience-enabling Technologies While Prioritizing Resilience-as-a-service				X
11107: Empowering Consumers with 100 % Green Power Solution				X
11111: Analysis Of The Incentive Program For The Voluntary Reduction Of Electricity Consumption In Brazil In 2021 From The Perspective Of Behavioral Economics				X
11131: Practical experiences of Flexibility market for DSO in Slovenia	X			
11135: From Ordinary Incentives Regulation To Sandboxes: A New Way To Enhance Continuity Of Supply				X
11136: A Framework for Development of Distribution Code towards Decentralized Power System				X
11150: Joint and Sequential DSO-TSO Flexibility Markets: Efficiency Drivers and Key Challenges				X
11155: Simulation And Comparison Of The Impact Of Different Price Tariffs On Grid Utilization				X
11381: A Scalable Open-Source Co-simulation Framework for Assessing the Effectiveness of Flexibility Activation Mechanisms on Congestion in Dutch Distribution Networks				X
11385: Flexibility Baselining In The UK – An Assessment Of Historic Methods				X
11394: A Review on Local Flexibility Market Advancement: Practices in Nordic Countries				X
11404: Method for the Assessment of Structural Parameters for Distribution Grid Cost Drivers				X

Block 2: "DSO BUSINESS & RISK MANAGEMENT"

Block 2 covers the DSO business management including risk management.

Paper 10136: The paper covers how virtual reality can be used in training in DSO companies and gives input both on the technology and the expected benefits.

Paper 10185: This paper attempted to establish a serious accident prevention measure considering the specificity of the working environment and a close analysis of safety accidents that occurred at power distribution construction sites in the past.

Paper 10215: The paper gives evidence of the impact heatwaves have on the distribution infrastructure in time.

Paper 10228: This paper discusses a novel approach for assessing historic extreme weather impacts and provides a methodology of how this baseline can be utilised to increase resilience of a distribution network to risks posed by climate change.

Paper 10260: The paper discussed how non-technical losses can be handled in a DSO company.

Paper 10280: This paper introduces the concept of gender mainstreaming in the electricity distribution sector, analyse the current situation in the energy sector based on a study carried out for the European Commission and propose a four-step plan to include gender perspective within new distribution projects.

Paper 10323: The paper investigates the effects of the age structure of the electrical equipment in power grids on the optimization of the distribution system operators' management strategies.

Paper 10340: The paper has introduced and described the innovative solution and approach developed by E-Distribuzione and Enel Grids in collaboration with CESI in the impact estimation of different and extreme weather conditions on MV network.

Paper 10386: The paper describes how an asset owner can handle growth and reinvestment needs considering overlap, long lead times and synergies.

Paper 10422: This paper provides an overview of the damage to the power distribution network caused by extreme weather like cyclones and describes the adopted measures that ensure the resilience of the network.

Paper 10462: In the present paper, the current state of the research regarding future frequency of lightning and severe thunderstorms is discussed.

Paper 10482: In this article, an attempt has been made to present Geospatial APM in ArchiMate which is for Enterprise Architecture (EA) modeling.

Paper 10499: This paper proposes the development of a new type of investment planning tool for DSOs for rapid evaluation of projected future consumption and generation.

Paper 10500: This study clarifies and strengthen climate risk management actions and to make the current structure-resilience balance and the various ongoing action plans (sustainable performance, reliability management, monitoring, source station safety and flood risk management) more efficient.

Paper 10522: This paper investigates this issue by analyzing the relevance of non-firm grid connection for a set of real-world LV-level photovoltaic projects.

Paper 10625: In this paper a novel disaster-based vulnerability index with the utilization of Geographical Information System (GIS) is introduced and explained.

Paper 10844: This work proposes a reconciliation approach to predict Photovoltaics (PV) production in distribution grids.

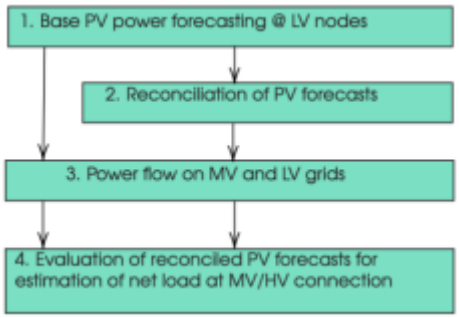

Figure 9: Methodological workflow described in paper 10844.

Paper 10852: The paper proposes an alternative to the post-fitting of grid requirements to economically planned energy communities.

Paper 10916: The paper presents examples of major energy efficiency improvement items and suggests the most efficient business model from the perspective of DSO.

Paper 10973: This paper is confidence in model outcomes used in the planning and operation of power grids.

Paper 10979: This paper would focus on how Enel Grids is designing his innovative Distributed Energy Resources Management System for DSOs planning and operation (DERMS).

Paper 11062: This paper discusses the electricity distribution pricing for energy communities (ECs) in the form of apartment buildings in the context of the Finnish electricity market environment.

Paper 11080: This paper quantifies technical impacts on a community established on a LV domestic network subject to a European grid tariff structure.

Paper 11110: This paper proposes a multi-criteria criticality indexing method for a quantitative consequence assessment of power transformer failures based a bi-level AHP.

Paper 11236: This study is focused on how flexible solutions are being implemented, assuming a crucial role in the DSO's adaptation to the new challenges arising in the Portuguese and French distribution grid.

Paper 11247: The paper describes how modernized climate maps considering 7 aspects can improve the understanding of climate risk.

Paper 11255: This paper presents an objective function for the meter placement that combines both monetary cost reduction and topological distribution.

Paper 11258: This paper discusses the long-term risk benefit approach that has been developed with distribution and transmission network asset managers and presents a comparison of the outcomes of the different asset investment approaches when undertaken for the same asset population.

Paper 11281: This paper has presented the interest of a utility function of von Neumann transposing to the case of integration of renewable energies in the electrical distribution system.

Paper 11283: This paper describes E-REDES journey for ISO55001 certification and the benefits.

Figure 10: Life cycle of E-REDES asset connected to paper 11283.

Paper 11352: In this paper the grid connection of energy super-stations and their technical and economic benefits are presented and reviewed.

Paper 11400: The paper describes ISO55000 (PAS55) and how Enel in Colombia has gone about implementing it.

Table 2: Papers of Block 2 assigned to the Session

Paper No. Title	MS a.m.	MS p.m.	RIF	PS
10136: THE USE OF VIRTUAL REALITY (VR) IN THE TRAINING OF EMPLOYEES IN ELECTRICITY DISTRIBUTION COMPANIES				X
10185: PREVENTION OF THE SEVERE SEFETY ACCIDENTS THROUGH PHYSICAL SEPARATION				X
10215: Real Time Quality Monitoring Of Electrical Distribution Network Affected By Heatwaves: A Data-Oriented Approach	X			
10228: ASSESSMENT AND VISULATION OF EXTREME WEATHER IMPACTS AND CLIMATE CHANGE RISKS ON DISTRIBUTION NETWORK OPERATION	X			
10260: ELECTRIC ENERGY DISTRIBUTION - CONTROL OF NTL (NON-TECHNICAL LOSSES)				X
10280: GENDER EQUALITY IN THE DISTRIBUTION SECTOR	X			
10323: OPTIMAL STRATEGIES FOR THE MANAGEMENT OF ELECTRIC POWER DISTRIBUTION SYSTEMS CONSIDERING DIVERSIFIED AGE STRUCTURES OF THE ELECTRICAL EQUIPMENT AND THEIR ECONOMIC AND TECHNICAL IMPLICATIONS				X
10340: Estimation Of Impact Of Extreme Weather Conditions On Distribution Asset And Improvement Of Operational Procedures Supported By Evolved Tools				X
10386: ASSET OWNER PERSPECTIVE ON MANAGING GROWTH AND REINVESTMENT NEEDS	X			
10422: EXTREME WEATHER AND POWER DISTRIBUTION SYSTEM RESILIENCE				X
10462: CLIMATOLOGICAL CHANGES AND NEW APPLICATIONS FOR SYSTEM GRID OPERATORS				X
10482: A FRAMEWORK FOR DYNAMIC RISKS AND RESILIENCY ASSESSMENT OF CRITICAL INFRASTRUCTURE- A CASE STUDY ON POWER DISTRIBUTION TRANSFORMERS				X
10499: TECHNICAL AND ECONOMIC GRID REINFORCEMENT ANALYSIS FOR THE DANISH DSO NETWORKS				X
10500: RESILIENCE OF THE ENERGY SYSTEM TO CLIMATE CHANGE : STUDY OF 3 RISKS FACTORS AND IMPACT ON RISK MANAGEMENT				X
10522: NON-FIRM GRID CONNECTIONS FOR LOW-VOLTAGE GENERATORS: A CASE STUDY	X			
10625: QUANTITATIVE APPROACH OF A NOVEL DISASTER- BASED VULNERABILITY INDEX IN DISTRIBUTION SYSTEM BY UTILIZING GEOGRAPHICAL INFORMATION SYSTEM STUDY CASE IN PALU AFTER DISASTER				X
10844: HIERARCHICAL FORECASTING FOR THE MANAGEMENT OF DISTRIBUTION GRIDS				X
10852: WHY DSO INVOLVEMENT IN ENERGY COMMUNITY PLANNING IS EXPEDIENT				X
10916: How Energy Efficiency Business affects Power System and New Business Model Suggestion from DSO				X
10973: ALL MODELS ARE WRONG, BUT SOME ARE USEFUL: AN EXPLORATION OF CONFIDENCE				X
10979: SOLUTIONS TO MANAGE LOCAL FLEXIBILITY SERVICES FOR THE DISTRIBUTION GRID IN THE ENERGY TRANSITION SCENARIO				X
11062: DEVELOPMENT POSSIBILITIES OF DISTRIBUTION NETWORK SERVICE CHARGES OF LOW-VOLTAGE CUSTOMERS – APARTMENT HOUSES AS ENERGY COMMUNITIES				X
11080: TECHNICAL IMPACTS OF THE DEPLOYMENT OF RENEWABLE ENERGY COMMUNITIES ON ELECTRICITY DISTRIBUTION GRIDS				X

11110: MULTI-CRITERIA CRITICALITY ASSESSMENT OF POWER TRANSFORMERS BASED ON A BI-LEVEL ANALYTIC HIERARCHY PROCESS				X
11236: FLEXIBILITY SOLUTIONS TO ADAPT E-REDES BUSINESS MANAGEMENT TO FACE NETWORK CHALLENGES	X			
11247: CLIMATE ANALYSIS TO PREVENT RISK TO DISTRIBUTION NETWORK ASSETS				X
11255: METER PLACEMENT ALGORITHM FOR RELIABLE DISTRIBUTION SYSTEM STATE ESTIMATION				X
11258: A LONG-TERM RISK BENEFIT APPROACH TO INVESTMENT OPTIMISATION				X
11281: MODELING OF RISK AVERSION LINKED TO RENEWABLE ENERGY POLICY AND DECISION- MAKER BEHAVIOUR				X
11283: E-REDES' ASSET MANAGEMENT CERTIFICATION INVOLVES THE ORGANIZATION AND IS NOT A MYTH				X
11352: IMPACT ON THE DISTRIBUTION NETWORK OF AN ENERGY SUPER-STATION				X
11400: STANDARDIZATION ISO 55000 & PAS 55				X

Block 3: CUSTOMERS, ENERGY COMMUNITIES & E-MOBILITY, ELECTRIFICATION, SECTOR INTEGRATION

Block 3 coves papers addressing aspects related to customers, energy communities, electrification issues and sector coupling.

Paper 10112 from Argentina addresses possible consequences of the insertion of Electric Vehicles in the Argentinian energy system, with the challenges and opportunities this will imply.

Paper 10117 presents results from a Norwegian pilot project where a battery energy storage system (BESS) was tested to identify its capability to perform fast frequency response (FFR) service. The main challenge identified was to meet technical requirements related to frequency response, and develop procedures related to the planning, managing, activation, and delivering of FFR service.

Paper 10122 from Germany analyse the significance of features from the identification of domestic appliance for load modelling perspectives.

Paper 10143 addressed the most attractive battery solutions already available (or close to be available) on the market for grid connection – beyond Lithium-ion batteries – e.g. Energy intensive supercapacitors (SCs), Na-Ion or Sodium-Ion batteries (SIBs), Zn-Ion or Zinc-Ion batteries (ZIBs).

Paper 10154 analyses the potential of a decentralized load management concept for optimization of security of supply. It further evaluates the transferability of the German concept to other selected countries.

Paper 10162 addresses the relevance of optimization and the monetization of residential demand side flexibility to reduce the electricity bill and the carbon footprint of residential electricity consumption, showing a case demonstrating the feasibility and benefits of aggregation of decentralized, behind-the-meter Battery-based Energy Storage Systems.

Paper 10233 from Germany addresses the impact changed flexibility operation could have on the necessary expansion in distribution grids – proposing a methodology that identifies the impact of local energy markets on the distribution grid expansion.

Paper 10236 highlights the potential of coupling electricity and gas vectors using the available infrastructure, analysing the electricity and gas distribution grids together. The concept is illustrated by a case study.

Paper 10254 focuses on residential consumer responses on motivator preferences to demand response and their willingness to enrol different household loads in demand response. The research is based on a survey answered by residential consumers of Finland and extrapolates the survey results to match the national statistics of Finland.

Paper 10285 from Iran uses a behavioural model to examine the effect of psychologically reducing demand policies on the amount of household electricity consumption during peak hours.

Paper 10313 from Brazil demonstrate how blockchain technology can help solve the need for secure, transparent, and reliable systems to deal with the large exchange of information and traceability of energy and hydrogen production.

Paper 10321 addresses the characteristics of inverters for photovoltaic electricity generation and storage systems, including the functions they are able to perform, and way of communication.

Paper 10345 from Portugal presents results from a project which intends to turn industrial kitchens into active players in the sustainable energy system.

Paper 10376 reports from a EU project which aims to establish a universal approach to the utilization of flexibility by Distribution System Operators and their engagement with new flexibility markets. This is done through developing the Universal Market Enabling Interface (UMEI) concept.

Paper 10388 from Belgium reports from a project with a cogeneration unit that was set up by a Property Management Agent of a large apartment building.

Paper 10411 presents an innovative concept and platform for public consultation of s DSO's network development plans, where customers can visit the platform and see, study, and give feedback about the network serving their neighborhood.

Paper 10421 from Iran addresses gamification as one of the solutions to change people's behavior and consumption style, with the purpose to increase the participation in the consumption management and reduce peak-load.

Paper 10487 reports from an Austrian work to assess the impact of optimizing available flexibilities in ski resorts on the CO_2 footprint, the costs of the consumed energy, and the monthly power peaks for ski resorts.

Paper 10497 from Germany gives a comparison of to what extent the usage of vehicle-to-home (V2H) could replace battery energy storage systems (BESS) in private households with photovoltaic (PV) installation.

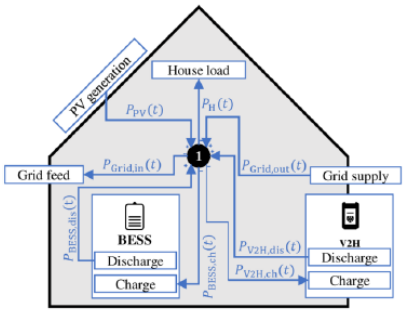

Figure 11: Energy flows within the house model –Paper 10497

Paper 10572 reports from experiences from Finland on tariff development, where new tariff structures and charging scenarios were analysed for ca. 5000 household customer.

Paper 10589 presents results from Swiss study of a demand response framework that promotes grid-beneficial behaviour of residential loads through a dynamic grid tariff and automated load switching.

Paper 10609 from the Netherlands proposes a method for coordination of community electricity markets that is straightforward, effective and considers the electricity deregulation – demonstrating how flexibility from prosumers can be utilized by the DSO to solve network problems.

Paper 10613 – also from the Netherlands – reports from two studies on how flexibility settlement can support congestion management – highlighting a prognoses-based baselining method as the most viable candidate to handle this.

Paper 10681 from France reports from a case study of a method to evaluate the electric flexibility of tertiary building equipment of the campus of the Catholic University of Lille.

Paper 10716 from Portugal presents a price optimization model to manage the electric vehicle (EV) charging load at the distribution networks, supporting a shift from a standard price approach to a dynamic price which relies on the calculation of a grid resilience factor.

Paper 10728 – also from Portugal – addresses initiatives and the results of a new solution to handle complaints related to damages to electrical equipment.

Paper 10752 reports from Irish perspectives on implementing residential customer flexibility in rural communities, highlighting among other things the challenges of controlling multiple technologies from different manufacturers in a coherent and optimized manner.

Paper 10775 from Finland reports from a survey of customers preferences regarding smart charging of electric vehicles.

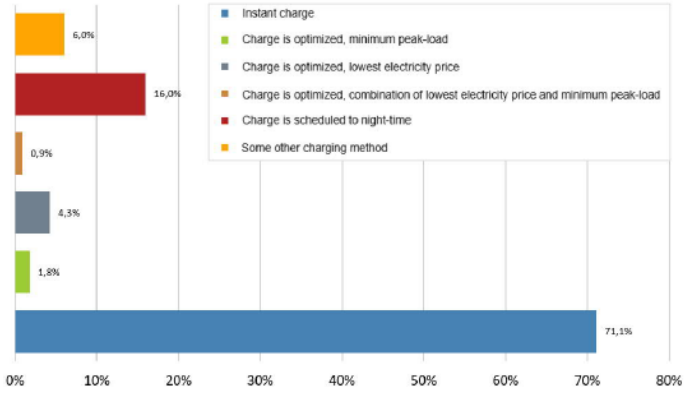

Figure 12 – Customer's preferred way of EV charging, Paper 0775

Paper 10786 reports on a method for enhancing network resilience during windstorms utilising battery energy storage systems (BESS) degradation, comparing the added value to resilience benefits against the BESS degradation risks in terms of BESS degradation costs.

Paper 10813 from the UK presents results of a feasibility study on the potential demand side response capacity embedded in the operations of water networks.

Paper 10829 from Belgium reports on EV charging losses for onboard chargers operated by three different charging methods, namely uncoordinated (dumb) charging, smart charging, and load balancing using key performance indicators such as energy consumption, peak power, self-sufficiency, and self-consumption.

Paper 10840 from Norway presents results from a pilot project where flexible loads have been identified and activated at both residential and industrial customers, where the main purpose of the pilot was to identify the realistic potential for flexibility at different types of customers – both in time of the day and time of the year.

Figure 13 Test results at commercial buildings –Paper 10840

Paper 10903 from Finland presents results relate to developing a new digital-based service concept to be introduced on distribution transformer level. The concept will be developed as a technical solution, but also considering related operations and business models as well customer interface.

Paper 10928 from South-Korea presents a model of optimizing the profits of photovoltaic operators utilising hybrid energy storage systems.

Paper 10936 from Finland and the US reports on integrating digital building flexibility through a sub-aggregator.

Paper 10952 proposes a new model to optimize the costs and benefits of residential customers participating in an incentive-based demand response program with the consideration of customers' comfort level.

Paper 10970 from Northern Ireland presents perspectives on how to develop electricity network for net zero, ensuring that the electricity network is a facilitator for net zero, while at the same time ensuring customer costs to be kept as low as possible.

Paper 11051 from Austria and Germany introduces a framework to operate renewable energy communities while improving grid-friendliness in low-voltage (LV) grids, e.g., by reducing grid equipment overloads.

Paper 11053 from the Netherlands investigates the environmental and financial effects of adding solar PV and storage to off-grid microgrids to reduce or remove diesel usage, exemplified for a military base use case.

Paper 11098 reports on Norwegian experiences on how a private charging dock, and a zero-emission station can be built by meeting both the requirements of the distribution system operators (DSOs) and the needs of the user / prosumer - enabling heavy-duty charging infrastructure in a capacity constrained grid.

Paper 11099 from Finland and the UK investigates business models for smart charging, particularly linking EV and/or homeowners, building managers, and network operators.

Paper 11152 from Finland explores experts' perceptions towards sector coupling and related policies in urban and rural contexts in a region in Finland – highlighting both threats and opportunities in this context.

Paper 11196 from Germany explores industrial flexibility ant the impact it may have in the high voltage level.

Paper 11235 from the UK presents a testing and demonstration platform, enabling real households to interact in real time with network hardware in a closed feedback loop.

Paper 11307 from the Czech Republic describes technical solutions and approaches securing development, installation, and operation of fleet non-public charging stations for electric vehicles (EV).

Paper 11320 reports from an Italian study on the use of performance indicators to encourage proactive user behaviours in renewable energy communities, presenting a methodology to simulate the change in members' habits related to the increase in awareness.

Paper 11346 from the UK paper presents possible provisions of flexibility by different technologies sees in the context of different business models – based on real use cases and associated data.

Paper 11489 from the UK evaluates the effects the different tariff structures on revenue streams of local energy systems in Spain and Austria under a energy service provision business model.

Table 3: Papers of Block 3 assigned to the Session

Paper No. Title	MS a.m.	MS p.m.	RIF	PS
10112: Challenges And Opportunities When E-Mobility Is Incorporated In Argentinian Scenarios				X
10117: Pilot Project where a Battery Energy Storage System is used for Fast Frequency Reserve		X		X
10122: Assessment Of The Significance Of Features For The Identification Of Domestic Appliance				X
10143: Advanced Electrical Energy Storage Technologies And Their Applications On Customer Side		X		X
10154: Potential of a Decentralized Load Management Concept and Transferability to Various Countries		X		X
10162: Flex Box: a Customer-oriented Approach for Residential Flexibility				X
10230: Viable LINK-based Energy Community: Increasing Flexibility and Resilience of Electricity Infrastructure				X
10233: Determining the Impact of Energy Sharing on the Necessary Distribution Network Expansion				X
10236. End-use Sector Coupling To Turn Customer Plants Into Prosumers Of Electricity And Gas		X		X
10254: Identifying motivators for Direct Load Control Demand Response				X
10285: Behavioral Approaches to Reduce Household Energy Consumption				X
10313: Traceability of power generation in a Multi-Energy Virtual Power Plant using Blockchain				X
10321: Identification and Characterization of Inverters used for PV Generation and Storage Systems				X
10345: Electricity Consumption Correlation Between Appliances in Industrial Kitchens				X
10376: The EUniversal Portuguese Demonstrator: From MV-LV Coordinated Identification Of Flexibility To Activation Through The UMEI				X
10388: The Interest of Energy Communities in Urban Areas – from a DSO's Perspective				X
10411 Public Consultation Platform for Network Development Plan		X		X
10421: Gamification an Innovative Approach to Reduce Electricity				X
10487: Multi Objective Optimization Of Flexibilities In Ski-Resorts – CO2, Power Peaks, And Day-Ahead Market				X
10497: Vehicle-to-Home or Battery Energy Storage Systems – A Comparison of the Potential Usage in Smart Homes		X		X
10572: Tariff Development for Smart EV Charging for Households				X
10589: Reducing Power Peaks In Low-Voltage Grids Via Dynamic Tariffs And Automatic Load Control				X
10609: Coordination of Community Electricity Markets and Distribution Network Operation				X
10613: Flexibility Settlement For Congestion Management: Two Practical Studies				X
10681: Study of Electrical Consumption Flexibility Offered by HVAC System Based on Rooms Thermal Modelling - Tertiary Building Case Study				X
10716: Grid Performance Optimization Supported By An EV Charging Dynamic Price Formation Model				X
10728: E-REDES Technical-Commercial Forum - a New Approach to Address Technical Complaints Involving Client Damages				X

10752: A DSO View On Implementing Residential Customer Flexibility In Rural Communities				X
10775: Preferences in EV's Smart Charging – Customer Survey				X
10786: Resilience Services from Battery Storage Degradation				X
10813: Electricity and Water Network Interoperability to Enable Flexible and Low Carbon Distribution				X
10829: EV charging evaluation using real-world datasets: a case study of energy consumption, peak power, self-consumption, and self-sufficiency				X
10840: Flexible activation for grid purposes – Experiences from a Norwegian pilot				X
10903: Smart Transformer as an Energy Community Service Node and Integrator of Local Resources				X
10928: Optimal Incentive Design based on Monte-Carlo Simulation for Hybrid ESS Considering Multiple Services Provision				X
10936: Integrating Digital Building Flexibility through Sub-aggregator Business Model				X
10952: Optimal Scheduling of Flexible Residential Loads Under Demand Response Programs Considering User Comfort				X
10970: Developing An Electricity Network For Net Zero		X		X
11051: Grid-Friendly Renewable Energy Communities Using Operating Envelopes Provided by DSOs				X
11053: Environmental Impact Assessment of Off-grid Microgrids Using Energy Storage and PV				X
11098: Enabling Heavy-Duty Charging Infrastructure in a Capacity Constrained Grid				X
11099: Review of Emerging Advanced Smart Charging Flexibility Business Models				X
11152: Exploring The Opportunities Of Sector Coupling – The Conflicting Interests Of Urban And Rural Energy Systems				X
11196: Industrial Flexibility Options: Impact And Usage As A Service In The High-Voltage Level				X
11235: Demonstration Of A Whole Energy Systems Accelerator				X
11307: Green Fleet Project				X
11320: Use Of Performance Indicators To Encourage Proactive User Behaviours In Renewable Energy Communities				X
11346: Business Models For Virtual Power Plants And Their Impact On Economic Operation				X
11489: Effects of Tariff Structures to the Revenue Streams of Local Energy Systems: Findings from the MERLON Project				X

Block 4: DIGITALIZATION, METERING, IT-SYSTEMS & CYBERSECURITY

Paper 10138: The paper also describes how the photographs taken by the players are integrated to a DSO's asset management processes and systems and how the photographs are analyzed by utilizing artificial intelligence.

Paper 10205: Enel X developed two living labs, called X Lab, in Rome and in Catania; the scope is electrification technologies and grid services testing. The paper presents the XLabs and some of the actual activities in progress there and the potential future applications.

Paper 10217: This paper addresses two big challenges in the digital transformation of large companies and outlines a solution developed as part of the WisNat project.

Paper 10267: This paper proposes a method to evaluate the risk for exposure of personal information from time series data, by handling identity and attribute disclosure.

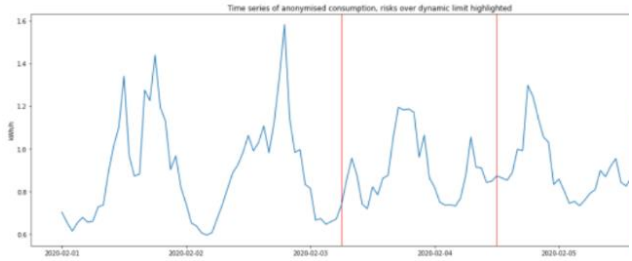

Figure 14: Anonymised time series with high risk hours highlighted, Paper 10267

Paper 10373: This paper demonstrates that a clustering based, outlier detection model can detect vulnerability-related usage pattern changes when these are applied to household energy usage.

Paper 10384: This paper presents current data exchange processes and a new shared data-hubs, SIORD, which unifies the real time information exchange between the Distribution System Operators and the distributed energy resources.

Paper 10410: In this paper, in addition to providing a clear definition of metaverse in distribution companies, a suitable model and strategy for implementation and deployment is presented.

Paper 10514: This paper presents the experience with Central Energy Meter applications used in the campus of Brno University of Technology (BUT), being a modern power grid in which communication plays an important role in making the system reliable.

Paper 10560: This paper presents experiences from India regarding the benefits of smart meter technology - both to customers and the utility.

Paper 10601: The paper describes a tool to improve grid status monitoring, with the purpose of the new tool to become a keystone enabling the energy transition and paving the way towards a digitized electrical grid supported by intelligent real-time management.

Paper 10673: The authors of this paper suggest the "Renewable energy data platform", which provides power transmission and distribution system data and incorporates the relevant on constructing renewable energy plants.

Paper 10684: This paper proposes a constrained linear optimization model for automatic distribution, a text classification model to help predict agent skills, and an automatic entity recognition model that extracts essential domain-specific information.

Paper 10785: This paper focuses on better utilization of existing network assets, which is key to avoiding significant network investments.

Paper 10804: This paper describes the use of an advanced anomaly and cyber threat detection system (ADS system) in the operational technology (OT) infrastructure of Elektro Celje.

Paper 10863: This paper focuses on identifying and quantifying important human events (regarding their impact on the energy consumption) from social media data.

Paper 10919: This paper, highlights some differences between academic efforts and first-hand industrial experiences, in order to steer the former towards more applicable research solutions for data-driven system identification in distribution networks, enabling the improvement of existing data sets.

Paper 10960: This paper gives an insight to the deployment of smart meters at Enedis which allows them to get data regarding supply quality directly from the customer. Using this data represents a great opportunity to improve supply quality of distribution network.

Paper 10989: Data science challenges have become a popular method for engaging the data science community in solving important and common machine learning challenges. They also highlight key problems facing the energy community and testing the limitations of what can be achieved by data- based solutions. This paper presents each challenge, which focusses on real issues facing future low carbon economy, and the effective methods and techniques utilized by participants.

Paper 11009: This paper discusses various solutions developed by NGED to provide open data in an accessible, agile and adaptable way to enable the transition to a decarbonised, decentralised and digitised energy system.

Paper 11010: In this paper a method described to develop a machine-learning pipeline that estimates electricity consumption and production at a half-hourly time step for small geographic areas by applying survey sampling

techniques to smart meters data.

Paper 11074: This paper introduces a language model for the DSO activities of Enedis. The model is based on state-of-the-art language models but has been trained on domain-specific data.

Paper 11121: This paper presents new modelling approach and PowerFactory-based software solution, developed for ENERGO-PRO Georgia, the distribution system company, for automated 0.4-35kV network model creation based on a field collected data.

Paper 11130: This paper is an overview of EUMED Metering, a CIM-Based Exchange Model, and presents first experiments of this standardized "energy data format" at Enedis, the main French Distribution System Operator (DSO).

Paper 11243: In this paper, a decision tree is trained with variations of the same FDI attacks' dataset to study how each variation affects the accuracy results to two different labels: location and status.

Paper 11244: This smart metering project is designed as a step toward the full digitalization of the distribution system in Serbia.

Paper 11256: This paper discusses the use of a data lake approach to maximise the use of existing data to embark on a modern risk-informed approach to asset management that can be enhanced as the approach matures.

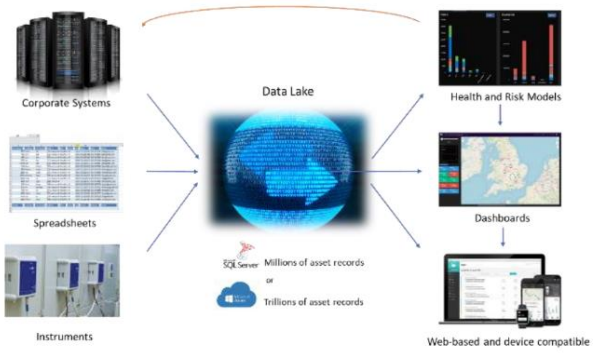

Figure 15: Example data lake system architecture, Paper 11256

Paper 11278: In this study, unsupervised and supervised machine learning were used on a pseudonymized smart meter dataset of approximately one million consumers from the Dutch DSO Alliander.

Paper 11310: This paper presents solutions and best practices for introducing Big Data technologies into the DSO environment and how to extract useful business value using these modern tools.

Paper 11440: This paper aims at presenting a machine learning application to enhance the quality of electrical distribution asset management, applied in four utilities in Brazil to avoid undesirable regulatory revenue undervaluation.

Paper 11447: This paper proposes applying a system thinking to a evolving utility paradigm and developing a unified digital architecture for sustainable digital transformation of distribution utilities that can facilitate a seamless integration of all the business processes with diverse technical systems/ solutions coming from different energy sectors and relevant ecosystems like Cities, Buildings and Homes in resilient & cyber secure manner.

Paper 11498: This paper presents a work that developed a solution to work on the client's claims, including (i) the anonymization of sensitive data and preparing its processing; (ii) the development of a text reading algorithm and consequent classification of complaints and suggestion of root causes; (iii) the automatization of the process and integration on E-REDES infrastructure; (iv) the creation of a platform for the management of complaints.

Table 4: Papers of Block 4 on Digitization assigned to the Session 6

Paper No. Title	MS a.m.	MS p.m.	RIF	PS
10138: EleniaGO – Crowdsourcing Maintenance Inspections		X		X
10205: Electrification Technologies And Grid Services Testing Inside Enel X Labs				X
10217: Knowledge Transfer to Industry and DSO Knowledge Graph				X
10267: Anonymisation Score For Time Series Consumption Data		X		X
10373: Using Smart Meter Data to Predict and Identify Consumer Vulnerability				X
10384: SIORD, a New DSO-shared Data Hub to Monitor and Control Distributed Energy Resources in Spain		X		X
10410: The future of Metaverse in electricity distribution companies (Definition, Roles, and Potential Research Issues of the Metaverse)				X
10514: Central monitoring application used at Brno University of Technology				X
10560: Smart meters technology – Benefits to consumers and utility				X
10601: New tool to improve the grid status monitoring and customer connections process				X
10673: Renewable Energy Data Platform Including Electric Power Transmission and Distribution System				X
10684: HAPe Optimizing Customer Relation by Automatic Task Distribution Using Constrained Optimization and Natural Language Processing				X
10785: Smart Metering, Monitoring & Optimising LV Network performance				X
10804: Cybersecurity In DSO OT Environment Using Advanced Anomaly Detection				X
10863: Time Series Machine Learning Augmented With Social Network Events To Improve National Electricity Consumption Profile Estimation				X
10919: Data Quality Challenges in Existing Distribution Network Datasets		X		X
10960: Leveraging Smart Metering Data To Estimate The SAIDI				X
10989: Data Science Challenges; A Wholes Systems Lens of Solving Energy Issues				X
11009: Open Data; Delivering Results For Data Stakeholders		X		X
11010: Estimating Local Electricity Consumption And Production For Small Geographic Areas using smart meters				X
11074: A State Of the Art Language Model Trained On A Corpus Of Texts Generated From The Set of DSO Activities				X
11121: Automated Development of the Software Model of the Distribution Network Based on Field Collected Data and GIS Coordinates				X
11130: EUMED Metering, A CIM-based Exchange Model: First Experiments And Perspectives From A DSO				X
11243: Supervised Machine Learning For False Data Injection Detection: Accuracy Sensitivity				X
11244: Smart Metering Project Serbia 2022 Prospective For DSO Operation Improvements				X
11256: Making The Most Of Existing Data – A Data Lake Approach To Risk Quantification		X		X
11278: Creating Bottom Up Load Profiles Using Disaggregation, Clustering and Supervised Machine Learning on Large Smart Meter Dataset				X
11310: Leveraging Big Data Technologies For Supporting DSO Operations And Adding Business Value To The Collected Data				X
11440: An Asset Management Machine Learning Application				X

11447: Architectural and system approach to sustainable digital transformation of distribution utilities				X
11498: Proactive Complaint Management witch ClientID				X