

CoSi and CROSS

SWEET Conference 2024

Adriana Marcucci, Hannes Weigt

Agenda

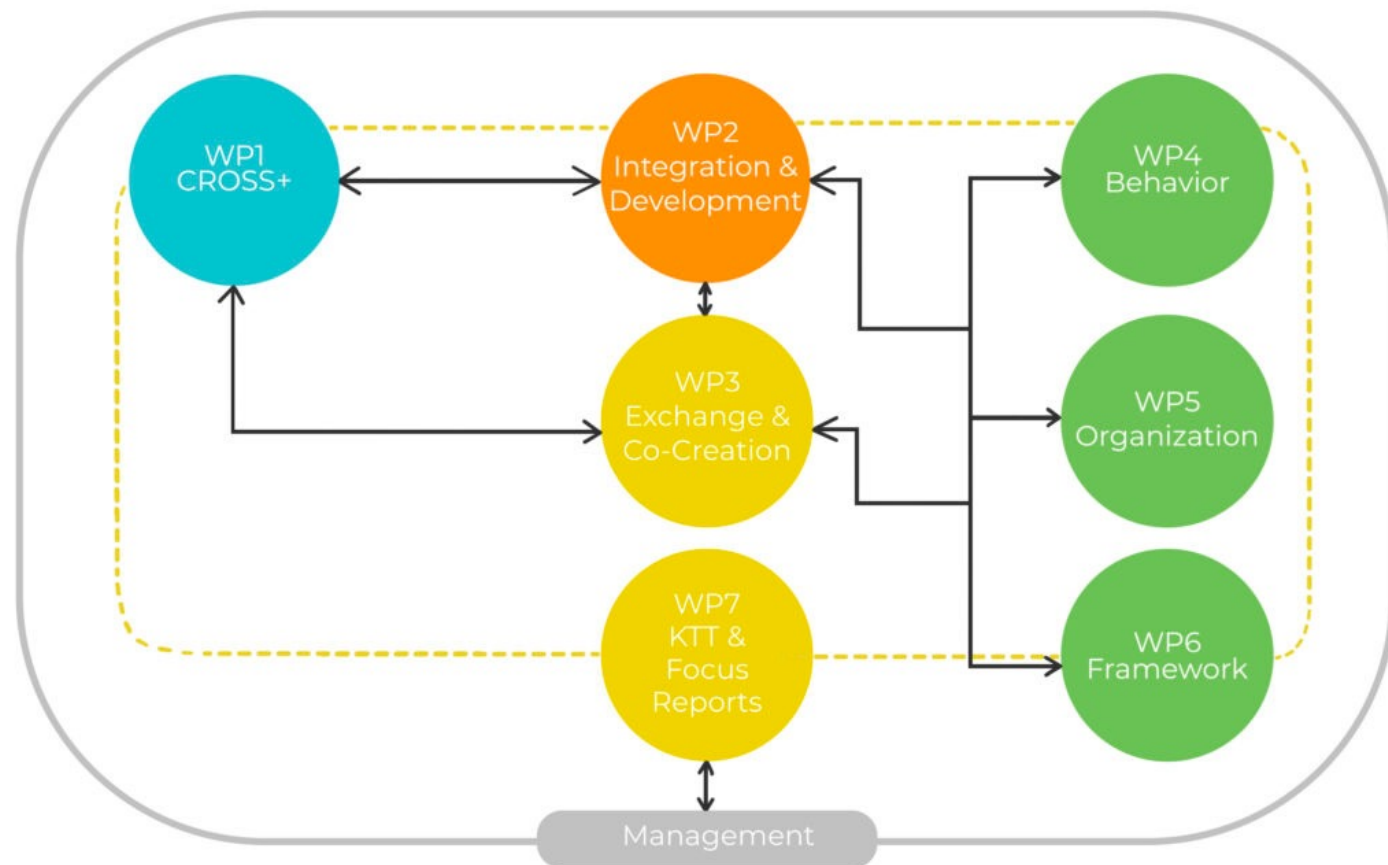
-
1. CoSi at a Glance
 2. From CROSS to CoSi
 3. CROSS Results
 4. Next steps
-

CoSi:

- Links energy modeling and SSH research
- Provides Tools for Integration
- Provides a platform for exchange
- Test Lab for new model approaches
- Window into the Swiss future

More Information at:

www.sweet-cosi.ch/



CROSS becomes CROSS+

CROSS activities are extended and become WP1 in CoSi:

- Provide an ***open energy research data platform*** for sharing model inputs and research outputs (***CROSSDat*** and ***CROSS Catalog***)
- Provide a systematic description of scenarios (**CROSS Scenarios**) and a platform for comparing findings from scenario analyses (**CROSS Results**)
- Define set of harmonized **assumptions** for energy system models
- Conduct the Swiss Household Energy Demand Survey (**SHEDS**)
- **Monitor** relevant developments for the energy transition
- Develop a **common data structure** for easier exchange

More Information at: <https://sweet-cross.ch/>

CROSS model result comparison

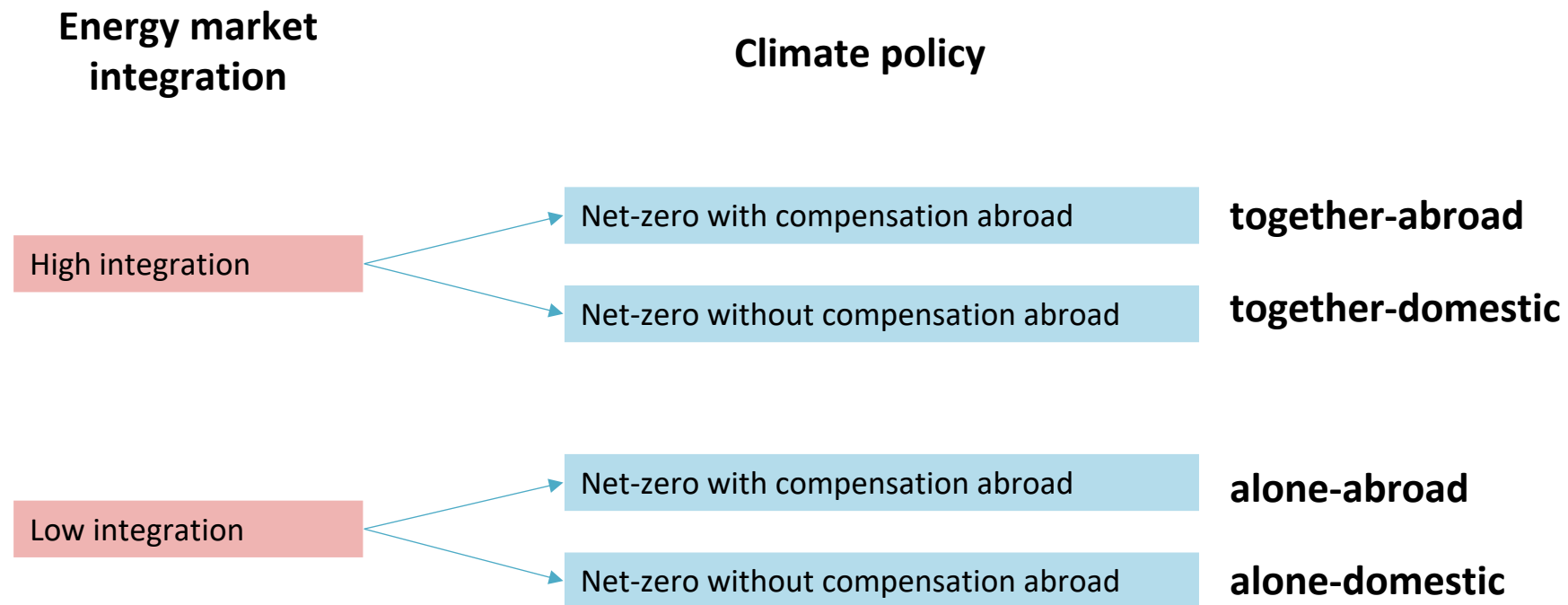
Run the same scenarios with similar models

- Different realizations: uncertainty (only model uncertainty)
- Common and uncommon
- Reasons for them

Ongoing process

- New questions
- New scenarios

CROSS scenarios

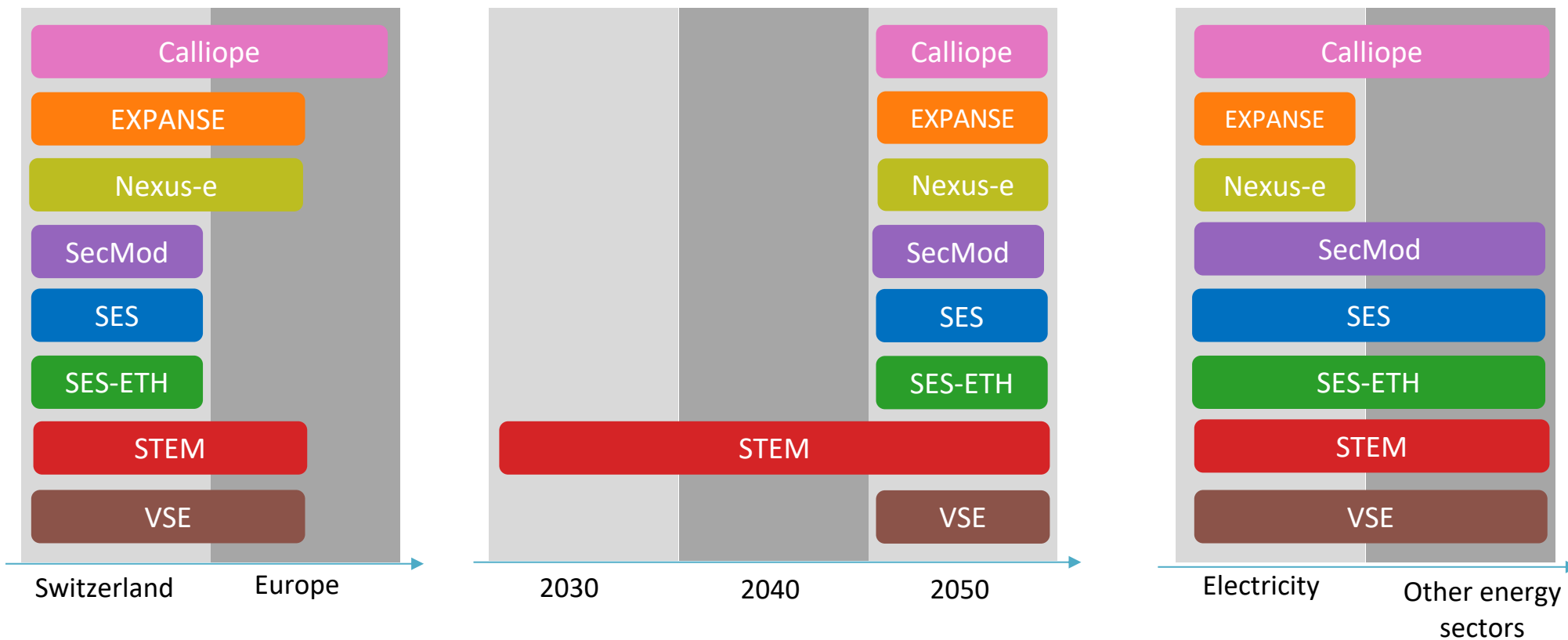


Complete documentation and data: <https://sweet-cross.ch/scenarios/>

Models and Studies: Overview

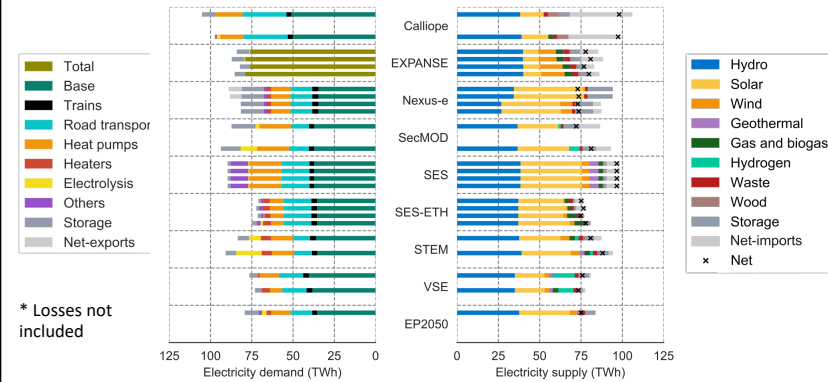
	Model / study name	Documentation	Model page
Calliope	Calliope, TU Delft	Link	Link
EXPANSE	Expanse, UNIGE	Link	
Nexus-e	Nexus-e, ETH Zurich	Link	Link
SecMod	SecMod, ETH Zurich	Link	
SES	Swiss Energy Scope, EPFL		Link
SES-ETH	Swiss Energy Scope, ETH Zurich	Link	
STEM	Swiss TIMES Energy Systems Model (STEM), PSI	Link	Link
VSE	Energiezukunft 2050, EMPA and VSE	Link	
EP2050	Energy Perspectives 2050+ (EP 2050+), Zero Basis scenario, Swiss Federal Office of Energy	Link	

Models and Studies: Scale and Resolution

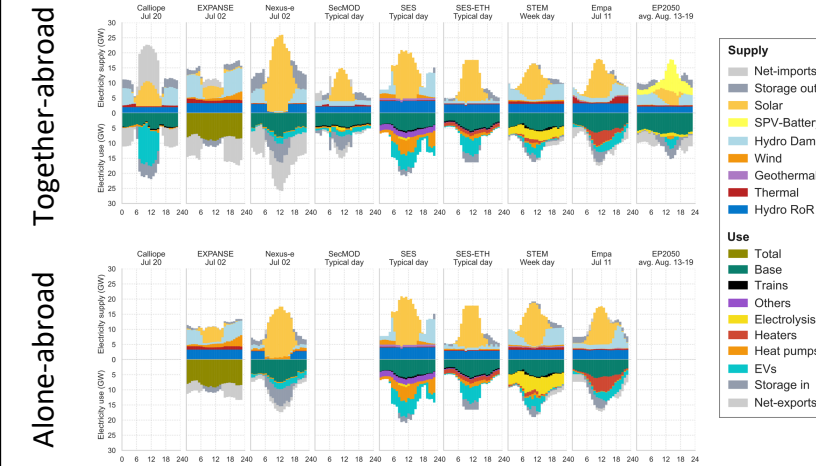


What did we compare?

Annual electricity demand and supply



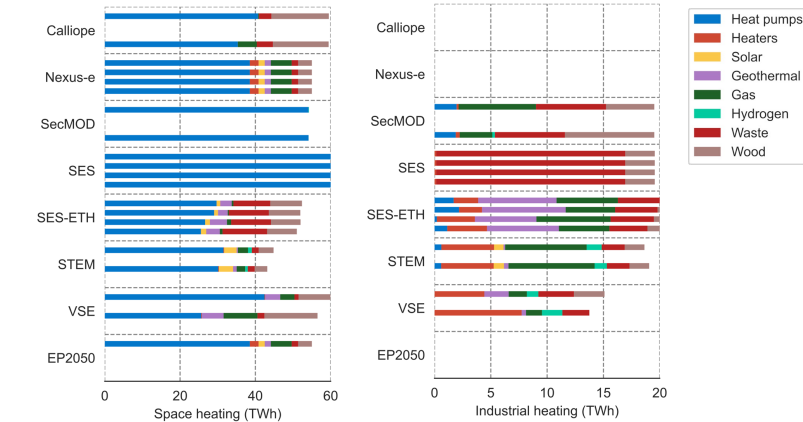
Hourly electricity supply and demand



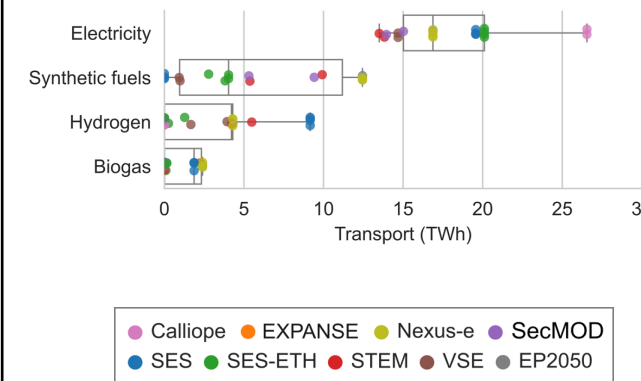
Flexibility provision

- What replaces solar at night and in winter?
- Who takes the excess electricity?

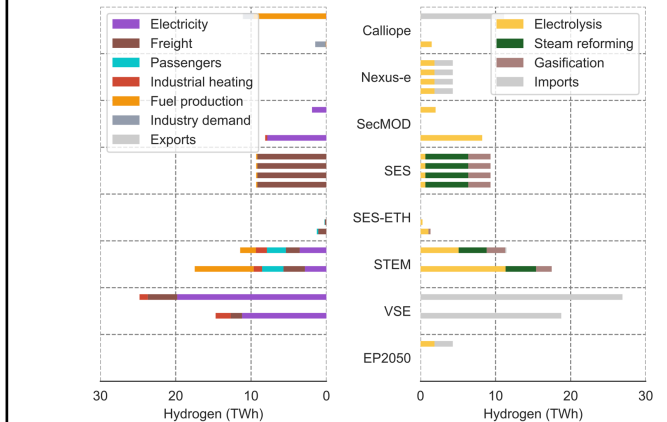
Space heating and industrial heat



Transport

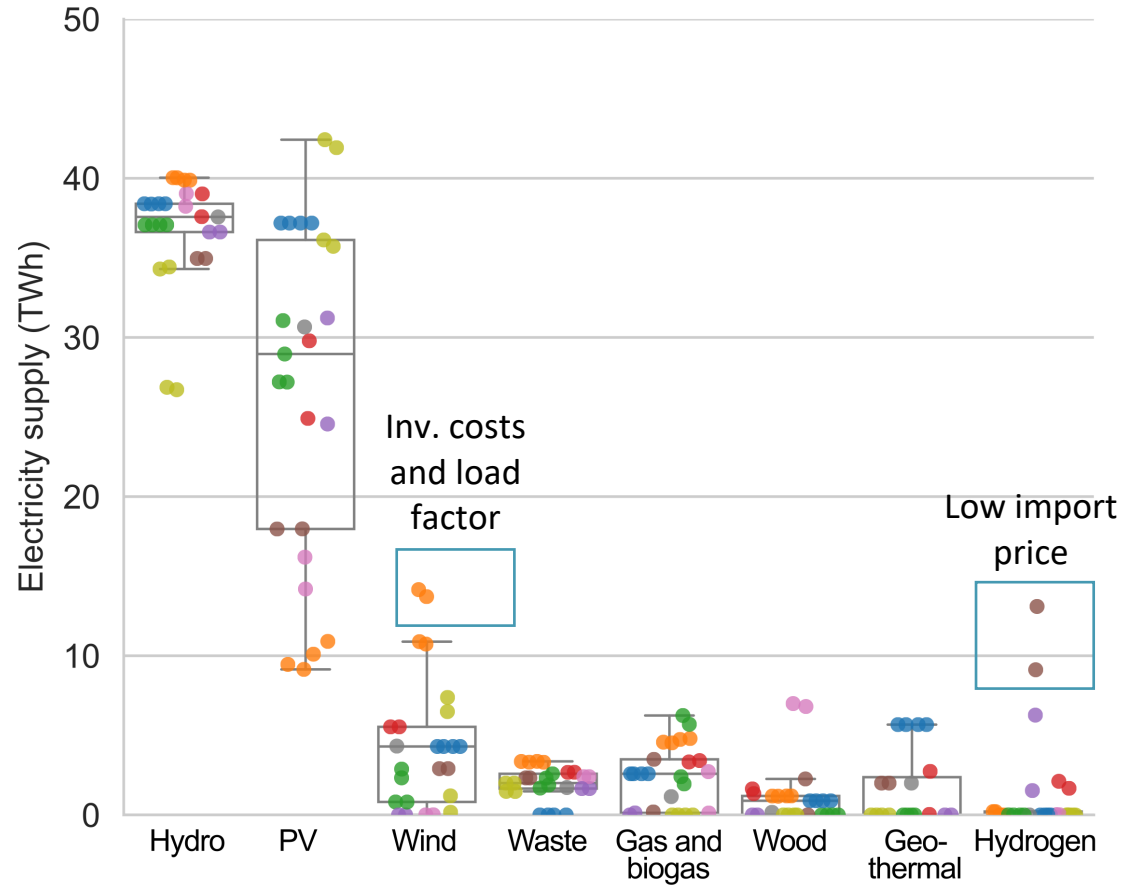


Hydrogen

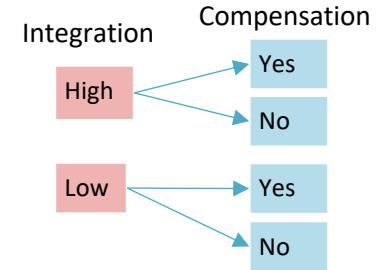
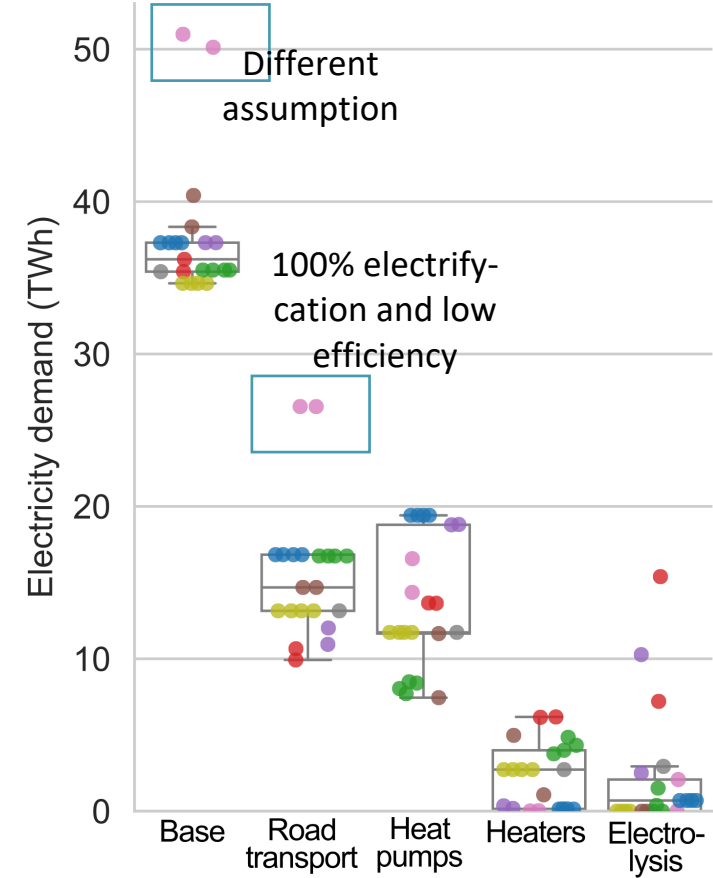


Annual electricity supply and demand (2050)

Electricity supply (2050)

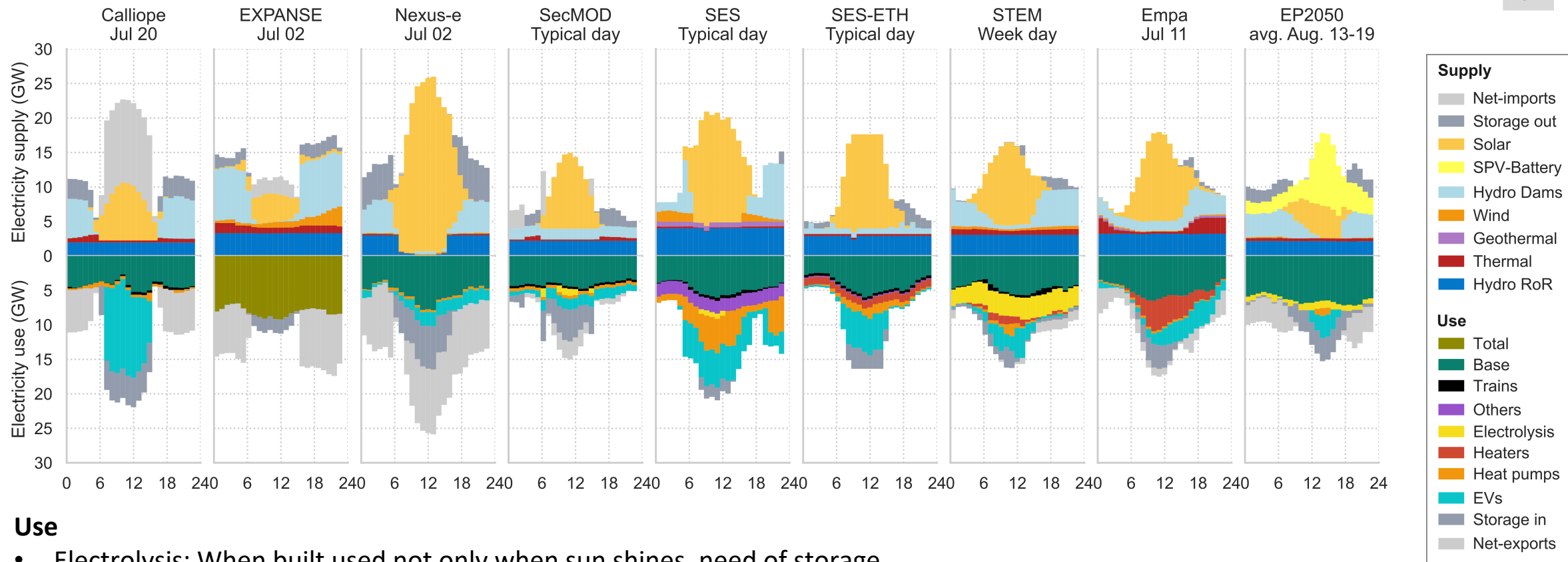
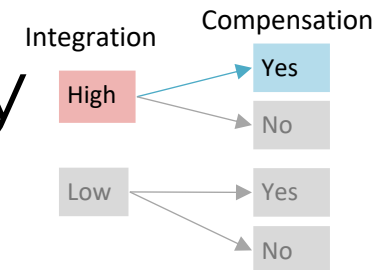


Electricity demand



● Calliope ● EXPANSE ● Nexus-e ● SecMOD ● SES ● SES-ETH ● STEM ● VSE ● EP2050

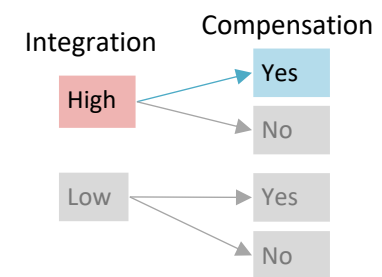
Hourly electricity demand and supply



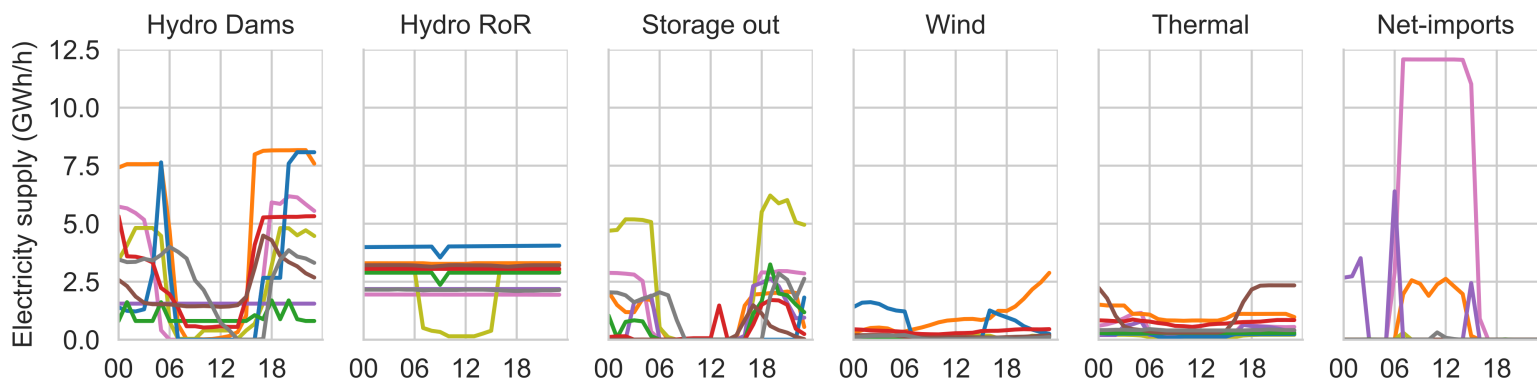
Use

- Electrolysis: When built used not only when sun shines, need of storage
- Electricity uses for excess solar: EVs, Heat pumps, Heaters, Trade
- Pumped hydro and imports:
 - Detailed representation of Europe: Pumped hydro: Switzerland \approx Battery for Europe
 - No detailed representation of Europe: Flexibility provider

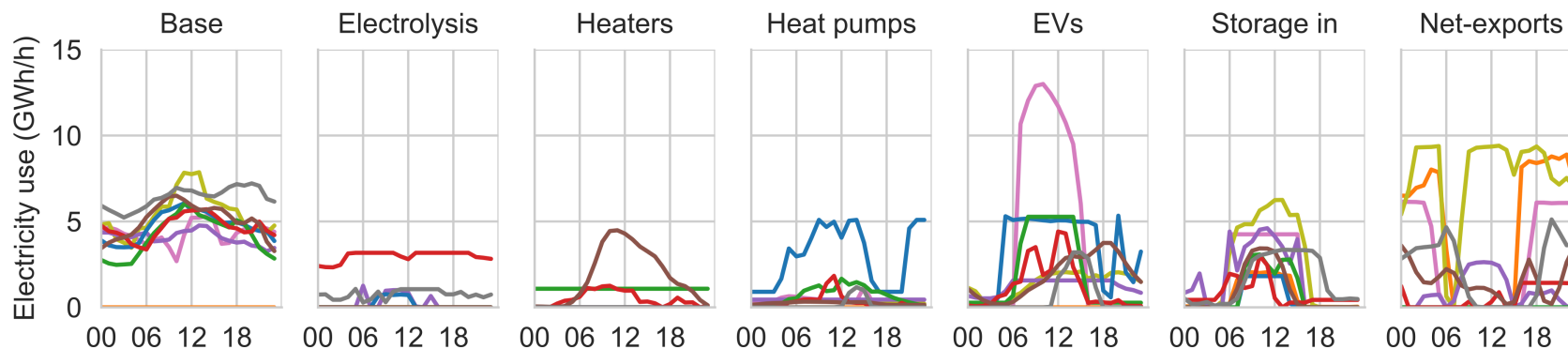
Flexibility provision



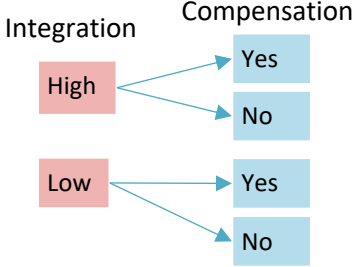
What replaces solar at night?



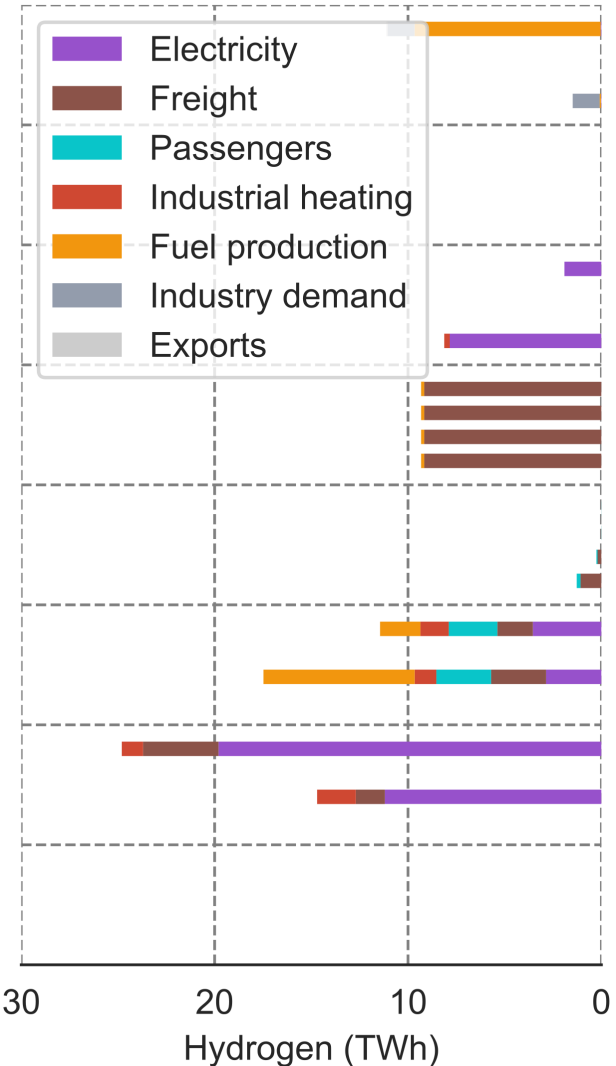
Excess production at midday?



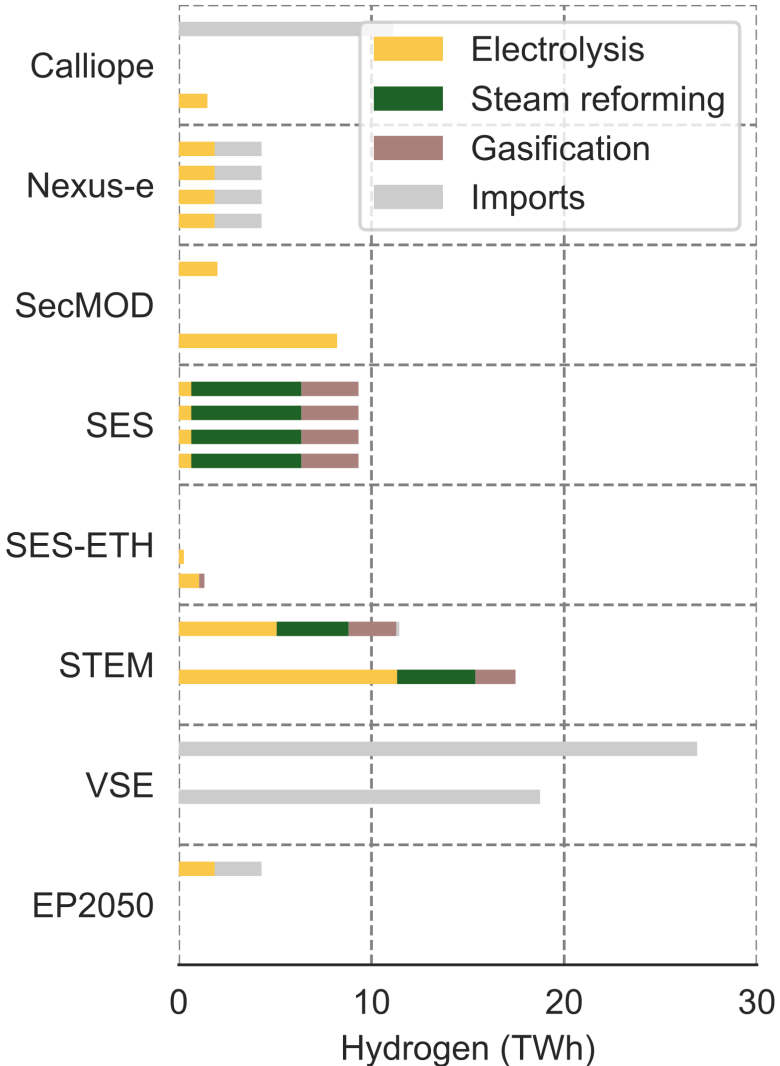
Hydrogen



Hydrogen use (2050)



Hydrogen supply (2050)



Learnings and Open Questions

Commons and less commons

- Some of the less commons are driven by model assumptions. E.g. COP of heat pumps, efficiency of electric vehicles
- Future work: Additional “harmonized” parameters with min and max values

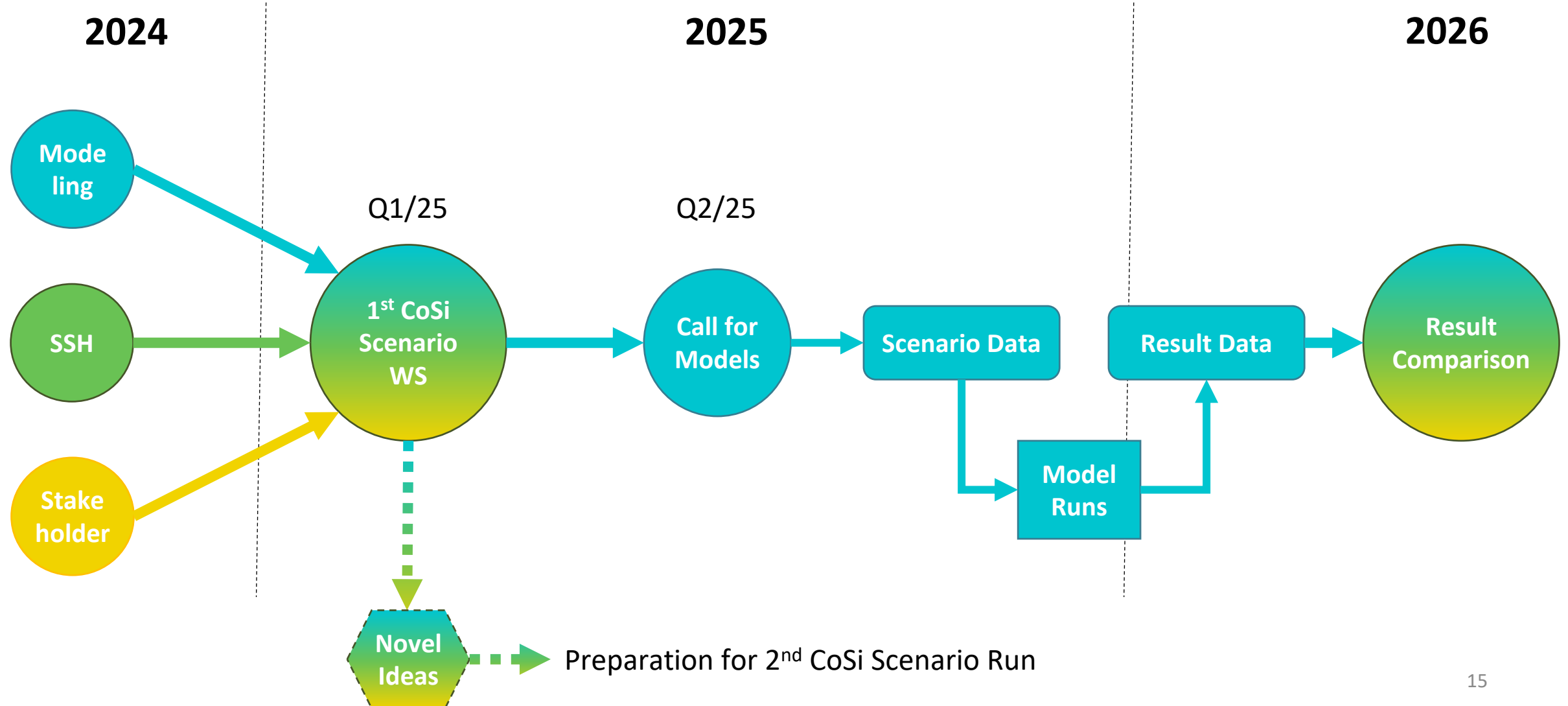
Scenario definition: Domestic vs. abroad

- No large differences in energy: innovative, DAC
- What about the costs?

Further analysis:

- H2 production and use
- Role of flexibility
 - A lot vs. little flexibility in EVs
- Installed capacities vs. production (not in current data)
- Biomass use (not in current data)

Towards the 1st CoSi Scenario



Thank you for your attention

- Hannes Weigt, CoSi coordinator, hannes.weigt@unibas.ch
- Adriana Marcucci, CROSS coordinator, adriana.marcucci@esc.ethz.ch
- Francesco Sanvito, Calliope model, F.Sanvito@tudelft.nl
- Zongfei Wang, EXPANSE model, Zongfei.Wang@unige.ch
- Jared Garrison, Nexus-e model, garrison@fen.ethz.ch
- Florian Baader and Niklas Nolzen, SecMod model, nnolzen@ethz.ch
- Gabriel Wiest, SES model, gwiest@ethz.ch
- Gianfranco Guidati, SES-ETH model, gianfranco.guidati@esc.ethz.ch
- Evangelos Panos, STEM model, evangelos.panos@psi.ch
- Arijit Upadhyay, Empa model (VSE study), Arijit.Upadhyay@empa.ch