The KBOB electricity model for buildings LCA: characteristics and effects

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treeze Ltd.

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Mountain lodge Monte Rosa/VS

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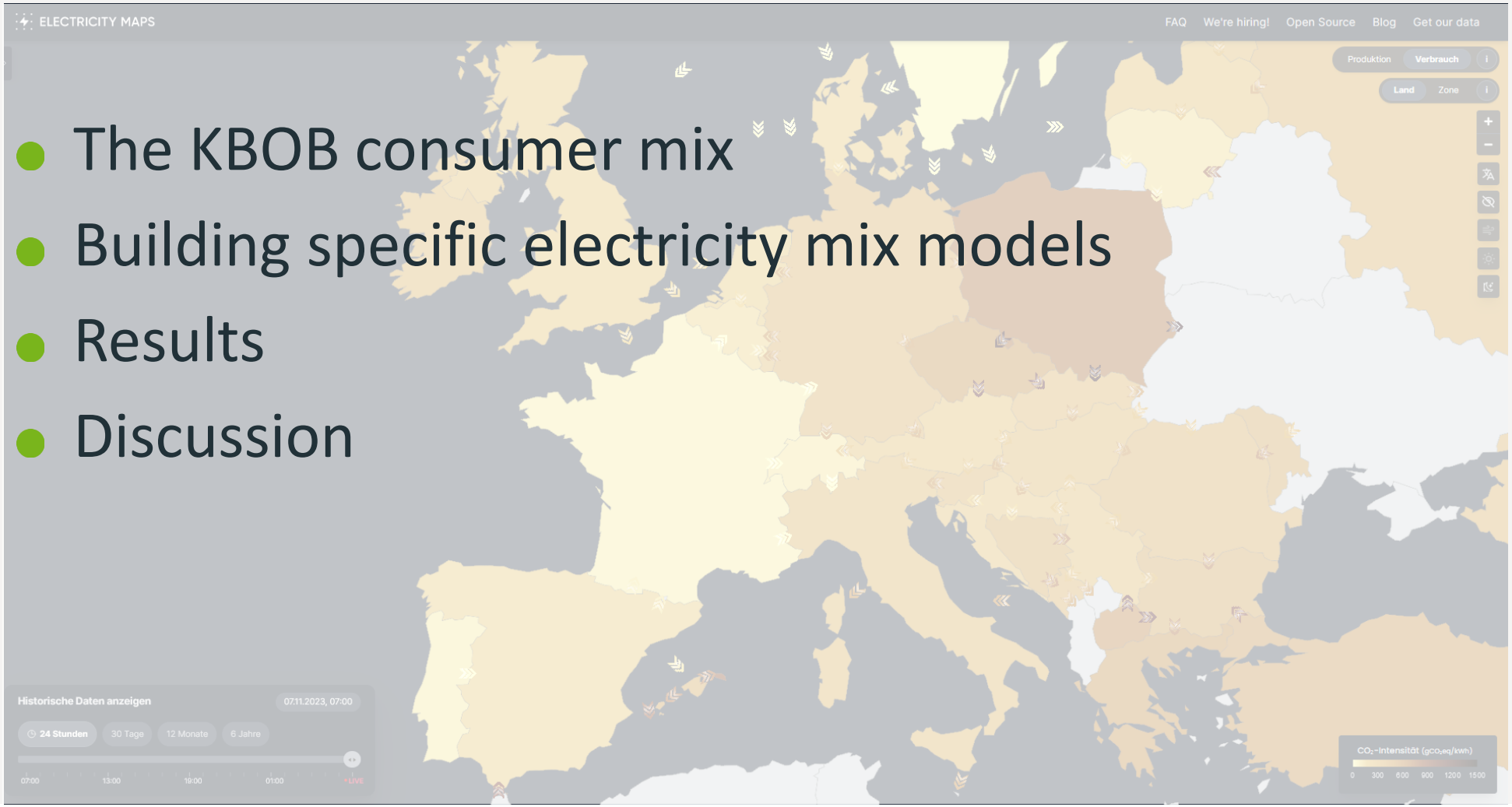
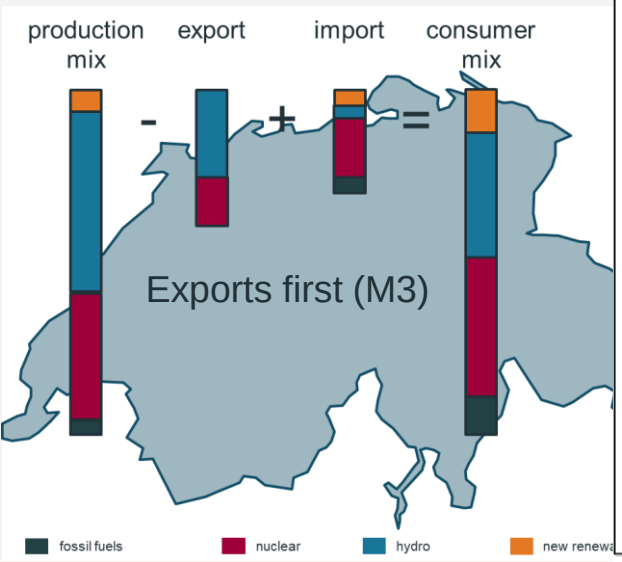
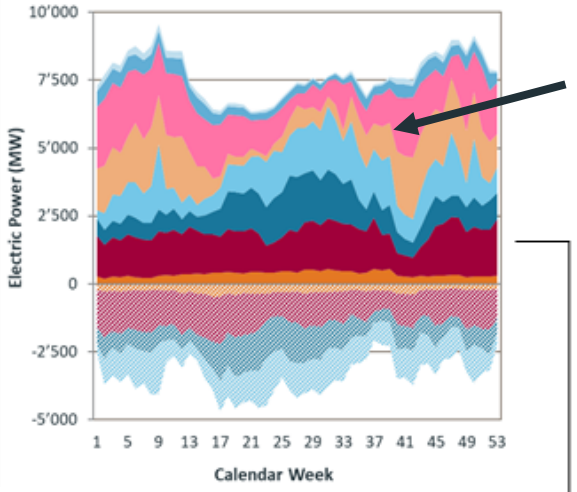


- The KBOB consumer mix
- Building specific electricity mix models
- Results
- Discussion

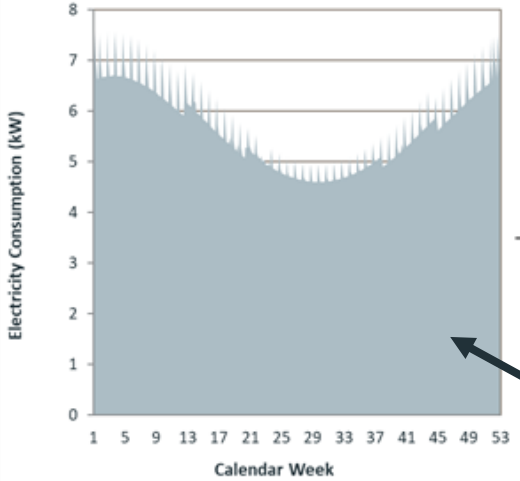
Electricity mix model “physical production and commercial trade” (KBOB-model)



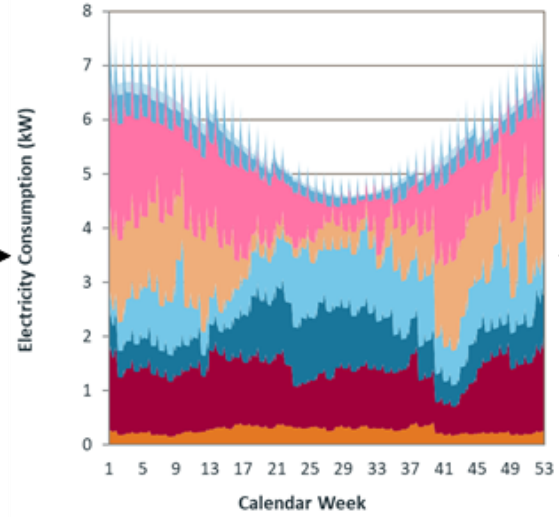
- Import Reservoir hydro
- Import Run-of-river hydro
- Import Nuclear
- Import Conv. thermal & renewable
- Reservoir hydro
- Run-of-river hydro
- Nuclear
- Conv. thermal & renewable
- Export Reservoir hydro
- Export Run-of-river hydro
- Export Nuclear
- Export Conv. thermal & renewable

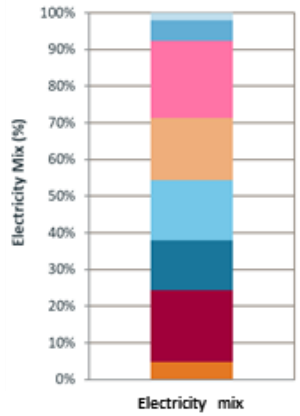


hourly production and trade



hourly consumption (building; CH)





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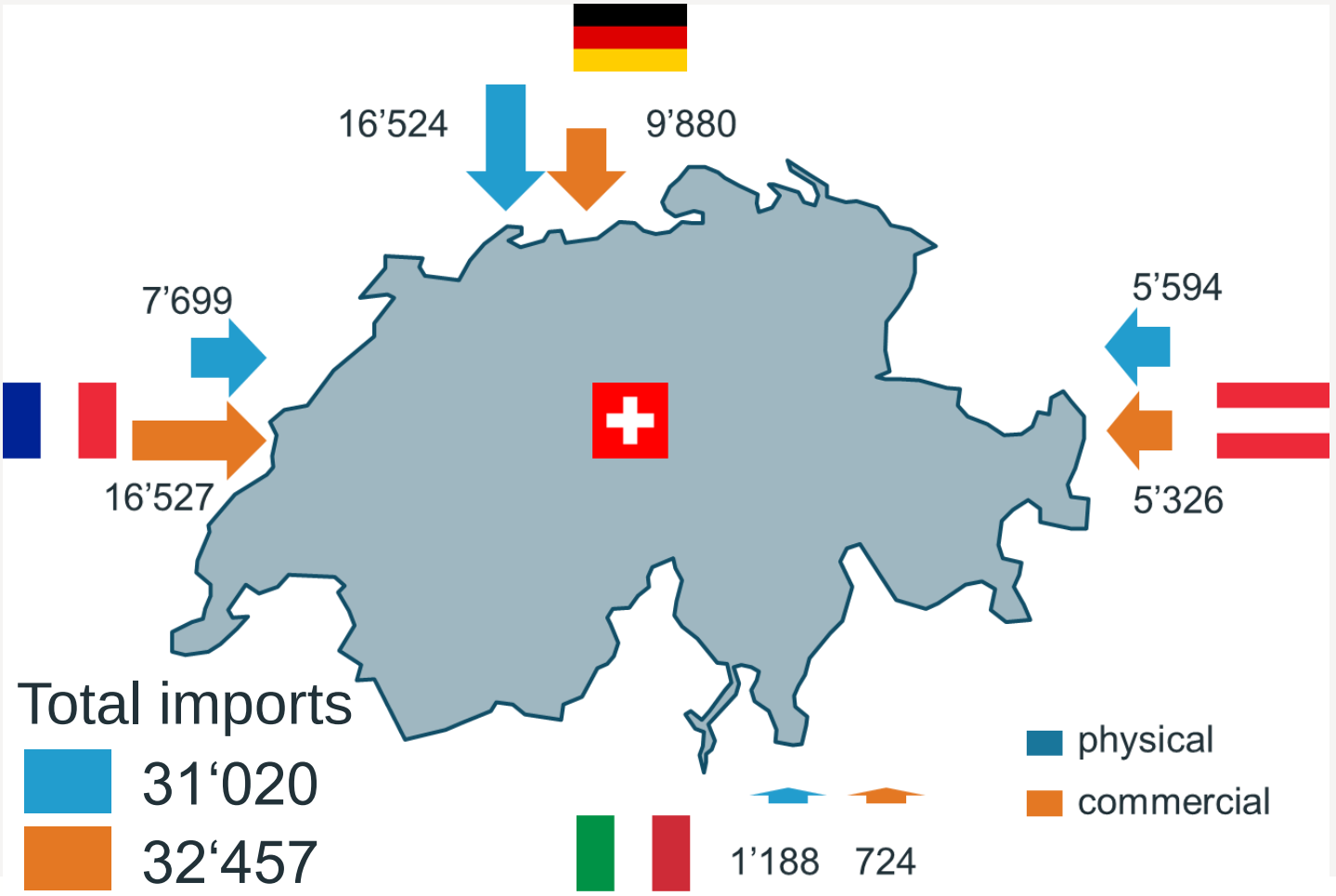
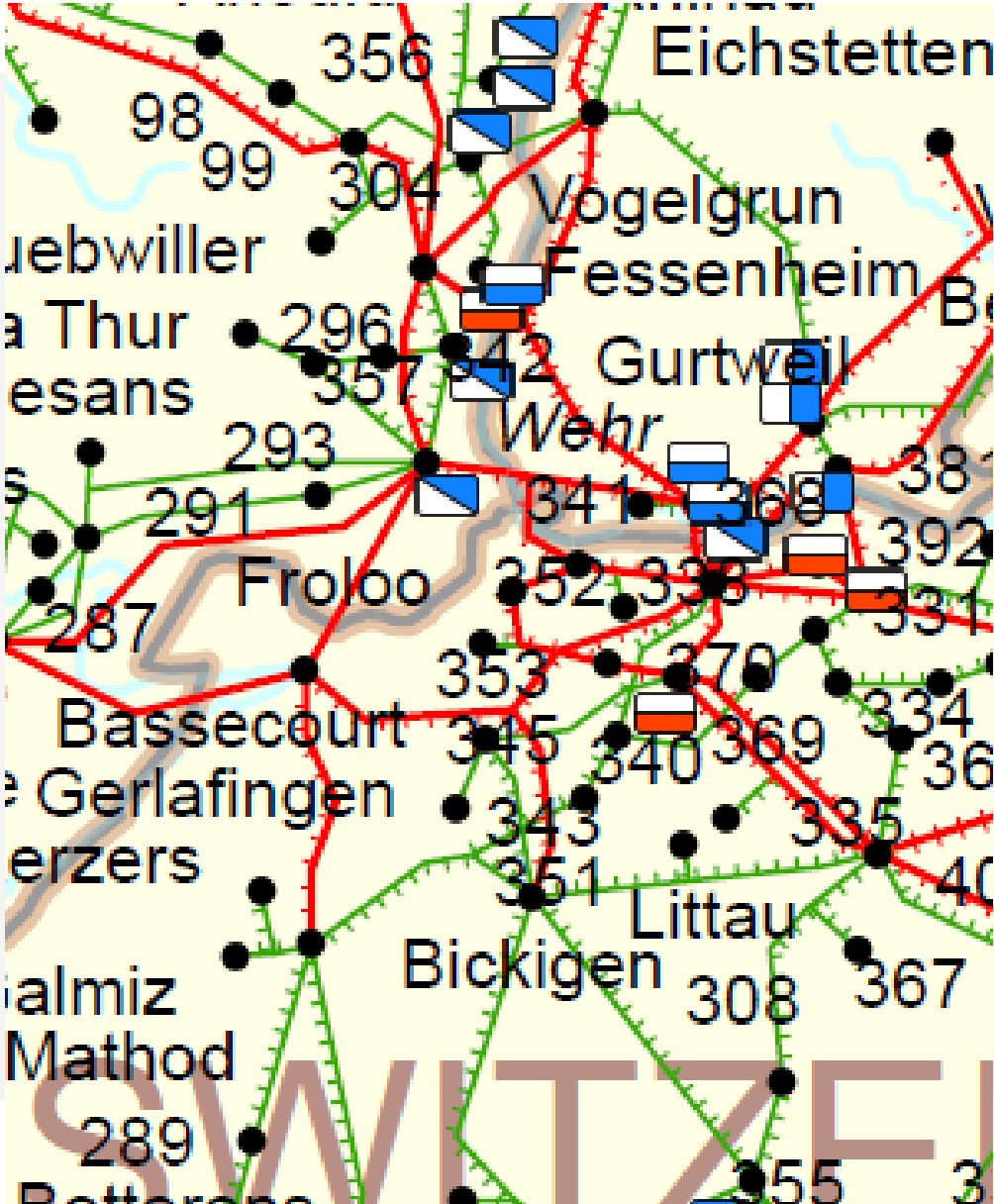
Trade: commercial versus physical flows

Commercial vs physical imports 2018 [GWh]





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Data sources

- Consumption profile (generic) residential building:
  VDEW 1999
- Consumption profile Switzerland: Swissgrid (2018)
- Electricity production and commercial trade data (2018):
  ENTSO-E transparency platform
  SFOE electricity statistics
  SFOE renewables energy statistics
- LCA database:
  UVEK LCI data DQRv2:2018

Case study building and key data

- **Residential building Rautistrasse** with 104 flats
- Minergy-ECO
- Massive construction
- Heating and hot water : 107 MJ/m^{2}a (electric heat pump)
- Ventilation & lighting : 45 MJ/m^{2}a

Scenarios

- PV: 32/64 kWp
- Battery: 32/64 kWh
- E-car charging stations: 7

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Case study building and key data

Residential building **MFH Rautistrasse, Zürich**		Electricity self generation			
		None	PV	PV&Battery	PV&electric car
Heating system	heat pump	1	2	2	1
Annual elelctricity mixes		attributional (building specific, Swiss national, Swiss GO, Swiss GO-ERE, ewz GO), long term marginal, average future Swiss	building specific attributional		
Total number of variants		10 (Switzerland) + 1 (ewz)			

		HP	HP+PV	HP+PV+BAT	HP+PV+ECAR	HP+2PV	HP+2PV+2BAT
Consumption	Building	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Electric car				18.9%		
Electricity	from grid	100.0%	76.2%	71.1%	92.2%	69.3%	55.8%
	from PV directly		23.8%	23.8%	26.7%	30.7%	30.7%
	from PV via battery			5.1%			13.5%
PV Production			32.3%	32.3%	32.3%	64.6%	64.6%
Exported electricity			8.4%	3.3%	5.6%	33.9%	20.4%

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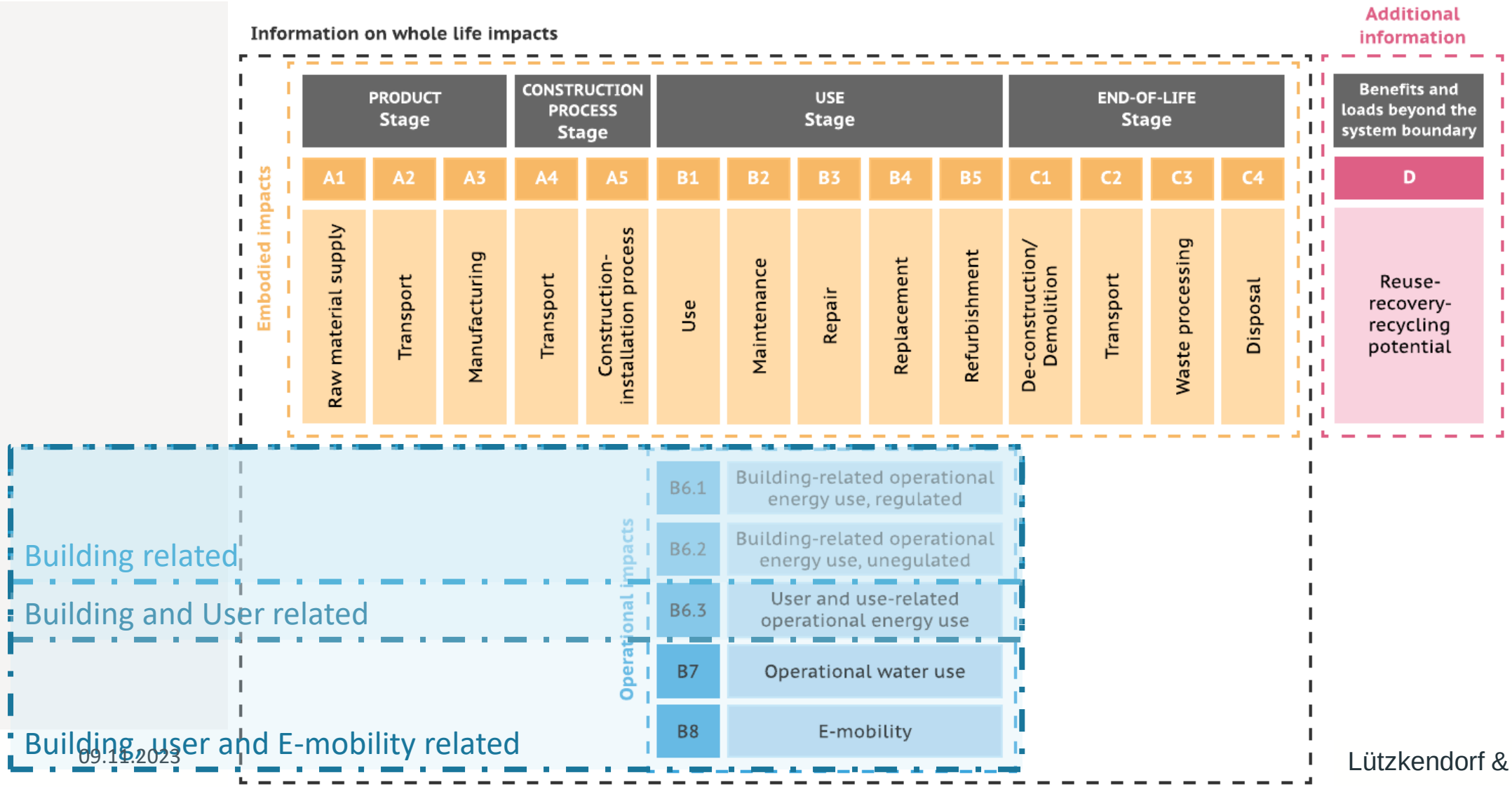
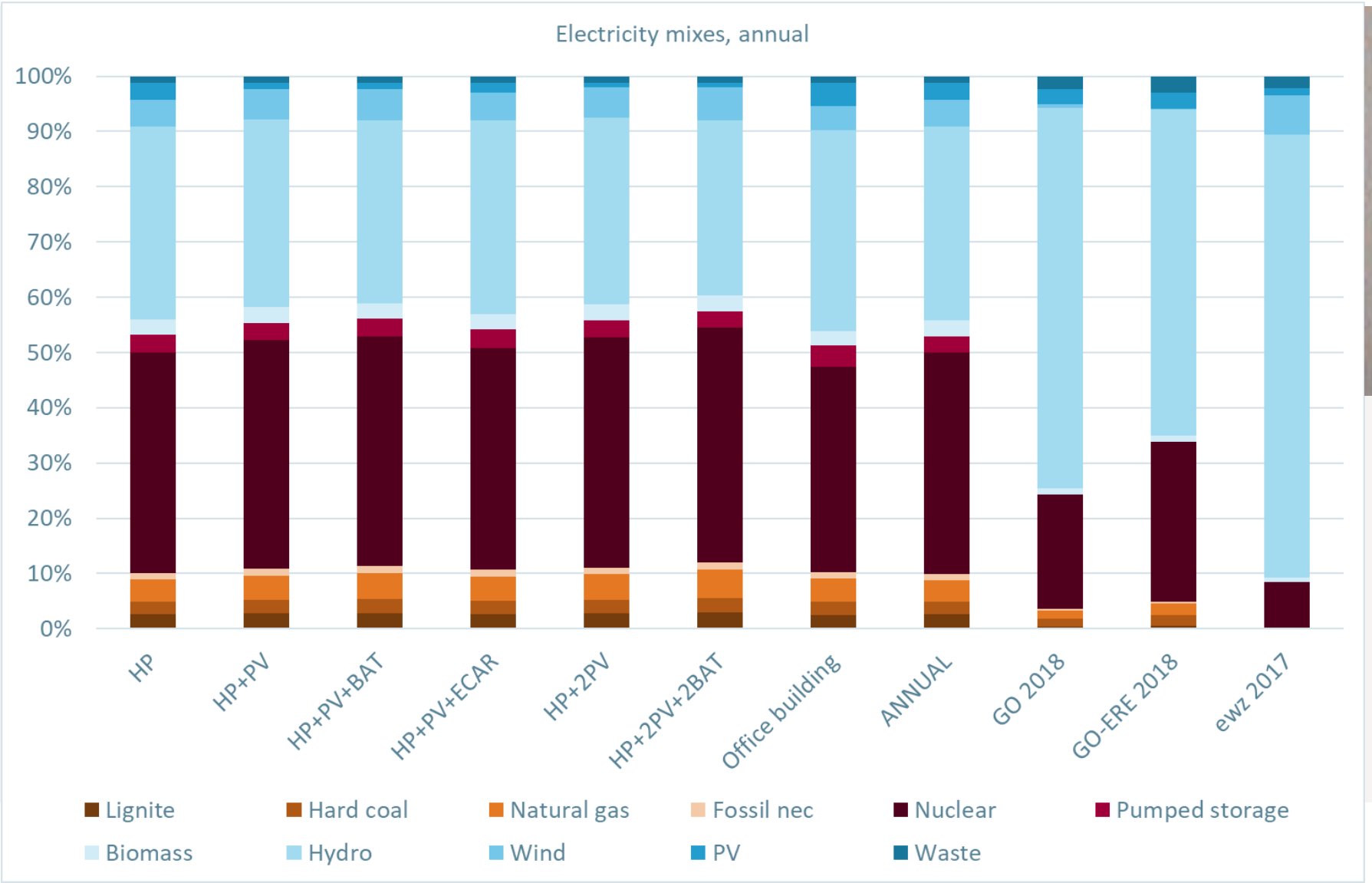
Electricity consumption considered in consumption profile



Lützkendorf & Frischknecht (2020)

Residential building electricity mixes



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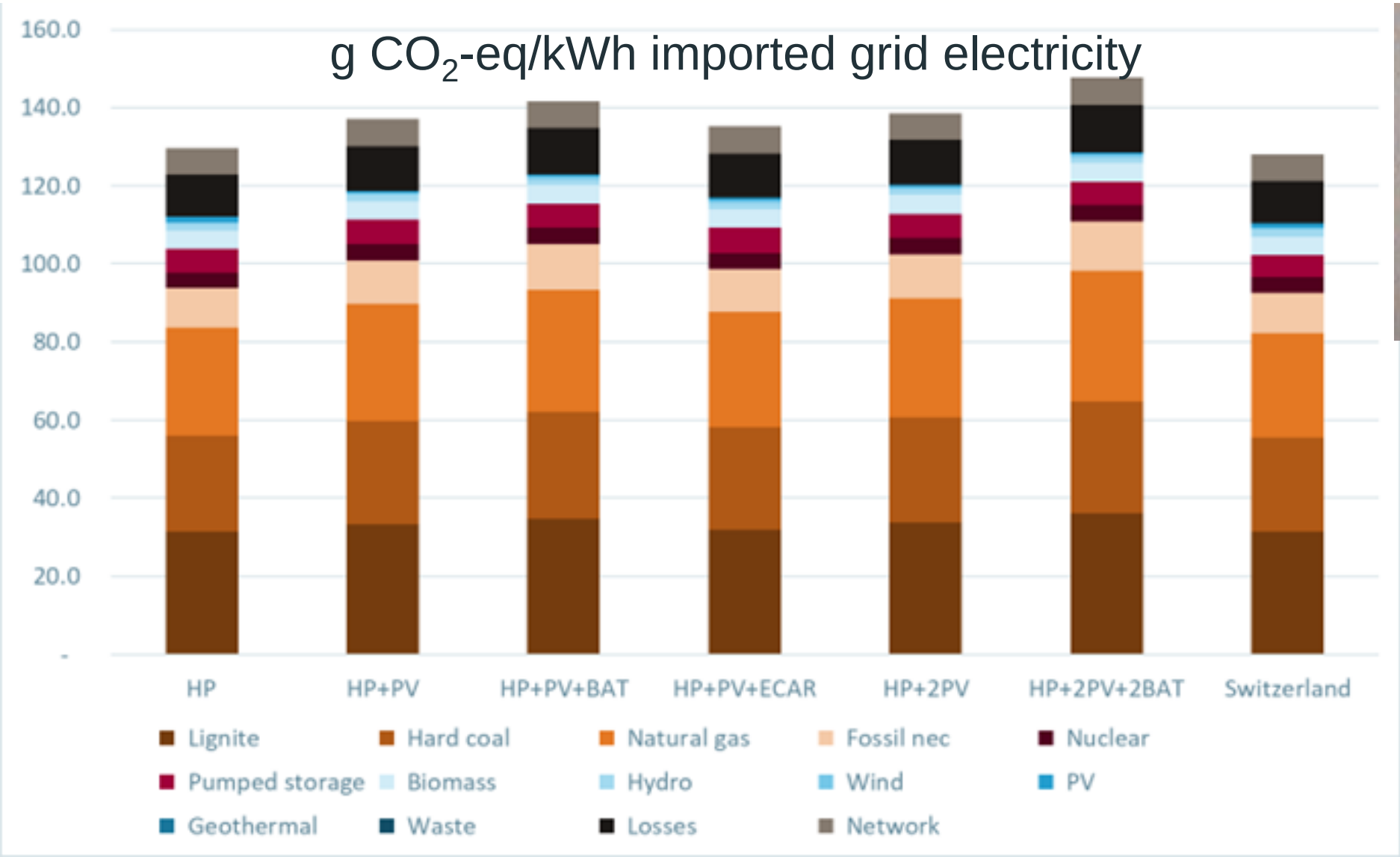
GHG emissions residential building electricity mixes



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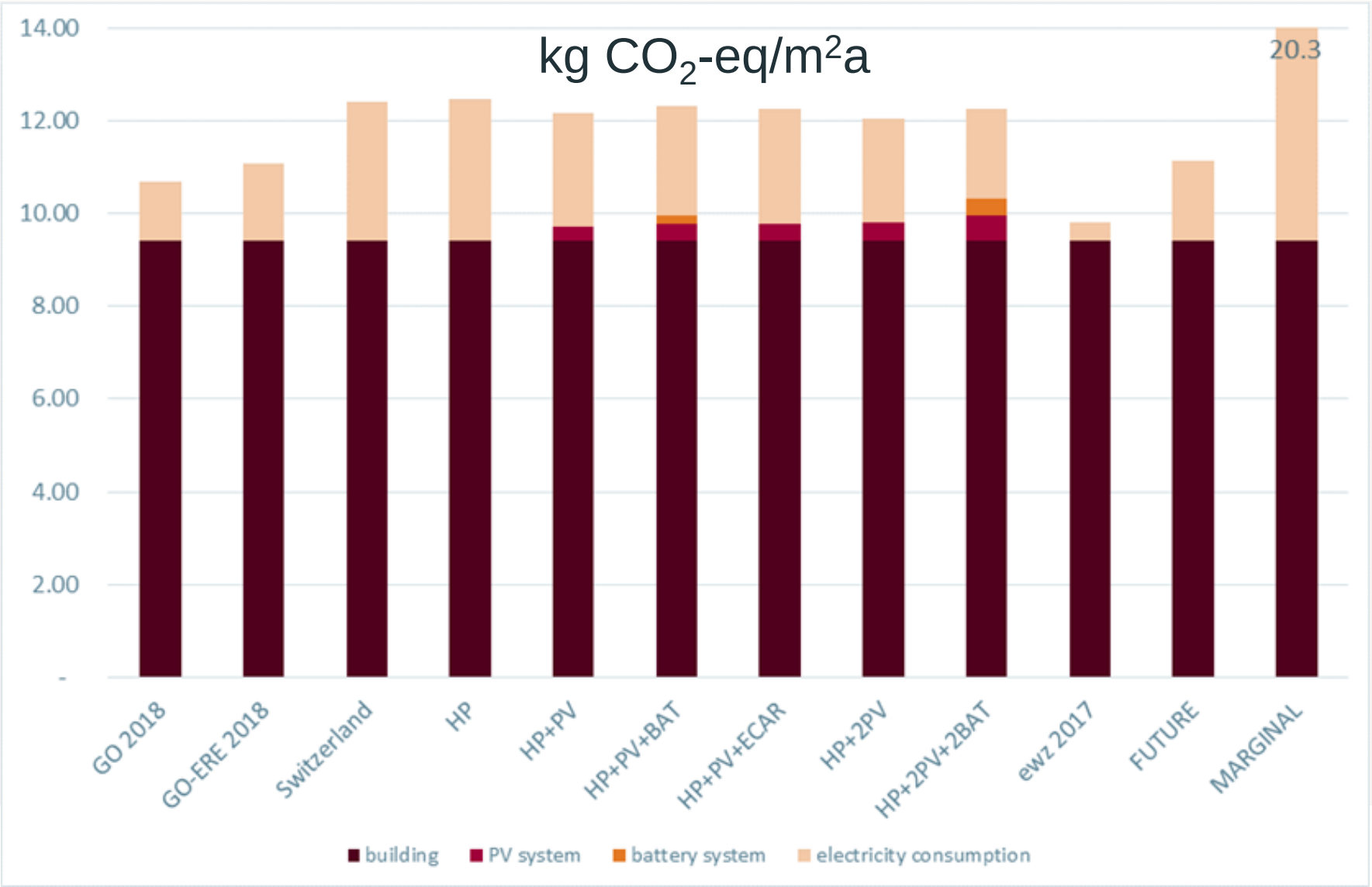
GHG emissions residential building



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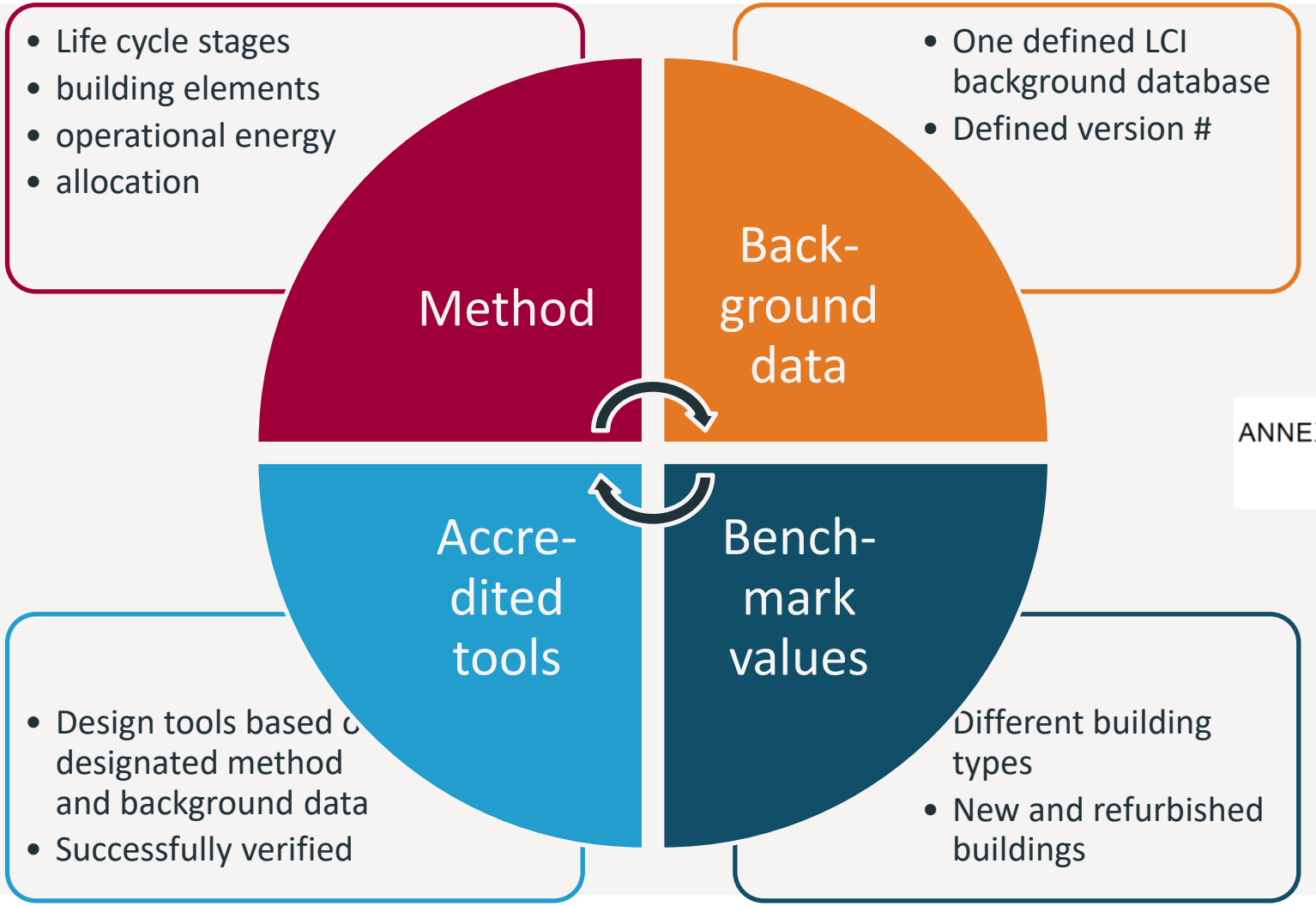
Building's environmental benchmark system: 4 interdependent elements



Discussion

- Physical and commercial trade data differ substantially (FR / DE)
- Data and statistics about provenience of commercial exports are key but not available
- Difference between KBOB annual Swiss mix and the building specific mixes is rather small
- Individual building related electricity mixes desintegrates the national mix
- Choice of electricity mix model may influence GHG emission target value setting for buildings

Conclusions and recommendations

- Do not segregate national electricity mix
- Building project specific mixes are not required nor useful in the context of building footprint benchmarks nor in early design
- Increase transparency regarding provenience of traded electricity
- Model trade with data on commercial imports/exports (Federal Office for Customs and Border Security)

Thank you very much

for your attention!

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