



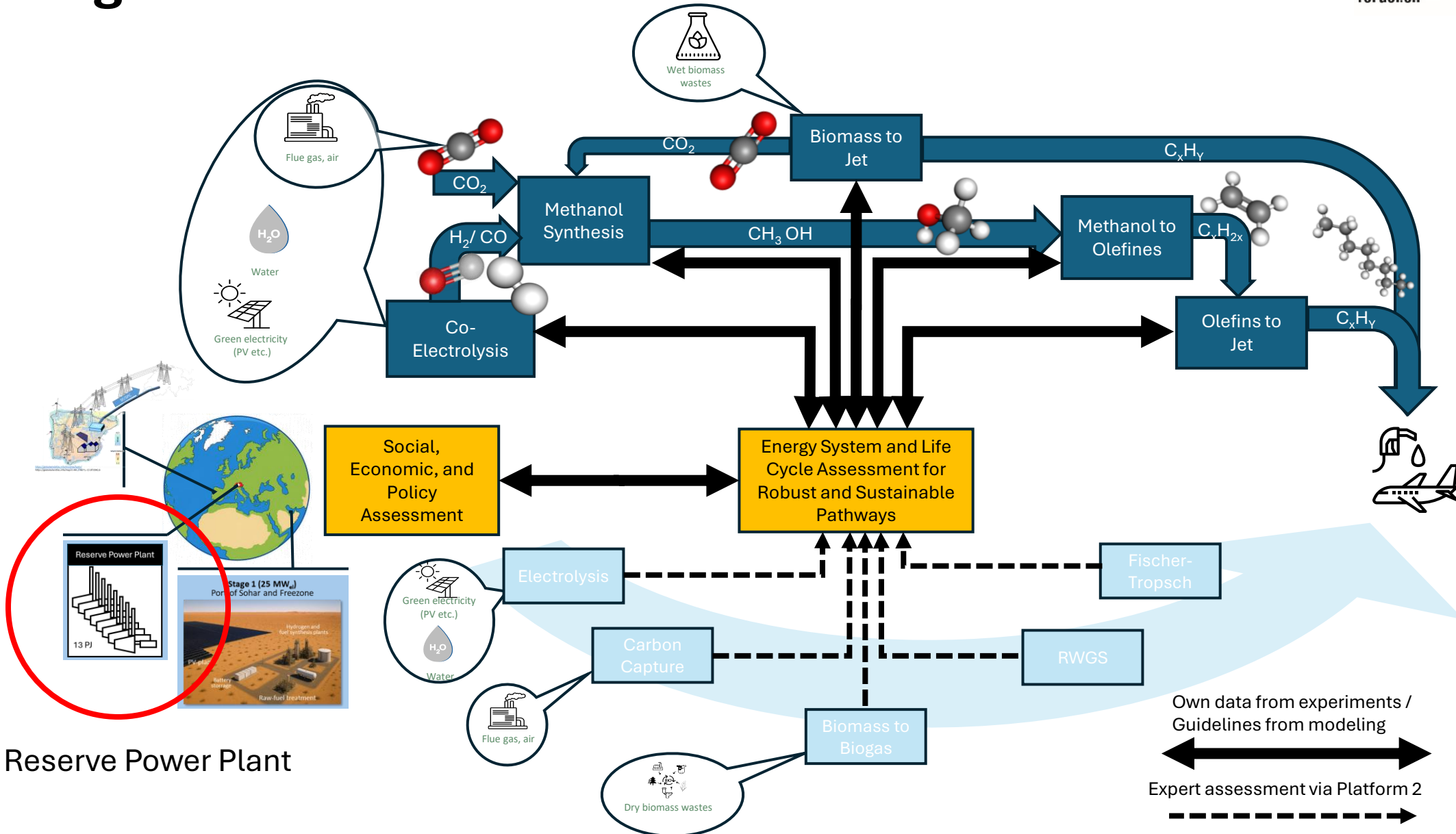
Renewable **Fuels** and **Chemicals** for Switzerland*

reFuel.ch Cases
Jörg Roth, Christian Bach

*reFuel.ch is a consortium sponsored by the Swiss Federal Office of Energy's SWEET programme and coordinated by Empa.



High-level introduction



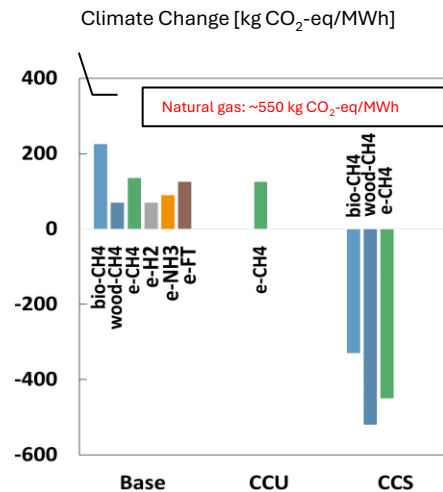
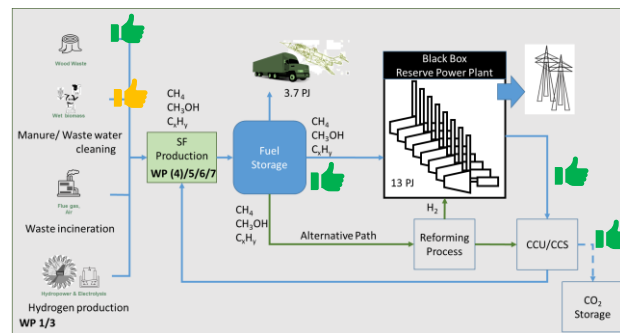
Reserve Power Plant

Case: Reserve Power Plants

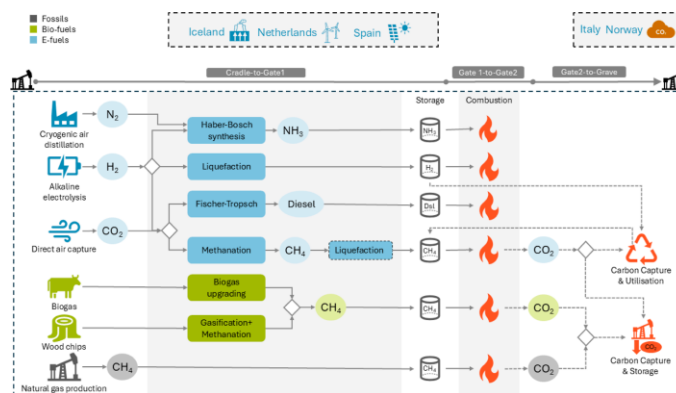
Science Perspektive TRL

Prospective Life Cycle Assessment of Alternative Fuels and Carbon Capture in Swiss Gas-Fired Power Plants

Energy & Fuels. 2026;40(30):16462-16478. doi:10.1021/acs.energyfuels.5c05190



- Renewable fuels achieving reductions of up to 87% in 2050.
- Biomethane from wood chips and e-hydrogen deliver the lowest climate change impacts.
- Several non-climate impacts increase for alternative fuels (land-use, ecotoxicity, and photochemical ozone formation by the production of biogas or wood chips for biomethane).
- Natural gas with CCS performs substantially better than the fossil baseline but remains more polluting than renewable options across several other environmental impact categories.



Case: Reserve Power Plants

Market Perspective MRL

Awarded bidders:

- Axpo (HVO, e-methanol)
- CIMO (Methane)
- Getec (HVO)
- Sidewinder (HVO)



<https://www.srf.ch/news/schweiz/versorgungssicherheit-schweiz-fuenf-co2-neutrale-reservekraftwerke-erhalten-zuschlag-vom-bund>



Case: Reserve Power Plants

Regulatory Perspective PRL

Winter Reserve Ordinance (WResV; SR 734.722), based on Article 8b Electricity Supply Act (SR 734.7).

Art. 7 para. 4 WResV: CO₂ emissions ... whose operators do not participate in the emissions trading scheme must be fully **offset by surrendering national or international emissions reduction certificates**.

Art. 8 WResV: conduct public tenders ... (c) other criteria, such as the technical quality, admissibility, environmental impacts, location and grid connection of a project, and the **possibility of operating the plant using renewable energy sources**.

Art. 20 WResV: **remuneration** shall cover: (a) operating costs dependent on use, including costs for the use of pipelines, the energy source, **the CO₂ levy and emission allowances**

The same applies to the mineral oil tax under the Mineral Oil Tax Act of 21 June 1996

The winter Reserve Ordinance is currently being revised. The consultation procedure closed 5 August 2026.

The Ordinance **does not currently contain an explicit obligation** to operate reserve power plants exclusively on renewable fuels.

The regulator is tasked with exploiting “all economically viable options for the use of CO₂-neutral fuels” and enacting “regulations on the offsetting of CO₂ emissions”, according to Electricity Supply Act SR 734.7.

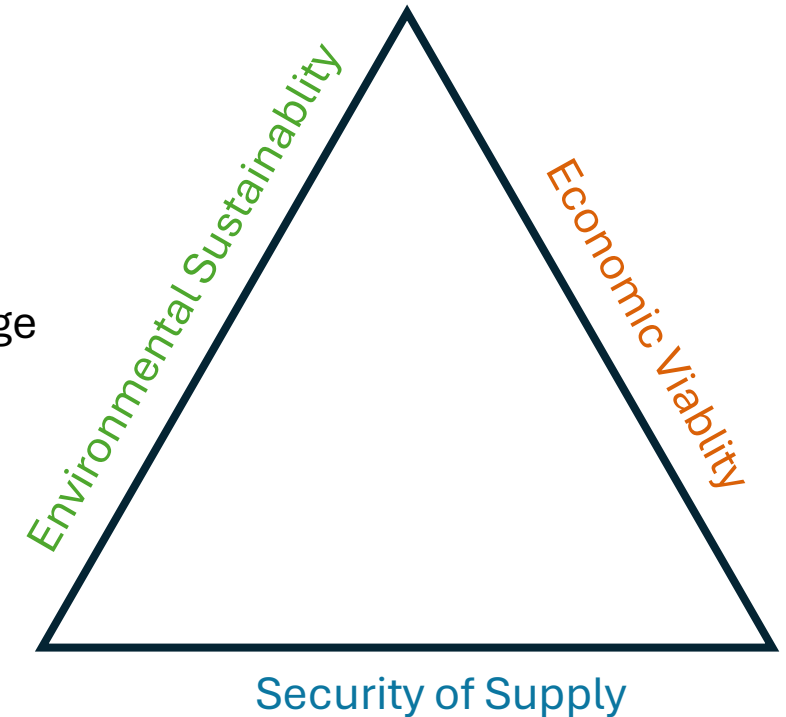
Case: Reserve Power Plants

Summary and Outlook

- **Science:** Bio and E-fuels reduce GHG emissions by 80+%
- **Market:** Privat sector invests with high TRL- technology drop-in ready
- **Regulation:** propagates renewable fueling, does not forbid fossil fuel usage

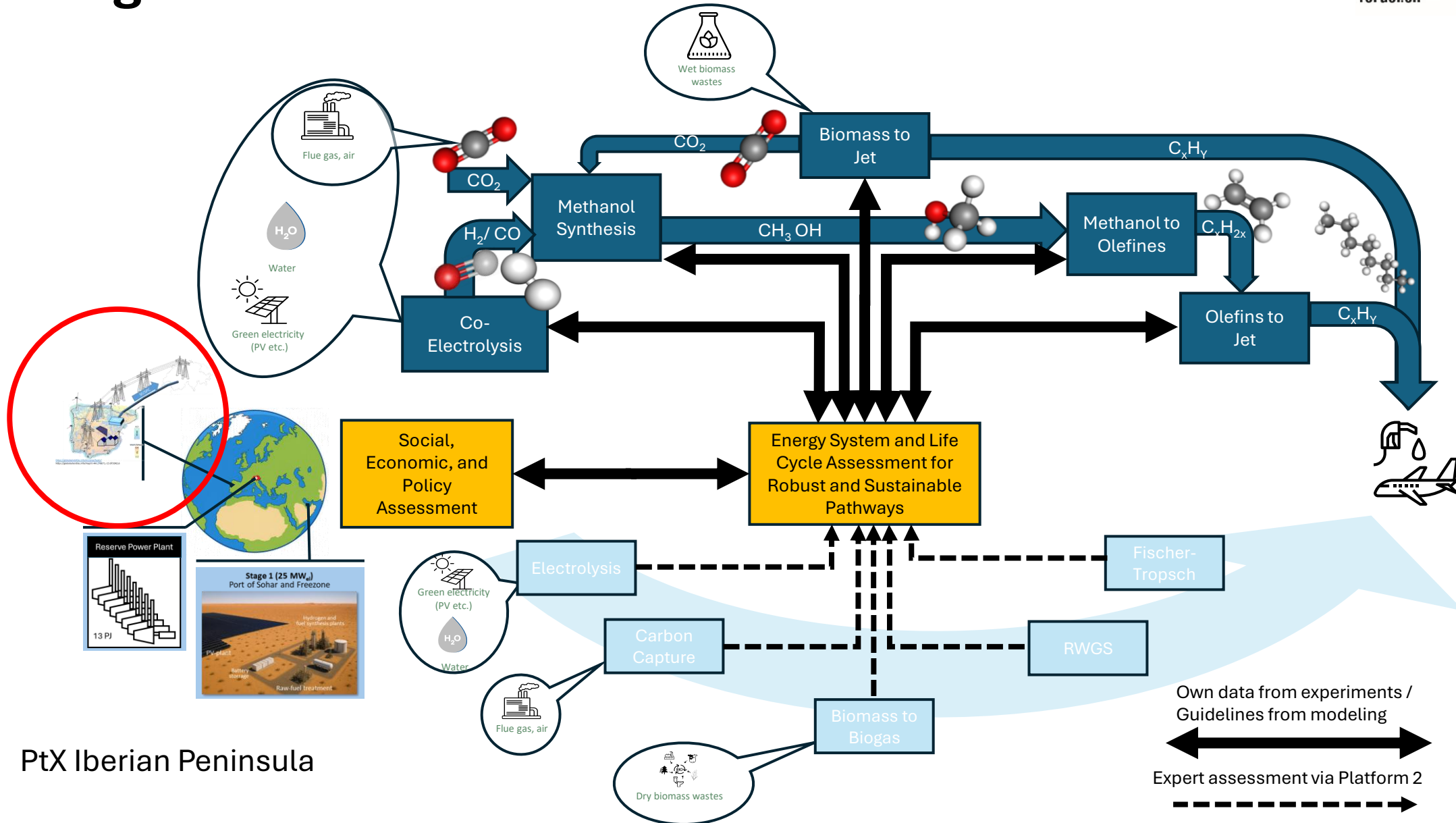
reFuel.ch:

- Supports the use of bio and e-fuels for **environmental sustainability**
- Sees opportunity for strengthening **supply security** when
 - the supply chains for renewable fuels are secured (imported and domestically produced)
 - the use of such fuels is mandated.
- Sees the **economic viability** despite high opex for renewable fuels if capex is low

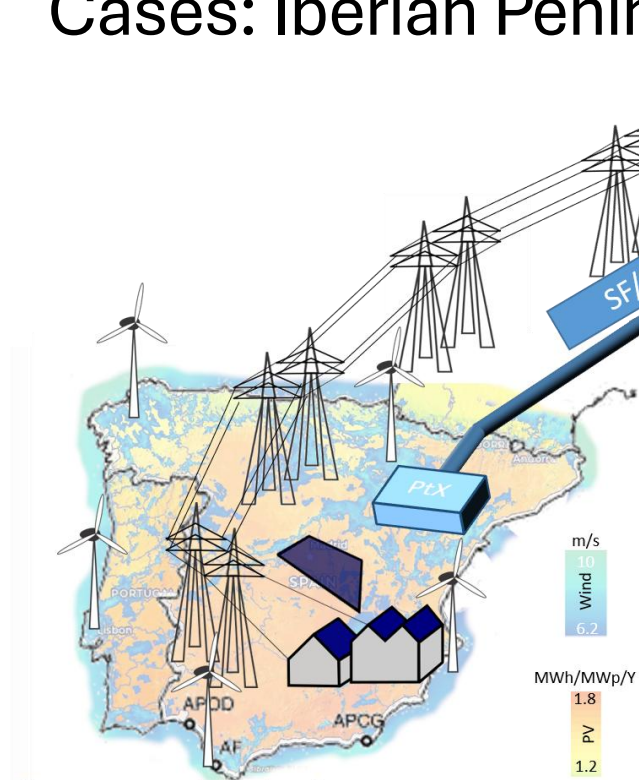


Outlook: Get operators perspective @ Next Round Table (November 10. 2026, On-line)

High-level introduction



Cases: Iberian Peninsula



<https://globalwindatlas.info/en/area/Spain/>
<https://globalsolaratlas.info/map?c=44.276671,-15.073242,6>

- **Science:** Country Risk Iberian Peninsula (1984-2025) **moderate 35 v 100**
- **Market:** Privat sector **does NOT invest** with high TRL- technology (H₂)
- **Regulation:** Import of certificates/blended molecules is an inter-office issue (Customs, Environment, Energy)

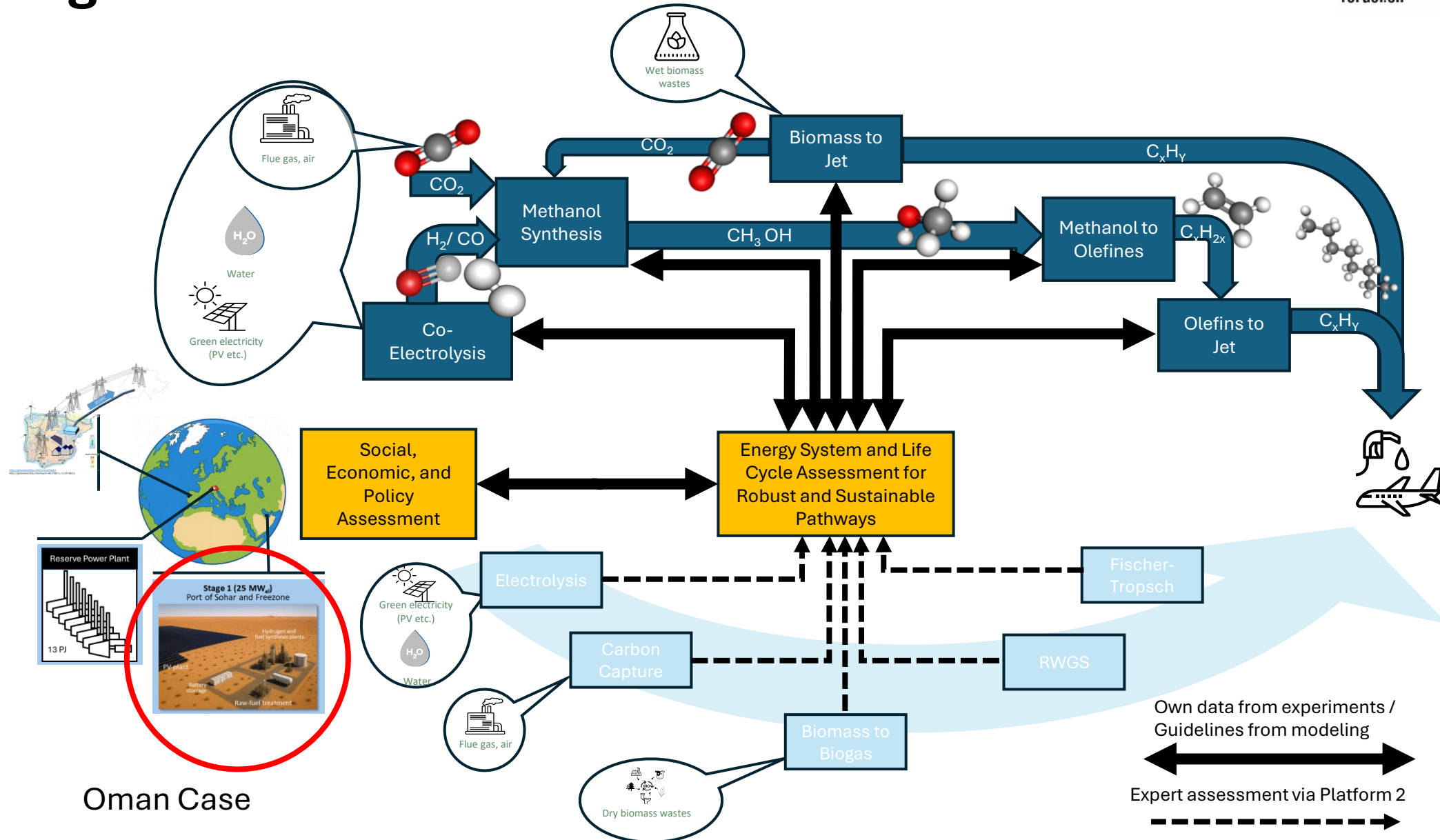
→ Implementation partner changed strategy, slow development of Swiss hydrogen market.

→ WP 2 keeps Iberian Peninsula on the list (Deliverable 2.8 Scenario results national CGE for Spain Q4/27)

→ Regulatory challenges similar to Oman case

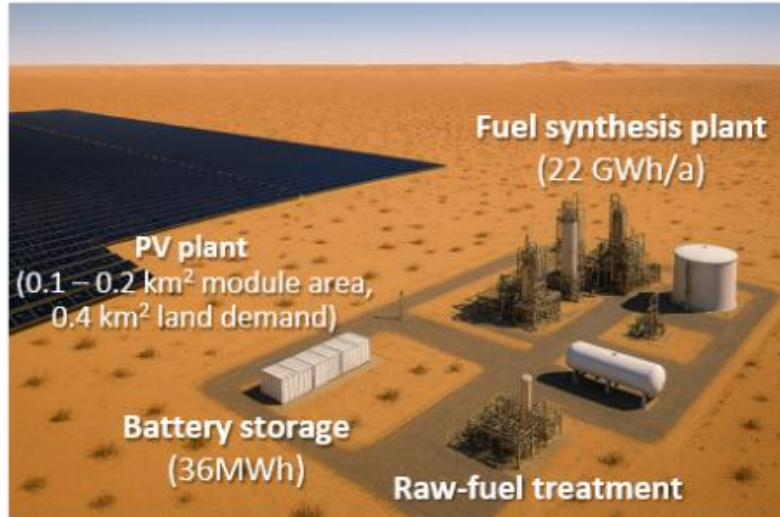
Case activities on hold

High-level introduction



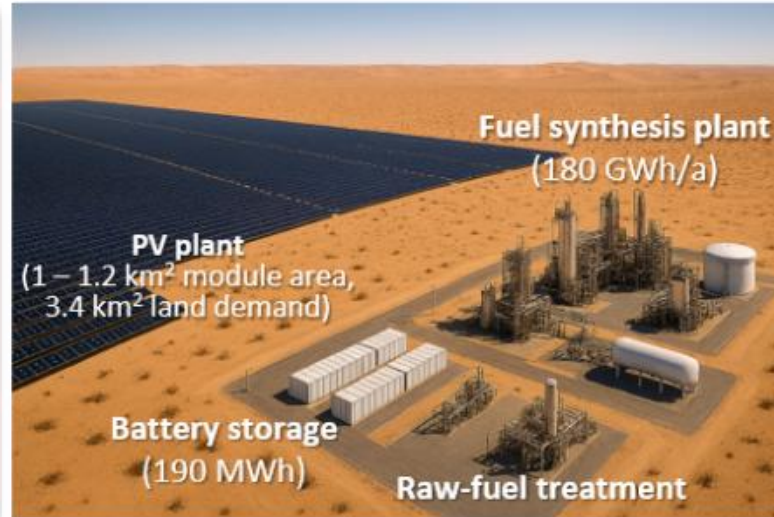
Oman Case: Sustainable fuel upscaling

Stage 1 (25 MW_{el})
Port of Sohar and Freezone



Invest: 70 - 75 Mio CHF
Operation: 2030 - 2040

Stage 2 (200 MW_{el})
Duqm (Hydrom auction)



Invest: 300 - 320 Mio CHF
Operation: 2035 - 2055

Stage 3 (2'000 MW_{el})
Duqm (Hydrom auction)



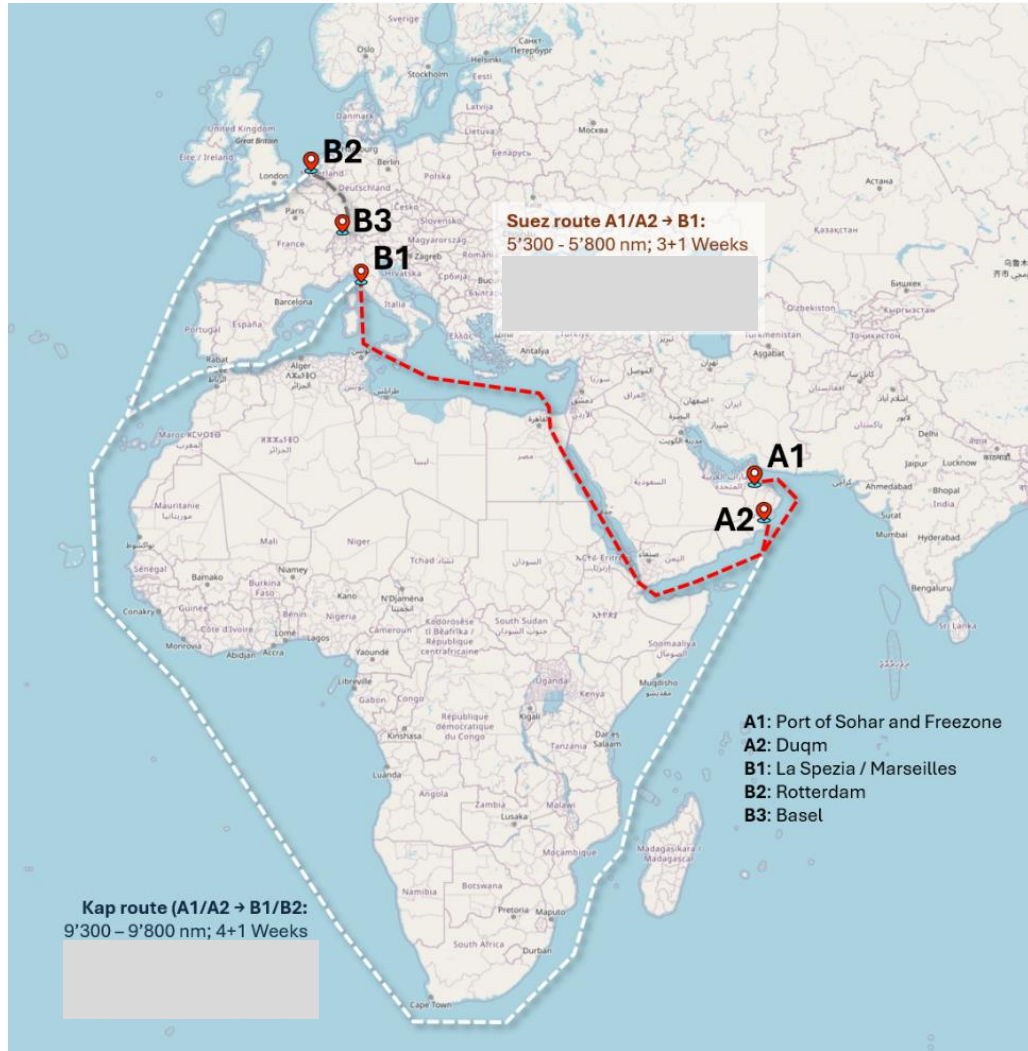
Invest: 2'000 - 2'200 Mio CHF
Operation: 2040 - 2060

AI generated pictures

- Owned by a Swiss company for the supply of Switzerland
- Production of renewable fuels of non-biogenic origin (RFNBO)
- Certified under the ISCC-EU Renewable Energy Directive III (RED-III)

Oman Case: Fuel logistics

preliminary results



Stage 1 plant: 20 ISO containers to Basel once a month



Stage 2 plant: Once a month, a 4'000 m³ product tanker to Rotterdam with transfer to a Rhine barge and transported to Basel



Stage 3 plant: One 50'000 m³ tanker shipment per month to Marseille/Fos-sur-Mer and injection into the pipeline

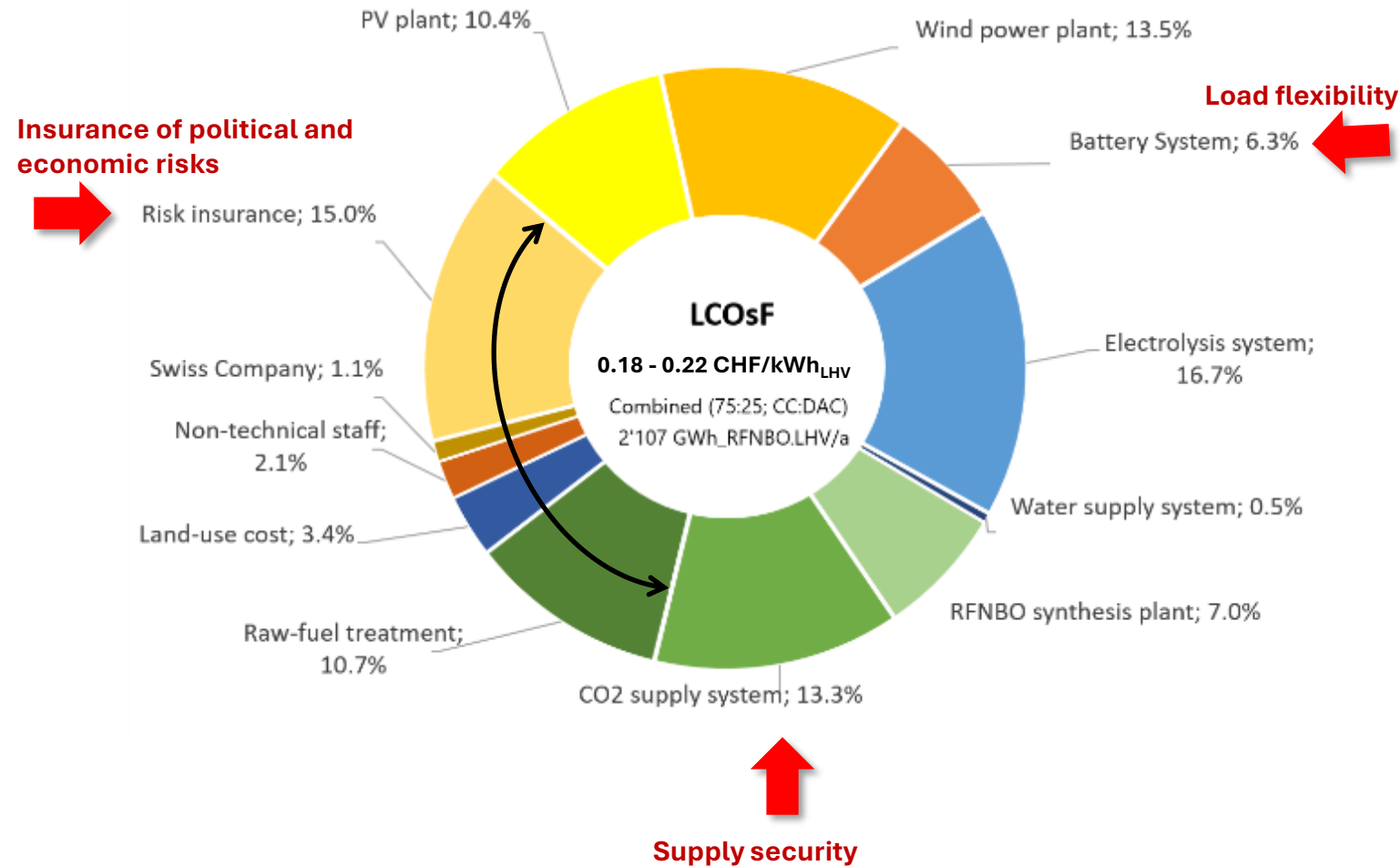


Oman Case: Production costs (LCOsF)

preliminary results

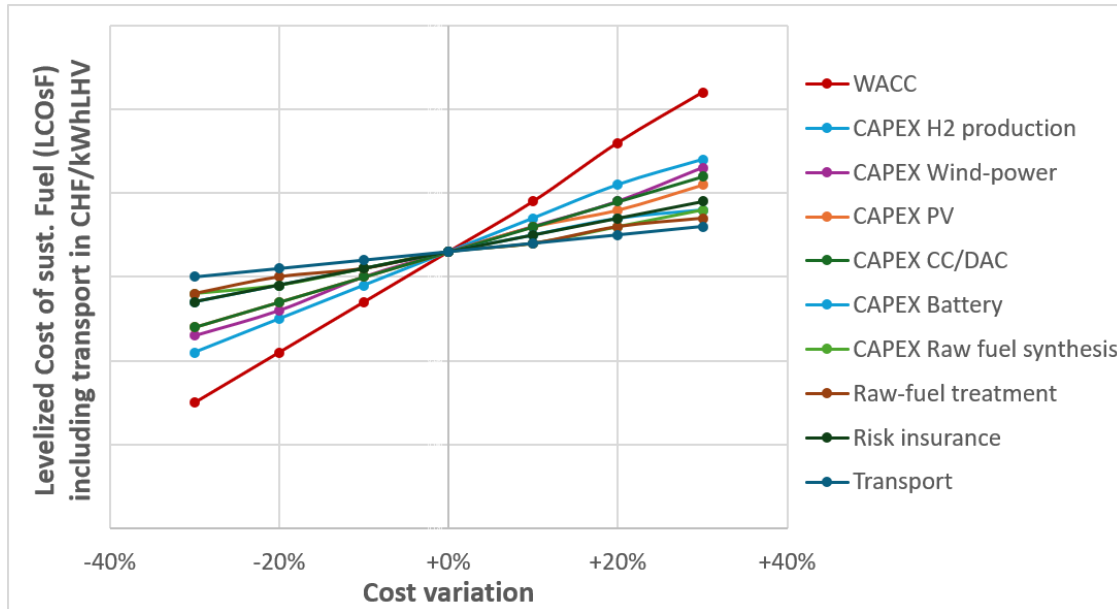
The production costs of electricity-based sustainable fuels consist of various cost components, which were analyzed as part of the pre-feasibility study for the potential locations.

In addition to the cost components listed in the Global PtX Atlas (Fraunhofer Institute IEE), additional cost components were taken into account (black arrow).



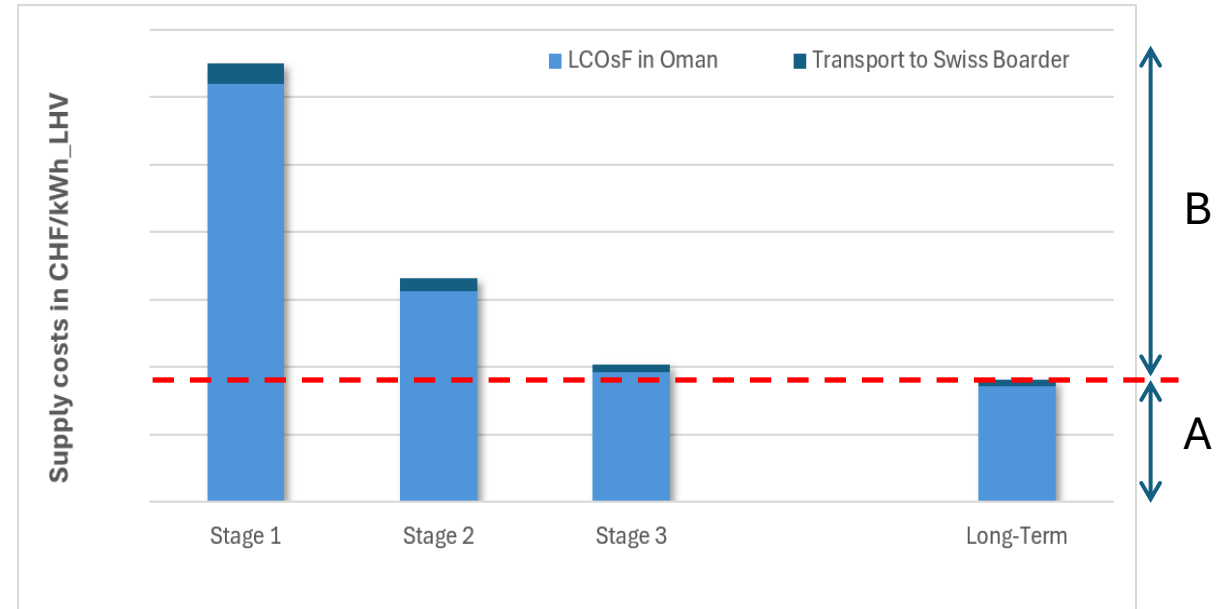
Oman Case: Sensitivities and Market introduction

preliminary results



Sensitivities regarding LCOsF:

WACC (8% as basis) show highest sensitivity



Two-tier Offtake plan:

Tier 1: long-term contract (8 – 12 years)

Tier 2: market integration with:

A: long-term oriented prize

B: levy on remaining fossil fuels

Oman Case: Implementation consortium formation

Development of high-level concepts
3-stage upscaling concept

Development of expert-level concepts
for Stage 1 plant and realization

Development of expert-level concepts
for Stage 2 & 3 plants and realization

Pre-feasibility study

Lead: Empa

**Pre-commercial
organization**
(according Swiss
law)

Lead: Consortium

**Commercial
company**
(according Swiss
law, incl. SPV)

Lead: Consortium

Q4/2026 – Q1/2027

Acknowledgement

The research published in this presentation was carried out with the support of the Swiss Federal Office of Energy as part of



reFuel.ch - Renewable Fuels and Chemicals for Switzerland

reFuel.ch is a consortium sponsored by the Swiss Federal Office of Energy's SWEET programme and is hosted by Empa.

The authors bear sole responsibility for the conclusions and the results presented.

