



Global gas markets, carbon pricing and the future of natural gas

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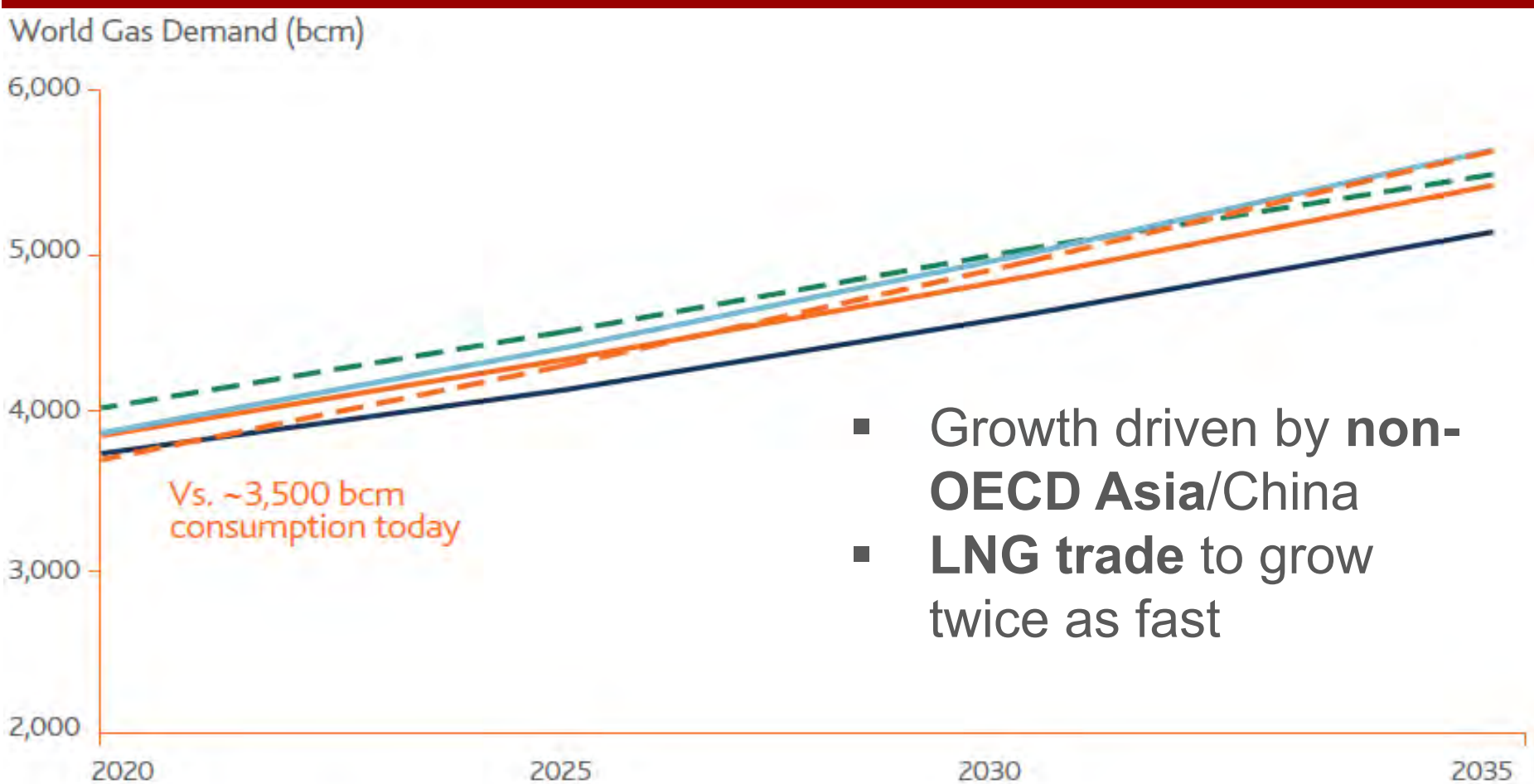
**2nd International Conference on the
Economics of Natural Gas Markets**

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Plan for this talk

- ① **Gas demand, prices and competition**
- ② **Coal-to-gas switching in power generation**
- ③ **Political economy & carbon pricing**
- ④ **Strategic positioning**

Gas demand is expected to grow steadily



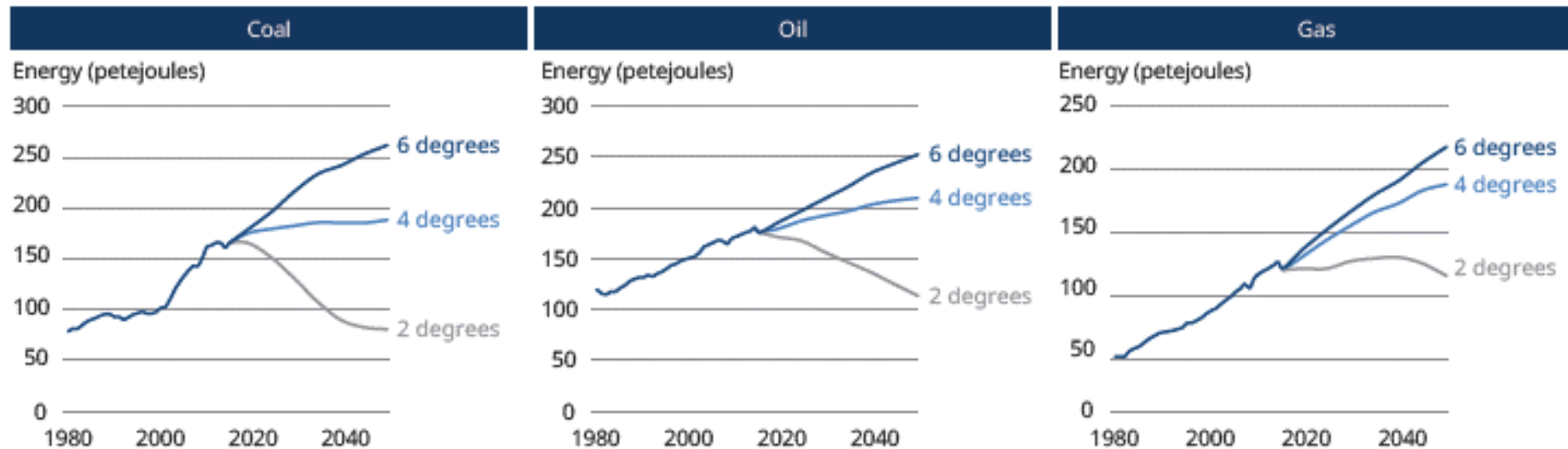
Source: SNAM 2017 Global Gas Report

Projections and growth CAGRs

— EIA Intl Energy Outlook 2016 (2.2%) — Shell LNG Outlook 2017 (2.0%) — BP Statistical Review 2016 (1.8%)
- - IEA Golden Age of Gas scenario – 2011 (1.8%)¹ — IEA - NPS 2016 (1.6%)²

Forecasts too bullish given climate challenge?

- Gas demand likely **more robust** than coal or oil

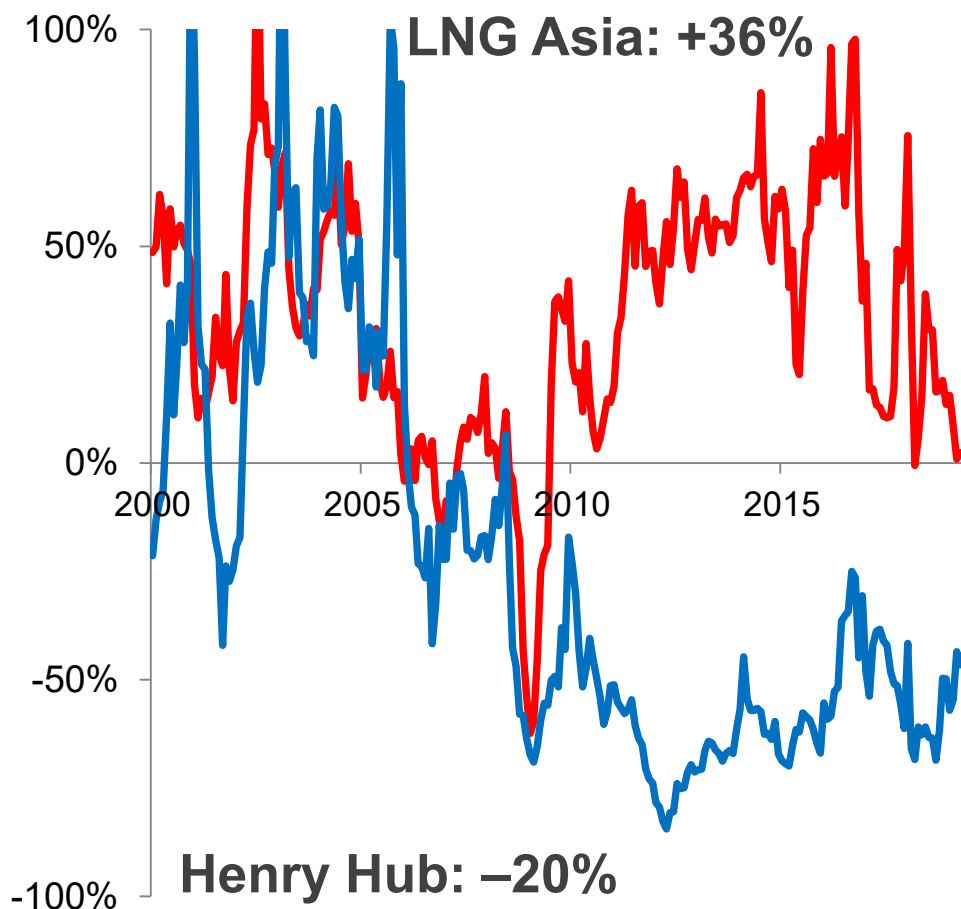


Source: Schroders (2018)

- How to secure **demand**? At which **prices**?
- ⇒ How much **new investment** in gas/LNG?

Regional price divergence is the historical norm

Price premium relative to EU natural gas



“Asian premium”:

- Most of last 20 years
- Imperfect competition + limits to arbitrage

Low & stable HH price

- US LNG exports
- Security of supply (LNG vs pipeline gas)

⇒ Global convergence to Henry Hub-based pricing?

Source: Calculations based on IMF data from January 2000 to April 2019

Competition in global LNG: A changing market

Balance of power: Shift to gas buyers post-2014

- Global price decline (comparable to crude oil)

LNG market structure:

	2007	2012	2017	2022
Seller HHI (# players)	.102 (14)	.140 (18)	.136 (18)	↑? Further US & AUS
Buyer HHI (# players)	.218 (18)	.180 (27)	.132 (39)	↓? Smaller Asian

⇒ LNG sell-side now *more* concentrated than buy-side

Note: Herfindahl index (HHI) is a measure of market concentration, ranging from 1 (monopoly) to 0 (many small players)

Source: Calculations based on 2018 GIIGNL data

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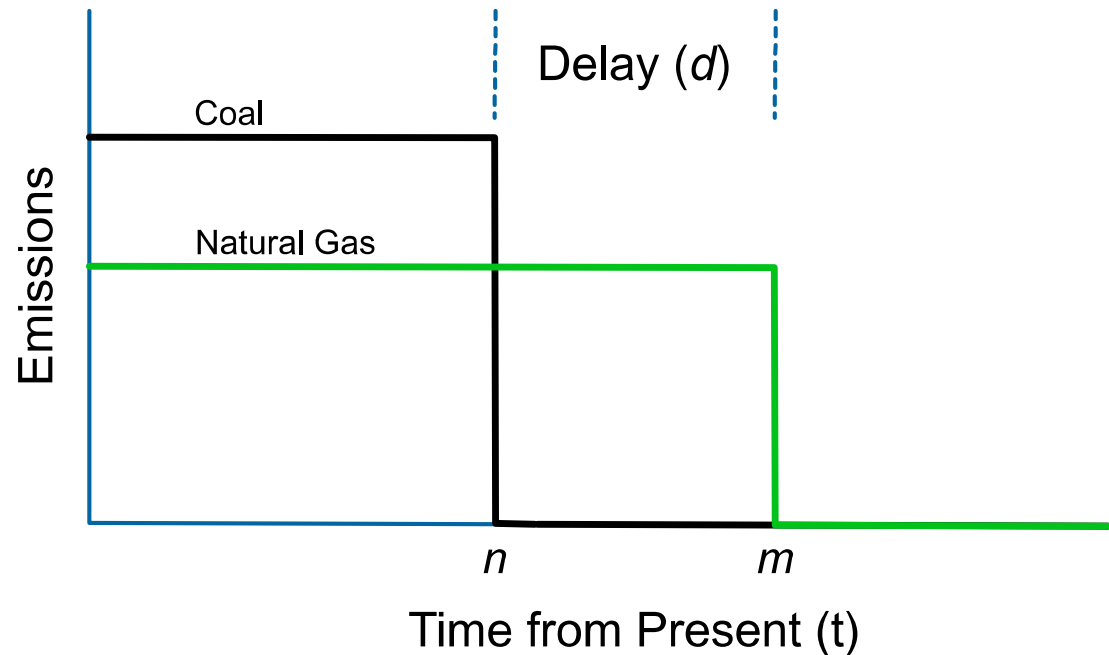
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Coal-to-gas switching from a climate perspective

How much delay in adoption of near-zero carbon technologies (NZCT) is achieved by switching to gas?

Parity ratio: Allowable years of gas per year of coal generation avoided

- **Literature:** ≈ 2.4 years
- Coal plant replaced 15 years before otherwise replaced by NZCT
- Gas can operate for ≤ 36 years, helping climate



⇒ **“Bridge fuel”** buys 1.4 years per year of coal displaced

Source: Adapted from Hausfather (2015)

Thought experiment: Global coal-to-gas switch

Q: How much existing coal-fired power generation can be replaced with existing unused gas generation?

Top 5	“Gas potential”
China	6%
US	47%
India	12%
Russia	37%
South Korea	35%

- **European countries:** mostly >100% potential
- **Zero potential:** Japan, Mexico, Poland, Kazakhstan

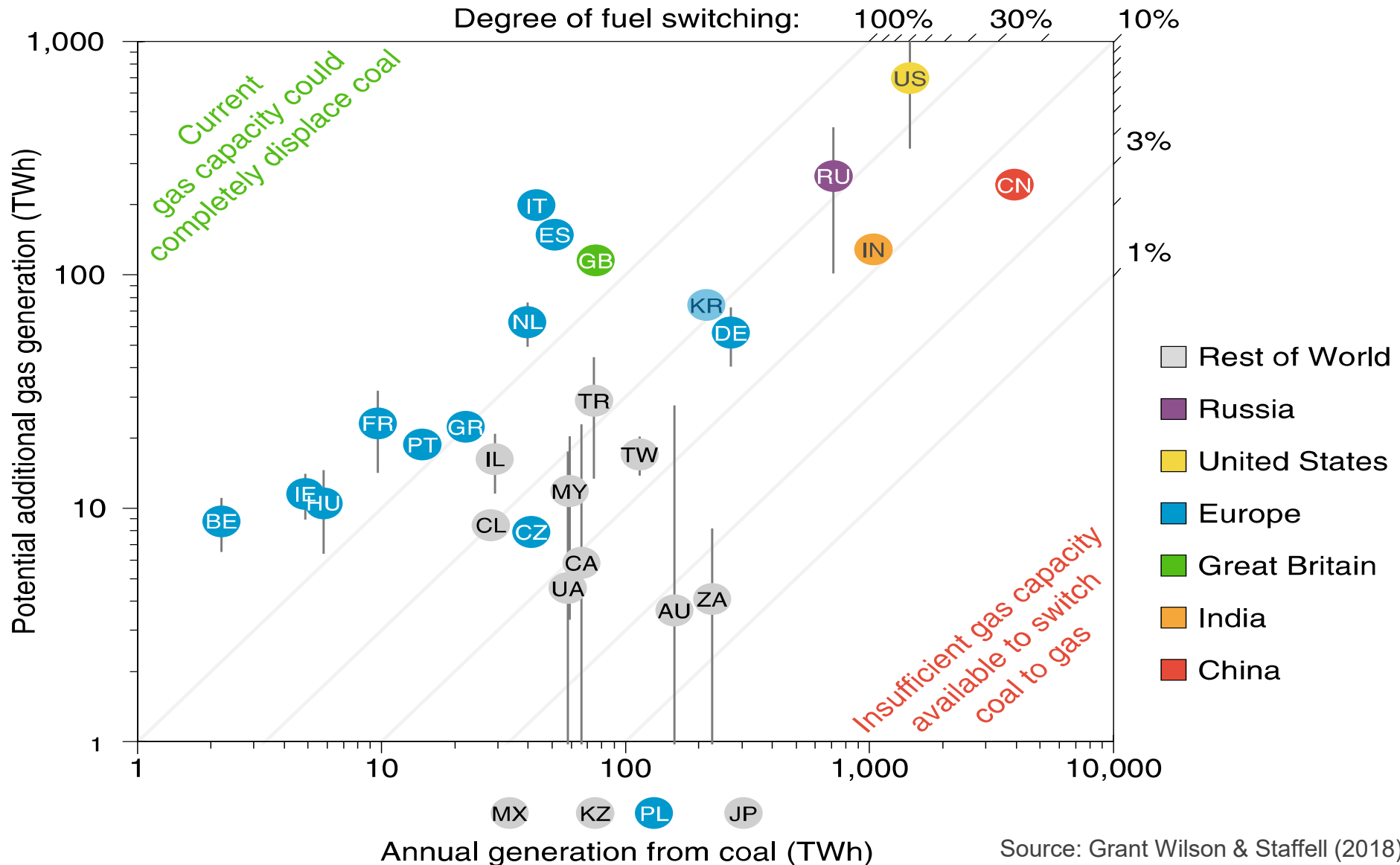
A: Global switching potential ~20% with existing assets

⇒ Annual global carbon emissions fall by ~1 GtCO₂

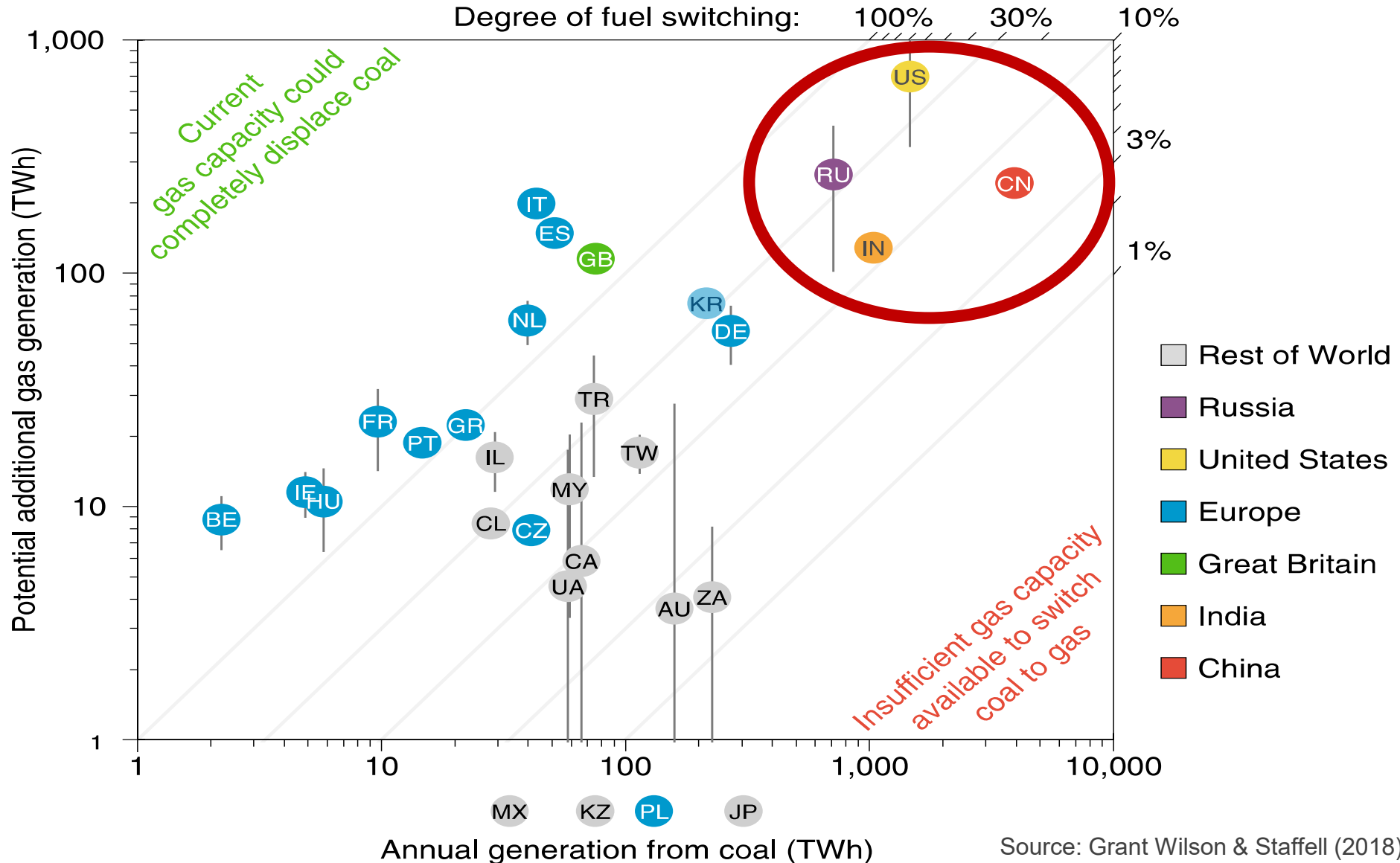
- **Social value:** ~\$50+ billion per year

Source: Grant Wilson & Staffell (2018), 2015 data

Potential for coal-to-gas switching in power

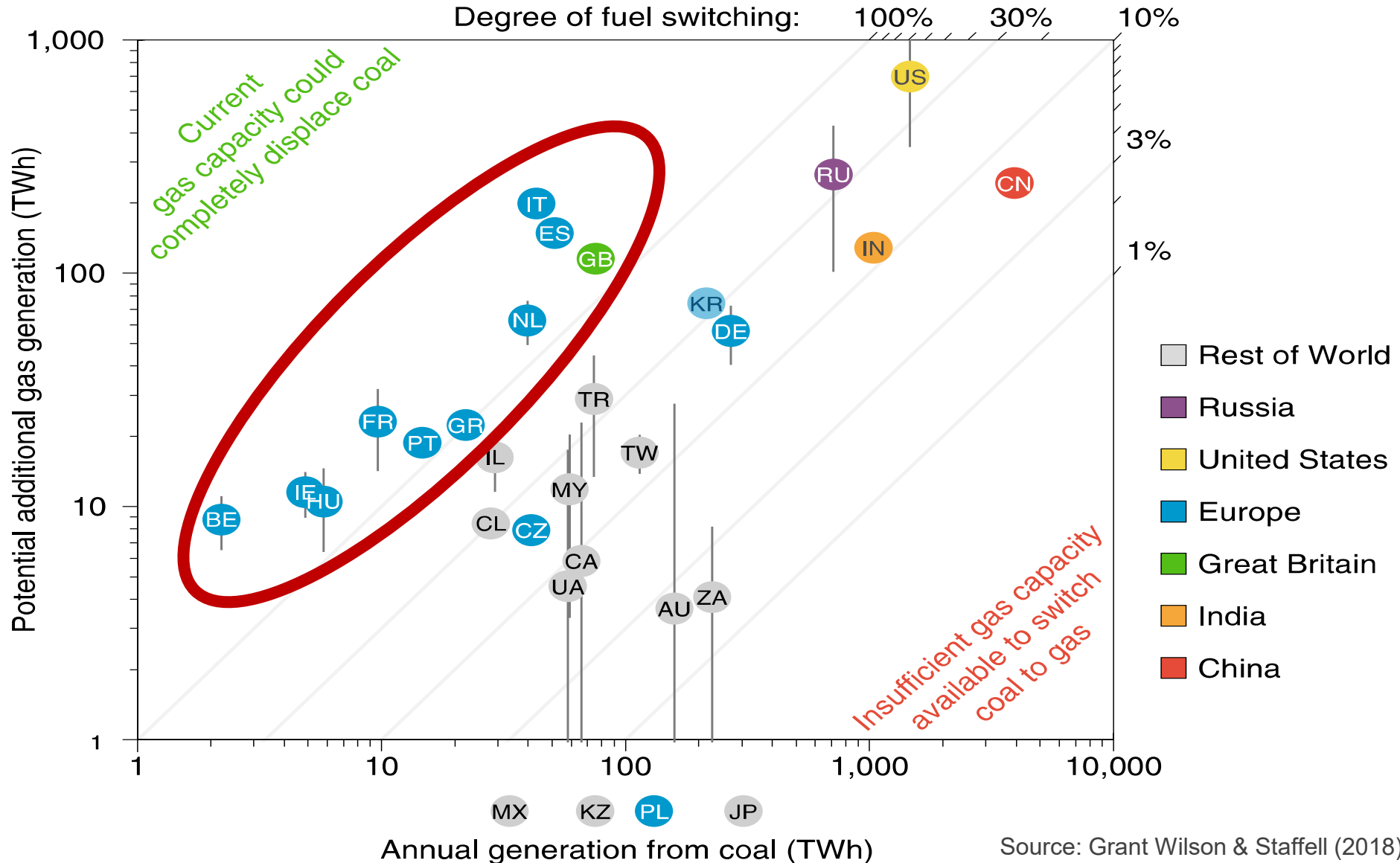


Potential for coal-to-gas switching in power



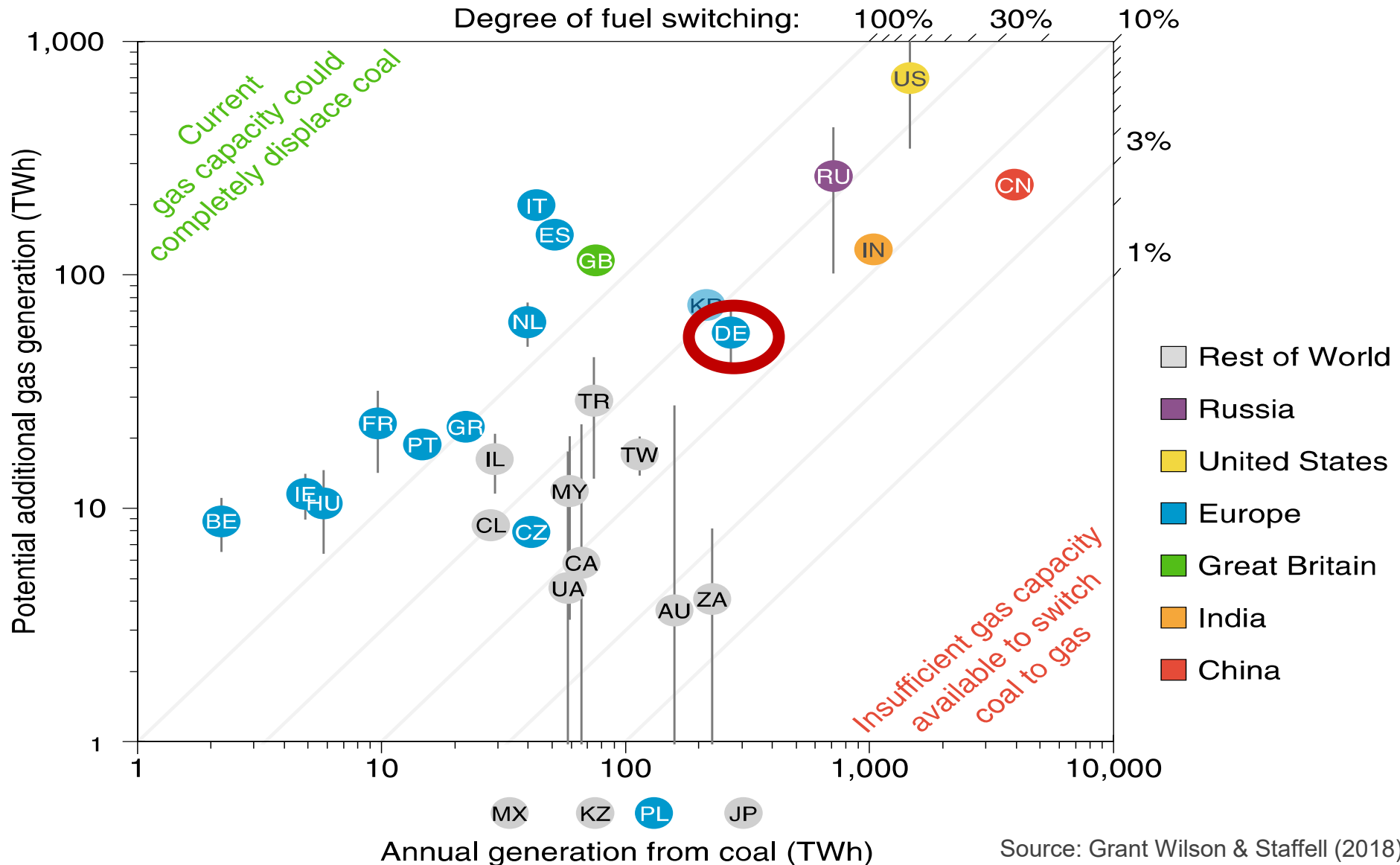
Source: Grant Wilson & Staffell (2018)

Potential for coal-to-gas switching in power



Source: Grant Wilson & Staffell (2018)

Potential for coal-to-gas switching in power

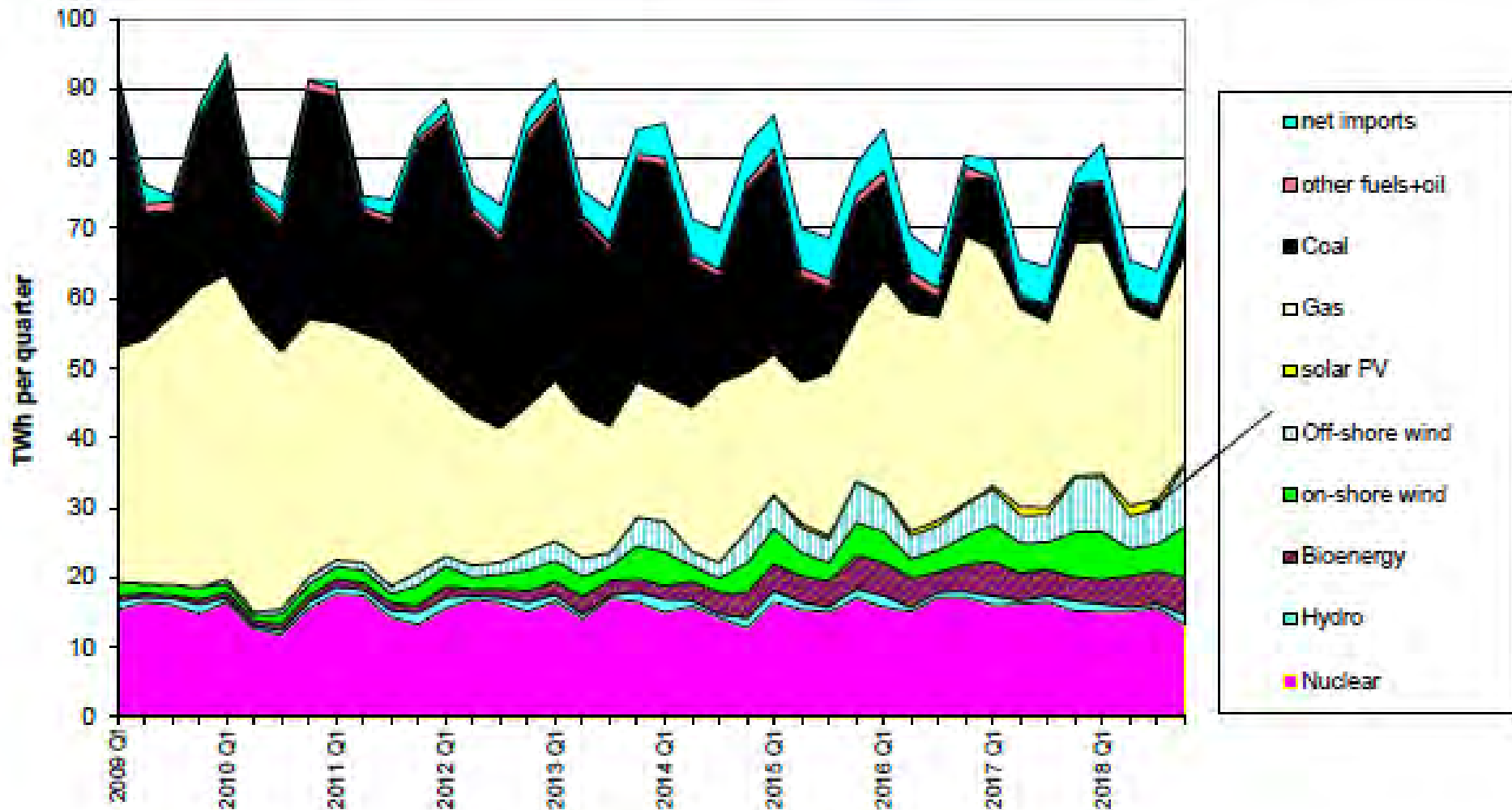


Source: Grant Wilson & Staffell (2018)

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UK: Decline of coal-fired generation



■ Coal share from 41% (2013) to 6% (2018)

⇒ Policy: Coal phase-out by 2025

Source: Chyong, Guo & Newbery (2019)

UK: Carbon price floor supports gas switch

Carbon Price Support (CPS)

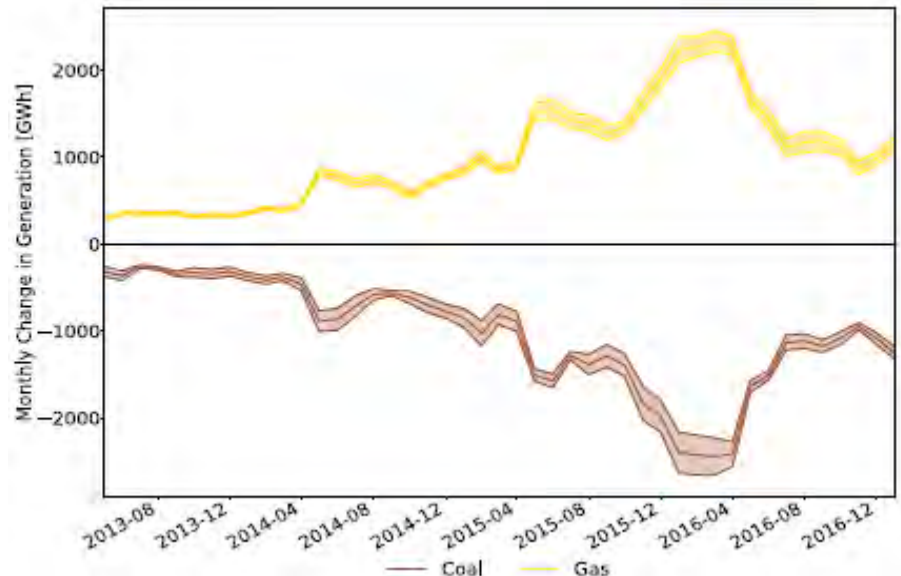
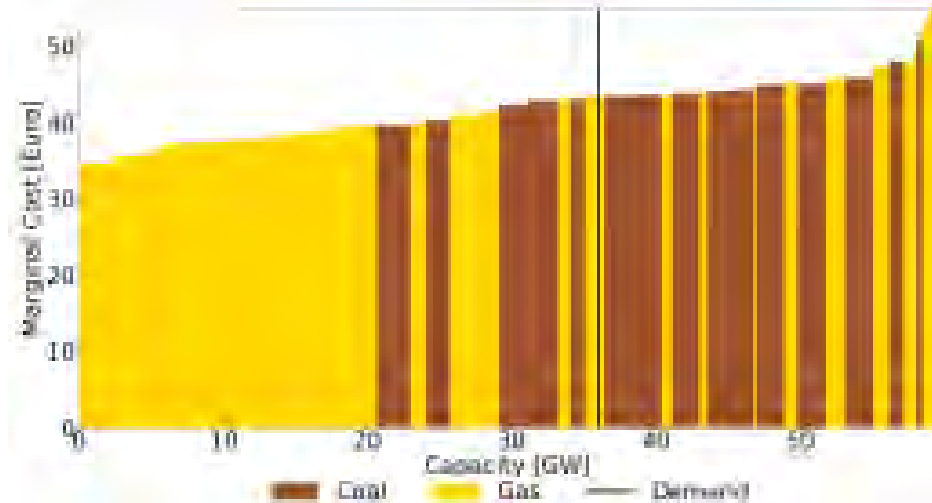
- EU ETS price + £18/tCO₂
- Tax revenue = ~€1bn per year

Direct policy impacts

- Efficient CCGTs run baseload
- 15% point shift from coal to gas
- Emissions reduction: 26.1m tCO₂ over 2013-2016 (-6.2%)
- Abatement cost: ~€18-30/tCO₂

Cross-border effects

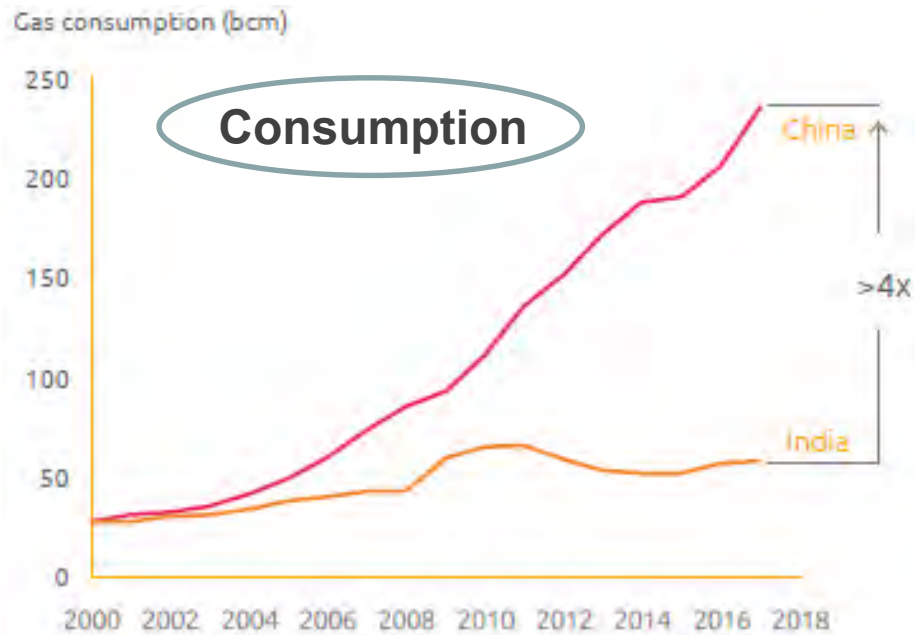
- More imports into GB
- Higher power prices in FR & NL
- Impact on *global* emissions?



Source: Abrell, Kosch & Rausch (2019)

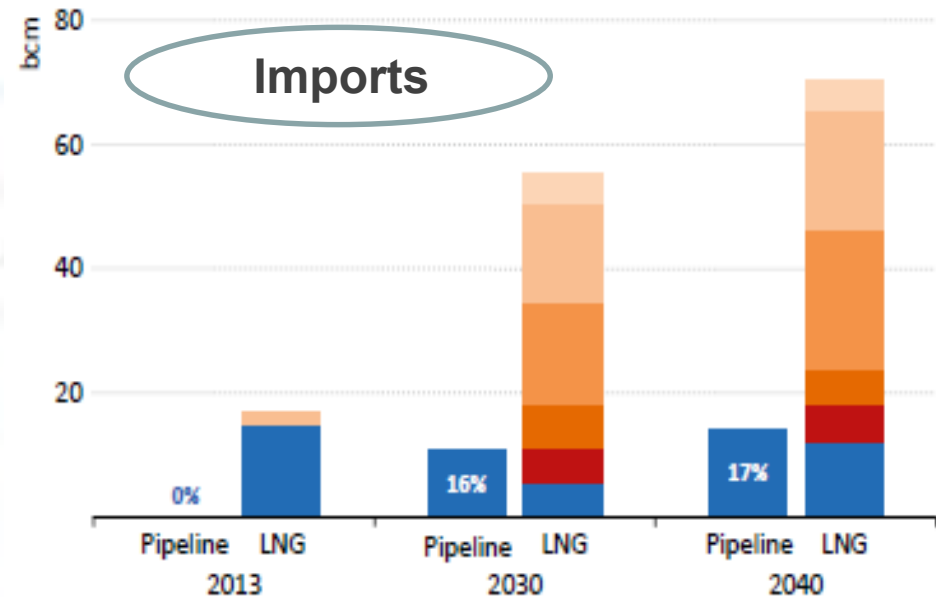
India: Gas catch-up & optimistic forecasts

- Gas has had **take-off in China**, so is India next?



Source: SNAM 2018 Global Gas Report

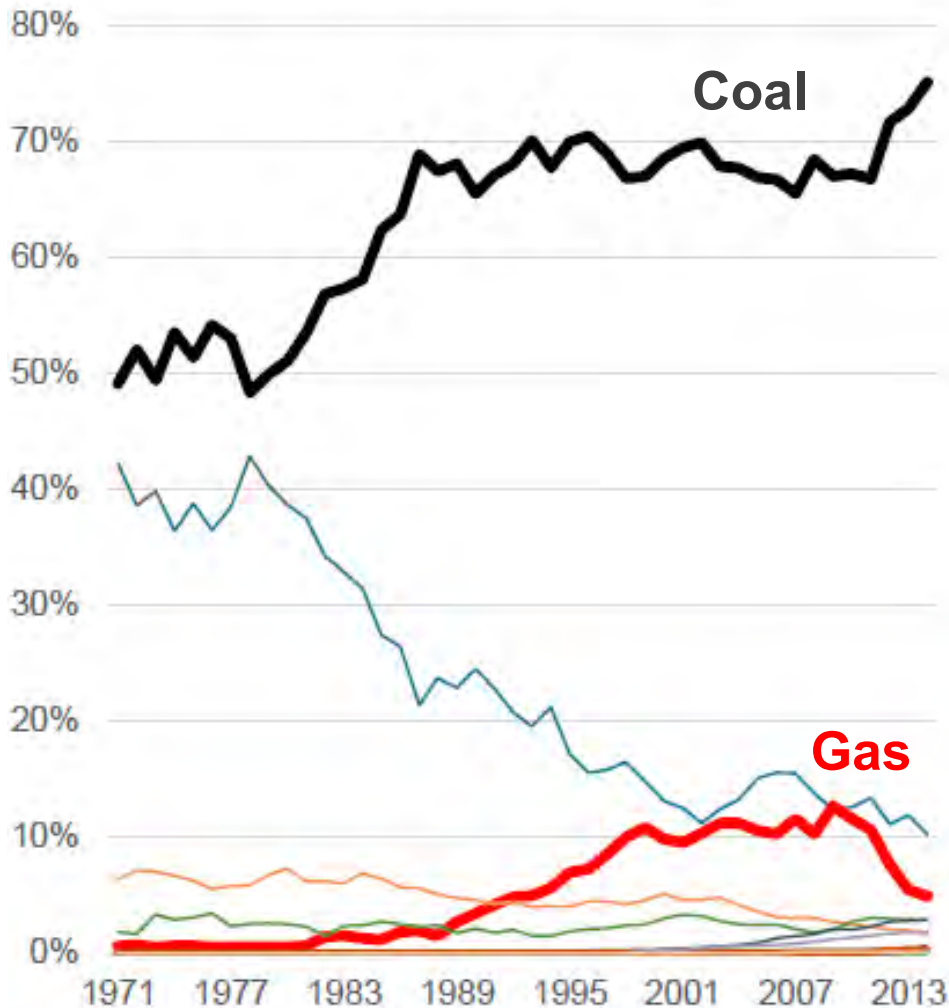
- LNG import forecasts** have been bullish...



Source: IEA 2015 India Energy Outlook

India: Gas squeezed by coal & solar

Electricity Generation by Fuel



No clear role for gas/LNG

- Not cost-competitive vs domestic coal
- Limited policy support
 - No carbon pricing
- Infrastructure constraints

Skipping gas? Coal to RE

- Ambitious 175 GW target for 2022 (esp. solar)
- Large cost reductions & low auction prices

Source: International Institute for Strategic Studies (IISS) & Vivid Economics

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Gas industry *itself* is in the midst of a transition

Strategic repositioning around natural gas:

- ① **Energy majors:** oil → gas/LNG & power/RE
- ② **Electricity companies:** coal/gas → RE
- ③ **Commodity traders:** oil → LNG
- ④ **Private equity:** → “legacy” coal/gas assets
- ⑤ **New players:** → LNG export, gas E&P

⇒ Trend to **large integrated** or **niche specialist?**

Conclusions

- ① Significant downside risk in **gas demand forecasts** due to climate-related uncertainties
- ② **Global gas prices**: regional price convergence unlikely to be permanent
- ③ Still huge **global potential for coal-to-gas switching** in power generation
- ④ Local **political economy** for gas/LNG in non-OECD (Asia) very different from OECD (Europe)
- ⑤ Ongoing **strategic repositioning** reflects companies' different visions of the future

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