

# Italian field test

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# active demand

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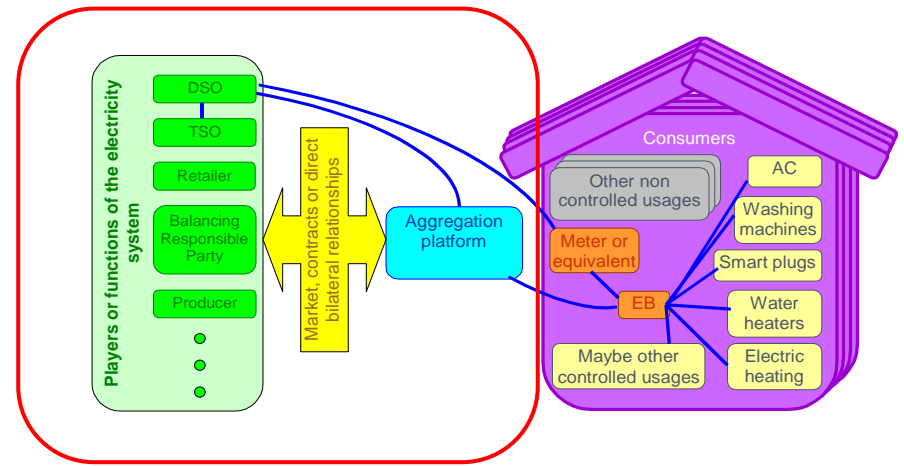


The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 207643

# Field Test Scope

To validate :

- the upstream part of the Address chain
- the algorithms and prototypes to enable and exploit AD business implemented in an operating Distribution Control Centre



To see effects of AD products visible at MV/HV level:

- Impossible to involve enough domestic customers (limited project budget)
- AD emulated by means of one storage system and MV producers and customers engaged for the purpose



# Field Test Site Description

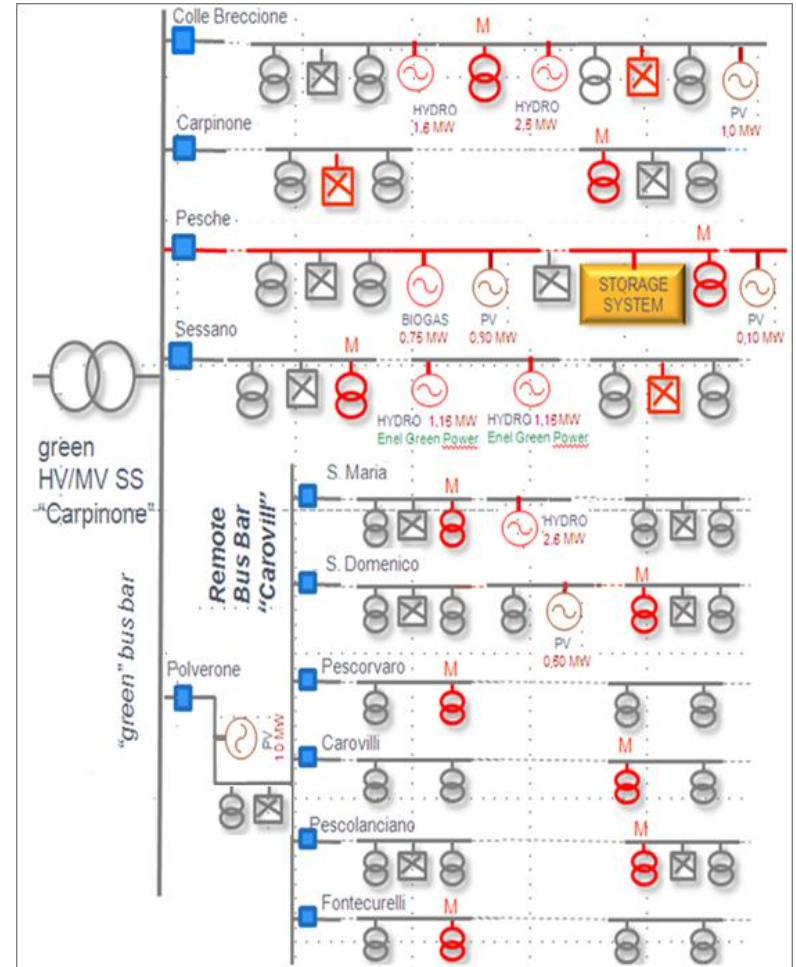


**Location: Carpinone**

Region: Molise  
 HV/MV substation: Carpinone

## ONE WHOLE MV network under test:

- **340 km** MV network (300 km overhead)
- **10** MV feeders
- **157** MV/LV substations
- **17** MV consumers (total power 13.2 MW)
- **11** MV DGs (13.3 MW: 5 hydro, 5 PV and 1 biogas)
- **1** Storage system (1000 kW - 500 kWh)
- **8110** LV consumers
- **63** LV DGs (total power 467 kW)



# Field Test features

- ✓ 17 P, Q Measurements along MV feeders:
- 10 MV/LV substations (LV load)
  - 4 MV Producers premises
  - 2 MV Consumers premises (MV load)
  - 1 Storage system



- ✓ Storage system (1 MW – 0.5 MWh) to emulate AD products visible on the MV level



# Field test goals



See effects of AD products visible at MV/HV level



Evaluate the behavior of DSO algorithms in an operating Distribution Control Centre



Estimate the load area and flexibility table algorithms reliability and variability under real network conditions



Assess the Validation process and reliability of the forecast tools



Verify if AD is exploitable for network problems solving

# Field Test Methodology

## Network Model



- ✓ Actual and complete MV - LV network models in CIM format

## AD products



- ✓ AD products emulated with different response levels (e.g. 80%, 100%, 120%) thanks to the storage system

## Forecasting Data & Measurements



- ✓ Load forecasting algorithm uses real load curves from SM
- ✓ Generation forecasting are based on real weather data
- ✓ Distribution State Estimation algorithm elaborates measures along MV feeders and in the HV/MV substation

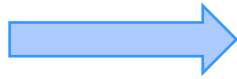


# Field Tests Execution Steps



Evaluate the test results

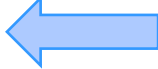
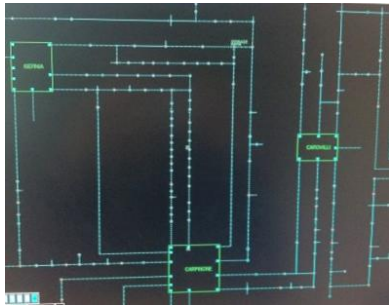
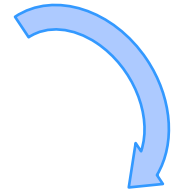
Prepare Input files



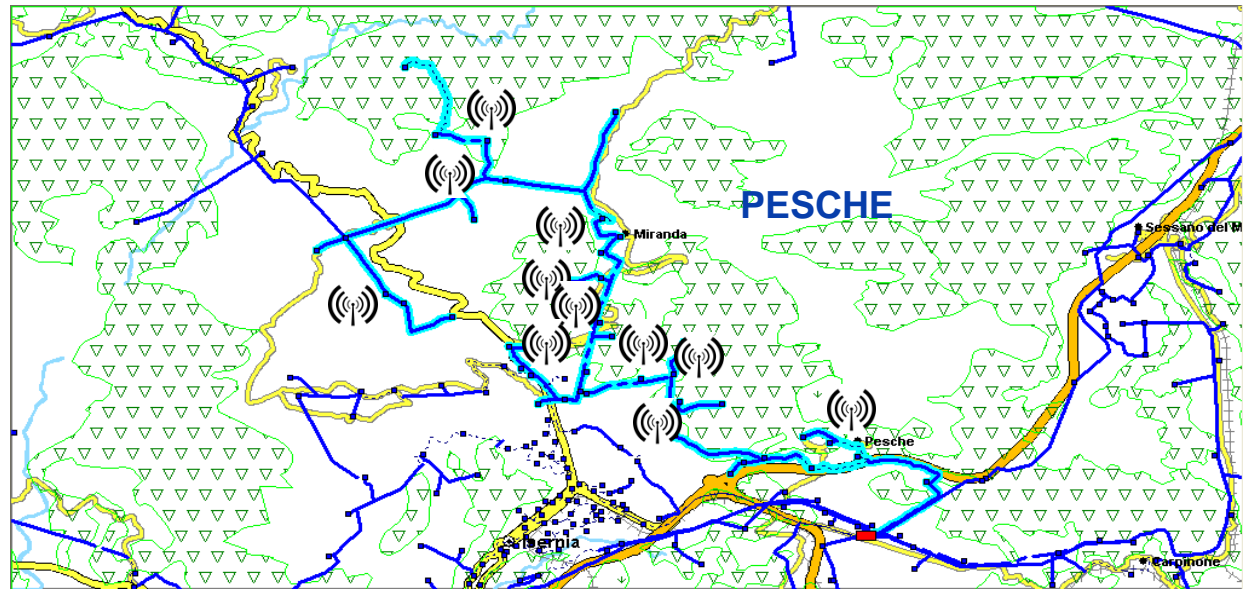
Run the MVCC algorithms



Emulate AD with storage system, MV producers or consumers



Check alerts on SCADA



Operate MV network





# Field Test Scenarios and Results

- ✓ **DSO as an AD product** to be able to request by the grid operator the problem. In this scenario, the DSO received the AD. 5 MW (0.5 MW) and the network operator had to reduce the AD to 0.5 MW (0.5 MW) to avoid the network overload. The loading of the network AD (0.5 MW) is a limitation, both the network operator and the DSO had to comply with the DSO for the problem was solved).

The screenshot shows the 'address' web application interface. The main heading is 'View/edit Supply Bid file'. Below this, there are fields for 'Select LOAD AREA:' (0001DM602031518LD05) and 'File type: Supply Bid request'. There are buttons for 'Modify', 'Save', and 'Download'. Below the form, there are two tables: 'SRP' and 'CRP'. The 'SRP' table has columns for 'Period' and 'Value (W)'. The 'CRP' table has columns for 'Period', 'Upper(W)', and 'Lower(W)'. A text box at the bottom of the screenshot reads: 'To upload and edit supply bids for Load Areas'.



The screenshot shows the 'address' web application interface for 'Off-line Validation'. The main heading is 'Off-line Validation'. Below this, there are fields for 'Select MACRO LOAD AREA:' (0001) and 'Select LOAD AREA:' (0001DM602031509LD01). Below the form, there is a table titled 'DSO Curtailment Matrix'. The table has columns for 'Date', 'SRP', and 'CRP'. The 'SRP' column has sub-columns for 'Total allowed power (W)' and 'Curtailment Factor (pu)'. The 'CRP' column has sub-columns for 'Total allowed power (W)', 'Curtailment Factor (pu)', and 'DOWN' (with sub-columns for 'Total allowed power (W)' and 'Curtailment Factor (pu)'). A text box at the bottom of the screenshot reads: 'Check the validation results'.

Date	SRP		CRP		DOWN	
	Total allowed power (W)	Curtailment Factor (pu)	Total allowed power (W)	Curtailment Factor (pu)	Total allowed power (W)	Curtailment Factor (pu)
28.09.2010 10:00	20000	0.243				
28.09.2010 11:00	20000	0.334				
28.09.2010 12:00	20000	0.275				
28.09.2010 13:00	20000	0.391				
28.09.2010 14:00	20000	0.339				
28.09.2010 15:00	20000	0.181				
28.09.2010 16:00	20000	0.239				
28.09.2010 17:00	20000	0.241				
28.09.2010 18:00	20000	0.182				
28.09.2010 19:00	20000	0.281				



# Conclusions

The Italian field test:

- ✓ **validated the DSO algorithms** developed by ADDRESS to enable AD and
- ✓ showed that **AD can be used to solve DSO and TSO network problems**

# Thank you

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