Life cycle assessment of Power to Gas technologies:demonstrations, learnings and implications

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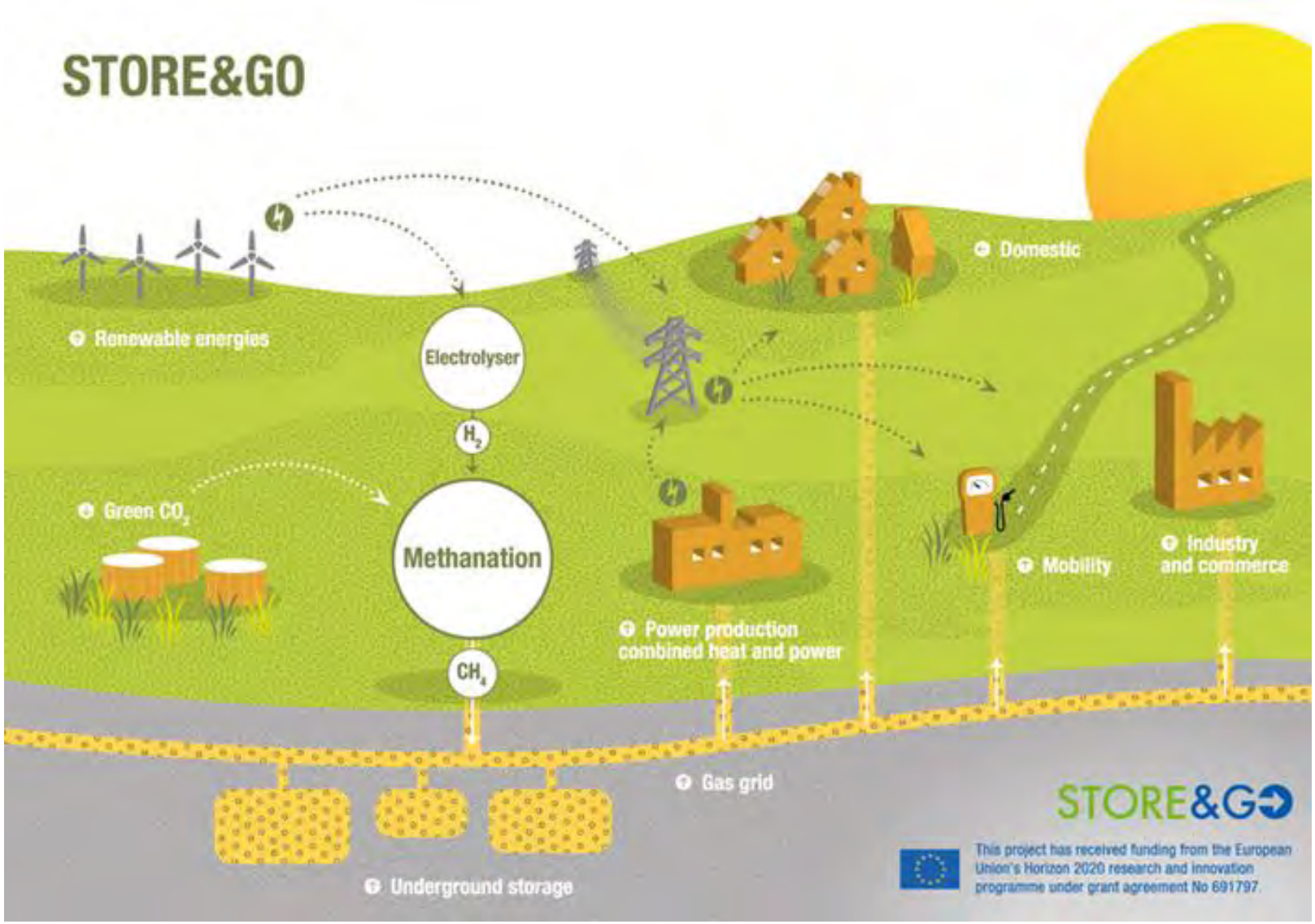
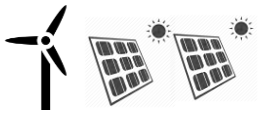
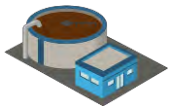
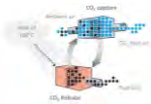
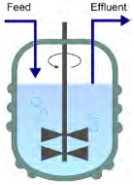
Power to gas (PtG) concept



Characteristics of three demo sites

	Falkenhagen (Germany) 1000kW	Solothurn (Switzerland) 700kW	Troia (Italy) 200kW
			
CO_2	 Bioethanol plant (300km, -35°C tanker truck)	 Wastewater plant (2.5 km pipe)	 Capture CO_2 from air (in-situ)
	HYDROGENICS	PROTON ON SITE	HYDROGENICS
	 High temperature	 Medium temperature	 Medium temperature

Scope of the study

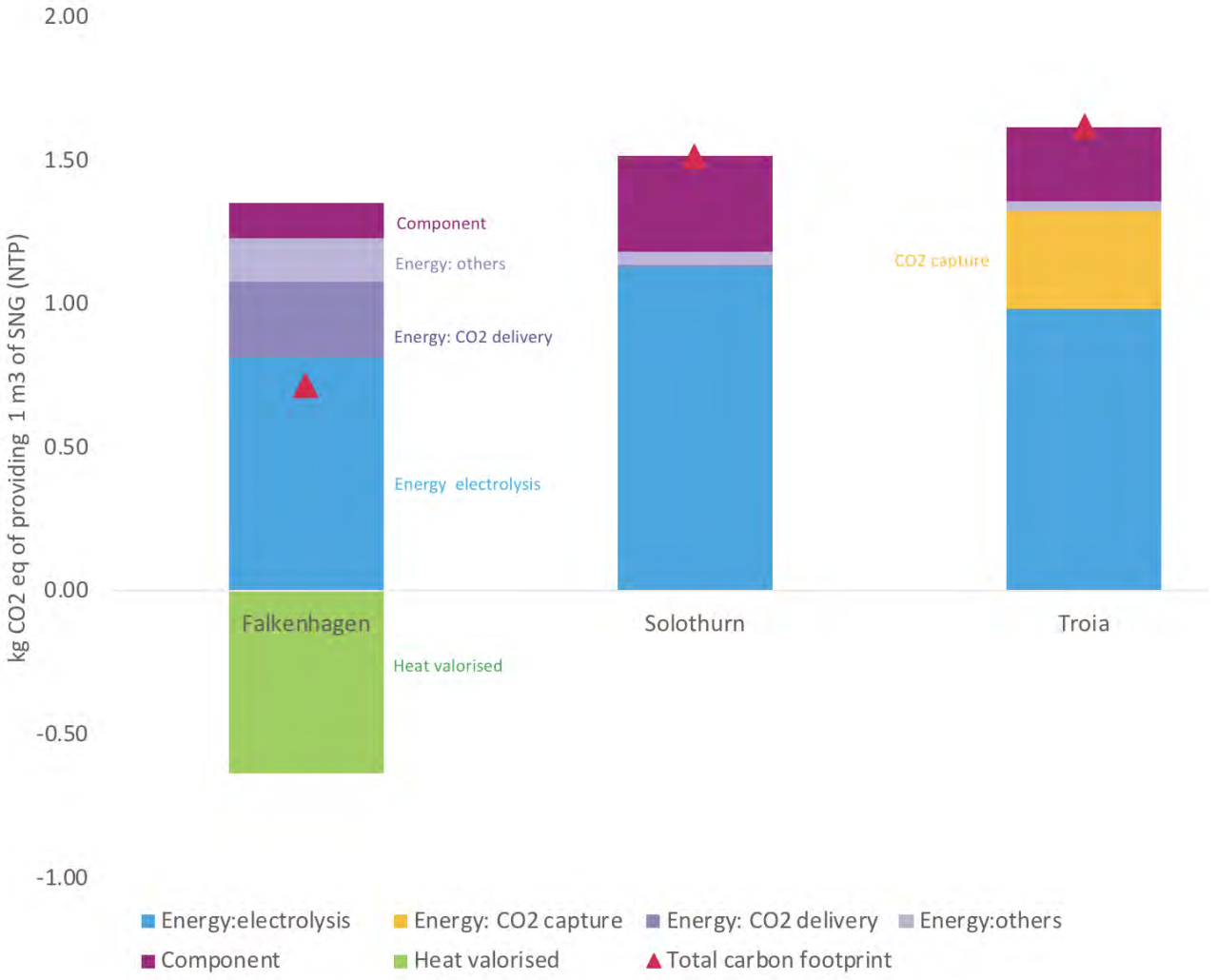
Scope: Synthetic natural gas (SNG)

Does it make senses to run PtG? If so, how?

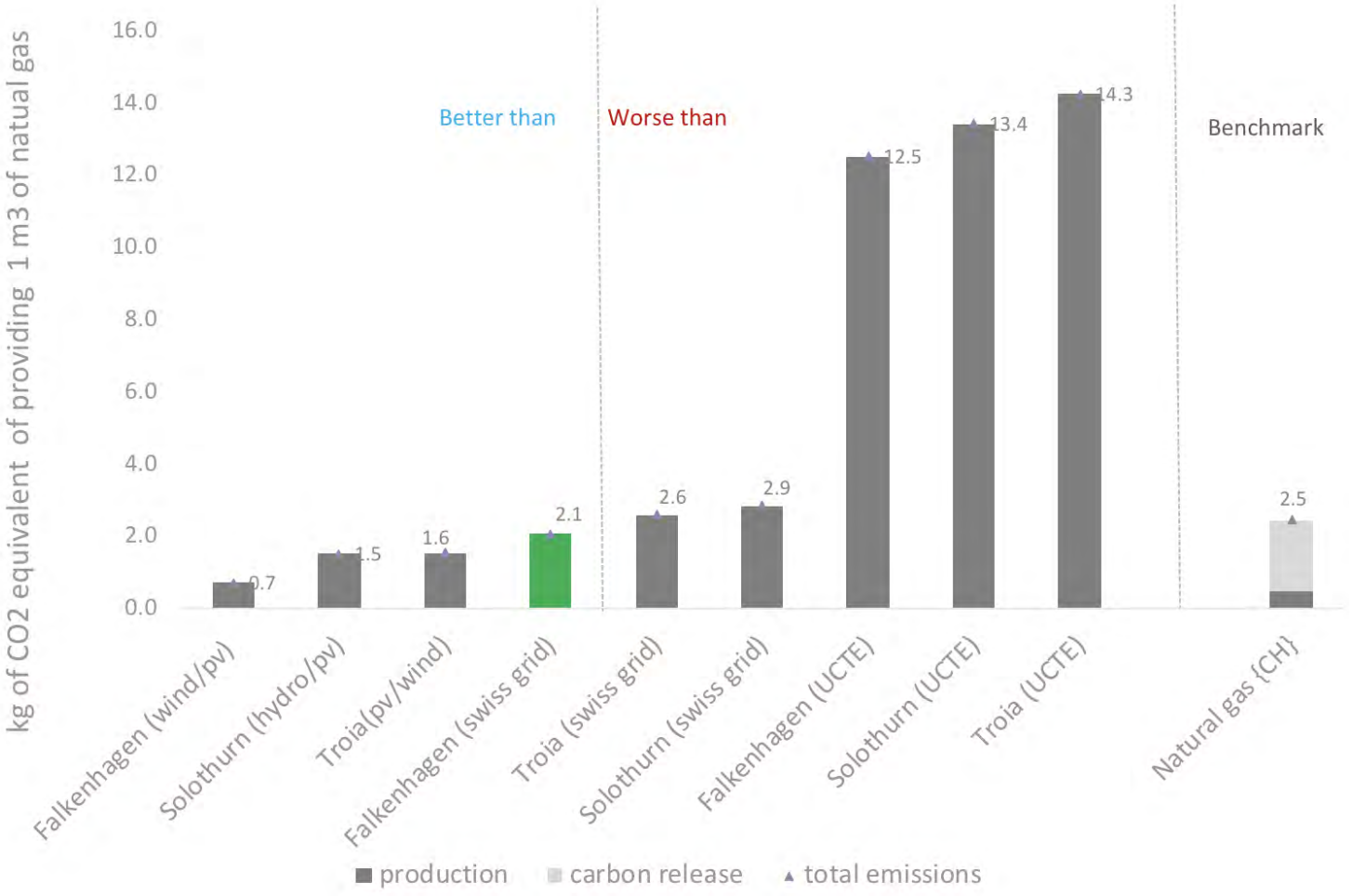
Water at risk?

Key strategies for lowering PtG carbon footprint

Carbon footprint of PtG demo sites with renewable input



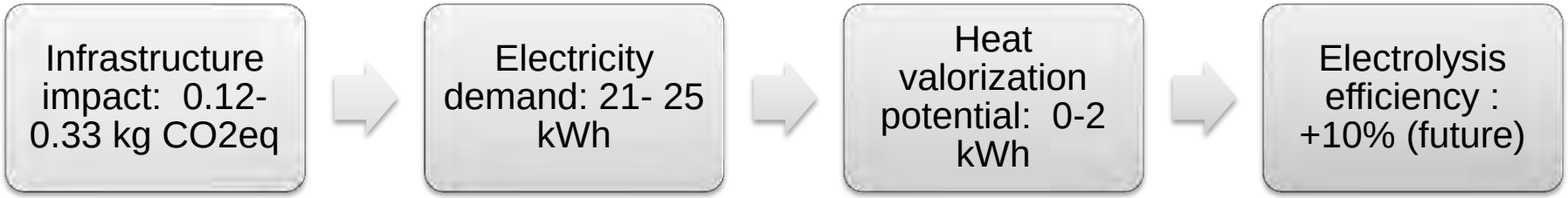
PtG can performs better or worse than fossil NG



Maximum electricity carbon emission intensity for PtG (g CO_2 eq/kWh)

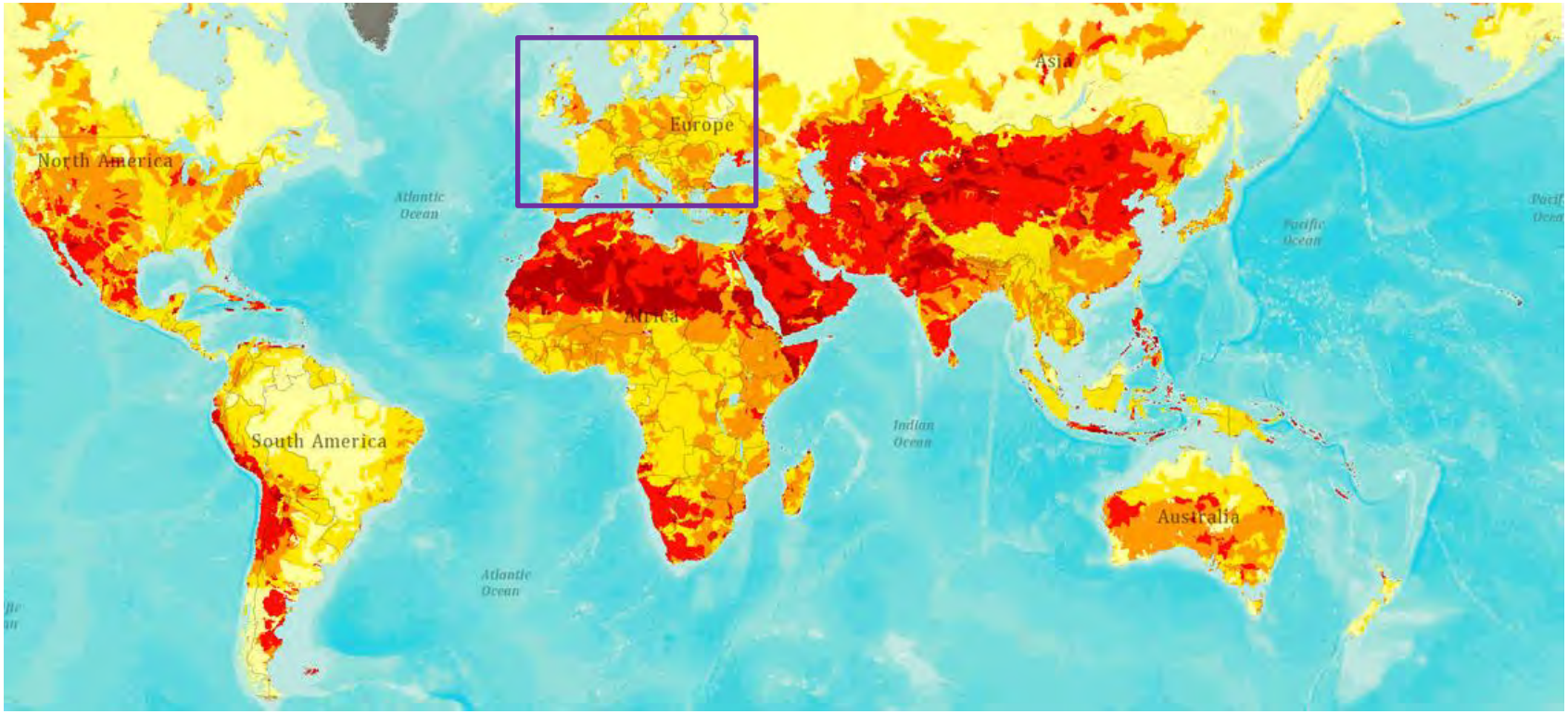
To be equivalent with fossil natural gas?

To produce 1 m^3 of SNG (NTP), what we have learned from the LCA of the demo sites?



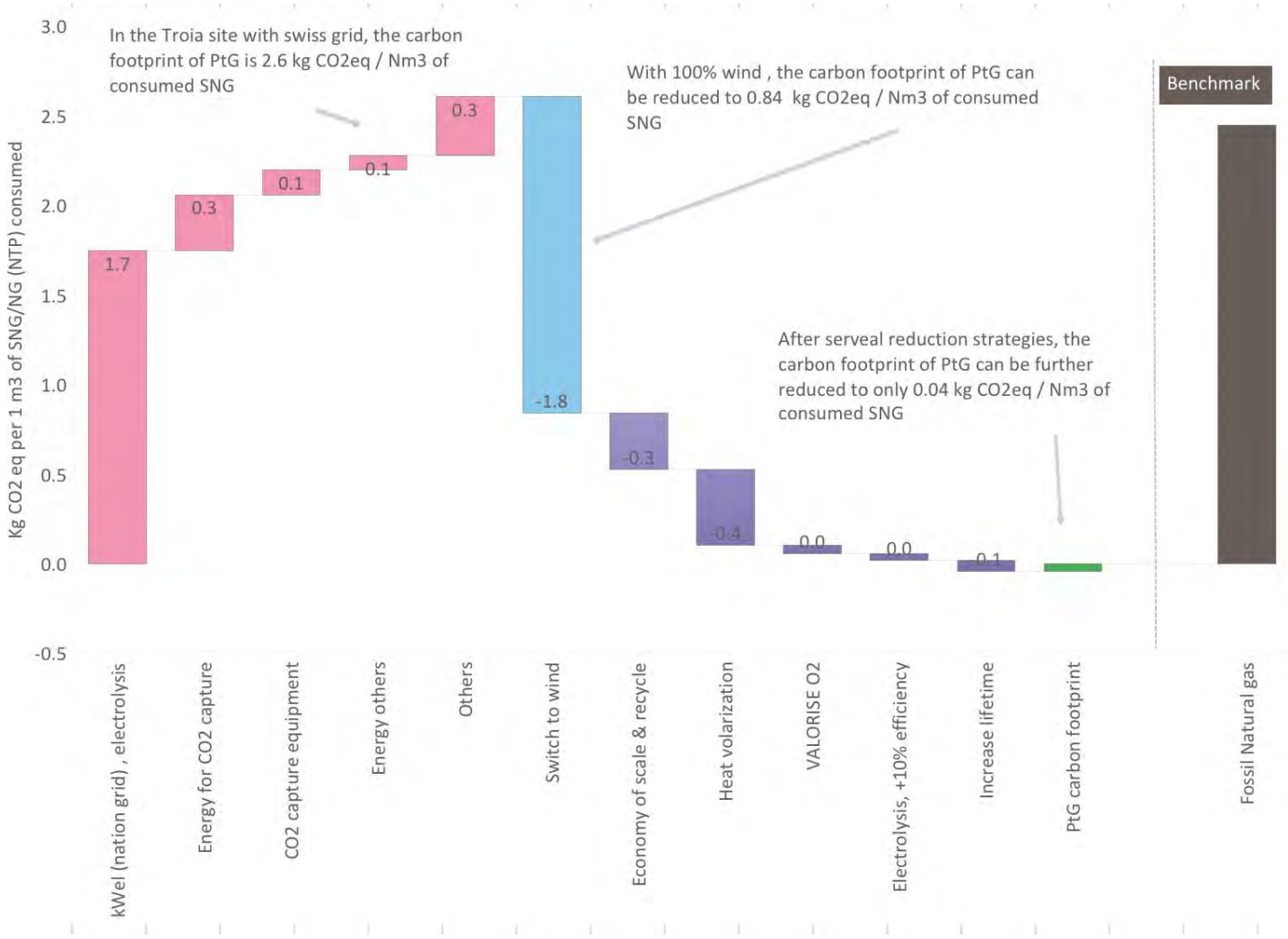
86-155 grams of CO_2 eq/kWh input

Water might not be a crucial issue for PtG deployment in most area of Europe



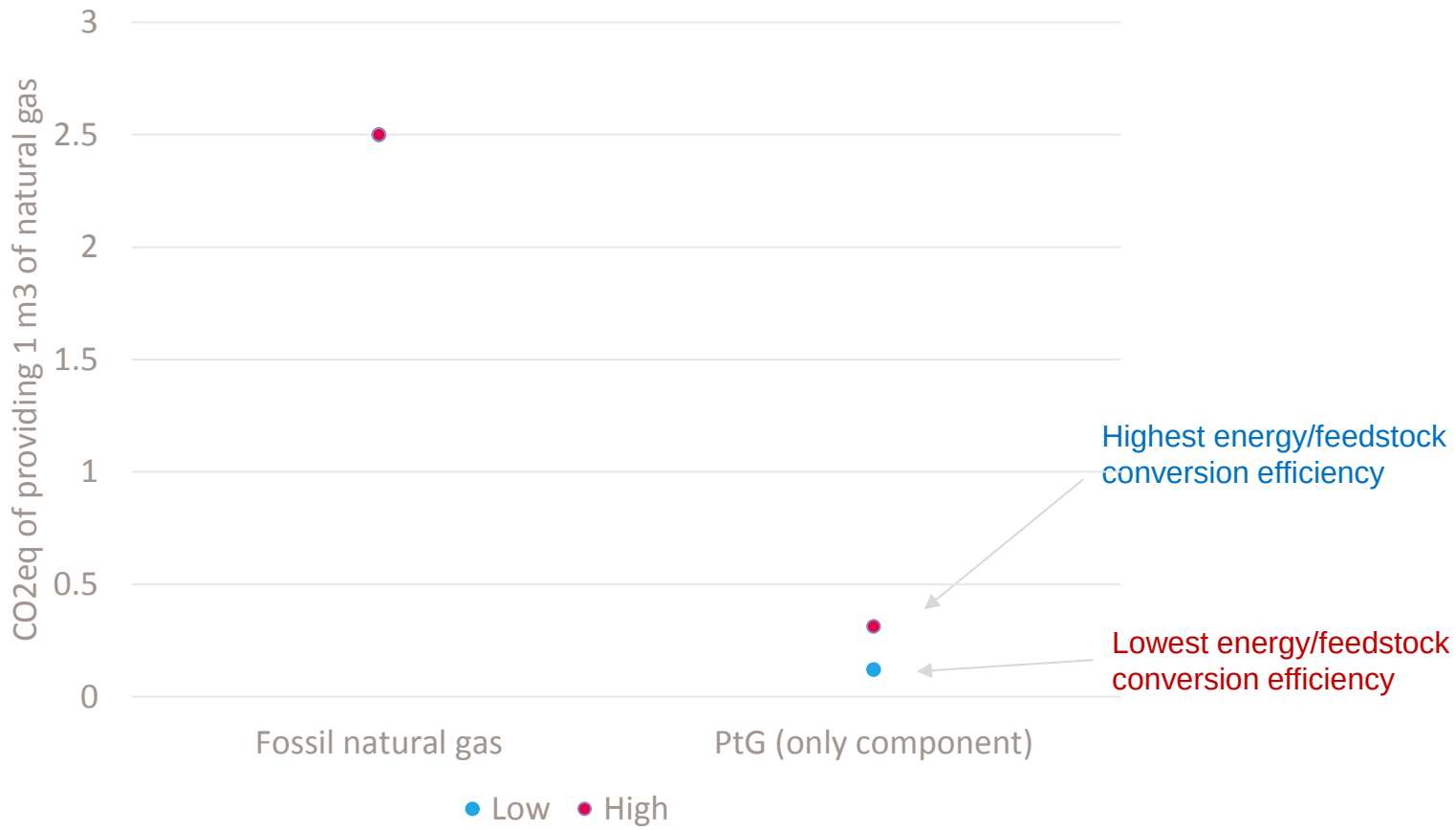
Global water risk map (WRI Aqueduct, FRANCIS GASSERT, et al 2015)

Key strategies to reduce PtG carbon footprint



Energy efficiency & Opportunity cost neglect

Consider the scenario: “what if feedstock impact are burden-free?”



Take-Away message

- PtG could be a strategic approach to **store the excess** electricity (from renewable sources) and provide **energy security** by decarbonizing the demand on fossil natural gas

- **Economy of scale** and **heat integration/valorization** are effective strategies to reduce carbon footprint of PtG systems

- A **systematic perspective** should be taken when evaluating the PtG systems and its interaction with the society

- **Water risk** is an important factor to be considered and further explored for PtG deployment

Thank you!

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