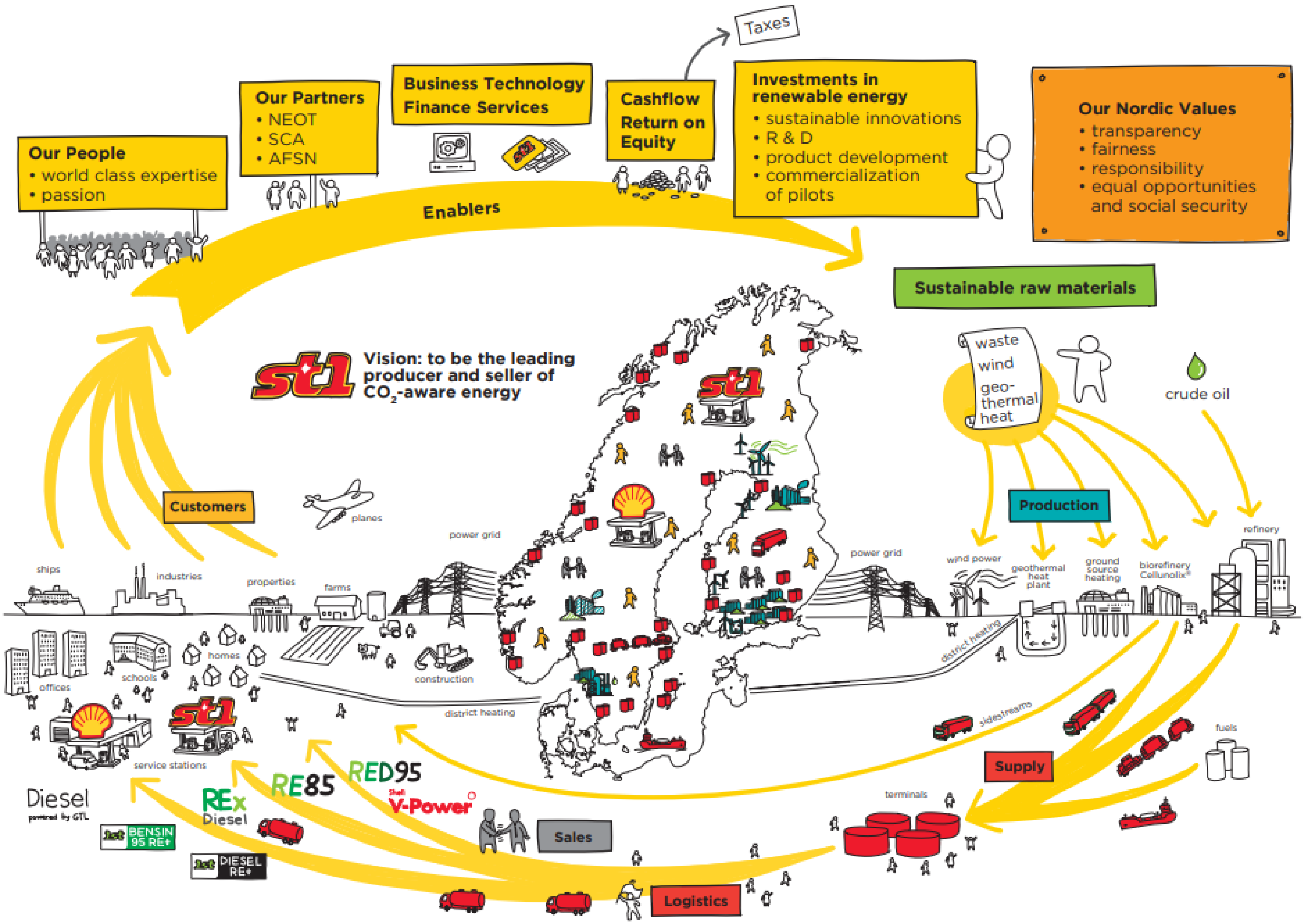
Role of renewable methane in energy transition

Ilona Järveläinen, St1 Nordic Oy

Aalto Energy Forum, Industry Energy Processes, 15th November 2022

GROUP STRATEGY: St1 VALUE CHAIN



Watch the video

St1 solving global energy challenges

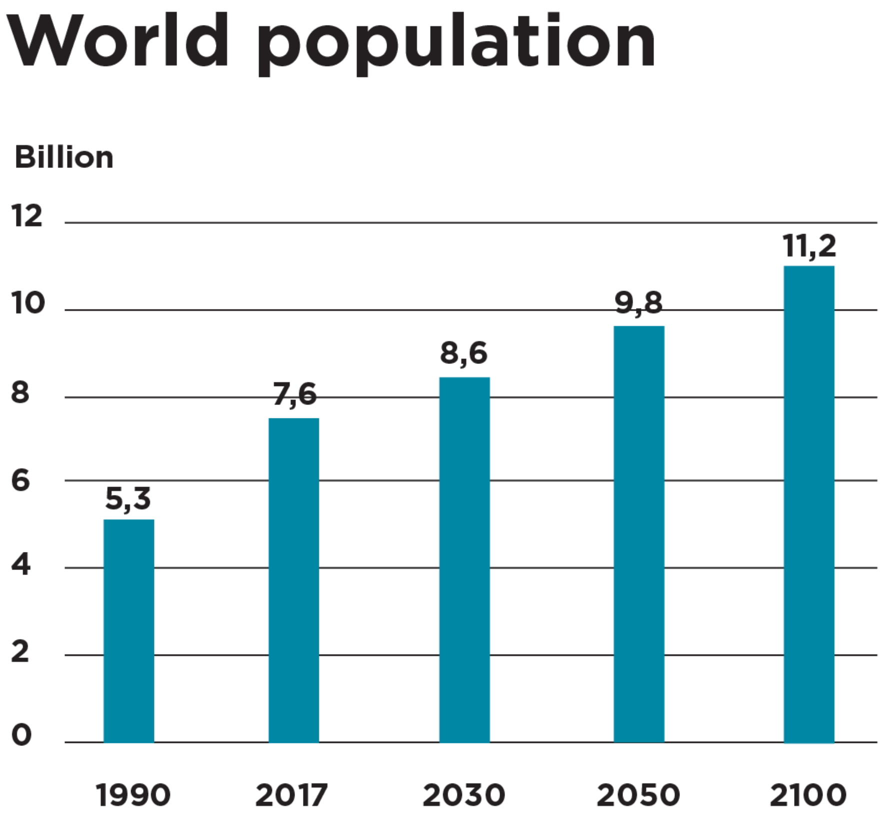
St1 Vision is to be the leading producer and seller of CO_2-aware energy

In the spirit of our vision, we research, develop, produce and invest to be able to provide our customers with CO_2-aware energy while creating positive societal impact

Our operations are strengthened by strategic long-term partnerships in various areas

The Global Energy Challenge

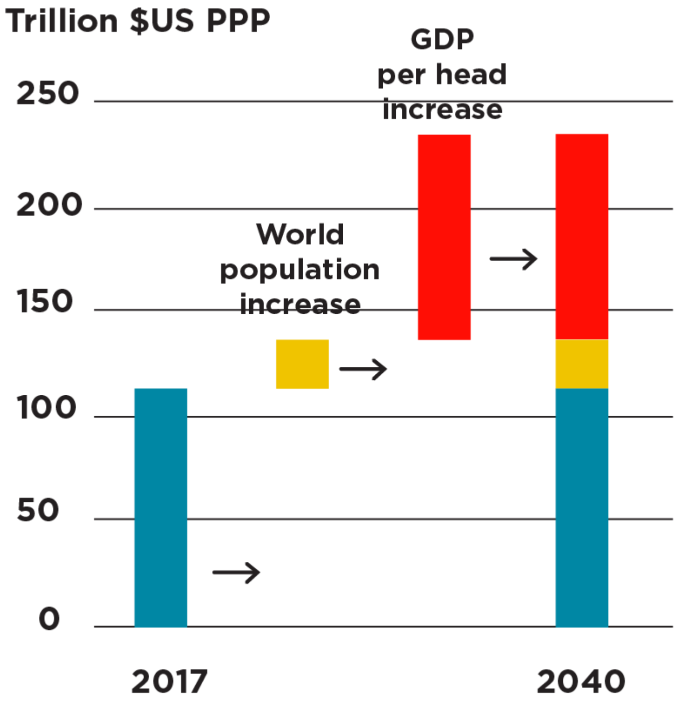
The global population is growing…



Source: United Nations, World Population Prospects 2019 (Medium variant)

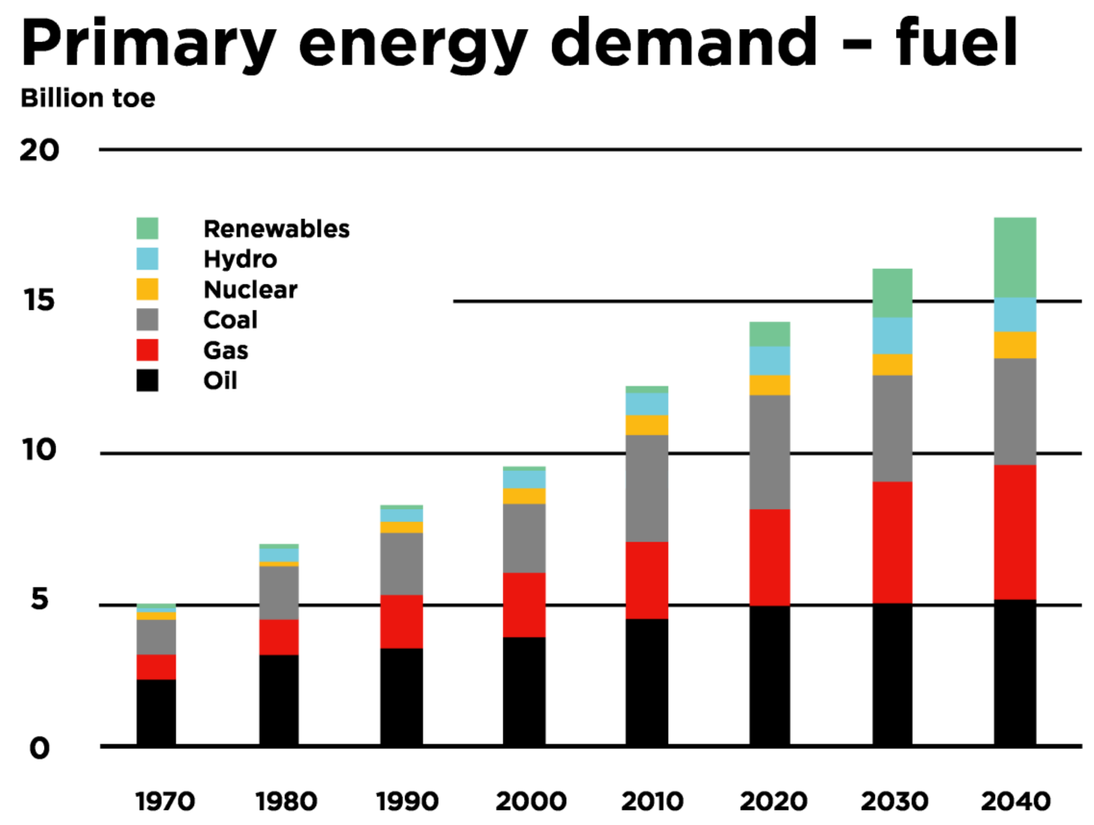
And so are standard of living

Increase in global GDP



Source: BP Energy Outlook, 2019 Edition

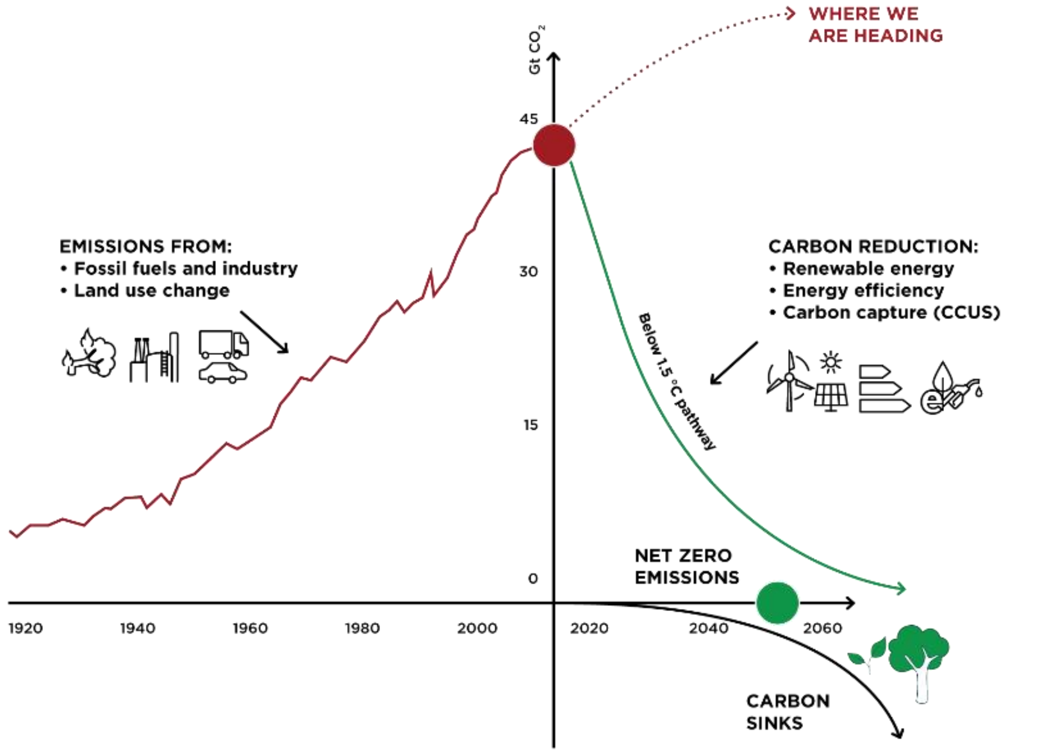
The higher the standard of living, the higher the energy consumption



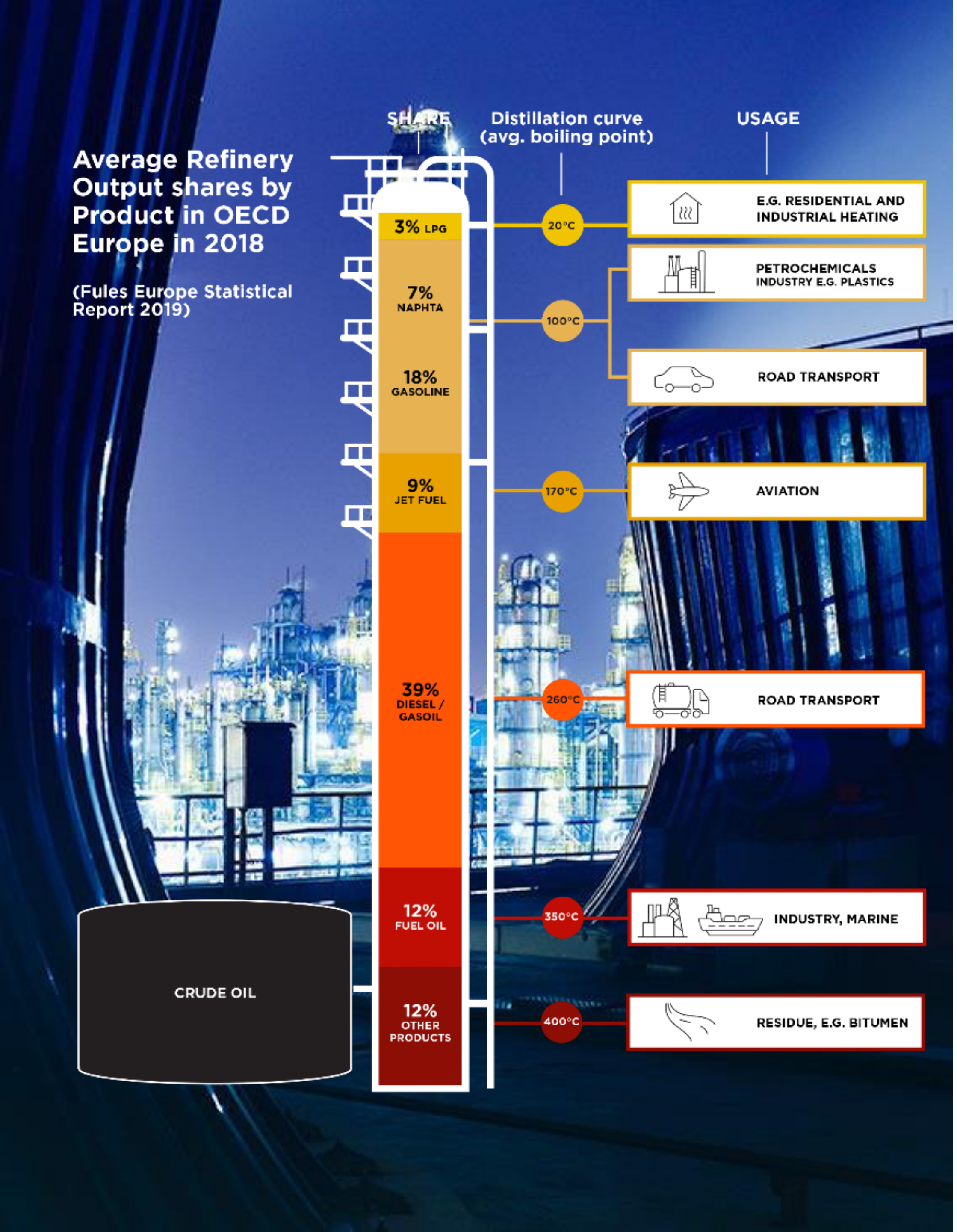
Source: BP Energy Outlook, 2019 Edition

Where we are going vs. where we should go

ILLUSTRATIVE PATHWAY OF GLOBAL NET CO_2 EMISSIONS LIMITING GLOBAL WARMING TO 1.5 °C



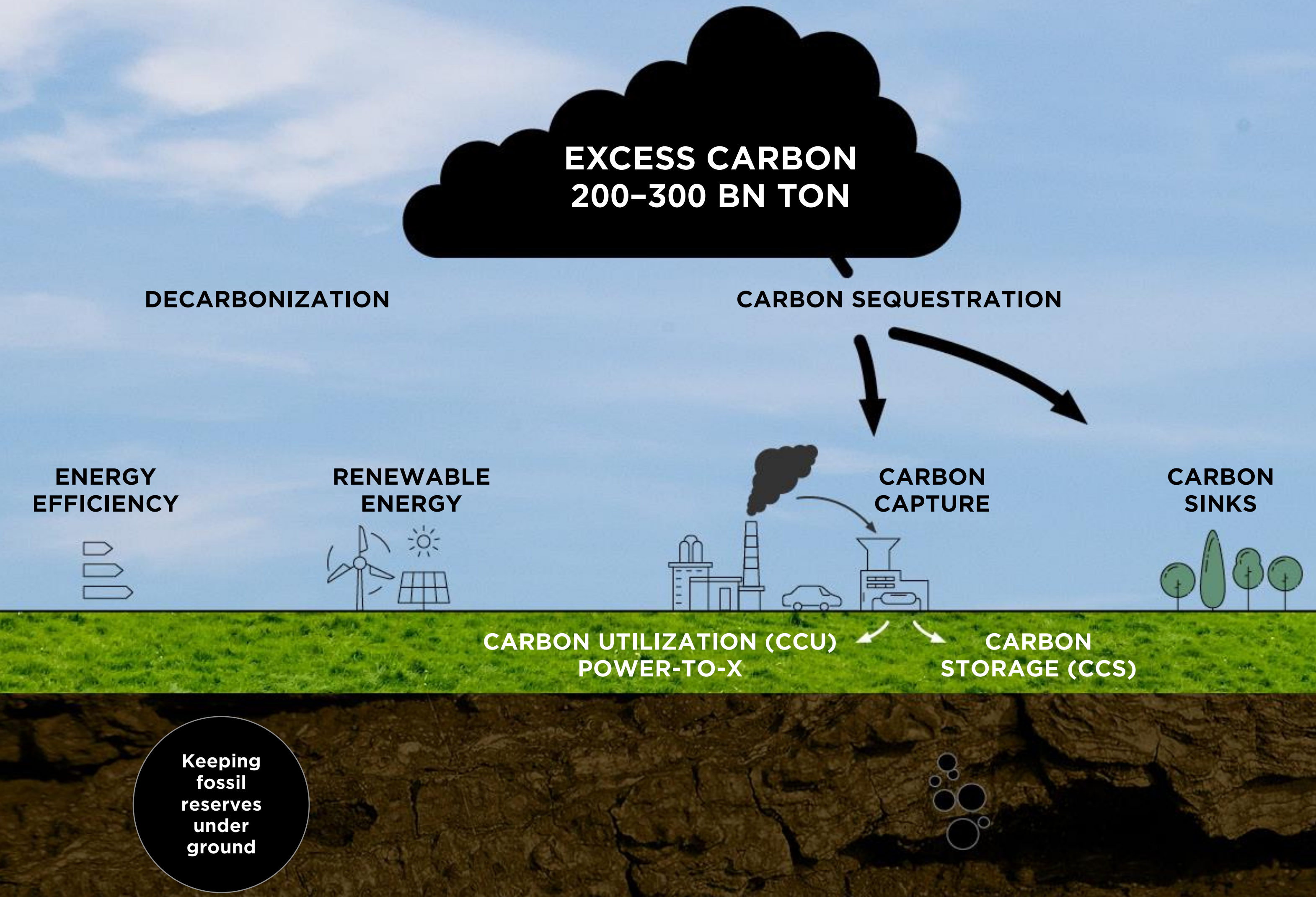
Source: Global Carbon budget 2019, IATA SSP Database, SSP2-19 and SSP2-baseline scenarios



The Distillation Curve Challenge

The demand on one oil product cannot be met without producing the others

Sustainable carbon cycle requires massive investments in



CURRENT ENERGY MARKET TRENDS

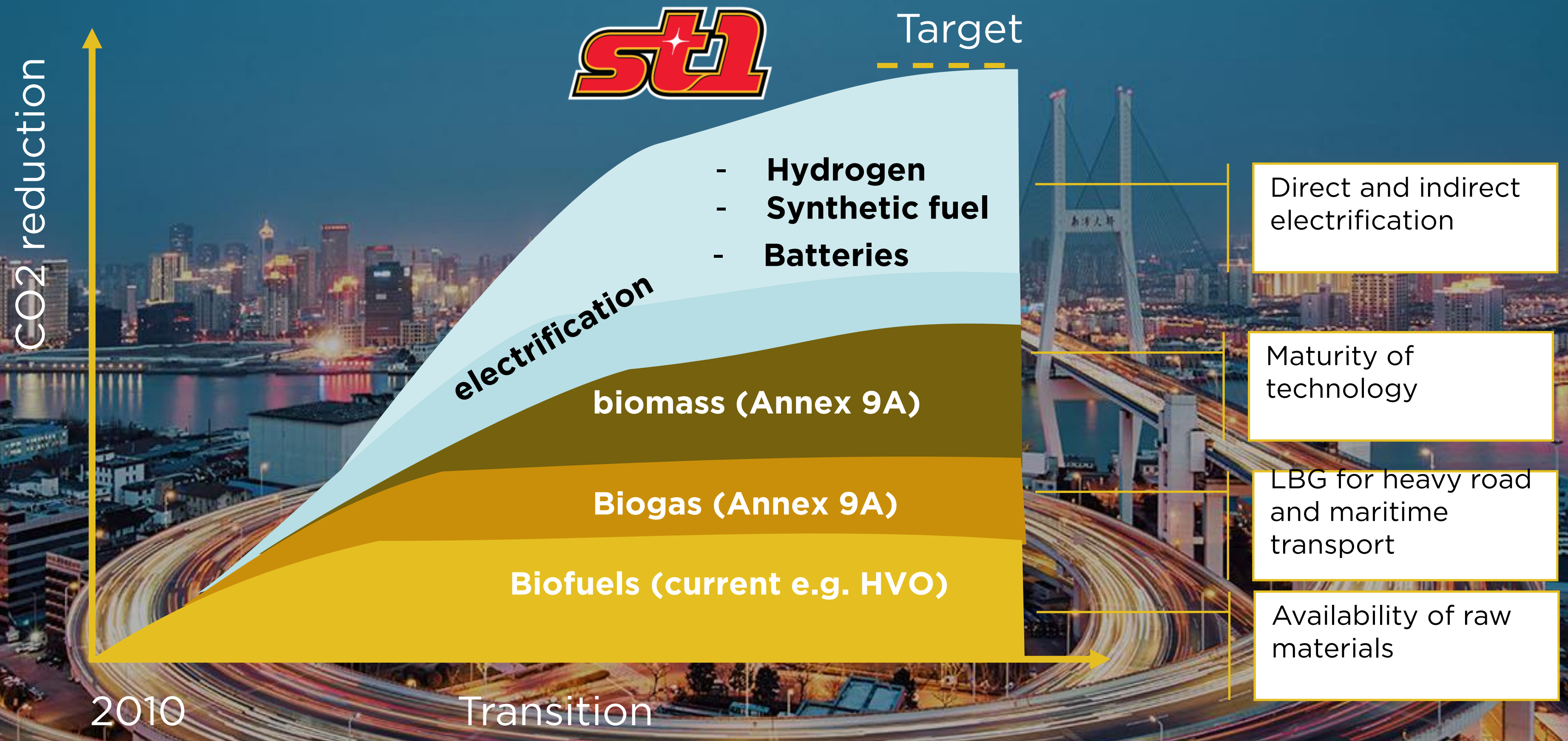
- Short-term responses have focused on securing available supply and protecting consumers, but many governments in the US, EU and elsewhere have adopted new policies that give a major boost to investments in clean energy and efficiency

- High and volatile energy prices are hurting households and businesses, shifting the choice of fuels and setting back progress towards achieving universal access to energy.

- European sanctions on coal and oil imports and Gazprom's decisions to cut gas supply are triggering a profound reshuffling of trade flows around the world

- Investments into renewable energy in Europe, more important than ever – not only from climate perspective but also from energy security perspective

The role of renewable energy sources in the energy transition



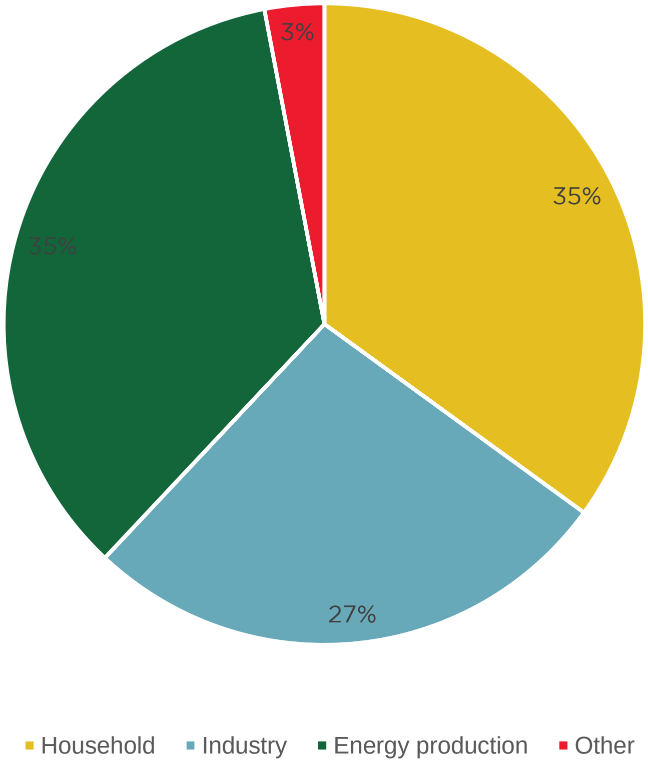
ROLE OF METHANE IN EUROPE

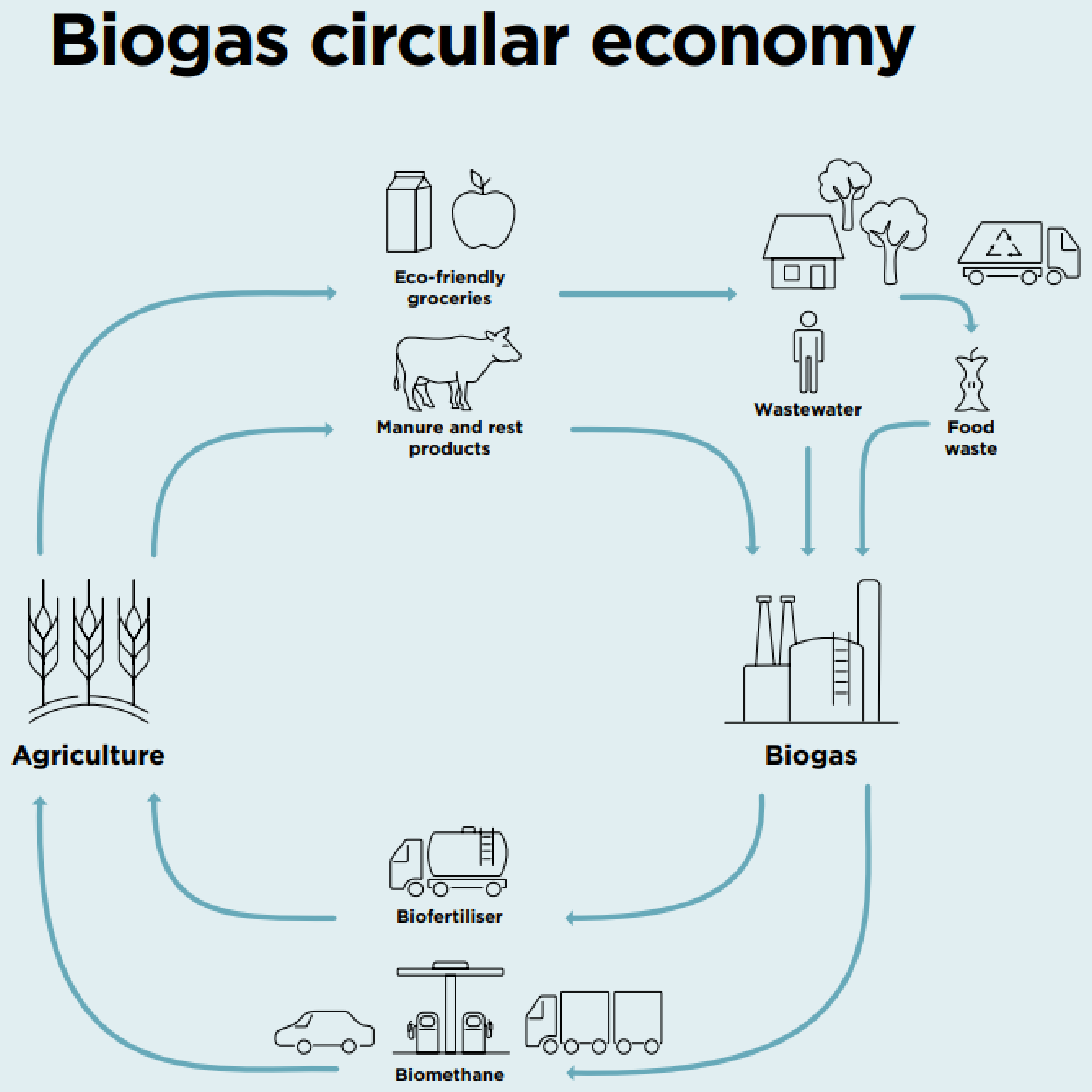
- Natural gas = methane (CH_4)
  - Can be used as compressed natural gas (CBG) or liquefied natural gas (LNG)

- Renewable methane sources:
  - Biomethane
  - Synthetic methane / e-methane

- Renewable methane provides a way to replace natural gas but also other fossil energy sources (diesel) depending on the sector

EU gas demand by sector (2019-2021)





BIOGAS AND BIOMETHANE

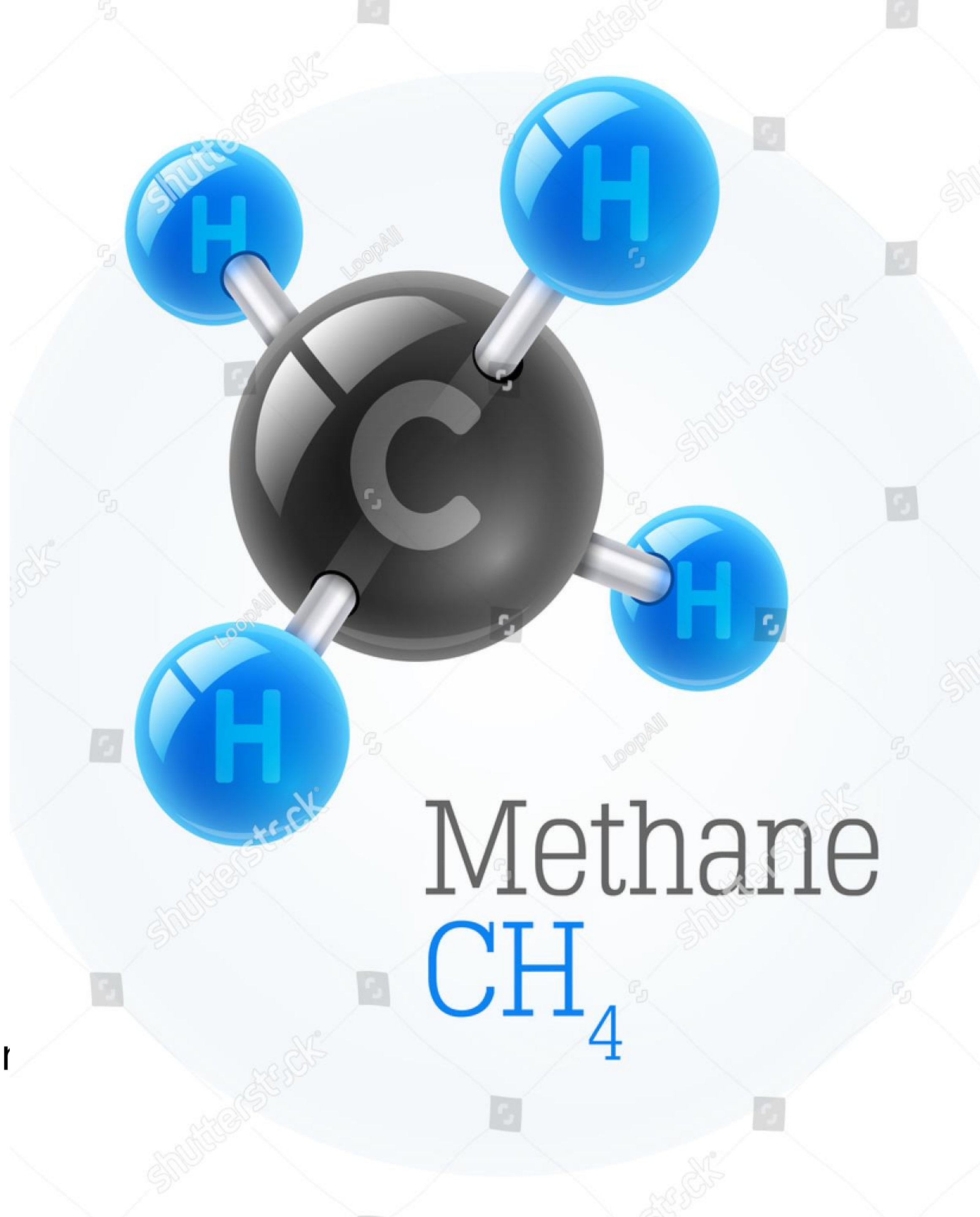
- Renewable methane produced from biomass
  - Biowaste, Sewage sludge etc.
  - Biomethane is produced from biogas by separating CO2
  - Similar molecule than natural gas, can be injected to gas grid or liquefied to LBG
- Current European level production 3 bcm

SYNTHETIC METHANE

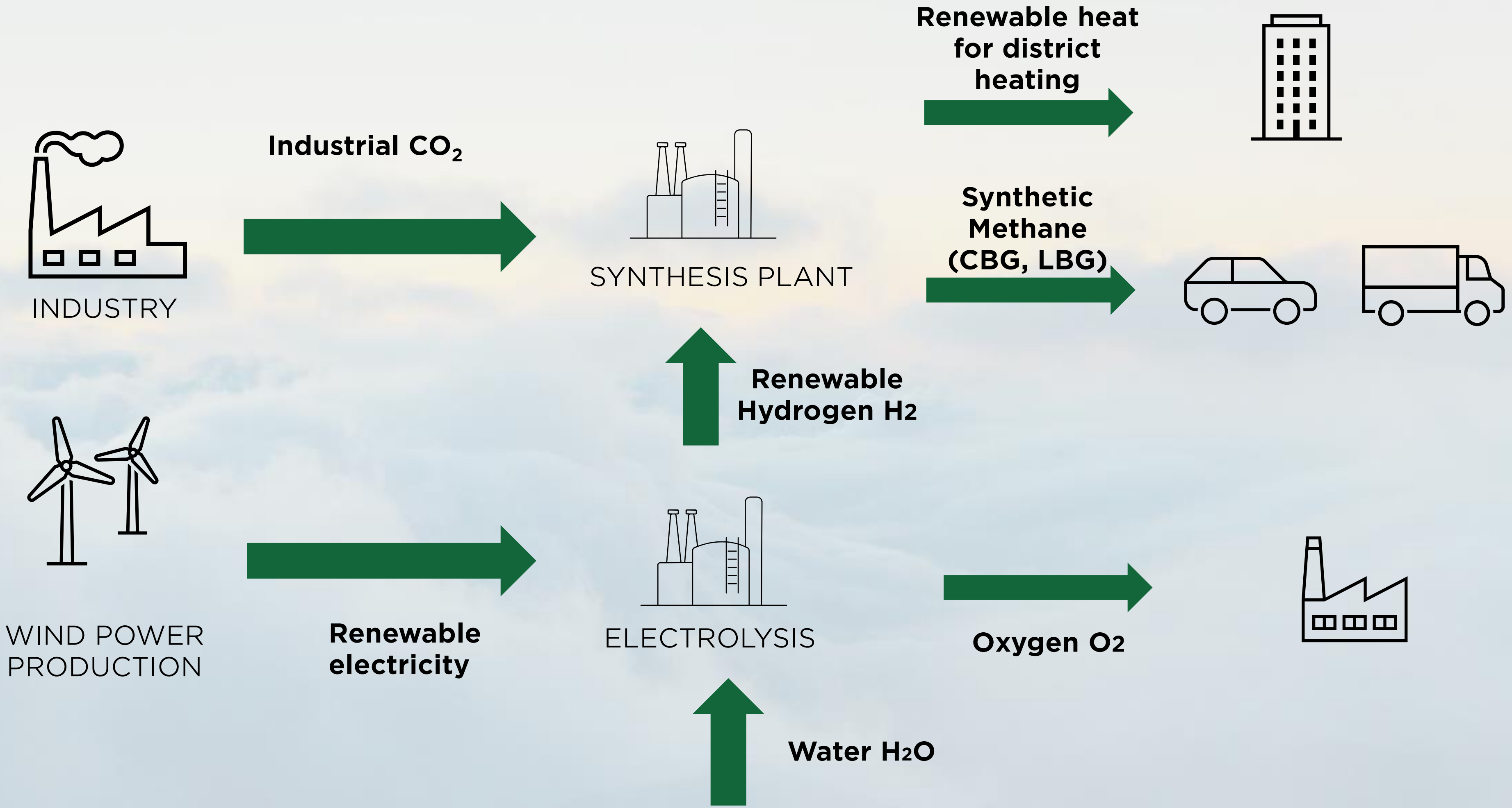
- Synthetic methane or synthetic fuels (also called e-methane or e-fuels) are fuels produced from **renewable hydrogen** and **carbon dioxide**

- Synthetic methane is same molecule than biomethane or natural gas and can be sold as CBG or LBG

- Synthetic methane provides a possibility to increase massively the supply of renewable fuels while all time increasing competition or waste and residue origin feedstocks



PRODUCTION OF SYNTHETIC METHANE



Renewable methane as sustainable transportation fuel

- Liquefied biogas and e-methane important part of energy transition especially on HDV and marine sector where direct electrification is not possible

- Biomethane:
  - Locally produced biomethane
  - Utilization of waste streams that cannot be utilized in higher value applications (such as chemicals, HVO)
  - Circular economy benefits
    - fertilizers, CO_2 capture

- e-methane:
  - The simplest carbon chain that can be produced via power-to-X
  - Needed to scale up the renewable methane production

BIOGAS AS TRANSPORTATION FUEL

Actual emissions of sold biogas by St1 were 9,5 g CO2/MJ in Sweden year 2021 which is 89,9 % reduction to fossil reference

St1 Renewable gas business

St1 renewable gas business – current status

- In Sweden we are a leading biogas player in CBG business with c. 30% (600 GWh) market share in traffic segment
  - Six biogas production and upgrading units
  - Long term collaboration with local Swedish biogas producers
  - Rest of supply is covered by importing biomethane via gas grid to Sweden from Europe
  - More than 50 public stations, about 20 bus depots
  - Active in all parts of the compressed biogas value chain

- Building up LBG business in SWE, FI, NO and aiming to start 2023

St1 renewable gas business – growth

- St1 heavily entering and expanding renewable gas business in the Nordics
- Building up value chain in Finland, Sweden and Norway for liquefied biomethane (LBG) to cover all parts of the value chain from supply to sales
  - Aiming to start LBG sales during year 2023
- Partnership building with companies sharing a same vision crucial to build up the business based on long term collaboration

St1's journey in renewable gas business

Biomethane/RNG

ST1 and Borås Energi och Miljö in bioLNG partnership

St1 enters the biogas market in Norway

RELEASE 06.05.21

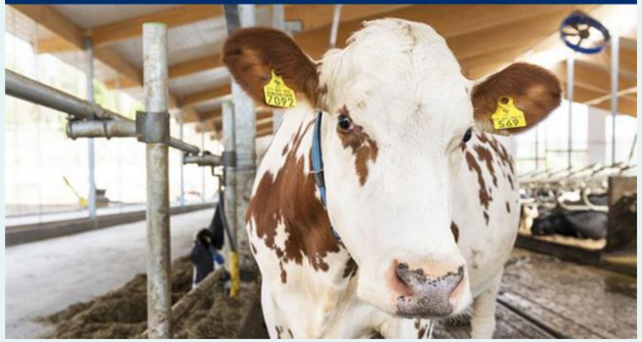
The energy company St1 Norge AS will together with Nor-log Gruppen and Knapphus Energi join a tripartite collaboration that will build a network of filling points for biogas in Norway.

Biogas

St1 to enter biogas business with acquisition of E.ON Biofor in Sweden

SUPPLY & PRODUCTION → DISTRIBUTION → SALES

Valio and St1 to produce biogas from manure – a new opening in reducing transport emissions



Vantaa Energy and St1 to cooperate in the distribution of electric fuel

1.6.2022

St1 Norge AS together with Nor-log Gruppen and Knapphus Energi joined a tripartite collaboration to build a network of biogas filling points in Norway.

Final words

- Importance of renewable methane even higher than ever due to the European current geopolitical situation
- Legislational environment need to enable investments and business growth
  - Uncertainty of investment environment
  - Sub-optimization and lack of value chain thinking
    - different targets drives different parts of value chain: CO_2 standards for HD vs. RED II targets
- Decision making & energy system building without sub-optimization
  - Where we find the highest value (economic, social and environmental) for biogas and e-methane?
- Partnering and strong collaboration between companies needed

Thank you!

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St1 Game Changer report 2021 available:
https://content.st1.fi/sites/default/files/2022-06/St1_Integrated_report_2021_2.pdf