



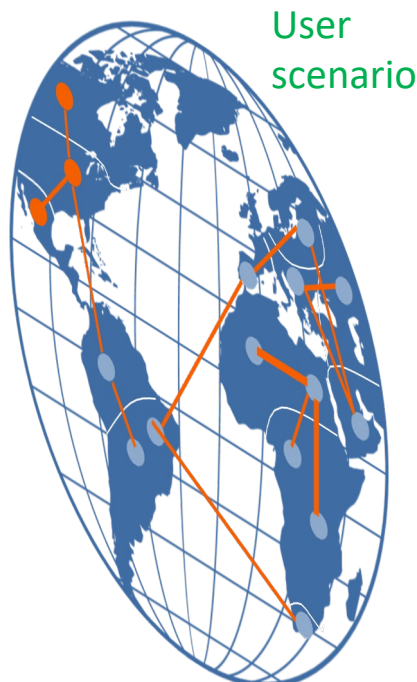
Romain Sacchi :: Postdoctoral researcher :: Technology Assessment :: Paul Scherrer Institut

# Prospective life-cycle assessment databases based on custom scenarios

21.08.2023



# User-generated scenarios



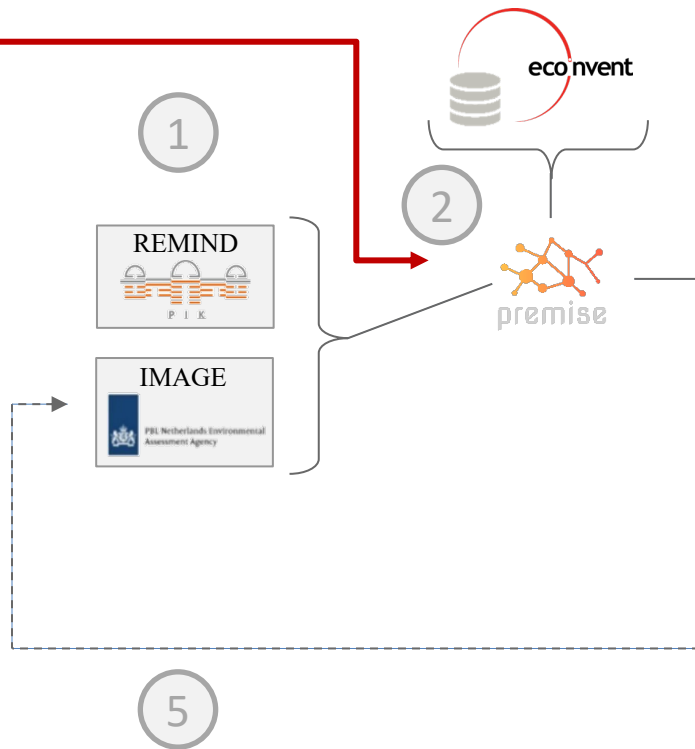
Maintain a coherent storyline

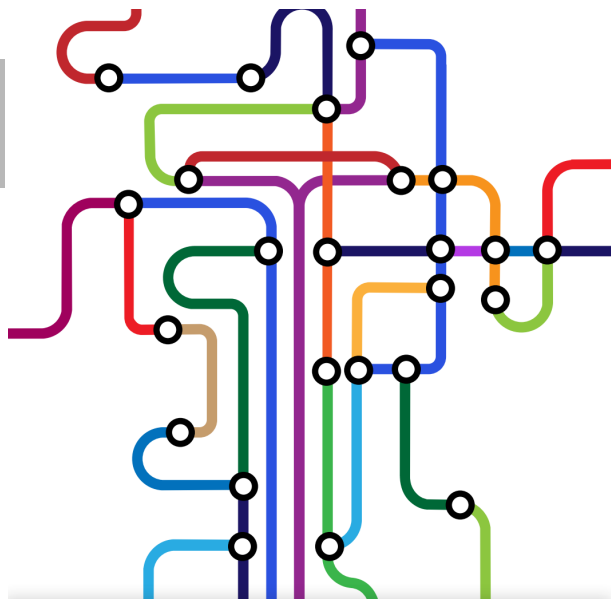
*datapackage.json*

```
{
  "profile": "data-package",
  "name": "ammonia-prospective-scenarios",
  "title": "Ammonia decarbonisation pathways...",
  "description": "Implementation of...",
  "source": "Boyce, J. C. (2022). Ammonia...",
  "version": "0.0.1",
  "contributors": [
    {
      "title": "Johanna C. Boyce",
      "email": "some.email@umail.leidenuniv.nl"
    }
  ],
  "dependencies": {
    "premise": ">=1.3.0"
  },
}
```

*Scenario data**Inventories**Configuration*

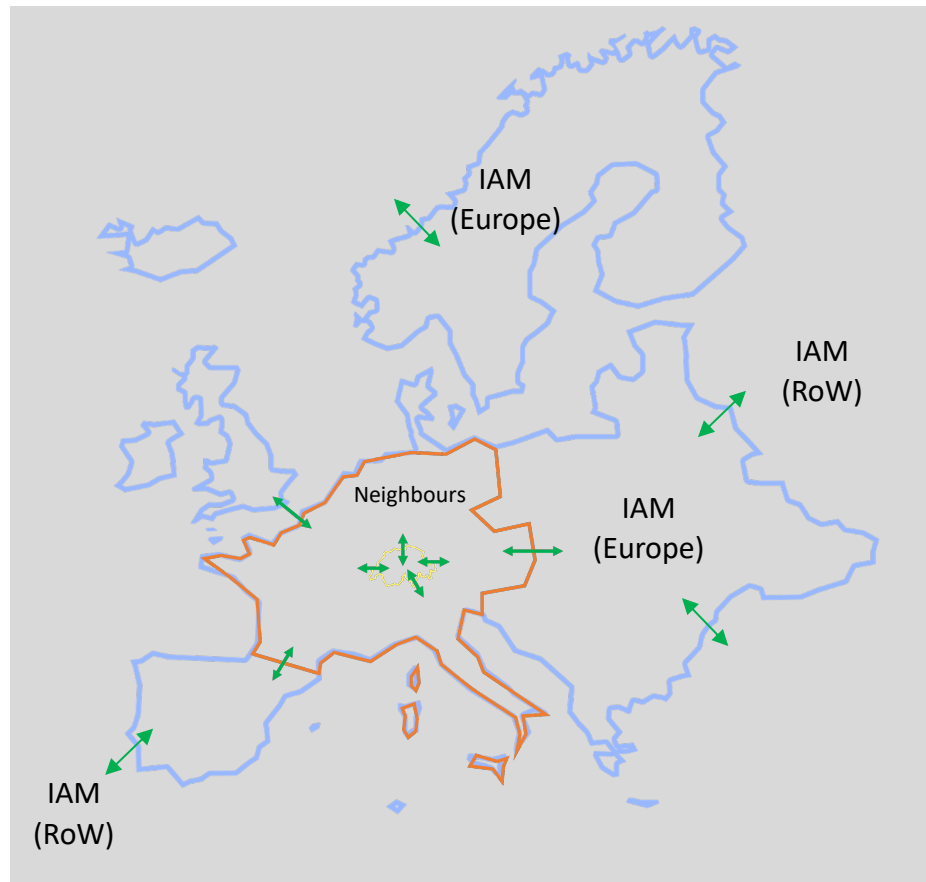
zenodo





## PERSPECTIVES ÉNERGÉTIQUES 2050+

RÉSUMÉ DES PRINCIPAUX  
RÉSULTATS



## Multiple scenarios to reach carbon neutrality by 2050.

### **Business As Usual scenario**

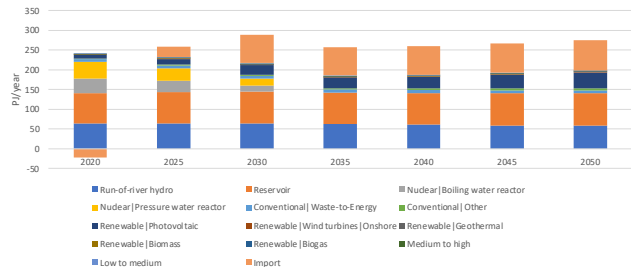
- a continuation of measures and instruments in place until the end of 2018
- does not foresee additional or more stringent measures.
- The development of technologies (efficiency, installations, devices, vehicles, appliances, etc.) follows autonomous technical progress and are based on the legal bases in force at the end of 2018.

### **ZERO Basis**

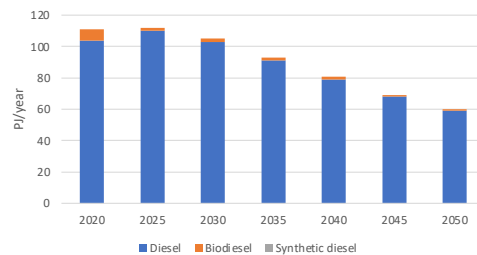
- foresees the rapid and comprehensive improvement of energy efficiency
- strengthening of the electrification of the energy system.
- ICEVs are replaced by BEVS
- fuel heaters are replaced by electric heat pumps and renewable energy heat networks.
- Electricity-based energy (synthetic fuels and combustibles, hydrogen) are also being used more
- Switzerland is able to cover its electricity consumption with domestic production. The remaining greenhouse gas emissions in the areas of industry and agriculture are offset by carbon capture and storage technologies.

# The Swiss case

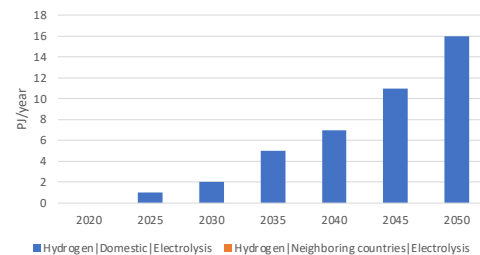
Consumption mix - Business As Usual



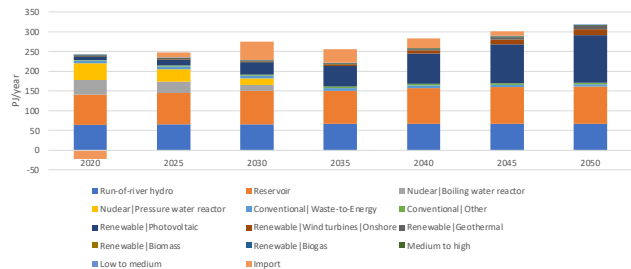
Diesel blend - Business As Usual



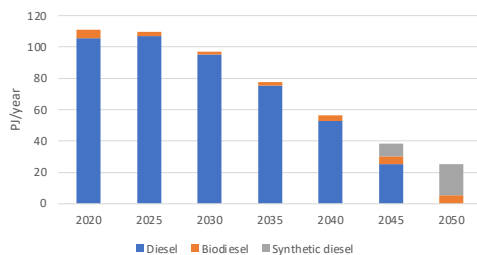
Hydrogen blend - Business As Usual



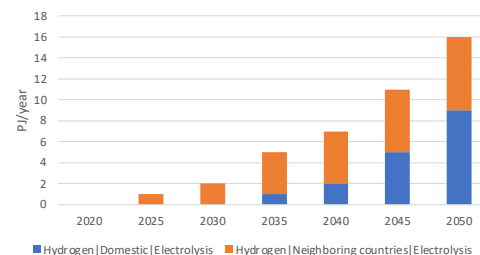
Consumption mix - ZERO Basis



Diesel blend - ZERO Basis

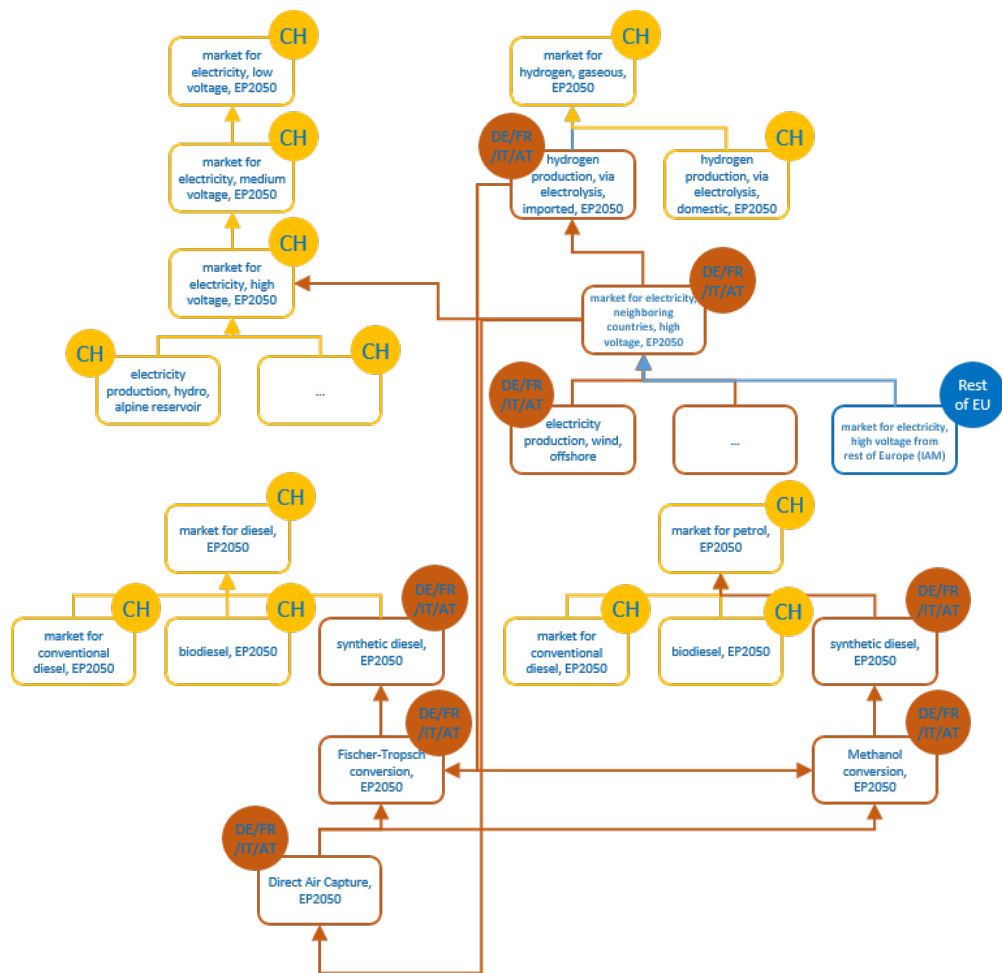


Hydrogen blend - ZERO Basis



# The Swiss case

- Automatic building of datasets network
- Adjusting efficiency, emission factors
- Relinking
- Exchanged flows change over time and across scenarios
- Efficiencies change over time and across scenarios



## Your turn!

- Either implement the Swiss scenarios and create prospective databases for each narrative.
- Or create your own scenario.

**In any case, adjust the level of complexity to finish on time.**

```
from datapackage import Package
```

```
fp = https://raw.githubusercontent.com/premise-community-  
scenarios/energy-perspective-2050-  
switzerland/main/datapackage.json
```

```
ep2050 = Package(fp)
```

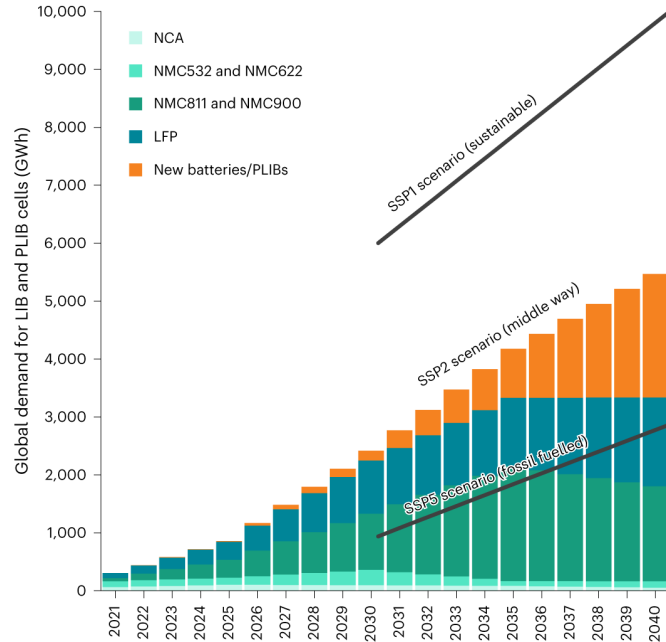
```
ndb = NewDatabase(  
    ...,  
    external_scenarios=[  
        ep2050  
    ]  
)
```



## Future battery production

Degen, F., Winter, M., Bendig, D. et al. Energy consumption of current and future production of lithium-ion and post lithium-ion battery cells. Nat Energy (2023).

<https://doi.org/10.1038/s41560-023-01355-z>



1. Create future battery mix
2. Adjust electricity and heat demand for cell manufacturing
3. Adjust electricity mix (by matching with Global scenario)
4. Adjust heat source (natural gas, heat pump)
5. Estimate the three different scenarios on the GWP of producing a BEV.

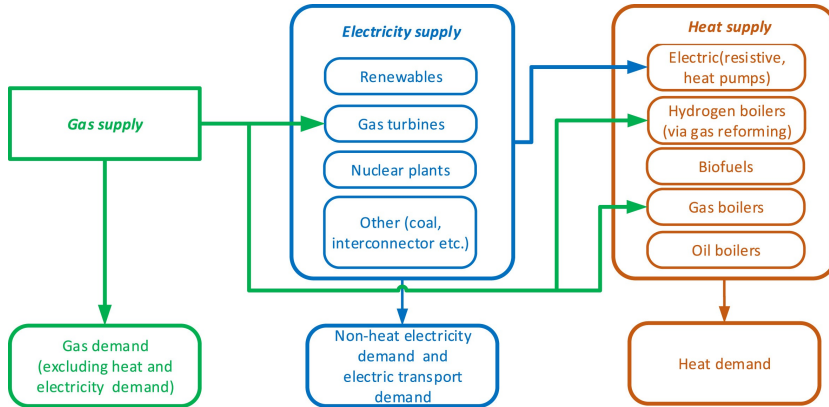
[illegible]

1. Phase out ozone-depleting gases according to the targets set by the Montreal Protocol.
2. Targets in time differ by country and application.
3. Estimate the benefits of the Montreal Protocol on the production of commodities previously relying on the use of ODP gases.

## Heat supply for Great Britain

Ali Ehsan, Robin Preece,

Quantifying the impacts of heat decarbonisation pathways on the future electricity and gas demand, Energy, 2022, <https://doi.org/10.1016/j.energy.2022.124229>.



1. Create time-specific heat mix.
2. Adjust efficiency of heat pumps.
3. Adjust electricity mix.
4. Adjust hydrogen mix.
5. Estimate the GHG emissions and primary energy demand relative to a BAU scenario.

Technology Assessment Group

<https://www.psi.ch/en/ta>

Questions?



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