

# InduStry-acadeMia pARtnership for the design and implementation

## of an efficient, Reliable and secure smart eNERGY network

SMART-NRG aims at bringing together experts, from industry and academia, from cross-sectorial research areas and complementary background, with the long-term goal of designing and developing a more efficient smart metering system for the future Smart Grid (SG). Special attention is devoted to the development of innovative Smart Energy Networks (SENs), with integrated communications, energy management, and security capabilities.

### Smart-NRG at a glance

**Project Manager**  
*Prof. Lazaros Merakos*

**Technical Manager**  
*Dr. Nikos Passas*

**Project website**  
<http://gain.di.uoa.gr/smart-nrg>

**Partners**  
 University of Athens (GR)  
 University of Barcelona (SP)  
 WEST Aquila S.r.l. (IT)  
 LINK Technologies S.A. (GR)

**Duration**  
 Jan. 2014 - Dec. 2017

**Contract number**  
 FP7-PEOPLE-2013-IAPP-612294

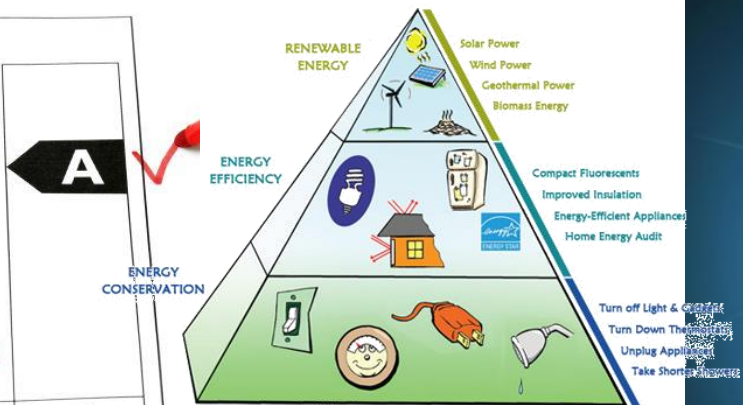
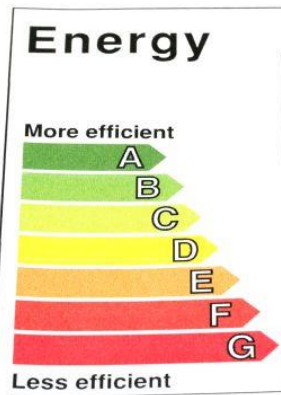
**Contacts**  
 Email: [iapp.smartnrg@gmail.com](mailto:iapp.smartnrg@gmail.com)  
 Twitter: [twitter.com/smart\\_nrg](https://twitter.com/smart_nrg)

### Motivation

Smart energy networks (SENs) are electric systems that use two-way networking technologies, cyber-secure communications technologies, and computational intelligence and control in an integrated fashion to efficiently manage energy consumption with the aim of providing a new electricity grid that is clean, safe, secure, reliable, resilient, efficient, and environmentally sustainable. SENs can be well regarded as a system of many systems, whose design challenges, requirements, and expectations can only be achieved through a holistic analysis, design, and optimization of all its components.

In SMART-NRG, we will go beyond state-of-the-art approaches for SENs by introducing an innovative and integrated protocol stack, which will be made of three interlinked and optimized sub-systems: (i) reliable communications and networking; (ii) smart energy management; and (iii) security and protection, which are one-to-one connected to the three key functionalities of SENs. The sub-systems will be studied, optimized, and integrated in a very efficient protocol stack, which will be tested via system level simulations and hardware testbeds, and, eventually, will be integrated into commercial devices.

The Smart Energy Living® Pyramid



## Research Objectives

The key technical challenges of the SMART-NRG project can be summarized as follows:

- **The proposal of a new protocol stack and network architecture for SENs** integrating communications, energy management, and security protocols, along with their analysis, design, and optimization for smart metering applications.
- The analysis, the design, and the optimization of an **efficient and reliable two-way smart meter communication infrastructure** by embracing a **stochastic network modelling framework**.
- The analysis, the design, and the optimization of **advanced smart energy management algorithms** for **better energy utilization**.
- The analysis, the design, and the optimization of **advanced security and privacy mechanisms** for **large-scale networks** with **reduced management and control overhead**.

## The SMART-NRG approach

The project is organized into 7 Work Packages (WPs). WP1 and WP7 are concerned with management and dissemination respectively. WP2-WP6 are 5 technical WPs as described below.

**WP1: Project Management.** Management and monitoring of the overall performance of the project.

**WP2: Definition of Smart Energy Scenarios/Requirements and System Architecture.** Definition of all relative scenarios, requirements and the overall system architecture.

**WP3: Design and Evaluation of Smart Energy Algorithms.** Design, analysis, and evaluation of new smart energy algorithms.

**WP4: Reliable and Secure Communication Protocols.** Design of reliable and secure communication protocols for SENs.

**WP5: Building Block Development and Validation.** Implementation and validation of algorithms and protocols in the testbed.

**WP6: System Integration with Proof-of-Concept in a Smart Metering Environment.** Final integration and proof-of-concept in a trial smart metering environment.

**WP7: Dissemination, Standardization, and Exploitation.** Provision of a framework for disseminating the achievements of the project as well as exploiting its key results.

