

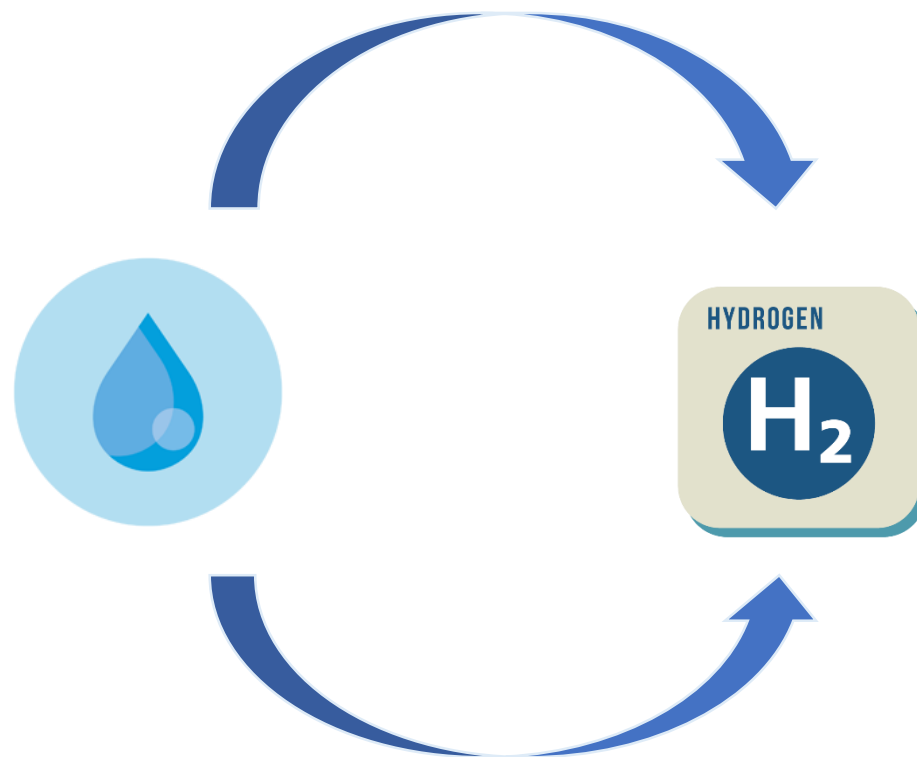
"Verso la transizione energetica: idrogeno tra presente e futuro"

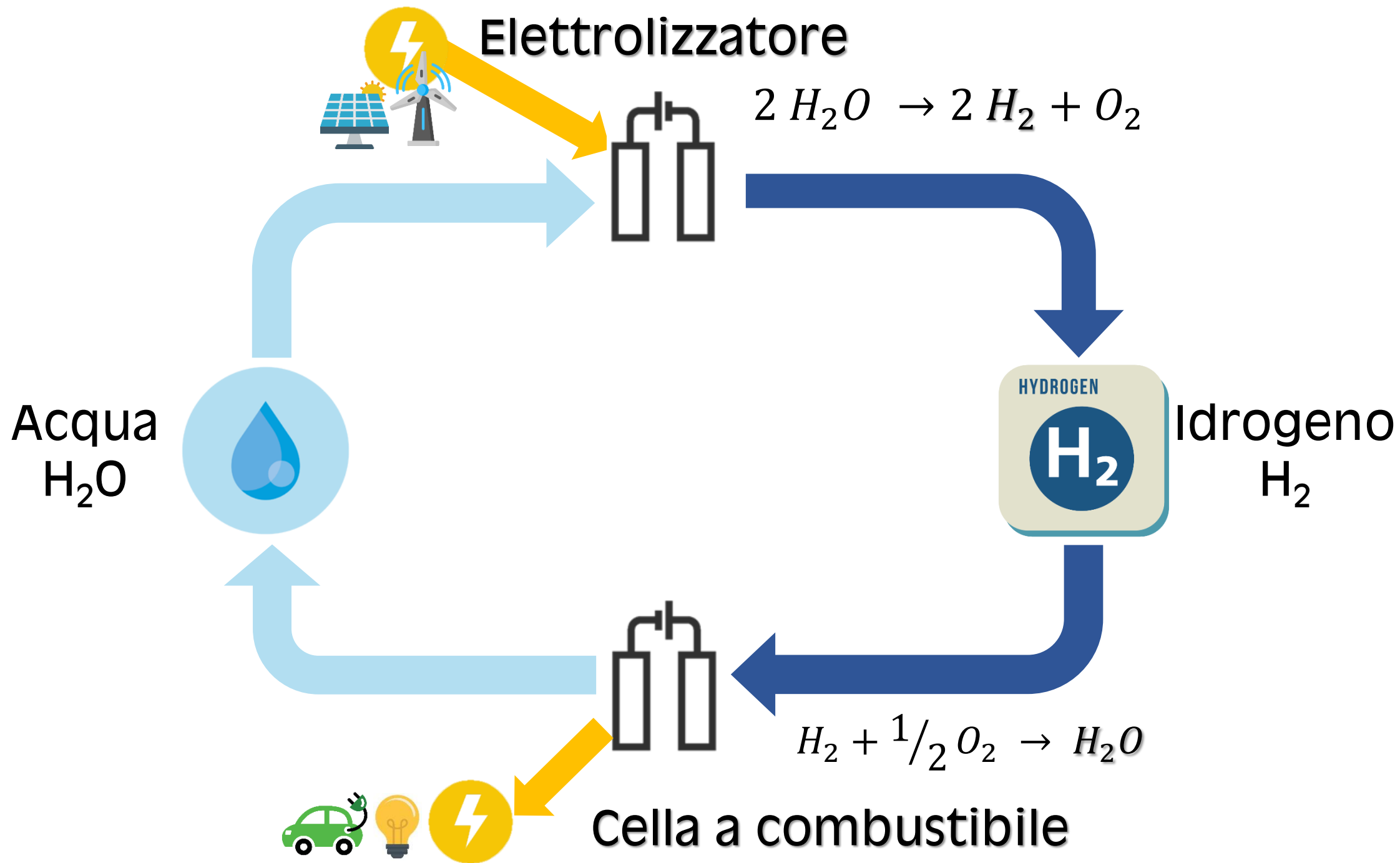
17 ottobre 2019

Marta Gandiglio – Dipartimento Energia, Politecnico di Torino

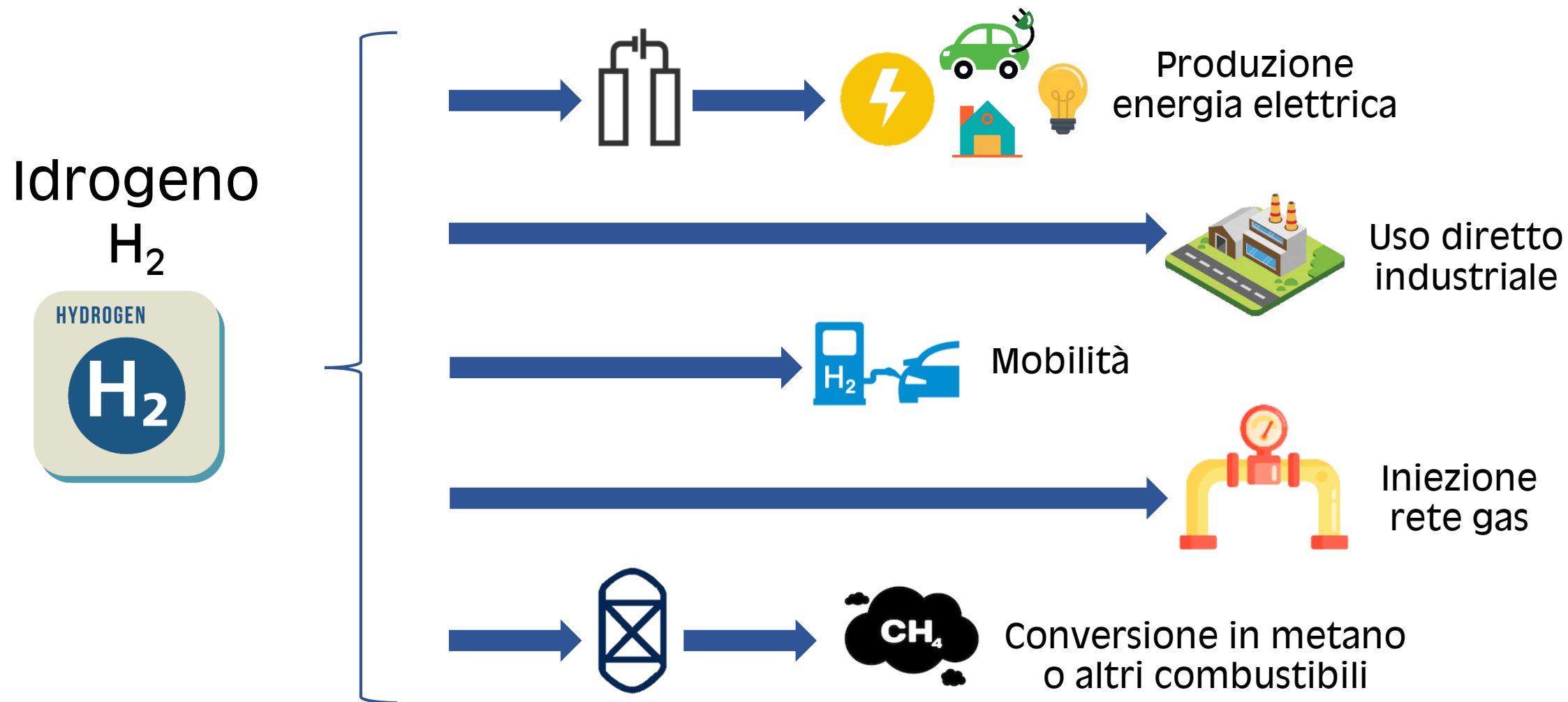


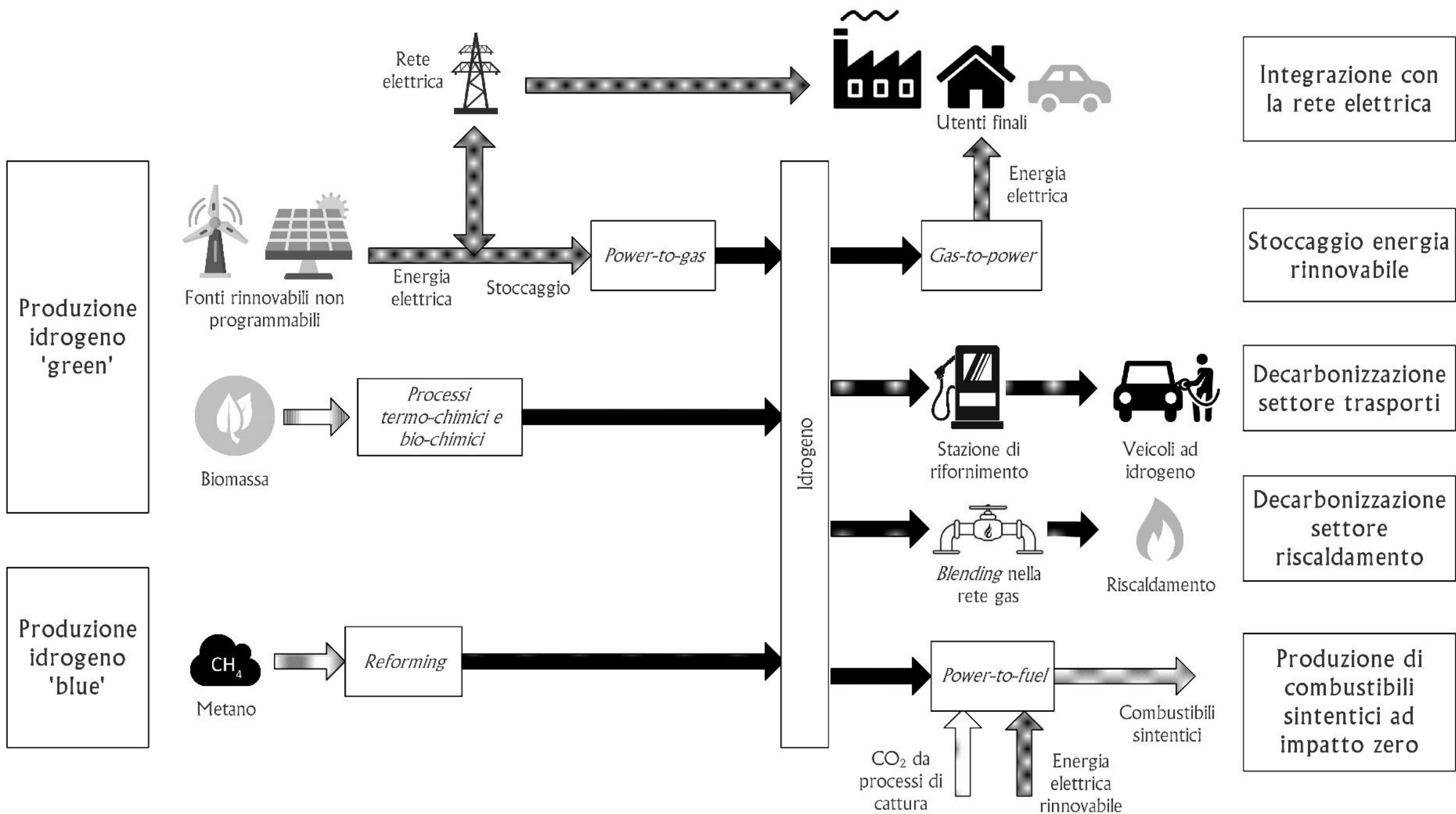
Il ciclo dell'idrogeno





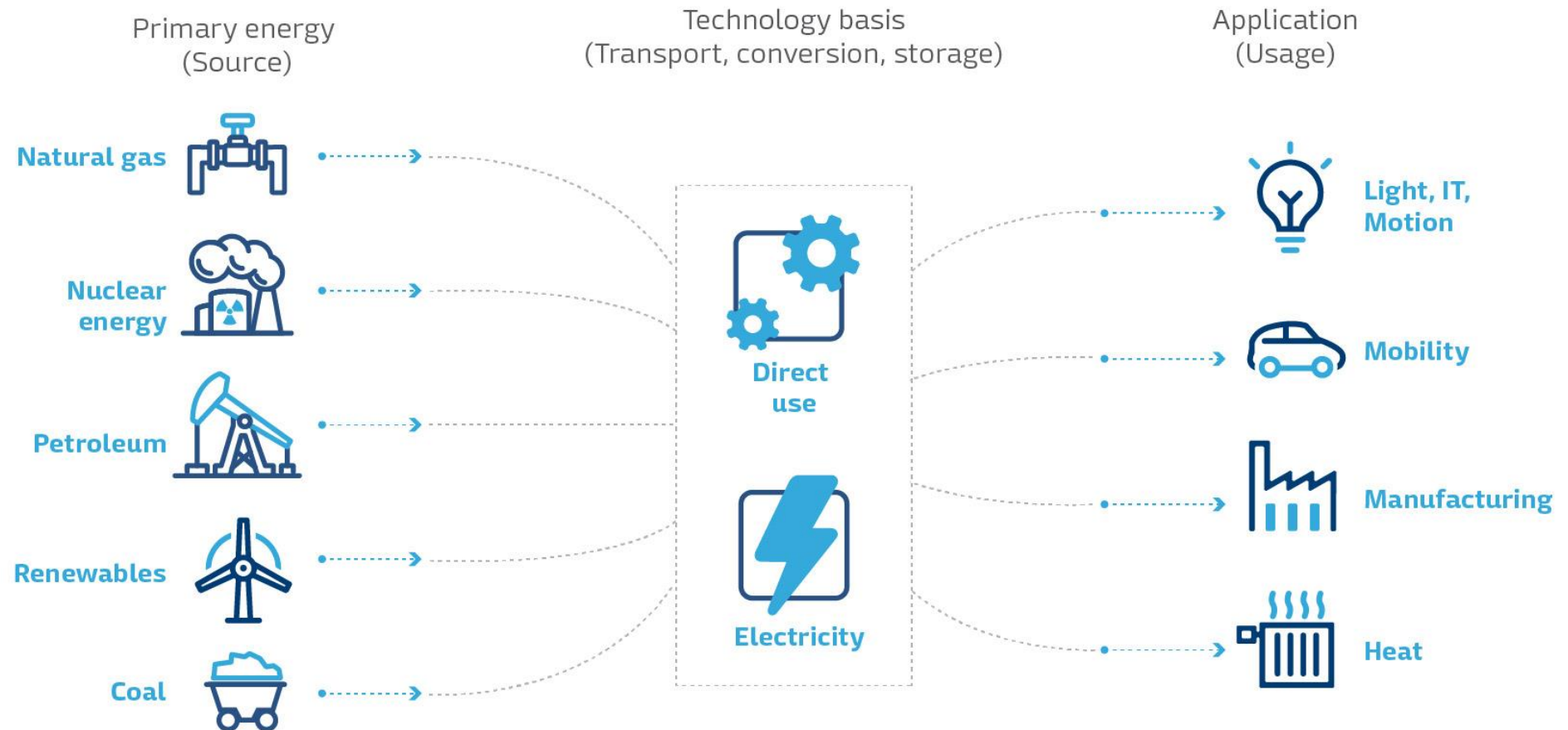
Applicazioni dell'idrogeno





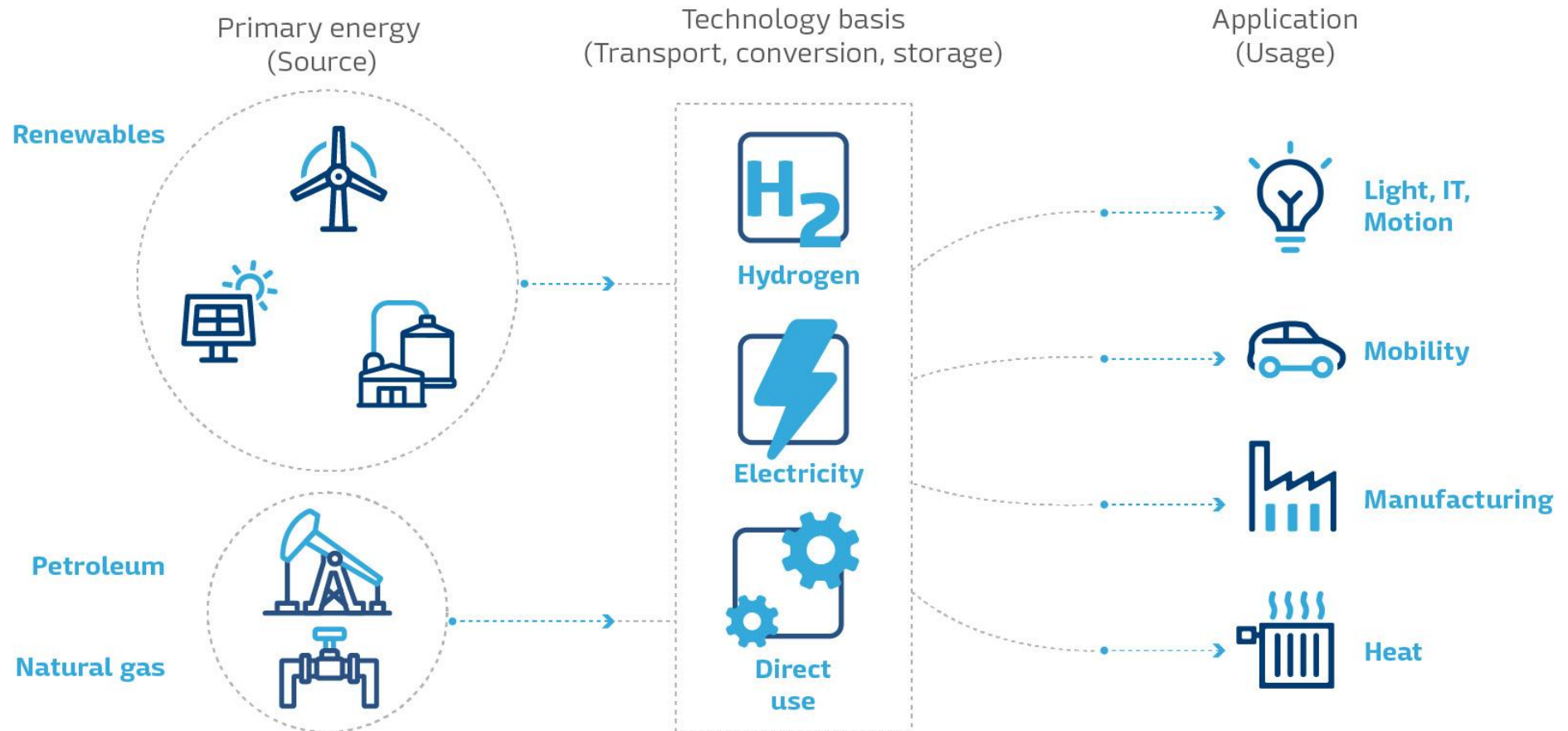
Energy system today

Despite the expansion of renewable energies, the **energy system** in **Germany** continues to feed itself largely from non-renewable sources.

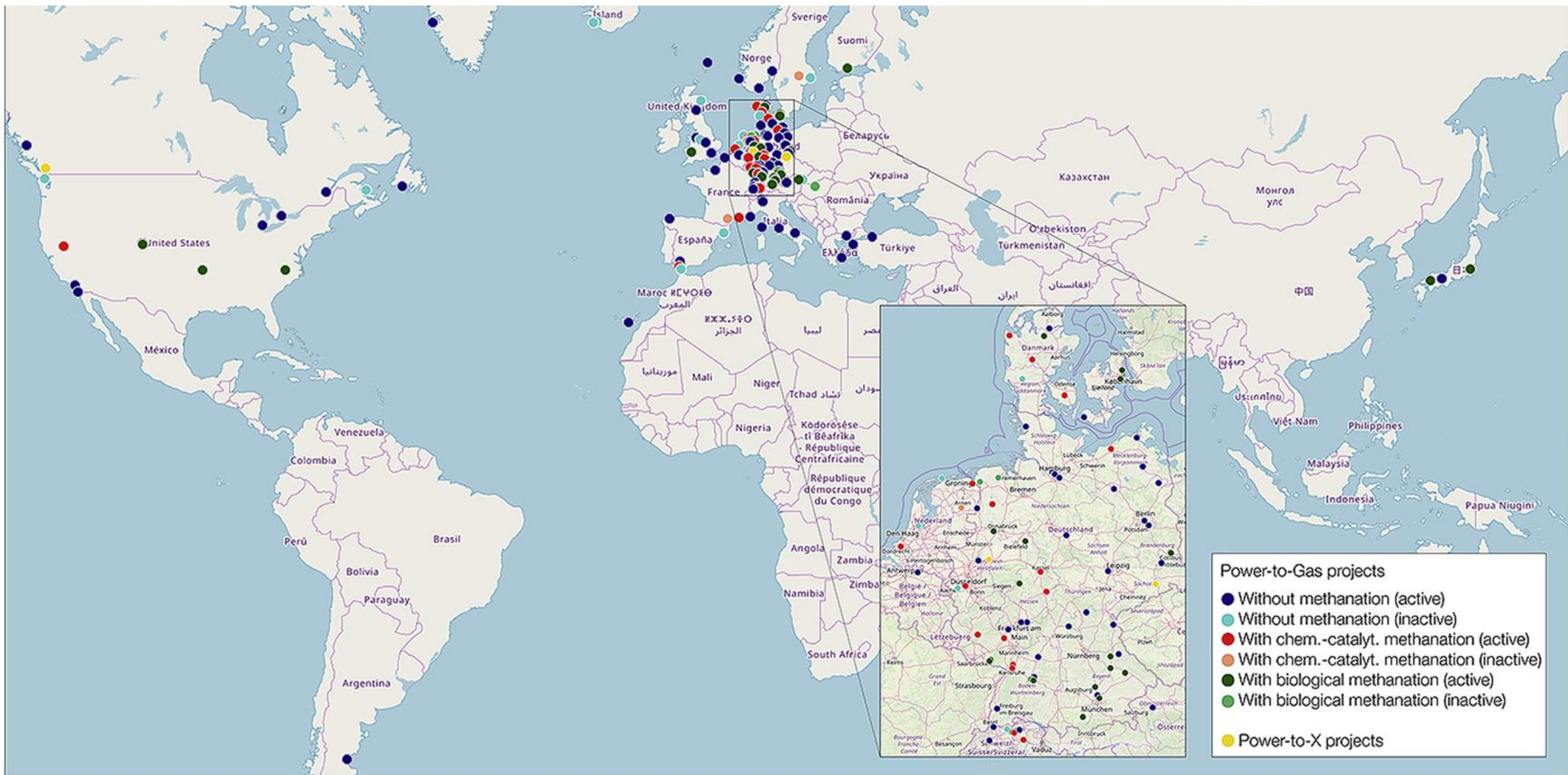


Energy system tomorrow

Our vision is to establish **hydrogen** as the **second central technology basis**. Most of the energy is generated from renewable sources.



Progetti power-to-gas





Rjukan, Norway; 1927 – 1970's

- Capacità: 30'000 Nm³/h ciascuno
- Consumo energetico: 135 MW ciascuno
- Alimentati da energia rinnovabile idroelettrica



Glomfjord, Norway; 1953 – 1991



4 MW of H₂ production units in China from a 200 MW wind farm



Il progetto DEMOSOFC

- POLITECNICO DI TORINO (IT): coordinatore
- CONVION (FI): fornitore tecnologia SOFC
- SMAT (IT): gestore sistema idrico e depurazione
- VTT (FI): analisi dati
- IMPERIAL COLLEGE (UK): business analysis



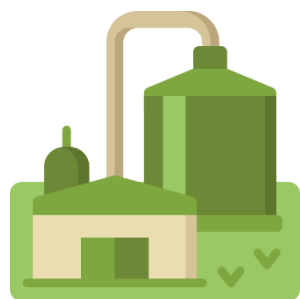
POLITECNICO
DI TORINO



Imperial College
London



- Timing: 01/09/2015 > 31/08/2020
- Project Budget : 5.905.336 €



Anaerobic digestion for
biogas production



Solid Oxide Fuel Cell
Internal Combustion
Engine or Micro Gas
Turbine



Electricity



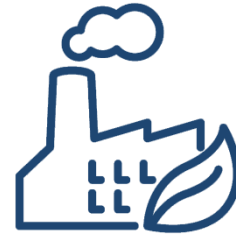
Heat

Perché DEMOSOFC?

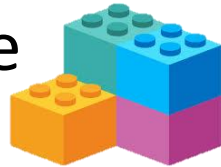
- Elevate performance

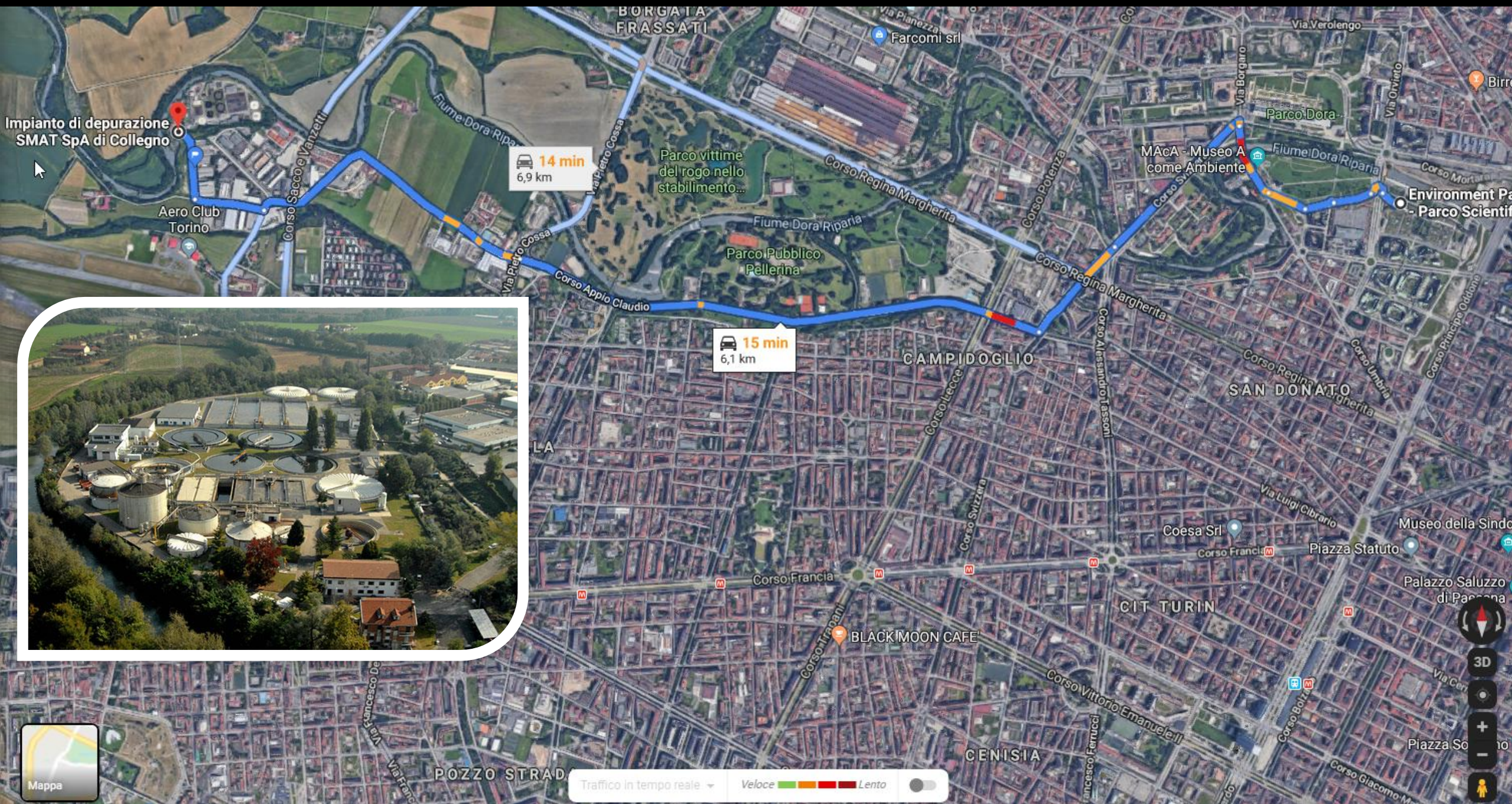


- Zero emissioni inquinanti in atmosfera



- Sistema modulare





Impianto di depurazione
SMAT SpA di Collegno

Aero Club
Torino

14 min
6,9 km

Parco vittime
del rogo nello
stabilimento...

15 min
6,1 km

CAMPIDOGLIO

SAN DONATO

CIT TURIN

CENISIA

POZZO STRAD.

Traffico in tempo reale

Veloce Lento



Mapa

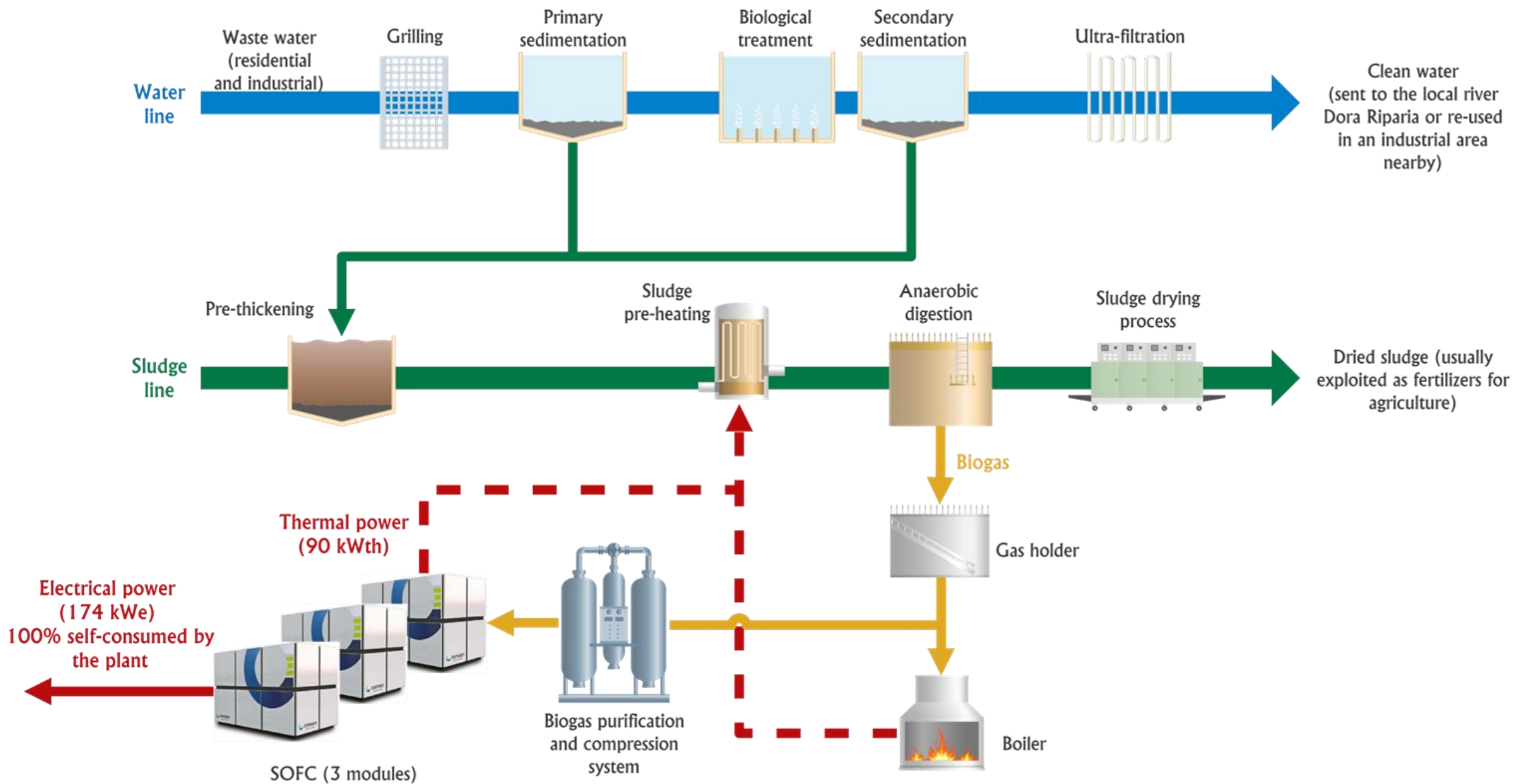
Il depuratore SMAT di Collegno

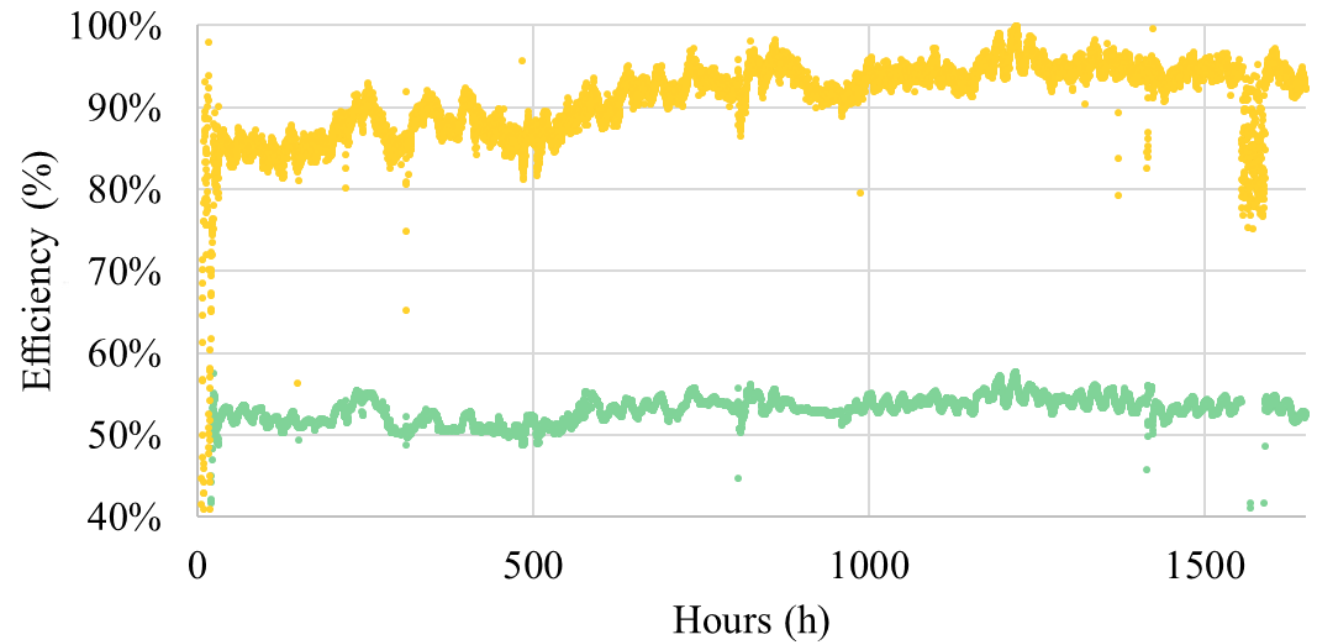
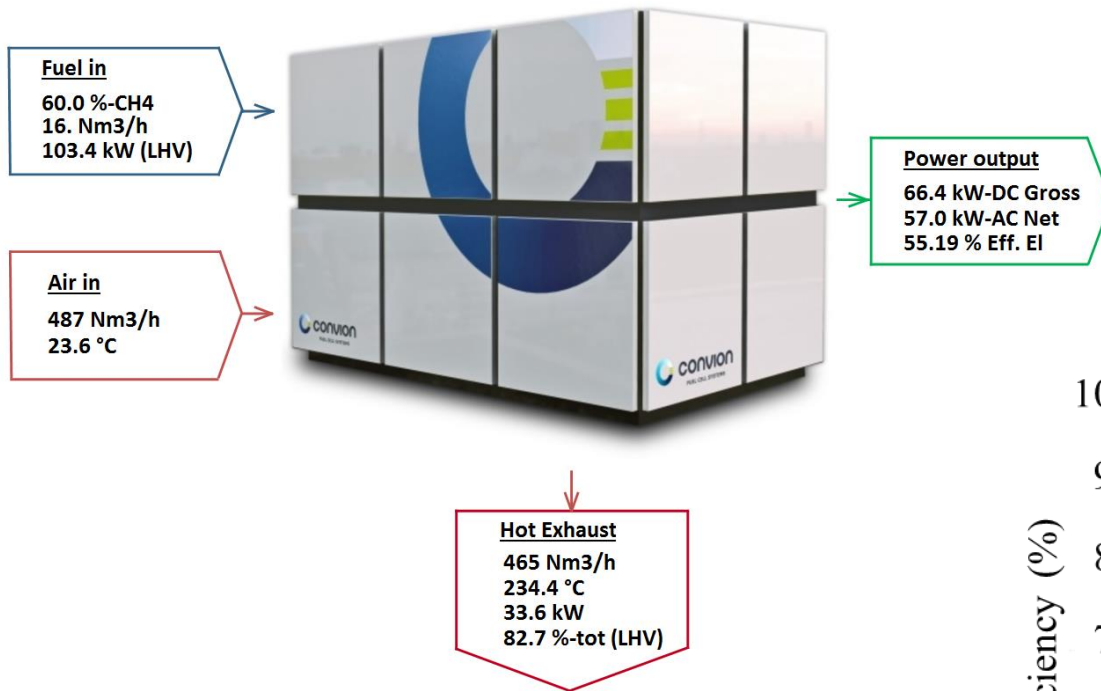




SOFC: Cosa ci offre il mercato?

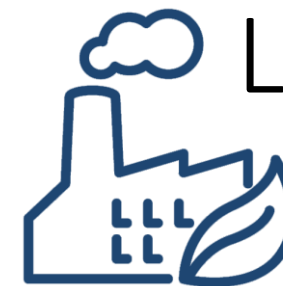




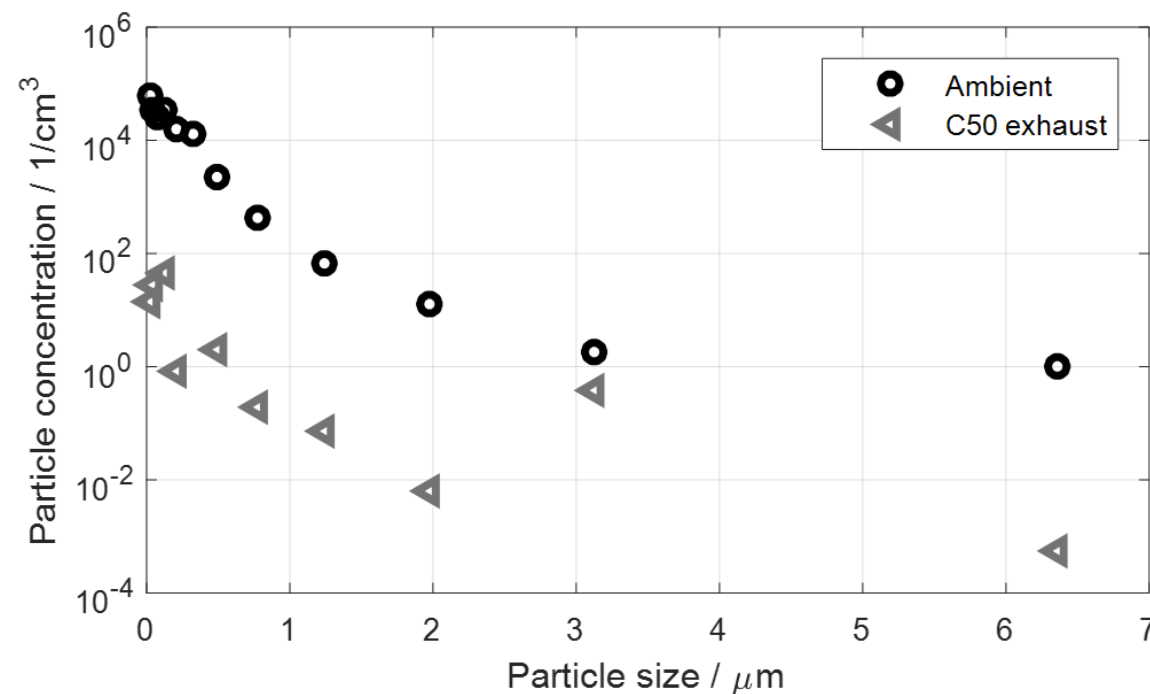


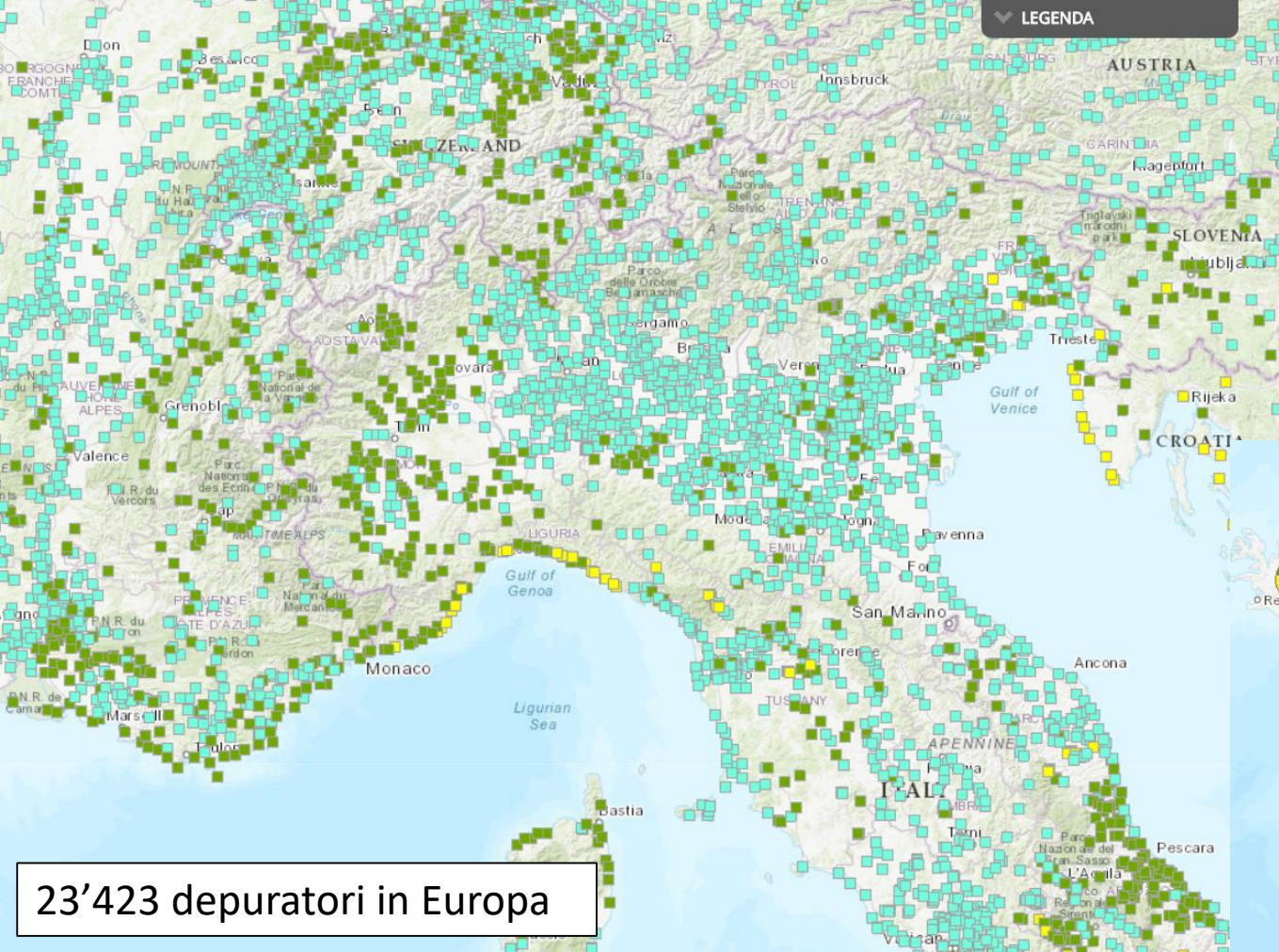
• Electrical efficiency (%) • Total efficiency (%)

Species	Unit	Measured value	Typical emission limits of gas engines and turbines ^{1,2}
H ₂ O	Vol-%	4.7	
CO ₂	Vol-%	3.4	
CO	mg/m ³	<9	100
CH ₄	mg/m ³	<2	
N ₂ O	mg/m ³	<8	
NO	mg/m ³	<20	
NO _x (as NO ₂)	mg/m ³	<20	75...200
SO ₂	mg/m ³	<8	15...60
C ₂ H ₆	mg/m ³	<14	
HCHO	mg/m ³	<7	
HF	mg/m ³	<10	
HCl	mg/m ³	<10	
SO ₂	mg/m ³	<10	
O ₂	Vol-%	18.3	
Particulate	mg/m ³	0.01	Ambient air EU reference values ³ 0.025 (PM _{2.5}), 0.05 (PM ₁₀)

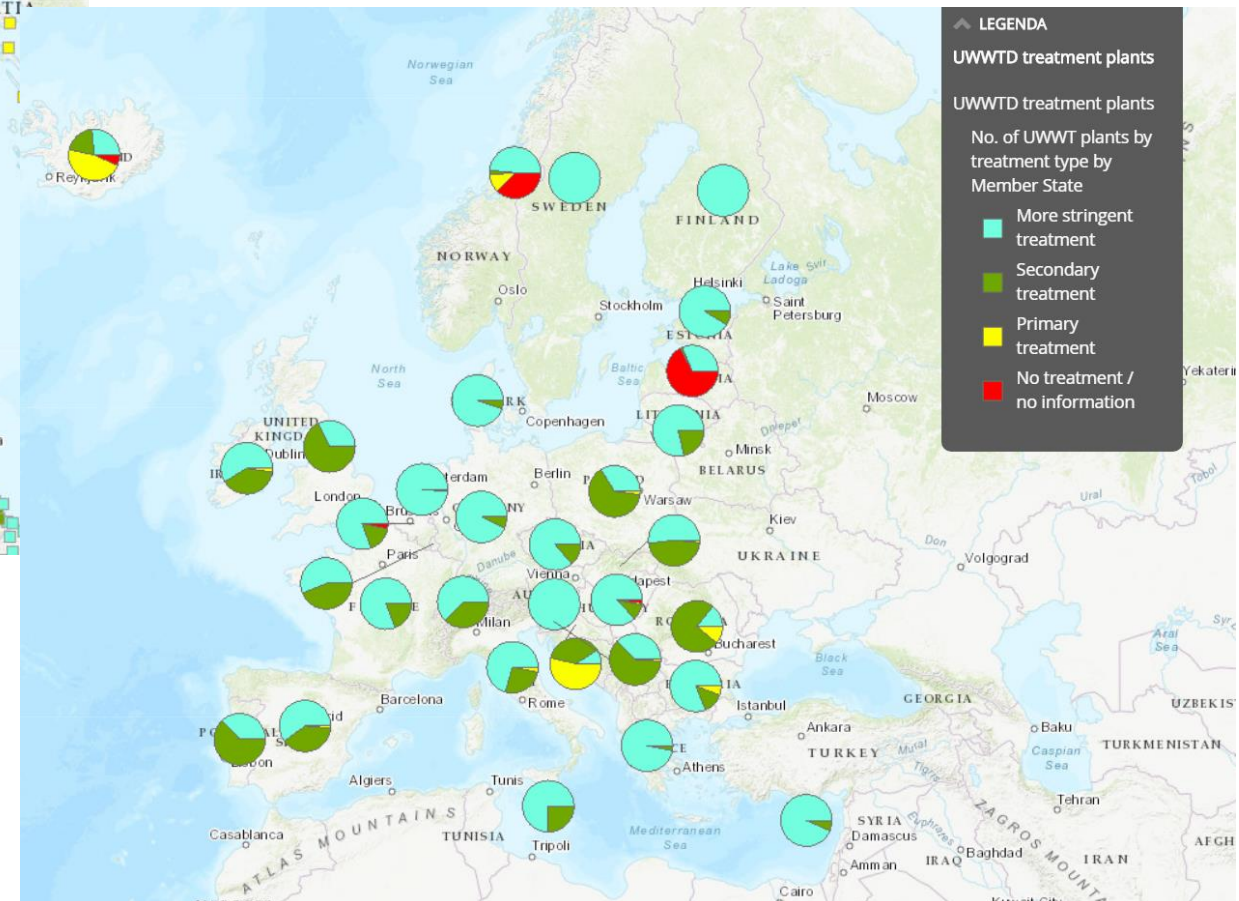
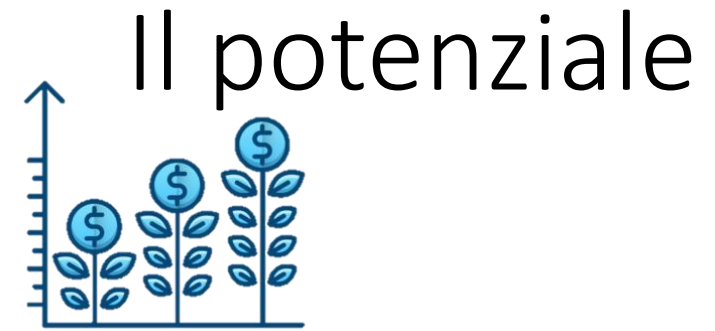


Le emissioni





23'423 depuratori in Europa



Urban Waste Water Treatment map

<https://eea.maps.arcgis.com/apps/MapJournal/index.html?appid=7fa4f0267d8249888b077803714e39fe&embed=true#>

