E-Fuels als Schlüssel für eine klimaneutrale und energiesichere Zukunft | Pressegespräch am 23. August 2022

TU Graz

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LEC

E-Fuels als Schlüssel für eine klimaneutrale und energiesichere Zukunft | Gesprächspartner

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E-Fuels als Schlüssel für eine klimaneutrale und energiesichere Zukunft | Fragestellungen

- Was sind die besonderen Herausforderungen im Energie- und Transportsektor in puncto Nachhaltigkeit?
- Welche Rolle spielen e-Fuels, insbesondere Wasserstoff, Ammoniak und Methanol dabei?
- Wie haben sich das LEC und die TU Graz zu weltweiten Vorreitern in diesem Forschungsbereich entwickelt?
- Welche Potenziale sind für Graz und ganz Österreich mit der e-Fuel-Forschung und der einzigartigen LEC Forschungsinfrastruktur verbunden? Wie profitiert die Allgemeinheit?
- Welche Rolle kommt dem Center of Hydrogen Research an der TU Graz zu?
- Wie kann die Produktion und Verteilung der zukünftig benötigten, riesigen Mengen an grünem Wasserstoff in Europa und insbesondere in Österreich erfolgen?

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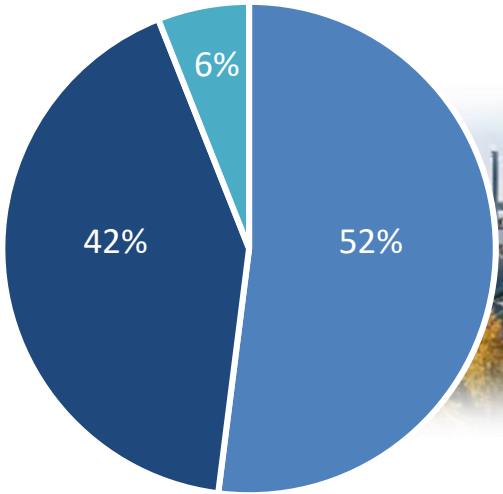
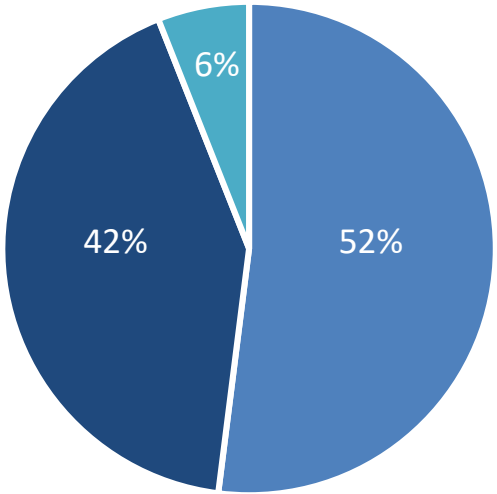
Large Engine Applications

Large Engine Applications

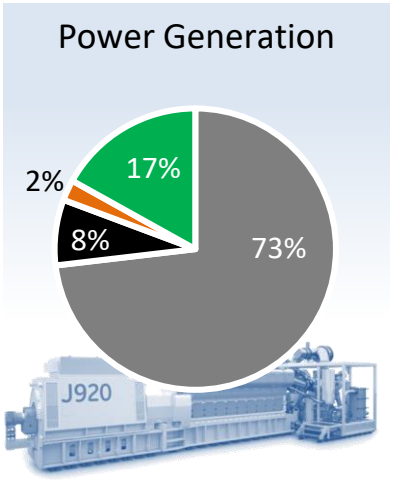


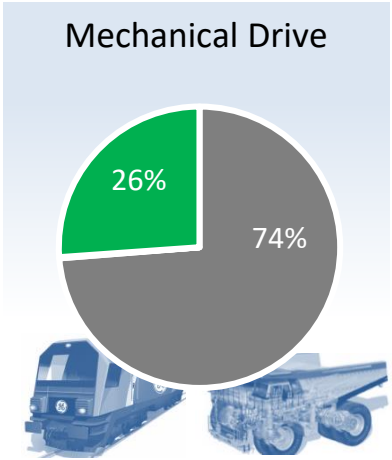
Fuels for Large Engines

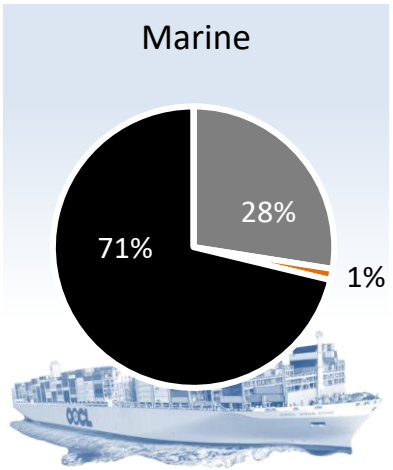


Mechanical Drive
Power Generation
Marine

Fuels



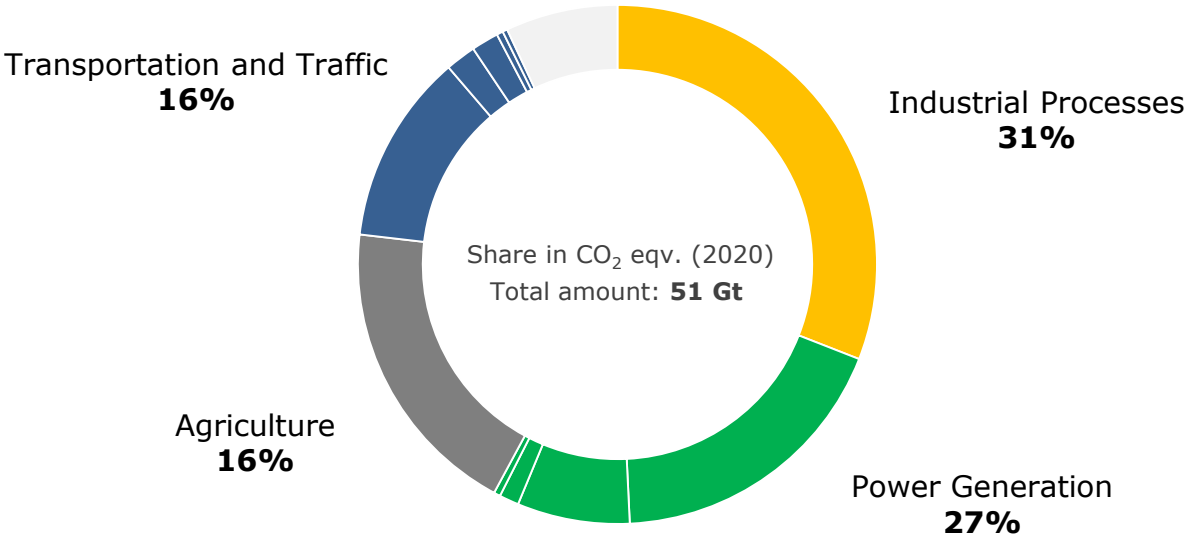




NG
Dual Fuel (NG/Diesel)
Diesel
HFO

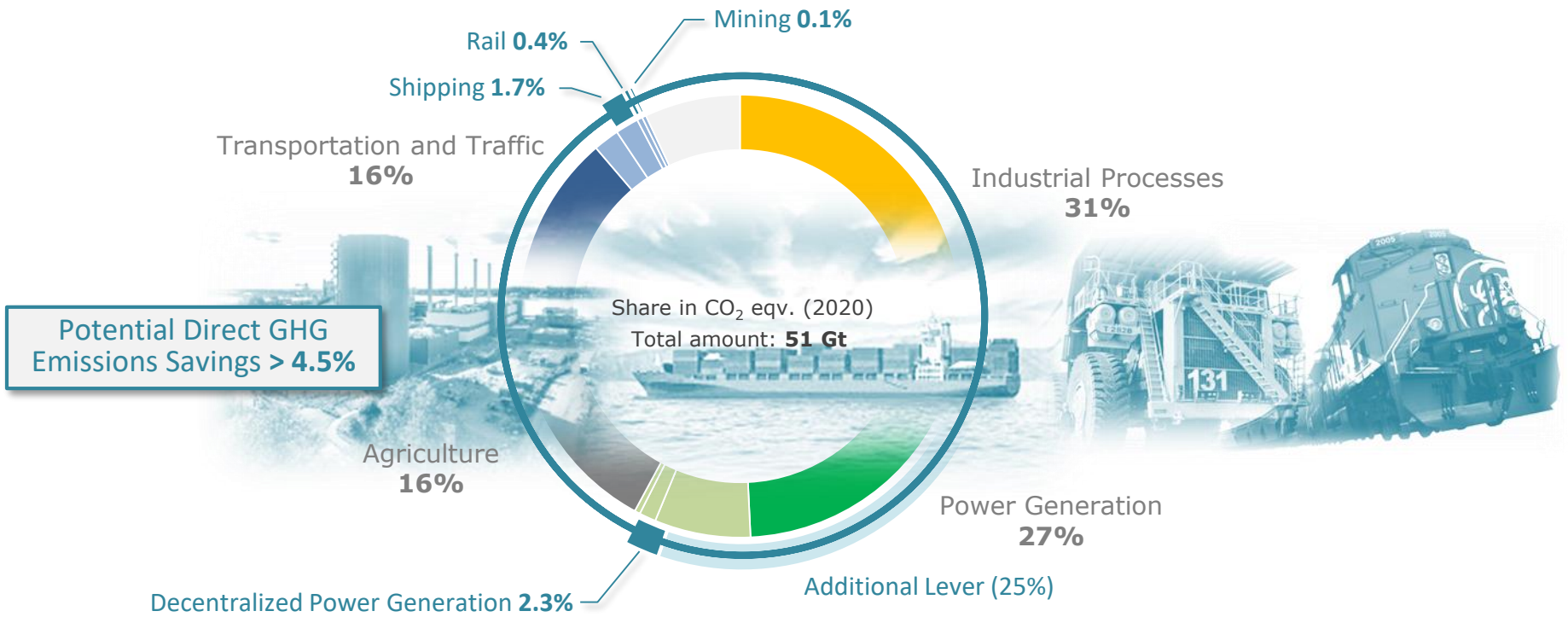
Engines > 1MW (Average values 2010 – 2016)
Source: Diesel & Gas Turbine Worldwide 2011 - 2017

GHG Emissions | Worldwide



Sources: https://ourworldindata.org/emissions-by-sector#energy-electricity-heat-and-transport-73-2
BP Statistical Review of World Energy 2020
LEC research

GHG Reduction Potential | Large Engine Area



Sources: https://ourworldindata.org/emissions-by-sector#energy-electricity-heat-and-transport-73-2
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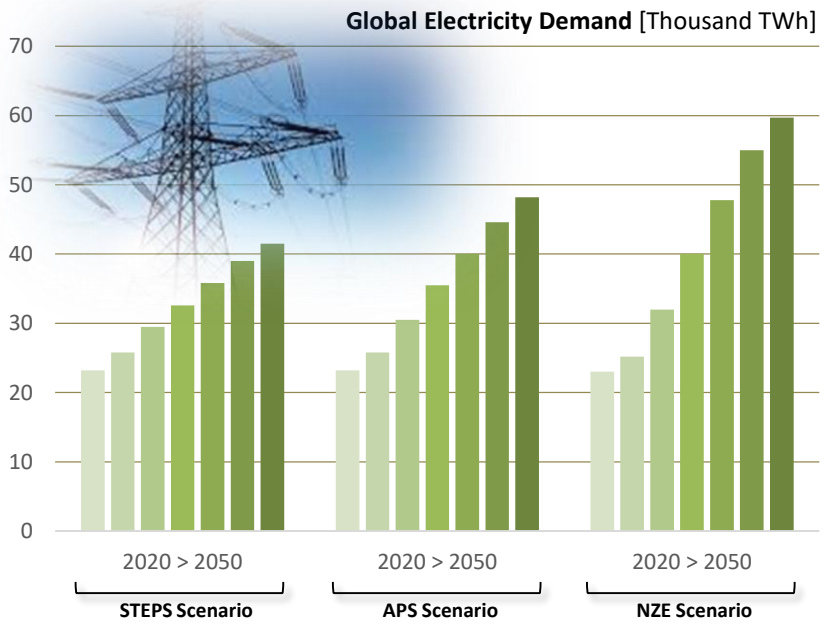
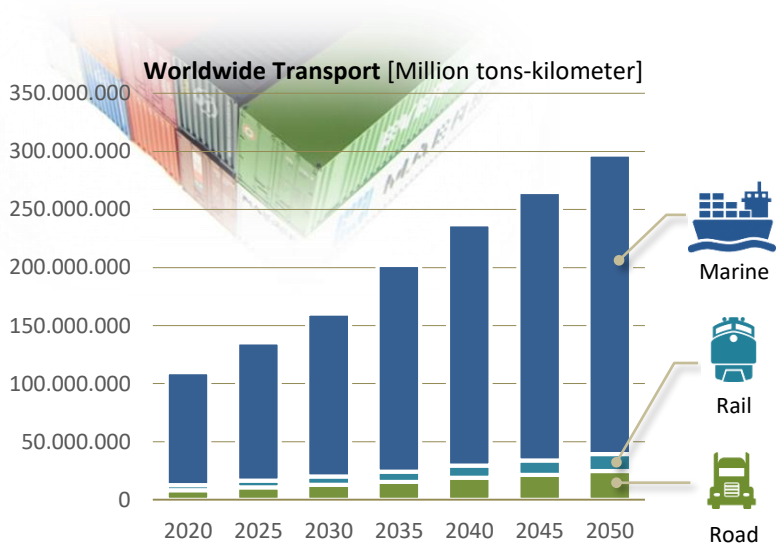
Increasing Demand | Power Generation and Transport

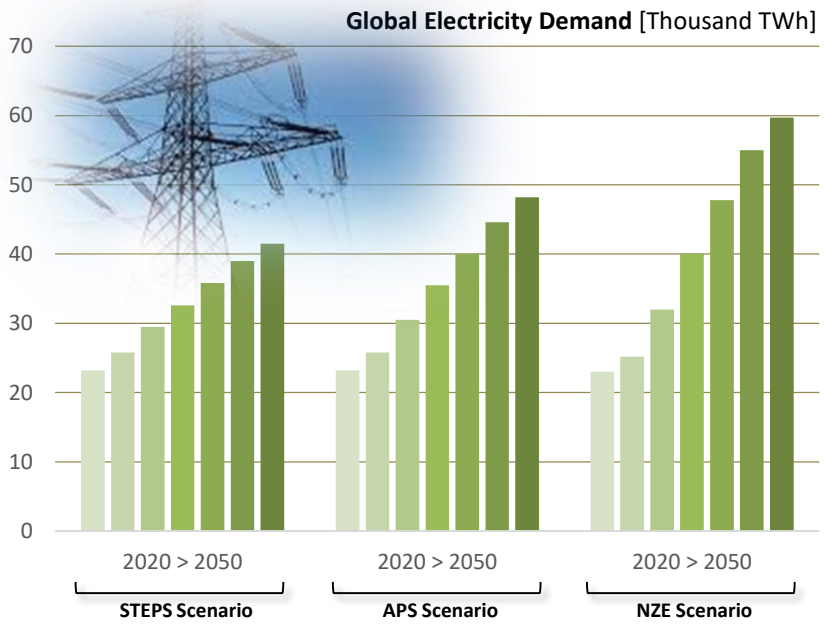


Source: IEA World Energy Outlook 2021

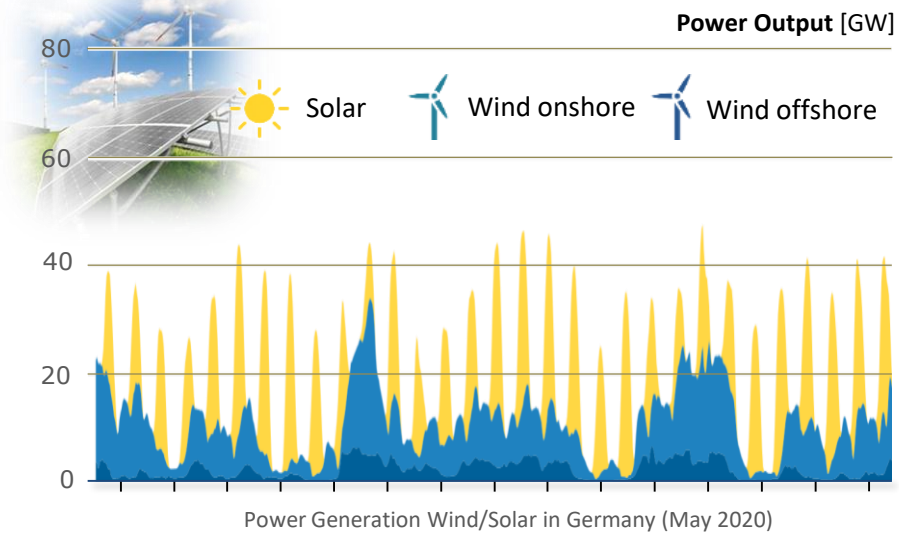


Source: ITF International Transport Forum 2021

Increasing Share of RES | Power Generation



Source: IEA World Energy Outlook 2021



Source: Agora Energiewende 2020

Pathways to Green Transportation

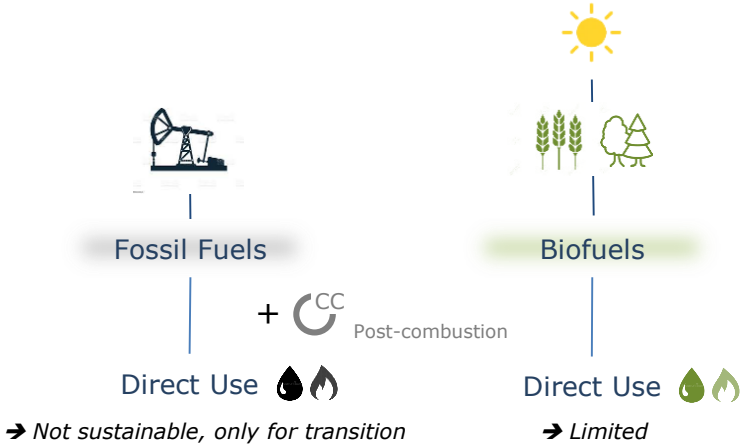
Fossil Fuels

+ CC Post-combustion

Direct Use

➔ *Not sustainable, only for transition*

Pathways to Green Transportation



Pathways to Green Transportation

Fossil Fuels

+ CC Post-combustion

Direct Use

➔ *Not sustainable, only for transition*

Biofuels

Direct Use

➔ *Limited*

Green Electricity

Batteries

➔ *Low storage density*

E-fuels (PtX)

➔ ***Main path***

Direct Use

➔ *Not everywhere, not always*

Battery-electric Marine Propulsion

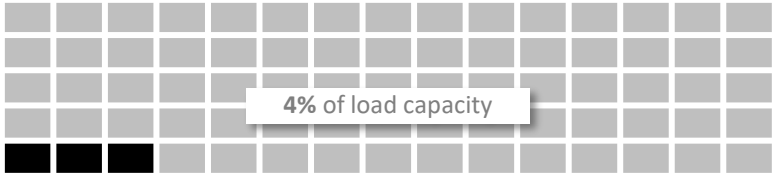
- Container Vessel **Emma Maersk**
  - Containers **14,770** TEU
  - Deadweight tonnage **156,000** tons
  - Fuel consumption **325** tons/day

Trip Asia - Europe

HFO

11.8 kWh/kg

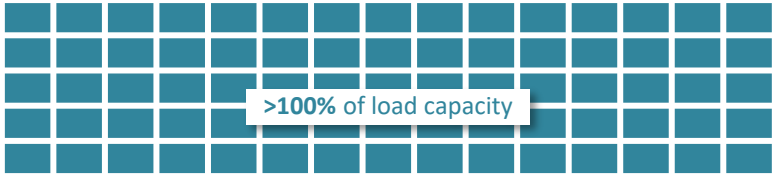
7,000 t



Battery-electric

0.25 kWh/kg

160,000 t



1 GW*

*) Charging time 48 hours

Pathways to Green Transportation

Fossil Fuels

+ CC Post-combustion

Direct Use

➔ *Not sustainable, only for transition*

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Green Electricity

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E-fuels (PtX)

➔ ***Main path***

Direct Use

➔ *Not everywhere, not always*

CO_2

Carbon-based

FT fuels **CH_4** **MeOH**

Carbon-free

NH_3 **H_2**

N_2

Pathways to Green Transportation

Fossil Fuels

+ CC Post-combustion

Direct Use

➔ *Not sustainable, only for transition*

Biofuels

Direct Use

➔ *Limited*

Green Electricity

Batteries

➔ *Low storage density*

E-fuels (PtX)

➔ ***Main path***

Direct Use

➔ *Not everywhere, not always*

CC Direct Air Capturing

CO_2

Carbon-based

Carbon-free

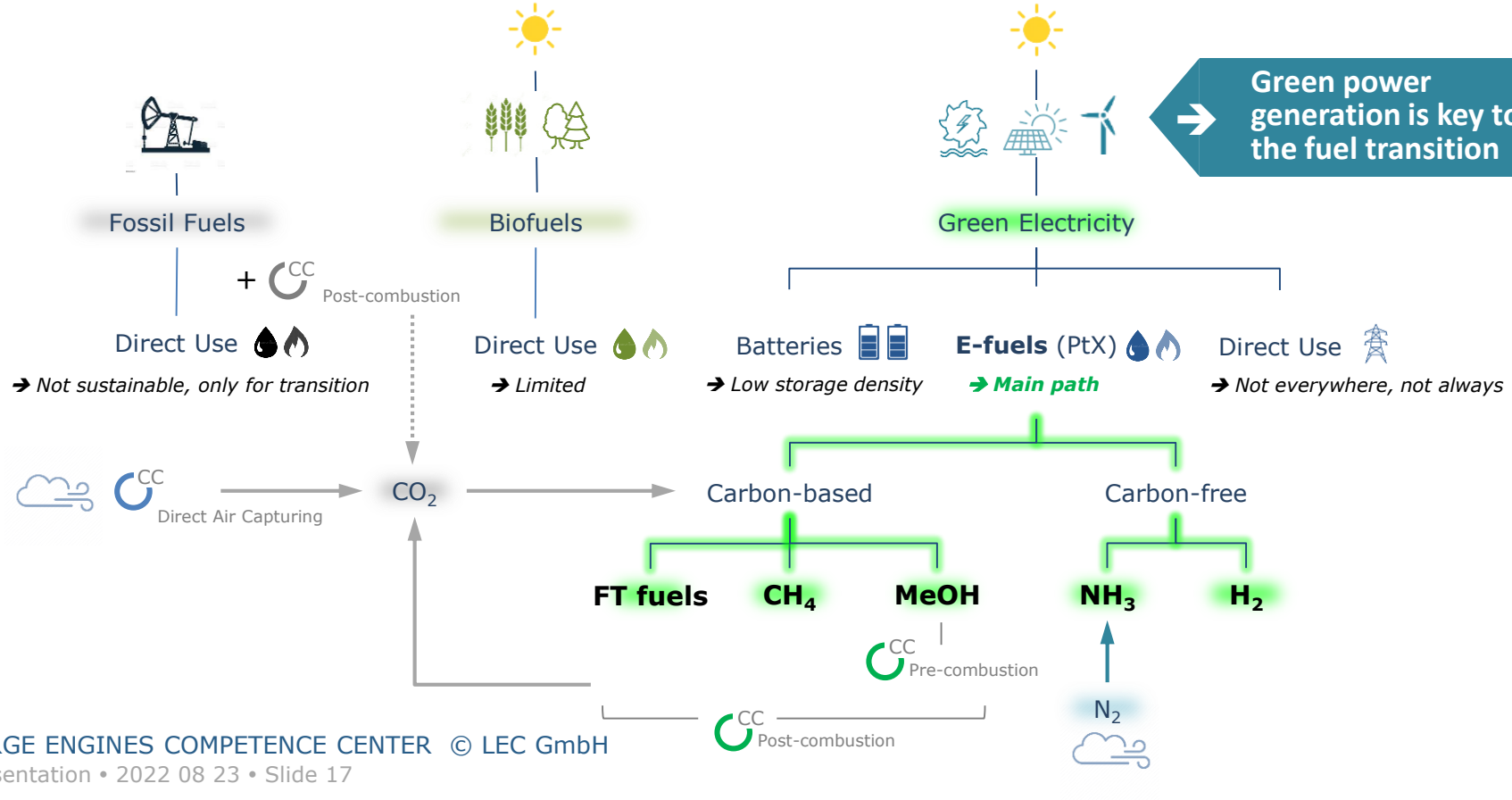
FT fuels **CH_4** **MeOH** **NH_3** **H_2**

CC Pre-combustion

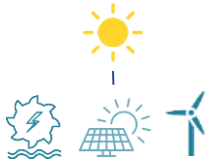
CC Post-combustion

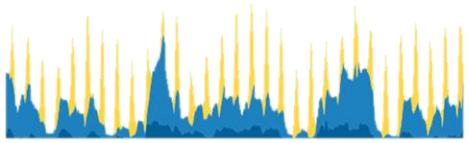
N_2

Pathways to Green Transportation



Green Power Generation





Green power generation is key to the fuel transition

Green Electricity

Batteries | E-fuels (PtX) | Direct Use

CC .... Carbon Capture

CO_2 → Carbon-based | Carbon-free

FT fuels — **CH_4** — **MeOH** — **NH_3** — **H_2**

N_2

Short-term / Seasonal Storage

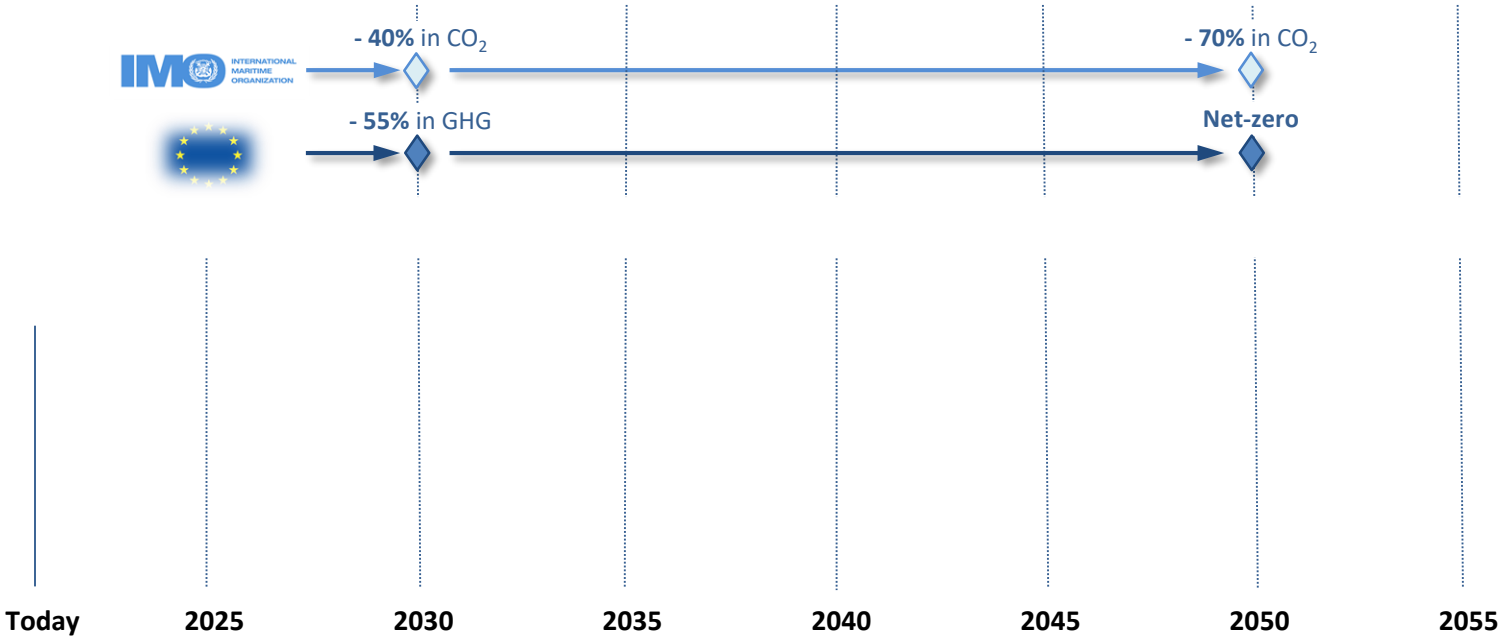
Back-up Power Grid Stabilization

Emergency Power Supply

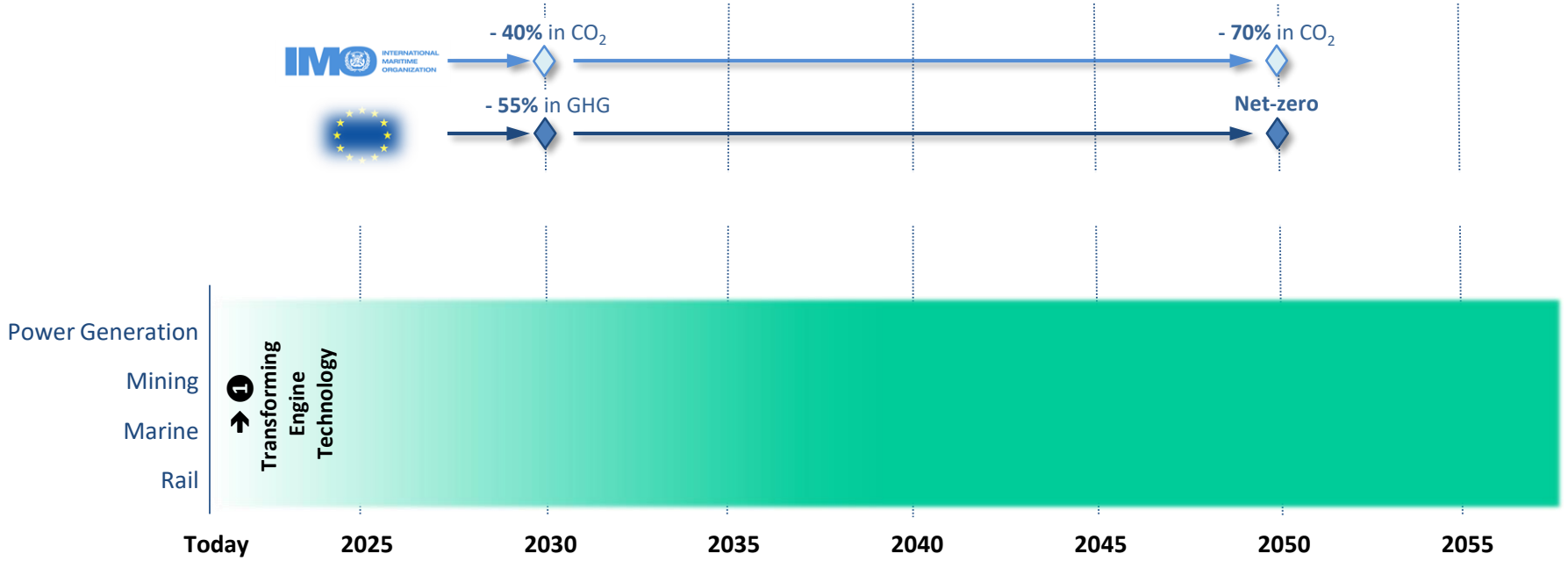
Highly Flexible Power Plant of the Future (Energy Storage and High-dynamic Reconversion)

Hospitals, Data Centers, etc. (Fast-start Capability)

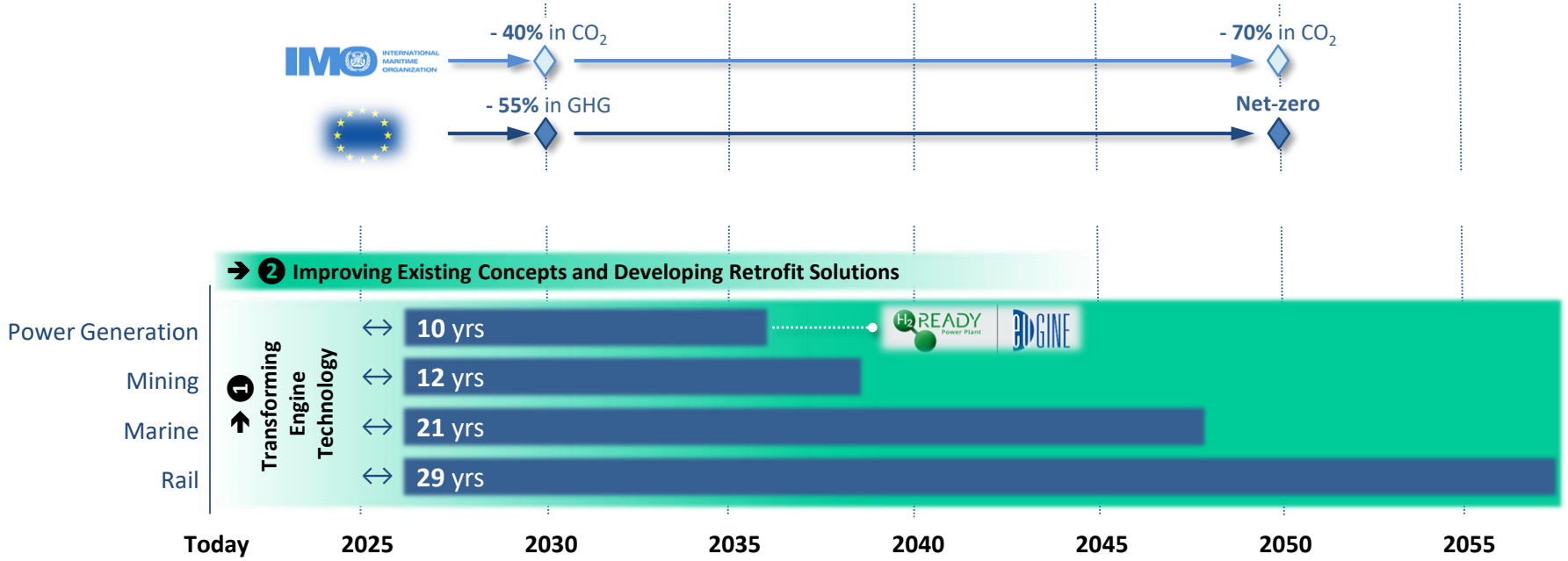
GHG/CO_2 Targets



General Approach



General Approach



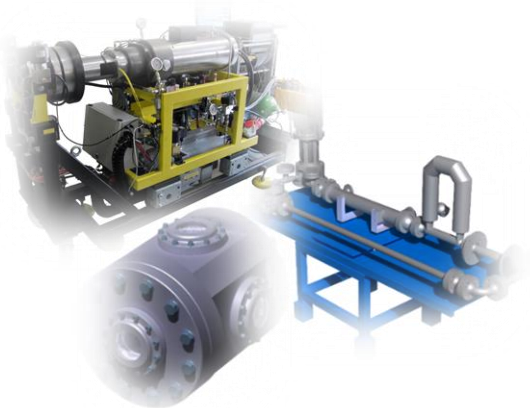
Average Lifespan or Time to Major Overhaul of Engine

LEC Infrastructure

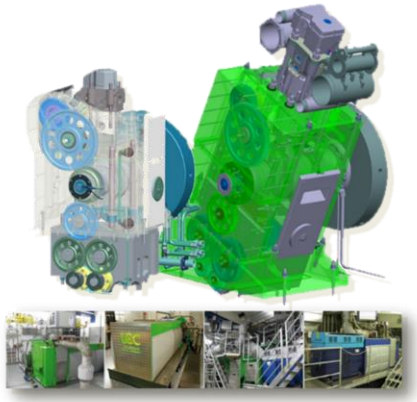
LEC Laboratory at the Graz University of Technology Campus
(Suitable for a wide range of fuels such as H_2, CO, MeOH, ammonia, etc. and all types of conventional fuels)

Test Rig Investigations → SCE Experiments → MCE Experiments → System Validation

IIC Laboratory
(Injection, Ignition and Combustion)

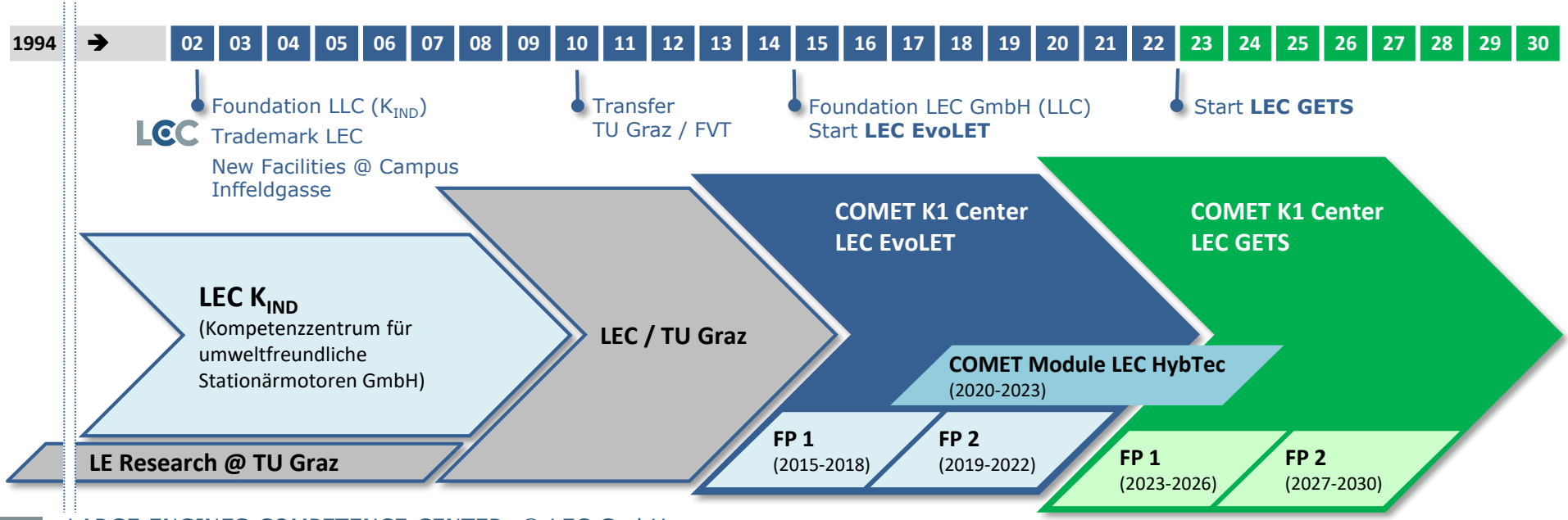


4 SCE Test Beds
(up to 900 kW)

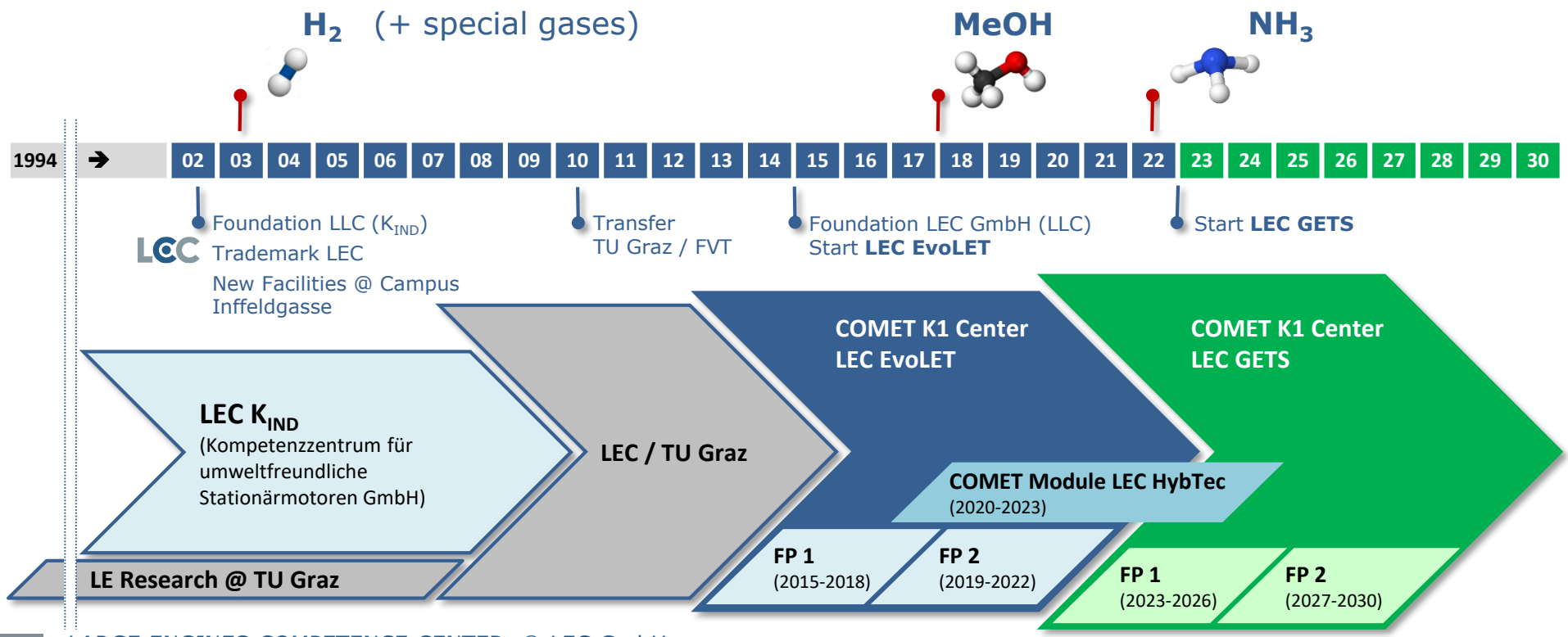


MCE and System Test Bed
(up to 3,500 kW)

LEC Development towards Zero Emissions



LEC Development towards Zero Emissions



Grüner Wasserstoff | Produktion und Verteilung

Center of Hydrogen Research | Wasserstoffforschung an der TU Graz und deren Forschungszentren

E-Fuels | LEC Infrastruktur