

Challenges in design and negotiation of hydrogen supply contracts – lessons from natural gas

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Hydrogen contracts – a challenging link in a herculean task!

- Contractual challenges for hydrogen much greater than natural gas
- No signed contracts
 - no bank finance
 - no hydrogen!
- What are the issues and how could they be overcome?



Agenda

1. Fifty years' successful experience of natural gas contracts
2. Crucial differences between natural gas and hydrogen
3. Six main challenges and potential solutions
4. Conclusion

Note: This presentation draws on an article which I co-authored in the German Energy-Law Journal EnWZ (Herausforderungen bei der Gestaltung und Verhandlung von Wasserstofflieferverträgen, Heft 1-2/2024)

1. Fifty years' experience of natural gas contracts



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- An undisputed success story:
 - EU share TPES: 7% (1970) → 25% (2020)
 - Three advantages: energy diversification, pressure off oil prices, and environmental
- European energy policy was very supportive
- Import projects were extremely capital intensive
 - Large part of the investment costs lay with pipelines / LNG terminals
 - Developers had to be certain to cover costs
- **Therefore, long-term contracts were essential**
- The essence was risk-sharing:
 - Supplier took price-risk
 - Offtaker volume risk
- Contract conditions:
 - Typically, 20–25-year duration
 - Often destination-clauses (pipelines – explicit)
 - Gas prices aligned with competing oil products
 - 3-month price-indexation provisions
 - Price-reopener, hardship, arbitration provisions
- **Offtakers were mainly aggregators with local monopolies and with high credit-ratings**
 - End-users (energy / power) came later
- Changes introduced in the early 2000s
 - Unbundling and gas-to-gas competition; LT contracts considered as anti-competitive
 - Price indexation on hub-prices

2. Crucial differences between natural gas and hydrogen - motivation and modality of introduction very different

Natural gas

- Introduced to diversify energy supplies in wake of 1973 and 1979 oil-crises
- Priced in line with oil product prices
- Two qualities: lo-cal and hi-cal
- Production driven by gas well-characteristics
- Industry use in existing boilers by changing burners
- Buyers were large national vertically-integrated gas companies
- Technical properties suitable for high-efficiency combined cycle gas plants

Hydrogen

- Introduced to meet CO2 emission targets in “hard-to-abate” sectors
- Priced at **multiple** of existing fuels
- Three categories: green, blue, pink
- Production driven by wind/sun
- Simple substitution of grey H2 in some cases; for others costly new industrial plants required
- Buyers will be industrial end-users, although trading companies may act as aggregators
- Introduction will depend upon one or more subsidies, with tough compliance conditions

3. Six main challenges and potential solutions:

(i) pricing



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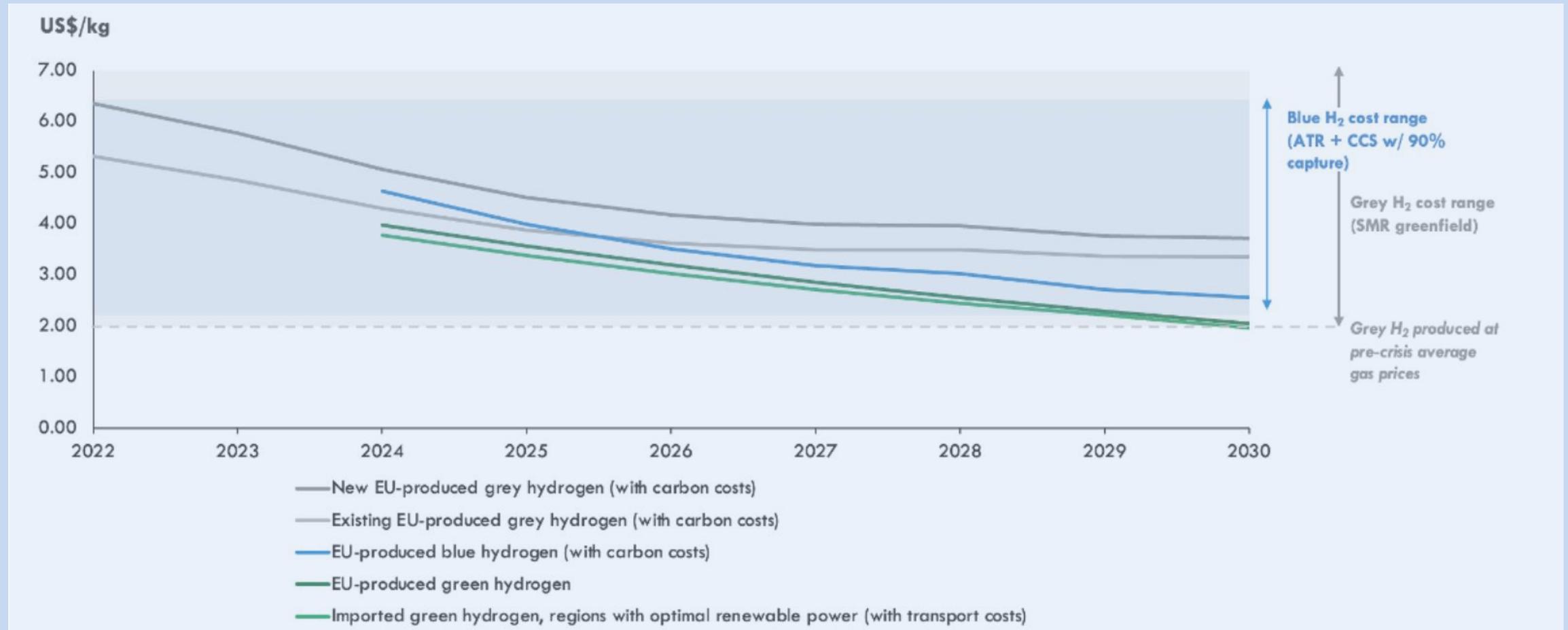
Natural gas

- Needed to introduce gas against competing oil products
- Production and transport costs did not set prices
 - Limited “learning-curve” effect
 - Did not play a role in price indexation
 - Had to be at least covered on average
- **Solutions:**
 - Pricing on value-basis = oil product price
 - Periodic adjustments to base price and / or indexation to reflect change in value of gas
 - Later priced based on gas hub prices

Hydrogen

- Need to sell at affordable price to buyers
 - Price will be a multiple of existing fuels
 - Value to buyers will depend on various factors:
 - E.g. price of CO₂, gas and green products
- Full production costs will play crucial role
 - Will vary widely by source and over time
- **Solutions:**
 - Cost-based pricing with no or limited indexation
 - **Subsidies to bridge gap between cost and value**
 - Prepare for flexible trading and hub-based prices

Potential cost of hydrogen – highly uncertain input factors (gas, CO₂, power and electrolyser costs) and high risks for first movers



Source: Green hydrogen task force white paper and 10 points action plan **June 2022**

(ii) Subsidies – a new factor in gas supplies



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- Substantial experience of subsidy-based supplies with renewable energy
 - Developers sign contracts with suppliers only when subsidy granted
 - Recent difficulties in wind projects without price indexation (e.g. for steel)
- Hydrogen may depend upon more than one subsidy:
 - Direct subsidies for cost of DRI steel plants
 - Subsidies for electrolysers
 - Carbon contracts for differences
 - Hydrogen imports: H2Global
 - Local hydrogen production subsidies
 - Pipeline subsidies
- Subsidies introduce new risks and challenges:
 - Delays in granting
 - Interactions between subsidies – not all predictable
 - Complex conditions to be satisfied e.g. environmental properties of hydrogen
 - Not proof against all potential market developments e.g. future imports of cheap green products
 - Offtaker could become cash-negative
- **Solutions:**
 - Understand interplay of subsidies
 - Include protection in contracts

(iii) The respective trading partners and offtaker risk



Natural gas

- Sellers
 - International oil companies (BP, Shell, Exxon, TotalEnergies etc.)
 - National oil/gas companies (Gazprom, Sonatrach, LNOG, Statoil etc)
- Buyers
 - Public or private vertically-integrated companies with local / national monopoly and high credit standing
 - Later end-users: industry and power companies

Hydrogen

- Sellers
 - External producers e.g. Middle East, North Africa
 - European producers e.g. Spain, Portugal
- Buyers
 - Trading companies e.g. RWE, Uniper, Energie
 - End-users e.g. refineries, steel and chemicals
 - Offtake risk (deindustrialisation, credit rating issue and imports of cheaper green products)
- **Solution:**
 - Sell preferentially to trading companies?
 - Plan for alternative offtakers / contract assignment

(iv) Co-ordination issues along supply chain



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Natural gas

- Need to align availability of production, transport to border, transport within country and offtake plant
- **Solutions:**
 - Production and transport to border covered by single company or consortium
 - Vertically-integrated buyers (transport and trade) helped co-ordinate development of inland pipelines and offtake
 - Dual-fuelling in industry/power sector
 - Repurposing of town-gas distribution sector
 - Growth of market enabled highly flexible trading

Hydrogen

- Need to align availability of renewables plants, electrolysers, transport to border, transport within border and offtake
- Additional challenges when ammonia used as energy carrier
- **Solutions:**
 - One or more national trading companies to create portfolios
 - Initial sales to existing hydrogen users – flexible substitution of grey hydrogen
 - Clear contract provisions to cover default of a party along supply chain

(v) Matching production and offtake profiles



Textile value chain

Natural gas

- Production
 - Profile driven by field characteristics
 - Difference between dry and associated gas
 - Ramp-up and depletion effects
- Demand
 - Highly seasonal for buildings
 - Dependent on GDP and industry and power market
- **Solutions:**
 - Contract flexibility: ACQ and DCQ
 - Substantial storage facilities
 - Flexibility from diversified portfolio

Hydrogen

- Production
 - Green H2: driven by weather
- Demand
 - Direct, flexible replacement of grey H2 in refineries and chemical plants
 - Installation of new plant e.g. for steel
 - Depends upon green product demand
- **Solutions:**
 - Contract flexibility, limited by production profile
 - Storage
 - Exploiting flexible demand
 - Development of portfolios

(vi) Meeting environmental requirements and ensuring acceptability



- Hydrogen has two challenges with no direct parallel in natural gas – additional contractual challenges
 1. Environmental specifications for green hydrogen are very stringent (RFNBO)
 - Subsidy qualifications depend upon them
 2. Hydrogen is highly explosive and the intermediate energy carrier, ammonia, highly toxic
 - Risk of a major incident damaging acceptability (e.g. Fukushima)
- **Solutions:**
 - Audit provisions for green hydrogen to ensure that conditions are met
 - Contract provisions to cover possibility of hydrogen / ammonia losing acceptability for limited period

3. Conclusion

- Parties will have to break new ground to overcome these challenges and conclude contracts...
- ...and to ensure their survival over their duration!



Thank you!



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