

ECONOMICS OF SECTOR COUPLING WITH POWER-TO-GAS

**FLUXYS FORUM
18.03.2019**

ULIEGE

- Potential of power-to-gas in Belgium?
- Model that captures a lot of details of the Belgian energy system

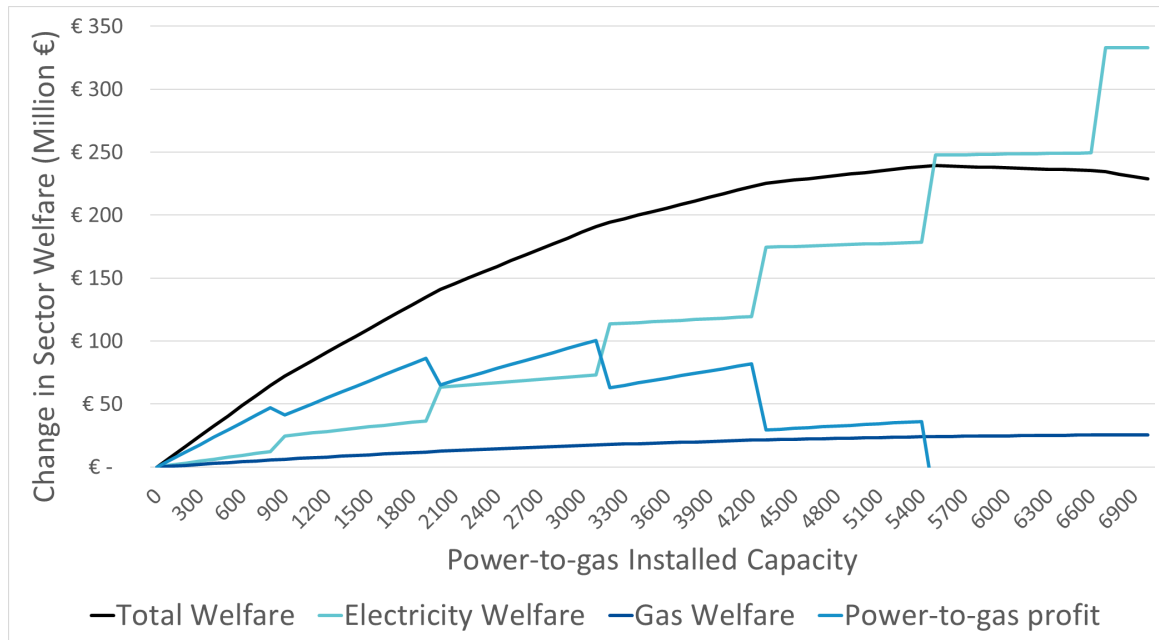
VLERICK

- Impact of power-to-gas on electricity and gas markets?
- Model that captures market interactions in a stylized energy system

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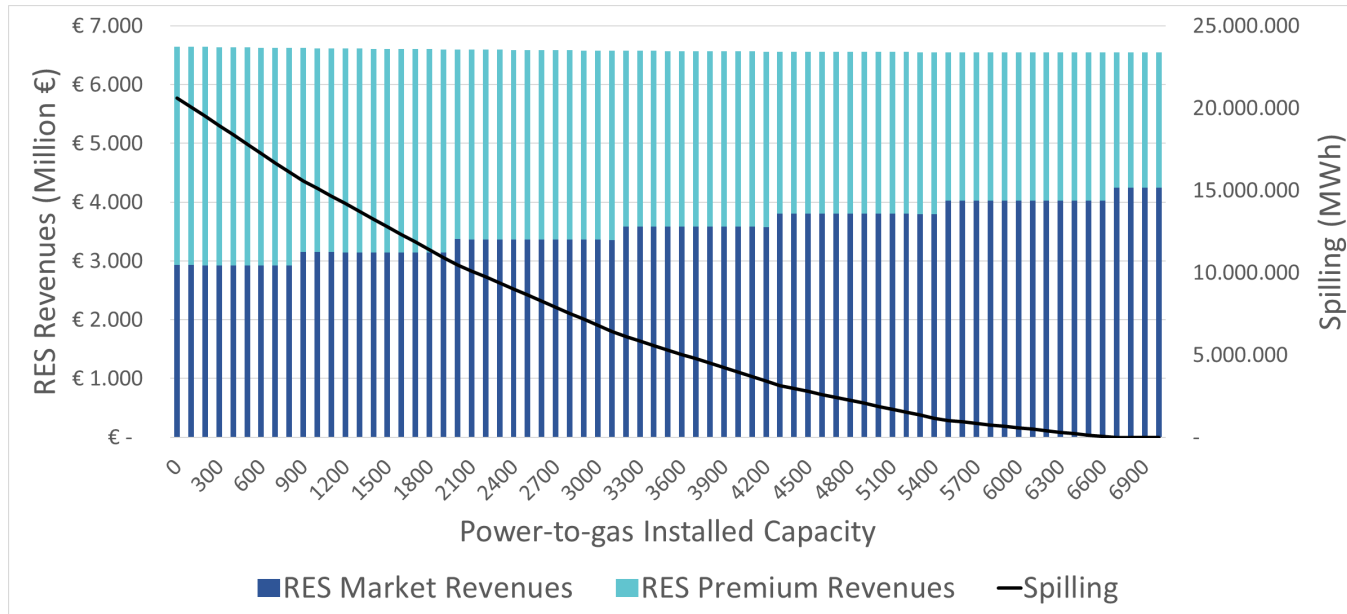
IMPACT OF POWER-TO-GAS ON ELECTRICITY AND GAS MARKETS

- **First finding:** In scenarios in which there is a potential for power-to-gas, both markets benefit, electricity more than gas



IMPACT OF POWER-TO-GAS ON ELECTRICITY AND GAS MARKETS

- **Second finding:** Power-to-gas sets the electricity market price in hours where otherwise the price would have been zero; this reduces the need for RES premiums

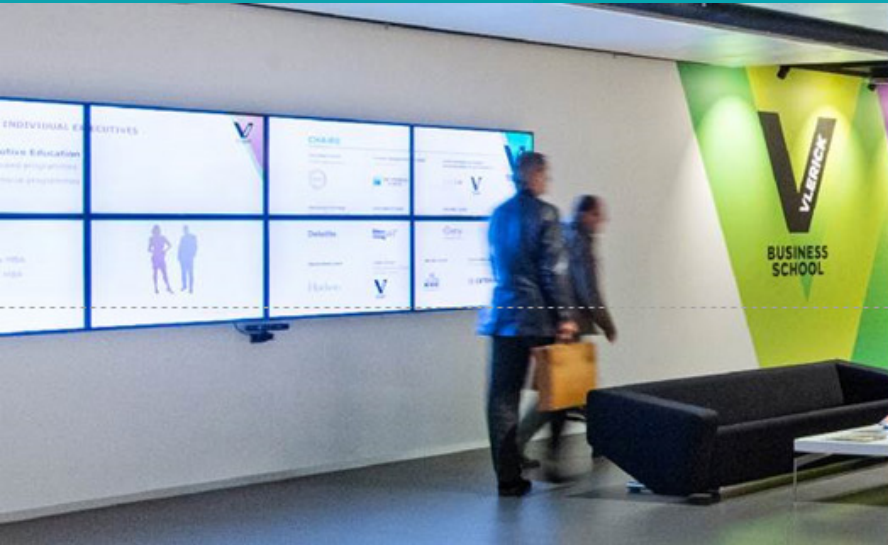


HOW STYLIZED IS OUR STYLIZED ELECTRICITY AND GAS SYSTEM COUPLED WITH POWER-TO-GAS

- Mixed Complementarity Model 1.0.
 - Electricity and gas market coupling with investment in power-to-gas
 - Investment (annualized fixed cost) and operation (variable cost) of power plants
 - 2 conventional power generation technologies
 - 1 renewable electricity technology with RES target
 - Gas supply via long term contracts (procurement cost function)
 - No electricity nor gas network constraints
 - 10 demand periods (876 hours) in electricity (slope) and gas (flat)
- Mixed Complementary Model 2.0.
 - Increase level of detail of electricity and gas market
 - Study interaction between renewable electricity and renewable gas targets and support schemes

POTENTIAL OF POWER-TO-GAS IN OUR STYLIZED SETTING

- **Third finding**: Renewable target (55-100%)
 - Confirms findings ULiege: power-to-gas has potential in scenarios with high CO2 reduction targets or high renewable targets
 - Additional remark: if RES target really high, cost of power-to-gas less important; for lower RES targets, cost of power-to-gas important driver (0 – 1000 €/kw)
- **Fourth finding**: Renewable availability (10-30%)
 - More spillage and more power-to-gas investments if renewable availability is negatively correlated with load and/or when load duration curve is steeper
 - Investment in power-to-gas increases if the average availability is reduced, even though spillage does not increase if we only change the average



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