Special Report - Session 6
CHALLENGES FOR DOSs IN NEW BUSINESS ENVIRONMENTS

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Introduction

The role of the DSO is evolving as the business as a whole is going through substantial changes.

All actors are trying to drive change, but this it is complex since there is are large legacy differences and no clear dominating drivers, "silver bullet", applicable over all countries/markets. This gives a variety of different solutions are required to meet the specific national society demands.

At the same time there are forces trying to unify the evolution. In Europe this is done through examples are the creation of regional markets being created and the development (and decision) of network codes. And in the center of the ongoing transformation is the market neutral and independent DSO's filling an increasingly important role.

Within this context, Session 6 has chosen to focus on the following four key blocks of papers in our selection:

- Block 1 New DSOs roles in a digital world
- Block 2 Development of regulation
- Block 3 Enabling flexibility
- Block 4 Asset and Risk Management

The blocks addresses each prominent issues related to the DSO business:

The first block highlights issues related the role of DSOs in the age of digitalization. The second block focuses on the ongoing developments in regulation of the distribution business. The third block targets different aspects of how to meet the need for increased flexibility in load, generation and in the network. Finally, the fourth block looks into the recent developments within asset and risk management, which are relevant for the DSO business.

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 – with a large span in topics addressed in the session.

In total Session 6 has accepted 97 papers. In the following each of the blocks of papers are presented, with briefs comments related to the contents of each paper.

Block 1: New DSOs roles in a digital world

Digitalization is key to business success in a dynamic environment where efficient management of information, processes and roles are crucial. The following papers shows the many different aspects of digitalization.

0023: The paper analyses a communication exception event happened in a data center of State Grid Shanghai Municipal Electric Power Company. The whole process of occurrence, disposal and recovery is elaborated.

0054: A auxiliary service process is proposed in this paper that consider smart grids requirements. It builds on the increased need of TSO/DSO communication to build joint auxiliary services.

0112: The paper describes dynamic data modelling within master data structures in order to pave the way for analytics and big data.

0147: The paper developed a novel approach to hands-on tackle the challenge of shaping new business models in five phases: understand the environment, ideate new value propositions, cluster and select promising value proposition bundles, design business models around them, and evaluate

their viability.

0223: This paper focuses on modelling activities in the Flexiciency Horizon 2020 project on meter data and their exchange among stakeholders.

0268: This paper provides a discussion on a set of topics driven by research carried out in the INSMART project. It presents a better understanding on the actual state of the art for utilities and DSOs seeking their new role as Data Manager and Market Facilitator.

0395: This paper presents an online tool designed and developed to address the problems with exchanging service providers, focusing on knowledge transfer efficiency and the co-creation approach of the overall design process.

0499: Technical, environmental and social benefits of AMI infrastructure project are reviewed and a comprehensive data monitoring system is proposed for efficient management of distribution network. Finally, the ability of proposed system in power quality improvement, distribution loss calculation, renewable resources integration and demand response program is presented.

0518: This Paper examines, in detail, all aspects related to rollout of AMI in India. It covers key issues such as smart meter standards and specification, testing of smart meters, retrofitting of existing meters, communication technology options, procurement strategy and business models for AMI rollout.

0521: This paper describes ISGF (India Smart Grids Forum) vision for the next generation of smart metering using internet – the era of IP Metering that would reduce the total cost of ownership and provide excellent last mile connectivity.

0522: This paper highlights the advantages social media can provide for electric utilities for better communication with their customers. Social media can be leveraged by utilities for directly reaching out to provide outage information, updates on service restoration, new tariff plans, billing and collection alerts, receiving feedback and several other useful tips and updates.

0664: EDP Distribuição extended the smart metering to the segments of public lighting and secondary substations (MV/LV). The purpose of this paper is to explain the three major areas of the process, namely, Implementation Control, Field Technical Work and IT Update.

0705: The paper describes the SORIA Smart Metering Solution that is a collaborative effort between 27 Norwegian DSO's rolling out smart meters.

0764: This paper present Elenia's experiences about AMI and application method of AMI system. Roll-out project was finalised at 2008 and since then the meters have been in active use and the supporting systems has been developed actively.

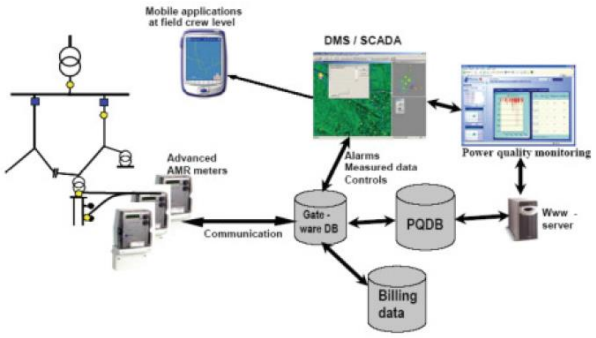

Figure 1: **Using AMI system in network management (Paper 0764).**

0794: This paper shows that collaboration between public administration and the Distribution System Operator in the same area is essential to any Smart Grid project. Early results show that the unbundled smart meter will have definitely a major role in further developments.

1019: This paper aims to find and explore tangible effects, concerning the operation efficiency and effectiveness in the smart grid rollout, and also the intangible benefits, such as gaining image positioning, by turning to advantage the massive installation of smart meters.

1111: This paper presents the development of a computational system to visualize, analyse and predict data related to residential customer satisfaction. Data mining techniques were used to develop regression models to predict satisfaction indices in moments different from a yearly field survey.

1181: The platform described in this paper has two main objectives: (i) guarantee neutral data access to all market agents; (ii) operate as a market hub for the Home Energy Management Systems flexibility, in terms of consumption shift under dynamic retailing tariffs and contracted power limitation requests in response to technical problems.

1306: The paper describes the development of the framework for a customer model and the relationship of this framework to critical industry standards and activities.

Table 1: Papers of Block 1 assigned to the Session

Paper No. Title	MS a.m.	MS p.m.	RIF	PS
0023: A COMMUNICATION EXCEPTION EVENT CAUSED BY AN INAPPROPRIATE CONFIGURATION OF FIREWALL IN DATA CENTER (DISASTER RECOVERY CENTER) OF STATE GRID SHANGHAI MUNICIPAL ELECTRIC POWER COMPANY				X
0054: PROPOSED DSO ANCILLARY SERVICE PROCESSES CONSIDERING SMART GRID REQUIREMENTS				X
0112: REALISING NETWORK INTELLIGENCE THROUGH MASTER DATA EXPLOITATION AND DYNAMIC DATA MODELLING				X
0147: HOW TO SHAPE DIGITALIZATION IN THE ENERGY SECTOR – A NEW APPROACH FOR SYSTEMATIC BUSINESS INNOVATION	X			
0223: MODELLING METERING DATA FLOWS, FROM USE CASES TOWARDS IMPLEMENTATION	X			
0268: INSMART - TOWARDS THE NEW DSO POTENTIAL ROLES IN LOW CARBON FUTURE AND INTEGRATED FRAMEWORKS FOR SMART CITIES				X
0395: KNOWLEDGE TRANSFER EFFICIENCY IN EDP DISTRIBUIÇÃO (ONLINE TOOL)				X
0499: The Experience of Implementation of AMI System in Mashhad: The Green Project of FAHAM				X
0518: AMI ROLLOUT STRATEGY AND COST-BENEFIT ANALYSIS FOR INDIA	X			
0521: NEXT GENERATION SMART METERING: IP METERING				X
0522: Leveraging Social Media by Utilities for Customer Engagement				X
0664: SECONDARY SUBSTATIONS SMART METERING CAMPAIGN				X
0705: THE SORIA SMART METERING SOLUTION				X
0764: EXPERIENCES OF USING AMI SYSTEM FOR DSO's BUSINESS OPERATION	X			
0794: UNBUNDLED METERS CAN BOOST SMART CITY PROJECT				X
1019: ENHANCING STAKEHOLDERS INVOLVEMENT BY SMART METERS DEPLOYMENT CAMPAIGN				X
1111: DATA MINING ON TECHNICAL AND CUSTOMER SERVICE DATA OF A BRAZILIAN DISCO TO INCREASE CUSTOMER SATISFACTION				X
1181: TOWARDS NEW DATA MANAGEMENT PLATFORMS FOR A DSO AS MARKET ENABLER – UPGRID PORTUGAL DEMO	X			
1306: DEVELOPING A FRAMEWORK FOR THE CUSTOMER MODEL OF THE FUTURE	X			

Block 2: Development of regulation

In the energy transformation the development of regulation in a timely manner is critical to succeed. The below papers shows the extensiveness and complexity with regulation.

0011: This paper present a first step towards finding a consensus on the parameters to take into account, the objectives to pursue, and methodology to follow when regulating the insertion of intermittent renewable energy, as is expected in a rather near argentine future.

0064: This paper addresses that policy makers should encourage national regulatory authorities (NRAs) to give DSOs appropriate incentives to implement the necessary innovative initiatives that support the transformation of the DSOs' business models.

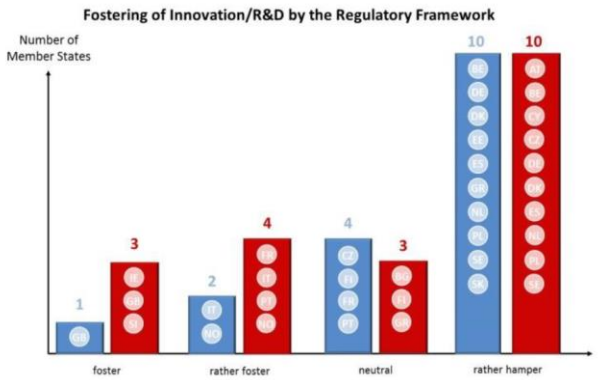

Figure 2 Categorization of regulatory frameworks concerning the level of fostering innovation (paper 0064).

0113: This paper explores the challenges for ANEEL, the Brazilian electricity regulator, in the light of proliferation of Distributed Energy Resources (DERs) which are expected to bring opportunities and threats for both incumbent regulated entities and new entrants.

0115: This paper presents an algorithm for identifying and forecasting "surplus flexibility" of storage systems in distribution networks. This approach enables the "multi-use-operation" of storage assets such as batteries. The paper also highlights and analyze the regulatory options for batteries.

0141: The paper gives an overview on the Smart Grid Roadmap of Switzerland, which identifies barriers for the development of Smart Grids.

0158: This paper proposes a new framework to study impacts of regulatory incentive policies on DG investment, as well as upgrading of upstream transmission substations and sub-transmission lines.

0342: This paper presents a regulatory framework developed to motivate investors for involving in distributed generation (DG) units expansion plans in distribution networks in the light of reward/penalty schemes.

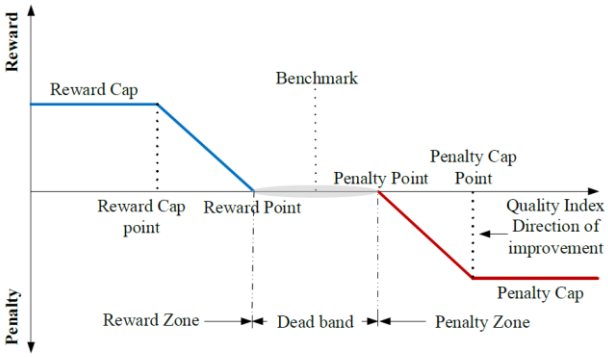

Figure 3 A general Reward-Penalty Scheme (paper 0342).

0358: This paper explores the topics bonding DSOs and DG owners under the present regulation and a planning structure that considers Distribution Capacity Contracts (DCCs) as a planning option is proposed.

0449: This paper investigates the effects of decrease in difference between marginal prices and electricity tariffs in the electrical energy sector on the performance of distribution companies are investigated and the effectiveness of it in subjects such as reducing energy consumption, peak load, level of customer satisfaction, timely payment of electricity bills, increase in revenue and the increased presence of distributed generation (DG).

0605: This paper proposes a pricing method which allows for interaction between active and reactive power markets while considering the effect of some units going offline.

0632: This paper presents the evolution of incentive regulation of quality in the Czech Republic and lists the parameters that have been set for the current regulatory period. The paper summarizes a method for calculating the 'zero borders', which was the main tool for setting the required values of SAIFIQ and SAIDIQ under the incentive regulation.

0766: This paper summarizes the needs for and regulation of frequency control resources in Turkey.

0825: This paper provides an overview of most recent methods for electricity fraud detection, based on concepts from data mining, state estimation, game theory etc.

0866: This paper introduces the Shaanxi Regional Electric

Power Group Co., Ltd's business framework mainly including the business of power distribution and retail, and analyses the changes of internal and external environments, especially the transition of market role and business mode.

0918: This paper presents a national platform for information on end-customer interruptions and outages in Denmark – a platform which is part of the introduction of new a supplier centric model, by which Electricity Retailers in the future is expected to be the customers "single-point-of-contact" in all matters incl. technical issues as outages.

0949: This paper presents the German project Designetz focusing on securing the energy supply in line with the objectives of the energy transition (decentralisation, decarbonisation and the interconnection of consumption and generation using information technologies) by combining supply-dependent generation with flexibility in relation to load and storage.

1017: This paper provides a summary on how Swedish distribution system operators (DSO) are regulated after a revenue cap model, and describes a potential development on the current utilization incentive scheme within this regulation.

1021: This paper presents some results from an analysis carried out by The Swedish Energy Market Inspectorate. The analysis has looked into how the revenue cap regulation may be improved from the next regulatory period (2020-2023) and beyond.

1079: This paper presents a route by which a Distribution Network Operator (DNO) evolves to a Distribution System Operator (DSO). It will highlight the work carried out by UK Power Networks to develop DSO capabilities to integrate Distributed Energy Resources (DERs).

1091: This article presents the drivers that will lead the Brazilian regulation to change the tariff methodology of the rural electrification cooperatives. It also analyses the benefits caused by this paradigm change.

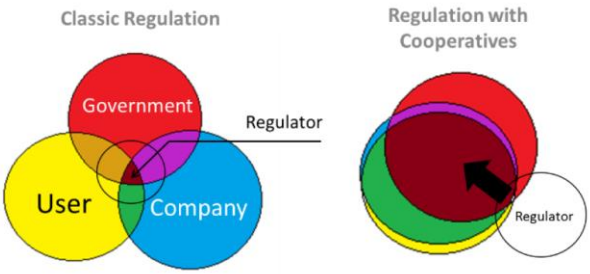

Figure 4 Agent's relationship (paper 1091)

1245: This paper provides an overview of the current policy framework for small scale renewable energy based systems in Brazil, focusing on (a) the recent changes in the net metering regulation, (b) market response to regulatory incentives, and (c) the remaining barriers for widespread deployment of this kind of distributed energy resources in the country.

1257: This paper evaluates from a distribution system operator (DSO) perspective, how market models alongside new and existing players can be orchestrated to stimulate a gradual deployment of public EVSEs in synch with forecasts for the evolution of Brazilian EV fleet.

1275: This paper proposes an algorithm to permit a microgrid operator to participate the ancillary service market in order to increase the revenue of its plant and at the same time to provide an important service for the whole power system.

1342: This paper proposes a performance based regulation (PBR) for the regulation of a Distribution Company with consideration for asset management time scopes. In this regard, a comprehensive separated regulation mechanism is presented so that the total expenditure for asset management is separated into two, capital expenditure (Capex) and operational expenditure (Opex).

Table 2: Papers of Block 2 assigned to the Session

Paper No. Title	MS a.m.	MS p.m.	RIF	PS
0011: REGULATION FOR INSERTION OF SMALL SCALE INTERMITTENT RENEWABLE ENERGY DISTRIBUTED GENERATION IN ARGENTINA				x
0064: INNOVATION INCENTIVES FOR DSOs- A MUST IN THE NEW ENERGY MARKET DEVEOPMENT	x			
0113: DISTRIBUTED ENERGY RESOURCES IN BRAZIL – ISSUES AND REGULATORY CHALLENGES				x
0115: FORECAST THE GRID ORIENTED BATTERY OPERATION TO ENABLE A MULTI-USE-APPROACH AND DISCUSSION OF THE REGULATORY FRAMEWORK	x			
0141: THE SMART GRID ROADMAP AND REGULATION APPROACHES IN SWITZERLAND	x			
0158: EVALUATION OF REGULATORY IMPACTS ON INVESTMENTS OF DISTRIBUTED GENERATION AND UPSTREAM NETWORK UNDER UNCERTAINTY: A NEW STOCHASTIC BI-LEVEL MODEL				x
0342: DEVELOPING A COMBINATORIAL REWARD-PENALTY SCHEME TO FACILITATE INTEGRATION OF DISTRIBUTED GENERATIONS				x
0358: REGULATORY MATTERS AFFECTING DISTRIBUTION PLANNING WITH DISTRIBUTED GENERATION				x
0449: MODELLING THE INFLUENCE OF SUBSIDIZATION ON ELECTRIC DISTRIBUTION COMPANY PERFORMANCE: CASE STUDY				x
0605: A PROBABILISTIC FRAMEWORK OF COOPERATIVE DISPERSE GENERATION RESOURCES SCHEME FOR PRODUCING REQUIRED REACTIVE POWER THROUGH SIMULTANEOUS ACTIVE AND REACTIVE POWER MARKET				x
0632: INCENTIVES IN SUPPLY CONTINUITY REGULATION AND SETTING ITS PARAMETERS IN THE CZECH REPUBLIC	x			
0766: BATTERY ENERGY STORAGE SYSTEMS, AN EFFECTIVE SOLUTION TO ANSWER ELECTRICAL GRID CHALLENGES IN TURKEY				x
0825: NON-TECHNICAL LOSSES: DETECTION METHODS AND REGULATORY ASPECTS OVERVIEW				x
0866: ROLE TRANSITION AND DEVELOPMENT STRATEGIES OF SPG IN THE MARKETIZATION REFORM				x
0918: NATIONAL PLATFORM FOR INFORMATION ON CUSTOMER INTERRUPTIONS AND OUTAGES IN DENMARK	x			x
0949: Designetz: A modular concept for the energy transition – from isolated solutions to an efficient energy system of the future				x
1017: DEVELOPMENT OF THE UTILIZATION AND SMART GRID INCENTIVE SCHEME WITHIN THE SWEDISH REVENUE CAP REGULATION				x
1021: ANALYSES OF THE CURRENT SWEDISH REVENUE CAP REGULATION	x			x
1079: ENABLING DISTRIBUTED ENERGY RESOURCES TO ENTER THE ENERGY MARKET AND SUPPORTING THE EVOLUTION TO A DISTRIBUTION SYSTEM OPERATOR				x
1091: REGULATION FOR THE BRAZILIAN COOPERATIVES (APPLICATION OF SOFT-REGULATION)				x
1245: RECENT CHANGES AND FUTURE TRENDS IN THE BRAZILIAN NET METERING REGULATION				x

Paper No. Title	MS a.m.	MS p.m.	RIF	PS
1257: MARKET MODEL FOR THE DEVELOPMENT OF RECHARGING INFRASTRUCTURE IN BRAZIL				x
1275: A MILP ALGORITHM TO SET BIDS FOR ANCILLARY SERVICES IN THE NEXT ITALIAN MARKET FOR DISTRIBUTE GENERATION				x
1342: DESIGNING A COMPREHENSIVE SEPARATED REGULATION MECHANISM OF DISTRIBUTION COMPANIES CONSIDERING SHORT AND LONG TERM ASSET MANAGEMENT				x

Block 3: Enabling flexibility

This block of papers addresses different aspects related to how to enabling and improving flexibility in distribution grids.

The papers are divided into the following three subgroups:

- Innovative tariffs
- New technologies and services for flexibility
- Actors enabling increased flexibility

Innovative tariffs

0133: This paper from the Netherlands describes the development of an innovative tariff system for a public Low Voltage Direct Current (LV DC) distribution network by Dutch distribution system operator Liander, where the tariff system offers incentives, which will stimulate customers of a local DC grid to collaborate.

0425: Paper 0425 from Egypt presents a study comparing Time of Use And Real- Time Pricing tariffs using a fuzzy optimisation.

0517: Paper 0517 from Iran propose a personalized pricing scheme using customers' real-time consuming data to produce a real-time price for each of them. The pricing is not only affected by the total consumption of the grid but also depends on personal consumption of each customer.

0556: Paper 0556 present results from Norway on alternative grid tariffs for household customers with roof top PV-panels and evaluates how alternative grid tariffs might affect the benefit from investing in a roof top PV-panel. The paper further shows how different orientations of the PV-panels can affect the benefits for the prosumers subjected to different grid tariffs (for example a power grid tariff), where the idea is that self-consumption will produce the best economic yield.

0701: Paper 0701 from Finland discusses the development of alternative power-based tariff structures for small customers. New tariff structures are needed to respond to future changes in the operating environment of the electricity distribution. The paper presents a power-based tariff structure based on a cost-causation principle and a power-based tariff structure with power and time limits.

0777: Paper 0777 from France proposes a methodology to allocate network costs among customers through grid tariff design. Most distribution grid tariffs are mainly based on the energy drawn from the grid. The adoption of self-generation can consequently offer a substantial reduction of the network bill, which raises equity and efficiency issues, related to network costs allocation among customers.

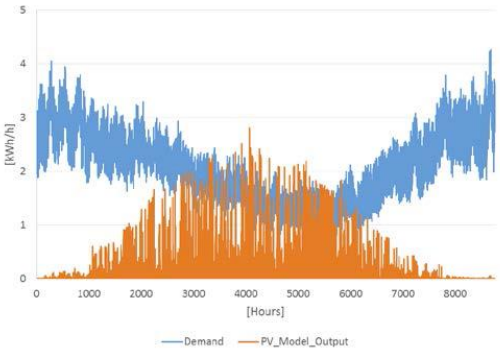

Figure 5 Load curve for typical residential customer and modelled PV-generation (Paper 0556)

0858: Paper 0858 from Finland presents work on how new power-based tariffs with different parameter settings affect the distribution of customer payments, showing that such tariffs with different time period options can have significant impact on how DSO's revenue is collected from customers.

0887: Paper 0887 from Finland discusses targets, challenges and impacts of new distribution tariff structures, especially power based distribution tariffs – summarizing preliminary results of an ongoing Finnish national research project. The paper states that the topic is very multifaceted, as changes in the pricing of electricity distribution have different effects on different actors of the field like customers, DSOs, electricity retailers and other third parties in the electricity sector.

0908: Paper 0908 from Finland describes transition steps towards power based tariffs. Before implementing power based tariffs in large scale, DSOs have to make sure that the change will not cause unwanted outcomes such as too aggressive an impact on the distribution fees of the customers or on the total revenue of the DSO.

New technologies and services for flexibility

0127: Paper 0127 from Belgium studies the local technical impacts of storage plants installed at the distribution level, but operated for solving issues related to transmission systems. The influence of the storage mainly depends on two considerations, namely its position in the network as well as the correlation between consumption on the studied network and total load within the whole system. The paper shows that the storage unit may even deteriorate the local situation

0165: Paper 0165 from China presents a work where energy storage resources are employed to reduce customers' breach influence and maintain load aggregators performance in the market.

0221: Paper 0221 from Belgium presents the E-Cloud project, where the aim of the described micro grid solution is to maximize the consumption of energy produced locally. The goal is to reduce the customer's electricity bill by a minimum of 10%, and further to ease the integration of renewable generation embedded in the distribution network, and avoid extra investment in the DSO network.

0225: Paper 0225 reports from an EU project FLEXICIENCY, describing a common architecture framework. Requirements are listed for data and service exchange at EU level, addressing data privacy and interoperability, among regulated and unregulated energy players.

0365: Paper 0365 describes work from the SENSIBLE project, with demonstration sites in Portugal, UK and Germany.

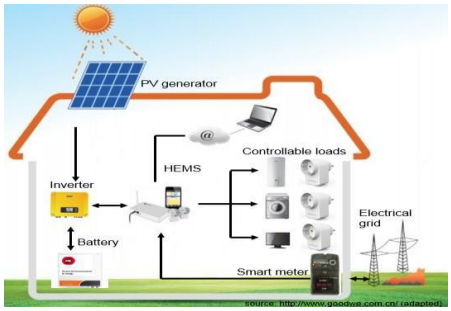

Figure 6 Residential assets architecture (Paper 0365)

0429: Paper 0429 from Germany gives provides insights in the technial integration of Power-to-Heat (PtH) assets in distribution grids. PtH is option for DSOs to integrate RES. The paper describes a test in Meisenheim where PtH assets are tested.

0730: Paper 0730 from Norway presents results from the EMPOWER project where a local energy market concept is introduced. The local energy market is organized within a neighborhood and supported by a platform based business model.

Figure 7 Hybrid local market (Paper 0730)

0867: Paper 0867 from Germany / UK presents how Virtual power Plants can be utilized to increase flexibility in regional power markets, incorporating both DER and demand response in the VPP.

0874: Paper 0874 from Iran describes how gamification and data mining to support the utilities, using modern technologies and efficient motivational tools to address this.

Adding the "reward" and "competition" parameters leads to costumers engagement and motivation towards achieving goals which have been determined by the electricity distribution companies.

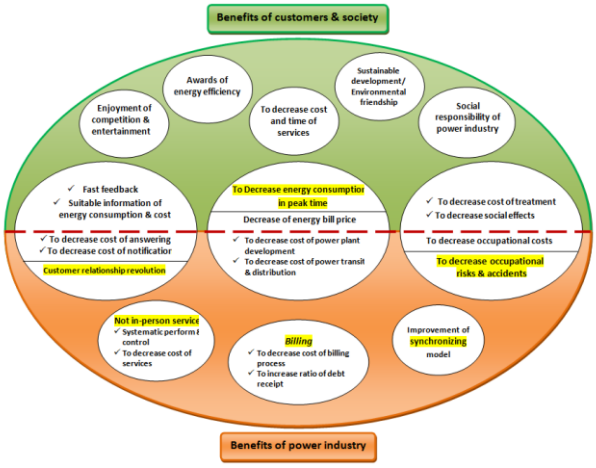

Figure 8 Benefits of EPEDC ELEGAME (Paper 0874)

1040: Paper 1040 from the UK presents results from testing of the demand response features of the ACCESS (Assisting Communities to Connect to Electric Sustainable Sources) system at the Power Network Demonstration Centre prior to its deployment on the Isle of Mull.

The paper presents the different components of the system in detail (i.e. what it is designed to do and why); the test regime undertaken at the PNDC; the results of the testing (i.e. how effectively it achieves its design objectives); and the updates to the ACCESS system based on the testing.

1198: Paper 1198 from France reports on the development of new hydrogen applications and infrastructure in France, using water electrolysis technologies to achieve energy transition goals. The paper shows the cost of providing flexibility services to the distribution system operator for three types of hydrogen infrastructures connected to the electricity distribution grid.

Actors enabling increased flexibility

0164: Paper 0164 from China describes a bidirectional decision-making model of load aggregators bidding and dispatching established based on market prediction and considerations of the customers' constraints.

0576: Paper 0576 from South Korea proposes a model for

small-scale electricity trading for the utility KEPCO and energy prosumers using micro-girds that have variety micro-grid models. The study examines the economic benefits for both the prosumer and the utility.

0589: Paper 0589 reporting from the SENSIBLE project, describes the community engagement strategies applied to the Évora and Nottingham demonstrators under the scope of project, taking into account the different phases of the project. The results presented supports the chosen community engagement strategies.

0744: Paper 0744 from Sweden presents results from the Smart Grid Gotland demonstration project, where the market test, which started in late autumn 2013 and ended in spring 2016, was a success from a customer satisfaction point of view. The paper concludes that automatic control based on price signals can be used to achieve a load shift from periods of high load to periods of low load, without affecting customers' comfort.

0838: Paper 0838 from Iran presents a new pricing policy to encourage distributed generation to participate actively in the restructured distribution network, based on nodal pricing. The proposed method has been implemented in a test distribution network to show the effectiveness of the proposed method.

0878: Paper 0878 from Sweden describes how customers can be categorized based on their demand patterns. The results can be used for deeper analysis regarding particular customer behaviors such as flexibility and new loads (electric cars, solar panels), and to develop template consumption profiles.

0987: Paper 0978 discusses automation of the supplier role using block chain based contracts, showing how an energy supplier contract for automated negotiation, settlement and payment, can be implemented – indicating a potential for blockchain based smart contracts to perform a supply role in the power system.

1117: Paper 1117 from Spain presents barriers for using demand response for Ancillary Services, and further a load modelling methodology for different electricity markets.

Table 3: Papers of Block 3 assigned to the Session

Paper No. Title	MS a.m.	MS p.m.	RIF	PS
0127: TECHNICAL IMPACTS ON DISTRIBUTION SYSTEMS OF MEDIUM-SIZED STORAGE PLANTS PARTICIPATING IN ENERGY AND POWER RESERVE MARKETS				X
0133: INNOVATIVE TARIFF SYSTEM FOR PUBLIC LV DC DISTRIBUTION NETWORK				X
0164: RESEARCH ON BIDIRECTIONAL DECISION-MAKING FOR LOAD AGGREGATORS PARTICIPATING IN MARKET TRANSACTIONS AND LOAD DISPATCHING				X
0165: ENERGY STORAGE CAPACITY OPTIMIZATION FOR LOAD AGGREGATORS CONSIDERING THE PROBABILITY OF DEMAND RESPONSE RESOURCES' BREACH				X
0221: E-CLOUD, THE OPEN MICROGRID IN EXISTING NETWORK INFRASTRUCTURE		X		
0225: PROVIDING SMART METERING DATA SERVICES THROUGH AN EU MARKET PLACE		X		
0365: ENERGY SERVICES BRIDGING THE GAP BETWEEN RESIDENTIAL FLEXIBILITY AND ENERGY MARKETS				X
0425: COMPARATIVE STUDY BETWEEEN: TIME OF USE AND REAL.TIME PRICING USING FUZZY TECHNIQUE				X
0429: THE PROJECT "POWER-TO-HEAT IN SMART GRIDS"– A MULTI-OBJECTIVE APPROACH FOR A MAXIMIZED VALUE OF FLEXIBILITIES IN GRIDS				X
0517: DEMAND SIDE MANAGEMENT CONTROLLING WITH PERSONALIZED PRICING METHOD				X
0556: ECONOMIC EVALUATION OF THE GRID TARIFF FOR HOUSEHOLDS WITH SOLAR POWER INSTALLED				X
0576: CHALLENGES FOR UTILITY WITH ENERGY PROSUMER IN KOREA				X
0578: WIND ENERGY PRODUCTION VARIATIONS IN CONTINENTAL PORTUGAL: AN ANALYSIS OF THE COMBINED EFFECTS OF SPOT MARKET PRICE AND FEED-IN TARIFF COSTS				X
0589: SENSIBLE PROJECT COMMUNITY ENGAGEMENT BOTH IN ÉVORA AND NOTTINGHAM DEMONSTRATOR SITES				X
0701: DEVEPLOMENT OF POWER-BASED TARIFF STRUCTURE FOR SMALL CUSTOMERS AND PATHWAY FOR THIS CHANGE		X		
0730: CREATING A LOCAL ENERGY MARKET		X		
0744: BEHAVIOR OF ACTIVE HOUSEHOLD CUSTOMERS ON THE ELECTRICITY MARKET – FINDINGS FROM MARKET TEST SMART GRID GOTLAND		X		
0777: COSTING NETWORK SERVICES FOR CONSUMERS WITH PV SELF-GENERATION				X
0838: DISTRIBUTED GENERATION ENCOURAGEMENT IN THE RESTRUCTURED DISTRIBUTION NETWORK BY MEANS OF NODAL PRICING				X
0858: IMPACTS OF DIFFERENT POWER-BASED DISTRIBUTION TARIFFS FOR CUSTOMERS				X
0867: VIRTUAL POWER PLANTS LEVERAGING ENERGY FLEXIBILITY IN REGIONAL MARKETS				X
0874: EPEDC ELEGAME: AN INTEGRATED MODEL USING GAMIFICATION AND DATA MINING TO REVOLUTIONIZE UTILITIES' FUNCTIONS				X

Paper No. Title	MS a.m.	MS p.m.	RIF	PS
0878: CATEGORISATION OF ELECTRICITY CUSTOMERS BASED UPON THEIR DEMAND PATTERNS				X
0887: REFORMING DISTRIBUTION TARIFFS OF SMALL CUSTOMERS – TARGETS, CHALLENGES AND IMPACTS OF IMPLEMENTING NOVEL TARIFF STRUCTURES				X
0908: ANALYSIS OF TRANSITION STEPS TOWARDS POWER-BASED DISTRIBUTION TARIFF OF SMALL CUSTOMERS				X
0987: AUTOMATION OF THE SUPPLIER ROLE IN THE GB POWER SYSTEM USING BLOCKCHAIN BASED SMART CONTRACTS				X
1040: TESTING AND VALIDATION OF THE ACCESS SYSTEM		X		
1117: SIMPLIFICATION AND EVALUATION OF DEMAND RESPONSE BY THE USE OF STATISTICAL AGGREGATED MODELS				X
1198: VALUATION OF HARNESSING FLEXIBILITY FROM DECENTRALIZED WATER ELECTROLYSIS SYSTEMS FOR THE DSO				X

Block 4: Asset and Risk Management

0067: The paper is a result of an international study to identify new and extended functionality that will be required to operate a safe, secure, reliable and affordable system in the future. It looked in detail at Ireland, Germany, New York and California with a high level review on other areas.

0090: This paper examines the history of how asset risk indices were developed within the electricity distribution sector over the two decades prior to the common methodology. Understanding the historical context helps with evaluating the strengths and also the limitations of moving to a common framework, thereby providing a good basis for evaluating where and how the framework is best applied whilst minimizing any 'modelling risk'.

0136: This paper introduces a theoretical planning and operation models within the smart city by classifying roles DSOs into six main intervention areas: parameters and resource availability, system costs, geolocation characteristics, energy prices, regulatory constraints and energy demand.

0234: The Future Power System Architecture (FPSA) project examines the changes to the GB power system expected over the next 15–20 years, and the challenges these will present. The project brief considered functions from a whole system perspective. This paper summarizes the key findings and conclusions from the FPSA project from the Distribution Systems Operator (DSO) perspective.

0239: In this paper, according to the practical situation of transforming Shanghai Municipal Electric Power Company DISASTER RECOVERY CENTER to DATA CENTER, the principal of information security protection was studied, and the new requirements of information security protection on DATA CENTER were described.

0249: This paper reviews the benefits of investing in an upgrade strategy for aging electrical switchgear infrastructure. Costs and production downtime scenarios are analyzed and low and medium voltage switchgear upgrade methods are discussed.

0252: To help reduce risk and potential cyber-attack surface, DSOs must implement a security organization and adopt active security processes. This paper will describe one of those processes that must be actively maintained. A suggested methodology and a smart patch management system based on IEC62443-2-4 standard is discussed.

0334: This work address the subject of Security-by-Design in Smart Grids. The approach is based on designing technologies with the Smart Grid Architecture Model and existing risk estimation formulas, with a look at characteristics to help estimating failure probabilities. Finally the paper discusses which way of combining these characteristics and failure probabilities fits best for a risk estimation and how it can be improved.

0388: Currently, there is a high level of outsourcing of the construction, maintenance and service activities to the AT, MT and BT network in EDP Distribuição. This paper aims to present the implemented model to monitor the execution quality of the services performed by external companies.

0404: This paper outlines changes that are causing a re-think of the way distribution networks are operated and how interactions with transmission are managed. It concludes by arguing for more active, coordinated operation of distribution and sets out priorities for development of new market and regulatory arrangements.

0523: This paper presents mandatory recommendations for the stakeholders on cyber security for power systems in India and is applicable to generation companies, network companies, manufacturers, IT providers and service companies.

0656: The paper covers the FPSA project's (Future Power System Architecture) view on the whole system perspective. The result helped collate evidence that 35 functions are fundamental to the evolution of Great Britain power system.

0667: This paper present the development of a research oriented towards the highest preponderance assets, such as distribution transformers. Research started from the evolution and development of asset management in electrical utilities, especially in electric energy distribution utilities, and the implication that asset management may have in Latin America. This work also aims to analyze various options for asset management at different time frames, with direct implications in the development of the company´s work.

0671: This paper considers the information of the measuring systems of an electric utility company in Brazil along with data on the deployed smart metering technology used in the Smart City Búzios Project. The ANEEL (Regulatory Agency for Electric Energy in Brazil) presents a methodology for evaluating costs and benefits of electronic measurement implementation in Brazil.

0799: This paper describes the new trends regarding cyber security introduced in the latest standards and provides an approach for deploying security in depth and improving the security of the grid from a risk perspective.

0844: The paper describes a new model called 'SAPIENT' has been trialed and adapted by Network Operators to manage the complexity of the latest Low Voltage (L.V.) intermittent fault location techniques.

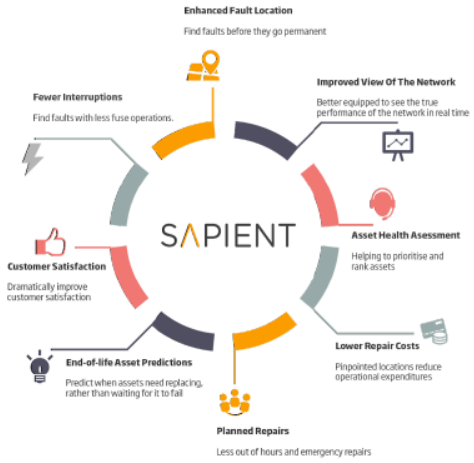

Figure 9 Outsourced 'SAPIENT' model provides many benefits (Paper 0844).

0869: The paper presents a solution to validate a DSO's long-term investment and maintenance policy both on company level and on community level. The result implements an asset management decision support tool that facilitates the whole strategic and operational asset management process "end-to-end" (in line with the infrastructure standards).

0936: This paper cover some practices and methods in creating effective cyber security architectures for substation and distribution automation systems and products which are robust enough to withstand cyber-attacks and resilient enough to recover in the event of security compromise and keeping device functional and executing its core functionality even during attack.

1015: This paper addresses the Evolution of the Quality of Supply (QoS) in the Portuguese Distribution System over the last years. This Quality of Supply can be noticed both in what regards continuity of supply and power quality (PQ).

1138: This paper address the emerging need for Distribution System Operators to optimise Distributed Energy Resources hosted in their networks. This paper presents the Active Network Management (ANM) technology platform elements developed to host DSO

optimization functionality and the requirements this addresses including: control platform architecture and properties

1147: In this paper a novel method based on independent component analysis is proposed. The basis of using this method is on the statistical independence of load components of different classes of customers. The proposed method decomposes the load components from the total measured load of a feeder. And then calculates the share of each component of the total load profile.

1204: The purpose of this paper is to present the transformation process that is currently being implemented in EDP Distribuição (EDPD), the main Portuguese DSO, in order to reap the full benefits of the ongoing smart grids' investments.

1217: The aim of this paper is to assess the financial risks that the Distribution System Operators (DSOs) incur in the energy commercialization process in Brazil.

1360: This paper presents 3D virtual world asset models can be created by efficiently modelling infrastructure from aircraft combined with rapid cloud computing and analytics. Used in disaster response mode, the same infrastructure can be even more quickly mapped, modelled, and then compared against the pre-disaster model to detect changes in the assets and all surrounding features including trees, structures and roads.

1361: The paper shows the limitless potential of analysing big data in the cloud, we are now able to move modelling into the fifth dimension (5D), which postulates all possible scenarios of change between two objects or locations. Now we are asking 'How could it change?'.

Table 4: Papers of Block 4 assigned to the Session

Paper No. Title	MS a.m.	MS p.m.	RIF	PS
0067: INTERNATIONAL REVIEW OF HOW POWER SECTOR DEVELOPMENTS ARE RESPONDING TO CHANGING SYSTEM CHARACTERISTICS				X
0090: ASSET RISK INDICES: COMMONALITY, DIVERSITY AND USAGE - THE HISTORY IN UK ELECTRICITY DISTRIBUTION		X		
0136 ENERGY MANAGEMENT AND PLANNING IN SMART CITIES				X
0234: WHAT DOES A DISTRIBUTION SYSTEM OPERATOR NEED TO KNOW ABOUT THE FINDINGS OF THE FUTURE POWER SYSTEM ARCHITECTURE PROJECT?				X
0239: THE NEW REQUIREMENTS OF INFORMATION SECURITY PROTECTION ON STATE GRID SHANGHAI MUNICIPAL ELECTRIC POWER COMPANY DATA CENTER COMPARED TO DISASTER RECOVERY CENTER				X
0249: GUIDELINES FOR MODERNIZING EXISTING ELECTRICAL SWITCHGEAR IN LV AND MV NETWORKS		X		
0252: ADDRESSING THE CHALLENGE OF CYBER SECURITY MAINTENANCE THROUGH PATCH MANAGEMENT				X
0334: DETERMINING FAILURE PROBABILITIES WITH QUALITATIVE CHARACTERISTICS FOR RISK ESTIMATION IN THE SGAM		X		
0388: OUTSOURCING ASSET CONSTRUCTION: EDP DISTRIBUIÇÃO QUALITY ASSURANCE STRATEGY				X
0404: ENABLING DISTRIBUTED ENERGY RESOURCES: PRIORITIES FOR FUTURE ACTIVE OPERATION OF DISTRIBUTION NETWORKS AND INTERACTIONS WITH TRANSMISSION				X
0523: INDIAN MANUAL FOR CYBER SECURITY IN POWER SYSTEMS				X
0656: A WHOLE SYSTEM PERSPECTIVE FOR ENERGY SYSTEMS				X
0667: REVIEW OF ASSET MANAGEMENT IN DISTRIBUTION SYSTEMS OF ELECTRIC ENERGY - IMPLICATIONS IN THE NATIONAL CONTEXT AND LATIN AMERICA				X
0671: TECHNICALAND FINANCIAL ASSESSMENTS FOR COMPARISON OF MEASUREMENT TECHNOLOGIES IN THE SMART CITY BUZIOS PROJECT				X
0799: DOES CYBER SECURITY MOVING TOWARD RISK MANAGEMENT LEAD TO NEW GRID ORGANIZATION?				X
0844: SCALING EXPERTISE VIA UTILISATION OF AN OUTSOURCED LOW VOLTAGE FAULT MANAGEMENT BUSINESS MODEL				X
0869: “END-TO-END” STRATEGIC ASSET MANAGEMENT PROCESS TO SUPPORT ASSET SERVICE ON COMMUNITY LEVEL		X		
0936: CYBER SECURITY - SECURITY STRATEGY FOR DISTRIBUTION MANAGEMENT SYSTEM AND SECURITY ARCHITECTURE CONSIDERATIONS				X
1015: EVOLUTION OF THE QUALITY OF SUPPLY IN THE PORTUGUESE DISTRIBUTION SYSTEM				X
1138: IMPLEMENTING OPTIMIZATION FUNCTIONALITY ON NETWORK MANAGEMENT PLATFORMS FOR NEW DSO BUSINESS MODELS				X
1147: DECOMPOSITION OF LOAD COMPONENTS USING DATE MEASURED IN THE BEGINNING OF SUBTRANSMITION SUBSTATIONS				X
1204: CHANGING THE DSO TO REAP THE FULL BENEFITS OF SMART GRIDS				X

Paper No. Title	MS a.m.	MS p.m.	RIF	PS
1217: ASSESSMENT OF ELECTRICITY DISTRIBUTION COMPANIES RISKS IN THE BRAZILIAN ENERGY MARKET FRAMEWORK		X		
1354: EFFICIENT DECISION MAKING SUPPORTED BY ISO 55000				X
1360: VIRTUAL ASSESSMENT WITHIN 24 HOURS OF A DISASTER				X
1361: IDENTIFYING INFRASTRUCTURE CHANGE IN THE 4TH AND 5TH DIMENSIONS		X		

SESSION 6 : Challenges for DOSs in new business environments

Block 1 - New DSOs roles in a digital world

0023 **A communication exception event caused by an inappropriate configuration of firewall in Data Center (Disaster Recovery Center) of State Grid Shanghai Municipal Electric Power Company**
H Junyi, L Wrong *State Grid Shanghi Municiple Electric Power Company, China*

0054 **Proposed DSO ancillary service processes considering smart grid requirements**
A Alkandari, *College of Technological Studies, Egypt,* A A Sami, *ESRI, Kuwait,* A Sami, *Consultant at Ministry of Electricity, Egypt*

0112 **Realising network intelligence through master data exploitation and dynamic data modelling**
J Whyte, F Fulton, B Paisley, *SP Energy Network, United Kingdom,* A White, A Putley, B Robinson *CGI, United Kingdom*

0147 **How to shape digitalization in the energy sector – a new approach for systematic business innovation**
B Römer, B Gemsjäger, W Fröhner, *Siemens AG, Germany,* G Di Lembo *Enel Global Infrastructure & Networks, Italy*

0223 **Modelling metering data flows, from use cases towards implementation**
K Boukir, *Enedis, France,* B Traverson, *EDF R&D, France,* R Povse, *University Ljubljana, Slovenia*

0268 **INSMART - towards the new DSO potential roles in low carbon futures and integrated frameworks forsmart cities**
Vera Nunes, A Rodrigues, T Simão, *EDP Distribuição, Portugal,* J P Gouveia *CENSE, Portugal*

0395 **Knowledge transfer efficiency in EDP Distribuição (online tool)**
R Bandeirinha, G Faria, H Batista, *EDP - Distribuição, Portugal,* L Roque, A Almeida, *University of Coimbra, Portugal*

0499 **The experience of implementation of AMI System in Mashhad: The Green Project of FAHAM**
A Khazaee, H H Safa, M Ghasempour, M K Moghaddam *MEEDC, Iran*

0518 **AMI rollout strategy and cost-benefit analysis for India**
R Pillai, R Bhatnagar, H Thukral, *India Smart Grid Forum, India*

0521 **Next generation smart metering: IP metering**
R Pillai, H Thukral *India Smart Grid Forum, India*

0522 **Leveraging social media by utilities for customer engagement**
R Pillai, A Sawant *India Smart Grid Forum, India*

0664 **Secondary substations smart metering campaign**
D Taborda, A Aires De Matos, J Geria, S Fortunato, *EDP Distribuição, Portugal,* João Silva, *Canas SA, Portugal*

0705 **The SORIA smart metering solution**
P E Nordbø, H T Ylvisåker *BKK Nett AS, Norway*

0764 **Experiences of using AMI system for DSO's business operation**
M Kauppinen, J Pylvänäinen, J Karjalainen, V Sihvola *Elenia Oy, Finland*

0794 **Unbundled meters can boost Smartcity project**
D Stanescu, *FDEE Transilvania Sud, Romania,* M Sanduleac, *Univ. Politehica Bucuresti, Romania,* D Federenciuc, *CN Transelectrica SA, Romania*

1019 **Enhancing stakeholders involvement by smart meters deployment campaign**
B Coutinho, E Ferreira, R Pena, V Nunes *EDP Distribuição, Portugal*

1111 **Data Mining on Technical and Customer Service Data of a Brazilian DISCO to Increase Customer Satisfaction**
L C Siebert, E K Yamakawa, E J Da Silva Júnior, L D Medeiros, *Lactec Institutes, Brazil,* A Catapan, *COPEL, Brazil*

1181 **Towards new data management platforms for a DSO as market enabler – UPGRID Portugal demo**
A Alonso, R Couto, H Pacheco, R Bessa, C Gouveia, L Seca, *INESC TEC, Portugal,* J Moreira, P Nunes, P G Matos, *EDP Distribuição, Portugal,* A Oliveira *WITHUS, Portugal*

1306 **Developing a framework for the customer model of the future**
M McGranaghan, O Siddiqui, K Smith, *EPRI, United States*

Block 2 – Development of regulation

0011 **Regulation for insertion of small scale intermittent renewable energy distributed generation in argentina**
A Jurado, F Nicchi, E Vinson, *UBA, Argentina*

0064 **Innovation incentives for DSOs - a must in the new energy market development**
O Günther, *Stromnetz Berlin GmbH, Germany,* S Politopoulou, *HEDNO, Greece,* D Verreth, *Enexis, Netherlands*

0113 **Distributed energy resources in Brazil - issues and regulatory challenges**
R E H B Amorim, A C M Araujo, C A C Mattar, H Lamin *ANEEL, Brazil*

0115 **Forecast the grid oriented battery operation to enable a multi-use-approach and discussion of the regulatory framework**
S Nykamp, T Rott, *Westnetz GmbH, Germany,* K Keller, *University of Twente, Netherlands,* T Knop *Innogy SE, Germany*

0141 **The smart grid roadmap and regulation approaches in Switzerland**
M D Galus, *Swiss Federal Office of Energy (SFOE), Switzerland*

0158 **Evaluation of regulatory impacts on investments of distributed generation and upstream network under uncertainty: a new stochastic bi-level model**
F Misaghi, *Monenco, Iran,* T Barforoushi *Babol Noshirvani University of Technology, Iran*

0342 **Developing a combinatorial reward-penalty scheme to facilitate integration of distributed generations**
M Jooshaki, A Abbaspour, M Fotuhi-Firuzabad, M Moeini-Aghtaie *Sharif University of Technology, Iran*

0358 **Regulatory matters affecting distribution planning with distributed generation**
M Alvarez, S Rönnberg, M Bollen, *Luleå University of Technology, Sweden,* R Cossent, *Pontifical University of Comillas, Spain,* J Zhong, *University of Hong Kong, Hong Kong*

0449 **Modelling the influence of subsidization on electric distribution company performance: case study**
B Adeli, *Electrical Distribution Co., Iran*

0605 **A probabilistic framework of cooperative disperse generation resources scheme for producing required reactive power through simultaneous active and reactive power market**
M Shamani, H Ahmadi, M Ramezani, *Tehran province DISCO, Iran*

0632 **Incentives in supply continuity regulation and setting its parameters in the Czech Republic**
P Skala, *EGU Brno, a.s., Czech Republic,* J Sefranek *Energy Regulatory Office, Czech Republic*

0766 **Battery energy storage systems, an effective solution to answer electrical grid challenges in Turkey**
D Theophile, N Frizi, *GE Energy Connections, France,* T Adanir, M E Akan *EDS Enerji, Turkey*

0825 **Non-technical losses: detection methods and regulatory aspects overview**
C Papadimitriou, G Messinis, *NTUA, Greece,* D Vranis, S Politopoulou, N Hatziargyriou, *HEDNO, Greece*

0866 **Role transition and development strategies for SPG in the marketization reform**
W Lin, Y Zhang, *Tsinghua University, China,* H Zhang, *SPG, China*

0918 **National platform for information on customer interruptions and outages in Denmark**
P K Hansen, *Danish Energy Association, Denmark,* T K Asmussen, *SEAS-NVE Net A/S, Denmark,* K C Jensen, *EniigMidt Net A/S, Denmark*

0949 **Designetz: a modular concept for the energy transition - from isolated solutions to an efficient energy system of the future**
E Wagner, *Westnetz GmbH, Germany,* A Breuer, O H Franz, *innogy SE, Germany*

1017 **Development of the utilization and smart grid incentive scheme within the Swedish revenue cap regulation**
B Fazlagic, E Shayesteh, P Hilber, *KTH, Sweden,* C J Wallnerström*Swedish Energy Markets Inspectorate (EI), Sweden*

1021 **Analyses of the current Swedish revenue cap regulation**
C J Wallnerström, E Grahn, T Johansson, *Swedish Energy Markets Inspectorate (EI), Sweden*

1079 **Enabling Distributed Energy Resources To Enter The Energy Market and Supporting The Evolution To A Distribution System Operator**
L McDonald, A R Ahmadi, S Do, S Georgiopoulos *UK Power Networks, United Kingdom*

1091 **Regulation for the Brazilian Cooperatives (Application of Soft-Regulation)**
M Pelegrini, F R Miranda, I O Cyrillo, *Sinapsis Inovação em Energia, Brazil,* J C M De Carvalho, *Força & Luz Engenharia, Brazil,* E P Madruga, E D Garcia, *Certaja Energia, Brazil,* M S Marques, *Cermissões, Brazil*

1245 **Recent changes and future trends in the Brazilian net metering regulation**
D Vieira, C A C Mattar, H Lamin, R E H-B De Amorim *ANEEL, Brazil*

1257 **Market models for the development of recharging infrastructure in Brazil**
L Rolim, M Marques, *CPqD, Brazil,* D Leite, *CPFL, Brazil,* C Silveira *Daimon, Brazil*

1275 **A MILP algorithm to set bids for ancillary services in the next italian market for distribute generation**
E Corsetti, A G Guagliardi, C Sandroni, *RSE, Italy*

1342 **Designing a comprehensive separated regulation mechanism of distribution companies considering short and long term asset management**
S-M Miri Larimi, M-R Haghifam, M H Bahmani, *Tarbiat Modares University, Iran,* M Zangiabadi*Newcastle University, United Kingdom*

Block 3 – Enabling flexibility

Sub-block 1 – Innovative tariffs

0133 **Innovative tariff system for public LV DC distribution network**
I Melnik, A de Kuiper *Alliander, Netherlands*

0425 **Comparative study between: time of use and real-time pricing using fuzzy technique**
A S Ahmed, *Petroleum Pipe Line Co., Egypt,* F Bendary, *Banha University, Egypt,* H M M Mostafa, *Egyptian Electricity Holding Co., Egypt*

0517 **Demand side management controlling with personalized pricing method**
M H Yaghmaee, M S Kouhi, A Saeedi, M Zabihi *MEEDC, Iran*

0556 **Economic evaluation of the grid tariff for households with solar power installed**
H Sæle, *SINTEF Energy Research, Norway,* B A Bremdal, *University of Tromsø (UiT), Norway/Smart Innovation Østfold, Norway*

0701 **Development of power-based tariff structure for small customers and pathway for this change**
R Apponen, P Heine, J Lehtinen, *Helen Electrity Network, Finland,* M Lehtonen, *Aalto University, Finland,* K Lummi, P Järventausta *Tampere University of Technology, Finland*

0777 **Costing network services for consumers with PV self-generation**
M Bordigoni, L Gilotte *Enedis, France*

0858 **Impacts of different power-based distribution tariffs for customers**
J Haapaniemi, J Haakana, J Lassila, S Honkapuro, J Partanen, *Lappeenranta University of Technology, Finland*

0887 **Reforming distribution tariffs of small customers - targets, challenges and impacts of implementing novel tariff structures**
A Rautiainen, K Lummi, A Supponen, J Koskela, S Repo, P Järventausta, *Tampere University of Technology, Finland,* S Honkapuro, J Partanen, J Haapaniemi, J Lassila, J Haakana, N Belonogova *Lappeenranta University of Technology, Finland*

0908 **Analysis of transition steps towards power-based distribution tariff of small customers**
K Lummi, A Rautiainen, P Järventausta, *Tampere University of Technology, Finland,* P Heine, J Lehtinen, R Apponen, M Hyvärinen, *Helen Electricity Network Ltd., Finland*

Sub-block 2 – New technologies and services for flexibility

0127 **Technical impacts on distribution systems of medium-sized storage plants participating in energy and power reserve markets**
J-F Toubeau, Z De Grève, F Vallée, *University of Mons, Belgium*

0165 **Energy storage capacity optimization for load aggregators considering the probability of demand response resources' breach**
K Zhang, Y Yu, *Electric Power Research Institute, China,* Y Song, Z Yan *Shanghi Jiao Tong University, China*

0221 **E-CLOUD, the open microgrid in existing network infrastructure**
D. Vangulick (1,3) presenting, *ORES, Belgium/ Université de Liège, Belgium,* B. Cornelusse, *Université de Liège, Belgium,* T Vanherck, *University of Mons, Belgium, N-SIDE, Belgium,* O Devolder, S Lachi, *RESA, Belgium*

0225 **Providing smart metering data services through an EU market place**
K Boukir, *Enedis, France,* D Wästlund, D Wästlund, *Vattenfal, Sweden,* B Traverson, *EDF R&D, France,* F Schwarzlaender, *Sap, Germany,* S Defrancisci *e-distribuzione, Italy*

0365 **Energy services bridging the gap between residential flexibility and energy markets**
R André, G Mendes, A Neto, P Castro, *EDP NEW R&D, Portugal,* A Madureira, J Sumaili, C Gouveia, L Carvalho, *INESC TEC, Portugal,* T Rautiainen, *Empower, Finland,* C Murphy O'Connor, *INDRA, Spain,* A Michiorri, A Bocquet, A Gerossier, *MINES-Paris Tech PERSEE PSL-Research University, France*

0429 **The project "Power-to-heat in Smart Grids"- a multi-objective approach for a maximized value of flexibilities in grids**
C Fuchs, S Nykamp, E Frerichmann, *Westnetz GmbH, Germany,* D Dillkötter, *Ruhr Universität Bochum, Germany,* D M Gross, M Lewalter *Innogy S.E., Germany*

0578 **Wind energy production variations in continental portugal: an analysis of the combined effects of spot market price and feed-in tariff costs**
R Prata, *IST, Portugal/EDP Distribuição, Portugal,* P M S Carvalho, *IST, Portugal,* I L Azevedo, *Carnegie Mellon University, United States*

0730 **Creating a local energy market**
B A Bemdal, *Smart Innovation Østfold, Norway/University of Tromsø, Norway,* P Olivella-Rosell, J Rajasekharan, I Ilieva, *Smart Innovation Østfold, Norway*

0867 **Virtual power plants leveraging energy flexibility in regional markets**
T Duerr, *Siemens AG, Germany,* I Miller, *Northern Power Grid, United Kingdom,* D Geach, *Siemens Plc, United Kingdom*

0874 **EPEDC ELEGAME: an integrated model using gamification and data mining to revolutionize utilities' functions**
A Yousefi, *Esfahan Province Electricity Distribution Co., Iran*

1040 **Testing and validation of the ACCESS system**
K Jennett, F Coffele, I Abdulhadi, *PNDC, United Kingdom,* B Stephen *University of Strathclyde, United Kingdom*

1198 **Valuation of harnessing flexibility from decentralized water electrolysis systems for the DSO**
K A Strang, M Delage, *Enedis, France,* J-C Lanoix, J Neave, F Barth, *Hinicio, France,* B François *Centrale Lille L2EP, France*

Sub-block 3 – Actors enabling increased flexibility

0164 **Research on bidirectional decision-making for load aggregators participating in market transactions and load dispatching**
K Zhang, Y Yu, *Electric Power Research Institute, China,* Y Song, Z Yan *Shanghi Jiao Tong University*

0576 **Challenges for utility with energy prosumer in Korea**
J-S Park, H-J Lee, D-Y Kim, *KEPCO, South Korea*

0589 **Sensible project community engagement both in Évora and Nottingham demonstrator sites**
G Mendes, *EDP NEW R&D, Portugal,* A J Pinto, *EDP SA, Portugal,* J Marsh, *MOZES, United Kingdom,* L Rodrigues, L Kiamba, *University of Nottingham, United Kingdom*

0744 **Behavior of active household customers on the electricity market - findings from market test Smart Grid Gotland**
C Svalstedt, *Vattenfall, Sweden,* M Löf *Vattenfall R&D, Sewden*

0878 **Categorisation of electricity customers based upon their demand patterns**
M Lindén, J Helbrink, M Nilsson, D Pogosjan, J Ridenour, A Badano *SWECO, Sweden*

0987 **Automation of the supplier role in the GB power system using blockchain based smart contracts**
L Thomas, C Long, P Burnap, J Wu, N Jenkins, *Cardiff University, United Kingdom*

1117 **Simplification and Evaluation of Demand Response by the use of Statistical Aggregated Models**
C Alvarez, *IIE-UPV, Spain,* J I Moreno, G López, *U. Carlos III de Madrid, Spain,* A Gabaldón, A Guillamón, *ETSII, Spain,* M C Ruiz-Abellón, *UPCT, Spain,* J Matanza, *IIT-ICAI, Spain,* S Valero-Verdú, M López, *EPSE, Spain*

Block 4 – Asset & risk management

0067 **International review of how power sector developments are responding to changing system characteristics**
N Hughes, *Enertech Consulting Ltd, United Kingdom*

0090 **Asset risk indices: commonality, diversity and usage - the history In UK electricity distribution**
M Black, G Howarth, M Nicholson, *Northern Powergrid, United Kingdom*

0136 **Energy management and planning in smart cities**
A Navidi, F A S Khatami *Electrical Distribution Company, Iran*

0234 **What does a distribution system operator need to know about the findings of the future power system architecture project?**
O Carpenter, *Ricardo Energy & Environment, United Kingdom,* J Devlin, D McNaught, *Frazer-Nash Consultancy Ltd., United Kingdom,* R Duck *Mapsar Ltd., United Kingdom*

0239 **The new requirements of information security protection on State Grid Shanghai Municipal Electric Power Company Data Center compared to Disaster Recovery Center**
J Wu, R Lu *State Grid, Shanghai, Municipal Electric Power Company, China*

0249 **Guidelines for modernizing existing electrical switchgear in LV and MV networks**
G Barbarin, D Seignier, *Schneider Electric, France,* A Gerstner, *Schneider Electric, Germany*

0252 **Addressing the challenge of cyber security maintenance through patch management**
A Gauci, *Schneider Electric, Canada,* S Michelin, M Salles, *Schneider Electric, France*

0334 **Determining failure probabilities with qualitative characteristics for risk estimation in the SGAM**
M van Amelsvoort, *OFFIS Institute for Information Technology, Germany*

0388 **Outsourcing asset construction: EDP Distribuição quality assurance strategy**
H Batista, R Bandeirinha, E Silva, J Santos *EDP - Distribuição, Portugal*

0404 **Enabling distributed energy eesources: priorities for future active operation of distribution networks and interactions with transmission**
K Bell, S Gill *University of Strathclyde, United Kingdom*

0523 **Indian manual for cyber security in power systems**
R Pillai, H Thukral, *India Smart Grid Forum, India,* R Sarangapani, *National Thermal Power Corporation, India*

0656 **A whole system perspective for energy systems**
R Hudson, P Lawton, *Energy System Catapult,United Kingdom*

0667 **Review of asset management in distribution systems of electric energy - Implications in the national context and Latin America -**
D Nieto, *Jujeña Energy Company S.A., Argentina,* J C Amatti, *Rio Cuarto National University, Argentina,* E Mombello, *San Juan National University, Argentina*

0671 **Technical and financial assessments for comparison of measurement technologies in the Smart City Buzios Project**
V Ferreira, M Fortes, B Borba, W Marques, R Maciel, T Ferreira, *FFU, Brazil,* W Correia, *ENEL, Brazil*

0799 **Does cyber security moving toward risk management lead to new grid organization?**
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