



At the system level, the specific energy demand at rated production rate will be below 25 kWh per kgH₂ referring to a system efficiency of above 70% on the basis of higher heating value (HHV). Furthermore, this system will be able to operate in overload mode referring to a production rate as high as 6.8 m³H₂ per hour (1.5 times overload). Rapid response of 1 second for a hot start and 10 seconds for a cold start are the operating targets of the system.

At the stack level, the project will implement a patented design approach based on hydraulic cell compression. This design allows for large planar cell components, which is required for future mass production, and effective cooling at very high production rates and temperature levels. Regarding sufficient stack conditioning, a cooling system will be developed for voltages of maximum 2.0 V per cell at rated power and of 2.3 V per cell in overload modus. Additionally, the target of PRETZEL is the development of a high pressure PEMEL stack, which opens a perspective for specific stack costs of below 500 €/kW. As for the production at 100 bar an additional compressor is omitted, for the targeted system specific systems costs are possible in the range of 750 €/kW.

This concept addresses the above aspects to realize the next generation electrolyzer technology, whilst meeting the needs of industrial scale hydrogen production in the near future.

Beyond these challenges, a significant increase of lifetime and improved operability will be achieved to cope with intermittent electricity supply from renewable energy sources.

This approach is encapsulated in the full title of the project: “Novel modular stack design for high PRESSure PEM water elecTrolyZER tEchnoLogY” with wide operation range and reduced cost. This is shorted to the acronym: “PRETZEL”.

Over the coming three years, the PRETZEL project will be carried out by an experienced and well-rounded consortium represented by the following partners:

- Deutsches Zentrum fuer Luft – und Raumfahrt EV (Lead Partner, Germany)
- Westfälische Hochschule Gelsenkirchen, Bocholt, Recklinghausen (Germany)
- Association pour la recherche et le développement des méthodes et processus industriels (ARMINES)
- Universitatea Politehnica Timisoara (Romania)
- Adamant Composites Ltd. (Greece)
- GKN Sinter Metals Filters GmbH Radevormwald (Germany)
- Centre for Research and Technology - Hellas (Greece)
- Soluciones Catalíticas Ibercat, S. L. (Spain)
- iGas Energy GmbH (Germany)

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