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Valsts pētījumu programma

Enerģētikas un klimata modelēšana virzībā uz oglekļa neitralitāti

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SRP "Energy and climate modelling towards net zero emissions"

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The aim

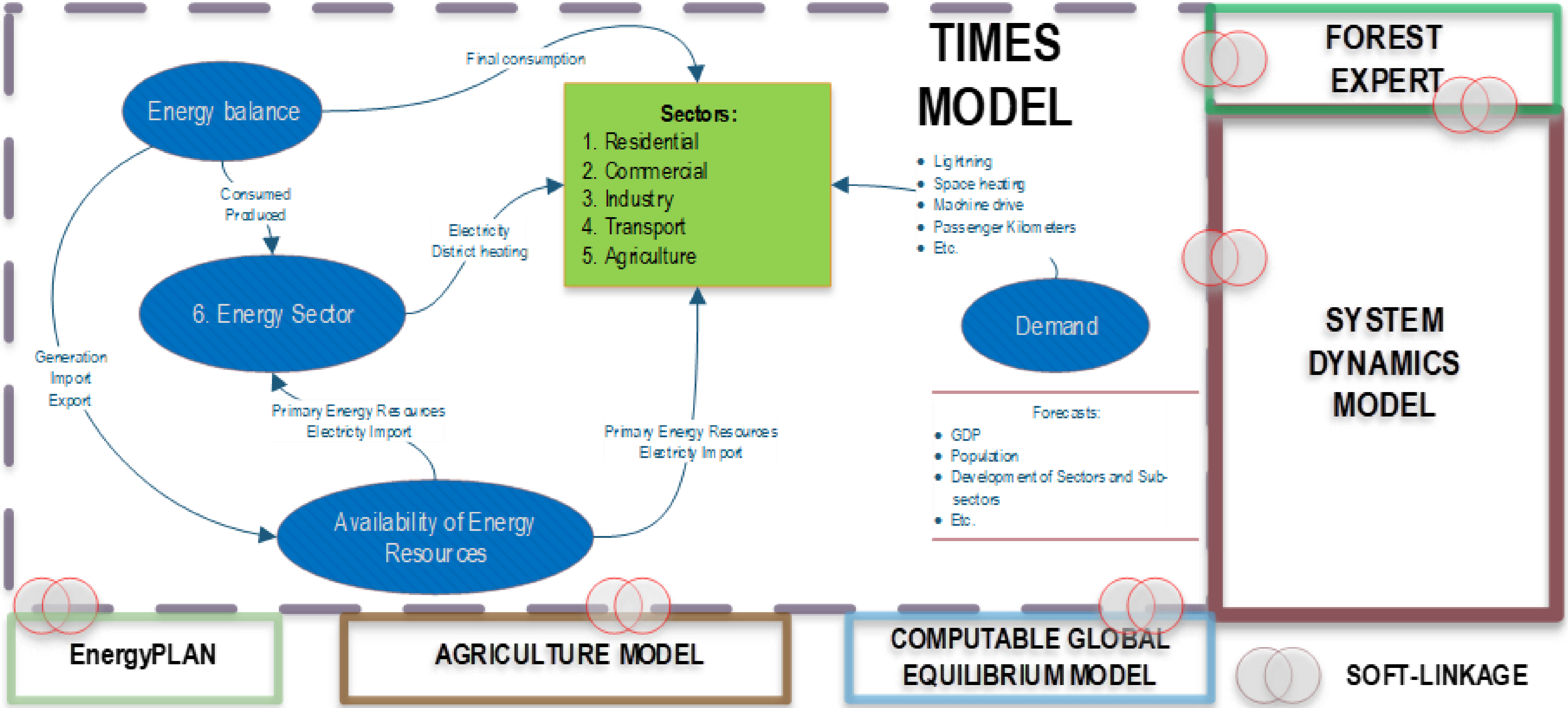
Development of the analytical knowledge base by introducing most up-to-date system of modelling instruments and tools, taking into account **techno-economic approach** & **socio-technical** aspects

1. **Conduct analysis** for data availability and develop new methodology for data management, prepare data base for modelling purposes
2. **Develop the modelling systems** and data sets, conduct modelling of socio-technical transition
3. **Develop scenarios** for energy climate system socio-technical transition **up to 2050**
4. Compare and **analyse the results**
5. **Assess** economic, social and environmental **impact of low carbon socio-technical transition**
6. **Prepare policy** proposals **for the long term development** of Latvian national **energy system and climate policy**.

Developed energy & climate modelling system

Scheme of Latvian multi modelling system (*supplement and soft-link*)

RTU: TIMES & SD & EnergyPLAN, **LU:** (CGE), **LLU:** (Forest expert & LASAM)



TIMES LATVIA energy system model blocks and structure

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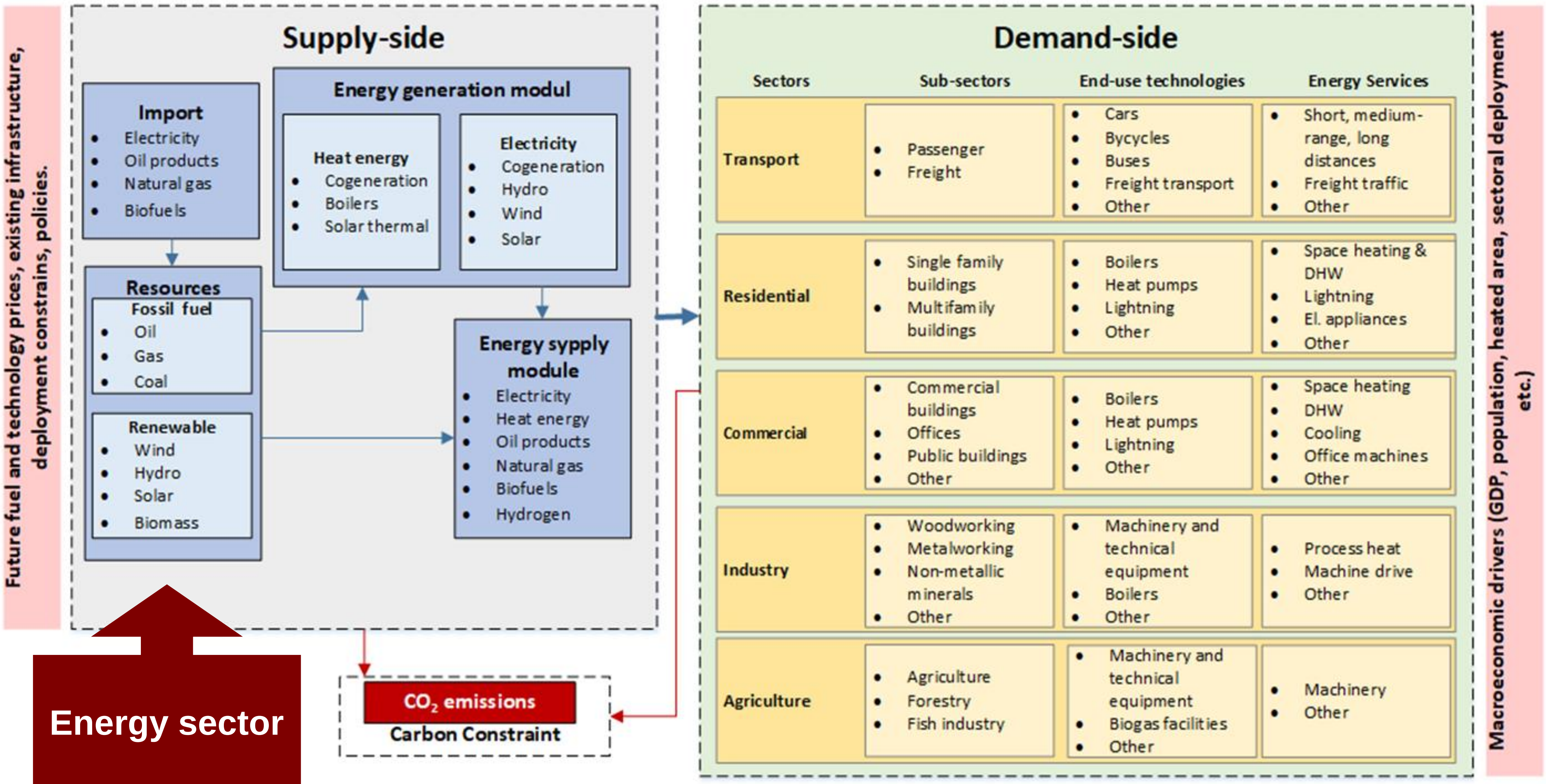
TIMES - Technology rich, bottom-up optimisation tool



Energy sector

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Functionality and features (TIMES)

- Resource availability and limitation, if any
- Technology capacity limitation:
  - Max new and/or additional capacity connect to the grid
- Time slices for different energy sources (wind, solar, hydro etc.) and demands
- Techonology techno-economical parameters:
  - CAPEX, OPEX, life time,
  - Efficiency, capacity & availability factor etc.
- Financial support (subsidies, grants etc.)
- Taxes, e.g. CO_2 tax

Residential & commercial and public sectors:

- Heating and cooling sub-processes (*energy -> heated area*)
- Lightning – not only energy, but lm/W and light output (light amount).

Transport sector:

Passenger mobility and behaviour:

- Travel Time Budget
- Distances (<5km, 5-25km, >25km)
- Comfort level

Intermittent energy generation

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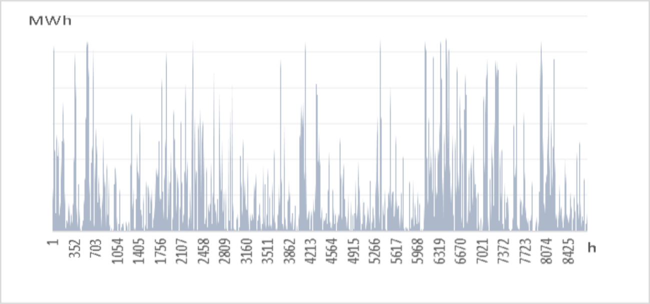
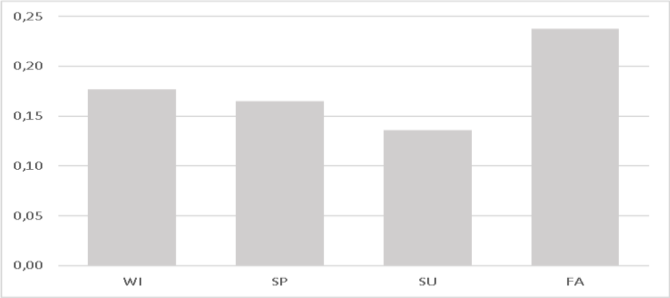
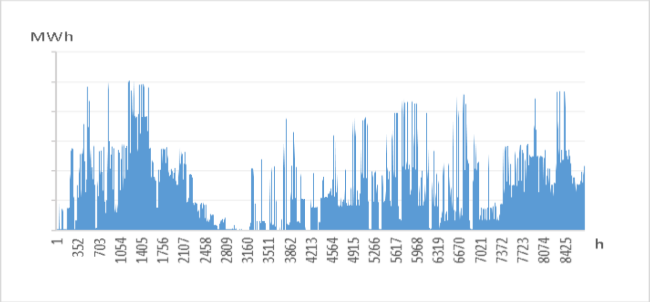
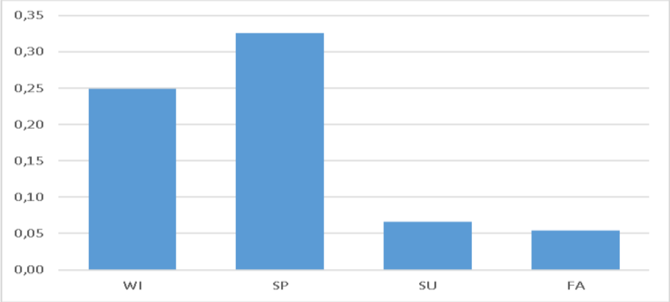
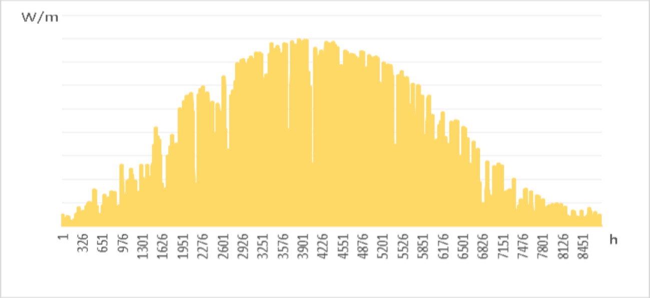
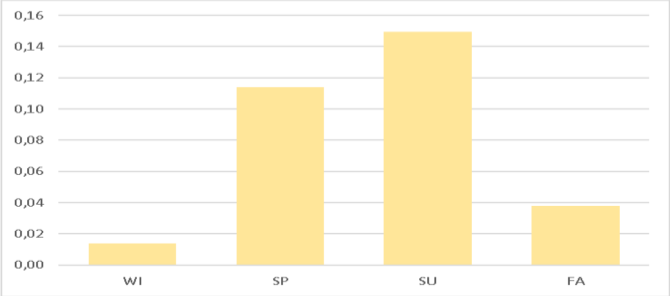
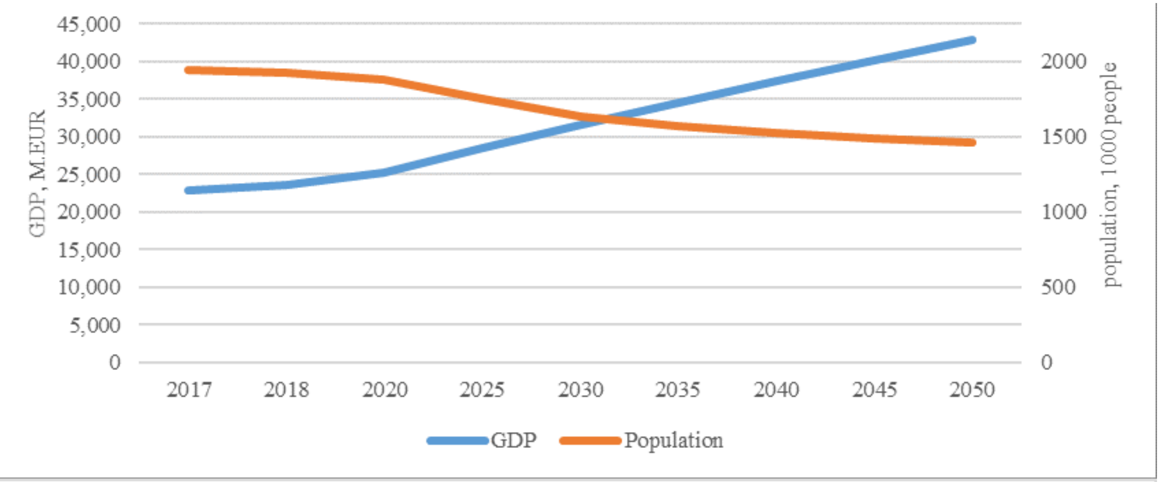
	Hourly generation	Seasonal capacity factor
Wind		
Hydro		
Solar		

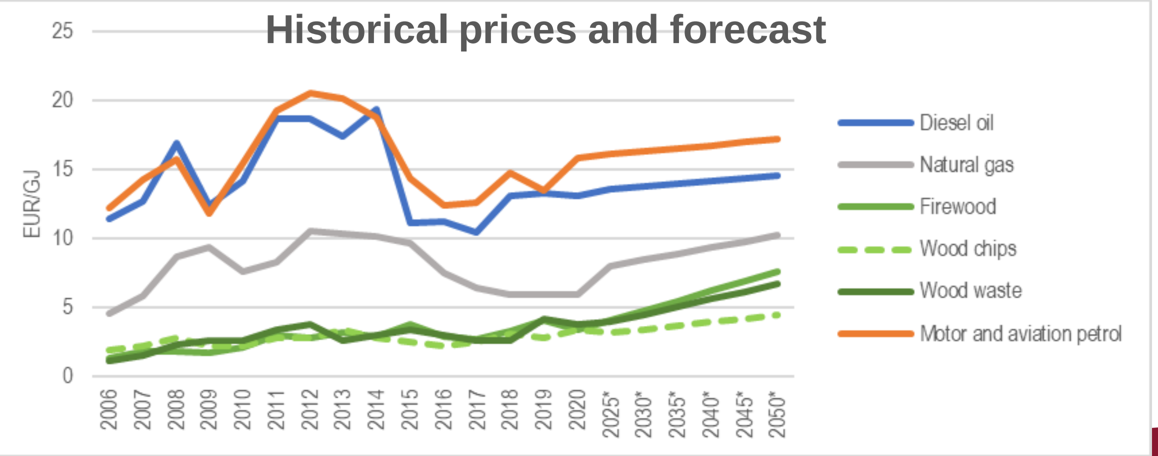
Drivers and triggers of TIMES LATVIA (*modelled on 11.2021.*)

Macroeconomic drivers:

- GDP, population, heated area, sectoral deployment etc.
- Sectoral energy demand projections are based on *EU Reference Scenarios 2020*

N!B! Energy and CO_2 prices sky-rocketed in 2022





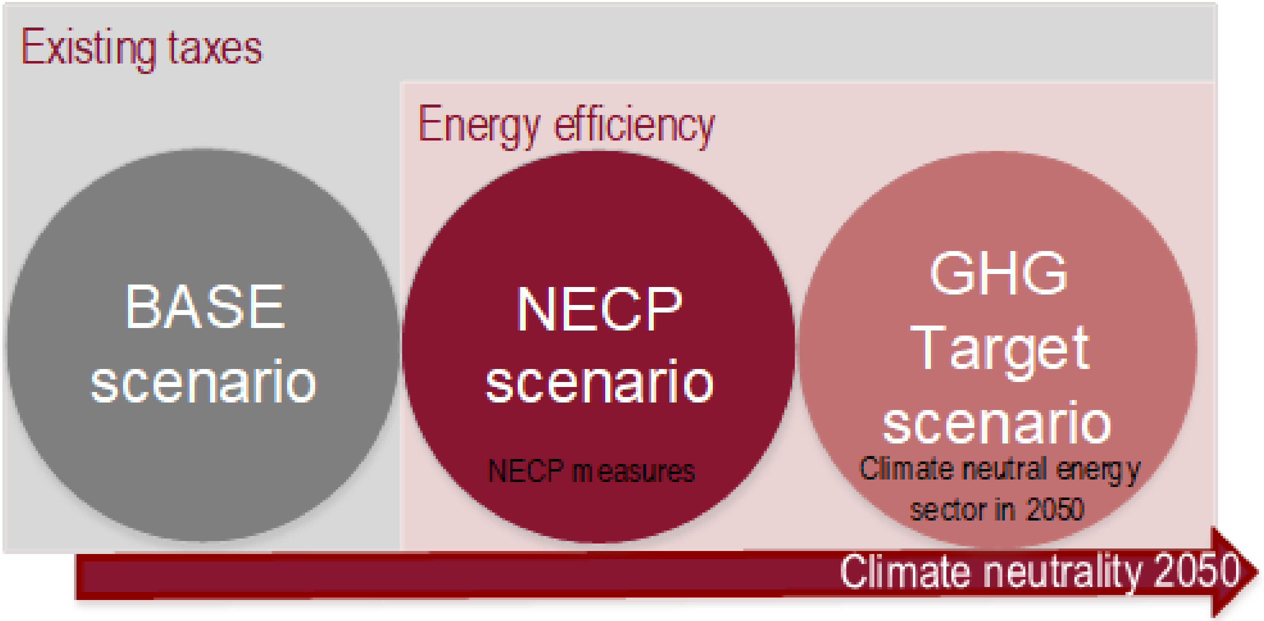
Taxes used in the model

Tax	Unit	Resource	2017	2018	2019	2020	2021	2022-2050
Excise	EUR/ GJ	Diesel oil	9.6	10.5	10.5	11.7	11.7	11.7
		Natural gas	115.7	5.94	5.94	5.94	5.94	5.94
CO_2	EUR/t	CO_2	2.85	2.85	4.5	9	12	15
Natural resource	EUR/t	Coal	10.7	10.7	10.7	21.3	21.3	21.3

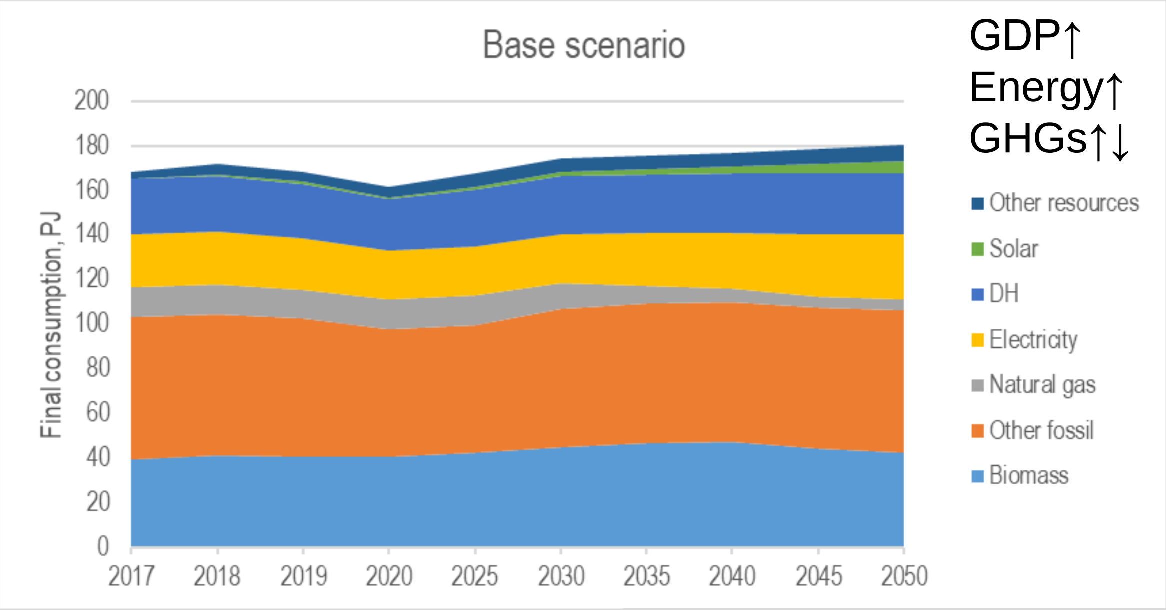
Scenarios (*modelled on 11.2021.*)

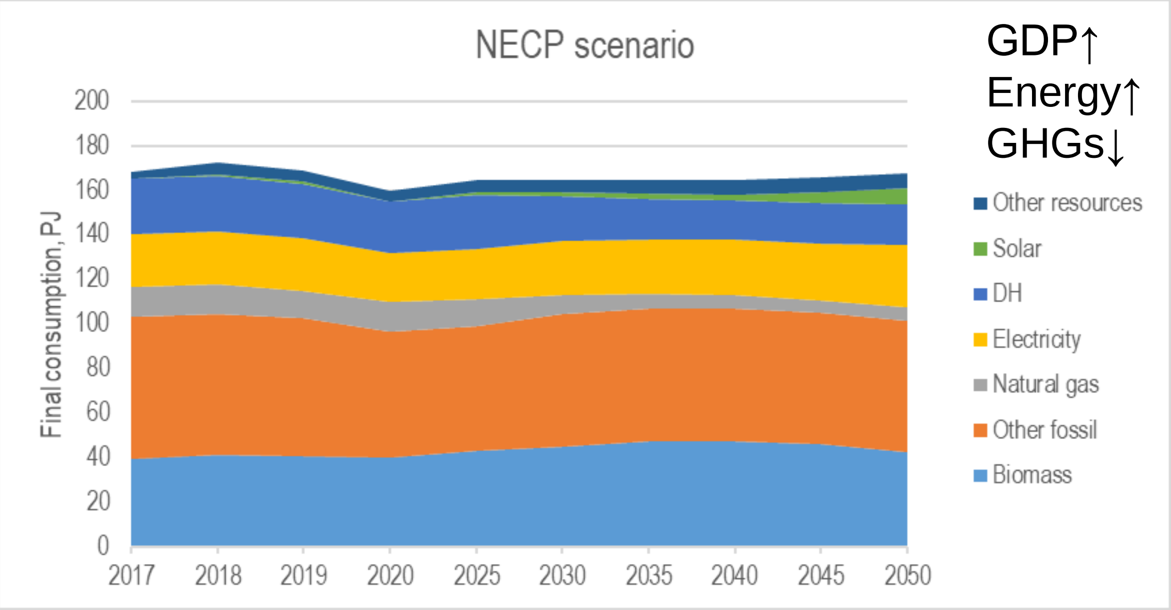
Matrix of developed pathways and scenarios for TIMES Latvia model:

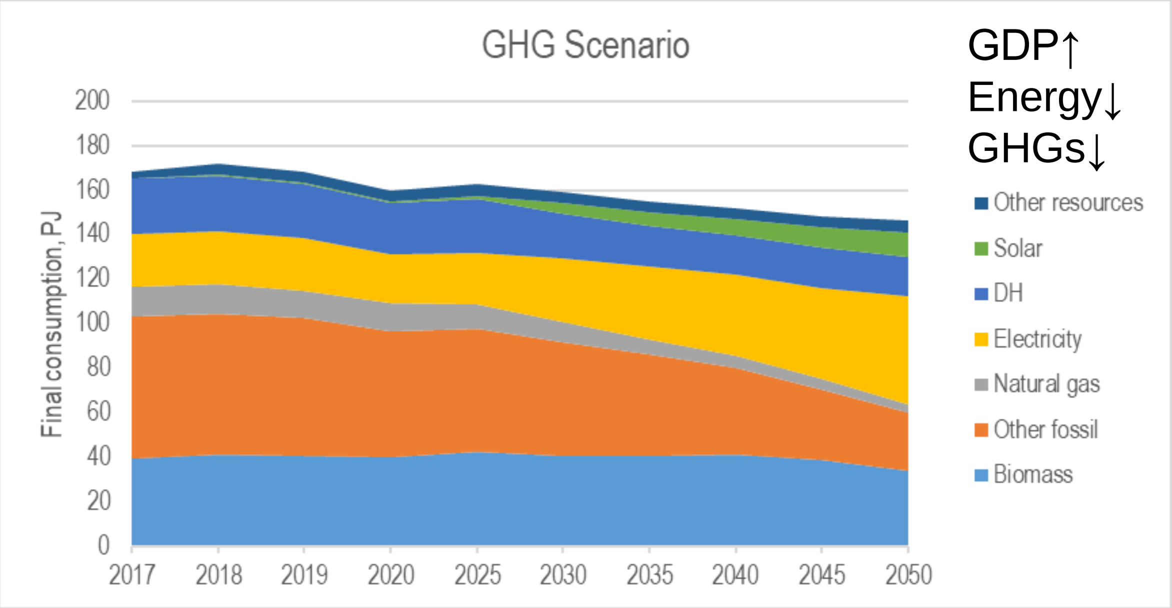
1. **BASE line scenario**
   Business as usual
2. **National Energy and Climate plan scenario**
   Measures, activities and focus from NECP 2030
3. **GHG Target scenario**
   Goal oriented optimisation



Total final consumption (*modelled on 11.2021.*)



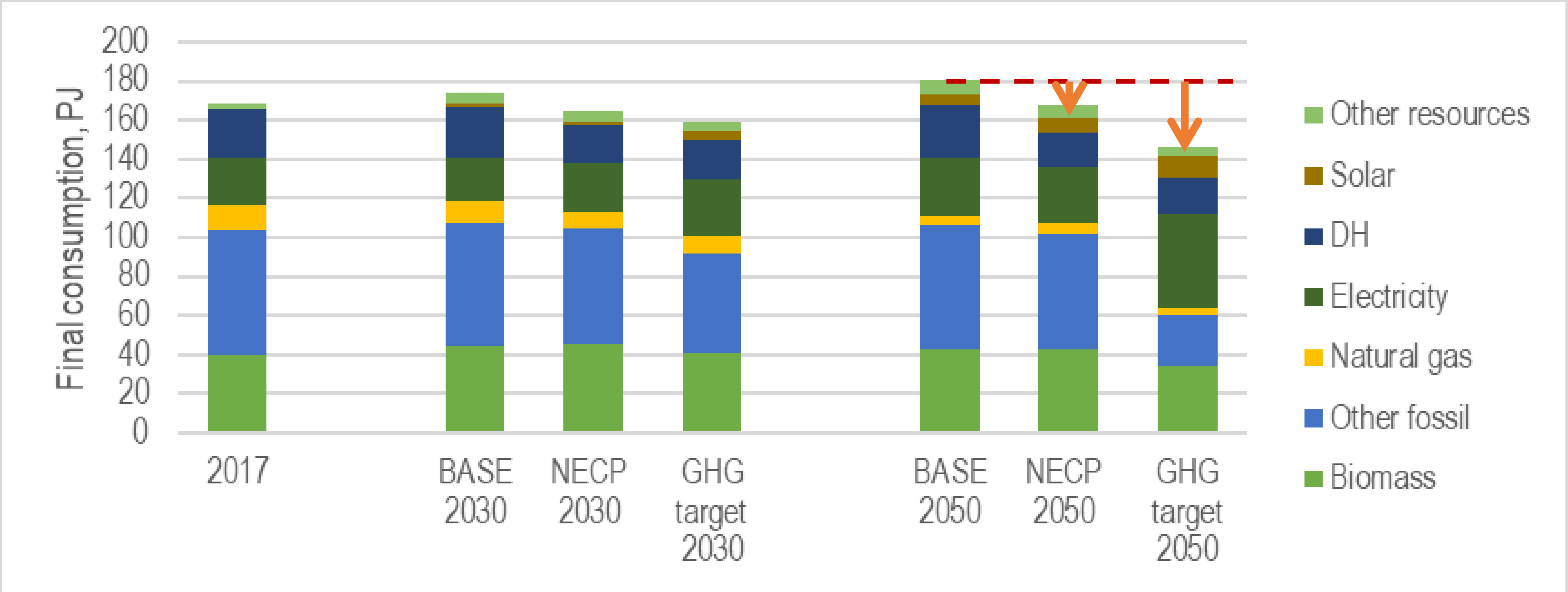




Total final energy consumption by energy sources (*modelled on 11.2021.*)

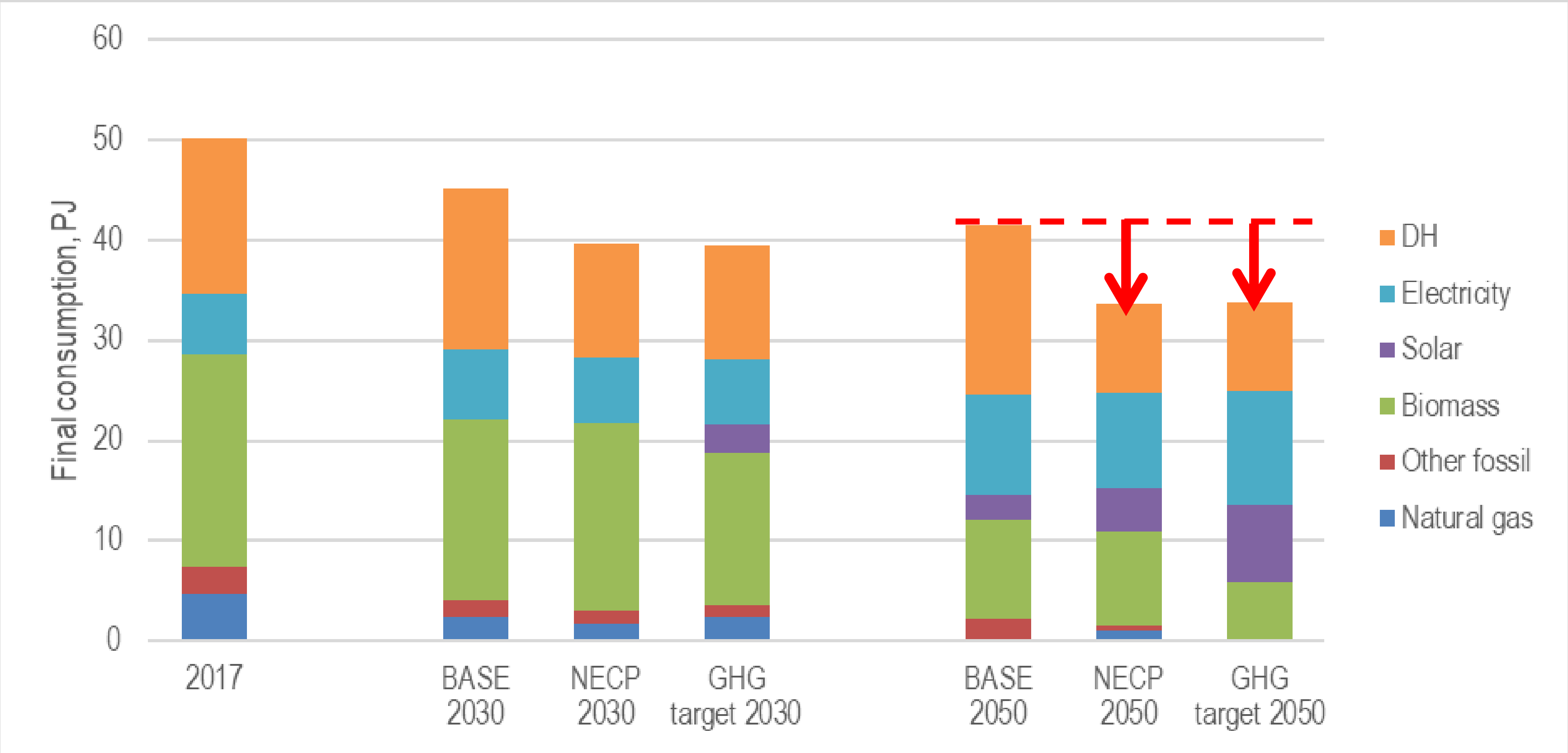
Decrease in final energy consumption by 34 PJ (↓18,9%) – BASE v.s. GHG scenario @2050

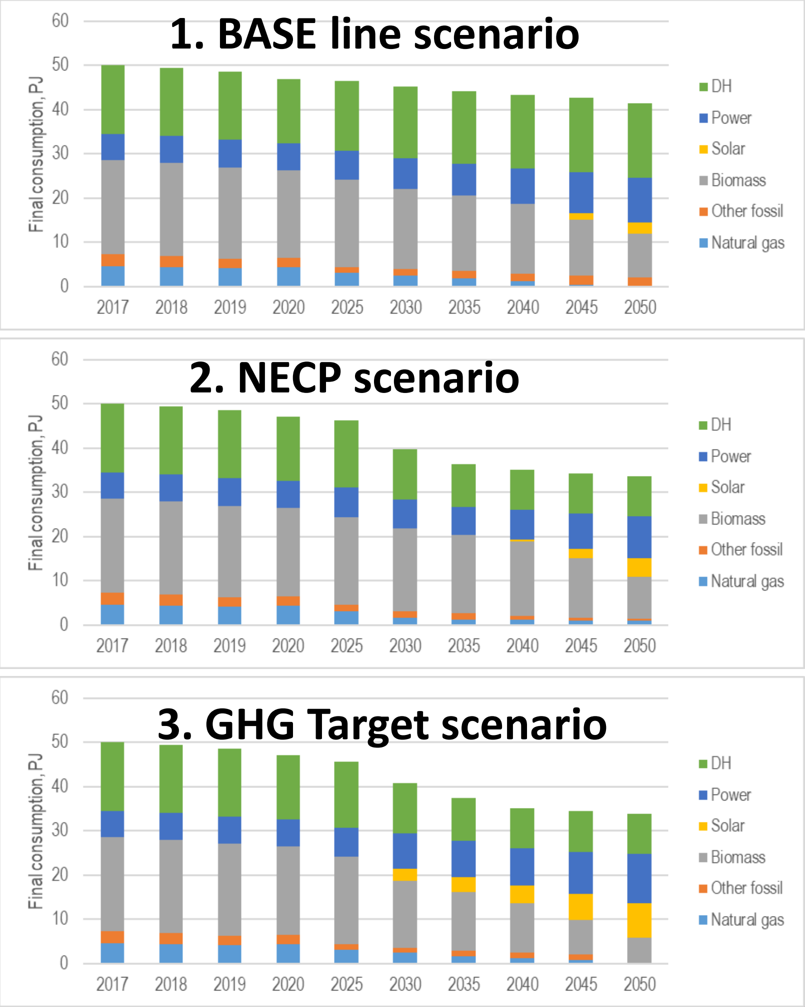
GHG scenarios (optimised energy system and optimal energy system structure) lead to lower energy demand due to radical energy efficiency and faster energy transition



Residential sector (*modelled on 11.2021.*)

Reduction of final energy consumption are the same in NECP v.s. GHG scenario @2050, but lower GHGs

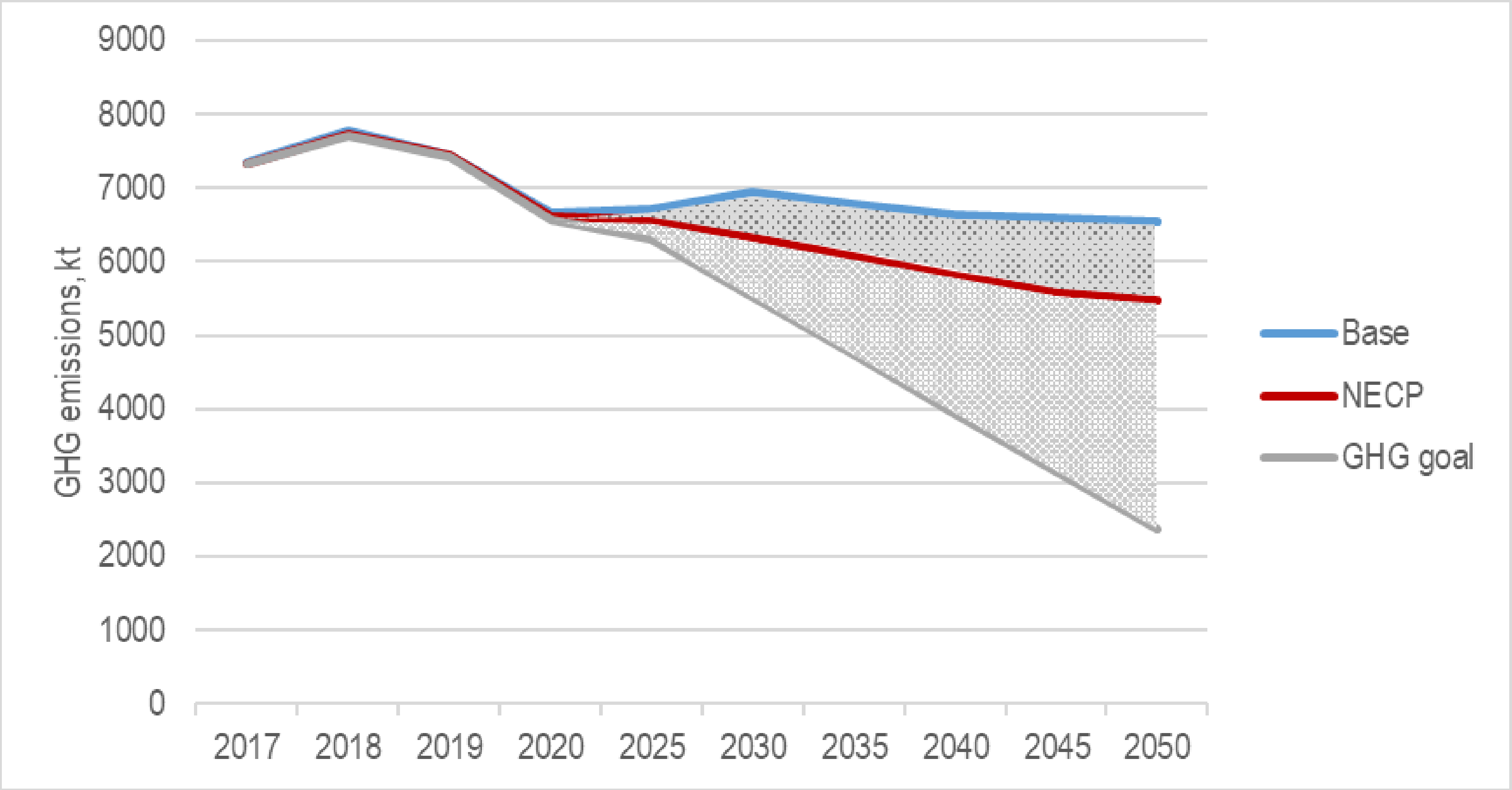




Total energy related GHG emissions in different scenarios (*modelled on 11.2021.*)

Decrease in GHG emissions by 4188 kt (↓63.9%) – BASE v.s. GHG scenario

Delivered by energy efficiency measures (~20%) + energy transition (80%)



Conclusions and final remarks

Projections – not forecasts

Created and developed solid **analytical knowledge base & modelling capacity** in IESE, RTU – SD & TIMES & EnergyPLAN

1. NECP & GHG target scenarios leads to reduced total energy consumption by 7,1 and 18,8 %, respectively
2. GHG Target scenario – it is possible to cover energy demand and significantly reduce GHG by rather radical and strong energy transition measures
   - ✓ Energy efficiency measures delivers ~ 20 %
   - ✓ Energy transition delivers ~80 %
3. **Energy transition prevails over energy efficiency on the way to the climate neutrality – it should be vice versa**
4. **Concept of energy system and base loads should be changed**

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