

Navigating a Low Cost Path to Net Zero

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Siemens Energy is a
**global leader in the
energy business**

~ 1/6

of global electricity generation
is based on our technology.

We are present in

> 90 countries.

92,000

employees work as a team
to energize society.¹

We invest around

€1bn annually in
research and development.



Key Imperatives for the Industry to Achieve Net Zero



**Capital
Expenditures**



**Standstill
Costs**



**New Ways of
Operation**



**Reshaping
Feedstocks**

Solutions for the Chemical industry



TERMINAL MANAGEMENT SYSTEM (CHEMICALS)



ELECTRICAL SYSTEMS AND SOLUTIONS



HEAT INTEGRATION



POWER INTELLIGENCE AND MICROGRID



ELECTRIFICATION OF DRIVES



POWER-TO-X



PROCESS IMPROVEMENTS

Let's look at 3 use cases...



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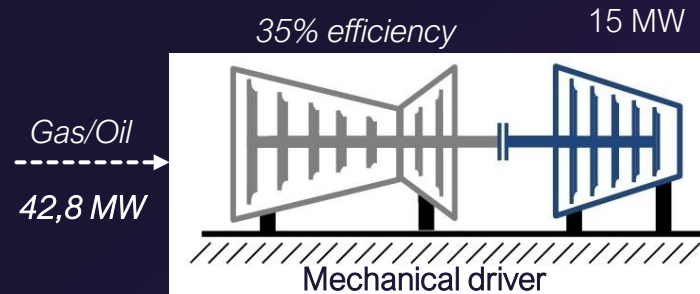
POWER-TO-X



PROCESS IMPROVEMENTS

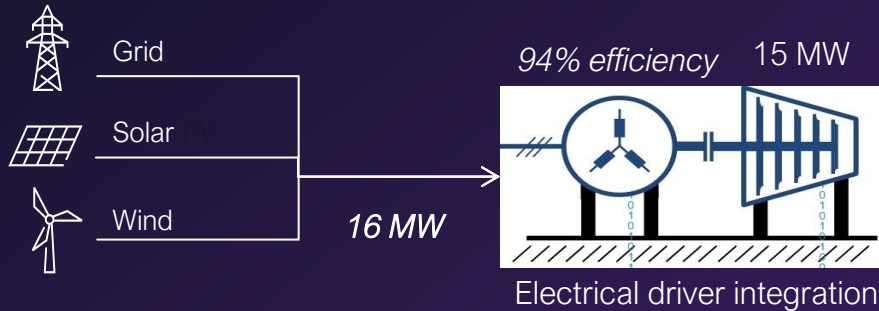
Electrification of Drives (Use Case 1)

Former customer operation:



Fuel costs: € 26M p.a.¹
 CO₂ emission: 75 kt p.a.
 CO₂ costs: € 6M p.a

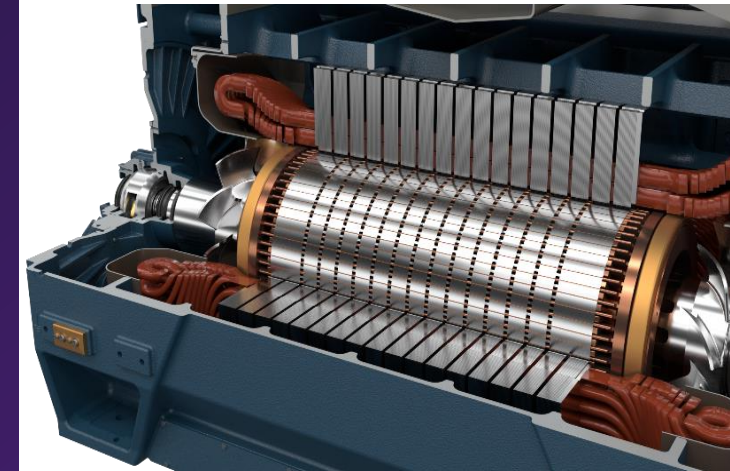
New customer operation:



Fuel costs: € 22.5M p.a.²
 CO₂ emission: 53 kt p.a.
 CO₂ costs: None

Benefits

Total Savings **€ 8M p.a.³**
 CO₂ reduction **22 kt p.a.**

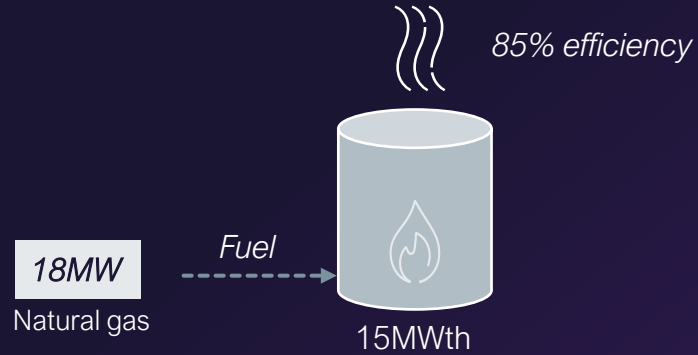


Application:
 Compressor train
 Electrification –
 Replacement of a gas turbine
 by an e-drive system

¹ Based on gas turbine on natural gas fuel, 8500 operating hours p.a. at 70 EUR/MWh and 80 EUR/t CO₂
² Based on grid power (CO₂ content on grid 0,4 kg/kWh), 8500 operating hours p.a. at 170 EUR/MWh, CO₂ taxes covered within electricity price
³ Case calculated based on 8' EUR CO₂ costs, incl system Maintenance costs

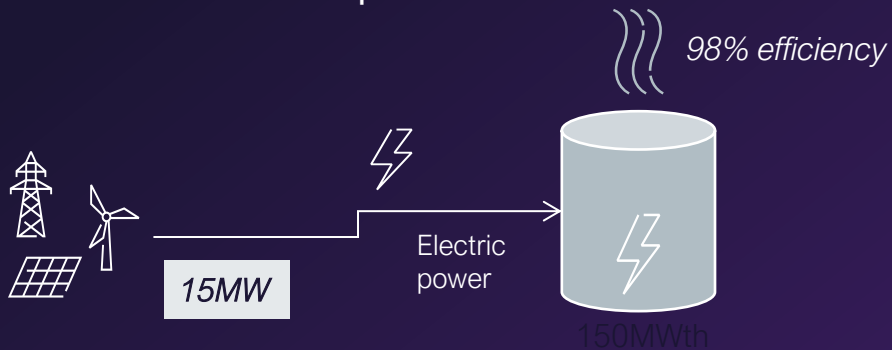
Heat Electrification (Use Case 2)

Former customer operation:



Fuel costs: € 14M p.a.¹
CO₂ emission: 30 kt p.a.
CO₂ costs: € 2.5M p.a

New customer operation:



Fuel costs: € 3M p.a.²
CO₂ emission: 10 kt p.a.
CO₂ costs: None

Benefits

Total Savings **€ 13M p.a.³**
CO₂ reduction **20 kt p.a.**

¹ Based on natural gas fuel, 8500 operating hours p.a. and power at 90 EUR/MW and 77 EUR/t CO₂

² Based on grid power (CO₂ content on grid 0,08 kg/kWh), 8500 operating hours p.a. and power at 25 EUR/MW, CO₂ taxes covered within electricity price

³ Including maintenance costs

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Application:
Replacement of gas boilers to electrical heating



HARU ONI Project

First integrated plant for climate-neutral e-fuel production from wind and water



750,000 liters

of e-methanol per year from 2023
(130,000 liters of e-gasoline)

>55 m liters

e-fuel per year planned from 2025

>550 m liters

e-fuel per year
planned from 2027



Project

Owner: HIF (Highly Innovative Fuels)
Off-taker: Porsche AG
Country: Chile, Patagonia

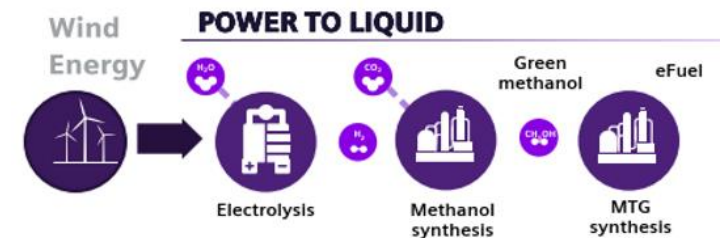
E-Fuel Types

E-Gasoline for Porsche cars
 E-Methanol for ships
Possible SAF for the aviation industry

Co-development Partners

- HIF Owner & lead developer
- PORSCHE Co-founder, Off-taker
- SIEMENS energy System integrator from wind to e-Fuel
- ExxonMobil MTG technology contributor

Process





GROVE

SIEMENS
energy

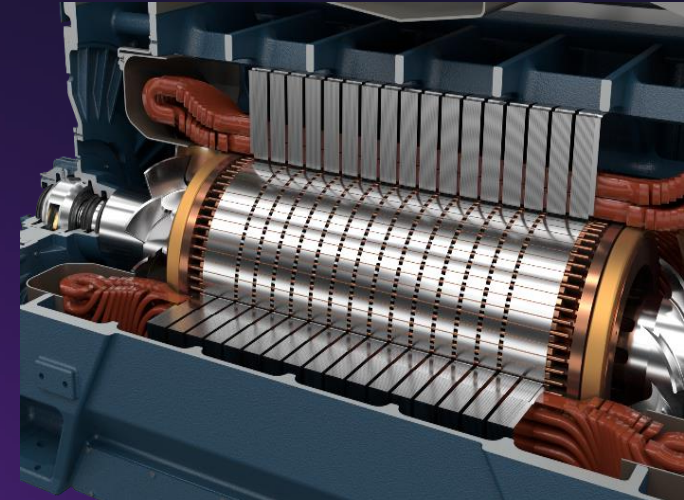
Decarbonizing the Chemical industry: Electrification, Automatization and Digitalization

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It can be as simple as:

- 1) Electrifying your fuel source
- 2) Electrifying your compressor trains



THANK YOU!