The Hungarian P2G Deployment Scenarios – ongoing projects, plans and P2G technology operations experience in Hungary

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Agenda

1. Framework for P2G deployment scenarios
2. Lessons learnt from international experience
3. Resources and capabilities in Hungary
4. Ongoing projects and plans
Framework for P2G Deployment Scenarios

Hungarian P2G technology development and its commercial applications should be based on international experience and local capabilities.

But how to start setting priorities?

- **External environment**
  - Critical success factors

- **Internal resources**
  - Distinctive capabilities

- **Competitive advantage**
# External environment

All international power-to-gas projects have been delivered by consortia of stakeholders assuring heterogeneous capabilities.

<table>
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<th>P2G projects</th>
<th>Core technology provider</th>
<th>Financial support/investment</th>
<th>Broad industry knowledge, material resources</th>
<th>Scientific knowledge, research and development</th>
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<td><strong>Audi e-gas plant</strong></td>
<td>Etogas</td>
<td>Audi</td>
<td>EWE Biogas, Audi</td>
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<td><strong>HELMETH</strong></td>
<td>Sunfire</td>
<td>EU</td>
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<td>Polytechnic University of Turin, European Research Institute of Catalysis, National Technical University of Athens</td>
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<td><strong>BioPower2Gas</strong></td>
<td>Microb-energy</td>
<td>Federal Ministry of Economics and Energy</td>
<td>Viessmann Group EAM EnergiePlus, EnergieNetz Mitte</td>
<td>iDe (Institute of Decentralized Energy Technologies), DBFZ (German Biomass Research Centre)</td>
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<td><strong>BioCat</strong></td>
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<td>Energinet, Hydrogenics, NEAS Energy, HMN Gashandel A/S, Biofos A/S, Audi, Insero</td>
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<td><strong>Underground Sun Storage</strong></td>
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Dr. Zoltán Csedő: The Hungarian P2G Deployment Scenarios – ongoing projects, plans and P2G technology operations experience in Hungary
External environment

P2G projects emerge from strong interorganizational networks; development of innovative P2G ecosystems are essential.

- Technology developer startups
- Strategic investors
- Financial investors
- State / EU institutions
- Large energy companies
- Research centers
- Universities

Innovative core technology
Financial support or investment
Broad industry knowledge and material resources
Scientific knowledge, research and development
Critical success factors

Lessons learnt from international P2G projects: two critical success factors should be met – cooperation & engagement.

**Cooperation** among
- technology developers
- large energy companies
- research centers and universities

to *combine complementary capabilities*

**Engagement** of
- strategic investors
- financial investors
- state institutions

to *ensure financial background* for new technology development and implementation
Internal resources

The Hungarian National Energy Strategy 2030 engages with innovative P2G / P2M technology, contributing to the development of a local P2G know-how.

National Energy Strategy 2030

- development of a pilot P2G plant supporting seasonal energy storage using P2G technology by feeding biomethane into the natural gas grid
- development of a 2.5 MW P2G commercial energy storage facility based on the Hungarian P2G prototype experience
- development of a mandatory biomethane buying scheme to encourage biomethane production
- development of a regulatory environment to support the market application of P2G technology
- support the provision of energy storage facilities for power plants that are not eligible for KÁT support
Internal resources

The First Hungarian Power-to-Gas Conference / Hungarian Academy of Sciences (2019) has demonstrated the presence of a local P2G ecosystem

Organizers:
• Budapest University of Technology and Economics
• Budapest Corvinus University
• Hungarian Academy of Sciences, Center for Energy Research
• Power-to-Gas Hungary Kft.
• Pietro Fiorentini Hungary Kft.

Patronage:
• Ministry of Innovation and Technology

An exciting dialogue has been initiated regarding the cooperation opportunities in innovative P2G projects between industry representatives, academia and regulators
Internal resources

Following the First Hungarian Power-to-Gas Conference, several R&D&I, regulatory and commercial workshops has been organized.

Know-how transfer: Professor Mets, University of Chicago

Budapest University of Technology and Economics – strategic research and development cooperation
Internal resources

The most innovative P2G mobile prototype of Europe has been built in Hungary (Vértes Power Plant - 2018); 2 yrs ‘stop&go’ operations experience

Analysis of over 100 000 operations data
Internal resources

Regional technology license, well-documented know-how, modern digital tools, advanced R&D results assure leading role for Hungary in P2G projects.

Exclusive technology license
Hungary + 9 countries (incl. V4)
Global patent development opportunity

Local know-how development
R&D platform, prototype operations, monitoring softwares, R&D&I activities
Distinctive capabilities

In comparison with international projects, four distinctive capabilities of the Hungarian P2G model can be identified:

- **Technological excellence**
  - Power-to-Gas Hungary and its partner network developed a highly efficient biomethanation technology with a patented archaea strain, as well as they have 2 yrs local operations experience.

- **Diversified commercial project pipeline**
  - Diversified pilot project portfolio aiming to target seasonal energy storage, decarbonization, mass production, virtual power plants, etc.

- **CEE regional entry strategy**
  - Power-to-Gas Hungary and its partners are the first movers in the CEE region, can achieve high regional market share and drive regional innovations.

- **Ecosystem based business model**
  - A multi-stakeholder business model driven by strong cooperations with regulators and innovation networks to ensure the dynamic exploitation of complementary resources.
Ongoing projects and plans

Ongoing projects and plans target the exploitation of the innovation potential of the P2G / P2M technology and the development of grid scale / commercial P2G facilities

- Development of the regulatory environment / according to the National Energy Strategy 2030
- Continuous technology development: electrolysis, biomethanation, CO₂ sources, testing different gas mixtures
- Technology scaling: 1 MW – 2.5 MW – 5 MW – 10 MW
- Site assessments, feasibility studies, site specific business models development
- Global patent development
- Research and publications
- Development of a local and regional P2G innovation ecosystem
Thank you for your kind attention!