Large scale fuel cell power plant demonstration in industrial/commercial market segments

Specific challenge: The maturity level of several fuel cell technologies is ready to achieve a market entry of fuel cell power plants in the most challenging market segments, i.e. commercial or industrial (50 kW - 10 MW). This is a way to meaningfully reduce harmful emissions like GHG (through improved energy efficiency of using natural gas and utilization of renewable fuels including biogas and/or green hydrogen) and emissions of NOx, SOx and PM (particles) and also to assure the security of power supply (through decentralized power production).

The realization of large scale demonstration projects are needed to build up confidence/acceptance of the various stakeholders (electricity/heat producers, public, politicians, investors etc.) and applications to reduce the market entry barriers and to commercialize the technology. These demonstration projects are needed for confidence building to trigger volume scale up with large scale orders. This leads to higher installed capacity and therefore to lower cost.

The main focus of this area would be in reduction of use of primary energy by efficient and direct conversion of chemical energy (hydrogen, biogas, natural gas and other hydrocarbons, power to gas, industrial waste gases etc.) into power in a decentralized power production to reduce losses due to transmission and distribution.

In order to increase competitiveness against standard CHP there is a goal to reduce the total cost of ownership (TCO in €/kWh) in the direction of grid costs and competitive total costs of energy in different applications.

Scope: Deploy example FC solutions in commercial or industrial market segments through strong partnerships between end users, industry, SMEs, local authorities, and FC suppliers.

The projects will target primarily demonstration of solutions integrating the following:

- 50 kW up to several MW capacity production of power and heat from natural gas, biogas or hydrogen

- Integration of a FC power plant in industrial/commercial processes

The project should aim at creating partnerships between end users, industry, local SMEs, financiers and local authorities, in order to ensure that the solutions are replicated and can be financed through various sources.

Therefore each project should:

- Validate real demonstration units in commercial applications will enable suppliers, various stake holders and end users to gain experience throughout the value chain

- Develop and reinforce business plans and service strategies (e.g. refurbishment of stacks at end of life, full service offers etc.) during the project and Life Cycle Analysis that will be replicable and validated in other market segments after the project

- Have a clearly defined structure, with roles and responsibilities properly spelled out for all involved entities

Cleaning of the fuel is out of scope of this topic.

Expected impact: The proposals are expected to have the impacts described below:

- Supplier and user experience of installation/commissioning, operation and use of distributed power generation

- Building and validating references to build trust among the stakeholders

- Enable active participation of consumers in order to bring the fuel cells technology closer to their daily business

- Reduction of the CO2 emissions with respect to the local grid by > 10%

- Reduction of the use of primary energy by

o Electrical efficiency > 45%

o Total efficiency > 70% (heat cycle: 45°C/30°C)

- Reduction of the CAPEX (no transport, installation, project management, no heat use equipment) to

o < 7,000 €/kW for systems < 1 MW

o < 4,000 €/kW for systems ≥ 1 MW

- Reduction of the maintenance costs (full service including stack replacement)

to < 0.05 €/kWh

- Reduce the overall energy costs

- Demonstrate a viable solution and a replicable business case

It is envisaged that the proposals will also bring societal benefits such as:

- Economic growth and new jobs at the local level, including supply-chain jobs

- Great basis for further growth of the industry

- Energy security and improved reliability

Any event (accidents, incidents, near misses) that may occur during the project execution shall be reported into the European reference database HIAD (Hydrogen Incident and Accident Database) at https://odin.jrc.ec.europa.eu/engineering-databases.html.

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