

## TRANSNATIONAL ACCESS USER PROJECT FACT SHEET

USER PROJECT	
<b>Acronym</b>	GaMDER
<b>Title</b>	Gamified Management of Distributed Energy Resources
<b>ERIGrid Reference</b>	01.003-2016
<b>TA Call No.</b>	1

HOST RESEARCH INFRASTRUCTURE			
<b>Name</b>	Ricerca sul Sistema Energetico - RSE SpA, Distributed Energy Resources Test Facility (RSE DER-TF)		
<b>Country</b>	Italy		
<b>Start date</b>	10/07/2017	<b>N° of Access days</b>	15
<b>End date</b>	28/07/2017	<b>N° of Stay days</b>	20

USER GROUP	
<b>Name (Leader)</b>	Aydogan Ozdemir
<b>Organization (Leader)</b>	Istanbul Technical University, Department of Electrical Engineering
<b>Country (Leader)</b>	Turkey
<b>Name</b>	Mustafa Bagriyanik
<b>Organization</b>	Istanbul Technical University, Department of Electrical Engineering
<b>Country</b>	Turkey
<b>Name</b>	Mustafa Alparslan Zehir
<b>Organization</b>	Istanbul Technical University, Department of Electrical Engineering
<b>Country</b>	Turkey
<b>Name</b>	Unal Kucuk
<b>Organization</b>	MAKEL Companies Group
<b>Country</b>	Turkey
<b>Name</b>	Filipe Joel Nunes Soares

**European Research Infrastructure supporting Smart Grid Systems Technology Development, Validation and Roll Out**

Organization	INESC – Instituto de Engenharia de Sistemas e Computadores do Porto
Country	Portugal
Name	Antonio Barbosa
Organization	INESC – Instituto de Engenharia de Sistemas e Computadores do Porto
Country	Portugal

**1. USER PROJECT SUMMARY (objectives, set-up, methodology, approach, motivation)**

GaMDER project aims to enable gamified management of local generation and storage devices. The main motivation for the project is low interest by DER owners to deploy grid and tariff responsive services and lack of simplification for advanced management functions. The project has three correlated focuses, namely, tariff-driven power and energy management by prosumers, wholesale market-driven aggregated management by aggregators, local grid issues mitigating management by distribution network operators (DNOs).



The project field tests are organized in three stages: characterization of distributed generation and storage devices (considering their power and energy management availabilities, constraints, response speed), validation of effective and remote power and energy management approaches, verification of online gamified management through a text-based interface. The system used in the tests is Distributed Energy Resources Test Facility of Ricerca sul Sistema Energetico (RSE DER-TF) with a different types of batteries, DGs, loads and an advanced monitoring and control infrastructure.

This project is intended to not only develop and verify a number of gamified management options, but also provide a comprehensive guide highlighting the useful methods for future studies.

**2. MAIN ACHIEVEMENTS (results, conclusions, lessons learned)**

Field-tests provided important insights about gamified management of DERs. DER flexibilities are summarized considering device power supply/demand capability, maximum storage capacity, response time and standby consumption. DER response delays range from milliseconds up to a couple of seconds for devices with low inertia, while devices with electromechanical parts (such as CHP and Redox battery) have longer delays (from 5 to 80 seconds). In order to store more energy, batteries can be charged/discharged at a lower rate. Supplementary and combinable modes can be provided to increase battery lifetime and/or reduce steady state error, while adding around 15 minutes to response time. Devices can follow a defined profile with more than 90% success. For devices with low inertia (batteries without electromechanical parts) management success is even higher than 98%. Devices considerably helped mitigating local undervoltage and overvoltage problems. Their impact is dependent on the distance to the bus facing the problem.

A general structure for gamified management interface is determined. This interface is aimed to provide main event content, a number of parameters that represent the actual state of the system, suggestions of actions that can be instantly deployed, shortcuts for actions always available, links to device/participator details and management statistics.

Main event content, system state representation and instantly deployable actions are tested on the field using a text-based interface on MATLAB for each of the correlated focuses (prosumer,

aggregator, DNO). Communication delay is only a few milliseconds providing fast deployment. After calibrated inputs (considering devices' auxiliary consumption) steady state error is below 1%.

### **3. PLANNED DISSEMINATION OF RESULTS** (journals, conferences, others)

The project will have a variety of dissemination tools. Formal dissemination activities will be scientific publications (1 conference paper and two journal papers) and the project website. Three semi-formal activities will be workshop, social media pages (LinkedIn and ResearchGate) and newsletters. A newsletter that explains dissemination activities will be published every 2 months. It will be distributed through a registered mailing list, whereas a copy of the newsletter will also be available on the website.