

DRES2Market: technical, business and regulatory approaches to enhance renewable energy capabilities to take part actively in the electricity and ancillary services markets.

DRES2Market is a European Union's Horizon 2020 granted research programme project, aiming at the development of a complete and comprehensive framework to facilitate an active participation of distributed generation based on renewable energy - solar PV and wind energy in the electricity market and supply of ancillary services to the power system.

Highlights at July 2021 - M12 Development of the 5 tasks:

Task 2.1.: Identifying technical and regulatory solutions, to enhance the participation of large renewable energy facilities in energy and ancillary services markets.

The technical and regulatory identified solutions, to enhance the participation of a distributed renewables in energy and ancillary services markets in the DRES2 Market Project has been divided into four categories, which are the following:

1. **Renewable production and storage:** some of the areas analysed in this part of the project has focused on:
 - PV technologies and their importance as a market driven by increasing demand in renewable energy, analysing PV modules, PV systems, PV system types, LCOE of PV systems and the environmental impacts of the PV systems.
 - Onshore wind is another approach that has been studied. The revision has focused on main turbine manufacturers, efficiency, capacity factors, and average wind power generation. Also, the importance of operation and maintenance costs, reliability of wind turbines technologies, and control strategies and maximum power point trackers have been analysed.
 - Electrochemical storage systems: different storage solutions were evaluated to determine their main characteristics regarding lead acid and carbon batteries, lithium ion and all solid lithium batteries, nickel redox vanadium and sodium ion batteries, etc. all of this types of electrochemical storage systems are characterised by their potential use, energy storage capacity, round trip cycle, response time, depth discharge, degradation, number of cycles, and investment and maintenance cost.
 - Pumped storage hydropower and its importance in controlling the necessity of renewable energy accumulation. During this chapter, the pump storage hydropower capacities in Europe have been analysed and the different types of pumped storage hydropower plants.
 - Thermal storage systems: this type of technology that stocks thermal energy in the same fluid used to collect it has been studied and a comparison among technologies was done to obtain the best conclusion and identify the main solutions for renewable energy integration and participation.
 - Converters and their contribution to distributed generation: current, additional, and new features for PV inverters have been analysed.
2. **Demand side management:** the aspects analysed during the stage have been the following:
 - Smart EV charging: a determining aspect to contribute to the demand side management such as the Electric vehicle, battery size, charging power and level, infrastructure, cost, and a number of charging points.
 - Power to heat and power to gas: power to heat mainly focused on their applications and the advantage for the residential sector and power to gas hopping for green Hydrogen's ability to store energy and their applications and perspectives as distributed energy storage.
 - Other demand side management such as prosumers, households, commercial, industrial, communities and blockchain.
3. **Control and Management:** the main aspects analyse had been:
 - Control and management for Distributed Energy Sources (DER) operators; related to the forecast technologies and methods mainly wind and solar generation forecasting and energy management systems and their optimization techniques and strategies for distributed generation grids.
 - Control and management for grid operators: involved in grid connection and protection solutions and power control.
4. **Distributed Energy Sources (DER) integration in the main EU countries:**
 - EU countries with large DER integration: like Spain, Denmark and Portugal have been identified among the ones with a larger integration of renewable in Europe, each country has been reviewed in terms of regulatory framework renewable installation and recent auctions approved and participation in electricity markets.
 - EU countries with medium integration of DER: France and Greece are some of the countries that have not yet reached a high integration. The characteristics of these countries have been identified and analysed.
 - EU Countries with low integration of DER: countries included in this group are Poland and the Czech Republic.
 - Demand response in the USA: as an example of a program to reduce electricity usage during periods of high-power prices or when the reliability of the electric grid is threatened. In exchange, end energy users are compensated for decreasing their electricity use.

Task 2.2.: Designing the affordable solutions (production equipment, storage devices, smart technologies and active demand approaches) to enable the active participation of distributed generation in the electricity and ancillary services market.

This task has focused on the research of more relevant information within the publications or the deliverables of each project, regarding:

- **development of dedicated technologies,**
- **study of social impacts, the analysis of the market and economical aspects,**
- **explanations of regulatory texts – grid codes and administrative requirements,**
- **development of dedicated solutions to enhance DER development gathering different technologies and also market, social and regulatory aspects.**

Twenty five European Union Programme projects have been reviewed and analysed. The document gives an overview of two of the main solutions identified in the reviewed project to ease the DER penetration in the distribution grid without lowering grid quality and grid stability and avoiding DER production curtailment. These two solutions attend to manage in a smarter way numerous dispatchable loads through Demand Response and DER generation units also: smart EV charging and artificial intelligence for energy systems, especially regarding aggregation methodologies.

Task 2.3.: Barriers for large integration of renewable energies in electricity and ancillary services markets.

This task focused on the market, regulatory, technical, administrative, financial, social and environmental barriers which slowdown large scale deployment of solar PV and wind power into the distribution networks.

We recognised and analysed major barriers that contribute to slowdown in the development of solar PV and wind sector in 6 European countries i.e.: Austria, Greece, France, Norway, Poland, and Spain. Each country has different objectives and is free to decide how to remove remaining obstacles in order to increase dynamics of the development of renewable electricity sources.

The move away from generation in large central power plants towards decentralized production from solar PV and wind energy requires overcoming some remain hurdles arising as a consequence of the general regulatory framework of electricity retail markets.

Regulatory and legal stability, market structure is of key importance for all RES investments. The regulatory and administrative requirements for solar PV and wind energy installations can limit the possibilities of expansion of distributed generation in European countries.

Despite significant progress in the field of RES regulations, and in a particular implementation of the RED Directive, and gradually overcoming many barriers, several barriers remain, and still the development of solar PV and wind energy are being slowed by market regulatory, administrative, economic, and social obstacles.

Task 2.4. : Integration approaches for enhancing the penetration of RES: grid codes, market rules and operative procedures and effective collaboration of the consumers´ frameworks.

The task is divided into two main sections: the first one introduces regulation on electricity markets and grids around Europe, while the second part focuses on the main target, which is the depiction of solutions to enhance the penetration of Renewable Energy Sources, such as the participation in local flexibility markets.

Evaluating the system operation and distribution grid codes and the market rules of some electricity systems in Europe (France, Austria, Germany, Italy, Poland, Greece, Great Britain and Spain, Sweden, Denmark, and Norway) and North America, best practices (e.g. in the Nordic electricity market) are identified about these issues and their future evolution.

Task 2.5.: DRES2Market economic assessment methodology to evaluate the proposed solution to enhance renewable energy penetration in the energy and ancillary services markets: evaluation, criteria, assessment procedures, and KPIs.

The aim of this document is to validate the performance of the most promising solutions and approaches proposed with a set of key performance indicators (KPIs) established according to economic, technical, social, and environmental criteria.

This deliverable collects the main existing Key Performance Indicators that are relevant for evaluation of the solutions and approaches identified for the large penetration of RES in electricity and ancillary services markets, related with:

- **Economic life cycle cost and value, grade of renewable integration, maturity, volatility in the electricity markets;**
- **Technical standards: energy security;**
- **Social aspects: advantage and disadvantage, energy security, energy democracy (poverty, justice, participation);**
- **Environmental impacts: positive and negative, including water, land-use, material resources, chemical leakage, and visual impact;**
- **Regulatory development to promote and integrate renewable energies and to ensure energy justice.**

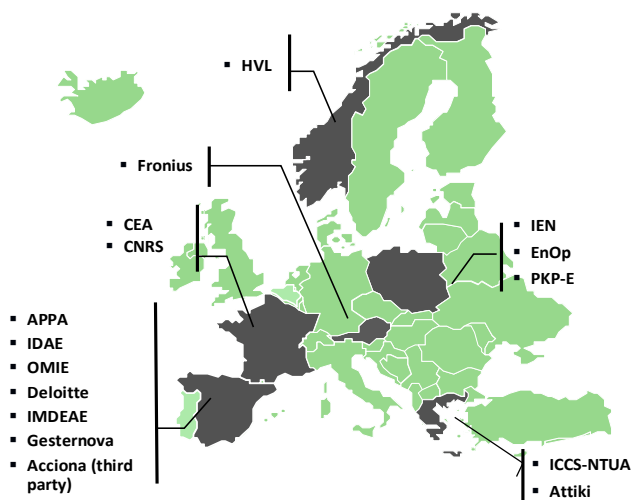
The selection of the Key Performance Indicators described is very wide. All those parameters have been analysed, to identify which are the most reliable indicators that should be taken into consideration, however not all of them will be tested in all the case studies and environments proposed in Work Package 3. For each case study will be selected these ones that suit better the solution evaluated.

Dissemination & communication

The DRES2Market partners Deloitte and Appa Renovables presented the progress and the first conclusions obtained in the first year of the DRES2Market project. This presentation took place at the first roundtable on July 8th of the Second Self-Consumption Congress organized by Appa Renovables in Madrid. <https://www.congresoautoconsumo.es/>



Partners



Countries involved

Austria
Greece
France
Norway
Poland
Spain



For more information please contact us or check the project's website: www.dres2market.eu

The project started on 1st August 2020 and will last until 31st of January 2023.

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