



## DELIVERABLE

<b>Acronym / Number</b>	WASTE2GRIDS / 826161
<b>Title</b>	Converting <u>WASTE</u> to offer flexible <u>GRID</u> balancing <u>Services</u> with highly-integrated, efficient solid-oxide plants
<b>Duration</b>	18 months
<b>Start date</b>	01.01.2019

<b>Deliverable Number</b>	D4.3
<b>Deliverable Name</b>	Communication, dissemination and exploitation plan and activities (update M10)
<b>Lead beneficiary</b>	DTU
<b>Authors (beneficiary)</b>	Mar Pérez-Fortes (EPFL), Ligang Wang (EPFL)
<b>Type (R/DEC/...)</b>	ORDP
<b>Disse. level (PU/CO/CI)</b>	PU
<b>Delivery date expected</b>	30.06.2019 (M6)
<b>Actual delivery date</b>	14.10.2019
<b>Comments</b>	

### Summary

The purpose of the deliverable is to summarize the past activities and to update the plans for communication, dissemination and exploitation.



## 1. Past activities for communication, dissemination and exploitation

The major activities are summarized as follows:

1. Olivier Bucheli attended the EU Sustainable Energy Week: Shaping Europe's Energy Future, which was held on 17-21 June 2019. Olivier introduced W2G projects to relevant participants.
2. CEWEP has been contacted to inform them of the W2G projects and W2G will send relevant results at an appropriate time to the association for results exploitation.
3. Publications:
  - Karen Pardos Olsen, Yi Zong, Shi You, Henrik Bindner, Matti Koivisto, Juan Gea-Bermúdez. Data-driven flexibility requirements for current and future scenarios with high penetration of renewables. *International Conference on Applied Energy* 2019, Aug 12-15, 2019, Västerås, Sweden. **This paper has been recommended for APPLIED ENERGY.**
  - Yumeng Zhang, Ligang Wang, Ningling Wang, Liqiang Duan, Yi Zong, Shi You, François Maréchal, Jan Van herle, Yongping Yang. Balancing wind-power fluctuation via onsite storage under uncertainty: power-to-hydrogen-to-power versus lithium battery, *Renewable & Sustainable Energy Reviews*, 2019, accepted.

## 2. Updates on the plan for communication, dissemination and exploitation

The following gives the updated plans for communication, dissemination and exploitation. **The new contents have been highlighted as bold texts.**

### 2.1. Measures to maximise impact

The overall objective of the project is to identify the most promising industrial pathways of waste gasification and solid-oxide cell integrated power balancing plants. The project aims are:

- To perform a preliminary investigation on the long-term techno-economic feasibility of waste-based power-balancing plants from both points of view, long-term available wastes and renewable-dominated (RES) power zones.
- To identify promising business cases.
- To study the feasibility of a large-scale waste-based centralized application.

To achieve these aims, an interdisciplinary team has been formed, with know-how and knowledge on each one of the relevant fields of the project: (i) reversible solid-oxide cell (SORC) (SOLIDpower), (ii) waste identification (ENEA), (iii) gasification and gas cleaning (ENEA), (iv) grid operation (DTU) and, (v) energy/process systems engineering (EPFL). The work performed in Waste2GridS is conceptual engineering work; already developed models and tools will be adapted and improved for the purposes of the project. More specifically, for (i) the identification long-term RES dominated power generation zones and of grid balancing needs (DTU), (ii) the identification of long-term available organic waste streams (ENEA), (iii) the plant modelling and optimal conceptual plant design with plant-wide heat and mass integration (EPFL and ENEA), (iv) the plant sizing and scheduling (EPFL), (v) the waste supply chain design and optimization (EPFL), and the (vi) SORC development path and upscale strategy (SP SA).

Dissemination, exploitation and communication tasks will be performed in WP4. A comprehensive Data Management Plan (DMP), to manage intellectual property (IP), data and results, will be finalized by month 6 of the project. Dissemination, exploitation and communication parallel actions towards different audiences will be described and performed along the overall length of the project.



Table 1 Overview of the dissemination, exploitation and communication actions related to the expected impacts from Waste2GridS project.

Expected impact	Dissemination	Exploitation	Communication
1 Techno-economic viability	1-3 scientific publications. <b>Workshop together with members from on-going relevant projects: W2W, BLAZE, others.</b>	Use of: (i) waste availability data, (ii) RES scenarios, (iii) grid strategies and (iv) the adapted optimization tool for (i) other areas of study (i.e. other countries), (ii) other technologies, and (iii) other projects.	2-3 conferences.
2 Plant design	1-3 scientific publications.	Use of the developed models to study other types of waste.	2-3 conferences.
3 Operating strategy	1-3 scientific publications.	<i>The expected impact is intrinsically a result's exploitation purpose.</i>	2-3 conferences. 1 article in a magazine/website. Linkedin/researchgate accounts. <b>Project website.</b>
4 Technology roadmap	1 technology roadmap.	<i>The expected impact is intrinsically a result's exploitation purpose.</i>	1 article in a magazine/website. Linkedin/researchgate accounts. <b>Project website.</b>
5 CO <sub>2</sub> and methane supply	1 technology roadmap.	<i>The expected impact is intrinsically a result's exploitation purpose.</i>	1 article in a magazine/website. Linkedin/researchgate accounts. <b>Project website.</b>

Note that publications and conferences' content will include more than one expected impact.

The results of Waste2GridS project are relevant to different priorities of the Horizon 2020 Work Programme from 2018-2020: Energy Union and Circular Economy. In particular, to the Focus Areas “Building a low-carbon, climate resilient future” and “Connecting economic and environmental gains – The Circular Economy”. The relevant EU Directives that can benefit from the results of Waste2GridS project are: (i) the Renewable Energy Directive (RED) (Directive 2009/28/EC<sup>1</sup>), setting a market share of 20 % of the total energy needs provided by renewables by 2020, and a 10 % of renewables in transport fuels, (ii) the Waste Framework Directive (Directive 2008/98/EC<sup>2</sup>), and (iii) the Fuel Quality Directive (FQD) (Directive 2009/30/EC<sup>3</sup>), as for the synthesized methane.

Table 1 summarizes the main impact points discussed in Section 2 of the project proposal, together with the suggested actions for dissemination, exploitation and communication of results. The innovation of the current project remains on (i) the application of the “multi-layer” methodology to such a waste-SORC integrated system, and (ii) the evaluation of the waste-based power-balancing plant under realistic conditions of waste production and grid balancing strategies, in two specific European countries. The business cases, and concepts for SORC commercialization, will be pointed out in the expected impact number 4. The CO<sub>2</sub> and synthetic methane markets will be discussed in expected impact number 5.

#### a) Dissemination and exploitation of results

<sup>1</sup> <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32009L0028>

<sup>2</sup> <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0098>

<sup>3</sup> <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0030&from=EN>



Waste2GridS project is expected to contribute mainly in the areas of circular economy and RES integration. Realistic input conditions will be kept, focusing in two well-defined geographical areas: Denmark (high penetration of wind energy) and Italy (high penetration of solar photovoltaic energy). The expected project results can be mainly classified as “knowledge, know-how and experience” that will be shared among the scientific community, population and policy-makers through scientific publications, conferences, magazines and roadmaps, respectively. **The workshop among members from the projects Waste2GridS, Waste2Watts, BLAZE, others, aims at bringing together main stakeholders and policy-makers in the area of biomass waste use for electricity production, and particularly, for grid balancing. The workshop will take place during the 28<sup>th</sup> European Biomass Conference & Exhibition (EUBCE 2020, <http://www.eubce.com/>), next 27-30 April 2020 in Marseille (France), as a side event. The workshop will highlight the latest advances in the studied synergies for grid balancing (system approach), the developed/adapted tools for that, etc. It will allow to pinpoint the capability of gasification-SORC, and to position SORC in future power-balancing markets.**

The potential users of the results of the project are professional stakeholders (industry, manufacturers, research institutions, etc), policy-makers, public bodies (government, standardization bodies, etc) and general public. Since the European society as a whole will ultimately benefit from the results of the project, specific measures are planned to increase awareness on circular economy and RES penetration, and on waste/SORC technology combination in particular. Taking into account the results to be achieved by the consortium during the project execution, a tailored communication action will address each target group in the best way possible to demonstrate the advantages and possible strategies of the Waste2GridS system and particularly, in comparison with the state-of-the-art and with competing electricity storage systems. The communication, exploitation and dissemination channels proposed to reach the targeted audiences mentioned above are **1 to 3 scientific publications, 2 to 3 conferences, 1 article in a magazine/website, one technology roadmap on feasible and optimal conditions for waste-based power-balancing plants and the organization of one workshop.** Up to date, we have assisted the International Conference on Applied Energy 2019, Aug 12-15, 2019, Västerås, Sweden; the work by Karen Pardos Olsen, Yi Zong, Shi You, Henrik Bindner, Matti Koivisto, Juan Gea-Bermúdez, “Data-driven flexibility requirements for current and future scenarios with high penetration of renewables” has been accepted as a full paper in the journal Applied Energy (lead by DTU). Other publications envisaged are on waste characterisation (lead by ENEA) and on the whole project (lead by EFPL), in journals like Biomass and Bioenergy, Energy, Applied Energy, from Elsevier, respectively. As mentioned for the workshop, one conference envisaged is EUBCE 2020. Other possible conference is CHISA/PRES conference (<http://2020.chisa.cz/welcome/>), in August 2020. Regarding the publication in a magazine, BioEnergy Sustainable (<http://www.besustainablemagazine.com>) is envisaged (if selected in EUBCE 2020 conference) as well as a local publication in the Swiss journal Le Nouvelliste (<https://www.lenouvelliste.ch/>). The technology roadmap will be written at the end of the project.

Dissemination of project results will contribute to (i) further and faster technological development of SORC (professional stakeholders), (ii) faster penetration of RES (policy-makers, transmission system operators – TSO, distribution system operators –DSO, and public bodies), (iii) increasing the usage of waste for energy purposes (policy-makers and public bodies), (iv) increasing the understanding about gasification and SORC operation (professional stakeholders, scientific community and general public), and (v) increasing public awareness about RES needs, and public acceptance about the proposed solution and its challenges (general public).



Committees / Associations / Partners	EPFL	ENEA	DTU	SP SA
International Energy Agency (IEA)		X	X	X
Industry grouping FCH-JU				X
Research grouping FCH-JU	X	X	X	
EMIRI- The energy materials industrial			X	
Danish Partnership for Hydrogen and Fuel Cells			X	
Swiss Hydrogen Association	X			X
European Biogas Association		X		

For the dissemination of results among policy-makers and public bodies, the members of the consortium belong to different national and international committees, where they will promote project results. Table 2 summarizes them.

### *Data and Knowledge Management*

The project will use methodologies and tools that have been already used and developed by the partners of the consortium. It will collect (first three items below) and generate an important amount of data, know-how and knowledge (i.e. the results of the project):

- RES balancing scenarios and balancing profiles for the identified zones in Denmark and Italy.
- Waste identification and location (with relevant resolution) for the identified zones in Denmark and Italy.
- Economic and performance data of the considered technologies (gasification, waste pre-treatment units, syngas cleaning units, SORC, others).
- Suitable configurations and working conditions of waste-based power-balancing plants.
- Suitable sizes of the waste-based power-balancing plants.
- Appropriate scheduling and storage strategies of the waste-based power-balancing plants.
- Realistic waste supply chains for large-scale power-balancing plants.
- Modelling tool.

We acknowledge the fact that data gathered and used as model input can have an associated uncertainty. The “degree of confidence” of the data will be presented qualitatively via the well-known Pedigree Analysis. The software used for process modelling will be Aspen Plus. The software(s) used for process optimization and energy profiles/waste resources matching will combine Matlab, Lua, GAMS and/or Ampl.

For the DMP and IP agreement in month 6, project partners will agree on data management (for instance, the type of format to be used -.csv, .pdf, .png, final tools to be used, type of data license according to Creative Commons, gold or green OA publications) and handling of intellectual property rights (IPR). Possible barriers for data sharing, curation and preservation will be properly identified and solutions will be proposed; this project is being carried out in collaboration with an industrial partner, and will use data in the framework of non-disclosure agreements (for instance, hourly electricity consumption and production at regional levels). The data management of this project will be supported by the Research Data Library Team of the EPFL. The potential intellectual property generated from this project will be fully discussed and exploited with help from the institutional Technology Transfer Office (TTO) from the EPFL.

Data and documents sharing among the members of the consortium will be made via EPFL Google Drive<sup>4</sup>. Publishable data (i.e. all collected data in the project, and the agreed results within the IPR, considering the

<sup>4</sup> <https://wiki.epfl.ch/help-gdrive-en>



possibility of patenting), in the framework of the Open Research Data pilot, will be stored on EPFL servers and can be published on Zenodo, where there is a specific EPFL community<sup>5</sup>. Zenodo fully supports the FAIR principles. Modelling codes will be appropriately described in the scientific papers. Zenodo can also be used to share our (gold or green) open access (OA) publications. The project will have a link placed in OpenAIRE. Most of project reports are intended to be public and linked to the project CORDIS webpage (as well as all the OA publications).

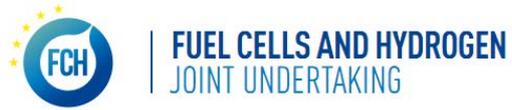
The members of the consortium will be free to use the knowledge and tools generated by them during the project for other projects or actions. Ideally, further work in the field to Waste2GridS will imply the study of further European areas or countries, and/or the inclusion and study of other waste-treatment technologies.

#### **b) Communication activities**

As pointed out in the first table of the current draft, results' communication activities are targeted to reach science community (via targeted conferences) and society at large (through a contribution in a magazine/website, and the associated LinkedIn - <https://www.linkedin.com/company/eu-h2020-project-waste2grids/> and <https://www.researchgate.net/project/WASTE2GRIDS-Converting-WASTE-to-offer-flexible-GRID-balancing-Services-with-highly-integrated-efficient-solid-oxide-plants> Researchgate accounts - , and project webpage - <https://www.waste2grids-project.net/>), with the aim to promote interest in the use of waste, in SORC and “emergency” to act towards a more renewable power grid. The consortium has a project logo, and associated templates for reporting and dissemination and communication, that appropriately identify the consortium and project's purpose.

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<sup>5</sup> <https://zenodo.org/communities/epfl/?page=1&size=20>



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