Special Report - Session 6
CHALLENGES OF DSO REGULATION & COMPETITIVE MARKET

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Introduction

The role of the DSO - in combination with the roles and expectations of an active customer - is high on the agenda for both market players and public bodies.

All actors are trying to drive change, but this is complex since there are differences regarding the dominating drivers in different countries/markets. This gives a variety of solutions required to meet the specific national demands.

At the same time there are forces trying to unify the evolution. In Europe this is done through the creation of regional markets and the development (and decision) of network codes.

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

Block A Involving the customer

Block B Smart Grids projects, metering & data security

Block C Market & Regulation

Block D More challenging DSO business environment

The blocks addresses each key issues related to the DSO business. The first block investigates the prominent topic of involving the customer; the key player in every energy system transformation. The second block focuses on experiences from ongoing smart grid projects, and issues related to smart metering and data security. The third block targets the issues of market and regulation in the new contexts of smart grids. Finally, the fourth block takes a look into the more challenging business environment that meets the DSOs in a changing system.

In the review process, Session 6 has accounted for different stakeholders all the way from governments/regulators, through competitive market players to academia. This variety of stakeholders makes Session 6 unique.

In total Session 6 has accepted 73 papers.

Block A: Involving the customer

Block A contains of 20 papers addressing different aspects of why the involvement of the customer is important and different methods for handling active customers including tariffs.

Paper **0101** discuss how to maximize the users' payoff by rescheduling their energy consumption. A distributed demand-side management system among users is presented with a two way digital communication infrastructure.

Paper **0122** describes the coming roll-out of smart meters in Norway and the expected implications for customers and other market players.

Paper **0158** presents an Iranian work around the impact of EVs on the performance of a micro grid. The combination of demand response and smart charging is of great benefit to the high penetration level of EVs in the micro grid.

Paper **0450** presents a methodology that aims at facilitating the definition of stakeholders' requirements for new system architectures. It is composed of 4 steps which allow identifying the links between stakeholders and/or systems and writing the necessary information.

Paper **0614** describes the project namely PEA smart web-based applications for customer services. It shows the developing of PEA web-based applications in four procedures. (i) The procedure for customers to apply for new electricity connections. (ii) The procedure for customers to reconnect their power supply that has been suspended on account of non-payment of dues. (iii) The procedure for customers to provide up-to-date information about electric outage status. (iv) The procedure for customer complaint and suggestion. They can be used by anybody that has accessed to internet and mobile phone.

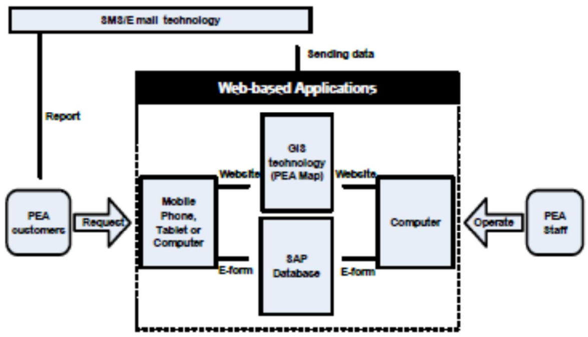

Figure 1 The architecture of the proposed PEA system, Paper 0614.

Paper **0631** describes how major DSOs are working together with market players and other stakeholders within the Horizon 2020 project FLEXICIENCY to develop a technical model to concretize the vision of data exchange based on meter data accessibility provided by DSOs close to real time.

Paper **0639** focuses on the future roles and responsibilities of DSOs due to the rising number of new stakeholders in the electricity market, such as local services energy cooperatives (LSECs).

Paper **0742** addresses the challenges posed by a higher penetration of wind energy in the UK for DNOs: an increased need for balancing services and a bigger amount of wind electricity curtailments – i.e. wasted electricity that cannot be used.

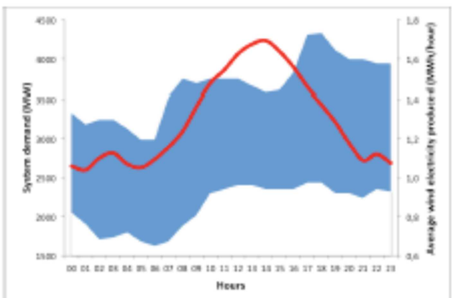

Figure 2 Comparison of the hourly average demand range and the hourly average wind electricity produced, Paper 0742.

Paper **0970** presents a study willing to assess the profitability of replacing a conventional thermostat by a smart thermostat in electrically heated households.

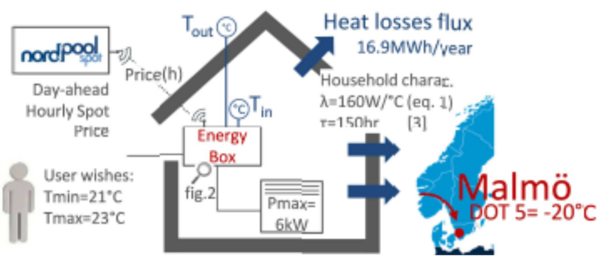

Figure 3 The system model used for simulation, Paper 0970.

Paper **1057** presents a simulation model of a fleet of electric vehicles and an EV aggregator to assess availability in offering demand response services. A case study using London neighbourhoods was developed to analyse the charging demand and the potential for grid services to compare attractiveness to customers and profitability for the aggregator.

Paper **1062** aims at proposing a network tariff design suitable for the grid integration of high amounts of decentralized generation and storage units.

Paper **1085** describes results from the national research and demonstration project DeVID (Demonstration and Verification of Intelligent Distribution Grids) in Norway. The project aims at demonstrating new smart grid technologies and methods for distribution networks, including how Demand Response can be realized through economic incentives, technologies and a new network tariff called "Subscribed power".

Paper **1104** discusses different purposes for the network tariff in interplay with power market pricing and demand response, and how different tariff element can be designed based on technical challenges in the local grid.

Paper **1119** discusses on the implementation possibilities of distribution tariffs that include a separate demand (i.e. power) component for small customers by taking use of the present, and still developing, smart metering technology.

Paper **1130** proposes and analyses two market-based strategies applied to detached houses for day-ahead congestion management. The strategies are applied to a real use case on Gotland, Sweden.

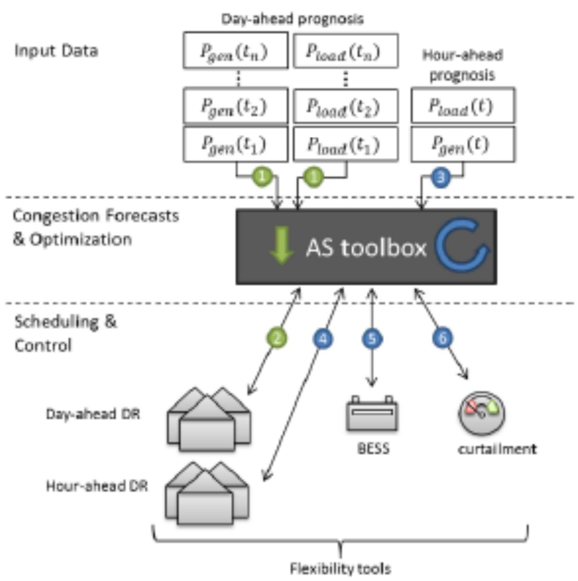

Figure 4 Conceptual overview of the toolbox used in

Paper 1130.

Paper **1156** address preliminary results of the AES Eletropaulo Smart Grid Deployment Initiative regarding the uncertainty of the relationship between consumers, utilities and Smart Grid.

Big Data analytics coupled with the DSO's information systems delivers a range of value adding services for the customer, such as:

- comparison with similar households
- indications of performance improvements over time
- consumption-weather dependence
- detailed consumption visualisation and breakdown
- personalised energy saving tips
- alerts (high consumption, high bill, extreme temperature, etc.)

Paper **1248** presents the development approach, describes the ICT system architecture and analyses the legal and regulatory context for providing this kind of services in the European Community.

Paper **1425** presents a methodology based on evolutionary algorithm for constructing complementary time-of-use (TOU) tariffs aimed to low-voltage consumers, which will be subsequently applied on a pilot program of Elektro, a distribution company located in the southeast of Brazil.

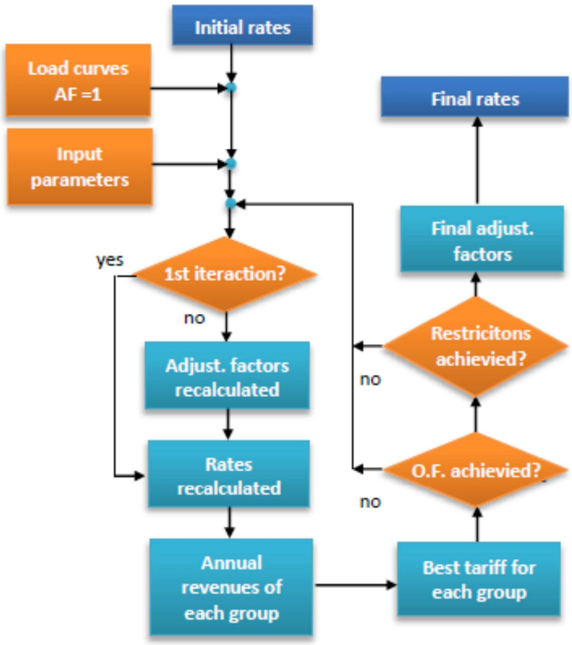

Figure 5 Evolutionary algorithm flowchart, Paper 1425.

Paper **1555** describes models for assessing the potential entrance to the White Tariff, a Brazilian time-of-use tariff, which is differentiated by usage level and exclusively destined to low voltage consumers.

Paper **1560** discusses the challenge with the combination of distributed energy resources (DER) and retail tariff structures to provide benefits to both utility consumers and the utilities. To improve understanding the paper simulated the physical and economic aspects of DER technologies, the buildings where they reside, and feeders servicing them.

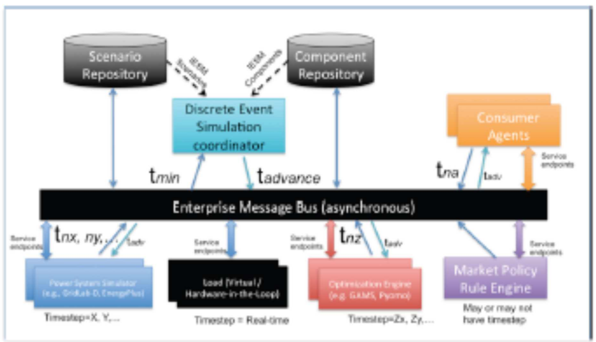

Figure 6 The integrated energy system model, Paper 1560.

Table 1: Papers of Block A – Session 6

Paper No. Title	MS a.m.	MS p.m.	RIF	PS
0101 Demand Response Energy Consumption Scheduling program Using Genetic Algorithm				X
0122 Attitudes, Expectations and Experiences with Smart Metering. Key Findings from the Norwegian Market 2006 - 2014.				X
0158 Inherent Potential of Electrical Vehicles to Flatten the Daily Load Curve in a Microgrid				X
0450 Innovative methodology to define stakeholders' requirements for smart systems				X
0614 PEA Smart Web-based Applications for Customer Services				X
0631 Opening up for a more competitive energy market with new energy services by making "real time" metering data accessible to market players				X + RT
0639 The future relation and roles of local energy cooperatives and DSOs	X			
0742 A comparison of the power-to-gas concept and battery electric vehicles to integrate wind energy into electricity networks				X
0970 Cost Benefit Analysis of households energy boxes deployment in Europe: impact of the spot prices				X
1057 Evaluating the financial incentives of smart charging-schemes for electric vehicles drivers and aggregators				X
1062 Suitable network tariff design for the grid integration of decentralized generation and storage				X
1085 Subscribed power - testing new power based network tariffs stimulating for demand response				X
1104 Smart Tariffs - In an Active Distribution Grid	X			
1119 Implementation possibilities of power-based distribution tariff by using smart metering technology	X			
1130 Analysis of demand response participation strategies for congestion management in an island distribution network				X
1156 A survey on the role of consumers in Smart Grid	X			
1248 Empowering customer engagement by informative billing – an European approach				X
1425 Application of evolutionary algorithm for construction of TOU tariffs for low-voltage consumers				X
1555 Tariff assessment: helping the energy consumer to get the best tariff				X
1560 Effects of Home Energy Management Systems on Distribution Utilities and Feeders Under Various Market Structures	X			

Block B: Smart Grids project, metering and data security

Block B contains 19 papers reporting from experiences from Smart grids projects, together with topics related to metering and data security.

Paper **0479** summarizes the main results and the tools developed in the framework of the GRID+ project to support the work of the European Energy Grid initiatives (EEGI) and to support smart grids pilot projects in addressing the most critical issues related to the complexity of smart grids systems: gap analysis, Key Performance Indicators (KPIs), scalability and replicability (SRA) and knowledge sharing platform. The present paper illustrates the most important tools that were developed to support distribution projects and the main indications that derive from the applications of these tools to real distribution pilot projects.

Paper **1278** presents results from the TRANSFORM project, where six major European cities, including Grand Lyon, are experimenting with processes and innovative ideas to become a Smart Energy City. In Lyon, the business district of Part Dieu has been chosen as the experimental area as there is currently a big urban development project in Part Dieu aiming at doubling the available building surface by 2030 while keeping the 2010 energy consumption level. This paper presents how ERDF and Grand Lyon managed to do an electricity-consumption diagnosis of the Part Dieu district in respecting the confidentiality regulations.

Paper **1644** describes G3-PLC which is a solution optimized specifically for smart metering applications and future smart grids services. This technology has been selected by ERDF, France, for the mass roll-out of his 35 million Linky meters. The paper describes the main mechanisms, the benefits and the opportunities of the G3-PLC technology. Actual results are revealed about the key performances achieved in the first G3-PLC field tests in France as well as the ability to dynamically adapt to different network configurations.

Paper **1658** reports from the GREEN-ME project (performed by two transmission system operators and two distribution system operators from Italy and France), describing the indicators used for assessing benefits which include both network-related and dispatching-related benefits.

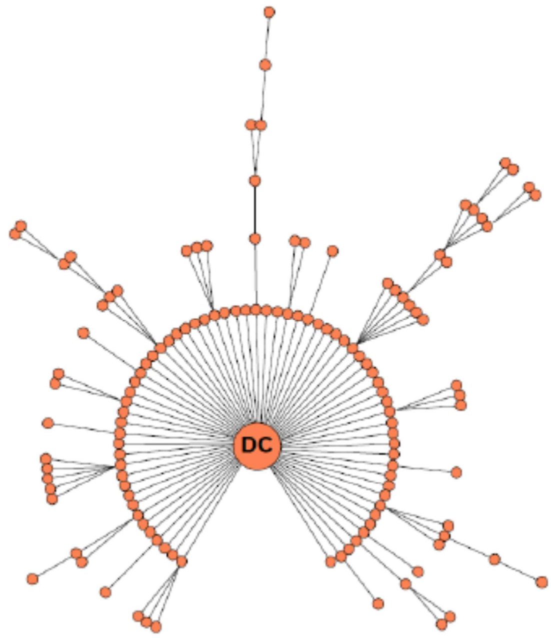

Figure 7 Example of G3 logical network topology (central node corresponds to the Data Concentrator), Paper 1644

Paper **0109** presents results from field test on multiple Smart meters switching and have investigated the impact of smart meters switching on the PQ of the electricity grid. Demand side management can be necessary to keep balance between the demand and the supply. By using Smart Meters, the Distribution System Operator can manage the demand side during peak load crisis and decrease the risk of blackouts. The smart meters may allow the DSO to switch loads in an area using a customer's prioritize list, while excluding emergency service providers and critical customers from switching. Moreover, switching multiple smart meters at a time might have impact on the Power Quality of the grid.

Paper **0167** reports from the South Delta Electricity Distribution Co., Egypt, about their practical experience in use of Digital Genius Meters and exploit technical advantages in building confidence with Consumers in terms of transparency, their ability to build a reliable measure system for both the company and their consumers.

Paper **0243** from Portugal reports of their work on establishing load profiles for LV customers, since knowing the pattern of consumption of customers and assess their progress over time is important for planning and operating the network.

Paper **0257** describes experiences from Brazil regarding new methods towards non-technical losses estimation in power utilities of Energisa Group. These methods make the utilities able to perform retroactive charging of illegal electricity consumption which was not billed. The paper proposes different models to estimate the non-technical losses for two groups of activities (residential and other classes) using typical load and demand factors, as well as the results from surveys carried out among consumers.

Paper **0718** from Spain focuses on the evolution of capabilities integrated in the smart meters, which will improve LV grid operation. Smart Meter manufacturers can improve the product capabilities offering new electric parameters for power quality, state estimation and statistical methods that could be very useful from the demand point of view. All this information can be stored in IEDs placed in the secondary substations, and then submitted to the distribution substation.

Net-metering encourages the installation of Distributed Generation (DG) adjacent to one user's premises, so that DG is used to offset part or even whole of the customer's energy consumption during a defined time period. Paper **0754** from Greece addresses the development of a net-metering regulatory framework that ensures the economic viability of the investment and protects both non-participating consumers from increased energy costs as well as interested stakeholders from possible loss of revenues.

Paper **0831** looks on net-metering from the Brazilian viewpoint, and presents several aspects:

- An analysis of the Brazilian net metering scheme and its characteristics
- Technical issues faced by small-scale DG
- Current outcomes of the regulation;
- Future perspectives for small-scale DG.

Paper **1003** from Finland analyses economic potential and practical implementation of end-user load control in the Nordic power markets. The paper reports that there is existing infrastructure and remarkably high capacity for load control in Finland. However, the implementation is hindered by number of barriers, such as long data transfer delays and incomplete operation and business models. Still, results of the analysis shows that the balancing market can provide remarkably high economic potential for the load control, many times higher than Elspot market.

Paper **1179** from Belgium addresses the impact of impact of the nodes density on G3-PLC network performance. G3-PLC is emerging as an attractive communication standard for smart metering applications. This standard includes different mechanisms and protocols which allows to deal with the poor transmission performance of the power line channel. In particular, all nodes of the network can act as relays. The paper reports the results obtained for different node densities and for different link qualities. These results highlight that it exists an optimal average number of neighbors for which the performance are improved.

The French paper **1264** reports of incentive regulatory frameworks for smart metering systems as illustrated in Figure 8~~Figure 3~~. It specifically addresses the the *Gazpar* and *Linky* smart metering projects.

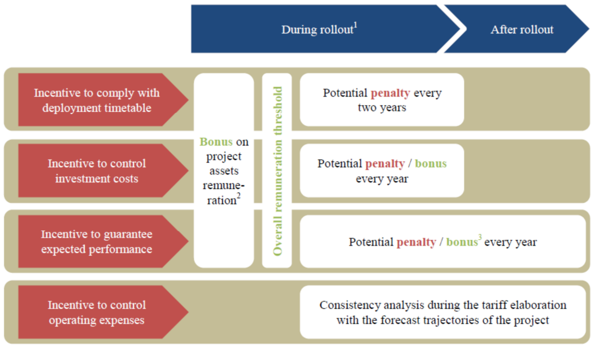

Figure 8 Global scheme of incentive frameworks for smart metering systems, Paper 1264

Paper **1480** from Iran reports on methods to handle the growing trend of Non-technical losses and electricity theft in electricity distribution networks. The paper proposes a novel method using a Time Domain Reflectometer (TDR) to diagnose and determine the power theft.

Paper **0260** from China describes results from Shanghai Municipal Electric Power Company from their Data Center / Disaster Recovery Center to realize quicker response, more efficient coordination and more reliable service for the company.

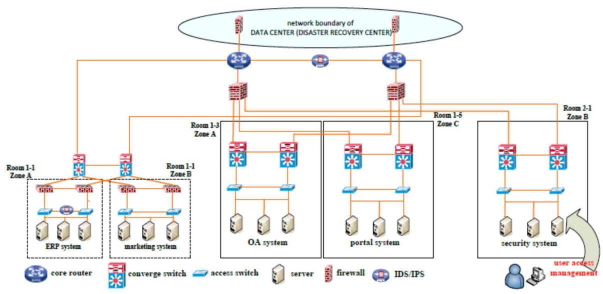

Figure 9 Schematic diagram of network structure of Shanghai Municipal Electric Power Company Data Center / Disaster Recovery Center, paper 0260

The Iranian paper **0279** discusses information security issues in smart metering systems including threats, security services and mechanisms to deal with system risks and in particular, the proposed security solutions and schemes in Iranian Smart Metering Project (FAHAM).

Paper **0646** from Korea addresses another security issue related to smart grids and proposes a PKI-based device authentication system for smart grid devices to develop a safe and reliable network environment between devices authorized through the legal authentication process and the server, and then applies it to the AMI environment.

Paper **0861** from Iran addresses effects of various cyber-attacks on smart meters. Meters contain important data which flow in network structure. Therefore, there are always attacks that challenge availability, integrity and confidentiality which are the most important security requirements of meters. The main purpose of the results presented in the paper is to evaluate the total effects of various attacks on meters.

Table 2: Papers of Block B – Session 6

Paper No. Title	MS a.m.	MS p.m.	RIF	PS
0109 Possibilities of demand side management with Smart Meters				X
0167 Impact Of Digital Genius Meters In Building Confidence with Consumers Experience Of (SDED) South Delta Electricity Distribution Co., Egypt				X
0243 Consumption patterns in clients without consumption diagram				X
0257 Estimation of Energy Consumption for DSOs Revenue Recovery due to Consumers with Proven Irregular Procedure				X
0260 The principle of Information security protection on data center (Disaster recovery center) of State Grid Shanghai Municipal Electric Power Company				X
0279 Information Security Management in Iranian Smart Metering Project(FAHAM)				X
0479 Overview of the solutions developed by the GRID+ project for supporting the European smart grids pilot projects in achieving the EEGI goals: main findings and lessons learnt	X			
0646 The PKI-based Device Authentication System for AMI				X
0718 Future applications based on the data provided by next generation of Smart meters				X
0754 Net-metering: Development of a regulatory and technical framework that ensures investment economic viability without adversely affecting Network and Market Operators' revenues	X			
0831 Net Metering Scheme in Brazil: regulation and perspectives				X
0861 Analyzing the Effects of Various Attacks on Smart Meters				X
1003 Economic potential of load control in balancing power market	X			
1179 Impact of node density on the performance of G3-PLC networks				X
1264 Definition of incentive regulatory frameworks for smart metering systems				X
1278 TRANSFORM project experimentations : Energy-consumption diagnostic of a French CBD district in order to support the city's energy transition	X			
1480 Electric power theft detection using Time Domain Reflectometer (TDR)				X
1644 ERDF G3-PLC Linky system: a robust and future proof solution for large scale AMM projects				X
1658 Cost/benefit assessment for large-scale smart grids projects: the case of smart grid project of common interest "GREEN-ME"	X			

Block C: Market & Regulation

Block C contains 15 papers addressing different aspects of market and regulation related issues.

Paper **0533** describes the French scheme for RES connection. It is based on two complementary processes managed at regional level and a new mode of invoicing for RES connection

Paper **0571** uses harmonized Europe network code known as EU-code as a benchmark for compatibility test of Australian and Iranian grid codes.

Paper **0627** presents a methodology to assess the effectiveness of alternative processes aimed at defining innovative, complete and coherent sets of rules for the management of the interconnected electrical system.

Paper **0684** presents a macroscopic analysis of interaction models for the provision of flexibility in distributions systems. It evaluates the economic efficiency of five different models.

1. **Model 1**. The DSO does not use any flexibility service and does not restrict grid users.
2. **Model 2**. The DSO does not use any flexibility service. To ensure the safety of its system the DSO restricts the users to a safe full access range computed on a yearly basis.
3. **Model 3**. An access contract specifies a full access range and a wider flexible access range. The grid user may produce or consume without any restriction within the full access range, which is computed on a yearly basis.
4. **Model 4**. This model is equivalent to Model 3 but the DSO pays for the activation of the flexibility of the grid users.
5. **Model 5**. The DSO acts as a simple flexibility user like the TSO or every BRP. The DSO does not restrict the grid users and relies on the flexibility offered by the other agents to operate its network.

Paper **0687** presents a business case for a local community electricity market. In this paper we try to identify real time economic signals that could drive a local community electricity market.

Paper **1078** describes the relationship between the costs of measures affecting the quality of power distribution (or more precisely, the supply continuity) and the expected SAIFI and SAIDI indices are at the core of a number of decision issues in the field of distribution networks. It presents a general methodology for the calculation of the partial relationship between costs and quality based on Monte Carlo simulation.

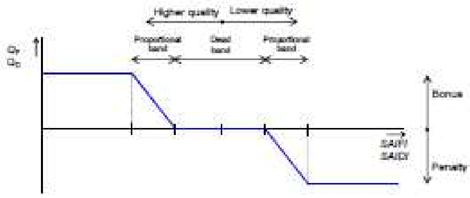

Figure 10 An illustration for the quality components calculation, Paper 1078

Paper **1081** introduces the concept of Virtual Power and Storage Plant (VPSP) which represents an aggregator of renewable and Distributed Energy Storage Systems DESS connected in the same medium voltage distribution network. The objective is to optimally coordinate the distributed storage systems to increase their operational and economic value.

Paper **1159** considers development of customer interruption costs (CIC) in three Finnish rural area electricity distribution companies in the following 15 year time period that is the time span of the supply security development plans each Finnish distribution system operator (DSO) has prepared. Requirement for supply security plans are due to new legislation reform targeting secure electricity distribution in major storms. The consideration shows that CIC reduce significantly, and thus so called quality incentive related to Finnish regulatory model provides quality bonus that increases allowed regulatory profit of the DSOs. Furthermore the effect of CIC development on the performance of economic regulation has been analysed.

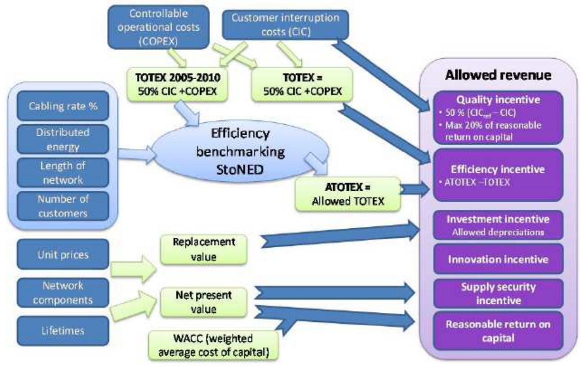

Figure 11 Description of the Finnish regulatory model applied in 2012-2015, Paper 1159

Paper **1163** evaluates how upcoming changes in the Swedish tariff regulation could affect distribution system operators (DSOs), with focus on reinvestment planning. This is done by general analyses as well as by authentic calculation examples of a real power distribution system. It describes the Swedish tariff regulation with expected changes, provides a summary of changes in Swedish laws and regulation affecting DSOs between 1996 and 2016, describes how a DSO at local distribution level conduct their reinvestments, illustrates economic calculation examples and finally presents analyses and conclude the results. Analysis results presented show that the outcome from the regulation is sensitive towards relatively small changes in WACC and age structure. The tariff cap allowed will however be significantly reduced for all tested scenarios. A reinvestment rate of in average~10 % regarding meters and IT and ~2.5 % regarding all other categories could be a rough guideline to meet the new incentives, but that could differ depending on the actual age structure of the DSO.

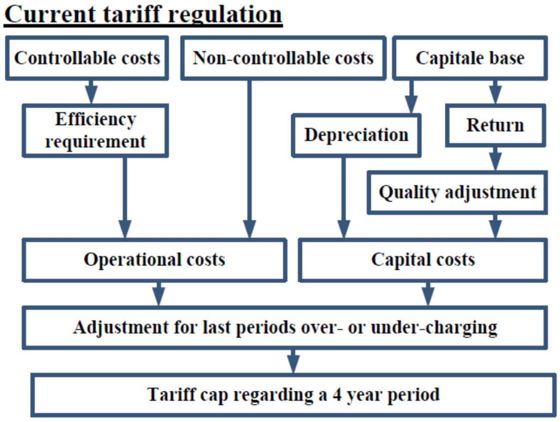

Figure 12 Overview of current and upcoming regulation, Paper 1163

Paper **1197** presents technical losses calculation using simplified models for regulatory purposes.

Paper **1250** tackles the main issues addressed by regulators and CRE's first propositions in order to enable the deployment of smart grids.

Paper **1270** deals with how to enable storage deployment. Electricity storage technology is one of the components that can provide flexibility to the electricity system and could become an important tool in the future. As new storage technologies are being developed, new technical, economical and regulatory challenges need to be overcome in order to enable the large-scale deployment of electricity storage.

Conventional Generation	Transmission	Distribution	Customers Services
Black start	Participation to the primary frequency control	Capacity support	End-user peak shaving
Arbitrage	Participation to the secondary frequency control	Dynamic, local voltage control	Time-of-use energy cost management
Support to conventional generation	Participation to the tertiary frequency control	Contingency grid support	Particular requirements in power quality
Renewable generation	Improvement of the frequency stability of weak grids	Intentional islanding	Continuity of energy supply
Distibuted Generation flexibility	Investment deferral	Reactive power compensation	Limitation of upstream disturbances
Capacity firming	Participation to angular stability	Distribution power quality	Compensation of the reactive power
Limitation of upstream perturbations		Limitation of upstream perturbations	
Curtailment minimisation			

Figure 13 Energy storage segmentation, Paper 1270

Paper **1406** deals with the definition of collective quality of service, aiming at proposing a method to establish quality indices based on a balance between social demands and the utility possible actions.

Paper **1517** gives detailed indications about the new requirements for Dispersed Generation plants in place in Italy, and about the regulatory mechanism (incentive award program) designed to foster the retrofit program for existing plants.

Paper **1648** focuses on what regulatory framework is needed to facilitate the demanding investment challenges that European distribution system operators (DSOs) are facing for the years to come. It analyses the economic performance of DSOs and regulatory systems in different European countries. Subsequently, it identifies good practices and provides recommendations on how economic regulation of DSOs should be revised in order to incentivise DSOs to make efficient long-term investments.

Table 2: Papers of Block C – Session 6

Paper No. Title	MS a.m.	MS p.m.	RIF	PS
0533 The French Scheme for RES connection. Coordination between stakeholders at regional level				X
00571 using harmonized Europe network code as a benchmark for compatibility testing of Australia and Iran grid codes				X
0627 New tools for new challenges; what works best to change electric systems rules in the age of RES				X
0684 Macroscopic analysis of interaction models for the provision of flexibility in distribution systems		X		
0687 A business case for a local community electricity market				X
1078 A partial relationship between costs and quality as a basis for setting regulation parameters of supply continuity		X		
1081 Assessment of a virtual power and storage plant for provision of market driven and regulated activities				X
1159 Effects of supply-security-based distribution network renovation on customer interruption costs and allowed regulatory profit in Finland		X		
1163 Summary of the Swedish tariff regulation and impact of changes on investment strategies		X		
1197 Technical losses calculation using simplified models for regulatory purposes				X
1250 Smart regulation for smart grids				X
1270 Electricity storage: How to enable its deployment				
1406 Quality of service targets based on balance regarding social demands and utility actions				X
1517 New requirements for DG plants in Italy to improve system security				X
1648 Electricity Distribution investments, what regulatory framework do we need				X

Block D: More challenging DSO business environment

Block D contains 19 papers addressing different aspects of the more challenging DSO business environment.

Paper **0127** proposes a methodology to calculate and evaluate the financial impact that the decisions may have in the budget of the DSO. This methodology includes the stochastic simulation of the decision on several scenarios of demand and energy prices.

Paper **0229** presents a model evaluating the price of a contract between an aggregator and a balance responsible (BR) entity. The contract terms allow the BR to optionally directly control several loads at the end–user's home where smart equipment, called energy boxes, are installed. These devices give access to control certain non-vital loads for load shedding purposes.

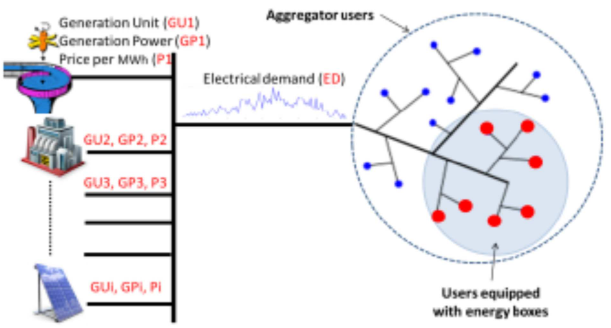

Figure 14 An overview for Paper 0229.

Paper **0235** describes a process that combines load and condition based risk. The output from the combined model is a measure of risk now and in the future, reflecting both the changing condition of the assets and changes in load.

Paper **0334** shows how EnervieAssetNetWork developed an approach for its major capital expenditure program to ensure that both agreed quality targets and a secured rate of return on assets for the existing electricity, gas and water infrastructure are achieved.

Paper **0399** presents a model to quantify the benefit of investments in smart distribution system automation and control technologies, which accurately reflects the relative value and risk from the perspective of different stakeholders including the system operator, demand customers and embedded DER

Paper **0428** presents a viable – as tested – way of reducing the workload on grid operators by third party certification considering requirements of the NC RfG by ENTSO-E.

Paper **0522** analyses the lifetime of the transformer as an indicator for evaluating the effectiveness of TOU is selected and the lifetime of a 250 KVA transformer is calculated, at first, based on transformer initial load curve, then using improved load curve by TOU program.

Paper **0539** presents a new load model is proposed for electric power distribution systems under varying voltage conditions in order to estimate the energy losses and, consequently, optimize the energy losses in the system.

Paper **0673** discusses ways to improve the knowledge of purchasing management and implement key aspects used by researchers and practitioners in the business branch.

Paper **0917** reports results from a study, within the evolvDSO project, examining key services associated with the potential new roles of DSOs. These services are provided across different business domains of DSOs and aim to face current challenges in a cost-efficient manner.

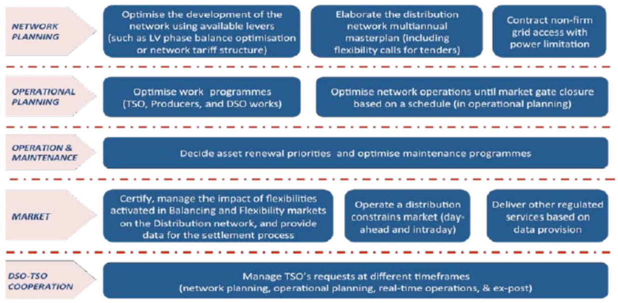

Figure 15 Key services presented in Paper 0917.

Paper **1020** analyses the feasibility of smart microgrids for business sites by means of a new developed Business Analysis Model. Smart microgrids accommodate the local power exchange between local production and consumption via smart grid technologies. Without regulatory changes smart microgrids are however not feasible.

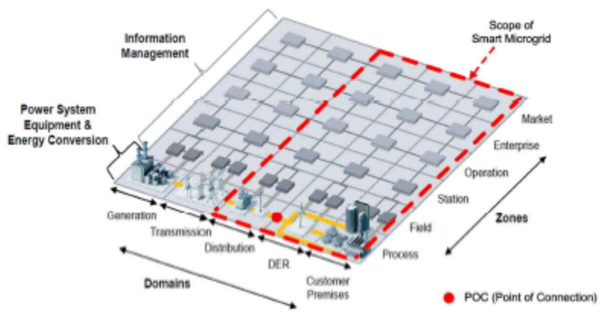

Figure 16 The smart micro grid scope, Paper 1020.

Paper **1025** proposes a decision support diagram in order to facilitate utilities to develop an appropriate and suitable AM system and its scope to enhance system reliability in a cost effective way by selecting proper options according to associated financial and technical objectives.

Paper **1099** presents the French experience concerning the use of flexibility in the electrical system. It particularly focus on use of flexibility of loads managed by aggregators to offer services to the TSO but also its impact on distribution network and the opportunities this flexibility offers to manage network congestions at Transmission or Distribution level.

Paper **1132** illustrates, by means of the role model, the potential (evolving and new) future roles envisioned at distribution system level which paves the way for the implementation of such approach.

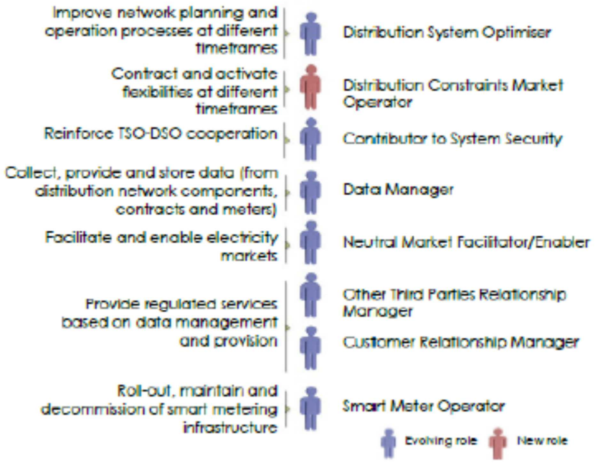

Figure 17 Potential roles at distribution system level, Paper 1132.

Paper **1218** explores the different competitive mechanisms applied by electric utilities from the US in promoting cost-effective Distribution Generation (DG) resources and the challenges that they face due to the increase in DG connections. Cases studies from California, Oregon, Colorado and New York are discussed.

Paper **1222** analyses and quantifies the opportunities that different parties such as the DNOs, generators and society may have when connecting more Distributed Generation (DG) within the distribution grid. Results suggest that DG owners benefit the most and wider society the least.

Paper **1269** presents based on the analysis of uncertainty factors of Smart Distribution Networks (SDN) construction under electricity market environment, a bi-level and comprehensive decision-making method for SDN planning is proposed.

Paper **1271** reviews the current process of reporting reliability data in Sweden. Limitations of reliability indices such as SAIDI and SAIFI are discussed and the need for more reliability measures is stated. The paper suggests the introduction of a reliability performance scorecard to analyse reliability measures in an organized system under different aspects.

Paper **1520** proposes a model for a short-term load forecasting serving as a basis for short-term energy procurement activities of supplier under public service obligation.

Paper **1543** discusses that only through transforming distribution system operations to enhance integration and management of DER reliably and economically will electric utilities be able to successfully transform and establish their future business models.

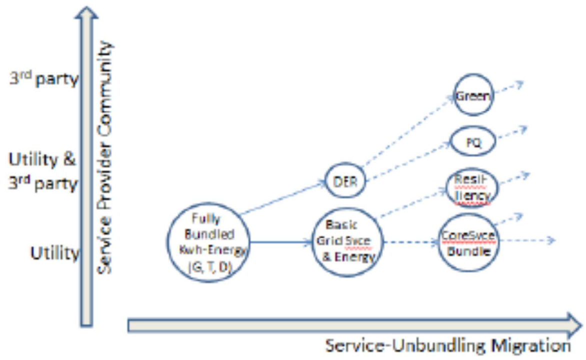

Figure 18 Distribution service transformation, Paper 1132.

Table 2: Papers of Block D – Session 6

Paper No. Title	MS a.m.	MS p.m.	RIF	PS
0127 Assessment of Electricity Distribution Companies Risks in the Brazilian Energy Market Framework				X
0229 Evaluating the costs of load shedding services for electricity networks				X
0334 Cash flow optimization based on an integrated Asset Management		X		
0399 Parameterised risk sharing in smart distribution system investments				X
0428 Verification of the Requirements of the ENTSO-E "NC RfG" - Reducing the Workload on TSO and DSO by Independent Certification				X
0522 Impact of time of use tariff on distribution transformer lifetime				X
0539 Energy loss minimization by load allocation in distribution systems				X
0673 Material Purchasing Management in Distribution Network Business				X
0917 The evolvDSO project: Key services for the evolution of DSOs' roles				X
1020 Feasibility of Microgrids for Industrial & Commercial Sites in the Netherlands				X
1025 Conceptual Design for Asset Management System Under The Framework of ISO 55000		X		
1099 A continuous evolution of the flexibility mechanisms in the French electricity system		X		
1132 evolvDSO: assessment of the future roles of DSOs, future market architectures and regulatory frameworks for network integration of DRES		X		
1218 The Role of Distribution Network Operator in Promoting Cost-Effective Distributed Generation: Lessons from the United States for Europe		X		
1222 Distributed Generation: Opportunities for Distribution Network Operators, Generators and Wider Society				X
1269 A Bilevel and Comprehensive Decision-making Method of Smart Distribution Network Planning under Electricity Market Environment				X
1271 A scorecard approach to track reliability performance of distribution system operators				X
1520 Short term forecasting the electricity load for the Croatian supplier under public service obligation				X
1543 Distribution System Operations Transformation for the Next Generation Electric Utility Business				X