PARITY Newsletter #3

March 2021

PARITY

parity-h2020.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 864319

Call identifier: LC-SC3-2019-ES-SCC

P A R I T Y

Latest News

PARITY First period ends in March 2021 and is a significant milestone for the project progress.

During the first 18 months, project activities were related to user & system requirements definition, software prototypes design and development as well as preliminary integration activities coupled with relevant dissemination & exploitation efforts. In particular, PARITY has analyzed applicable business cases and use cases that revealed the potential of PARITY framework to provide benefits for all different actors involved (D3.1). Pilot site audits that were performed (D3.2) helped to identify already available equipment and further needs at each site. In addition, a Performance Measurement and Verification (PMV) methodology has been defined for the project (D3.3). With regard to the Local Flexibility Markets (LFMs), barriers that hinder LFM proliferation were identified and categorized (D4.1), latest LFM technologies were reviewed (D4.3), and an investigation of LFM market models was performed, resulting to the design and specification of PARITY LEM/LFM market platform. Moreover, several business models involving the aggregators, market operators, and Distribution System Operators (DSOs) have been defined (D4.4). The overall system architecture has been delivered along with the description of each component (D3.5), as well as the selected measures to ensure privacy and security (D3.4). Additionally, the specifications of the PARITY Oracle, the Blockchain Agent and off-chain components, have been defined (D5.1, D5.2, D5.3). First versions of smart contracts have been developed and feasibility of the approach has been validated in a simple scenario which integrates IoT and Blockchain (D5.4). Data models have been defined in JSON format to describe assets, users, Service Level Agreements, and other entities for the operation of the market platform. On grid level, the Smart Grid Monitoring and Active Network Management functionalities of the DSO toolkit (D6.3) and STATCOM device (D6.2) have been described in accordance with the traffic light concept applied, as well as their interfaces. Towards the optimization of flexibility management, a Power-to-Heat model, and algorithms for generating Distributed Energy Resource models and occupancy estimation/forecasting models have been developed (D7.2). In terms of communication and dissemination, a detailed plan has been defined and communication channels (e.g. social media etc.) have been

PARITY

parity-h2020.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 864319

Call identifier: LC-SC3-2019-ES-SCC

established and utilized (D9.2). Partners have participated in several conferences and workshops in order to disseminate the achievements of the project (D9.3), and also in activities of the BRIDGE initiative. Furthermore, the first version of the project exploitation and business innovation plan was realized (D10.3).

From all the above mentioned deliverables, the public ones can be downloaded through the PARITY Website.

Publications from UNICOSIA and CUERVA was presented in November 2020 at the European, Mediterranean, and Middle Eastern Conference on Information Systems) under the title: Blockchain in Smart Energy Grids: A Market Analysis

Modern society consumes a huge amount of energy, making the energy industry highly important across the globe. Customers are supplied with the electricity via the energy grid, as part of the utility value chain and pay on per-unit consumed basis. Thus, grid operations and energy prices have little effects on actual energy demand because grid imbalances frequently arise rapidly over very short periods of time, due to imprecise forecasts or unexpected events. Non-predictable renewable energy sources variable generation raises crucial challenges in grid management, making grid defection a rapidly increasing challenge to traditional energy markets. Blockchain technology has been studied to overcome these problems for application in the smart energy grid, and experts agree that it has the potential to change the electricity market. Blockchain and distributed ledger technologies can promote a transparent, secure and decentralized transactions network that will allow new innovative business solutions. Although, the integration of blockchain into the smart energy grid poses some challenges and prohibits the widespread use of blockchain technology in the energy sector.

In the presented paper a market analysis was conducted, to investigate the parameters that affect the large-scale adoption of blockchain in smart energy grids. The first part of the paper is setting up the scene, introducing the blockchain and smart grid fundamentals, as well as presenting blockchain's potential impact on different energy use cases. On the second part of the paper the market analysis is presented, providing blockchain technology's market opportunities within the energy grid. The paper ends with a description of threats and market challenges that the technology has

PARITY

parity-h2020.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 864319

Call identifier: LC-SC3-2019-ES-SCC

to address in order to get through the hype, prove its economic, social and technological potential and eventually be accepted in the mainstream.

The article can be accessed in the following link:
https://link.springer.com/chapter/10.1007/978-3-030-63396-7_8 - citeas

Publications co-authored by PARITY partners University of Deusto, University of Nicosia and e7 was presented in September 2020 at the 5th International Multidisciplinary Conference on Computer and Energy Science (SpliTech) under the title: Barriers to Widespread the Adoption of Electric Flexibility Markets: A Triangulation Approach

Abstract:
The electricity markets are changing across the world and one of the biggest changes is the widespread deployment of Distributed Energy Resources (DER). This paper analyses the barriers that hinder the proliferation of Local Flexibility Market (LFM) and Local Energy Market (LEM) platforms, where DER can participate through Internet of Things (IoT) and Blockchain technologies. After surveying the body of knowledge, interviewing experts and consulting end-users of pilot-buildings through questionnaires, the authors identified a comprehensive list of barriers that can be classified within the following main themes: (1) fit to current lifestyles, (2) administration, (3) standardization, (4) trust, (5) technical, and (6) costs, where each category has several sub-categories. Finally, the paper develops a categorization by their nature and finds a suitable distinction between socio-economical, technical and legal barriers. The taxonomy and the dataset with experts' categorisation is publicly available in Zenodo for other researchers and interested audiences. To the best of the authors' knowledge, there are no current research studies exploring in detail heterogeneous barriers posed from diverse backgrounds, and the degree each one of them affects the adoption of LFM.
The article can be accessed following the link:
https://ieeexplore.ieee.org/abstract/document/9243744/authors - authors

Publications co-authored by PARITY partner SUPSI was presented in October 2020 at the 9th DACH+ Conference on Energy Informatics under the title: Non intrusive load monitoring for demand side management

Abstract:
In the context of a pilot project, the Lugaggia Innovation Community (LIC), we address the problem of non-intrusive load monitoring for the purpose of demand side management on low voltage grids in presence of distributed power generation (photovoltaic). From the power readings of smart meters, we estimate the photovoltaic production and detect the activation of major loads (heatpumps and domestic water heaters). Experiments, conducted with real data and in silico, show that exploiting meter readings only, we can estimate PV production with MAPE ranging from 4.6% (best case) to 41.9% (worst case). Even with non negligible photovoltaic production estimation errors, the proposed method is capable of detecting the activation of heatpumps and domestic water heaters.

The article can be accessed following the link:
https://energyinformatics.springeropen.com/articles/10.1186/s42162-020-00128-2

Publications co-authored by PARITY partners University of Deusto, University of Nicosia and e7 was published in October 2020 at the Journal of Cleaner Production under the title Overcoming barriers for the adoption of Local Energy and Flexibility Markets: A user-centric and hybrid model

Abstract
To achieve the European climate targets and the Paris Agreements, at least 65% of the electricity needs to be generated from renewable energy sources by 2030. This requires a significant increase of distributed energy resources, posing a challenge for distribution system operators to integrate them into existing hierarchical grids. The concept of Local Flexibility Markets has recently gained attention as a market-based tool to tackle this challenge, making use of demand side flexibility. In this paper a Delphi method has been performed, showing that there are still numerous barriers in place preventing a widespread adoption of such markets in Europe. The main obstacles for market participants refer to standardisation issues. Based on that, a hybrid market model has been developed, comprising elements of a Local Flexibility Market and a Local Energy Market. To activate demand side flexibility from local energy transactions, spatio-temporally varying price signals are introduced, reflecting the constraints of the distribution grid. The paper shows, that this novel market approach helps to overcome relevant standardisation issues, but also certain barriers regarding end-users' lifestyles, which is because prices are comprehensible signals that can motivate end-users to participate. Moreover, a set of

numerical examples is provided to illustrate the monetary benefits that could be gained by consumers and prosumers in the proposed hybrid market model. The examples show that the major share of the cost savings result from local energy trading, but the hybrid market model is also able to accumulate additional smaller revenues from providing flexibility. Finally, the systematic approach of characterising the market model in this paper offers a valuable framework for other researchers to map their ideas among existing approaches of Local Energy and Flexibility Markets.

The article can be accessed following the link:
https://www.sciencedirect.com/science/article/pii/S095965262102535X


CERTH
circe
UNIVERSITY of NICOSIA
HYPERTECH energy labs
MERIT CONSULTING HOUSE
Cuerva
Energía Transparente
URBENER Energía
BFS
HEDNO
CheckWatt
e·on
AEM
Azienda Elettrica di Massagno SA
University of Applied Sciences and Arts of Southern Switzerland
SUPSI
HIVE POWER
ENERGY INNOVATION ENGINEERING
QUE TECHNOLOGIES
Deusto
University of Deusto
TurningTables