



## Synergistic Approach of Multi-Energy Models for an European Optimal Energy System Management Tool

### Deliverable D2.1

## Definition and requirements of three case studies

### Summary

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## List of acronyms used in this document

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CCS	Carbon capture and storage
COP21	21th United Nation's climate change conference, Paris 30.11 – 12.12.2015
COP	Coefficient of performance (e.g. of heat pumps)
CTS	Commercial, Trade Service (sector)
CS	Case Study
CWE	Central Western Europe
EEX	European Energy Exchange
eH2050	e-Highway2050 European project (data source)
ENTSO-E	Coordination and cooperation of the TSOs (Electric Transmission Grid)
ENTSO-G	Coordination and cooperation of the national gas transmission system operators (TSOs) across Europe (Gas Transport Network)
ETS	The EU emissions trading system
EU	European Union
MIM	Multimodal Investment Model (used in plan4res case study 1)
RES	Renewable Energy Source
TYNDP	Ten-Year Network Development Plan
WP	Work Package



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## Glossary of terms used in this document

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- 'useful energy' and 'final energy'

The term 'useful energy' describes the energy type originally required to provide the technology-neutral benefit of a concrete task to be done, e.g. the amount of thermal energy for heating a room, mechanical energy for moving a car, or electricity for powering a lightning bulb etc. 'Useful energy' must be seen in contrast to the term 'final energy' which usually describes the amount of primary and/or secondary energy consumed for powering the unit or conversion process which provides the useful energy. Losses during energy conversion (or transport) will be considered in terms of efficiency causing differences between 'final energy' input, amount and type of energy needed for powering the conversion process, and the output of 'useful energy', amount and type of energy that is really required by the task to be performed.



## Executive Summary

### Key Words: Case Studies

In this deliverable the definition and requirement of three case studies to be performed within the plan4res project are given.



**Case study 1:**  
**Multi-modal European energy concept for achieving COP 21 goals with perfect foresight, considering sector coupling of electricity, heat and transport demand**



**Case study 2:**  
**Strategic development of pan-European network w/o perfect foresight and considering long-term uncertainties**



**Case study 3:**  
**Cost of RES integration and impact of climate change for the European Electricity System in a future world with high shares of renewable energy sources**

- **Objective of plan4res**

The general objective of plan4res is to fill the gaps between the increasing complexity of the future energy system planning and operational problems and the currently available system analysis tools. Enhanced end-to-end planning and operational tools dealing with technological and market uncertainty, emerging technologies and increased sector coupling of multi-energy vectors such as heat, cold and transport will be assembled in a synergistic approach to support European system planners, operators, decision makers, regulators.

- **Objective of the case studies**

The modular nature of the tools allows them to be tailored to the specific needs of different entities and can adapt to the wished (or data imposed) granularity. This should be highlighted



by a set of exemplary case studies. Each of these case studies focuses on a different viewpoint on the energy system and the methods and tools necessary to solve their use cases, questions and challenges.

Three case studies (CS) with European scope will be performed to show the adequacy and relevance of the developed tools and modelling framework and its interoperability.

This comprises case study specific scenarios, highlighting their individual viewpoints on the energy system. This includes case study specific model-exogenous data, geographical scope, technology assumptions and tool functionality. Additionally, matching topics and assumptions will be assembled in a common story line, including a set of corresponding joint data.

A 'joint' scenario following this common story line will be analysed with the model approaches described in each case study. This should enable check of interoperability of the tools (results of one case study as input to another one) and enable comparison of the model approach.

- **Objective of this document**

In this document we will describe:

- The main common assumptions for the 3 case studies
- Specific assumptions for each case study
- Data used and data sources for each CS
- Questions that each CS aims at answering to
- Methodology for answering the questions, including a description of the tools and models that will be used, and a description of the various simulations that will be conducted
- Expected results from 3 case studies



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