



ETSAP WS series  
Current practices

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Teams

# Survey: Energy trade

## Current practices: Energy trade

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# Survey on current modelling practices – Energy trade

How does your TIMES model(s) and analysis consider energy trade of e.g., electricity, hydrogen and biofuels, + + +:

1. What is the **spatial resolution** of your model (number of regions, countries)?
2. What **commodities** are traded between internal and external regions?
3. How do you **model** energy trade of these commodities? Including capacity expansion and what **constraints** are included, e.g., availability factors, trading volume, bi/unidirectional trade etc.
4. How do you **adjust energy trade parameters**, e.g., prices in external regions (impexp), with the focus of various analysis?





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## Summary of survey contributions:

### - **Several institutes work with multiple TIMES energy models**

- UCC: Ireland (1 region), multi-regional (26 countries)
- STEM: Single country (Swiss) with 15 nodes for transmission grid infrastructure
- VTT: Global model (20 regions?), European model (9 regions), Nordic model (11 regions)
- LTU: Sweden (1 region), Västerbotten (15 regions), Malmö (1 region)
- VITO: Belgium (1 region)
- RSE: Italy (1 region), multiregional national model (20 regions)
- IFE: Norway (5 regions), Europe (29 regions)

# Summary of survey contributions:

## - Traded commodities

- All models trade electricity and fossil fuels
- Most models trade biofuels (and other bio products) and hydrogen
- VTT: trade nuclear fuels and CO2 (green certificates, CO2 allowances)
- Fossil fuels and biofuels are often included only as import

Commodities	UCC	STEM	VTT	IFE	LTU	VITO	RSE
Electricity	X, Y	X, Y	X, Y	X, Y	X, Y	Y	X, Y
Fossil	X, (Y)	Y	X, Y	(Y)	(Y)?	(Y)	X, Y
- Coal	X		X, Y	(Y)			X, Y
- Natural gas	X		X, Y	(Y)			X, Y
- Crude oil/oil	X		X, Y	(Y)			X, Y
- LNG			X	(Y)			
Biofuels	X, (Y)	Y	X, Y	X, (Y)	X, Y		X, Y
Hydrogen	X		X	X			X, Y
Synthetic fuels		Y	X				
Nuclear fuels			X, Y				
CO2			X				

X: Internal, Y: External, (Y): Unilateral (import)

# Summary of survey contributions:

## - Modelling methods

- Most models include availability factors, as well as restriction on capacity expansion on trade connections
  - Some models also have activity bound on specific connections or commodities
  - Scenario specific constraints related to country's energy dependence or national production policies
  - RSE: electricity trade volumes either exogenous (from European model) or endogenous (capacity limits)
- Electricity prices are defined on a timeslice level, while prices for other energy commodities are often on an annual level
- Most models use exogenous electricity prices from other European/global models
  - LTU: also use LCOE from identified technologies
  - VITO: uses price-quantity curves
- Price development is scenario specific to capture uncertainty
- What about stochastic modelling?

# Reflections?