A Multi-Agent System for Collaborative Smart Solar powered Micro-grids

R. Aversa, B. Di Martino, and S. Venticinque
Second University of Naples – rocco.aversa@unina2.it

S. Jiang, S. Hallsteinsen
Stiftelsen SINTEF, Norway

G. Horn
University of Oslo
Smart-Energy Domain

- In Europe, 88.4 GW of PV-systems were connected to the grid in 2014 (ref. PV Status report 2014)

- This is stimulated tremendously by countries like Germany and Italy
Lack of alignment between Consumption and Production

Low Self-Consumption
Excess PV power could have been used to power neighbours.
CoSSMiC – www.cossmic.eu
Collaborating Solar Powered Smart Micro-Grids

- Project ID: 608806
- Duration: October 1st 2013 - September 30th 2016
- Total cost: 4.267.061 €
- Funded by European commission - Directorate General Connect
call FP7—Smart Cities –2013
- Funding scheme: Collaborative Project STREP
CoSSmic Objective

Exploit the variation in energy consumption patterns between building in a neighbourhood by coordinating load shifting and the use of storage capacities according to:

- user preference and constraints
- prediction of PV production
- consuming profile of user's appliances
Expected Results

- Increment the self-consumption of the neighborhood
- Reduce peak demand to the central power grid
- Reduce need for peak capacity reducing infrastructure costs
- With less total storage capacity
Energy market
Distributed Approach

Consumption tasks

Consumers
PV panel production

Producers

Consumption time
Until 13:30 (has to leave for a meeting)
CoSSMic Multi-Agent System

**Consumer**
- Learn energy profiles of consuming appliances
- Send a proposal for buying energy
- Receive an actual schedule for its task
- Ranks the best vendors

**Producer**
- Predict PV production
- Receive energy demand
- Schedule energy tasks if there is available energy
Device Classification

- PV Panels (PRODUCERS)
  - Predictive approach
  - Weather Forecast
  - Plant features
- Single run devices (CONSUMERS)
  - Multiple operation modes
- Periodic run device (CONSUMERS)
  - Setting point
  - Environment
- Storage devices (PROSUMERS)
The CoSSmic Neighborhood architecture
CoSSMig project requires that the software prototype should be installed and maintained by the trial users in Caserta e Costanza in order to evaluate the CoSSMig concepts in practice and to investigate the possible benefits.

MAS² (Multi-Agent Simulated System) should overcome the limited representativeness of our neighbourhood real trials, finding out more about how the benefit of our approach depends on the configuration of the neighbourhood the accuracy of weather forecasts the price models of the public grid, and so on.
CONCLUSION

- CoSSMic project aims at improving decentralized energy management
- A MAS based distributed solution is being implemented.
- Consumer and Producer Agents contribute to find the best global schedule negotiating energy exchanges.
- Energy Market is built over a P2P and server-less overlay.
- Evaluation stage of the project using a simulation based approach
Thanks!
rocco.aversa@unina2.it

www.cossmic.eu
This project has received funding from the European Commission under the FP7 program

CoSSMic – Collaborating Smart Solar-Powered Microgrids

FP7 Collaborative Project no. 608806

Project duration: October 2013 - September 2016

Strategic objective: 7.1 b