



# Changing Oil Realities - Possible Medium Term Impacts on the EU Gas And Energy Developments

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# What has happened since the last meeting

- Geopolitics
  - Russia vs. the “IMF World”
  - Currency flux (Swiss frank, USD/EUR, Ruble)
- Infrastructure
  - SouthStream out
  - TAP TANAP fixed
  - Alternatives discussed
- Oil
  - Oil price dropped down more than 50%
  - Some shale oil producers are below breakeven
  - Investments in non-conventional and offshore dropping

# GACs contribution and value

- Remember the slide from September 2014 presentation?

## Preceding the High/Low Road

- Drastic deterioration of geopolitical relations: EU-Russia
  - From 4-regional EU-28 model to 8-regional model
  - Motivation: ranging by access to gas infrastructure, renewables potential and green policy compliance
- Threats to logistics of Russian gas delivery
  - Ukrainian PM announcement of “closing the transit for Russian gas”
  - Continued blockade of the South Stream
  - Careless policy and political messages, leading to additional escalation

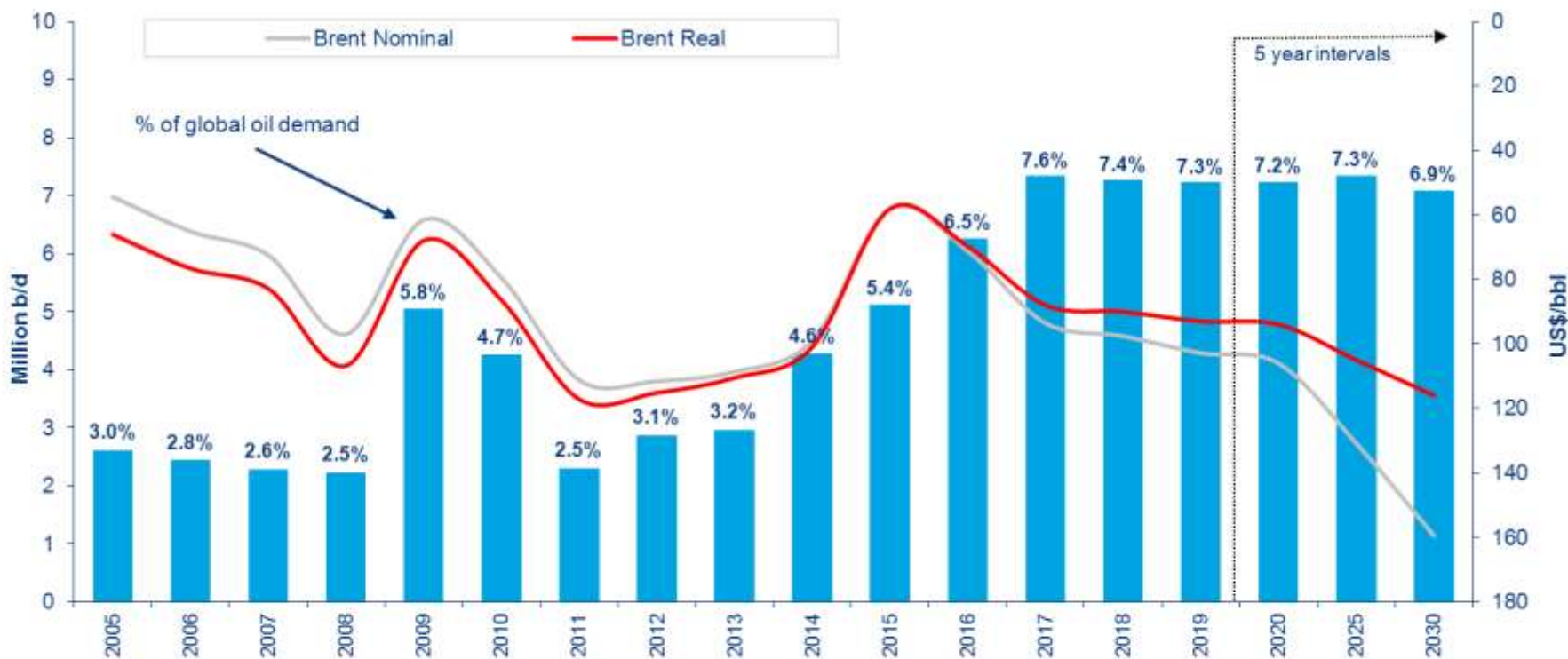
**GAC is needed now more than ever in its history**

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- **WE ARE HAPPY GAC IS BACK!**

# Oil: capacity vs. price analysis

OPEC Spare Capacity, its Proportion of World Oil Demand & Brent Price (real 2015 terms, reverse axis)



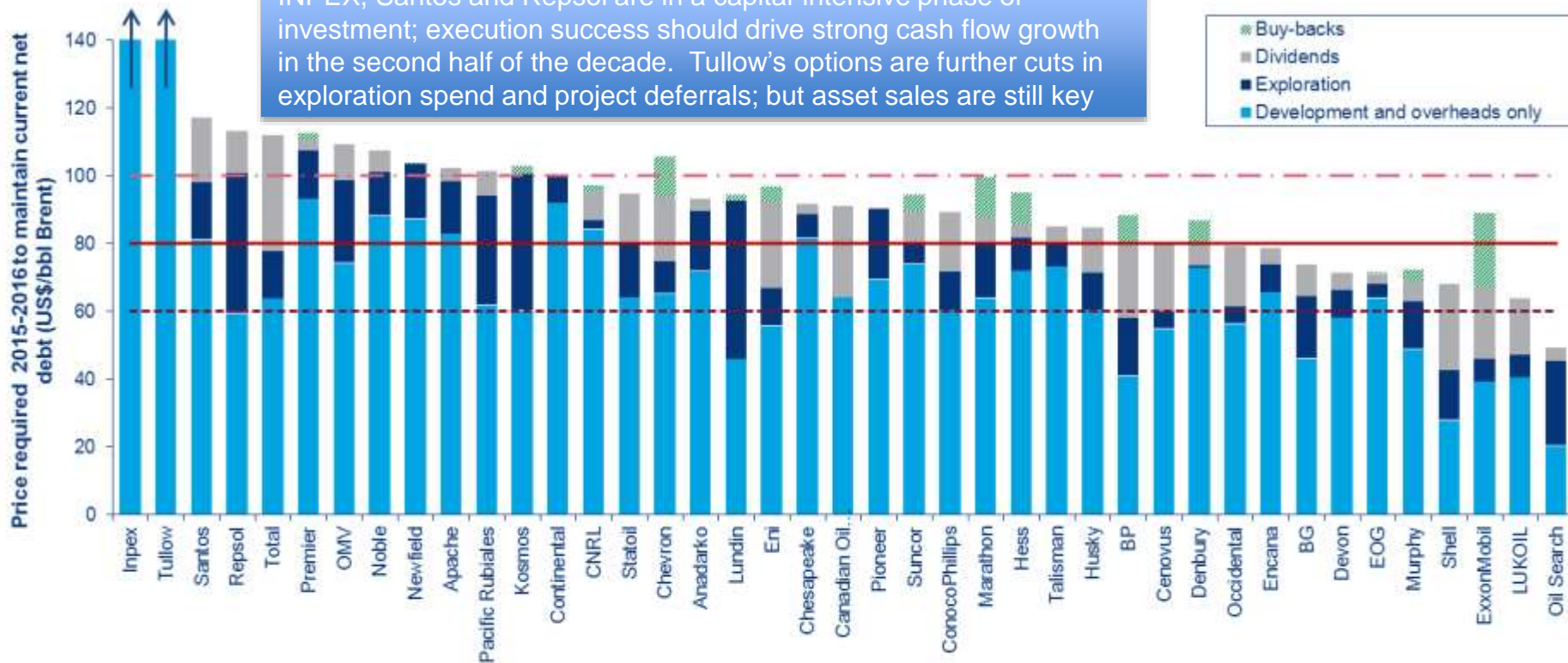
Source: Prices History - Thomson Datastream, Forecast - Wood Mackenzie; OPEC Capacity - Wood Mackenzie

Source: Wood Mackenzie, 2015

# Oil: new price curves to introduce to the study

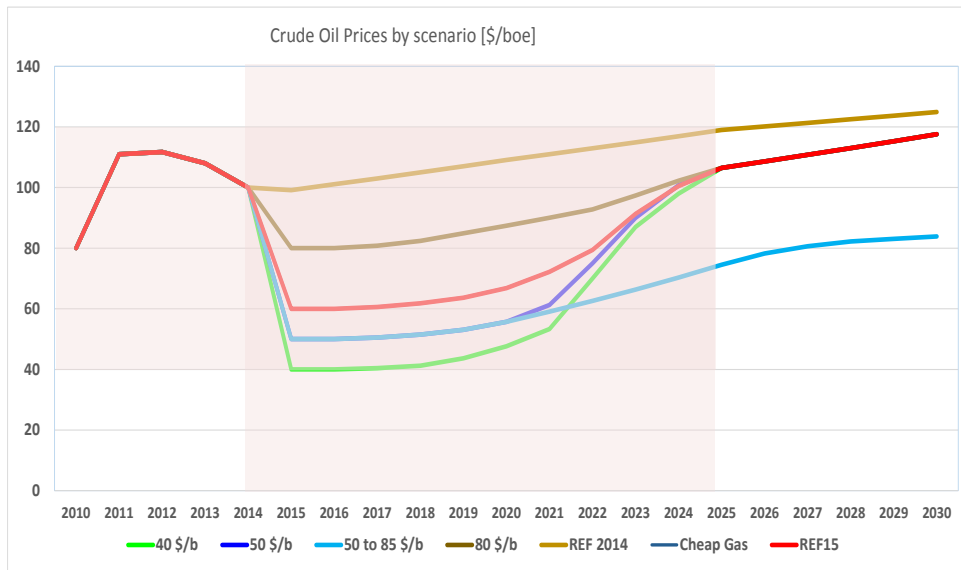
Brent price required to retain current net debt levels in the near-term (2015 – 2016)

INPEX, Santos and Repsol are in a capital-intensive phase of investment; execution success should drive strong cash flow growth in the second half of the decade. Tullow's options are further cuts in exploration spend and project deferrals; but asset sales are still key



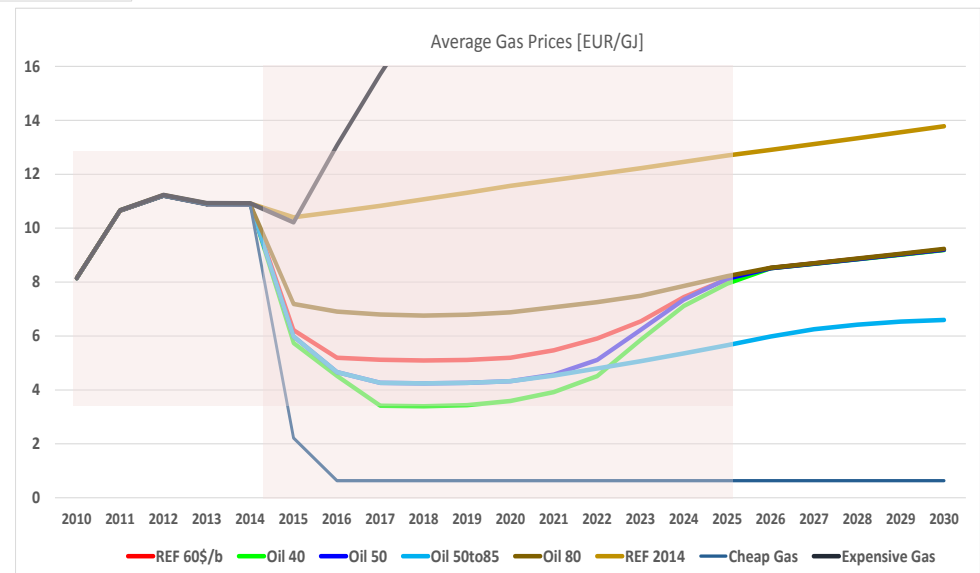
Source: Wood Mackenzie, 2015

# Given all that, we chose these oil and gas scenarios



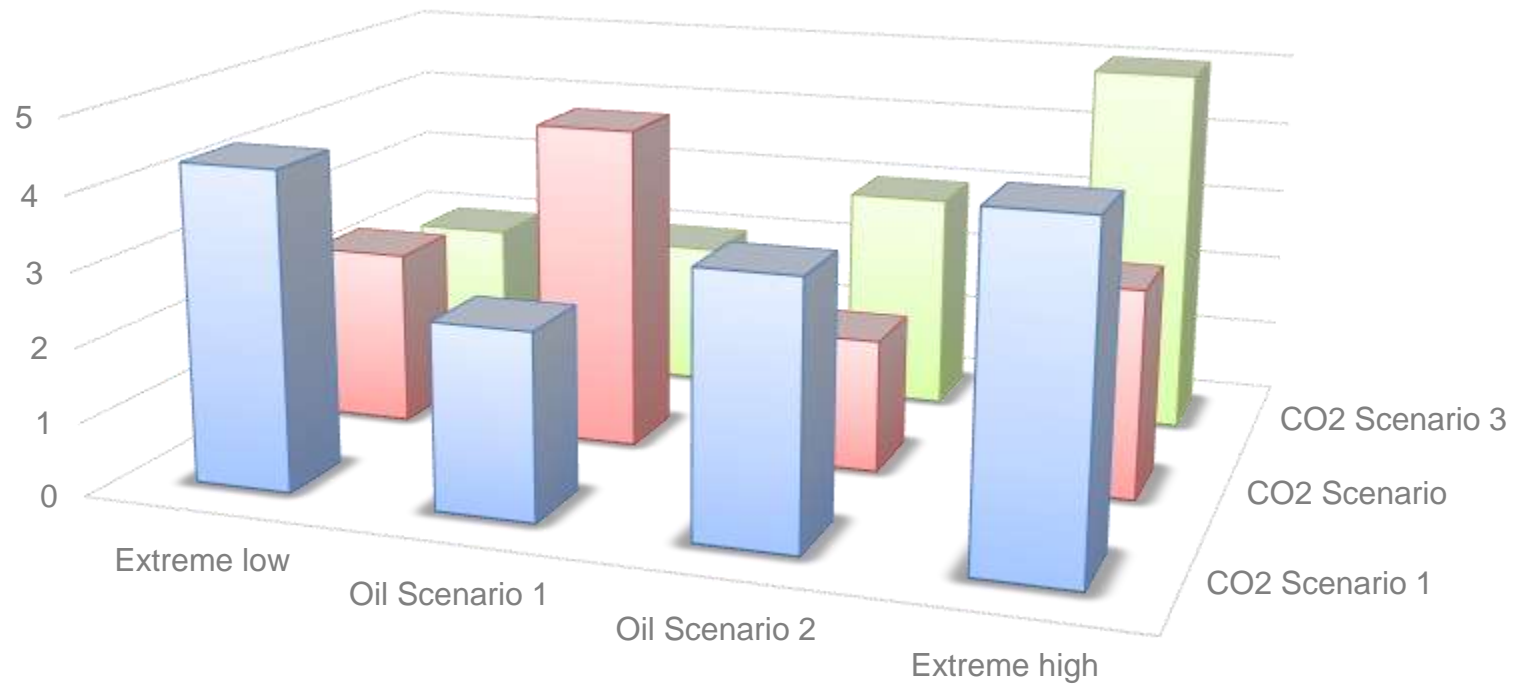
Oil price fixed at 40, 50, 60 and 80 \$/bbl for 3 years. Afterwards approaches the earlier forecasts

Gas prices are modeled with a linear regression coefficient, by country of origin with a lag of 1 year relative to oil prices



# Shaping scenario filed: dimensions and stress-points

Essential Output: Gas TPES, Imports, Bill, ...



## We were seeking answers to the following questions

- How would the EU energy system react to Short term, foreseeable shocks in oil price (3 years downtime, slow recovery)
- How would the current EU model (2015 research state) react in extreme high and extreme low gas prices? If results are valid, what vectors do these extreme scenarios indicate for the EU and exporters (including Russia)
- What would it mean for natural gas in terms of :
  - Indigenous EU production
  - Use in power generation
  - Final use
  - Exporters revenue and infrastructure incentives
- What additional impacts on the EU energy system would the CO2 reduction policies (targets and taxes) deliver?
- Finally, is this crisis bearable for the EU and the gas exporting countries?



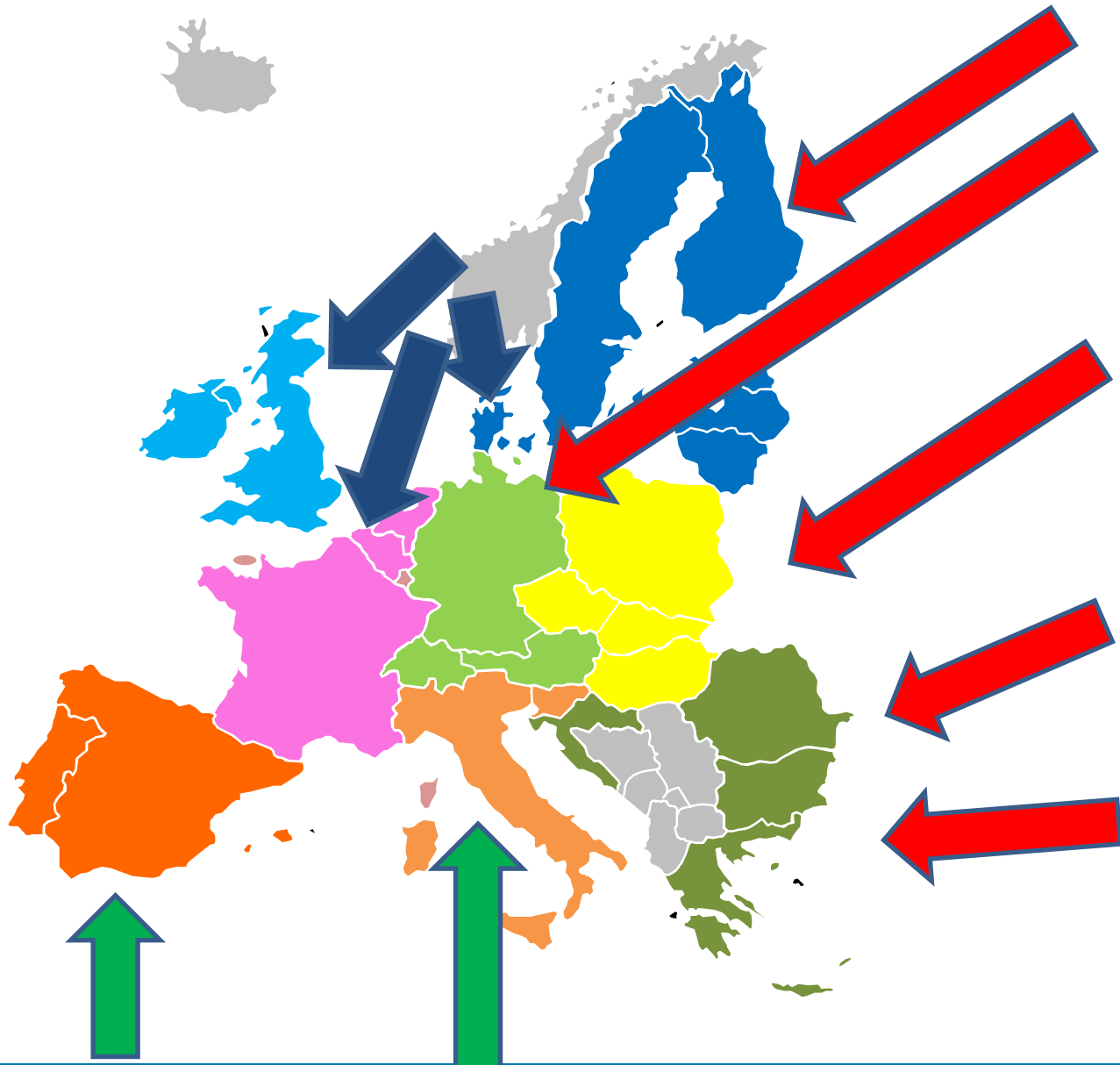
- Planned and protocolled by GAC changes to the Integrated Modeling Environment
  - Supply modeling
  - Demand modeling
  - Regional structure
- Introduction of the scenario field
- First glance at the results: high aggregation figures



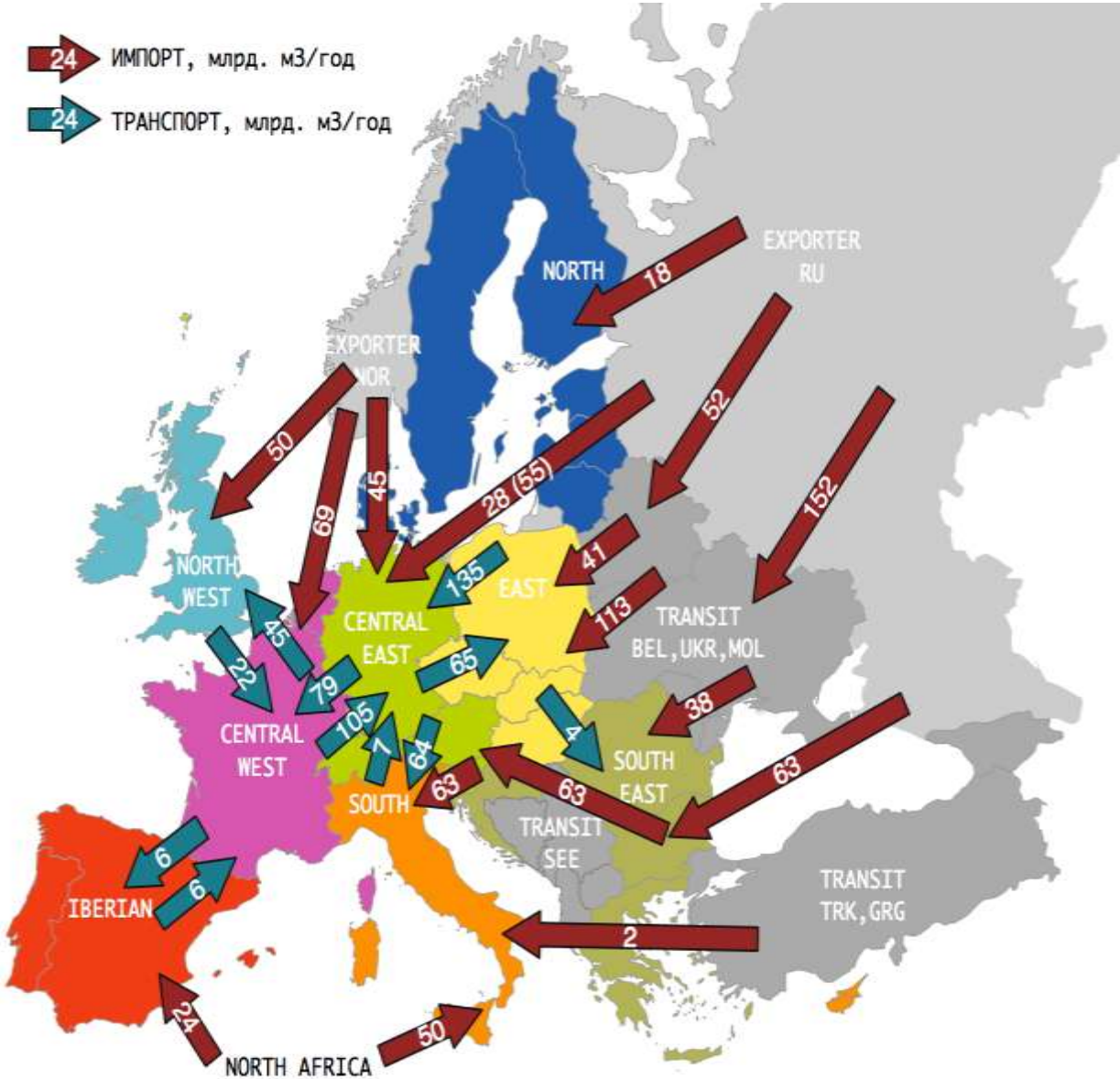
# European Regions



# Gas Import Routes

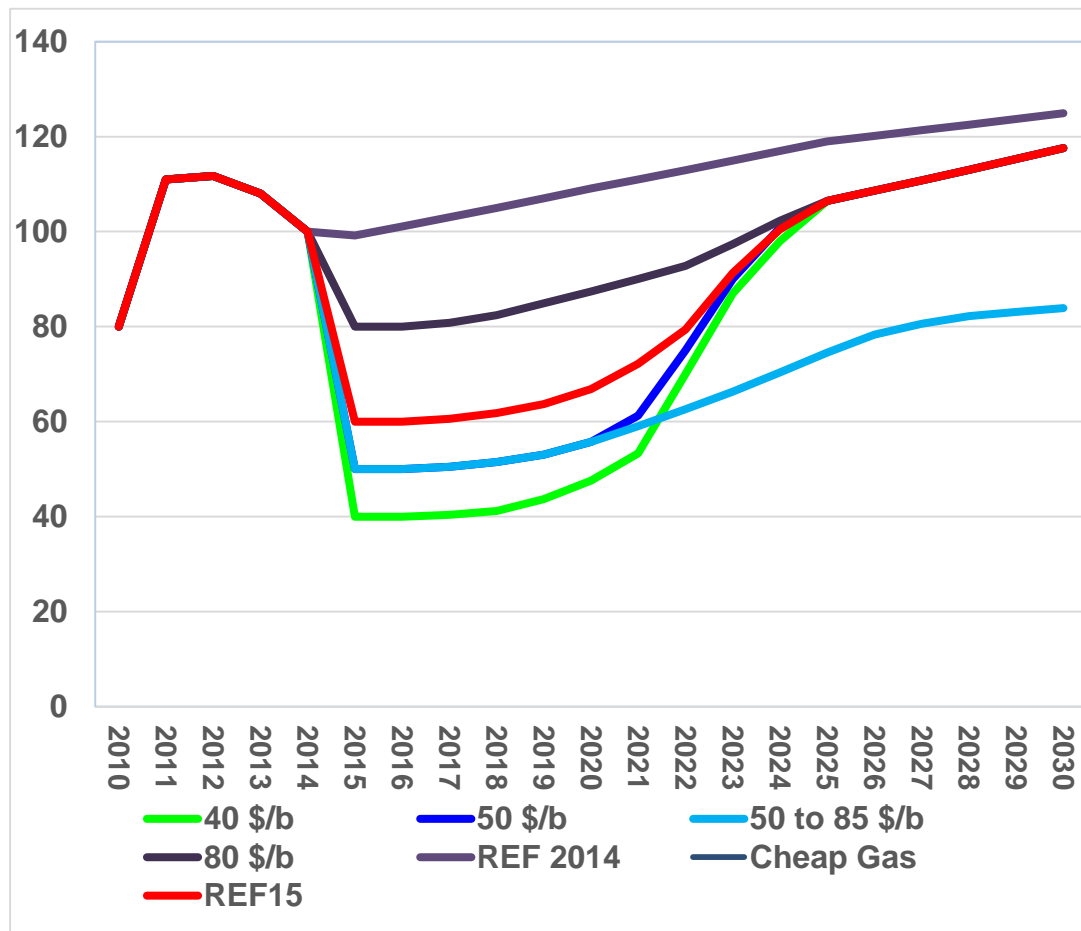


# Indigenous Gas Connections



# Prices and Restrictions

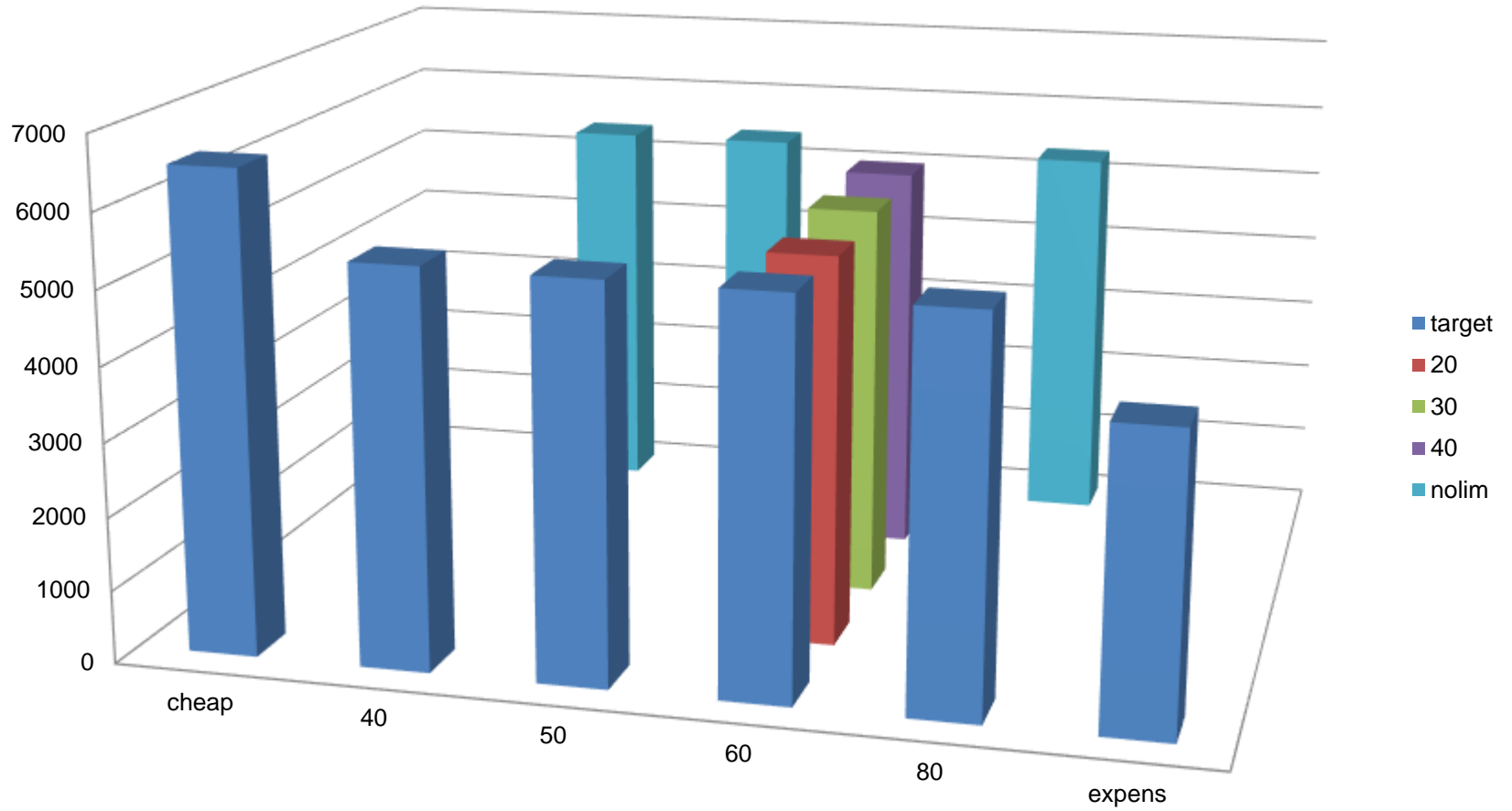
	Targets	CO2 tax	Oil Price trajectory
REF-15	YES	NO	60 \$/b
REF-14	YES	NO	80 \$/b (old)
OIL 40	YES	NO	40 \$/b
OIL 50	YES	NO	50 \$/b
OIL 80	YES	NO	80 \$/b
TAX 20	NO	YES	60 \$/b
TAX 30	NO	YES	60 \$/b
TAX 40	NO	YES	60 \$/b
REF TAX 20	YES	YES	60 \$/b
REF TAX 30	YES	YES	60 \$/b
REF TAX 40	YES	YES	60 \$/b
OIL40 TAX30	NO	YES	40 \$/b
OIL50 TAX30	NO	YES	50 \$/b
OIL80 TAX30	NO	YES	80 \$/b
No Targets	NO	NO	60 \$/b
Cheap Gas	YES	NO	61 \$/b
Expensive Gas	YES	NO	62 \$/b



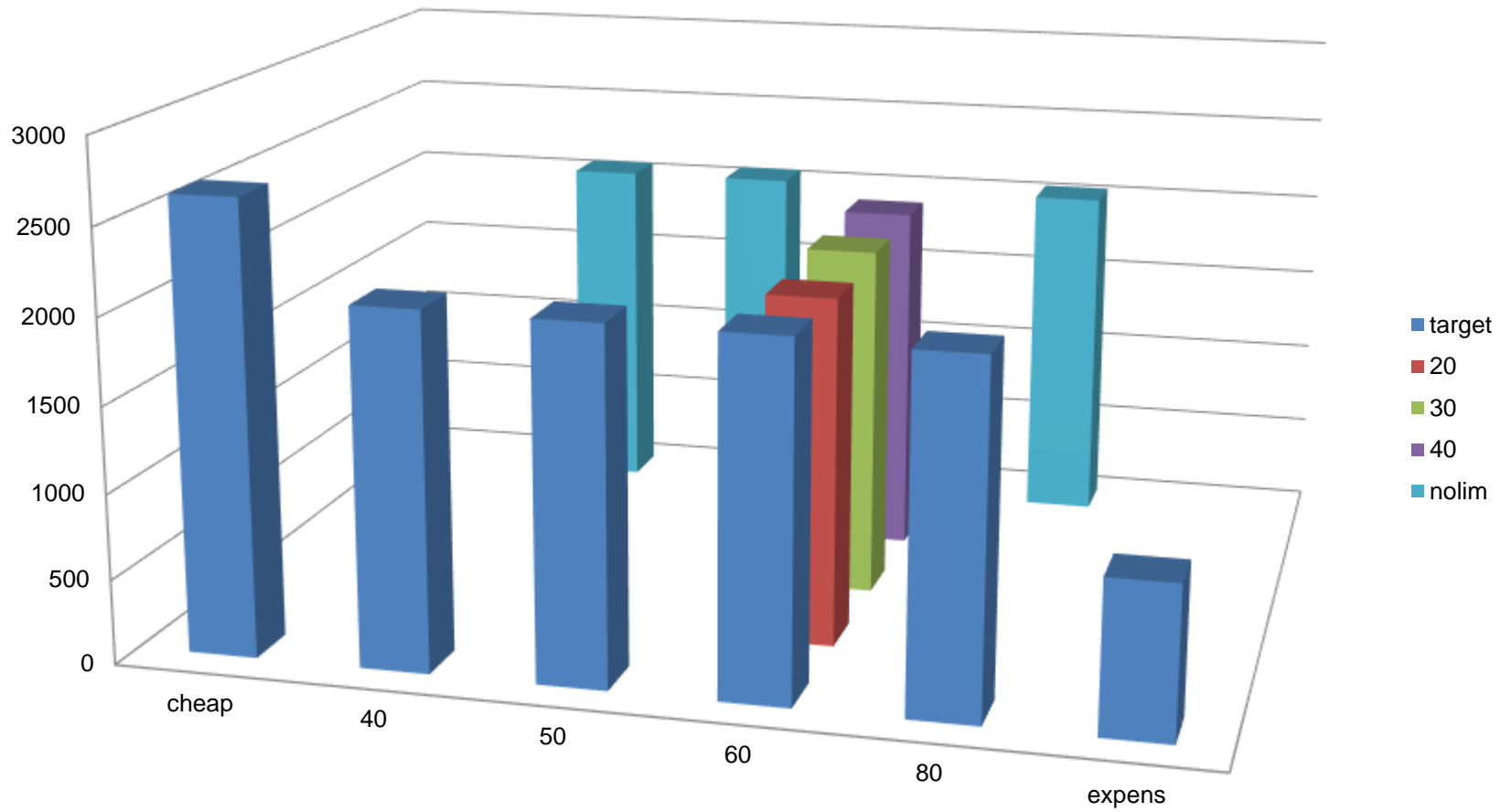
# The Scenarios

		oil price [Euro/boe]					
		cheap	40	50	60	80	expens
		cheapG	oil40	oil50	REF	oil80	expenGa
CO2 tax	target	as					s
	20				NoCO2limit20		
	30				NoCO2limit30		
	40				NoCO2limit40		
	nolim		Oil40Nolim	Oil50Nolim		Oil80Nolim	
Additional scenarios:					<b>Africa</b>		
					<b>FreeScen</b>		
					<b>NoCrisis</b>		

# Total Gas Imports to the EU 2015 to 2025 [bcm]

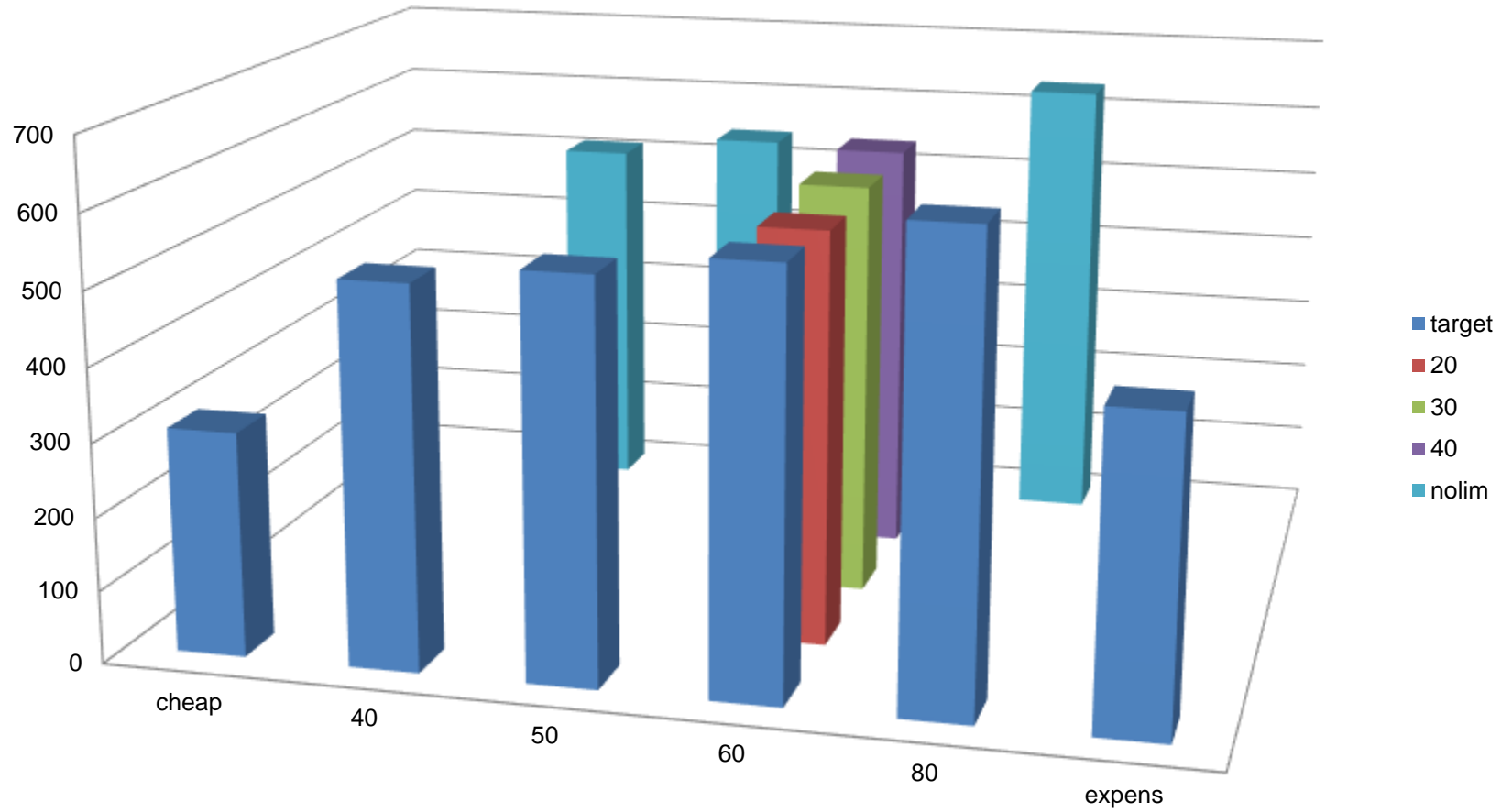


# Gas Imports from Russia 2015 to 2025 [bcm]





# Value of Gas from Russia 2015 to 2025 [bill EURO]



# In Numbers for 2015 to 2025

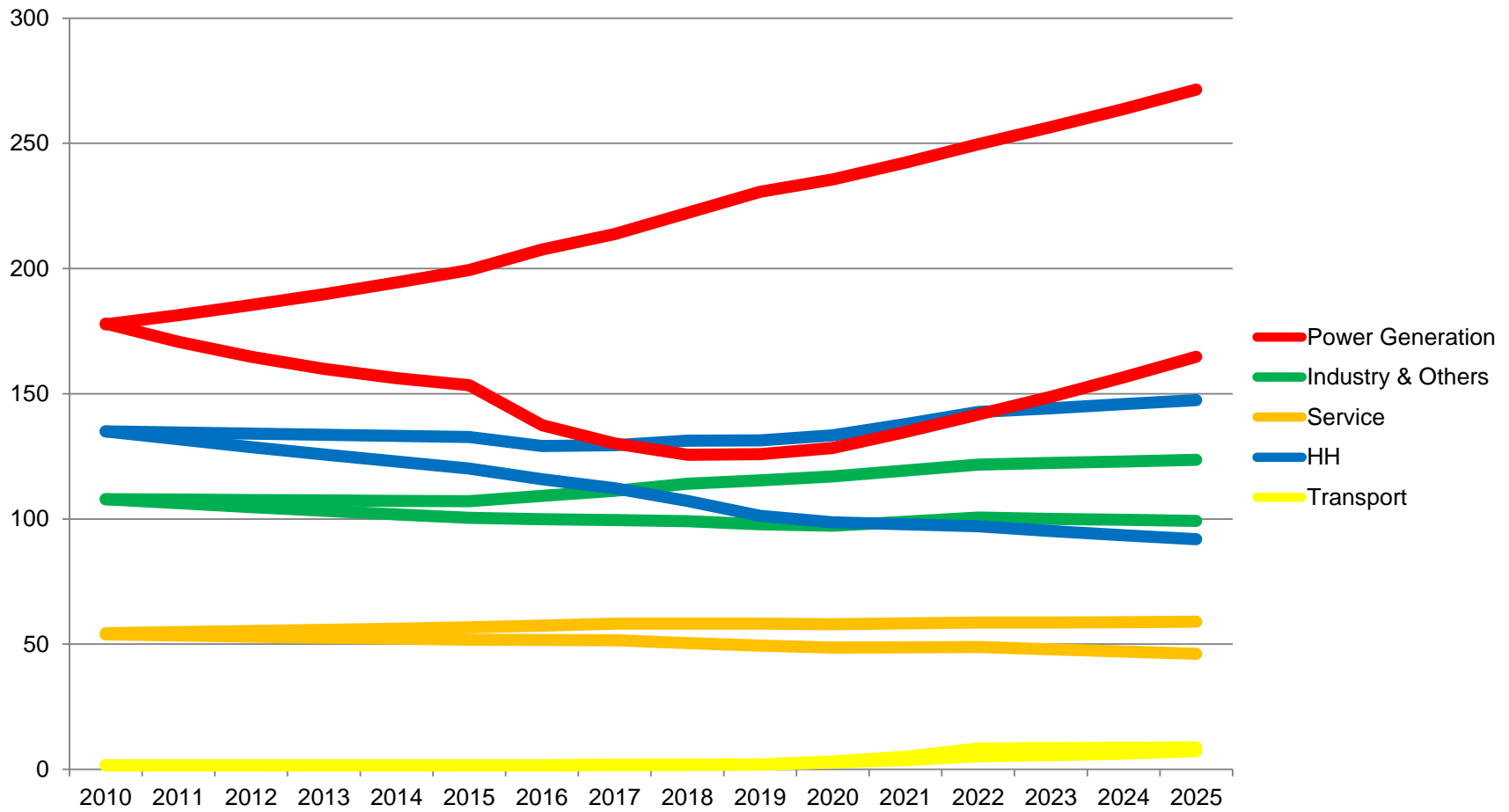
Total Gas Imports [bcm]							
		oil price [Euro/boe]					
		cheap	40	50	60	80	expens
CO2 tax	target	6518	5396	5365	5348	5285	4012
	20				5283		
	30				5387		
	40				5444		
	nolim		5386	5384		5317	

Gas Imports from Russia [bcm]							
		oil price [Euro/boe]					
		cheap	40	50	60	80	expens
CO2 tax	target	2642	2084	2074	2069	2039	896
	20				2034		
	30				2075		
	40				2095		
	nolim		2063	2064		2041	

Value of Gas from Russia [billEuro]							
		oil price [Euro/boe]					
		cheap	40	50	60	80	expens
CO2 tax	target	307	519	544	573	633	422
	20				563		
	30				572		
	40				577		
	nolim		510	538		633	

# Gas Use [bcm/year]

(cheap and expensive gas scenarios)



- Oil market fundamentals and surrounding factors leading to the current crisis
- Detail results overview on the aggregated EU level
- Stress-testing: extreme scenarios for model



# The international oil market - wither price of oil

- Lesson 1:
  - “The probability of occurrence of predicted energy trends is inversely proportional to the intensity of the underlying consent.” (Henry Linden)
- Lesson 2:
  - No running out in sight - Peak oil debunked. Note: Oil use will peak eventually but not for reasons of scarcity
- Lesson 3:
  - Economically recoverable reserves =  $f(\text{market price, technology, demand, politics})$

# The international oil market - wither price of oil

- Lesson 4:
  - Prices = f(demand, spare production capacity, investment, geopolitics (energy security), expectation [speculation])
- Lesson 5:
  - Prices  $\neq$  costs – short run versus long-run marginal cost

# Oil market today

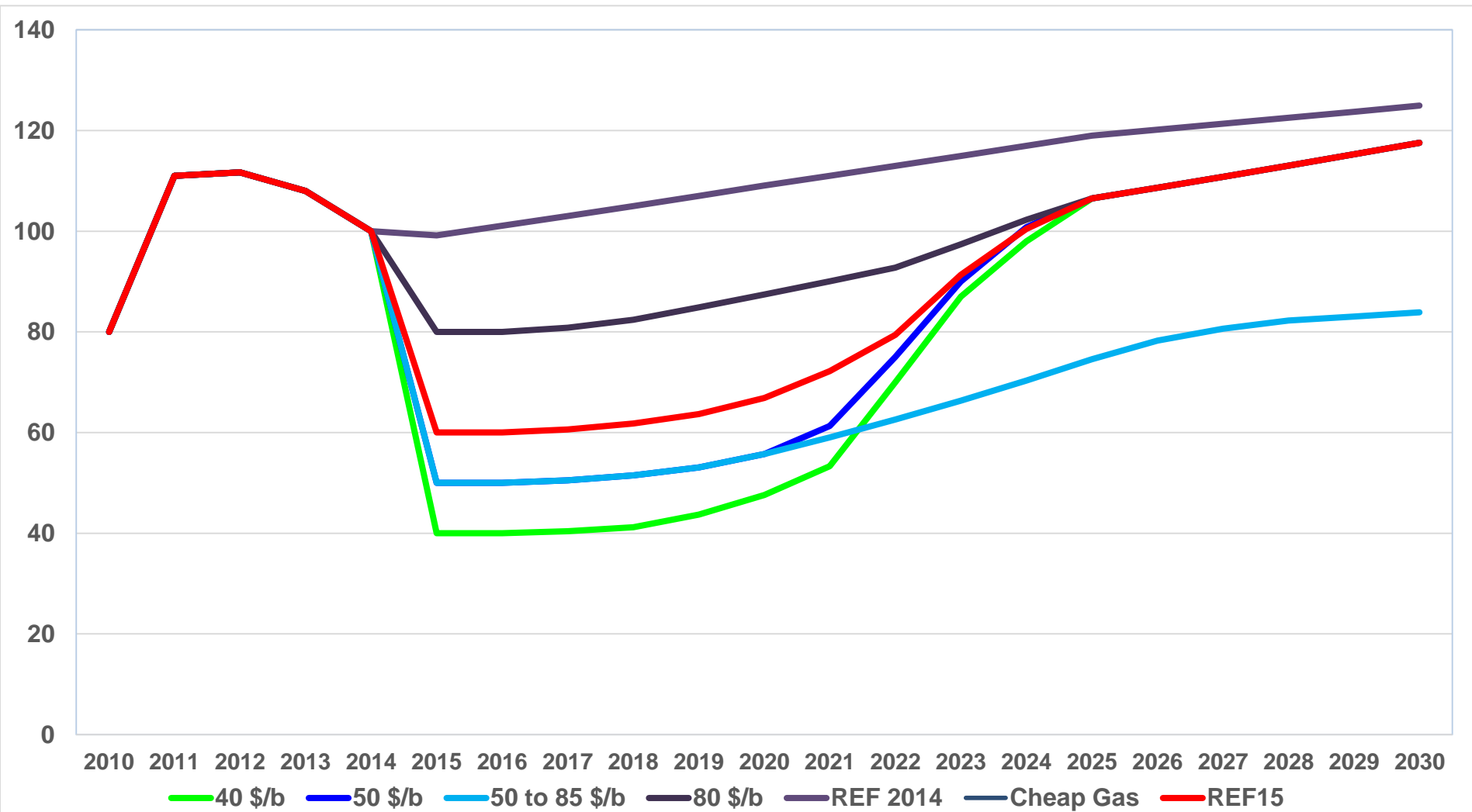
- Stagnating demand at best due to overall sluggish economic development
- Shale oil increased US oil output by 80% or 4 mmb/d versus 2008 (remember North Sea & Mexico in the early 1980s)
- Correction of the perverse situation that the lowest cost producers are the swing supplier
- Accelerating decline in rig counts for shale oil development & a general cut-back in capital outlays
- Some oil producing countries can weather the storm – others encounter severe financial and budget shortages
- Volatile financial markets & exchange rates
- Uncertainty with respect to future environmental regulation

## Oil market rebound – Critical issues

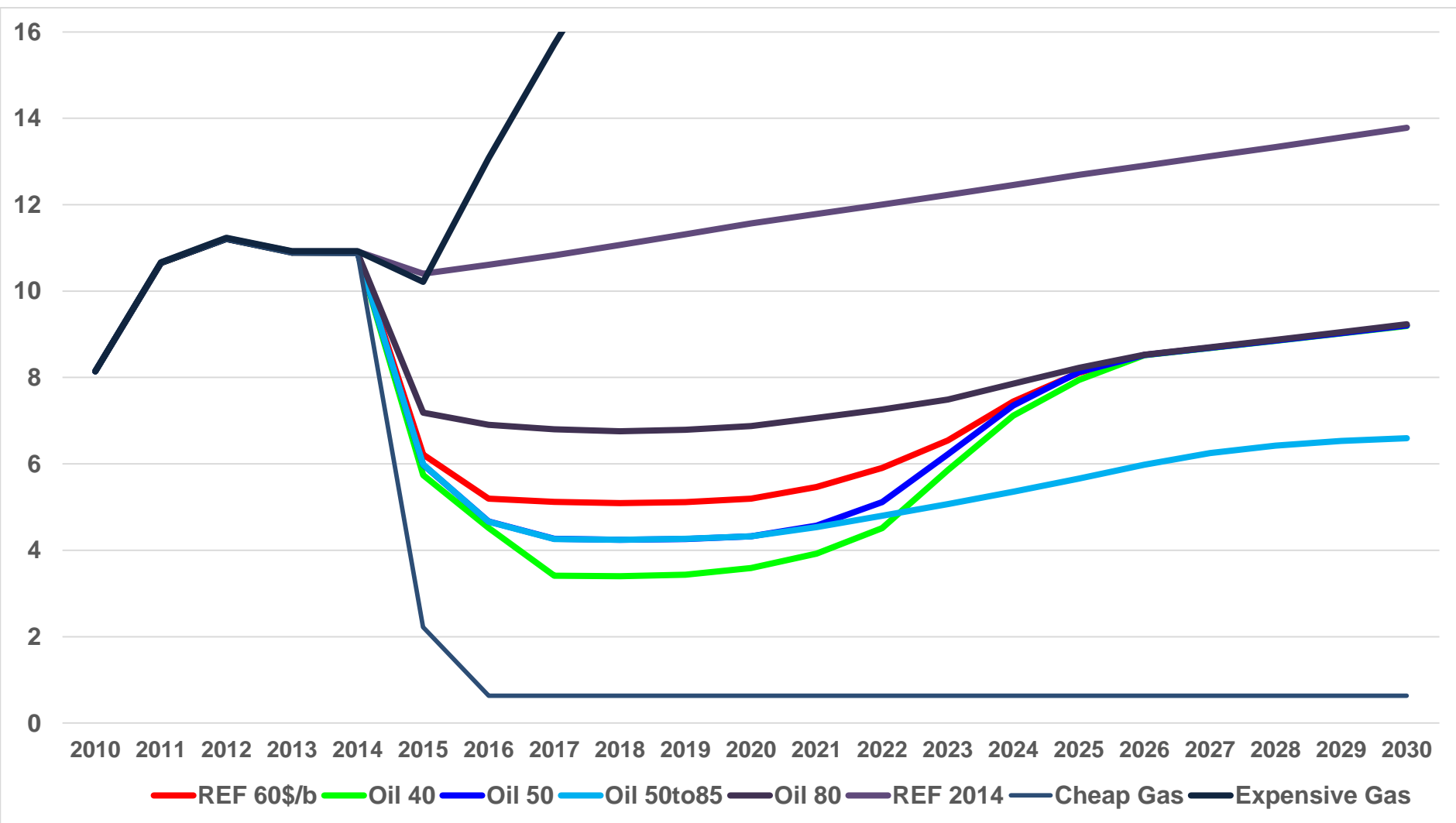
- Change in Saudi leadership
- Turmoil in Nigeria
- Libya promising development halted
- Iran and Iraq
- Offshore developments around the world
- Short-run prices likely to stay low until new investments required
- Estimated transfer of \$1.5 - \$2 trillion from oil exporting countries to oil importing countries (D. Yergin) – Stimulating economic growth and oil demand?



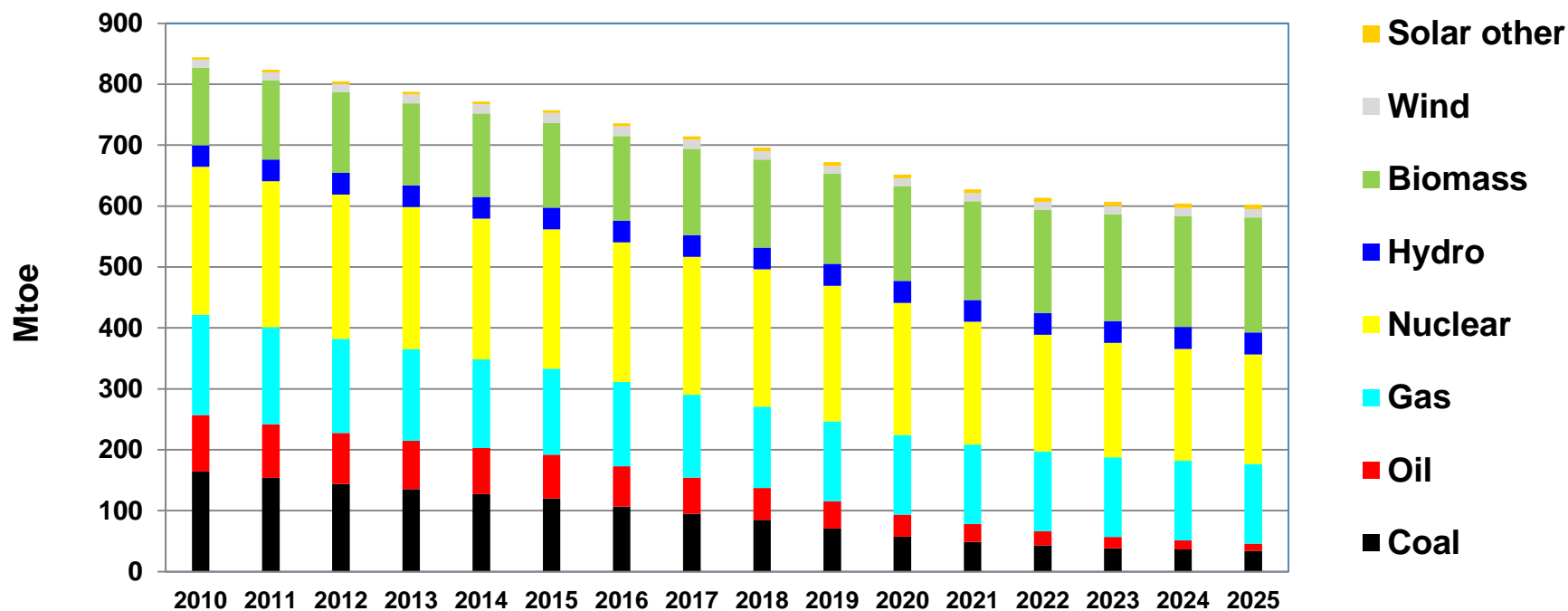
# Crude oil prices, \$/boe



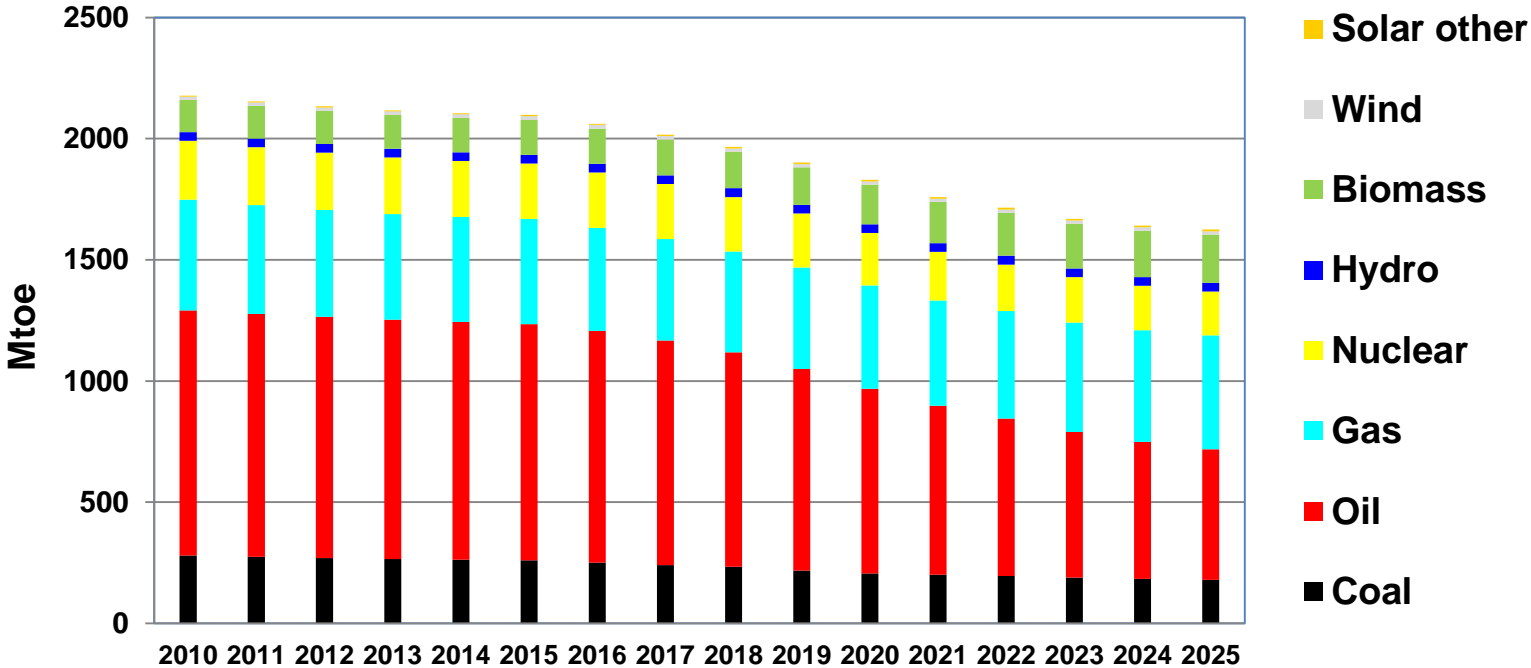
# Average gas import prices, €/GJ



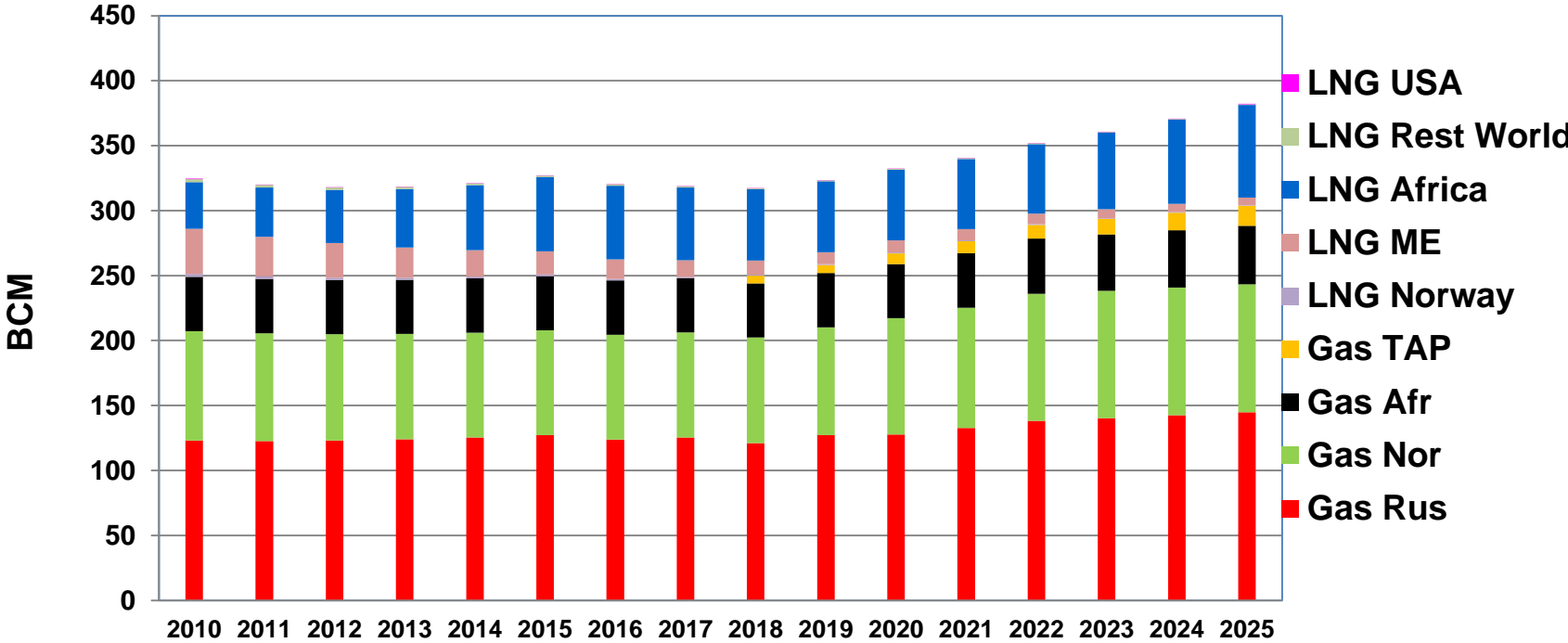
# Primary energy production: Ref15



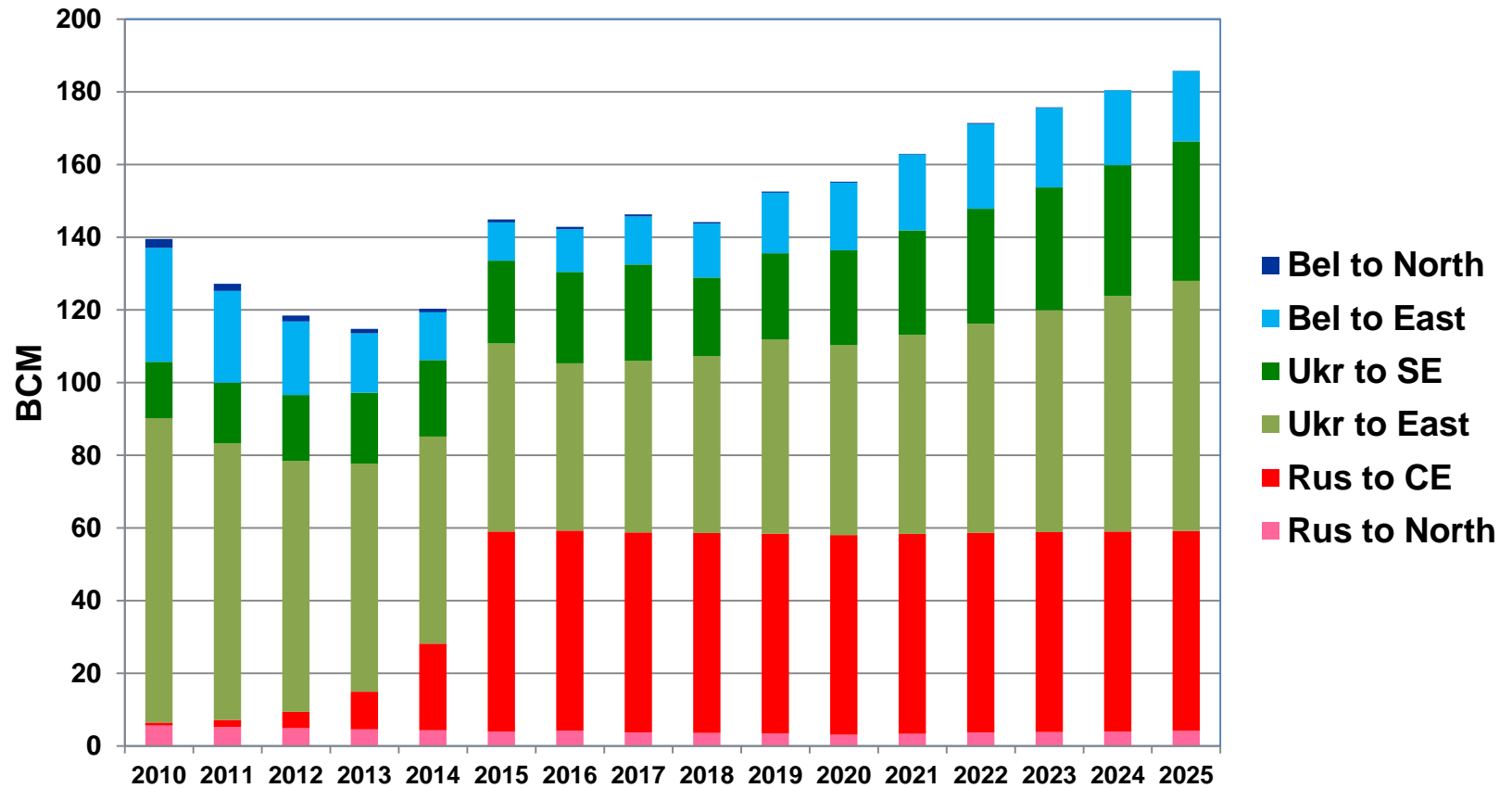
# Primary energy supply: REF15



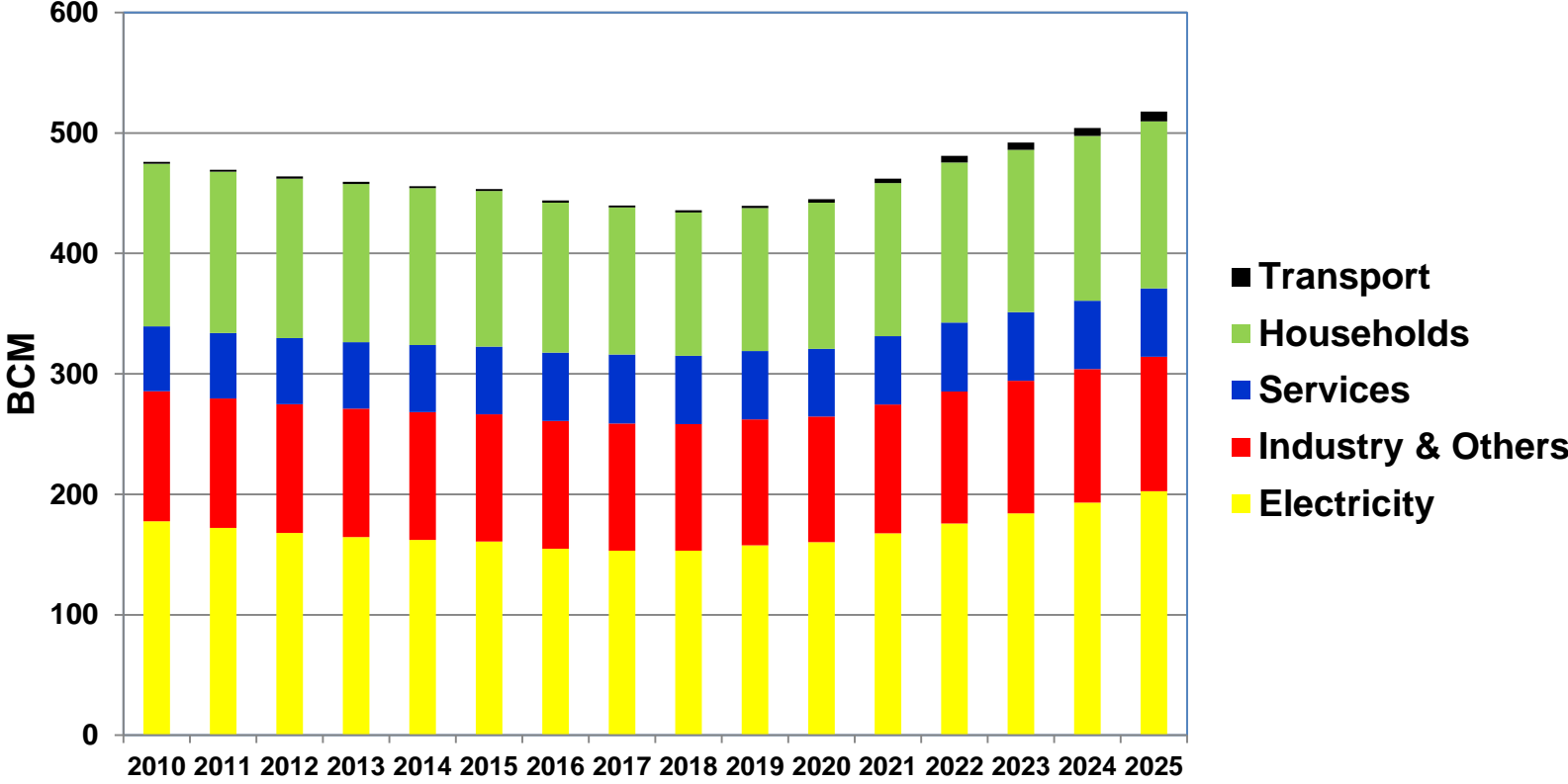
# Gas imports: Ref15



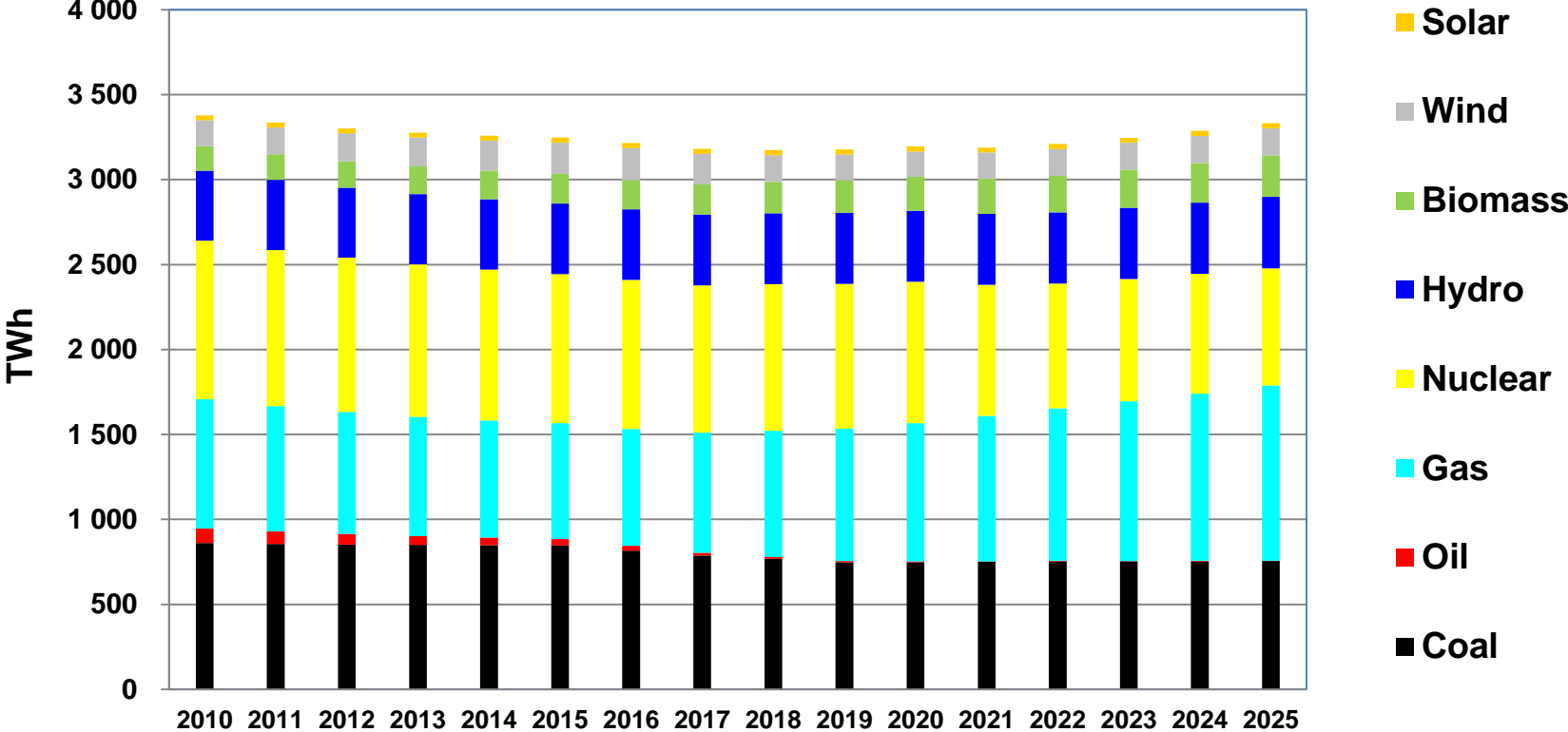
# Gas trade Russia to EU: REF15



# Gas use by sector: Ref15

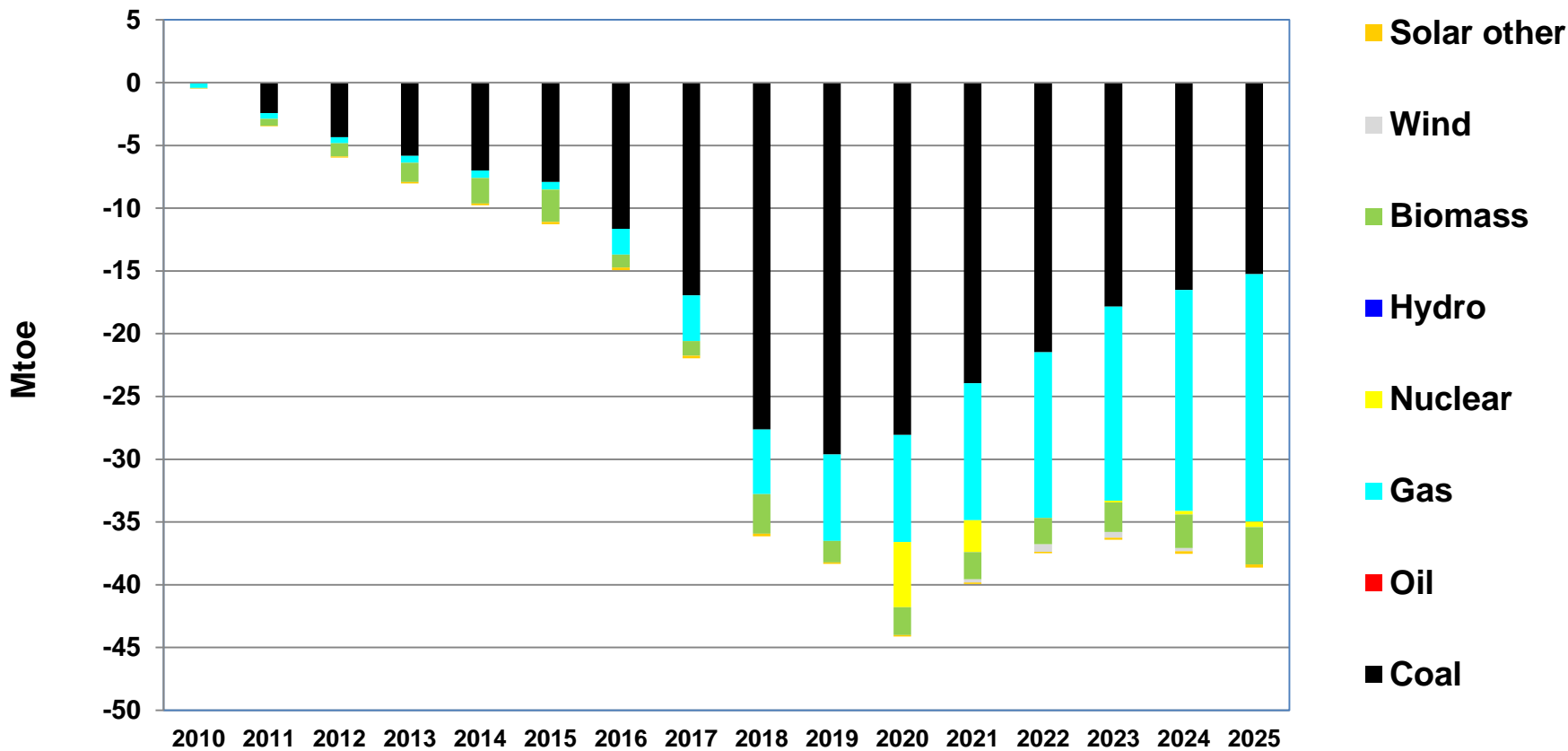


# Electricity generation by fuel: Ref15

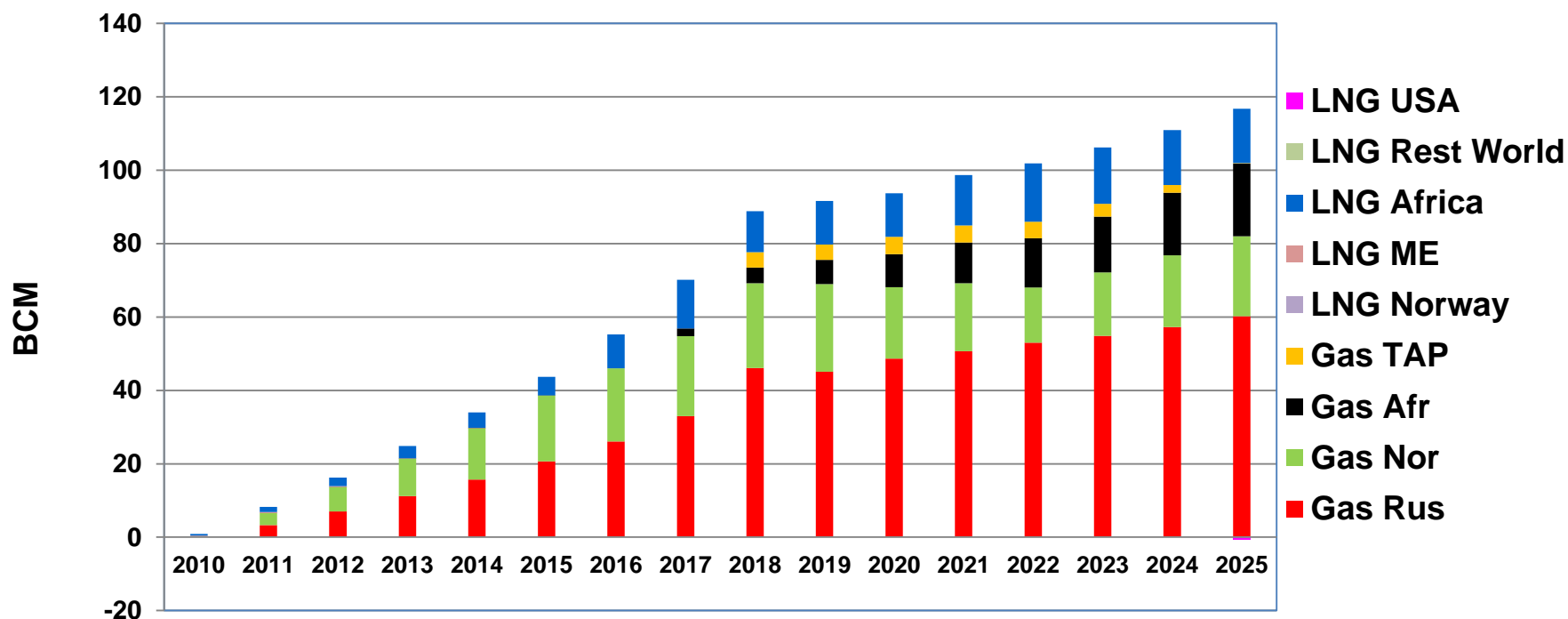




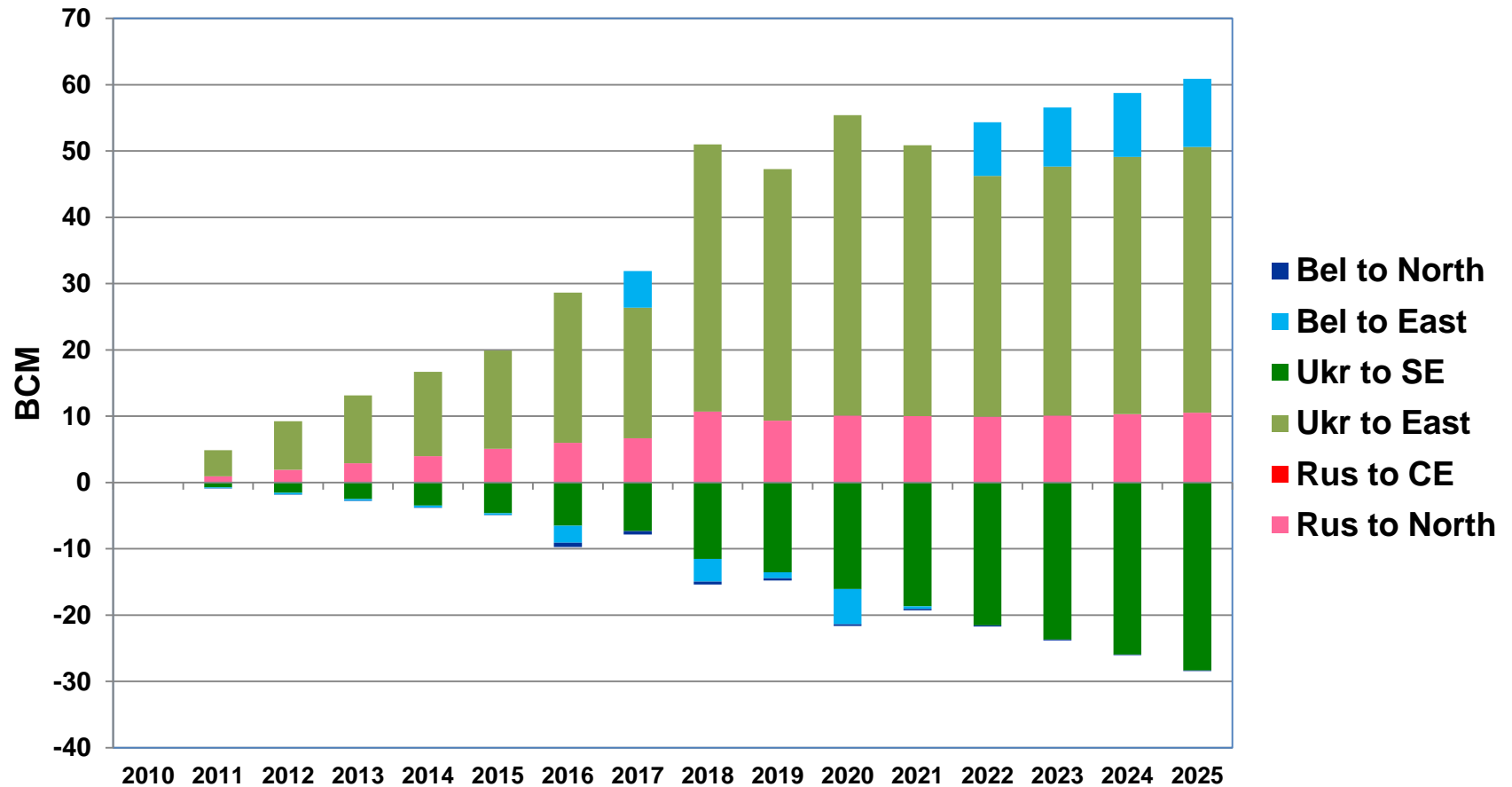
# Domestic primary energy production: CheapGas versus REF15



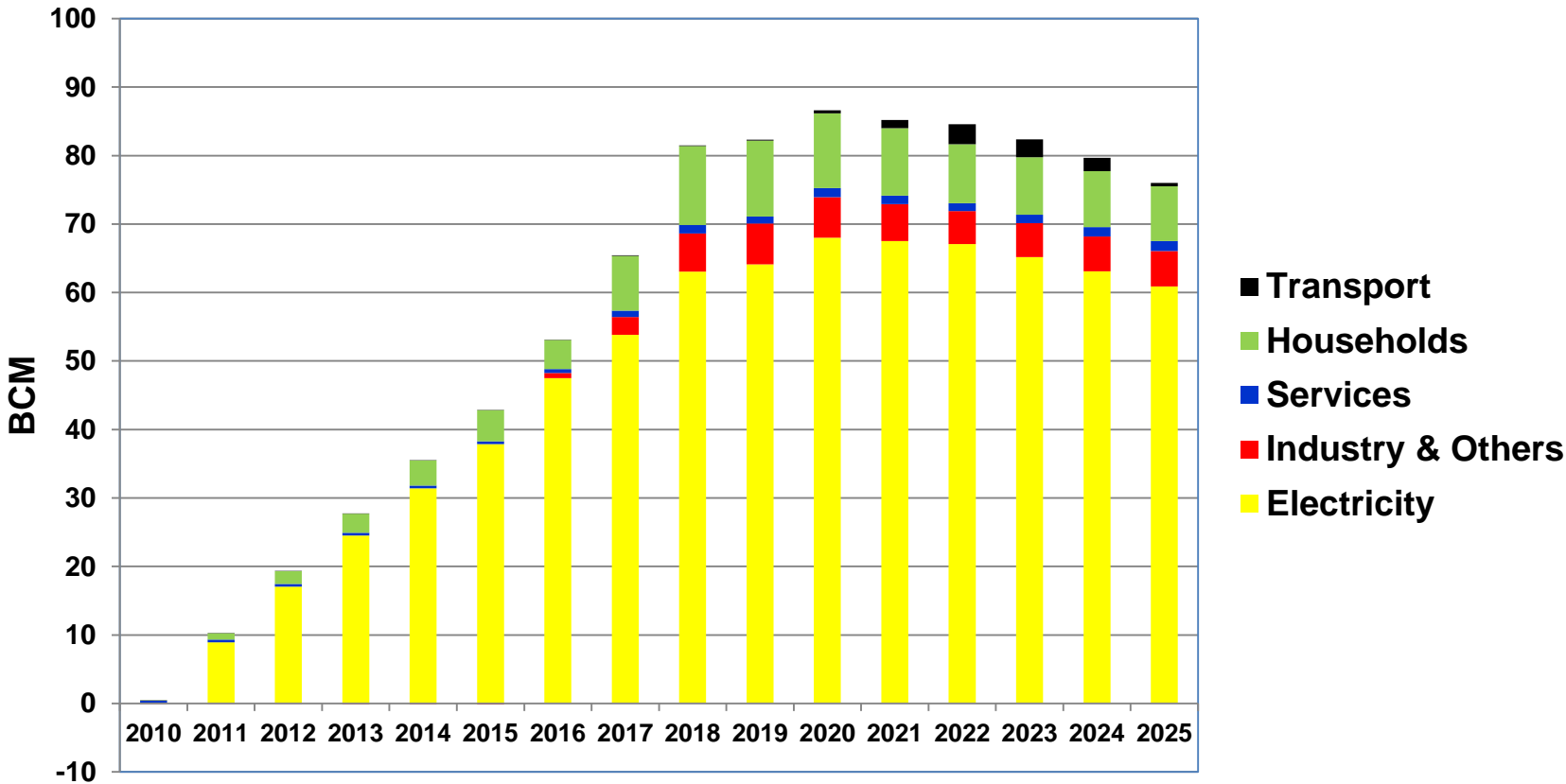
# Difference in gas imports: CheapGas versus REF15



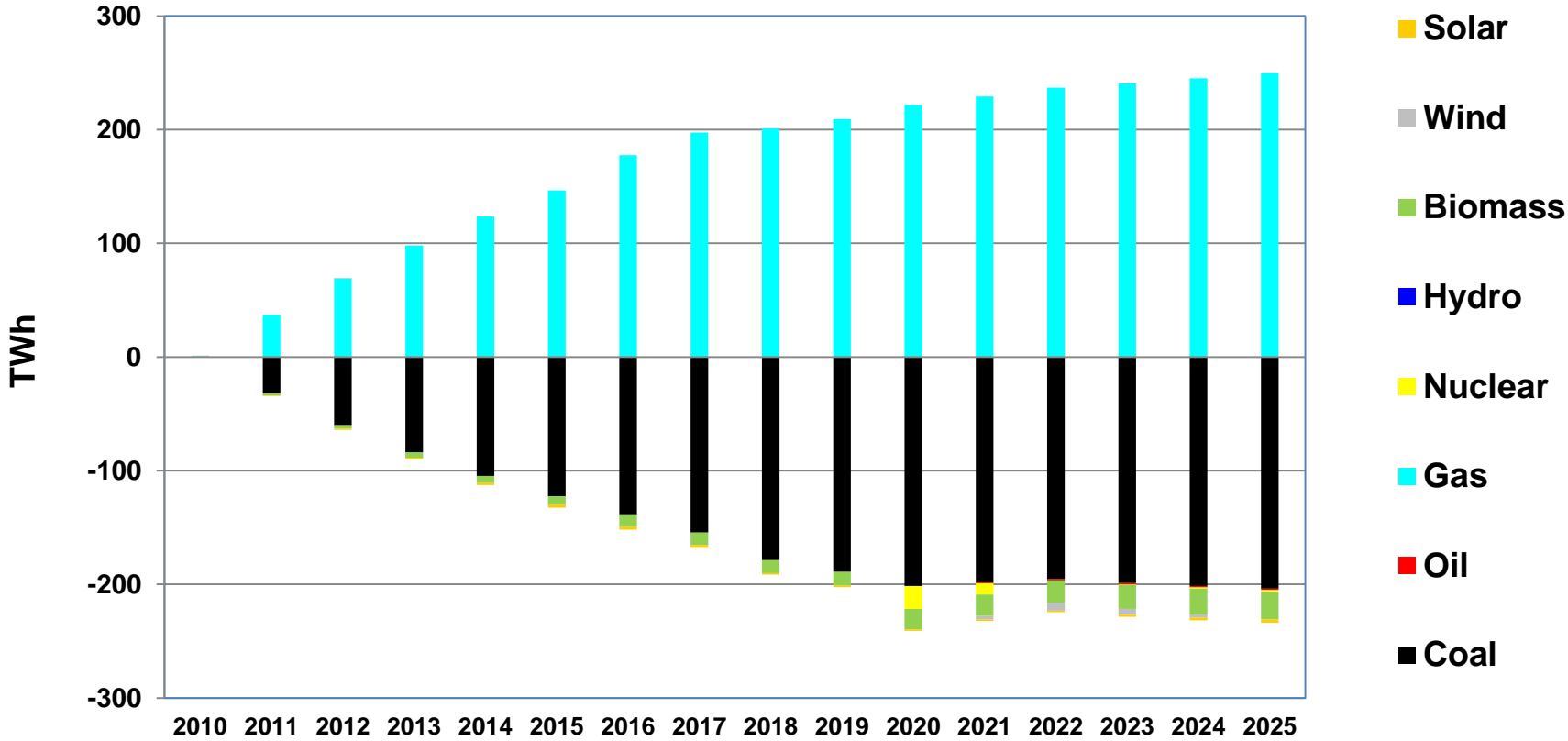
# Gas trade Russia to EU: CheapGas vs REF15



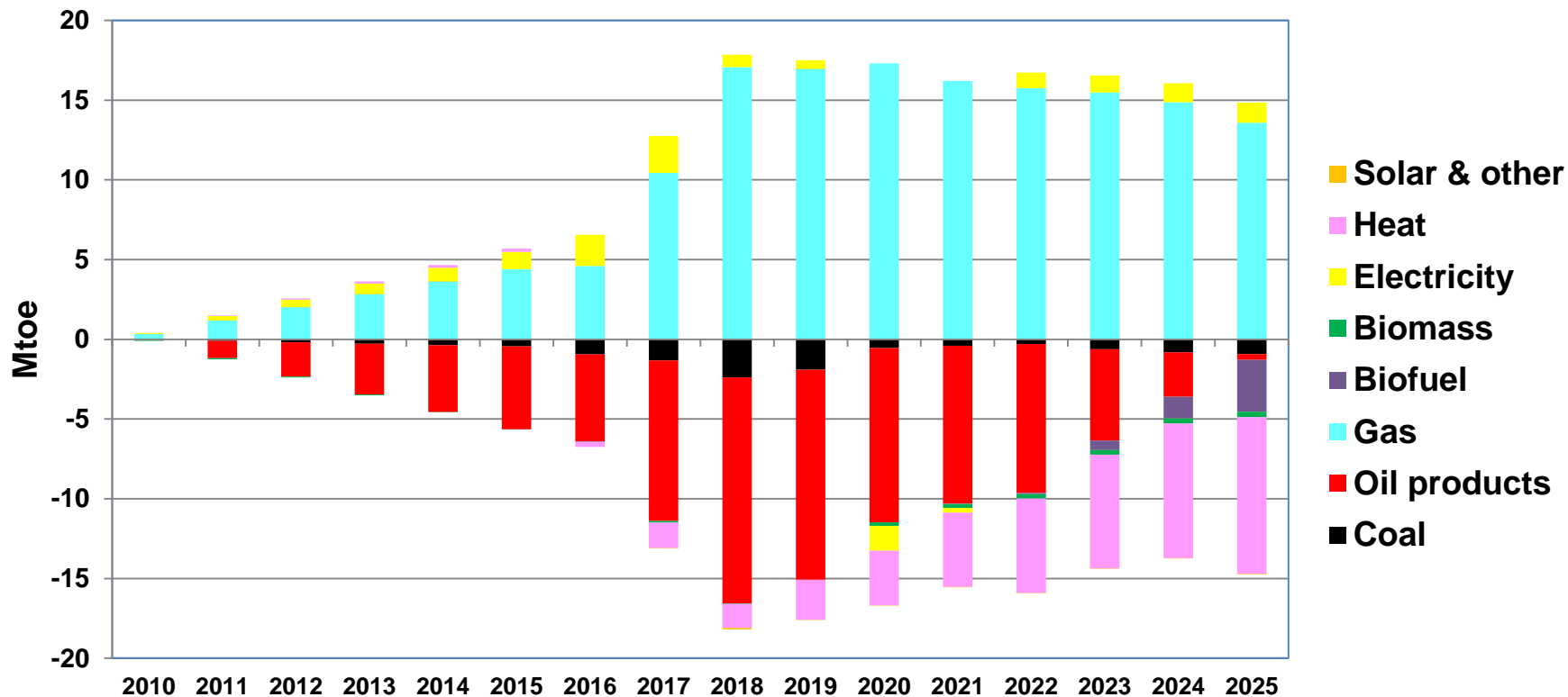
# Difference in gas use by sector: CheapGas versus Ref15



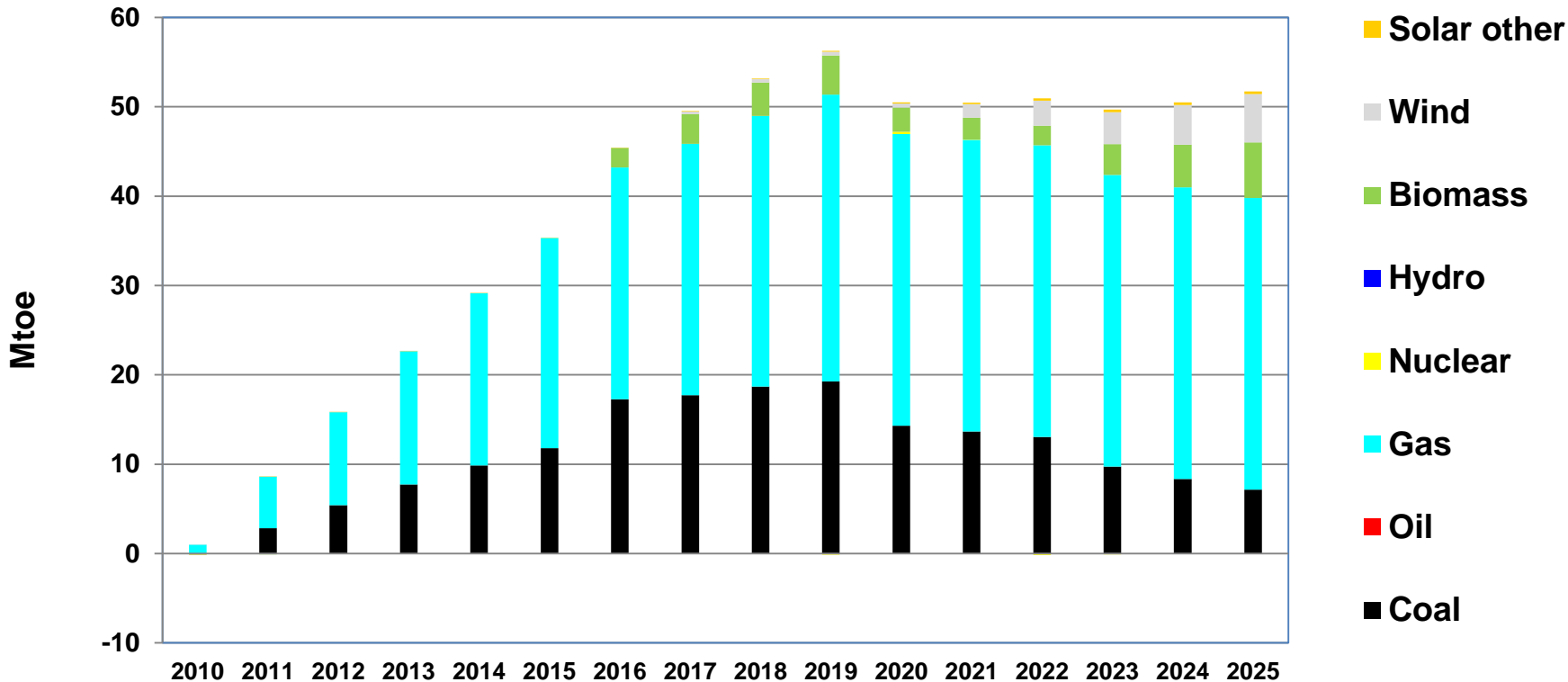
# Difference in electricity generation: CheapGas vs REF15



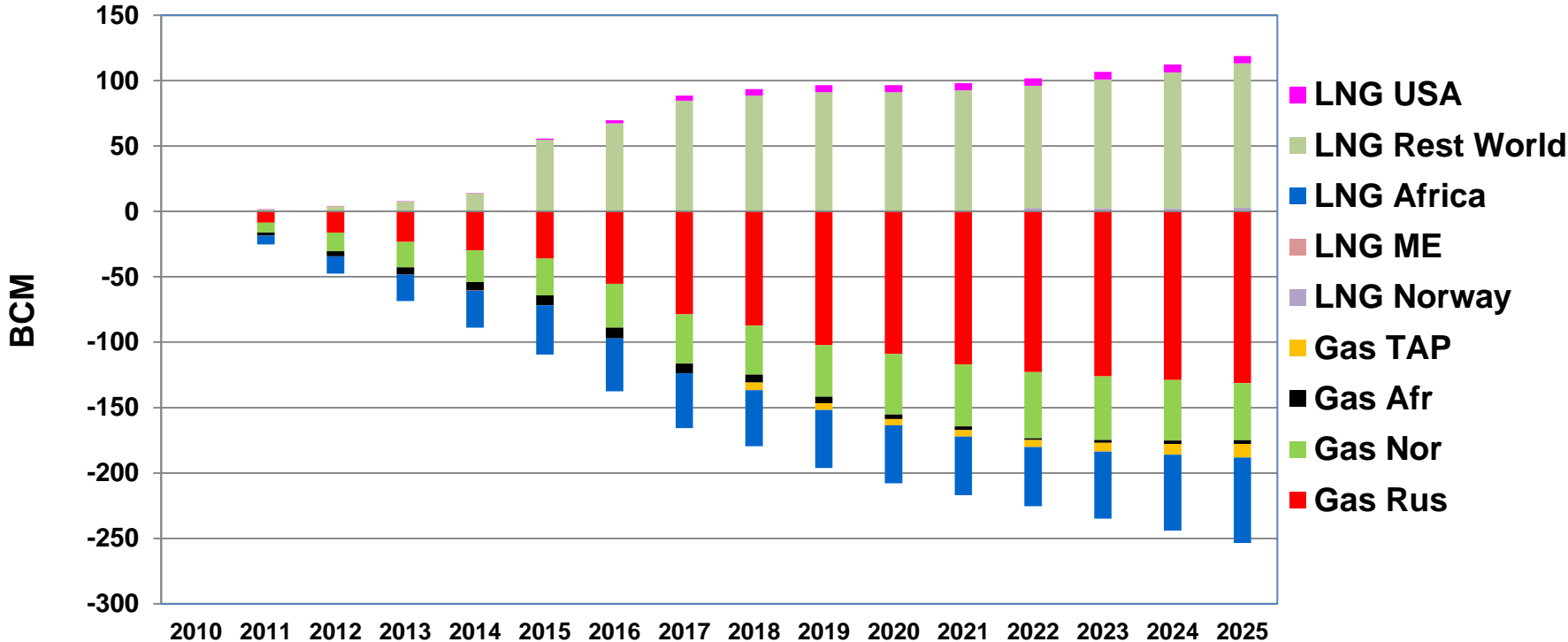
# Difference in final energy: CheapGas versus Ref15



# Domestic primary energy production: Expensive Gas versus REF15

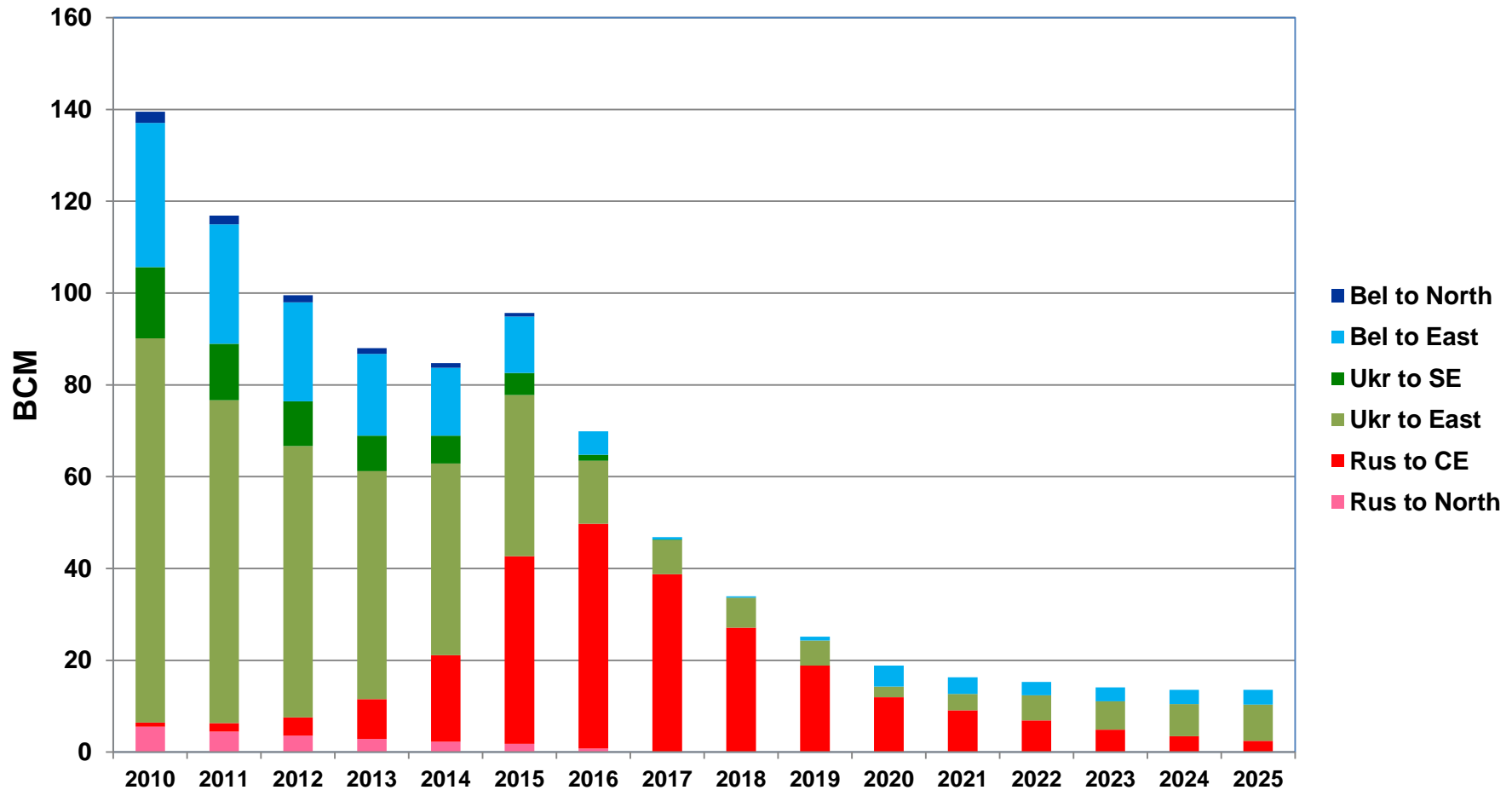


# Difference in gas imports: ExpensiveGas versus REF15



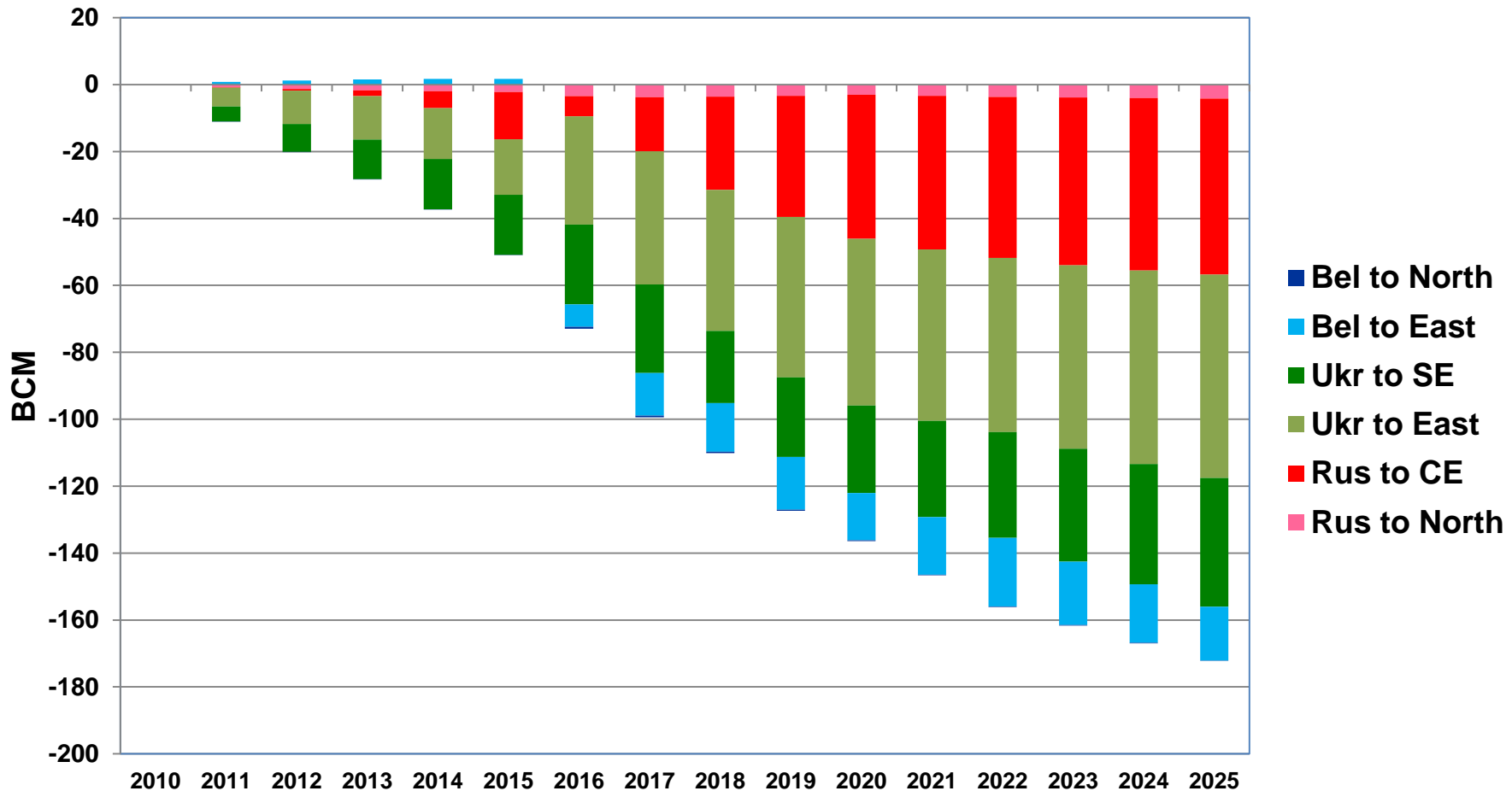


# Gas trade Russia to EU - Expensive Gas

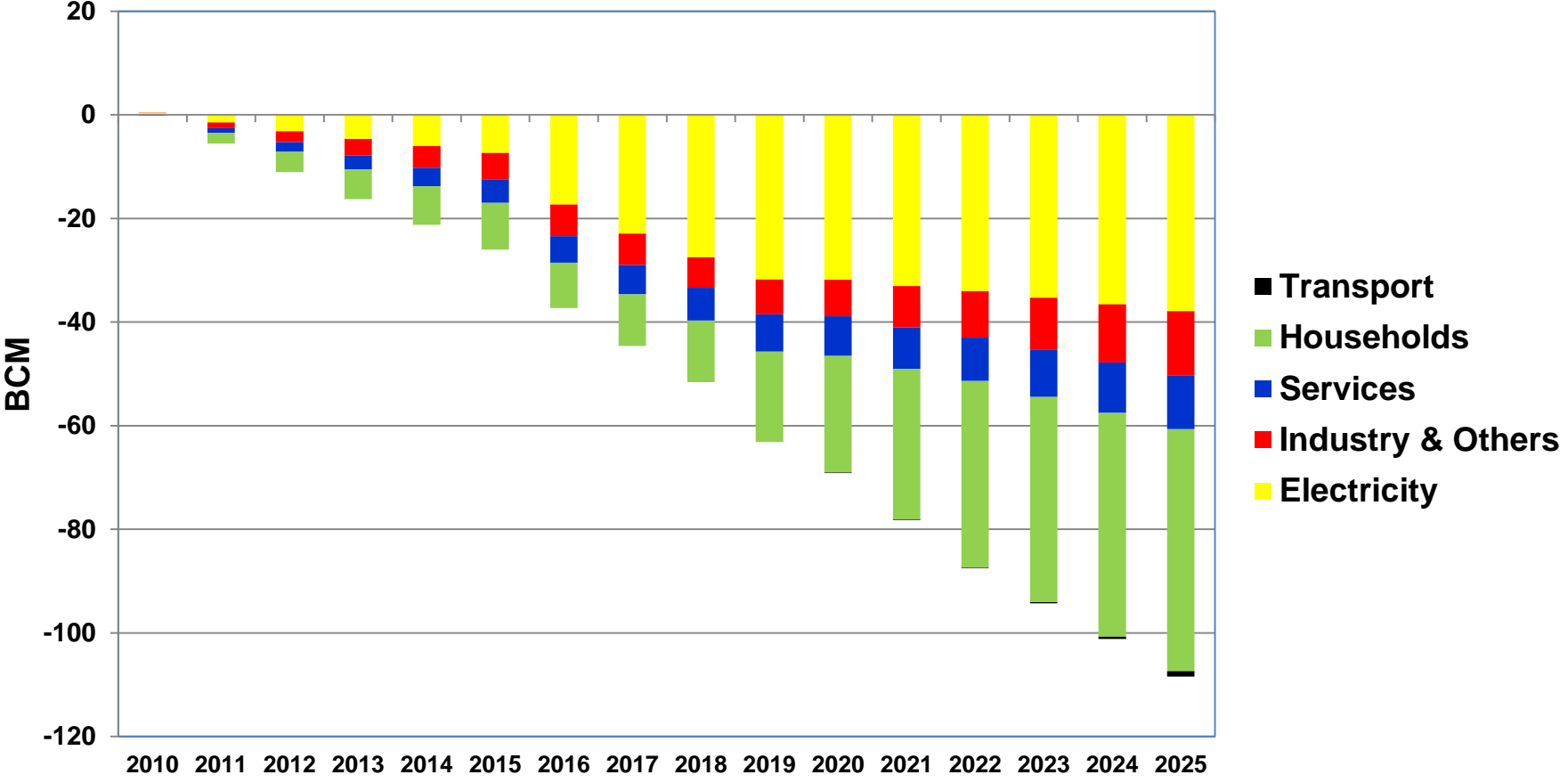


# Gas trade Russia to EU

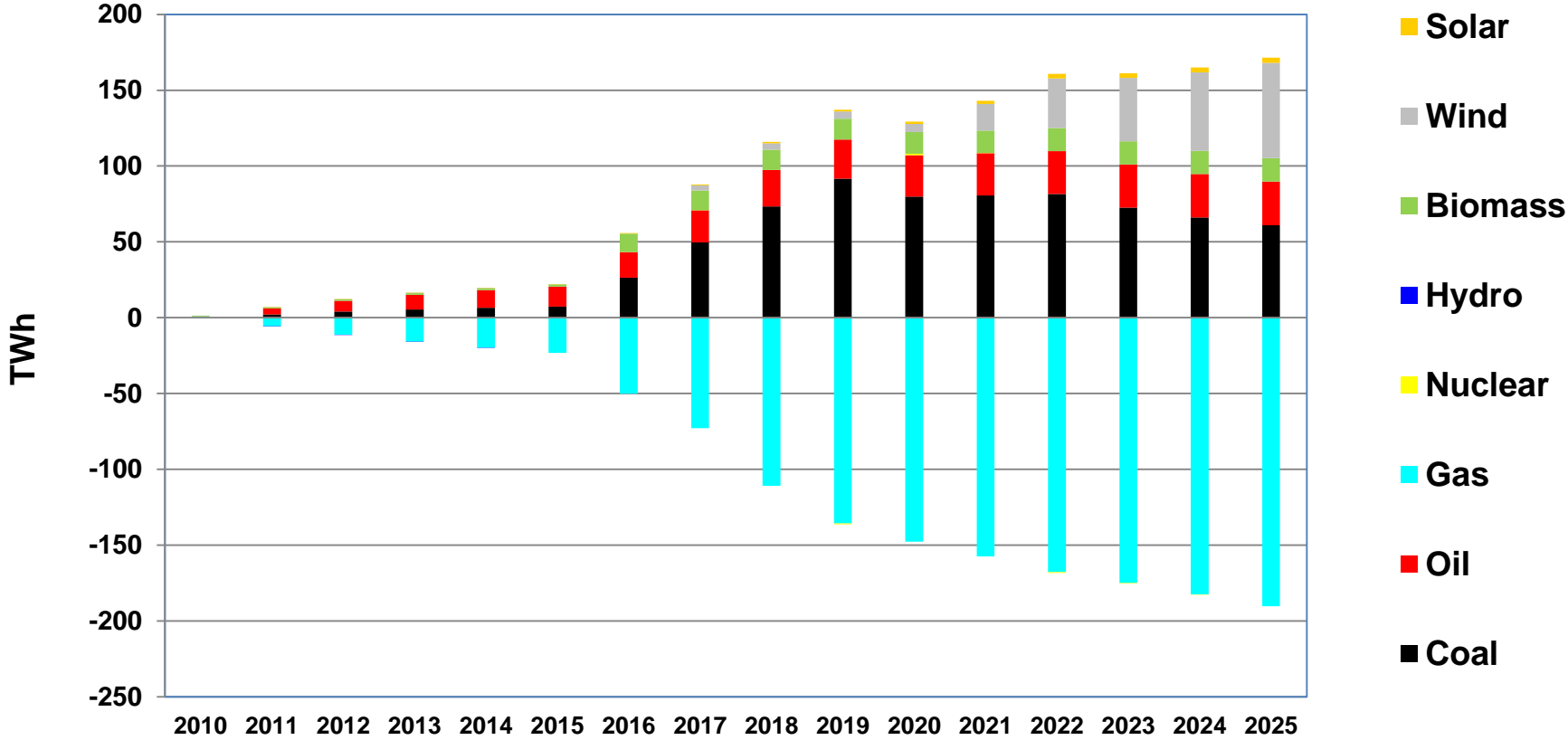
## Expensive Gas vs REF15



# Difference in gas use by sector: ExpensiveGas vs Ref15



# Difference in electricity generation: ExpensiveGas vs REF15



# Difference in final energy: ExpensiveGas vs Ref15

