NICE GRID, the French Smart Grid pilot project of GRID4EU

IEEE SmartGridComm 2014, Venice

Kevin MERCIER, ERDF
ERDF, a major electricity DSO in Europe

ERDF is in charge of 95% of electricity distribution in France

Key Figures

- 35 million customers
- 436,000 new connected customers / year
- 11 million field operations / year
- 396 TWh delivered with less than 6% losses and 29.5 TWh of local generation
- 10 GW of renewable energy production connected (+ 1.6 GW in 2012)
- SAIDI 97 mn (-20% vs 2010)
Global agenda

• GRID4EU presentation
• NICE GRID pilot project
• Focus on communication in NICE GRID
• To stay connected with GRID4EU and NICE GRID
Global agenda

- GRID4EU presentation
- NICE GRID pilot project
- Focus on communication in NICE GRID
- To stay connected with GRID4EU and NICE GRID
An EU FP7 Smart Grids project

- Project lead by **6 Electricity Distribution System Operators** - covering altogether more than 50% of metered electricity customers in Europe
- Overall **27 partners** from various horizons (utilities, manufacturers, universities and research institutes)
- Duration: **51 months** from November 2011 to January 2016
- Total eligible costs: **€ 54M** - requested EC Grant € 25.5M

www.grid4eu.eu
6 Demonstrators – 27 Partners

www.grid4eu.eu
Use cases collection synthesis

1. Secondary Substation Node (SSN) or LV & MV Control Infrastructure
2. Automatic Failure Detection
3. Automatic Grid Recovery
4. Customer Engagement

1. Outage Detection in the LV Network
2. (dec.) grid operation in MV networks

1. Failure Management in MV networks

1. LV Grid Automation of Failure Management
2. MV Grid Automation of Failure Management
3. Management of Islanding operation

1. Islanding
2. Reduction of power demand
3. Manage maximised PV production on LV network regarding constraints and flexibility programs
4. Encourage residents to adopt smarter habits according to network state

1. Voltage Control on MV Grids
2. Anti-islanding Protection on MV Grids
3. MV Measurement Acquisition
4. Demand Response for MV Customers
Global agenda

• GRID4EU presentation

• **NICE GRID pilot project**

• Focus on communication in NICE GRID

• To stay connected with GRID4EU and NICE GRID
Nice Grid Objectives

- **4 objectives**
  - Optimise solar generation on a distribution grid
  - Reduce peak load thanks to demand response
  - Manage microgrid islanding
  - Study behaviour of Prosumers

- **2 key characteristics**
  - The project relies on ERDF **Linky** smart meter
  - Li ion Storage devices at 3 levels within the Grid
Carros area description

- Carros is located in the South of France, and is an electrical peninsula
- 15 000 inhabitants, including both residential and industrial areas
- Already 1,8 MWp of PV production
- A single 400 kV line
- 88 MT/BT transformers
- 25 MW peak load
Nice Grid Consortium

- Tier 1 Partners
  - ERDF
  - EDF
  - ALSTOM
  - SAFT

- Tier 2 Partners
  - RTE
  - DAIKIN
  - NetSeenergy
  - Socomec

- R&D and University
  - ARMINES
  - EDF R&D

- Financing and subsidies entities
  - Région PACA
  - Conseil Général des Alpes-Maritimes
  - NICE Côte d'Azur
  - Carros
  - ADEME
  - GRID4EU
  - Investissements d'Avenir
  - SEVENTH FRAMEWORK PROGRAMME
  - CO - FUNDED BY THE EUROPEAN UNION
Nice Grid Use Cases On a Map

PV Area
550 Linky clients
200 kWp installed

Islanding area
12 Industrial clients
420 kWp installed

Customer Behavior
2500 Linky clients

Storage location
Flexible Load Management

- Traditional Production / Consumption curves
- Production / Consumption curves with flexible load management
**Nice Grid Architecture**

**Flexibility Demand**
- Transmission System Operator Demand Response Request
- Consumption Forecasts D-1
- Production Forecasts

**Optimization and Management**
- Network Energy Manager (NEM)

**Bids**
- B2B Aggregator
- B2C Aggregator
- Network Aggregator

**Network Transmission System Operator Demand Response Request**
**ALSTOM**
**ERDF**
**Electricité Réseau Distribution France**
**Nice Grid**
**A Smart Solar District**
1. Production forecast
2. Load forecast
3. Power needs calculations & publication
   a. Power flow calculation
   b. DSO power needs entries
   c. TSO power needs entries
   d. Power needs publication
4. Aggregator bids submission
5. Optimal selection of flexibilities & bids award publication
   a. Clearing process
   b. Result checking: network analysis
6. Implementation of power adjustments
First results – Summer 2013

Average power consumption and solar generation in Summer (in W)

- +2.5 kWh consumption per client between noon and 4 PM
- +0.1 kWh consumption in total per client (load shifting)

Source: ERDF, EDF R&D
First results – Winter 2013

Average power consumption in winter (in W)

- 25% consumption per client between 6 PM and 8 PM (peak load hours)

Source: ERDF, EDF R&D
Nice Grid Li ion storage installation

1MW - Primary Substation

33 kW - LV grid

4 kW - Residential
Global agenda

- GRID4EU presentation
- NICE GRID pilot project
- **Focus on communication in NICE GRID**
- To stay connected with GRID4EU and NICE GRID
Linky Smart metering infrastructure
IT architecture
Communication with field equipments
Control, Operation and HMI

- Nice Grid Master Control Unit
  - Power status
  - Charge
  - Standby
  - Discharge
  - Events
- Battery status
- Current alarms level
- PCS status
- Battery instructions
TSO UI for power requests and offer selection

TSO requests entered by the operator
DSO UI – Geographical view of network
DSO UI – Power flow calculation

Backfeed on 2ndry substation
Broadband PLC Supervision
Broadband PLC – IP Webcam in secondary substation
Global agenda

- GRID4EU presentation
- NICE GRID pilot project
- Focus on communication in NICE GRID

- To stay connected with GRID4EU and NICE GRID
GRID4EU public communication

www.grid4eu.eu

Subscribe to the GRID4EU newsletter:

Follow us on social media:

on Twitter: twitter.com/Grid4EU

Join on LinkedIn: http://www.linkedin.com/groups/Grid4EU-4799216/about

All public deliverables are available on the GRID4EU Website:
http://www.grid4eu.eu/project-demonstrators/deliverables.aspx
Web site : www.nicegrid.fr
Contact : contact@nicegrid.fr
Twitter : twitter.com/Nice_Grid
Showroom : route de la ZA de la Grave, CARROS, FRANCE
Thank you for your attention