Addunt Exco Istanbul

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H Y D R O G E N I M P L E M E N T I N G A G R E E M E N T

TASK 29
"Distributed and Community Hydrogen"

DISCO-H2

HIA Members' Interest

- USA
- Japan
- UK
- UNIDO-CHET
- New Zealand
- Canada
- Denmark
- Finland
- France
- Greece
- Korea
- Spain

Industrial Interest

- Hydrogenics
- HyRamp
- Fuel Cells Today
- PURE Energy

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Distributed and Community Hydrogen

Background:

This new task is proposed as follow-on to Task 18: Evaluation of Integrated Systems. The proposal is to studying hydrogen systems integrating with electricity and other energy and mobility networks. The Task should have considerable industrial input and work to move hydrogen systems to commercialisation.

A proposed draft vision statement is:

Vision Statement:

This Task will be successful when the technical, economic, social and environmental benefits of hydrogen in communities are evident and the Task has played a role in helping to implement such systems leading to replication or mass production. To this end, the Task aims to take a holistic view of low carbon energy networks and to identify the appropriate situations where integrating hydrogen systems within such networks offers added value.

Objective:

To progress the optimisation and replication of "green" hydrogen within distributed and community energy systems.
This will be through identifying situations where the use of hydrogen is appropriate and assess the technical, environmental, economic and social benefits of such systems.
Analysis will include:

- Cost benefit analysis,
- Business case and market research
- Identification of technical benefits and gaps
- Materials for education and awareness raising
- Material for planners and regulatory authorities to help them facilitate incorporating hydrogen systems within energy networks.

This should form part of the foundations for commercialisation efforts and favour new job opportunities.

Scope:

The Task will focus on H2 applications in energy Communities and distributed systems mostly involving stationary applications but also looking at potential benefits for transportation. As energy community it is intended a group of interacting people living in a common location featuring shared geographical location and energy needs.
Communities to be considered should be up to 1000 people and the total installed power capacity of the hydrogen energy technologies (both producing and consuming hydrogen) in the communities should not exceed 500 kW.

The scope of distributed and community hydrogen covers:

- Island, rural and urban communities
- Off-grid or communities connected and interacting with smart grids
- Industrial distributed H2 applications

The hydrogen used should be produced at a local level (i.e. distributed) rather than at a centralised industrial scale.

In the long term, whole cities may integrate hydrogen into their energy networks. However, this project will concentrate on developments on a subdivision level or smaller as it is envisaged that this is how distributed and community hydrogen systems will be built up.

A full range of energy applications for which hydrogen may be used shall be considered, for example: heat, power, transport and cooking. This will allow studies of how hydrogen can be used as a vector to bridge different energy networks and manage peaks of load consumption and generation. Thus, electrolysers, reformers, fuel cells, ICEs, hydrogen burners and renewable energy generation systems are all likely to be components. The Task will take a holistic view of how these components can be integrated in and complement existing energy networks.

Preferentially the investigated sources of hydrogen will be renewable but other sources like reforming of Natural Gas or wastes will be taken into consideration.

Following a review of various projects, six projects will be selected for detailed analysis consisting of:

- 2 Islands;
- 2 off-grid;
- 2 Industrial (distributed) applications.

Out of these six projects three generic models of the distributed and Community H2 concept will be developed so as to represent the three above mentioned categories. These concepts will be designed to be scaled-up in light of concept replication and market penetration.

Implementation:

The work will be broken down into the following Subtasks articulated in various Activities:

Subtasks: (suggestions of Subtask (ST) and Activity Leaders in parenthesis)

1. Management (UNIDO-ICHET)
    1.1 Management and reporting
2. Analysis and Selection (Canada)
    2.1 Community identification (Canada)
    2.2 Data Collection (in relation to economic, social-regulatory, environmental and technical areas) (Denmark)
    2.3 Project selection (France)
3. (DISCO-H2) Model concept development (CRES)
    3.1 Selection of Island model

3.2 Selection of off-grid model
3.3 Selection of industrial model

4 (DISCO-H2) concept replicability (TBD)
4.1 Market analysis
4.2 Risk analysis

5 Dissemination (UNIDO-ICHET)
5.1 Task results dissemination
5.2 Scientific community
5.3 Industrial sector
5.4 Regulating Authorities

Subtask 1 (ST1): Management

The management will take care of the Task progress development and will guarantee that reports and deliverables deadlines are fulfilled timely and effectively. Furthermore it will insure a proper communication between the Task and the IEA-HIA secretariat.
The first priorities of the management actions are:

- Collection of letters of intent from members;
- Definition of subtask leaders within the first 3 months.

Subtask 2: Analysis and selection

This subtask studies the projects and executes a selection on the ones that will be further analysed in ST3. It is subdivided into three tasks.

Activity 2.1 (A2.1): Community identification.
The list of projects to be reviewed is to be identified at the earliest stage of the subtask following a round of contacts with the authorities/communities realising the projects.

Activity 2.2 (A2.2) Data collection. This activity will review the selected projects, using also experience gained from Task 18, particularly related to Technical issues. Moreover the main studies/projects already carried out on the subject (i.e. Roads2HyCom, HyWays, etc.) will be consulted to fine tune the projects evaluation.

It will involve collecting and using the following information:

Economic
In general, provide business cases and market analysis with potential funders and politicians as the target audiences. In particular

- Identify if there are common themes between projects.
- How systems or components can be replicated via turn key solutions or mass production. How systems can integrate with renewable energy generation and transport.
- Identify areas for cost reduction either through modularisation, technical improvements or better interfaces/system optimisation.
- How a energy community using hydrogen can act as an economic alternative to energy infrastructure extension?, upgrade or redesign.
- Reduction in costs associated with fuel imports.
- How do 'green tariffs', carbon credits etc. change the business case?
- What are the markets for distributed oxygen from electrolysis?

What is the market pull/needs for distributed and community hydrogen? What is missing at present?

Social

How can hydrogen systems help:

- Reduce energy poverty
- Increase energy awareness
- Improve health/reduce pollution
- Create education/job opportunities
- Improve of energy security through diversification

What is the social pull/needs for distributed and community hydrogen? What is missing at present?

Environmental

How can hydrogen systems help:

- Make the most of renewable sources
- Increase penetration of renewables
- Reduce fossil fuel use.
- Improved community environmental footprint/ reduce green house gas emissions

Regulatory

The Task will endeavour to develop ongoing dialogue with governments and agencies to ensure regulation is a catalyst rather than an obstacle for the development of hydrogen technologies. It will identify where governments can facilitate the removal of barriers to development.

- Who are the bodies who will be involved in integrating hydrogen systems into energy systems?
- What information/education do they require?
- How can hydrogen enhance community and economic development in a 'doubly sustainable' manner (i.e. environmentally and economically)?

Technical

Linking with the findings above and in dialogue with industry, the Task should study the following areas:

- Identify technical gaps or weakest links in overall systems, e.g. control systems, electrolysers for dynamic loads, interfaces with renewable generation.
- Identify market needs that are not satisfied or only partially satisfied at present.
- Consult with industry on how technical gaps can be overcome, hydrogen systems can be integrated with low carbon energy systems.
- What technologies are most suitable for different applications and at what size?
- Consult with industry on how mass production, modularisation can occur using selected case studies as examples.
- Identify where standards are required or recommend technical requirements themselves (For example: in terms of pressure ranges or the level of material quality).
- Investigate how hydrogen energy systems can interact with Smart grids and be an energy vector between different renewable energy resources and different energy uses.

- What combinations of energy delivery networks should be used e.g. electricity wires and/or hydrogen pipelines and/or gas pipelines. These could be as an alternative or to support existing energy networks.
- What improvements are needed to components/ what opportunities are there for manufacturers? e.g. electrolysers for renewables, H2 sensors, control system improvements, efficiencies.
- Provide 'specifications' of the barriers that need to be solved/opportunities for industry.
- How can oxygen be used locally?

It is envisaged that the outputs will be presented in a matrix form, an example being shown in the table below.

Table 1 Evaluation matrix

Project Strategy	Indicators	Baseline	Target	Means of Verification	Critical Assumptions
Social Economical Environmental/ technical Regulatory					

Activity 2.3 (A2.3) Project selection

The final outcome of Activity 3 will be to select 6 projects subdivided into 3 categories:

1. n. 2 projects involving islands
2. n. 2 projects off-grid
3. n. 2 industrial projects (distributed).

Subtask 3: Model concept development

This subtask focuses on the selected projects as a result of Activity 2, it develops and defines three main concept models, one per each project category (as mentioned above), that can be reproduced and replicated as far as distributed and community hydrogen applications are concerned. Each of the three categories will be the subject of a devoted activity.

Subtask 4: Concept replicability

This task studies the potential for the concept applicability among selected stakeholders (e.g. SIDS, etc.) by suggesting application sectors in order to achieve market penetration. This part will be the subject of activity 4.1

Another activity (A4.2) will carry out the Risk analysis of the selected three concepts.

Subtask 5: Dissemination

This subtask is articulated in four activities.

A5.1 will deal with the definition of target groups. In addition the following actions are envisaged:

- A public website with:
  - Education and awareness materials for the general public, decision makers and planners including videos.
- Videos streamed for example on Youtube and other outlets
- Articles in magazines for different sectors (i.e. for business, municipalities, engineering sectors, general public).
- Papers to energy and hydrogen journals and conferences

- 'Handbooks' in electronic form covering the three different areas namely, islands, off-grid applications and industrial distributed applications.

Since it is important that the work is disseminated both within and outside of the hydrogen community, the Task results are disseminated within both scientific (A5.2) and industrial community (A5.3) as well as among Regulating Authorities (A5.4).

Task timetable and work flow

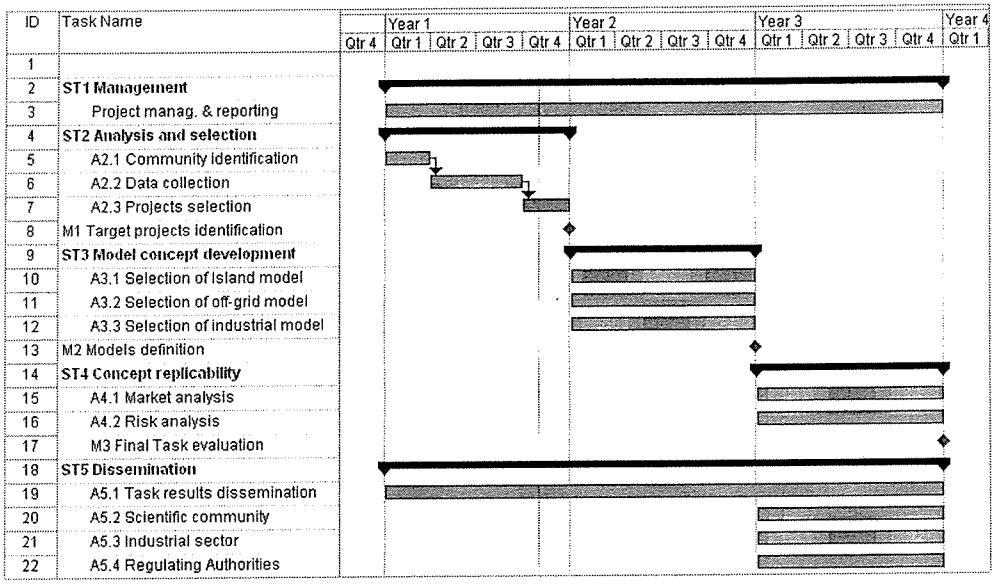

Figure 1 Gantt chart

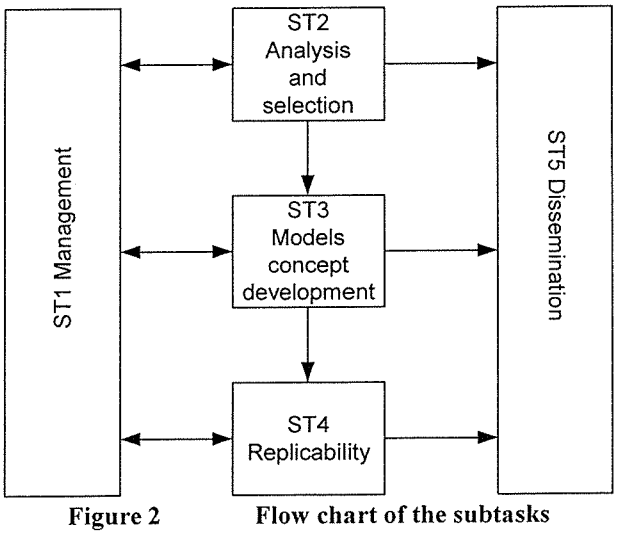

Figure 2 Flow chart of the subtasks

Potential projects

There are a range of potential projects that could be studied as part of the Task. The projects listed below are just a few of the possible candidates.

Projects list:

1. Bozcaada, Turkey
2. Lolland Community hydrogen project
3. Aistratis, Greece
4. Hebridies, new housing estates, smart grid developments?? UK,
5. Totara Valley, NZ or Matiu Somes Island Sanctuary
6. Bella Coula, Canada or other
7. EOLHY, MYRTLE, or PEPITE, France
8. Others

Deliverables

Each subtask produces a report as a deliverable. The complete set of expected deliverables is summarised in the following table:

Table 2 Deliverables list

Deliverable n.	Del. name	ST n.	Task month
D1	Report of A2.1	2	4
D2	Public website	5	6
D3	Report of A2.2	2	10
D4	Report of A2.3	2	13
D5	Report of A3.1	3	25
D6	Report of A3.2	3	25
D7	Report of A3.3	3	25
D8	Report of A4.1	4	37
D9	Report of A4.2	4	37
D10	Report of A5.1	5	37
D11	Report of A5.2	5	37
D12	Report of A5.3	5	37
D13	Report of A5.4	5	37

Milestones

Milestone n.	Milestone name	ST n.	Task month
M1	Target projects identification	2	12
M2	(DISCO-H2) models definition	3	24
M3	Final Task evaluation	4	36

Duration of Task

The first phase of the Task would be 3 years but it is envisaged that it would be extended by a further 2 years (5 years in total) as this is the time scale for hydrogen systems to be on the path to commercialisation.

External Collaborations

There are a number of bodies that will be able to provide information and engage with key groups and authorities with which the Task should aim to collaborate as appropriate. In addition, the Task should maintain links with other HIA or IEA work. Bodies that the Task should aim to maintain in dialogue with could include:

- IEA HIA Tasks 19, 21, 23, 24 specify tasks names
- IEA Renewable Energy Implementing Agreement
- HyRamp
- EU Strategic Energy Technology Plans
- C40
- Small Island States (SIDS)
- JTI of the EC
- EU REIslands
- Islenet
- Stories ?
- Nordic Network for Sustainable Energy Systems in Isolated Locations (NORDSESIL)
- Covenant of European Mayors
- Clean Cities
- POLIS?
- State initiatives in California and New York
- Californian Hydrogen Business Council
- Hydrogen trade associations

Some of these organisations or industrial partners may wish to be contributors. In other cases (for example the EU Strategic Energy Technology Plans), the project should feed information into roadmaps, consultations, etc.

Commitment and skills set needed

Each participating member would be expected to commit half a person-year per year of the project. Together the skills of the experts should encompass:

- Website and outreach skills
- Commercial/business expertise/ market analysis (MBA type skills)
- Technical knowledge (for hydrogen systems, smart grids and energy systems in general)

- Assessment of environmental benefits, green house gas reduction etc.
- Regulatory and planning expertise
- Skills in social engagement

Operating Agent

UNIDO-ICHET will be acting as the Operating Agent of Task 29

Intellectual Property and Publication

As this Task would involve business and potentially commercially sensitive information and intellectual property, a robust agreement over ownership will be needed. The HIA already have a basic form of words that can be built upon for this Task.

In addition, it is likely that no information should be published on behalf of the Task until there is a consensus between the members on its correctness.