E-fuels WP6 :
Task 6.1 LCA

RED2 and e-fuels

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E-fuels WP6: Energy System and Climate Impact Analysis

VTT

T6.1 WtW analysis

- State-of-art methods
- Climate impact assessment of selected fuel chains (LCA)
- EU RED2 sustainability criteria for e-fuels & EU regulation on vehicles tailpipe CO_2 emissions

T6.2 System level impacts

- System level impacts of increased e-fuel production on the surrounding energy system
- Energy system modelling (e.g. TIMES-VTT).

T6.3 Economy and policy implications

- The modelling results from T6.2 are used to evaluate the economical and policy implications
- Interesting market areas or countries?

Content

- RED2 and e-fuels
- RED2 sustainability criteria for renewable fuels
  - Current criteria for bioenergy
  - Emission saving requirements established
- Critical questions concerning e-fuels
  - Origin of electricity for e-fuel production
  - Examples
- Key messages

Disclaimer:
These slides represent author's current interpretation of the RED2. The final sustainability criteria for e-fuels are not yet published, and could differ from the current interpretation.

RED2

- To be implemented by June 2021
- Sets the EU targets for renewable energy in general (32% by 2030) and in transport (14% by 2030)
- Sets the sustainability criteria for renewable fuels
  - These need to be met in order to account the energy content of the fuel to the renewable energy target and to benefit from public financial support
- Currently sustainability criteria applied for biofuels, but all bioenergy and other renewable fuels to be included (transportation fuels, electricity, heating, cooling)

- In Finland, Energy Authority (Energiavirasto) is the responsible authority
- Law proposal on including e-fuels in the Finnish “jakeluvelvoite” currently on comments

RED2 and e-fuels

- In RED2 e-fuels are classified as:

  "RFNBOs = Renewable fuels of non-biological origin"

(36) 'renewable liquid and gaseous transport fuels of non-biological origin' means liquid or gaseous fuels which are used in the transport sector other than biofuels or biogas, the energy content of which is derived from renewable sources other than biomass;

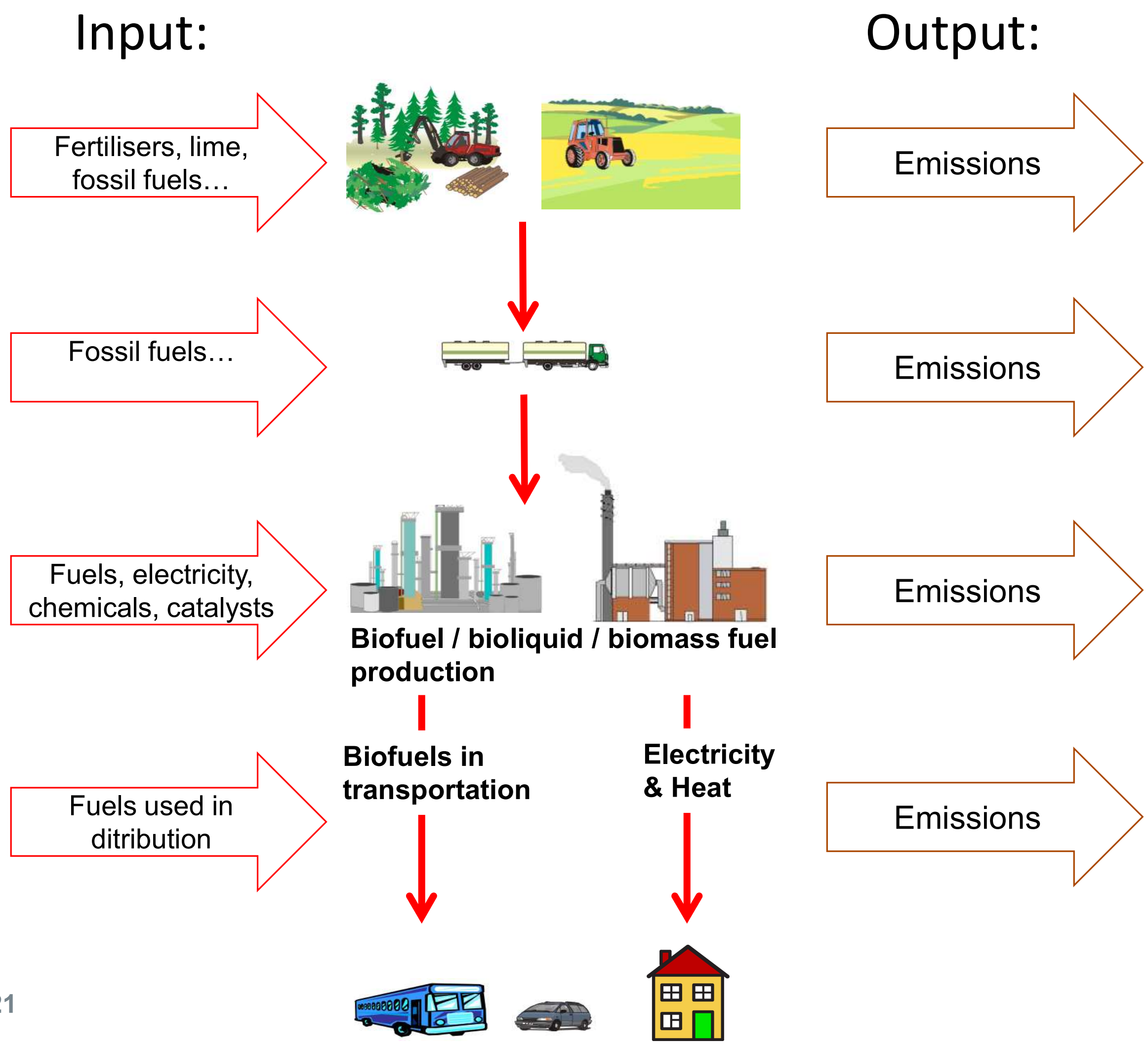
- Can be included in the separate target for advanced biofuels (at least 3,5 % in 2030)
- 70% emission saving limit established
- Delegated act by December 31 2021 on the GHG calculation rules for RFNBOs
- Revised RED2 published in summer 2021 → impact on RFNBOs?

RED2 emission saving criteria

$$\text{EMISSION SAVING} = \frac{\text{Total emission of fossil fuel} - \text{Total emission of renewable fuel}}{\text{Total emission of fossil fuel}}$$

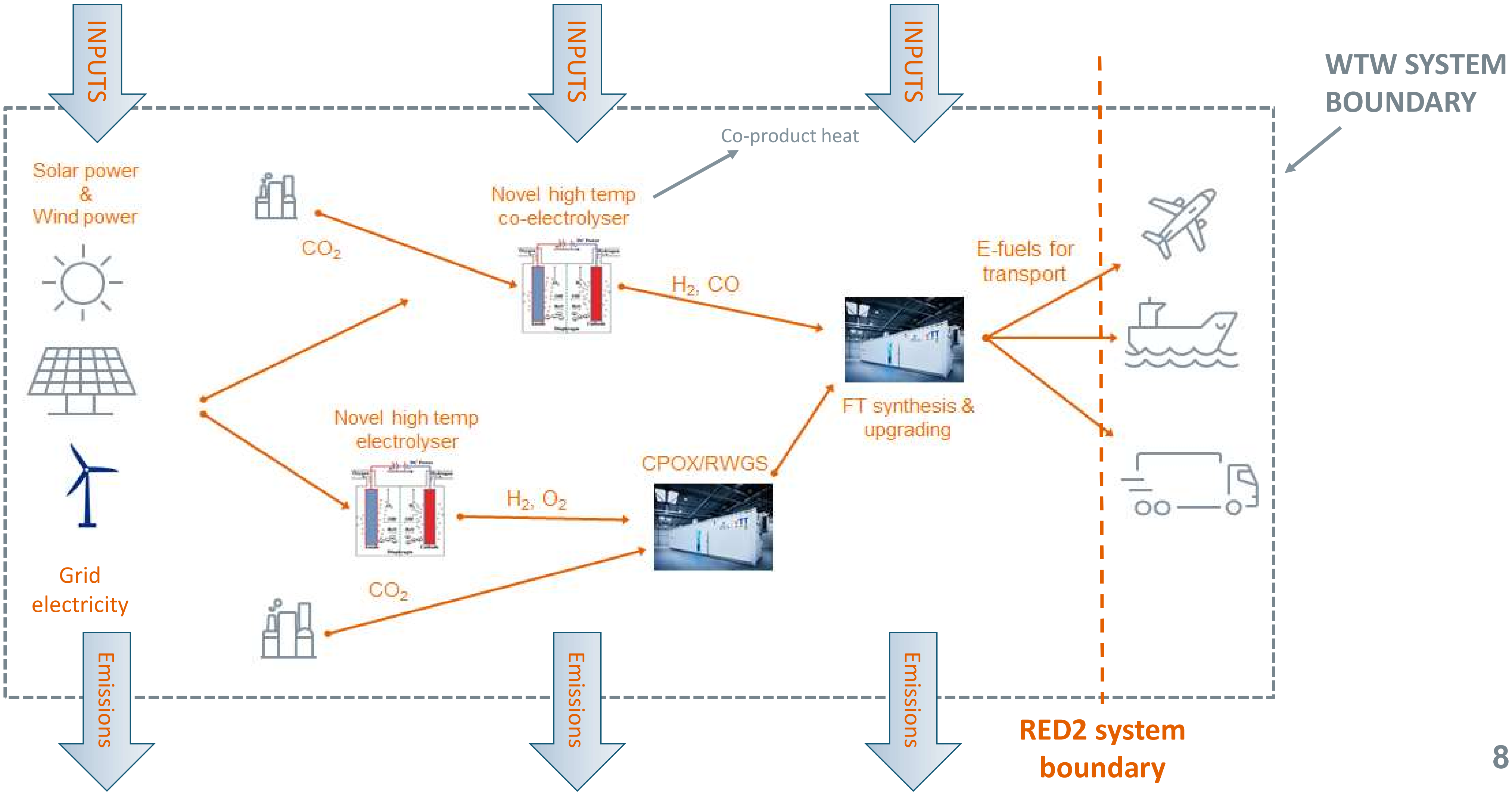
	RED1 Emission saving limit	Fossil comparator (gCO2eq/MJ)	RED2 Emission saving limit	Fossil comparator (gCO2eq/MJ)
Biofuels, biogas in transport	60% (2015)	83.8	65% (2021)	94 (transport)
Bioliquids	60% (2015)	91 (electricity) 77 (heat) 85 (co-generation)	65% (2021)	183 (electricity) 80 (heat)
Biomass fuels (>20MW fuel capacity, 0.5 electricity capacity for biogas)			70% (2021) 80% (2026)	183 (electricity) 80 (heat) 124 (heat, if coal replaced) 94 (transport)
Renewable liquid and gaseous transport fuels of non-biological origin			70% (2021) (Article 25)	Maybe also 94 ?
Recycled carbon fuels			By 2021 delegated act to define GHG threshold	

Calculation of GHG emissions of bioenergy



- The emissions are calculated throught the whole life cycle.
- For wastes and residues calculation starts from the collection of these raw materials.

Similarly for e-fuels



Specific questions on e-fuels

Electricity for electrolyser:

- Three different cases for electricity for RFNBO production foreseen?
  - Grid electricity
  - Renewable electricity, direct connection
  - Renewable electricity from grid (with a guarantee of origin)

- Additional requirements in RED2:
  - Additionality (additional renewable electricity production, e.g. new plant)
  - Temporal & geographical correlation (e.g. at the same side of grid congestion)

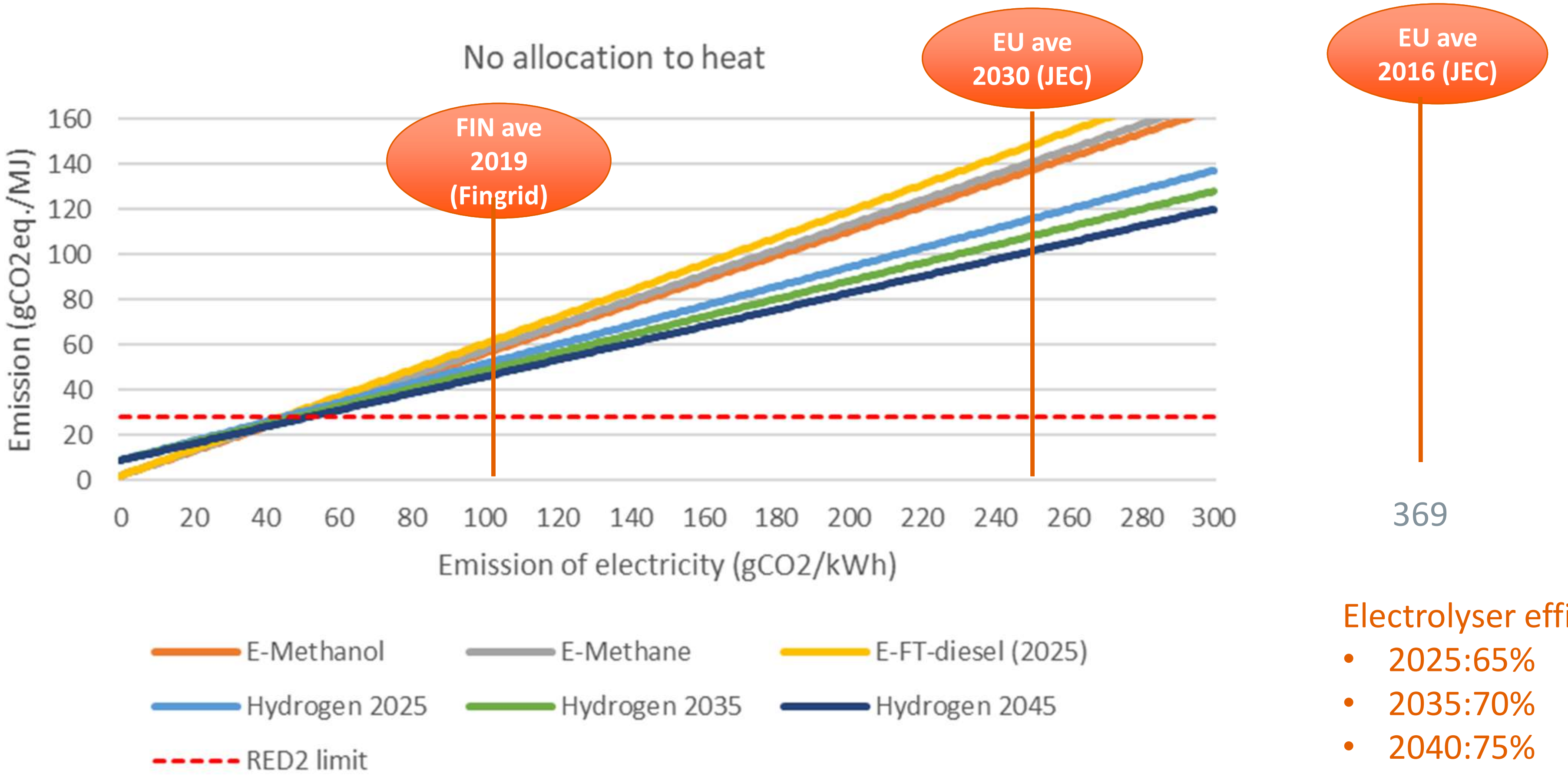
Critical points in e-fuels GHG balance
(Experience from previous studies)

- Source of hydrogen → Electricity for electrolyser & efficiency of the electrolyser

- Co-product heat → Can it be used? Can emission be allocated to it?

- Source of CO_2 → In RED2 CO_2 probably considered with zero emission (emissions allocated to the plant of origin of CO_2)

Emission intensity of electricity used in electrolysis



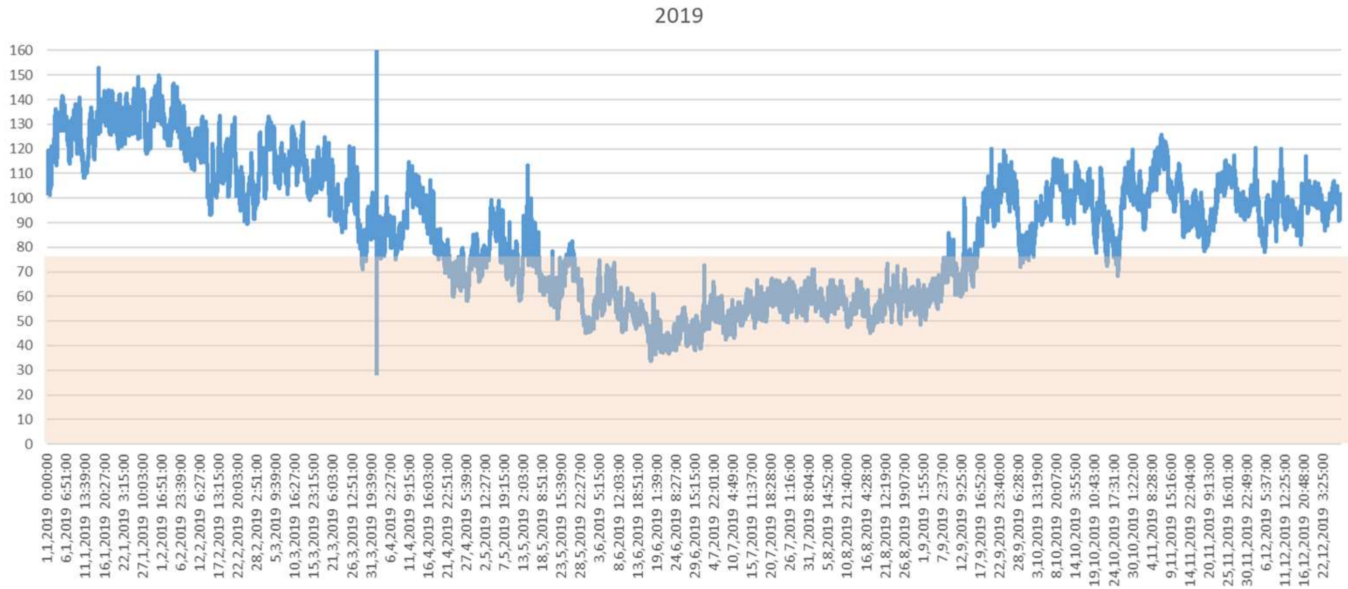
Electrolyser efficiency:

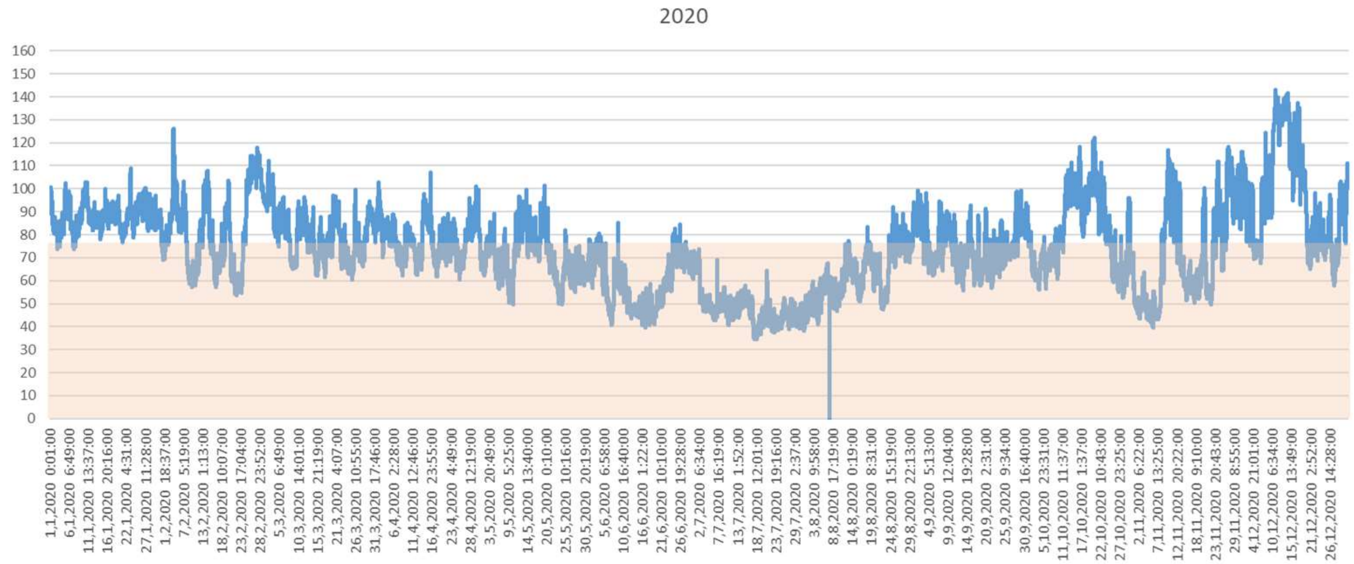
- 2025:65%
- 2035:70%
- 2040:75%

VTT calculations, source for process parameters:
https://www.nordicenergy.org/wp-content/uploads/2020/09/Nordic-Power-2X-for-Sustainable-Road-Transport.pdf

Finnish average grid electricity

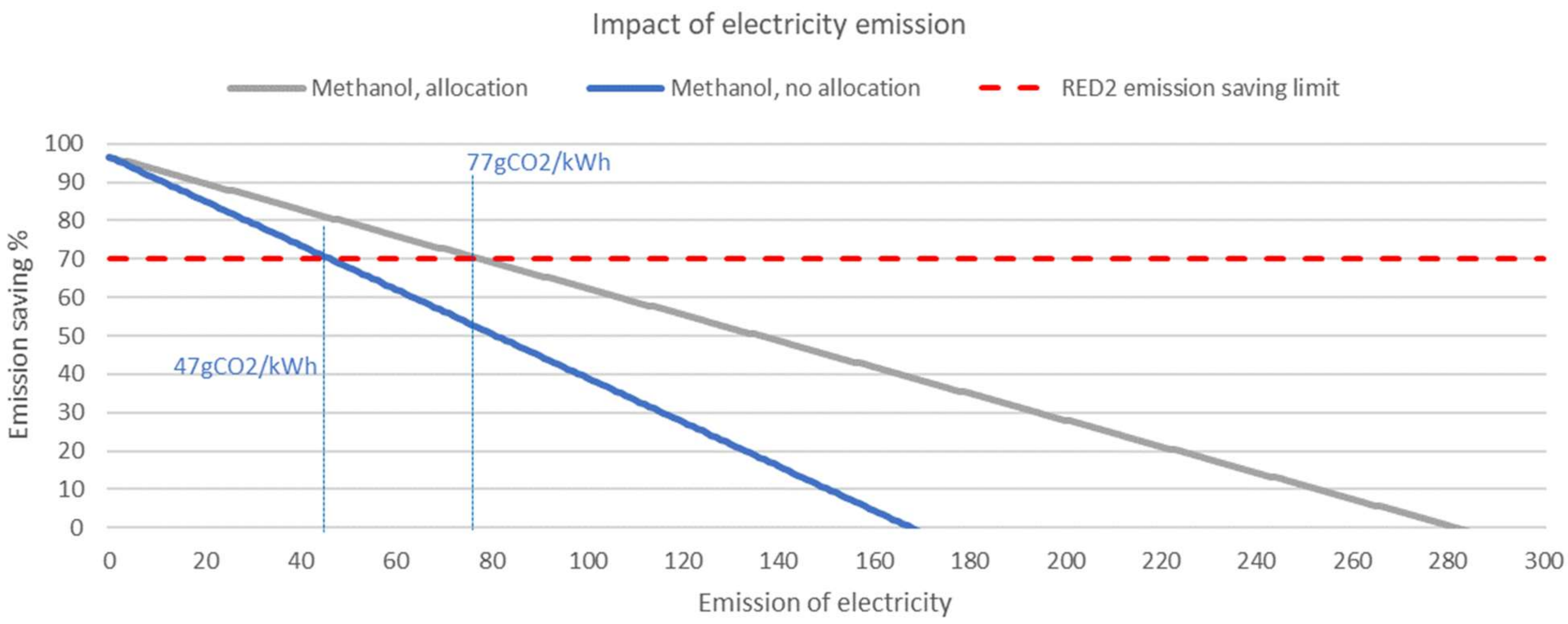
Emission less than	<80	<60	<40	gCO2/kWh
2019	3554	1949	78	hours
2020	5371	1963	74	hours





- Data from Fingrid: https://www.fingrid.fi/sahkomarkkinat/sahkomarkkinainformaatio/co2/

Impact of allocation: Energy allocation & no allocation to heat



Source: https://www.nordicenergy.org/wp-content/uploads/2020/09/Nordic-Power-2X-for-Sustainable-Road-Transport.pdf

Key messages

- E-fuels can be included in the RED2 target for advanced biofuels (RFNBOs) if sustainability criteria met
- Emission saving calculation criteria will be established during 2021
- Emission of electricity used in electrolysis is critical for the final result