

Mas²tering

**Multi-Agent Systems and Secured coupling of Telecom and Energy gRIDs
for Next Generation smartgrid services**

FP7 – 619682

D7.6 Contributions to events and journals

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Abstract

The deliverable, ‘D7.6 Contributions to events and journals’, reports on the contributions to events and journals resulted from the research and demonstration activities in the Mas²tering project. Mas²tering was aimed at developing distributed information and communication technology (ICT) solutions to enable decentralised flexibility management within the low-voltage (LV) electricity distribution network. The collaboration between energy and ICT partners offered an opportunity for multidisciplinary dissemination of project findings that allowed us to reach a wider audience. Effective dissemination increased project visibility to the target audience. During the course of the project, Mas²tering accomplished targeted dissemination through (a) the organisation of four special and joint sessions in scientific conferences, (b) presented research concepts and findings in thirteen industry and related events, (c) published twelve peer-reviewed articles in conferences, and (d) published five peer-reviewed journal articles.

[End of abstract]

Executive summary

Mas²tering was aimed at developing distributed information and communication technology (ICT) solutions to enable decentralised flexibility management within the low-voltage (LV) electricity distribution network. The project enabled new collaboration opportunities between grid operators, telecom and energy companies, both from technology and business perspectives. The innovative Information and Communication Technology (ICT) platform offers monitoring and optimal management of low-voltage distribution grids by integrating last mile connectivity solutions with distributed optimisation technologies, while enhancing the security of increased bi-directional communications. The resulting multi agent system (MAS) platform facilitates user-focused decision-making that will bring value and competitiveness. Consistent with recent communications from the Commission, the project puts prosumers first, provides them with access to the energy market in new ways, and provides flexibility management solutions for the grid's most pressing challenge – capacity management.

Communication, dissemination and exploitation are three essential pillars for realising the impact of a collaborative project. Effective dissemination increases project visibility to the target audience while increasing the uptake of project outcomes for real-life implementation. Research and development projects are increasingly being asked to provide evidence of contribution to society and the economy; i.e. the impact of research. Mas²tering participated in key industry and academic events on smart grid, ICT for energy, and energy management to ensure the widest possible dissemination. The project published research findings in high-impact journals and widely acknowledged events and conferences. Also, the project encouraged and realised cross-collaboration between traditionally segregated groups of researchers in ICT and energy for academic and technical publications.

During the course of the project, Mas²tering accomplished targeted dissemination through (a) the organisation of special and joint sessions in scientific conferences, (b) presented research concepts and findings in industry and related events, (c) published peer-reviewed articles in conferences, and (d) published peer-reviewed journal articles.

Four co-located workshops and special sessions targeting the participants of major energy and ICT related conferences were organised with the intention of reaching distinct but equally important audiences ranging from policy-makers and industrials to academics with related specialisations. Papers and presentations from external partners working on similar research were invited and reviewed independently before acceptance.

Project partners presented Mas²tering concepts, results and outcomes in **thirteen industry relevant events**. The events ranged from local to national and European. Feedback received from engagement and communication with stakeholders were fed back to the consortium that helped shape the agenda and direction of the project.

Twelve articles were published in high-impact conferences whose proceedings were published by major publishers such as IEEE, Springer, Elsevier and MDPI. **Four articles were published in high-impact journals** published by leading publishers: IEEE, Elsevier, MDPI. All these journals are indexed in the Science Citation Index (SCI), Web of Science (WoS) and Scopus. **A fifth paper** was accepted in a recent journal about smart grids, edited by Springer and indexed in the INSPEC database. All journal respective publication platforms are accessible to the wider audience and caters to various audience types from academia to industry.

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Keywords	Mas ² tering, publications, events, journals, conferences, dissemination

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1 Introduction

Mas²tering is aimed at developing distributed information and communication technology (ICT) solutions to enable decentralised flexibility management within the low-voltage (LV) electricity distribution network. The innovative ICT platform offers monitoring and optimal management of low-voltage distribution grids by integrating last mile connectivity solutions with distributed optimisation technologies, while enhancing the security of increased bi-directional communications. The project also aims at enabling new collaboration opportunities between grid operators, telecom and energy companies, both from technology and business perspectives. The resulting multi agent system (MAS) platform facilitates user-focused decision-making that will bring value and competitiveness. Consistent with recent communications from the Commission, the project puts prosumers first, provides them with access to the energy market in new ways, and provides flexibility management solutions for the grid's most pressing challenge – capacity management. Aspects that make Mas²tering unique are:

- The creation of local communities of prosumers at the local level who are empowered to optimize their in-home consumption, generation, and storage and to sell flexibility to upstream actors that enhances network efficiencies;
- The use of MAS optimization for flexibility management at the local level;
- Interoperability between smart gateway and smart meters to enable flexibility management;
- Security solutions that make data communication aspects secure and reliable;
- Business models that give evidence to the value of leveraging combined energy and telecom infrastructure using Low Voltage flexibility management and resulting in a more efficient energy system and better deal for consumers; and
- Collaboration within the Universal Smart Energy Framework (USEF).

Mas²tering emphasises on the visibility of its activities to its actors, stakeholders and target groups from the industry, academia and end-users. Dissemination to events and academic outlets such as journals and conferences is a key vehicle in generating impact from the research and development (R&D) activities. As part of Task 7.4, significant efforts have been dedicated to the widespread dissemination of results beyond conventional means such as web visibility, social networks, newsletters and brochures. The objectives of Task 7.4 are to:

- Identify and participate in key industry and academic events on smart grid, ICT for energy, and energy management;
- Publish project findings in high-impact journals and widely-acknowledged events and conferences;
- Ensure widest possible dissemination beyond academic publications; and
- Encourage and realise cross-collaboration between traditionally segregated groups of researchers in ICT and energy for academic and technical publications.

This report details the activities undertaken as part of Task 7.4: Contribution to events and journals, and discusses their impact using available metrics of engagement.

1.1 Relationship to other work packages

To realise the main work package objective of increasing the impact of the project at the European level and beyond, WP7 worked in close collaboration with the key work packages: technical (WP2-5), services and business models (WP1), and use cases and validation (WP6). Periodic evaluation results from WPs 1-6 was undertaken to identify findings that can be disseminated, which are then matched with upcoming events and outlets that were monitored as part of Task 7.1: Watch activities and standardisation.

1.2 Scope of the report

This report discusses the dissemination activities undertaken as part of Task 7.4: Contribution to events and journals. The specific contributions discussed in this deliverable are:

- Peer-reviewed academic journal articles
- Peer-reviewed conference publications
- Presentations at conferences and events
- Special sessions in scientific conferences

1.3 Document structure

The document is organised as follows. Chapter 2 discusses the background and project strategies for dissemination. Chapter 3 provides information on the project contribution to events, and organisation of special sessions and workshops at scientific conferences. Chapter 4 provides the list of peer-reviewed conference publications by the consortium and Chapter 5 discusses the peer-reviewed contributions to scientific journals. Chapter 6 concludes the deliverable with a discussion on the lessons learned with a view that it may be useful for other research projects for devising their dissemination strategies.

2 Background

Communication, dissemination and exploitation are three essential pillars for realising the impact in a research project [1]. Effective dissemination increases project visibility to the target audience while enhancing the take up of the project outcomes for real-life implementation. Research and development projects are increasingly being asked to provide evidence of contribution to society and the economy; i.e. the impact of the research [2]. The project, therefore, prioritised dissemination to ensure their integration with the research and development activities.

2.1 Strategies for dissemination

The cornerstone of the integrated approach to dissemination was the collaboration between project partners from different backgrounds; e.g. energy vs. ICT, and industry vs. academia. Materials for dissemination were identified at the level of work packages, which were then matched with dissemination methods at the general assemblies and project technical committee meetings. WP7 provided overall vision and support to task and WP leaders, not only in identifying relevant events and outlets but also in preparing the manuscript. Overall, the following items were considered for selection of an event:

- **Dissemination types:** The project considered various methods of dissemination and their effectiveness in reaching the targeted audience, as well as the nature of outcome (or content) to be disseminated. The initial decision on the type of dissemination was primarily based on ‘matching the contents with the channel of dissemination’.
- **Integrating stakeholders early:** Mas²tering was driven by business and user needs, for which the project engaged with key stakeholders from partner countries and beyond. While engagements with the stakeholder group helped in answering the question ‘why’ and to shape the direction of the research, they were a valuable resource and a ‘sounding board’ for selecting an effective dissemination outlet.
- **Ethical and regulatory issues:** A significant part of Mas²tering activities involved the collection, analysis and archival of energy consumption data from different pilot sites. Two fundamental ethics issues were considered during dissemination: (a) the project team’s ethical responsibility for research findings to be accessible so that they can inform the development of new knowledge, and (b) the responsibilities the team had to those who provided the data on which our research was based. For ensuring accessibility, the dissemination strategy prioritised ‘Open Access’¹ compliant outlets. Ethical and regulatory issues related to data processing, privacy and security were considered during dissemination. In all cases, relevant national and European regulations and guidelines were consulted.

2.2 Generating impact

Overall, the coordinated dissemination actions led to fruitful discussions, insights gathered, and benchmarks to integrate into the project work plan. Stakeholder impact was not mapped per action, but rather tracked as a whole in terms of reaching the broadest possible audience due to the cross-sector and multidisciplinary nature of the topic. Classification was based on four categories: attendance, reports, peer-reviewed articles in journals and conferences, and presentations, which covered the spectrum of Mas²tering dissemination.

The impact generated by the various external dissemination activities achieved in Mas²tering can’t be quantified or measured individually, but rather to say that when resources allowed the message was

¹ Gold Open Access (OA) was the preferred option where funding was available from institutional and other sources. Otherwise, Green OA was chosen where feasible.

communicated and overall received well by intended audiences and enabled stakeholders to become aware of the project structure, ambition, and results. Specific feedback gathered from stakeholders are reported in D1.1-D1.4 and within after-action reports as detailed in section 3.3 of the current document.

The project website earned a global Alexa rank of #10,785,138, which puts itself among the top 30 million most popular websites² worldwide. It reaches roughly 1,320 users and delivers about 2,910 page views each month. Daily average page views were 97, average daily visitors 44, and 10 total sites linking

² Alexa statistics for Mas²tering.eu. http://www.statshow.com/www/mas2tering.eu#main_information

3 Organisation of and contribution to events

In addition to the core workshops as a vehicle for engaging the key stakeholders for identifying and validating research directions, Mas²tering organised several special sessions in academic conferences. These sessions ensured engagement with the wider academic and industrial research community, feedback from which were used to enhance research methods and directions. The consortium partners also presented Mas²tering concepts and outcomes at various industrial and technical events at national and European levels.

3.1 Organisation of Mas²tering workshops

Although the four project workshops are reported in deliverables D1.1 - D1.4, a brief summary of the stakeholder engagement achieved through core workshops are as follows.

Business Convergence – Telecom/Grid Operator/Utility:

- **WS1.** (D1.1, M3, October 2014) Led by Telecom Italia in Venice hosted by Telecom Italia, ZigBee Alliance, & Energy@Home Assoc. in the framework of “Smart Homes Day 2014.”
- **WS3.** (D1.3, M24, June 2016) Led by R2M held in conjunction with Sustainable Places 2016 in Anglet, France, led to a conference paper being published and Value-Driven Advisory Group engaged.

Smart Grid Technologies and Use Cases:

- **WS2.** (D1.2, M14, October 2015) was the catalyst for fruitful discussions with high-level stakeholders regarding the approach and use cases at the end of the project’s first year
- **WS4.** (D1.4, M36, September 2017) was a deliberate exploitation-oriented gathering focused on innovations for Energy-efficient Buildings and the wider smart grids that connect them. This final edition of the Mas²tering workshop focused on key results in the project, namely: Physical Testing at the ENGIE Crigen facilities, Simulation of the Cardiff Grid, Project Use Cases, the MAS Platform as key technology, and the overarching Business Model Approach.

3.2 Organisation of special sessions in academic conferences

Four co-located workshops targeting the participants of major energy and ICT related conferences were organised during the course of the Mas²tering project. Each of these workshops was intended to reach distinct but equally important audiences ranging from policy-makers and industrials to academics with related specialisations. All special sessions invited contributions from authors within and outside the Mas²tering project. The submissions were independently reviewed before acceptance. The following sub-sections discuss the organisation and outcome of the organised workshops and special sessions.

3.2.1 Special session 1: Security, flexibility and demand management in smart low voltage grids

The first workshop³ on “security, flexibility and demand management in smart low voltage grids” was co-hosted with the first EAI International Conference on Smart Grid Inspired Future Technologies (SmartGIFT) in Liverpool, UK on 19-20 May 2016. This workshop was motivated by the need for Europe to transition its energy markets (generation, distribution and consumption) into smart energy systems by supporting bi-directional flows of revenue, energy and information, the increased penetration of distributed energy resources (DER), self-consumption of on-site generation, and the optimization of energy flows in a safe, reliable, secure, and affordable way. The workshop brought together industrials, ICT and cyber security experts, energy suppliers / retailers, distribution grid operators (e.g. Distribution

³ <http://smartgiftconf.org/2016/show/workshop-mas2tering>

System Operators, Distribution Network Operators), scientists, business analysts, and power engineers to share and exchange their experiences and ideas towards progressing the state-of-the-art in residential/commercial energy consumption optimization, the facilitation of aggregated flexibility trading, and prosumer-oriented smart energy communities.”

The workshop co-chairs were:

- Monjur Mourshed, Cardiff University, UK
- Maryse Anbar, Engie, FR
- Thomas Messervey, R2M Solution, IT
- Meritxell Vinyals, French Alternative Energies & Atomic Energy Commission (CEA), FR

The workshop sought contributions in the following topics:

- Enhancing LV-grid reliability, cyber-secure performance, and resilience
- Controllable load/self-optimization in EU “districts” and “neighborhoods”
- Interconnection of various devices (hardware) & agents (software), from the value chain covering smart meter to the national networks.
- Models of European LV-grid topologies, markets, and regulations
- Self-consumption and peak shaving without grid constraints
- Emerging technologies (i.e. Link-Boxes) for LV substation performance optimization, automation, and enhanced peak load profile monitoring
- Self-consumption and peak shaving with the presence of grid constraints
- Optimization algorithms, protocols/semantics, and prediction forecasting
- Future Smart Energy Market model (example: USEF framework)
- Substation Automation for peak load reduction and peak shifting
- Use of local flexibility and web services to offset grid reinforcements
- Energy consumption and energy management at HAN level
- District and community engagement of RES / DER
- Forecasting, optimization, and prediction for secure smart grid
- HAN Energy Management Systems/ ZigBee /Energy@Home / Gateway
- Smart Grid Standards & Requirements for low Voltage Topologies,
- Cross-sector and stakeholder-centric business and data models,
- Emerging DER technologies and interoperability (PV, CHP, battery, etc.)

The following publications were accepted after double-blind peer review:

- Baris Yuce, Monjur Mourshed, Yacine Rezgui. *An ANN-based Energy Forecasting Framework for the District Level Smart Grids.*
- Zia Lennard, Laura Rodriguez-Martin, Ivan Grimaldi, Mario Sisinni. *Business use case and cyber-security assessment framework for using home gateway boxes to optimise scheduling of energy-flexible appliances.*
- Hisain Elshaafi, Meritxell Vinyals, Michael Dibley, Ivan Grimaldi, Mario Sisinni. *Combination of Standards to Support Flexibility Management in the Smart Grid, Challenges and Opportunities.*
- Tracey Crosbie, Vladimir Vukovic, Michael Short, Nashwan Dawood, Richard Charlesworth, Paul Brodrick. *Future demand response services for blocks of buildings.*
- Juan Espeche, Thomas Messervey, Zia Lennard, Riccardo Puglisi, Mario Sissini, Meritxell Vinyals. *Use Cases and Business Models of Multi-Agent System (MAS) ICT Solutions for LV Flexibility Management.*

3.2.2 Special session 2: Collective and Adaptive Smart Energy management in districts and neighbourhoods (CASE)

The second workshop⁴ was organised in association with Fondazione Bruno Kessler, Italy and was co-located with the IEEE conference on Smart Cities (ISC2)⁵ on 12-15 September 2016 in Trento, Italy. The overall aim of the session was to enable participants to present research linked with the proliferation of distributed energy resources (DER) in distribution networks for a demand-responsive smart energy grid in districts and neighbourhoods, to reduce transmission and distribution (T&D) loss, peak demand and congestion. In particular, the following were used as the basis for the invitation and selection of contributions:

“Matching spatially and temporally-dynamic demand with intermittent DER generation requires the understanding of energy use behaviour and end-user flexibility. There is a potential for the application of inference, forecasting and information modelling techniques, which can be coupled with distributed control, and optimization – enabling self-organization in the form of collectively provided services, and facilitating the exchange, diffusion and adoption of virtuous energy conservation practices. Another potential is collective adaptation, as a way to guide users to change their behaviour and optimize overall energy use.”

The workshop co-chairs were:

- Monjur Mourshed, Cardiff University, UK
- Antonio Bucchiarone, Fondazione Bruno Kessler, Italy

Session topics:

- Business models
- Crowdsourcing for energy management
- Models and algorithms for collective action and adaptation
- Decentralized and incentives-based decision making
- Forecasting generation and consumption

⁴ <https://events.unitn.it/en/isc2-2016/tracks-and-sessions>

⁵ Proceedings are available at <http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=7573871>

- Inferencing and adapting user behaviour
- Information modelling for distributed energy management
- Integration of distributed energy-related services
- Interactions between heating and electricity grid
- Monitoring low - and medium - voltage grid

The following publications⁶ were accepted after double-blind peer review:

- Du, Hu, Phil Jones, and Bobo Ng. *Understanding the reliability of localized near future weather data for building performance prediction in the UK.*
- Marcus Brennenstuhl, Dirk Pietruschka, Ursula Eicker, Malcolm Yadack. *Towards Understanding the Value of Decentralized Heat Pumps for Network Services in Germany: Insights Concerning Self-Consumption and Secondary Reserve Power.*
- Jean-Laurent Hippolyte, Shaun Howell, Baris Yuce, Monjur Mourshed, Hassan Sleiman, Meritxell Vinyals, Loïs Vanhée. *Ontology-based Demand-Side Flexibility Management in Smart Grids using a Multi-Agent System.*
- Baris Yuce, Monjur Mourshed, Yacine Rezgui, Omer Rana. *Preserving Prosumer Privacy in a District Level Smart Grid.*
- Patrick Lynch, Jamie Power, Richard Hickey, Derek Kelly, Thomas Messervey, Juan Espeche, Youssef Oualmakran. *Maximising Value for Local Flexibility Management in Low Voltage Distribution Networks.*

3.2.3 Special session 3: Smart grid clustering

This special session⁷ titled “Smart grid clustering”, co-organized by Fuse-it and Mas²tering projects as part of the Sustainable Places conference on 30 June 2017. The following publications were accepted after double-blind peer review:

- A Multi-Sided Business Model for Local Flexibility Management in Low Voltage Distribution Networks (Entrepreneurship and Sustainability Issues, Entrepreneurship and Sustainability Center, 2016)
- Messervey, Thomas, Mario Sisinni, Juan Manuel Espeche, Zia Lennard, Meritxell Vinyals, Marie-France Robbe, James Sharman, and Julien Ardois. *Mas²tering: Business Cases and Technologies for Low-Voltage Flexibility Aggregation with Prosumers and Local Energy Communities Workshop.*
- Oualmakran, Youssef, Juan Manuel Espeche, Mario Sisinni, Thomas Messervey, and Zia Lennard. *Residential Electricity Tariffs in Europe: Current Situation, Evolution and Impact on Residential Flexibility Markets.*

Many papers were published by MDPI at <http://www.mdpi.com/2504-3900/1/7>.

⁶ http://events.unitn.it/sites/events.unitn.it/files/download/isc2-2016/isc2-2016-papers-schedule_13.pdf

⁷ <http://www.sustainableplaces.eu/sustainable-places-2017/>

3.2.4 Special session 4: Special track on smart grids and smart buildings

Special session on “intelligent and secure management towards smart buildings and smart grids”⁸ at conference Distributed Computing and Artificial Intelligence (DCAI) was organised as part of DCAI conference, held on 21-23 June 2017. The workshop was co-organized by:

- Isabel Praça, Polytechnic of Porto, Portugal
- Adrien Becue, Airbus Defence and Space Cybersecurity, France
- Zita Vale, Polytechnic of Porto, Portugal
- Meritxell Vinyals, CEA, France.

The background for the session was the role of the European electricity market and its transformation to competitive and decentralized management of the European network, as well as network performance improvement by incentives to first consume locally produced energy (solar panels, wind turbines). Buildings will be progressively equipped with smart household items able to adapt building consumption to available energy production in real time. The session invited contributions on the following topics:

- Services for analysis, forecast, and monitoring of available energy grid
- Tools for dynamically optimizing the demand-side (smart buildings) to the supply-side (smart grid)
- Communication and cybersecurity technologies

In this context of the transition towards smart grids, intelligent buildings have to tackle the challenges of smarter energy management, enhanced automation and connectivity. In light of stricter environmental policies and cost-reduction objectives, building managers are exploring innovative solutions to predict, monitor, control, and optimize energy consumption. The trend toward smart buildings is enabled by the growing integration of information technology with the energy systems. An unwanted consequence of this is the growing exposure to cyber-attacks. Artificial Intelligence is expected to play a key role in this new relationship between the smart buildings and the smart grid. This special session, therefore, aims to bring together researchers and practitioners from diverse areas of Artificial Intelligence, distributed computing, intelligent decision-making, smart management, communication and cybersecurity to explore new applications of Artificial Intelligence techniques in the fields of the smart building and the smart grid.

The following papers were accepted after blind peer-review:

- R.A.S. Fernandes, L.O. Deus, L. Gomes, Z. Vale. *Statistics-based approach to enable consumer profile definition for demand-response programs.*
- F.A.S. Borges, I.N. Silva, R.A.S. Fernandes. *Features extraction-based method for voltage sag source location in the context of smart grids.*
- Meritxell Vinyals, Maxime Velay, Mario Sisinni. *A multi-agent system for energy trading between prosumers.*
- Gil Pinheiro, Eugénia Vinagre, Isabel Praça, Zita Vale, Carlos Ramos. *Smart grids data management: a case for Cassandra.*
- Catarina Ribeiro, Tiago Pinto, Zita Vale, José Baptista. *Data mining for prosumers aggregation considering the self-generation.*

⁸ <http://www.dcai-conference.net/special-sessions/ism2sbg>

Many papers were published by Springer: <https://doi.org/10.1007/978-3-319-62410-5>.

3.3 Presentations in related events

In addition to academic conferences and events, project partners presented Mas²tering concepts, results and outcomes in industry relevant events. Thirteen presentations were made at various events. Details on the presentations and the partner responsible are presented in Table 1. Outcomes and key feedback from presentations in related events are presented in Table 2 while Table 3 illustrates audience type and reach at the relevant events.

Table 1: Presentation by partners in related events.

No.	Title of the Event	Partner	Year	Presenter	City	Event dates
1	European Utility Week ⁹	R2M	2014	Zia Lennard	Amsterdam, Netherlands	4-6 Nov 2014
2	Wireless Congress	TI	2014	Andrea Ranalli	Munich, Germany	12-13 Nov 2014
3	European Smart Grids Summit	ENGIE	2015	Maryse Anbar	Nice, France	19-20 Feb 2015
4	TSSG Industry Open Day	TSSG	2015	Steven Davy	Waterford, Ireland	3 Mar 2015
5	Energy@home Mini Maker Faire	TI	2015	Ivan Grimaldi	Torino, Italy	6 Jun 2015
6	ERA-Net Smart Grid workshop of the “Working Group on Regulatory and Market Development” ¹⁰	R2M	2016	Juan Espeche	Milan, Italy	9-10 Feb 2016
7	Innogrid2020+	LAB	2016	Youssef Oualmakran	Brussels, Belgium	27-28 Jun 2016
8	Sustainable Places 2016	R2M	2016	Thomas Messervey	Anglet	29 Jun-1 Jul 2016
9	A Customer-Focused Energy Business: Positioning in a Changing World ¹¹	LAB	2016	Youssef Oualmakran	Brussels, Belgium	5 Oct 2016
10	International Conference on Design & Sustainable Innovation for Smart Cities ¹²	R2M	2016	Zia Lennard	Nice, France	8 Dec 2016
11	USEF OpenADR webinar ¹³	R2M	2017	Thomas Messervey		26 Jan 2017
12	EDIE Live ¹⁴	SMS	2017	James Sharman	Birmingham, UK	23-24 May 2017

⁹ <http://www.european-utility-week.com/>

¹⁰ http://ec.europa.eu/research/era/era-net-in-horizon-2020_en.html

¹¹ <http://www.eurelectric.org/events/2016/a-customer-focused-energy-business-positioning-in-a-changing-world/>

¹² <http://cityopt.eu/>

¹³ <http://www.openadr.org/webinar-series>

¹⁴ <https://exhibition.edie.net/>

Table 2: Outcomes and key feedback from presentations in related events.

No.	Event title	Outcome	Host	Country
1	European Utility Week ¹⁵	Liaising with partners from EcoWatt (France), FlexAlert (USA), and Pret Pour. (Belgium) was performed in order to benchmark solutions and identify unique value propositions for Mas ² tering. Key datapoint was the approximate value of an “engaged” customer is only about 70 Euro/year, so it’s important to look elsewhere for significant impact regarding demand response at LV level.	Synergy Events	NL
2	Wireless Congress	Presentation by Andrea Ranalli showing new smart grid functionalities based on Mas ² tering use cases towards standardizing the communication between the DSO and utility meters using the Energy Home Box in PLC/ZigBee. ¹⁶	Elektonika	DE
3	European Smart Grids Summit	Discussions on Multi-agent techniques offering the opportunity to explore a decentralized solution for decentralized flexibility sources aiming to provide a technical framework to think resilient local energy management. Attendees agreed that it can be an innovative and robust way to complete the energy management services.	Radisson Hotel	FR
4	TSSG Industry Open Day	Mas ² tering was presented to local SMEs, several multinationals, start-ups and national industry partners. In total, 87 persons were at the event and networking went well. /	TSSG	IR
5	Energy@home Mini Maker Faire	Mas ² tering was presented to stakeholders of the Energy@Home standard which boosted visibility of the project results in a key early adopter segment being targeted for technology commercialization.	Energy@Home Mini Maker Faire	IT
6	ERA-Net Smart Grid workshop of the “Working Group on Regulatory and Market Development” ¹⁷	R2M became part of the working group which allowed for important technical updates and technology watch take-away to be implemented into Mas ² tering technical activities, specifically in WPs 1 and 6.	AMAT - Milano	IT
7	InnoGrid2020+	Two scientific posters were displayed to the diverse audience of smart grid stakeholders &	InnoGrid2020+	BE

¹⁵ <http://www.european-utility-week.com/>

¹⁶ <http://www.mas2tering.eu/wp-content/uploads/2015/03/TI-Action-1-ZigBee-Developer-Conference-2014-Munich-session.pdf>

¹⁷ http://ec.europa.eu/research/era/era-net-in-horizon-2020_en.html

		members of the VDAG attended as invited guests of the project. ¹⁸		
8	Sustainable Places 2016	Presentations were delivered by RIKON to validate the business strategy as developed in D1.5. VDAG members attended the session	SP2016	FR
9	A Customer-Focused Energy Business: Positioning in a Changing World ¹⁹	Gained insights on business vision of aggregators, utilities, storage companies on flexibility and energy sharing. Results of the analysis contributed to business case development as reported in deliverables of WP1 (specifically D1.7)	Eurelectric	BE
10	International Conference on Design & Sustainable Innovation for Smart Cities ²⁰	Cost benefit analysis presentations review allowed for benchmarking actions to be performed with similar projects focused on smart communities (UC2) and cities (UC3). The results have been captured in deliverables of WP1 where business cases are developed	CUM	FR
11	USEF OpenADR webinar ²¹	Participation in this webinar strengthened the replicability of the MAS Platform in the emerging “Prosumer-Aggregator-Market”. It was stated that USEF covers the market model between the aggregator and market and that OpenADR covered how devices communicate between the prosumer and aggregator.	OpenADR	N/A
12	EDIE Live ²²	Mas ² tering was discussed with Flexitricity, EnergyPool, Enernoc & Smartest Energy in order to benchmark against existing commercial solutions and provide visibility for the local aggregator business cases developed in WP1 (D1.5-D1.7).	National Exhibition Centre	UK

¹⁸ http://www.mas2tering.eu/wp-content/uploads/2015/04/InnoGrid_poster2_general-factsheet.pdf

¹⁹ <http://www.eurelectric.org/events/2016/a-customer-focused-energy-business-positioning-in-a-changing-world/>

²⁰ <http://cityopt.eu/>

²¹ <http://www.openadr.org/webinar-series>

²² <https://exhibition.edie.net/>

Table 3: Audience type and reach at the events where presentations were made.

No.	Title of the Event	Audience type			Audience reach	
		National	European	Global	Direct	Indirect
1	European Utility Week ²³	Yes	Yes	Yes	~200	~500
2	Wireless Congress	Yes	Yes	Yes	~100	~200
3	European Smart Grids Summit	Yes	Yes	Yes	~85	~100
4	TSSG Industry Open Day	Yes	No	No	~50	~100
5	Energy@home Mini Maker Faire	Yes	No	No	~100	~500
6	ERA-Net Smart Grid workshop of the “Working Group on Regulatory and Market Development” ²⁴	Yes	Yes	No	~200	~500
7	Innogrid2020+	Yes	Yes	No	~150	~1000
8	Sustainable Places 2016	Yes	Yes	No	25	~100
9	A Customer-Focused Energy Business: Positioning in a Changing World ²⁵	Yes	Yes	Yes		
10	International Conference on Design & Sustainable Innovation for Smart Cities ²⁶	No	Yes	No	~50	~50
11	USEF OpenADR webinar ²⁷	No	Yes	No	3500	7000
12	EDIE Live ²⁸	Yes	No	No	~100	~1000

²³ <http://www.european-utility-week.com/>

²⁴ http://ec.europa.eu/research/era/era-net-in-horizon-2020_en.html

²⁵ <http://www.eurelectric.org/events/2016/a-customer-focused-energy-business-positioning-in-a-changing-world/>

²⁶ <http://cityopt.eu/>

²⁷ <http://www.openadr.org/webinar-series>

²⁸ <https://exhibition.edie.net/>

4 Scientific publications in conferences

The consortium published project concepts and findings in high-impact conferences during the project lifetime. The consortium as a whole contributed to the selection of conferences. The following aspects were considered for the selection of a conference:

- **Target audience:** Where possible the consortium aimed to maximise the exposure to both energy and ICT research areas;
- **Reach:** The reach of the conference should ideally be global. However, to maximise impact in Europe, we should prioritise key travelling events that are being organised in partner countries in Europe.
- **Impact:** Only high-impact and established conferences are considered;
- **Publication:** Where possible, the publication of the conference should be in proceedings published by leading publishers (e.g. IEEE, Springer, Elsevier, MDPI) and should have a digital object identifier (DOI); and
- **Peer-review:** The perceived quality of peer-review should be a key consideration for publication. Experiences can contribute to the determination of potential peer-review quality.

An overview of conference publications is given in Table 4, along with their bibliographic details in Table 5. Engagement metrics in terms of views, downloads and citations (so far) are given in Table 6.

Overall, all twelve publications were published in high-impact conferences whose proceedings were published by major publishers such as IEEE, Springer, Elsevier and MDPI. Their respective publication platforms are accessible to the wider audience and caters to various audience types from academia to industry.

Table 4: Overview of conference publications.

No.	Title	Authors	Conference	Place	Date	Lead
1	Smart Grid Futures: Perspectives on the Integration of Energy and ICT Services	Monjur Mourshed, Sylvain Robert, Andrea Ranalli, Thomas Messervey, Diego Reforgiato, Regis Contreau, Adrian Becue, Kevin Quinn, Yacine Rezgui, Zia Lennard	The 7th International Conference on Applied Energy (ICAE2015)	Abu Dhabi, UAE	28-31 March 2015	CU
2	Collaborative Framework for Monitoring Reliability of Distributed Components of Composed Services	Hisain Elshaafi, Dmitri Botvich and Steven Davy	13th European Conference on Multi-Agent Systems	Athens, Greece	17-18 December 2015	TSSG
3	Use Cases and Business Models of Multi-Agent System (MAS) ICT Solutions for LV Flexibility Management	Juan Manuel Espeche, Thomas Messervey, Zia Lennard, Riccardo Puglisi, Mario Sissini, Meritxell Vinyals	1st EAI International Conference on Smart Grid Inspired Future Technologies (SmartGIFT)	Liverpool, UK	19-20 May 2016	R2M
4	Combination of Standards to Support Flexibility Management in the Smart Grid, Challenges and Opportunities	Hisain Elshaafi, Meritxell Vinyals, Mario Sissini, Ivan Grimaldi, Michael Dibley		Liverpool, UK	19-20 May 2016	TSSG
5	An ANN-based Energy Forecasting Framework for the District Level Smart Grids	Baris Yuce, Monjur Mourshed, Yacine Rezgui	2016 IEEE International Smart Cities Conference (ISC2)	Liverpool, UK	19-20 May 2016	CU
6	SMART: A process-oriented methodology for resilient smart cities	Monjur Mourshed, Antonio Bucchiarone, Fahmida Khandokar		Trento, Italy	12-15 September 2016	CU
7	Preserving Prosumer Privacy in a District Level Smart Grid	Baris Yuce, Monjur Mourshed, Omer Rana, Yacine Rezgui		Trento, Italy	12-15 September 2016	CU

8	Ontology-based Demand-Side Flexibility Management in Smart Grids using a Multi-Agent System	Jean-Laurent Hippolyte, Shaun Howell, Hassan Sleiman, Meritxell Vinyals, Baris Yuce, Lois Vanhee, Monjur Mourshed		Trento, Italy	12-15 September 2016	CU
9	Maximising Value for Local Flexibility Management in Low Voltage Distribution Networks	Patrick Lynch, Jamie Power, Richard Hickey, Derek Kelly, Thomas Messervey, Juan Manuel Espeche, Youssef Oualmakran		Trento, Italy	12-15 September 2016	TSSG
10	A Multi-Sided Business Model for Local Flexibility Management in Low Voltage Distribution Networks	Patrick Lynch, Richard Hickey, Thomas Messervey	Sustainable Places 2016 Conference (SP2016)	Anglet, France	29 June-1 July 2016	TSSG
11	Mas ² tering: Business Cases and Technologies for Low-Voltage Flexibility Aggregation with Prosumers and Local Energy Communities Workshop	Thomas Messervey, Mario Sisinni, Juan Manuel Espeche, Zia Lennard, Meritxell Vinyals, Marie-France Robbe, James Sharman, Julien Ardeois	Sustainable Places 2017 Conference (SP2017)	Middlesbrough, UK	27-29 June 2017	R2M
12	Residential Electricity Tariffs in Europe: Current Situation, Evolution and Impact on Residential Flexibility Markets	Youssef Oualmakran, Juan Manuel Espeche, Mario Sisinni, Thomas Messervey, Zia Lennard		Middlesbrough, UK	27-29 June 2017	LAB

Table 5: Bibliographic details for the conference publications.

No	Title	Proceedings/book title	Volume	Pages	Publisher	Date of publication	Place of publication	Open access	Peer-reviewed	DOI
1	Smart Grid Futures: Perspectives on the Integration of Energy and ICT Services	Energy Procedia	75	1132-1137	Elsevier BV	28/08/2015	Netherlands	Yes	Yes	10.1016/j.egypro.2015.07.531
2	Collaborative Framework for Monitoring Reliability of Distributed Components of Composed Services	Lecture Notes in Computer Science	9571		Springer	17/08/2016	Switzerland	No	Yes	10.1007/978-3-319-33509-4_5
3	Use Cases and Business Models of Multi-Agent System (MAS) ICT Solutions for LV Flexibility Management	Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering	175	136-142	Springer	13/11/2016	Germany	Yes	Yes	10.1007/978-3-319-47729-9_14
4	Combination of Standards to Support Flexibility Management in the Smart Grid, Challenges and Opportunities	Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering	175	143-151	Springer	13/11/2016	Germany	Yes	Yes	10.1007/978-3-319-47729-9_15
5	An ANN-based Energy Forecasting Framework for the District Level Smart Grids	Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering	175	107-117	Springer	13/11/2016	Germany	Yes	Yes	10.1007/978-3-319-47729-9_12
6	SMART: A process-oriented methodology for resilient smart cities	IEEE International Smart Cities Conference (ISC2)			IEEE	10/03/2016	USA	No	Yes	10.1109/ISC2.2016.7580872
7	Preserving Prosumer Privacy in a District Level Smart Grid	IEEE International Smart Cities Conference (ISC2)			IEEE	10/03/2016	USA	No	Yes	10.1109/ISC2.2016.7580829

8	Ontology-based Demand-Side Flexibility Management in Smart Grids using a Multi-Agent System				IEEE	10/03/2016	USA	No	Yes	10.1109/ISC 2.2016.7580 828
9	Maximising Value for Local Flexibility Management in Low Voltage Distribution Networks				IEEE	10/03/2016	USA	No	Yes	10.1109/ISC 2.2016.7580 830
10	A Multi-Sided Business Model for Local Flexibility Management in Low Voltage Distribution Networks	4	Entrepreneurship and Sustainability Issues	380-391	Entrepreneurship and Sustainability Centre	16/11/2016		Yes		10.9770/jesi .2017.4.3S(12)
11	Mas ² tering: Business Cases and Technologies for Low-Voltage Flexibility Aggregation with Prosumers and Local Energy Communities Workshop	1	Proceedings	972	MDPI	11/09/2017	Switzerland	Yes		10.3390/proceedings1070972
12	Residential Electricity Tariffs in Europe: Current Situation, Evolution and Impact on Residential Flexibility Markets	1	Proceedings	973	MDPI	11/09/2017	Switzerland	Yes		10.3390/proceedings1070973

Table 6: Engagement metrics for conference publications.

No.	Title	Metrics (monthly)		Citations	
		Views	Downloads	GS ²⁹	Scopus ³⁰
1	Smart Grid Futures: Perspectives on the Integration of Energy and ICT Services	1050 (38)		18	14
2	Collaborative Framework for Monitoring Reliability of Distributed Components of Composed Services		340 (22)	-	
3	Use Cases and Business Models of Multi-Agent System (MAS) ICT Solutions for LV Flexibility Management		354 (28)		
4	Combination of Standards to Support Flexibility Management in the Smart Grid, Challenges and Opportunities		342 (26)		
5	An ANN-based Energy Forecasting Framework for the District Level Smart Grids		344 (27)	1	
6	SMART: A process-oriented methodology for resilient smart cities	165 (8)	1	2	1
7	Preserving Prosumer Privacy in a District Level Smart Grid	79 (4)			
8	Ontology-based Demand-Side Flexibility Management in Smart Grids using a Multi-Agent System	229 (10)		4	2
9	Maximising Value for Local Flexibility Management in Low Voltage Distribution Networks	66 (3)		2	
10	A Multi-Sided Business Model for Local Flexibility Management in Low Voltage Distribution Networks				
11	Mas ² tering: Business Cases and Technologies for Low-Voltage Flexibility Aggregation with Prosumers and Local Energy Communities Workshop	143 (36)	33		
12	Residential Electricity Tariffs in Europe: Current Situation, Evolution and Impact on Residential Flexibility Markets	152 (38)	42		

²⁹ Google Scholar. <http://scholar.google.com/>

³⁰ Scopus. <http://www.scopus.com/>

5 Scientific publications in journals

In addition to disseminating to predominantly academic communities, peer-reviewed publications in scientific journals also validate the science undertaken in a piece of research through external peer-review. The following aspects were considered for the selection of a scientific journal to publish Mas²tering research:

- **Esteem and Impact:** Journal impact factors and ranking as published in Journal Citation Reports (JCR) were considered for funding the best journal for the nature of the contents.
- **Review quality:** Review timeframes, where available from the publishers' websites, were considered. Journal review policies were assessed to ascertain the independence (of the review from the publication process) and rigour of the review process.
- **Open access:** The journal must be open access (OA) compliant. At the very least, the journal should support Green OA route. If possible, Gold OA should be pursued via institutional and/or project funding.
- **Discipline specific vs multidisciplinary:** Depending on the focus of the prepared manuscript, the selection of a journal primarily depends on whether the contents would suit a discipline-focused or a multidisciplinary journal.

An overview of published journal articles is given in Table 7. Engagement metrics in terms of views, downloads and citations (so far) are given in Table 8. Overall, four publications were published in high-impact journals published by leading publishers: IEEE, Elsevier, MDPI. One publication was accepted in December 2017 in a journal published by Springer. Four journals are indexed in the Science Citation Index (SCI), Web of Science (WoS) and Scopus. The fifth journal is indexed in the INSPEC database. Their respective publication platforms are accessible to the wider audience and caters to various audience types from academia to industry.

Table 7: Overview of journal articles.

No.	Title	Authors	Journal	Vol.	Pages	DOI	Lead	Year	Publisher	Date	Open access
1	A Smart Forecasting Approach to District Energy Management	Baris Yuce, Monjur Mourshed, Yacine Rezgui	Energies	10	1073	10.3390/en10081073	CU	2017	MDPI	25/06/2017	Yes
2	Efficient Buyer Groups with Prediction-of-Use Electricity Tariffs	Valentin Robu, Meritxell Vinyals, Alex Rogers, Nicholas Jennings	IEEE Transactions on Smart Grid	In press	1	10.1109/TSNG.2017.2660580	CEA	2017	IEEE	27/01/2017	No
3	Degree-day based non-domestic building energy analytics and modelling should use building and type specific base temperatures	Qinglong Meng, Monjur Mourshed	Energy and Buildings	155	260-268	10.1016/j.enbuild.2017.09.034	CU	2017	Elsevier BV	14/09/2017	Yes
4	Climatic parameters for building energy applications: A temporal-geospatial assessment of temperature indicators	Monjur Mourshed	Renewable Energy	94	55-71	10.1016/j.renene.2016.03.021	CU	2016	Elsevier BV	27/01/2017	Yes
5	Secure Automated Home Energy Management in Multi-agent Smart Grid Architecture	Hisain Elshaaafi, Meritxell Vinyals, Ivan Grimaldi, Steven Davy	Technology and Economics of Smart Grids and Sustainable Energy	3			TSSG	2018	Springer	Accepted	No

Table 8: Engagement metrics for journal articles.

No.	Title	Publisher metrics (monthly)		Citations	
		Views	Downloads	Google Scholar	Scopus
1	A Smart Forecasting Approach to District Energy Management	643	503	2	2
2	Efficient Buyer Groups with Prediction-of-Use Electricity Tariffs	91	80 (7)	5	
3	Degree-day based non-domestic building energy analytics and modelling should use building and type specific base temperatures	617 (206)			
4	Climatic parameters for building energy applications: A temporal-geospatial assessment of temperature indicators	4736 (236)		3	2
5	Secure Automated Home Energy Management in Multi-agent Smart Grid Architecture		Not yet available		

6 Conclusion

Mas²tering engaged with the wider community throughout the project to realise its goal of developing context-relevant distributed ICT solutions for enabling decentralised flexibility management within the low-voltage distribution network. Contributions to events and journals were one of the key pillars of the dissemination strategy that enabled the consortium to reach both academic and industry audiences at a global scale. The dissemination strategy focused on maximising the impact from participation in events and publications in outlets such as conferences and journals.

Overall, the project organised **four** core workshops to drive the development and refinement of ICT solutions and **four** special sessions in high-impact scientific conferences. The special sessions were open to internal and external contributions and resulted in collaborative exchange of ideas with other relevant projects in Europe and beyond. In addition, the consortium presented Mas²tering concepts and results in **thirteen** national/European events on energy and ICT at various stages of development.

Regarding publication, the project published **four** articles in high-impact Science Citation Index (SCI) journals, **one** article in a recent journal dedicated to smart grids and **twelve** articles in well-regarded conferences, the proceedings of which were published by major global publishers.

Together with the four workshops, four special sessions, thirteen event presentations, five journal articles and twelve conference publications, Mas²tering dissemination activities reached tens of thousands of potential audience and stakeholders. The direct impact of the reported dissemination activities is evident, to some extent, in the number of citations the publications attracted despite being available only for a short while.

The integrated dissemination strategy adopted in the project catered to a wide variety of audiences, including industry, academia and policy stakeholders. The use of multiple channels of dissemination helped in ensuring a wider engagement thus maximising the potential for impact of the research.

The project made significant progress in terms of both the quality and quantity of dissemination activities, the success of which was partly due to the Mas²tering's strategy of integrating dissemination planning and actions with the research that took place in various work packages. From our experience, it worked well as each WP leader and participant identified the materials that can be communicated and the type of dissemination channel most suited to the content.

7 References

- [1] EC, Communicating EU research and innovation guidance for project participants, Brussels, Belgium: European Commission, 2014.
- [2] Institute of Education, “The Resaerch Ethics Guidebook: A resource for social scientists,” University of London, 2017. [Online]. Available: <http://www.ethicsguidebook.ac.uk>. [Accessed 30 November 2017].