



**CASE STUDY: TECHNOLOGIES  
FOR ENERGY MARKETS 2030  
– 2050**

Innovative Technologies for Power-to-Gas, Flame 2019, GELSENWASSER AG,  
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**GELSENWASSER**

# CONTRIBUTION OF GAS AND HEAT INFRASTRUCTURE TO CLIMATE POLICY

## CASE STUDY OF THREE GERMAN UTILITIES ON TWO SCENARIOS FOR CARBON REDUCTION



**GELSENWASSER**  
GAS. STROM. NATÜRLICH WASSER.



### *"Revolution" scenario*

- GHG reduction based on regulatory approach and wide-ranging electrification of all sectors as well as improved energy efficiency (e.g. building insulation)
- Focus on new electricity infrastructure and energy applications

Policy based approach  
Sectoral goals for industry, energy, buildings  
national energy supply

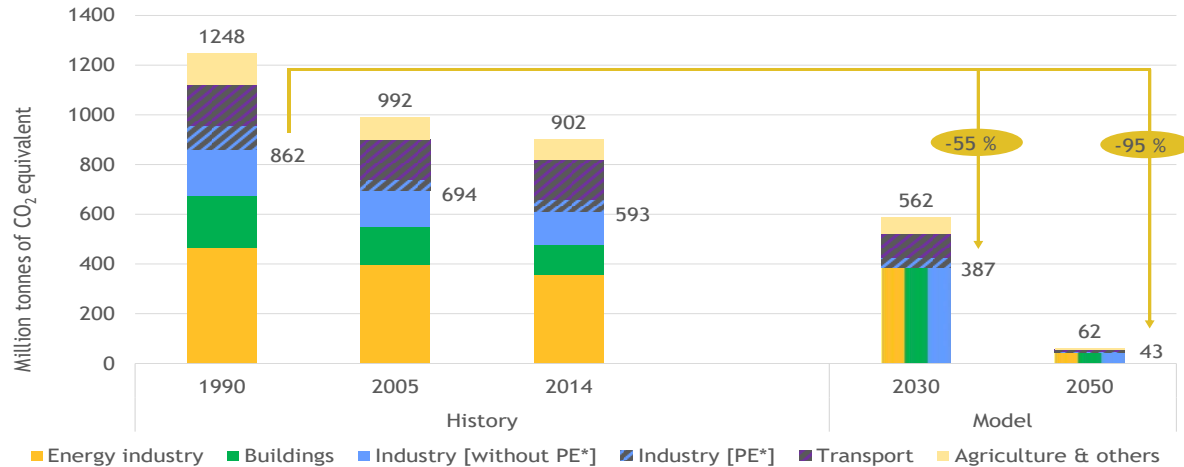
### *"Evolution" scenario*

- GHG reduction based on integrated optimisation of electricity and heat sectors without giving preference to any specific technology
- Optimum use of existing infrastructure and energy-consuming plant to allow cost-efficient CO<sub>2</sub> avoidance
- Exploiting short-term, low-cost opportunities to cut CO<sub>2</sub> emissions until 2030

- Technology open
- Goals across sectors
- Import/Export power and fuels

# IN BOTH SCENARIOS CLIMATE TARGETS CAN BE REACHED FOR 2030/2050

## DIFFERENT WAYS TO DECARBONZE ENERGY, BULDINGS AND INDUSTRY



Optimisation across different sectors, main focus of study

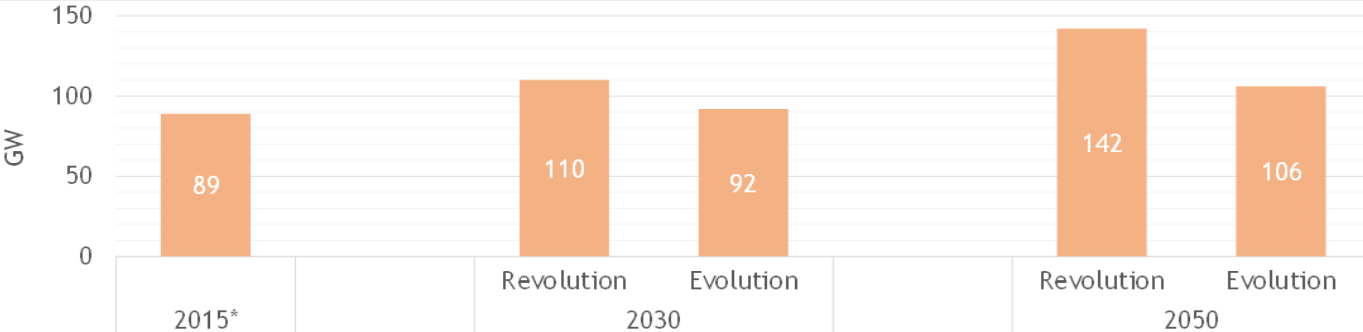
In scope but not included in optimisation

Not in scope

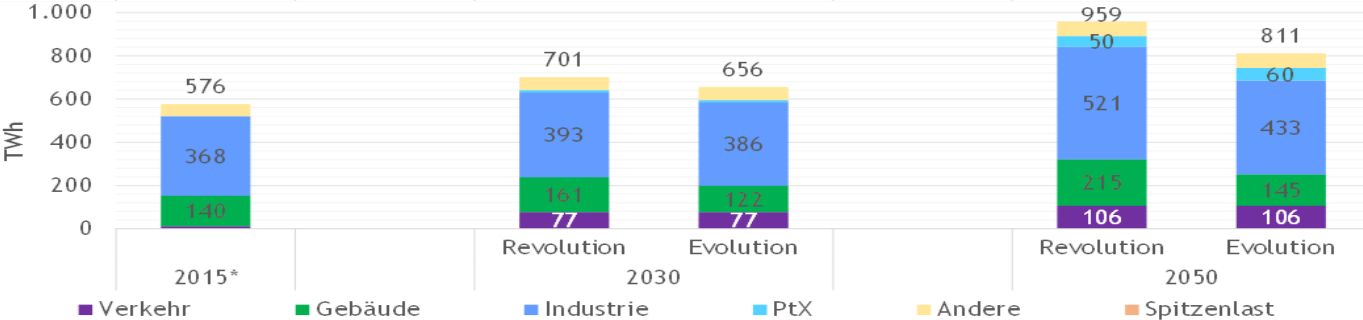
# DEMAND AND PEAK LOAD ARE RISING DUE TO ELECTRIFICATION („DARK DULDUM“)

WITH ELECTRIFICATION GRID CHARGES RISE 70% FOR INDUSTRY, 100% FOR PRIVATE CUSTOMERS

Necessary Peak Load in Germany



Electricity Demand in Germany by sectors

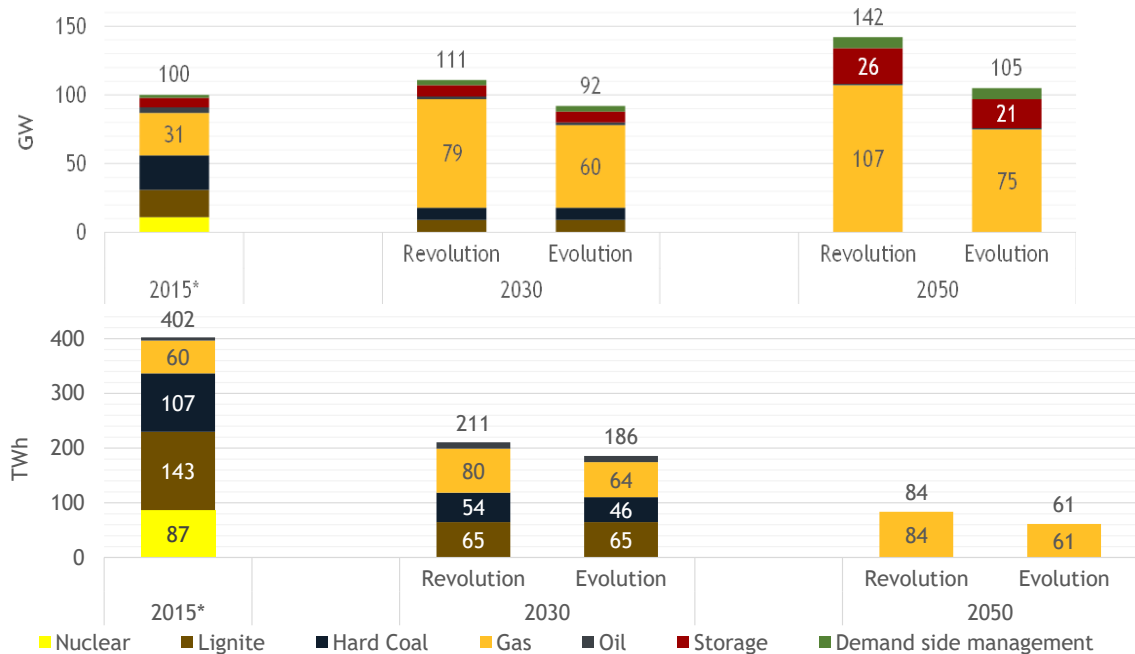


\*Data based on information provided by bdew

# GAS-FIRED POWER GENERATION CAPACITY TO QUADRUPLE UNTIL 2050 ACCORDING TO REVOLUTION SCENARIO – EVOLUTION MUCH MORE EFFICIENT

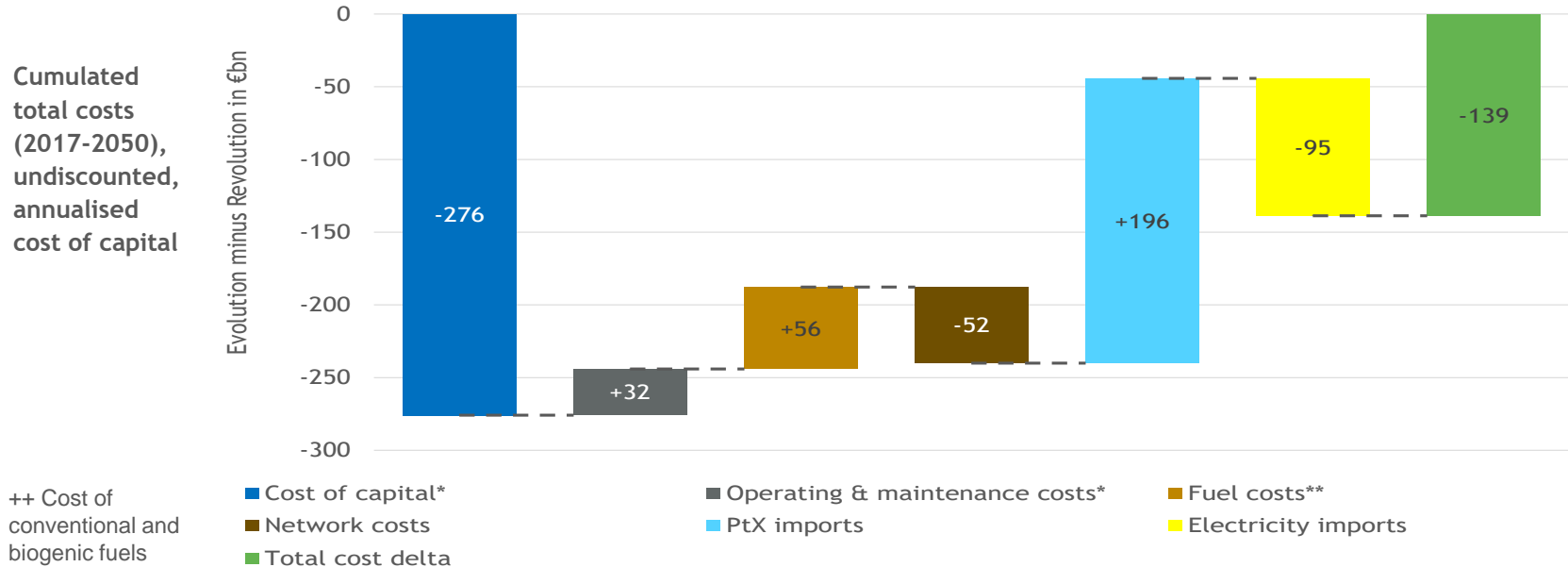
GAS AND RENEWABLES ARE RESPONSIBLE AFTER ENDING OF COAL AND NUCLEAR POWER

Secure  
generation  
capacity



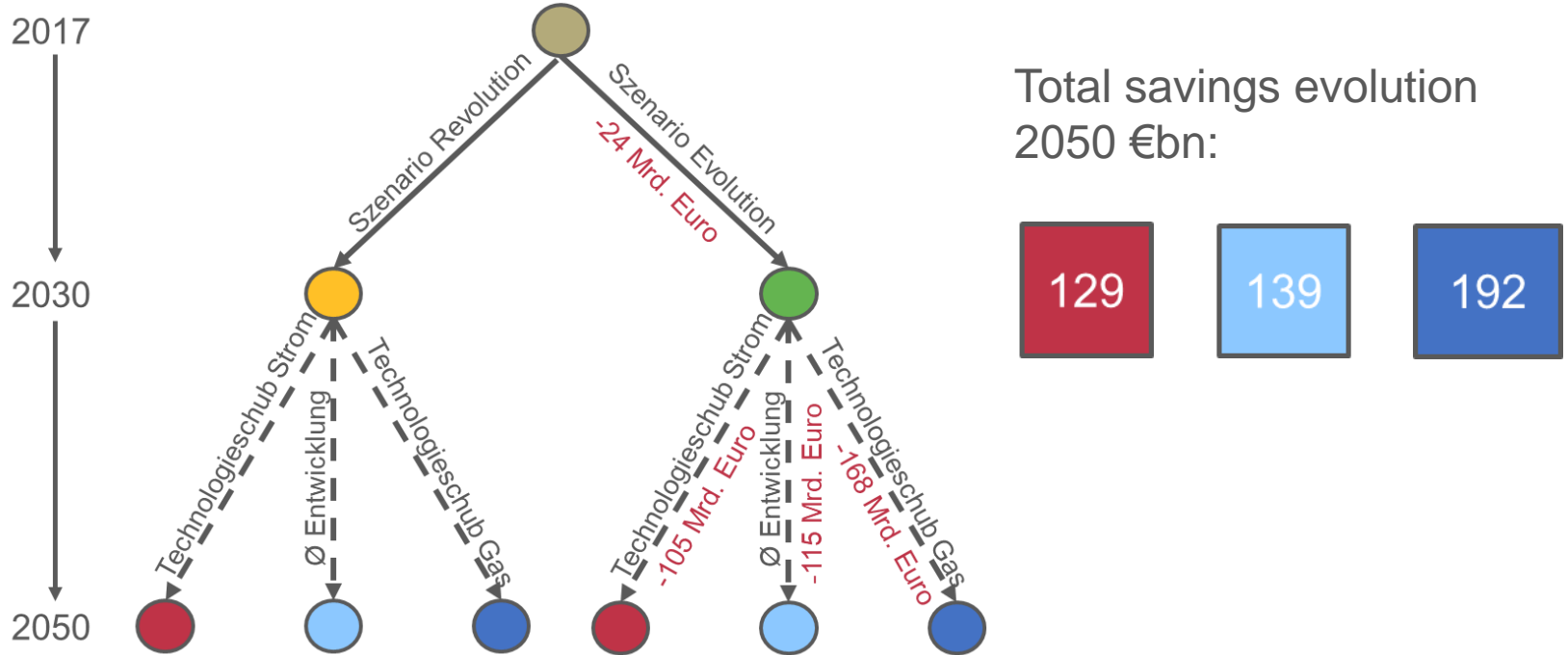
# SOLUTION THAT DOES NOT FAVOUR ANY TECHNOLOGY IS EUR 139 BN CHEAPER

REASON: CAPITAL COSTS: COST OF CAPITAL AND OPERATING/MAINTENANCE COSTS OF POWER PLANTS, PTX SYSTEMS, RENEWABLE ENERGY FACILITIES, THERMAL INSULATION FOR BUILDINGS AND HEATING SYSTEMS



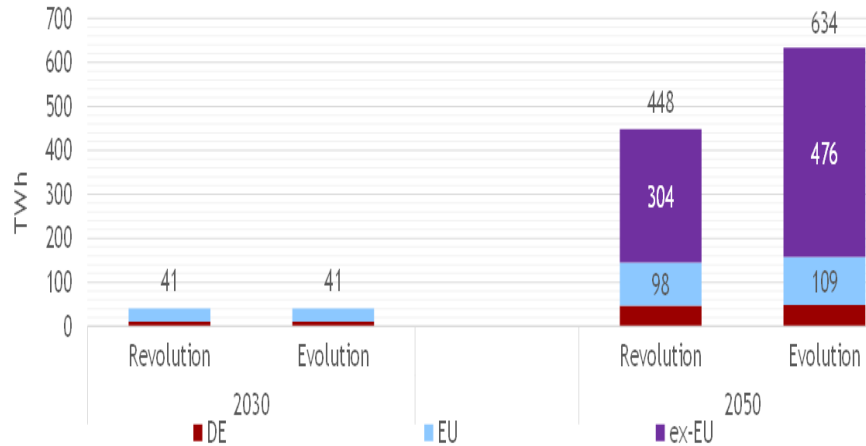
# EVOLUTION SCENARIO OFFERS MORE OPTIONS FOR SHAPING THE FUTURE IN A COST-EFFICIENT WAY – OTHERWISE RISK OF „LOCK-IN“ OR DEVALUATING GRIDS

LOCK-IN EFFEKT WITH TECHNOLOGY-OPEN APPROACH IS HIGHLY IMPROBABLE

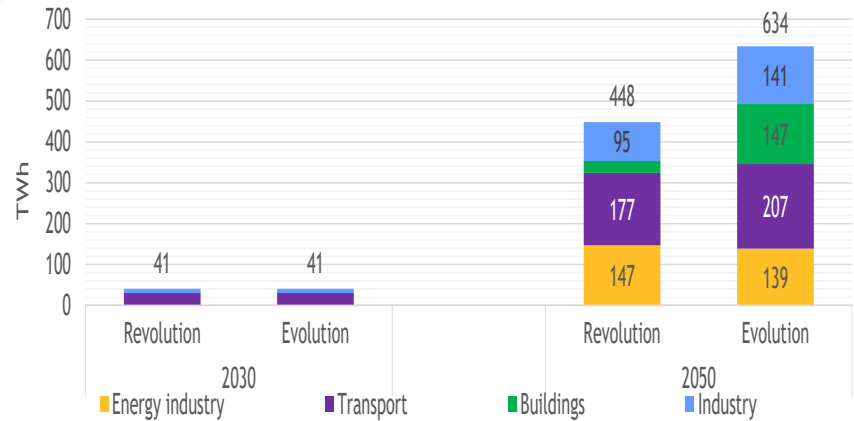


# IMPORT OF SYNTHETIC FUELS AFTER 2030 IMPERATIVE IN BOTH SCENARIOS TO ACHIEVE CLIMATE GOALS OF 95%

IN BOTH SCENARIOS GREEN GAS IS NECESSARY



PtX-quantities by origin



PtX-demand by sectors



# KEY FINDINGS

RESULTS ARE STILL IN DISCUSSION FOR GERMAN CLIMATE POLICY

- Climate goals can be reached on two pathways
- Technology-open approach is cheaper and more flexible; no matter what technology wins
- Renewables to the maximum – framework, acceptance?
- Gas-fired power-plants must be pushed - Incentives.
- Gas and heat Infrastructure stay necessary. Power grids to be reinforced
- Carbon pricing across sectors
- Incentives for decentralized cogeneration
- **Green gas is necessary in any scenario!**



# GREEN GAS IS ON THE RUN

HYDROGEN AND SYNTHETIC METHANE MIGHT HELP TO DECARBONIZE

- › Sector coupling projects all over Germany
  - › „Power-to-X“-Alliance
  - › Hydrogen can be integrated in existing market
  - › Usage of surplus renewable power
  - › Storage capacity in gas storage facilities!
  - › About 40 projects – 2 large-scale projects on the map
- › Blending hydrogen in the grids
- › **What about the framework?**



# HOW TO PUSH RENAABLE GAS IN THE MARKET

MANY WAYS TO PUSH TECHNOLOY - DEPENDING ON POLITICAL GOAL AND CONCEPT

## › What is the product?

- › Blue Hydrogen?
- › CCS/CCU without acceptance
- › Biogas and biomethane
- › **Hydrogen**
- › **Synthetic methane**

## › Framework: What could be done?

- › Common definition of the product
- › Feed-In tariffs?
- › Political goals or quotas?
- › Carbon pricing vs emission trading scheme
- › Start with grid or directly to the market...
- › GO – Concept



A close-up photograph of three water droplets of varying sizes resting on a vibrant green leaf. The droplets are highly reflective, showing highlights and shadows. The leaf's veins are visible, creating a textured background. The overall color palette is dominated by various shades of green.

THANK YOU!



**GELSENWASSER**