# Case Study: Fuel Cell City

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# Overview

- Case Study Background
- The Innovation Field of Fuel Cell Technology
- Hydrogen and Fuel Cell Futures
- The Scenario Method
- Workshop Tasks

# Case Study Background

- Project ‚Open Innovation' within programme ‚Factory of Tomorrow'
- Stakeholder Involvement in Innovation Processes (Environmental Technologies)
- Fuel  Cells and Wood-Plastic Composites
- 'Lead User Method' and 'Constructive Technology Assessment'
- CIPAST WS: Scenario Process on Future use of Fuel Cell Technology at Municipal Level

# Fuel Cell Technology

- Basic principle: Exploiting chemical reaction energy (e.g. hydrogen and oxygen)
- Application areas:
  - Mobile (Fuel Cell Vehicles)
  - Stationary (Decentralised energy supply)
  - Portable (Laptops, mp3-players, mobile phones)
- Hydrogen as energy *carrier*

# Ecological Risks and Potentials

- Cycles of Hype and Disappointment
- Ecological Potential:
  - High energy efficiency
  - Avoiding local emissions
  - Possibly strong reduction of total emissions
- Ecological Risks:
  - Reinforcement of fossil fuel regime
  - Use of nuclear energy and CCS as contested alternatives

# Status Quo

- Niche Applications:
  - Military applications and space technology
  - Yachts and luxury travel vans
  - Pilot and Demonstration Projects
- Barriers to Mass Market Introduction:
  - Costs
  - Durability
  - Hydrogen storage and distribution

# Future Developments?

- In competition with other technologies
- Reluctance to make prognoses – introduction to mass market not before 2015-2020
- Potential future niches:
  - Emergency power supply
  - Off-grid power supply
  - Fuel cell vehicles in public transport
  - Hybrid utility vehicles (electric / fuel cell)

# Visions of the Hydrogen Economy

- Niche applications or mass market?
- Centralised or decentralised supply?
- Fossil, nuclear or renewable energy sources?

- Transition Pathways?
- Contribution to reduction of GHG emissions?

# The Municipal Level

- Dependence on larger-scale developments
- Local niches important for learning processes in relation to emerging technologies

- Profiling as Eco- and High-Tech-City
- Local air quality
- Regional resources (firms, research institutes)
- Graz: Hydrogen fueling station ‘HyCentA’

# The Scenario Method

- Used in complex situations, when future developments are highly uncertain
- Aim: Developing a variety of *possible* future development pathways, to explore the risks and potentials involved
- Participatory Scenario development: Integrating experts from various fields, the 'lay' public

# The Scenario Method: Realisation

- Preparative Work:
  - Background research
  - Framing of the Issue
  - Selection of stakeholders
- Implementation of Scenario Process:
  - Identification of Framework Conditions / Driving Forces
  - Developing Basic Scenarios
  - Fleshing out of Scenarios
  - Scenario Assessment
  - Strategy Development

# Workshop Tasks (Overview)

| | |
|---|---|
| 9:30-10:30 | Group Work on **Task 1: Framing of Issue** |
| 10:30-11:15 | Sharing of Results and Discussion |
| 11:15-11:45 | Group Work on **Task 2: Basic Design of Scenario Process** (Part 1: Pros and Cons) |
| 11:45-12:15 | Break |
| 12:15-13:00 | Group Work on **Task 2: Basic Design of Scenario Process** (Part 2: Defining an Outline) |
| 13:00-14:00 | Sharing of Results and Discussion in Plenary |

# Task 1: Framing of Issue

**Background:** A Research Institute is Planning a Scenario Process concerning the Future Use of Fuel Cell Technology at the Municipal Level of a Medium-Sized City (Graz)

**Tasks:**

- Define Focus and Scope by
  - Formulating *one* central question
  - Defining goals (max. 5 sentences or bullet points)
- Describe which Stakeholder Groups should be involved and how.

# Task 1: Framing of Issue

**Issues to be Considered**: Think about

- Framing: Not too narrowly technical, not too broad
- Appropriate time horizon
- Appropriate focus (local/global scenario development)
- Communal Interests (Why should a municipality engage with the issue?)
- Use of Scenario Methodology (What can this method achieve?)

# Task 2: Basic Design of Scenario Process:

**Background:** Based on the framing of the issue, a scenario process consisting of the following broad steps should be implemented:

- Identification of relevant framework conditions / driving forces
- Using possible patterns of framework conditions for the development of scenarios
- Fleshing out of scenarios
- Scenario assessment
- Strategy development

# Task 2: Basic Design of Scenario Process:

**Tasks:**

(1) Discuss and Document Pros and Cons of Various approaches to the Scenario Procedure
Orientation Questions:

- Which factors need to be taken into account and balanced against each other ? (e.g. time constraints vs. maximising participation)
- Under which circumstances may one or another approach be more appropriate?

# Task 2: Basic Design of Scenario Process:

**Tasks:**

(2) Define:

- Number and content of meetings
- Types of scenarios to be developed
- Approach to scenario assessment
- Approach to strategy development
- Amount of prior specification

# Actual Implementation

Three Step Scenario Process:

(1) Framework Conditions and Basic Scenario Development

(2) Fleshing out of Scenarios and Scenario Assessment

(3) Backcasting and Potential Pilot Projects

# (1) Framework Conditions and Basic Scenario Development

- Introduction to the issue and scenario method
- Brainstorming: framework conditions
- Group work: Storylines
- Plenary: Presenting storylines and grouping them to basic scenarios

# (2) Fleshing out of Scenarios and Scenario Assessment

- Presentation and discussion of fleshed out scenarios
- Presentation and discussion (selection) of assessment criteria
- Group work: Qualitative assessment of more/less sustainable variants of individual scenarios according to criteria
- Report to plenary and discussion

# (3) Backcasting and Potential Pilot Projects

- Backcasting: Timeline for necessary steps to be taken in various policy areas
- Discussion of relevant strategies at the communal level (adaptive / normative)
- Discussion of possible pilot projects