evolvDSO

Development of methodologies and tools for new and evolving DSO roles for efficient DRES integration in distribution networks

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COOPERATION

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 608732.

Publishable Summary

Document Information

Programme	FP7 – Cooperation / Energy
Project acronym	evolvDSO
Grant agreement number	608732
Name of the Document	**Publishable Summary**
WP/Task related	WP8
Type (distribution level)	PU
Date of delivery	29/12/2015
Status and Version	V1.0
Number of pages	9
Document Responsible	Marco Baron – ENEL
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Grant Agreement number: **608732**

Project acronym: **evolvDSO**

Project title: **Development of methodologies and tools for new and evolving DSO roles for efficient DRES integration in distribution networks**

Grant Agreement for: Collaborative project

Date of latest version of Annex I against which the assessment will be made: 11-11-2015

Periodic report: 2nd

Period covered: from 1st September 2014 to 30th September 2015

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Project context and main objectives:

The goal of reducing the emission of CO2 in Europe to address the global problems of climate change and resource scarcity poses a number of technical and operational challenges to all actors along the electricity value chain. In particular, the target of a 20% share of renewable energy resources in the EU energy consumption mix as one of the EU 20-20-20 goals requires new technical, regulatory as well as market-related approaches to the way electricity networks are managed today.

The transition of distribution networks towards a smart system which supports the successful integration of distributed renewable energy sources (DRES) and demand participation in the electricity system, requires an evolution of the role of DSOs with respect to the operation and management of the grid, as well as new tools to support these potential new roles.

Within this context, the evolvDSO is a Collaborative Project financed by the Seventh Framework Programme (FP7) to . This 40 months project, running since the 1st September 2013, aims at defining

future roles of distribution system operators (DSOs) on the basis of a set of different future scenarios. Selected tools and methods to enable these future DSO roles will be developed and validated through computer simulations based on real grid data and real-life testbeds, and encompassing **Planning**, **Operational Scheduling**, **Real-time operations** and **Maintenance**. The new tools and methods will enable DSOs in collaboration with transmission system operators (TSOs) and other market players to support the transition of the distribution networks towards a smart system that supports a successful integration of DRES. To facilitate the uptake of the new tools and methods, evolvDSO will provide recommendations for the regulatory framework and market architectures and elaborate proposals of new interactions among key stakeholders.

Work performed in the second period of the project and main results achieved so far

The project further investigated the evolving and future DSO roles (defined within the first period) with the aim to identify the main regulatory changes required for their adoption, the strategic implications for the interactions between different market stakeholders when adopted, third party assignation of evolvDSO roles and the evolution of these roles, taking into account current and expected trends.

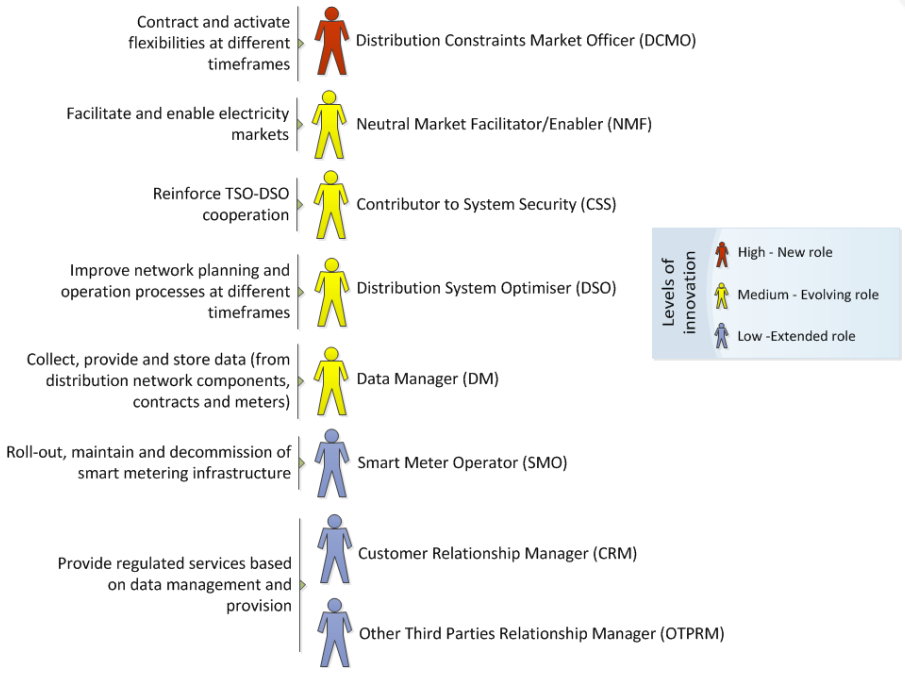

Figure 1: Potential (evolving and new) roles at distribution system level

Starting from the analysis of the System Use cases defined in WP2 and representing the most innovative functionalities covering different domains, DSOs belonging to the Consortium ranked the most innovative and relevant functionalities. Ten tools, covering four domains, composed the final list of tools.

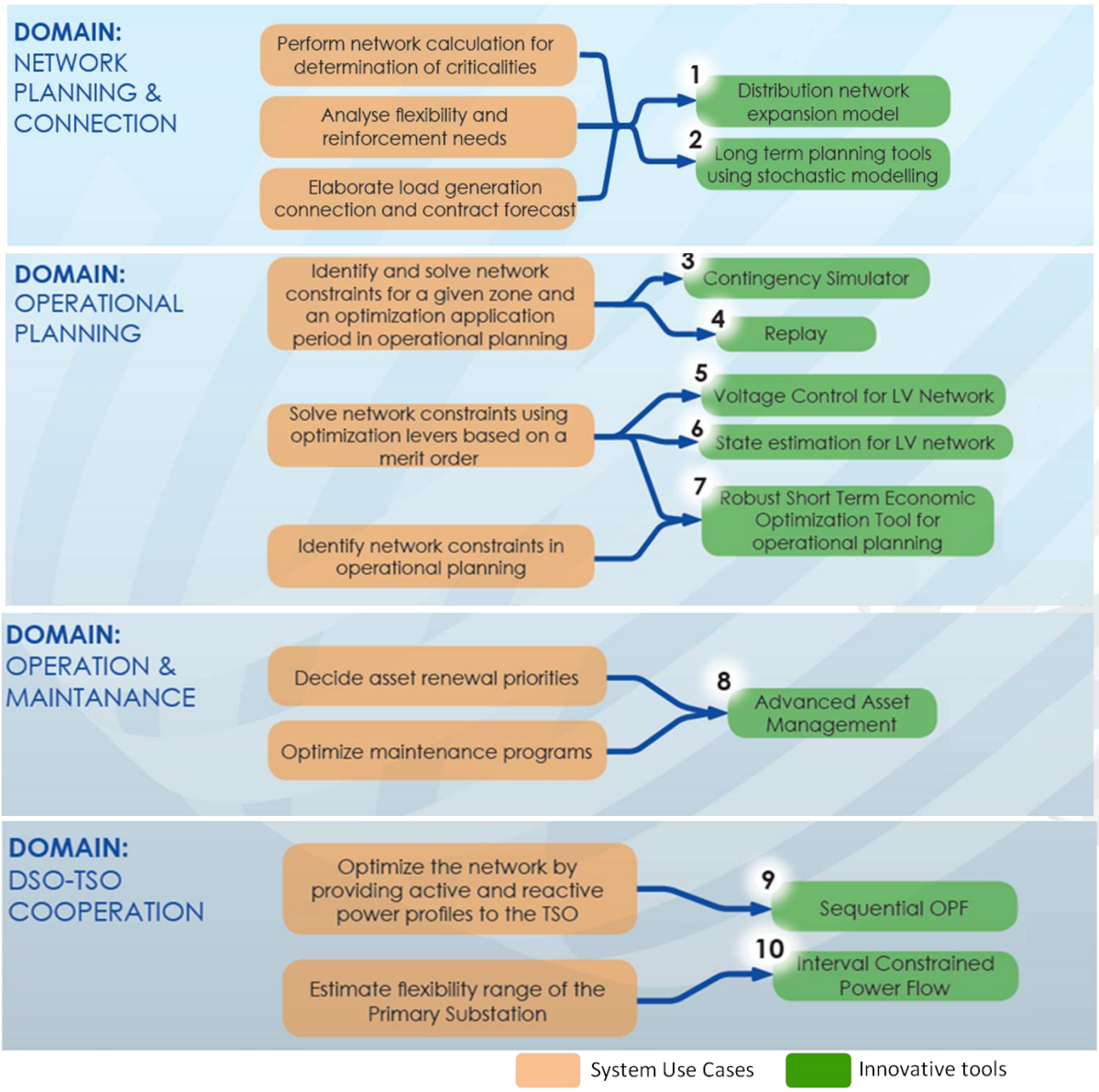

Figure 2: List of tools developed in the project and covering four main domains

Those tools need input data from real grids or other realistic data in order to be validated and tested. Furthermore, realistic data is important in order to develop tools closely related to the DSO business and to draw conclusions from the results of the tools and methods used within the project. Therefore a dataset for the tools as well as the format used for the data exchange were defined.

In the first period, EEGI KPIs were aligned with the system use cases developed. This alignment was the result of the preliminary analysis completed before the tools were defined, therefore they have been revised within the framework of WP5. Moreover, in order to accurately assess the quality and performance of the tools it was necessary to include more granular KPIs (namely "Operational KPIs") as well as a preliminary analysis of the scalability and replicability potential.

All the tools envisaged in WP3 have been validated through simulations. The results have been structured in a way that the peculiarities of the countries involved are highlighted. The simulations allowed the assessment of the impact of the tools considering the set of high level EEGI KPIs, operational KPIs defined within the framework of WP5 and their impact taking into account the scenario conditions defined in WP1 and WP2.

In order to complement the validation tests performed in WP3, in September 2015 the real life demonstration and laboratory testing of a subset of tools started. DSO were inspired by the CEI 62559 Intelgrid when selecting the tools to be tested.

These tests will help the DSOs to operate the selected WP3 tools and assess their value and applicability within the real operational environment.

Guidelines for field and laboratory testing within the evolvDSO project have been delivered to make sure that most of the selected Key Performance Indicators (KPIs), measurements and metrics for the different tools will be addressed in the different trials and they will give quantitative and quantitative results, taking into account the different types of networks and processes ongoing in those networks.

The proposed process to test the tools and methods within this project is based on the ISO/IEC/IEEE 29119, which is an internationally agreed set of standards for software testing.

The table below shows an overview of the six selected tools developed by the research institutes and the different trials where they will be applied by the DSOs.

Laboratory and field tests matrix		Field test and laboratory sites					
		Northern Site HV&MV test site (Field)	**Southern Site** HV&MV test site (Field)	**Milano Centro Prove** (Lab)	**SOGRID** MV&LV test site (Field)	**VENTEEA** MV test site (Field)	**Various MV networks** (Lab)
INESC	Interval Constrained Power Flow	To be tested	To be tested	/	To be tested	To be tested	/
	Sequential OPF	To be tested	To be tested	/	/	/	/
	LV State Estimation	/	/	/	To be tested	/	/
RSE	Contingency Co-Simulation	/	/	/	/	To be tested	/
ENEL	Replay	/	/	To be tested	/	/	/
UCD	Advanced Asset Management	/	/	/	/	/	To be tested

Table 1: Laboratory and field tests matrix

The picture below shows the workflow carried out in the second period, including the indication of the deliverables of reference.

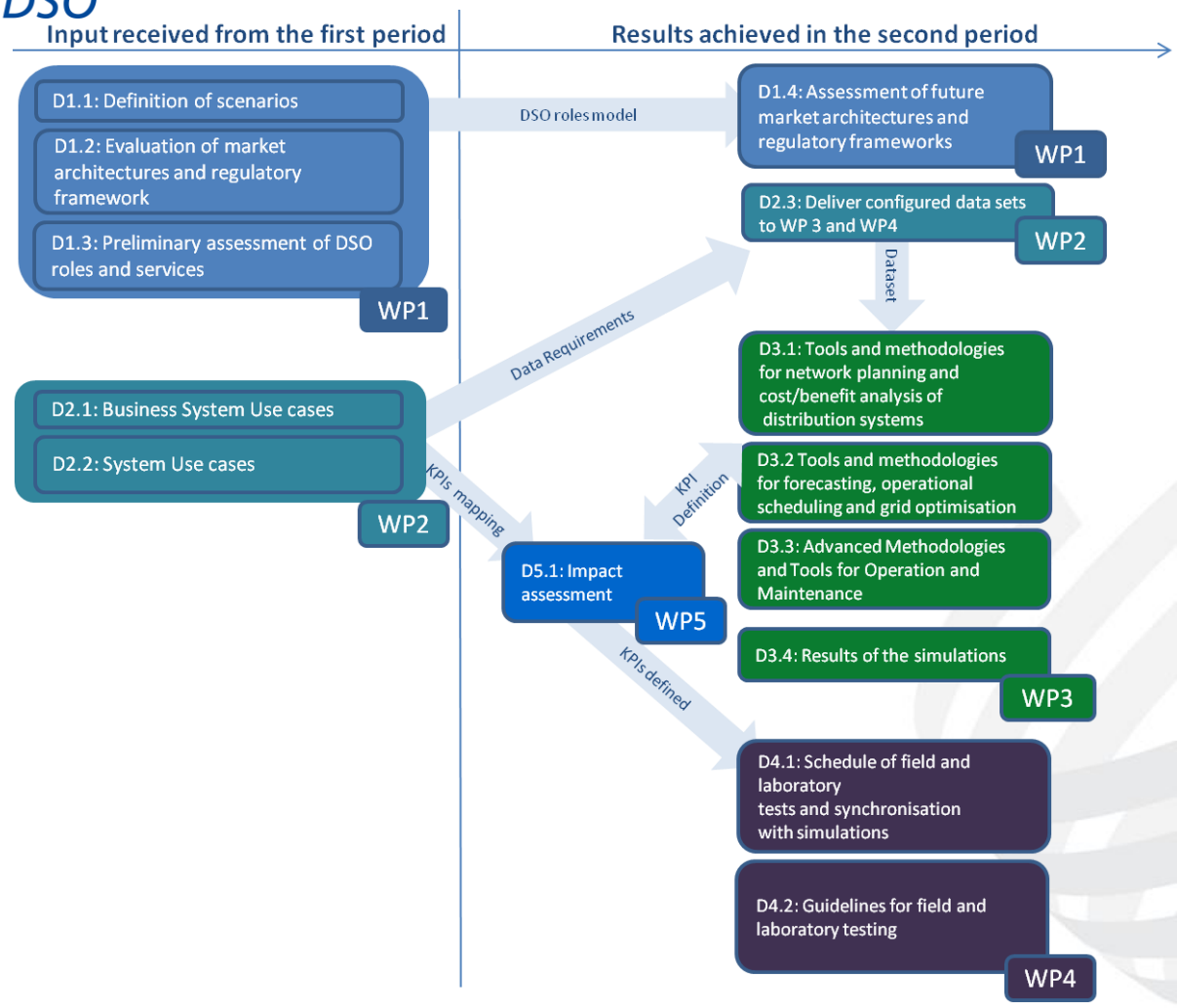

Figure 3: Second period workflow and link with the first period workflow

The Consortium delivered all the required results in preparation of the last period, where the main conclusions of the project will be drawn, in particular:

- Results of the field tests performed;
- Analysis of the impact of the tools on the high level EEGI objectives and their potential in terms of scalability and replicability;
- Recommendations for the implementation of a set of validated methodologies and tools;
- Recommendations for changes in the regulatory framework and market architectures in a set of short-term and long-term scenarios where the DSO role evolves/changes;
- A roadmap towards an electricity system of the future.