

The SmartNet Project

Carlos Madina – WP 5: Realisation of physical pilots



Agenda

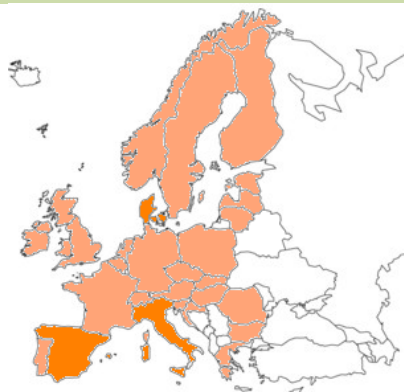


- Aim and goals of WP5
- WP5 location in SmartNet
- Activities description
- Key products



Coordination with laboratory simulations to bridge the gap between present real-world implementation and the opportunities envisaged for the future.

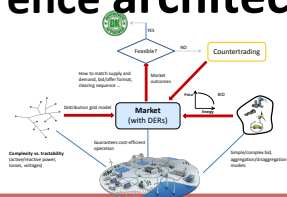
Coordination and realisation of three pilots to evaluate the performance of different TSO-DSO interactions under different market structures.



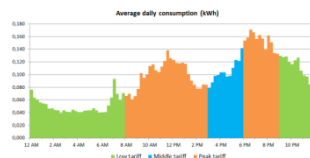
Identify & remove barriers to facilitate the way to the pan-European market for ancillary services.

Aim and goals of WP5

Reference architectures



Market and aggregator models



ICT specifications



**Results of
laboratory
simulations**



**Pilot
realisation**



**Validation of TSO-
DSO interactions in
real operations**



**Contribution to
widespread adoption
of SmartNet**

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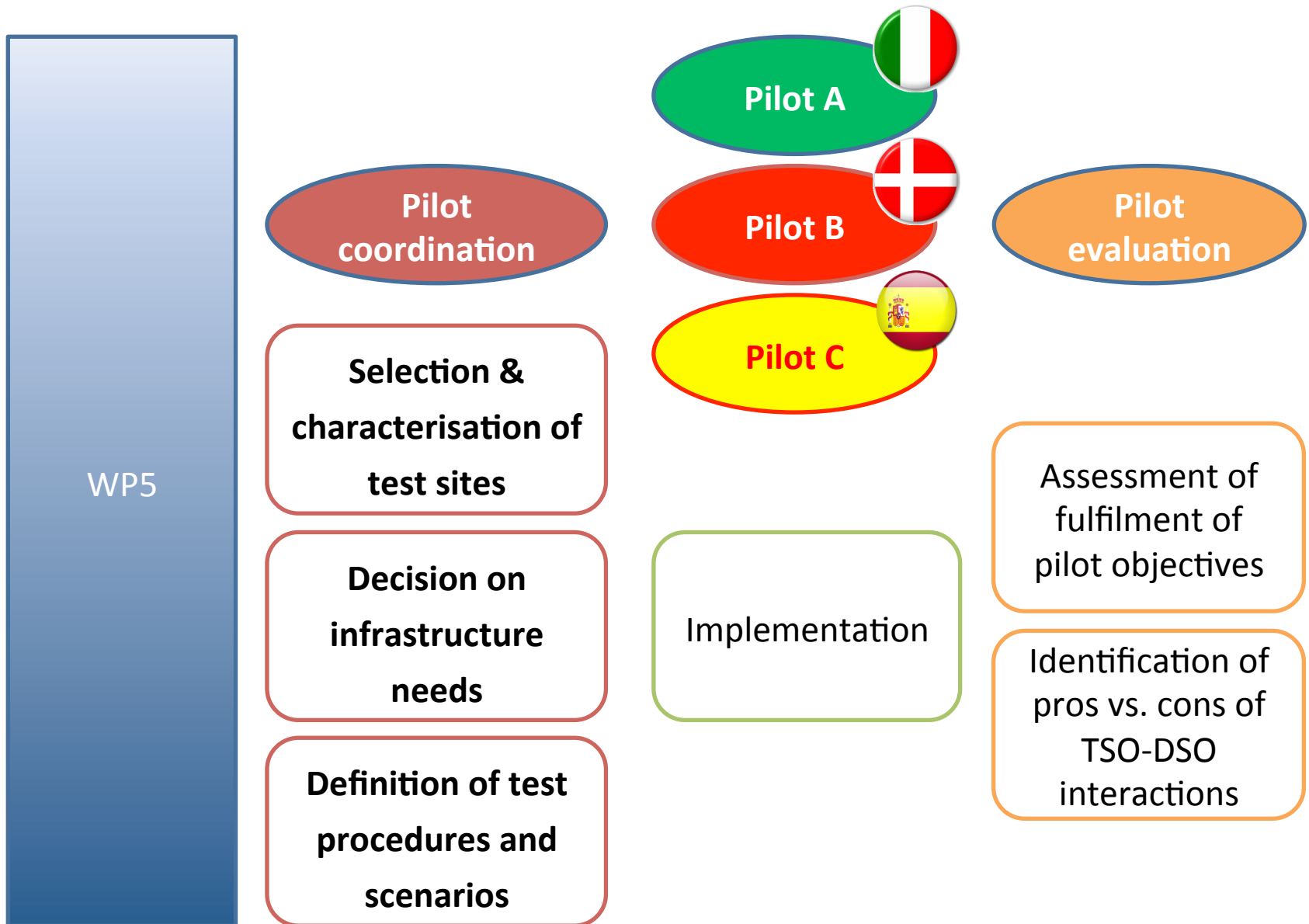
WP5 location in SmartNet

	Year 1				Year 2				Year 3			
	1	4	7	10	1	4	7	10	1	4	7	10
WP5												
<i>T5.1</i>												
<i>T5.2</i>												
<i>T5.3</i>												
<i>T5.4</i>												
<i>T5.5</i>												

Pilot coordination

Pilot implementation

Pilot
evaluation



Task 5.1: Coordination of pilots

- **Task leader:** TECNALIA
- **Overall aim:** Assurance of the complementarity of the different demos and avoidance of overlapping between them.
- **Goals:**
 - Definition of the **specific sites** where the demos will be deployed.
 - Definition of the **infrastructures** that need to be installed in the pilots.
 - Definition of the **test scenarios** to be carried out.

Participant	p.m.
TECNALIA	5
TERNA	1
DTU	1
ENDESA	1
DC	1
<i>Total</i>	<i>9</i>

Task 5.2: Realisation of Pilot A

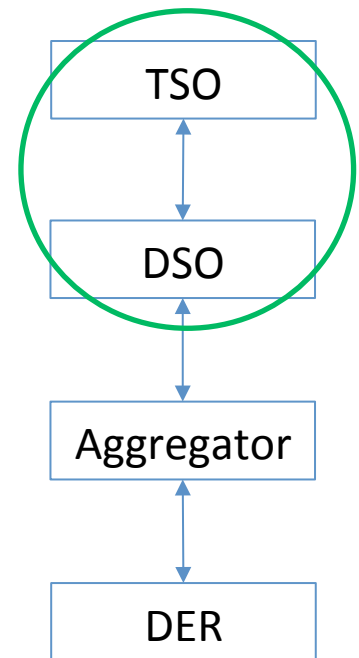


- **Task leader:** TERNA
- **Overall aim:** Demonstration of the opportunities, needs and feasibility of the interaction between TSO, DSO and consumers.
- **Goals:**
 - Development of an **aggregation** system and implementation in field of a device in order to **exchange all the data** with the TSO.
 - Development of an architecture and implementation in field of a system for the **voltage regulation**.
 - Development of an architecture and implementation in field of a system for the **power-frequency regulation**.

Participant	p.m.
TERNA	7
RSE	5
SELNET	10
SELTA	24
SIEMENS	36
<i>Total</i>	<i>82</i>

Pilot A: Italy

- Focus on TSO-DSO data exchange:
 - Aggregation of information.
 - Type of data to be exchanged.
- Data about forecasts and real-time for :
 - Load connected at DSO level.
 - Generation, differentiated by source.
 - Total DG available at the interconnection point.
- Grid services to be tested:
 - Voltage regulation.
 - Power/frequency regulation.
 - Balancing.
 - Contribution to system defence plans.



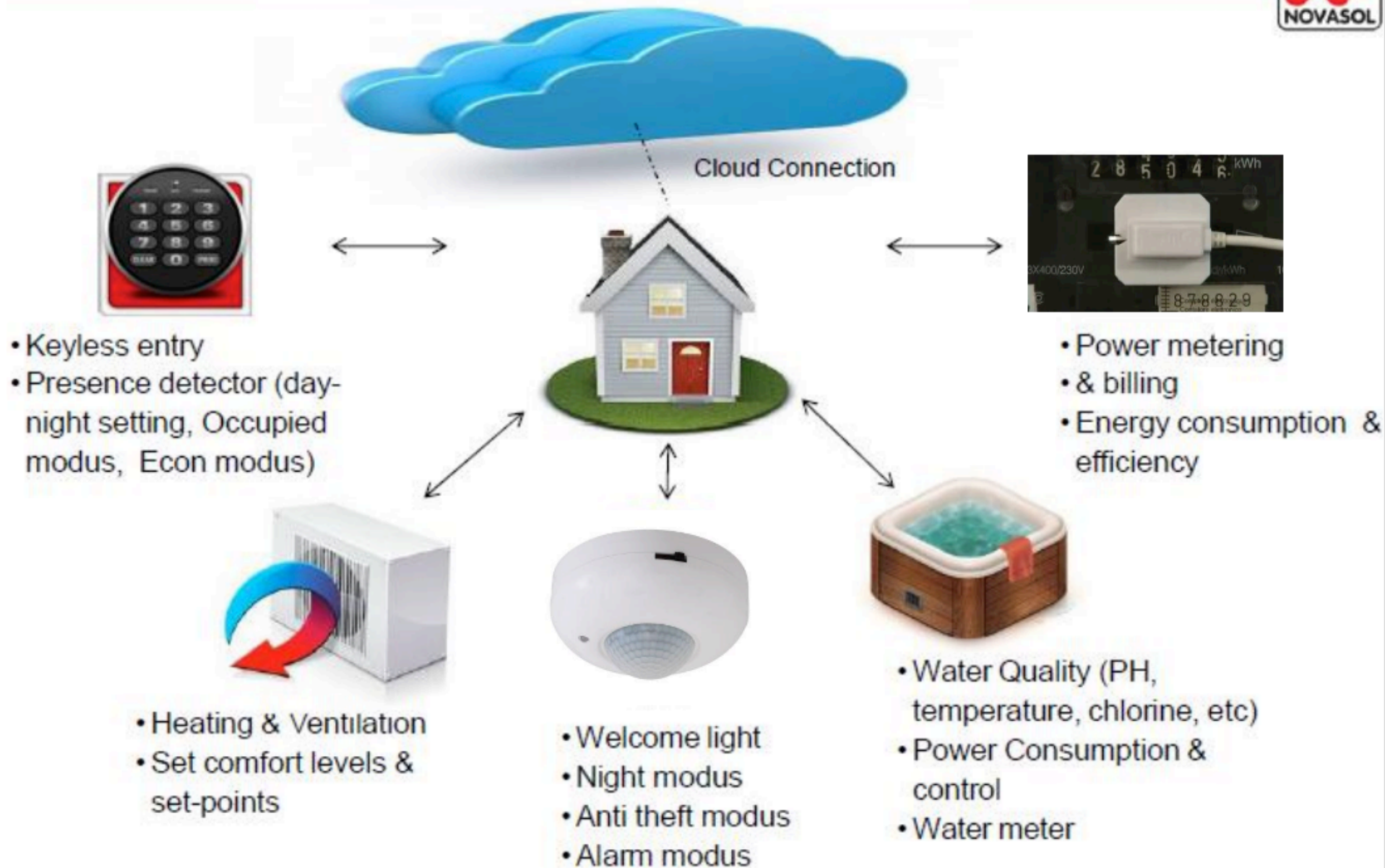
Partners involved: **Terna**, RSE , Selnet, Selta , Siemens

Task 5.3: Realisation of Pilot B



- **Task leader:** DTU
- **Overall aim:** Assessment of the potential for provision of ancillary services from an aggregation of summer houses with swimming pools.
- **Goals:**
 - **Aggregation** of a sample of 16 summer houses.
 - Implementation in field of ICT technology to exchange data between TSO, DSO, aggregator and smart houses.
 - Development of an architecture and implementation in field of a system for the **voltage regulation**.
 - Development of an architecture and implementation in field of a system for the provision of **balancing power**.
 - Development of an architecture and implementation in field of a system for the provision of **congestion management**.

Participant	p.m.
DTU	18
DC	14
ENERGINET	1
EURISCO	8
NYFORS	6
NOVASOL	8.8
<i>Total</i>	<i>55.8</i>



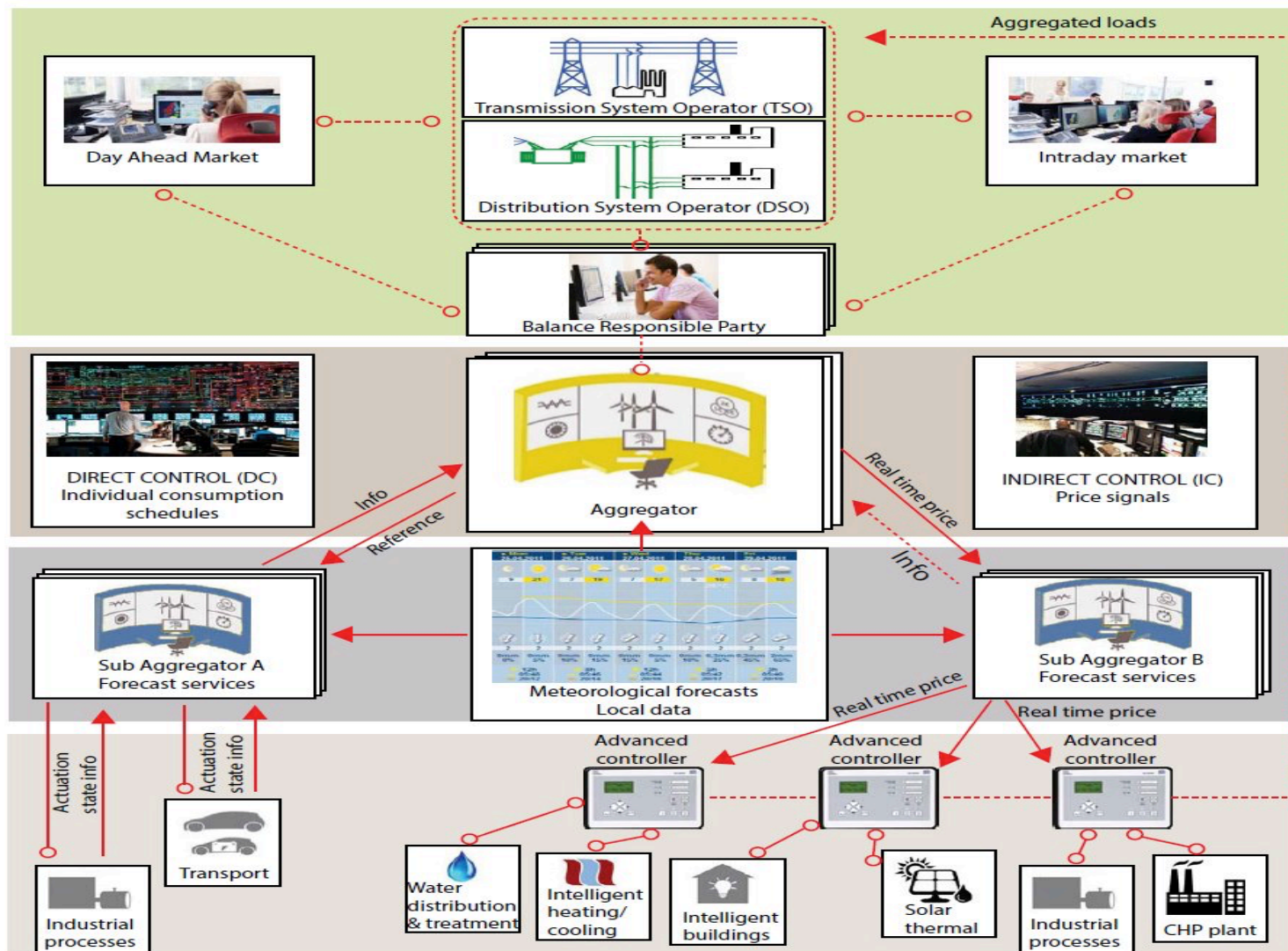


- Aims at assessing the potential for provision of ancillary service
- Considers an aggregation of 10 Danish summer houses with swimming pools
- The heating of the swimming pools gives the flexibility
- Links to other interests from Nyfors and Novasol on providing extra smart services to house owners
- The economy related to the energy consumption of pools is today rather problematic for the house owners



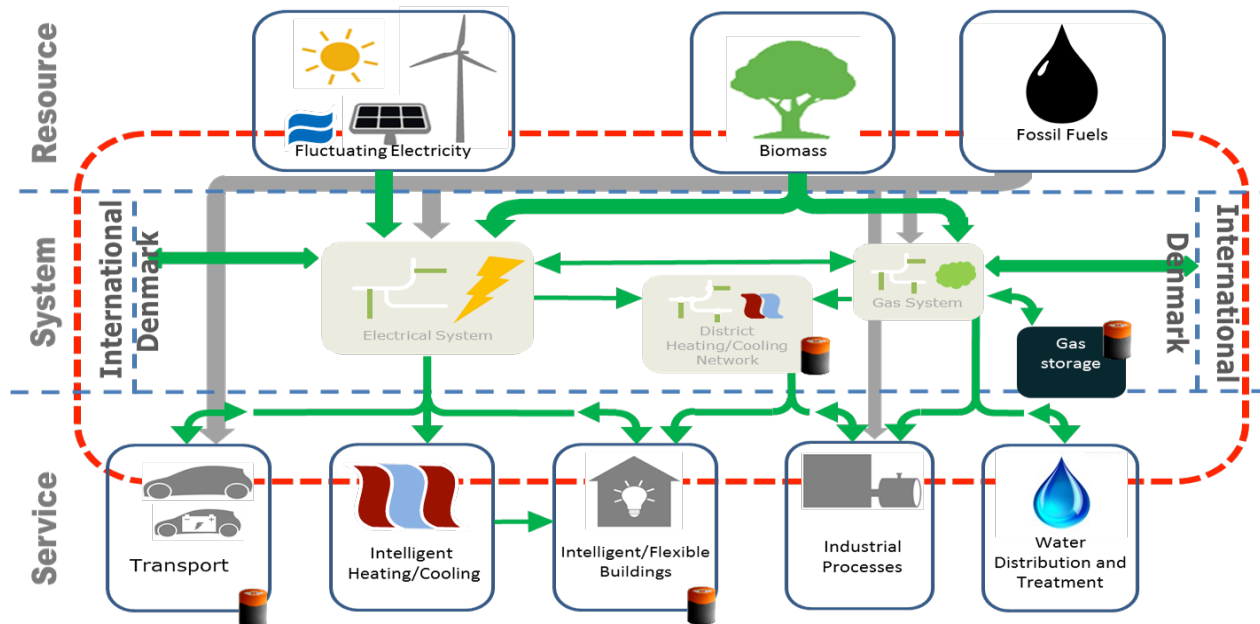
Infrastructure required

- Remote data acquisition and control system in the houses
- Integration with a weather and load forecast system on local scale
- Infrastructure for exchange of data between DSO/TSO and aggregator (DC) for the activation of ancillary services
- Links to other interests from Nyfors and Novasol on providing extra smart services to house owners





Energy Systems Integration using **data analytics and ICT solutions** leading to **models and methods** for the operation of **future integrated energy systems**.

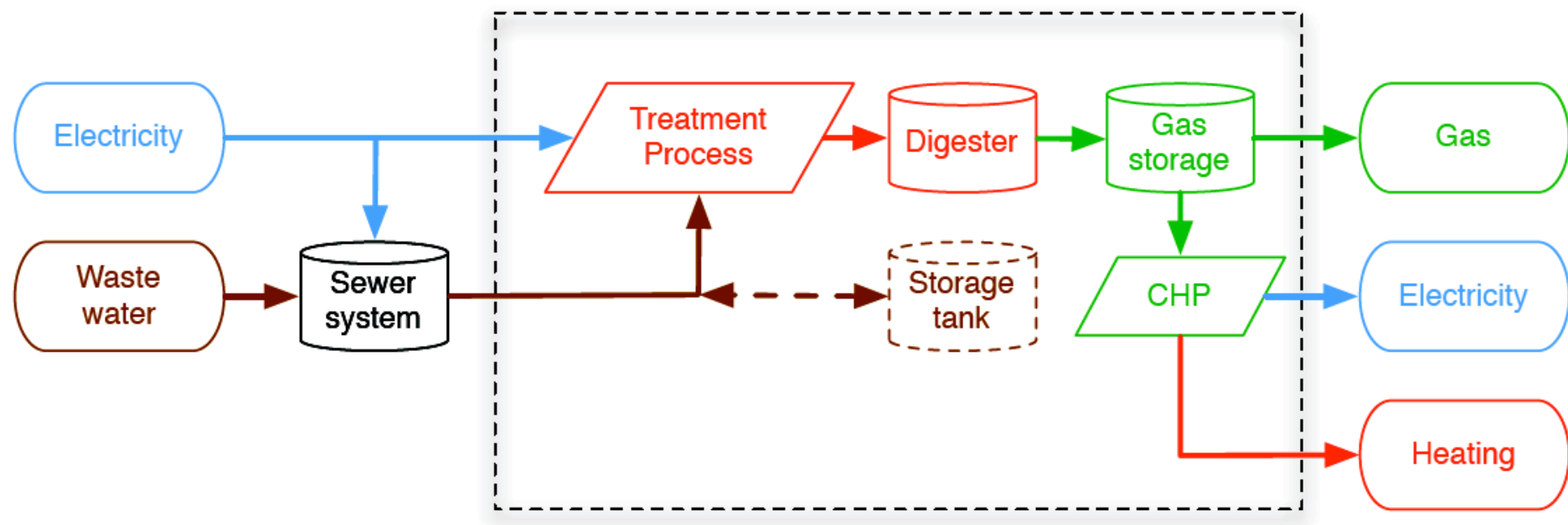




Resources

WWTP Energy Hub

Energy service





- Balancing: the large inertia of pools allows for shift of electricity consumption by several hours
- Voltage regulations: via active coordination of the flexibility below a critical node on the DSO grid
- Congestion management: active load management to help finding an optimal routing of the power



- Demonstrate aggregation services (of eg. 10 summer houses)
- Implementation in field of ICT technology to exchange data between TSO, DSO, aggregator and smart homes
- Use of online web-based services for price, load, and wind power forecasting
- Development of architecture for all 3 services – see previous slide.

Task 5.4: Realisation of Pilot C



- **Task leader:** ENDESA
- **Overall aim:** Assessment of the potential for the DSO to provide ancillary services to the TSO from an aggregation of radio base stations.
- **Goals:**
 - **Aggregation** of a 10-20 radio base stations to build up about 50 kW of flexible demand.
 - Virtual provision of **frequency control services** by the DSO to the TSO.
 - Implementation of the mechanisms for DSO-TSO coordination related to the **technical validation** of flexibility services at the distribution level.
 - Development of flexibility **simulation tools** for complementing the 50 kW available in the pilot to reach the minimum 5 kW required by the TSO.

Participant	p.m.
ENDESA	28
DC	14
TECNALIA	20
VODAFONE	15
<i>Total</i>	<i>77</i>



REGULATED MARKET

NON REGULATED MARKET



TSO
REE

Endesa will obtain flexibility from different demand aggregators and trade it in the **ancillary services** market operated by the TSO.

Portfolio Optimization

ENDESA
DSO
IMS

ENDESA
DSO
Aggregator

VPP: 5 MW

ENDESA
MARKET PLACE
For this Pilot

Aggregators

4,85 MW

50 KW

Demand Response
aggregation &
optimisation
module

Services Application Layer



Software suite that
manages real time
communication to
the various sites and
send data to the DR
module

100 KW

ENDESA
EMS

VODAFONE
IMS

Point Of Delivery
Connection

METERING

D-FACTS

5-10 UNITS / 100 KW

V2G/
B2G

Vodafone
Cloud

10-20 UNITS / 50 KW



Buckets can be based around load shedding capacity or graphical regions dependant upon the need

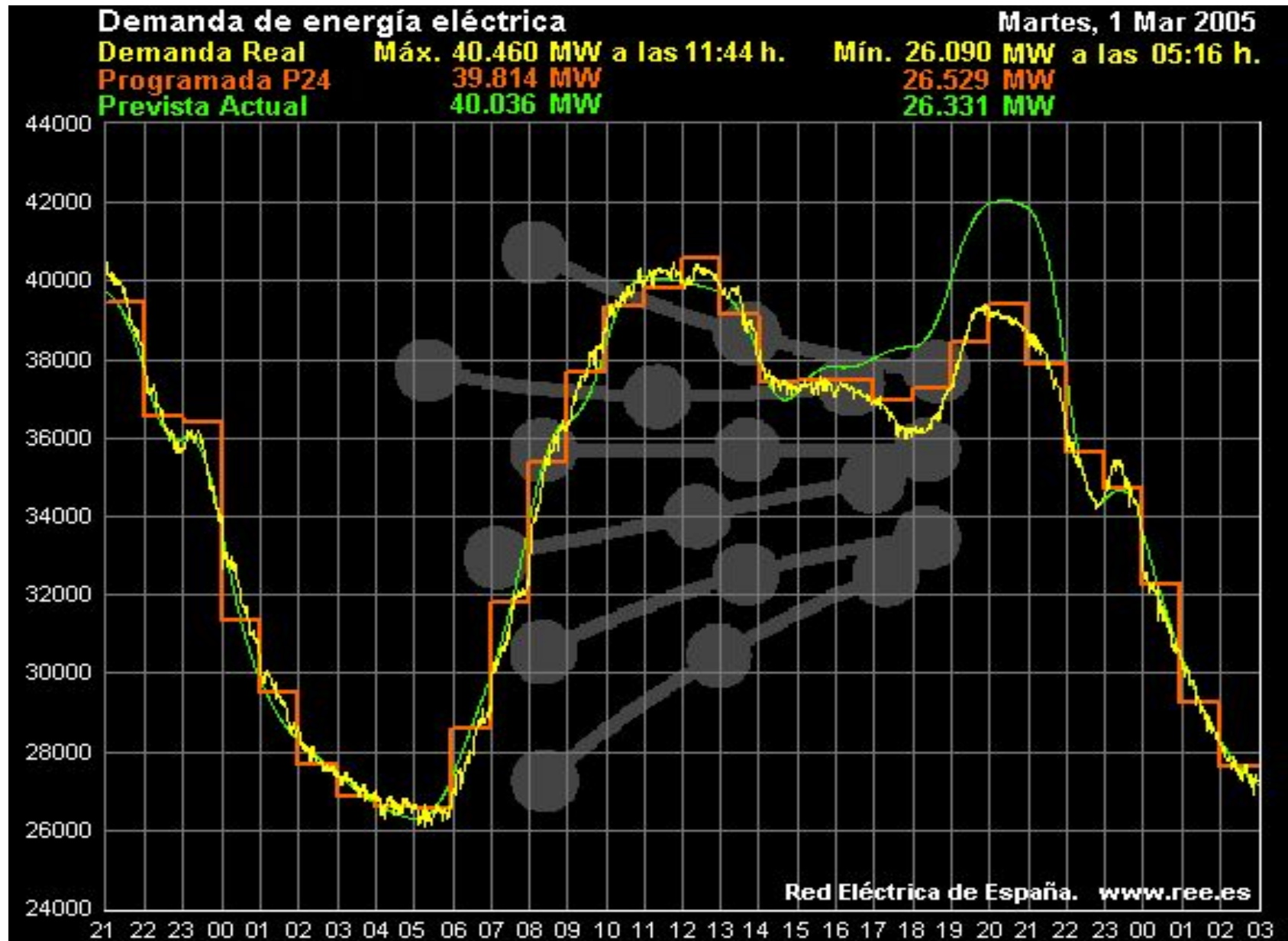


Interruptible load service

- Regulated contract which establishes the conditions for:
 - Service provision: Pre-warning time, duration of the event, number of events per year (max. and min.).
 - Remuneration.
- Provided by consumers:
 - Connected directly to transmission grid.
 - Which can reduce their consumption by (at least) 5 MW at any moment.
- Conditions for the provision changed recently.



Interruptible load service



Task 5.5: Evaluation of results

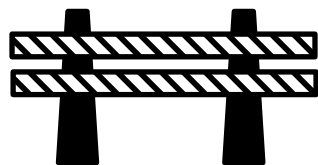
- **Task leader:** TECNALIA
- **Overall aim:** Compilation of results of the pilots to derive recommendations for different stakeholders.
- **Goals:**
 - Assessment of **fulfilment of pilot objectives**.
 - Comparison of TSO-DSO interaction **behaviour in real-life** vs. expected trends from simulations.
 - Identification of **strengths and areas of improvement** of interactions.
 - Provide **input for recommendations and future R&D activities**.

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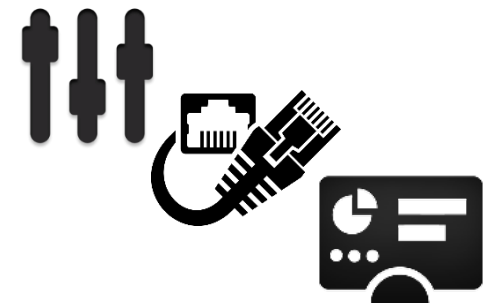
**Validated TSO-DSO interactions
(technical + operational)**

**Demonstrated interoperability and
scalability to the whole European system.**



**Identified barriers for real implementation
and regulatory proposals**

**Guidelines on best practices to implement
the considered TSO-DSO schemes**



Thank you for your attention...

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Smartgrids Area

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