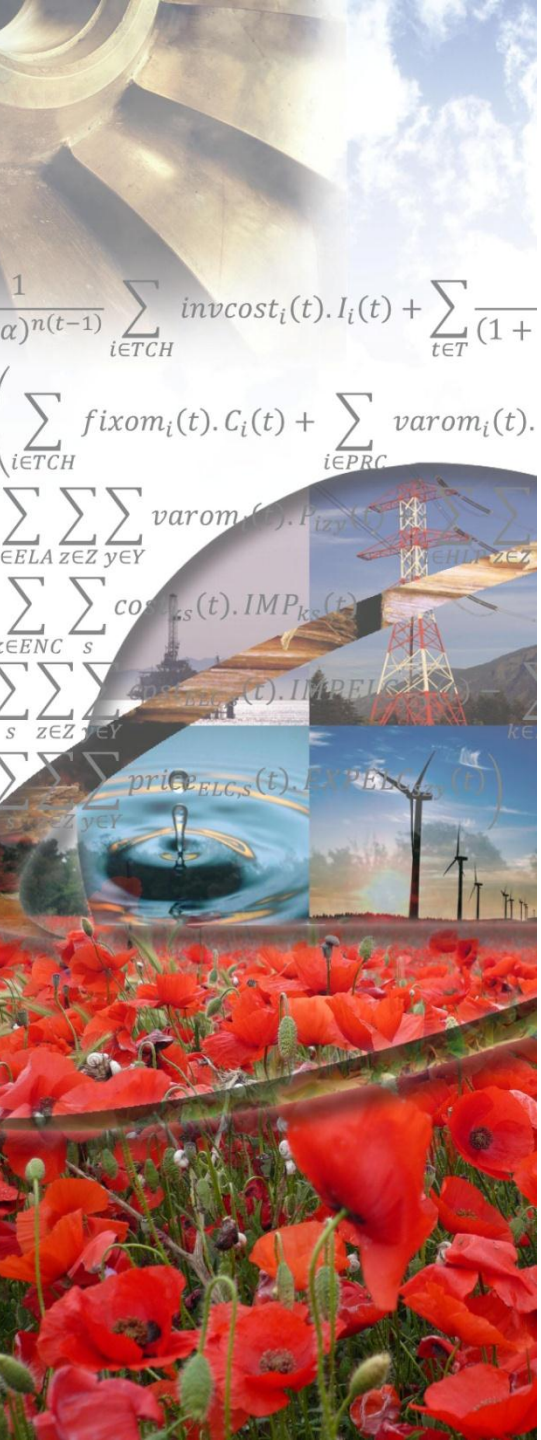

Evaluation of the French Energy Transition for Green Growth Law with Times-FR

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ETSAP - 10 July 2017

INTRODUCTION

- Targets of the energy transition law for green growth (2015):
  - 40% less greenhouse gas emissions in 2030 et 75% in 2050 compared to 1990
  - 30% less fossil fuel consumption in 2030 compared to 2012
  - Increase the share of renewable energy sources to 32% of the final energy consumption and 40% of the electricity production
  - Reduce final energy consumption by 50% in 2050 compared to 2012
  - Reduce the share of nuclear power in electricity production to 50% by 2025

- Tools associated:
  - National low carbon strategy:
    - Overarching and sectoral policies orientation
    - Carbon budgets
  - Multi-annual energy planning

EVALUATION OF UNDERLYING PATHWAYS

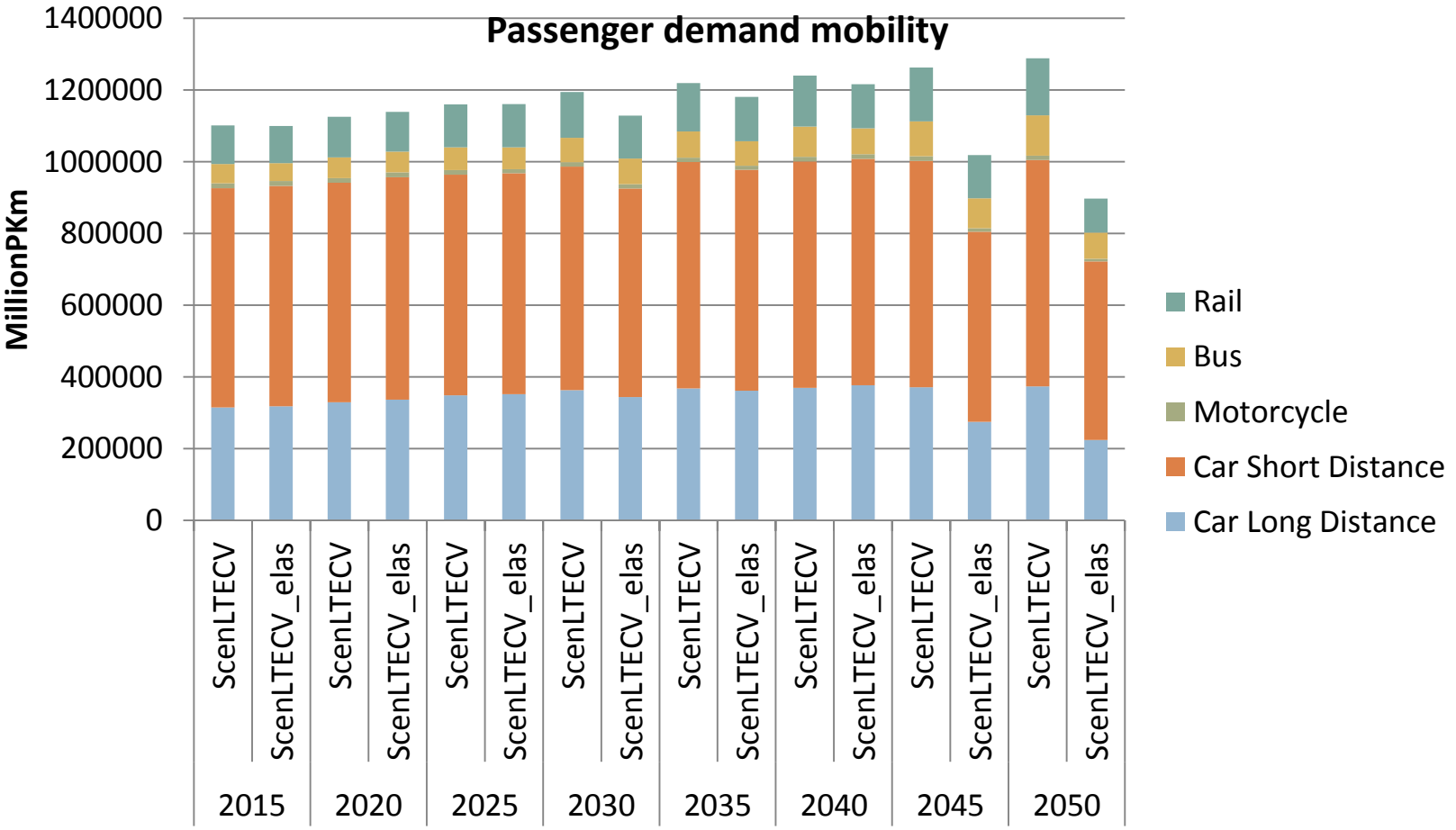
- New base year for the calibration : 2014
- Main hypothesis : provided by the prospective scenarios of the French ministry of ecology that were used for the reference scenario of the low carbon national strategy
  - Discount rate 4%
  - Carbon tax : 56€/tCO2 in 2020 and 100€/tCO2 in 2030 (excluding the ETS sectors)
  - Demand scenario : same assumptions until 2035

SCENARIOS

- Reference scenario: AME_Times
  - Based on the hypothesis mentioned previously
- Scenario with the 5 goals of the french law: LTECV
- Variations with the different goals:
  - ScenCO2: constraint CO2
  - ScenCO2_ENR: constraint CO2 and ENR
  - ScenCO2_ENR_Nuc: constraint CO2 and ENR and Nuclear
  - Etc…

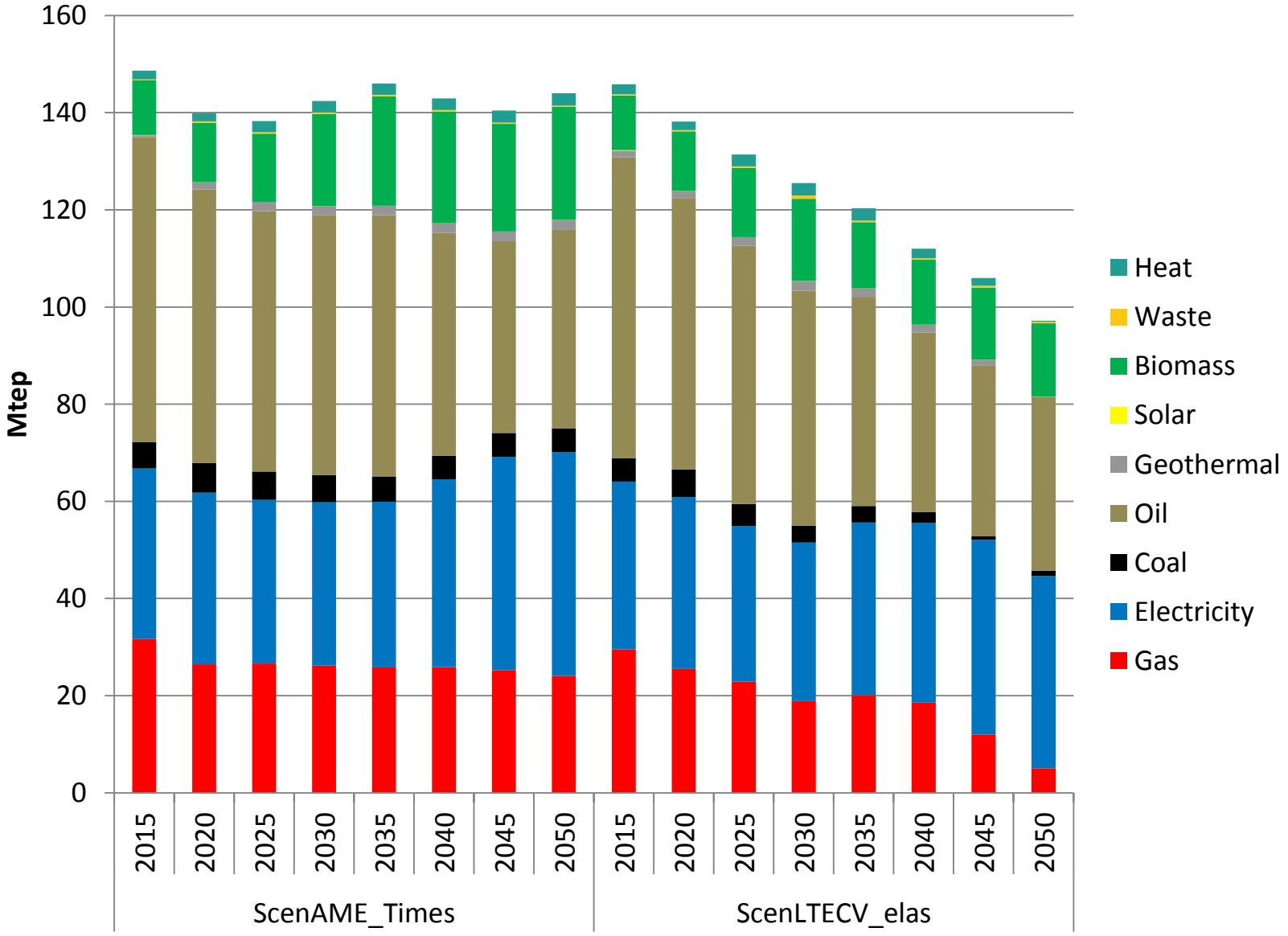
IS THE EVOLUTION OF THE DEMAND CONSISTENT WITH THE TARGETS?

- Without elasticity, the system is overconstrained (dummy imports) → significance of reducing the demand to meet the CO2 target

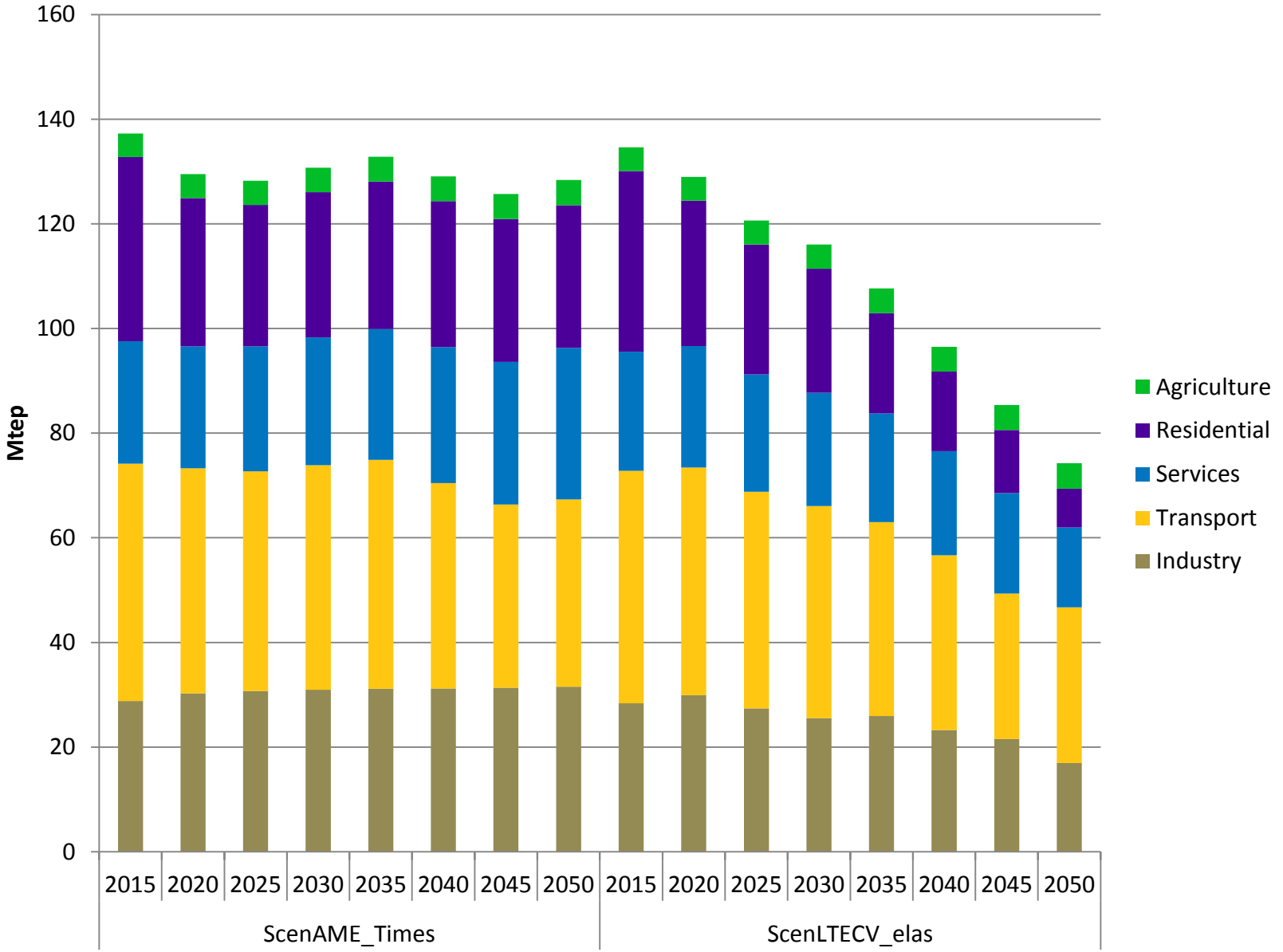


FINAL ENERGY CONSUMPTION

How evolves the energy mix ?



FINAL ENERGY CONSUMPTION



WHAT SAYS THE REFERENCE SCENARIO OF THE SNBC ?

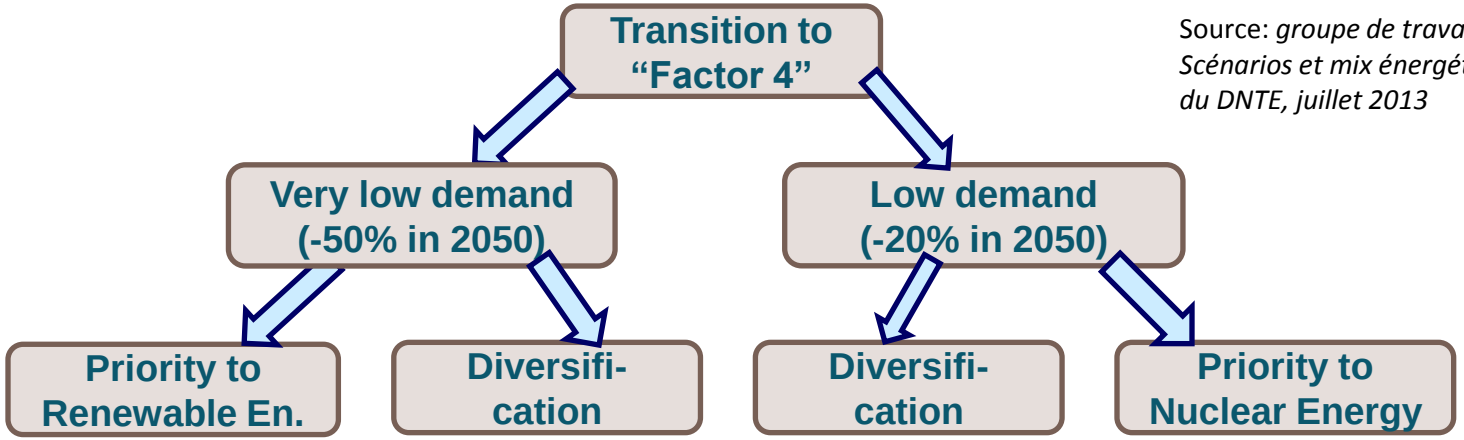
Variation between 2010 and 2030

(%)	Scenario	
Sector	**AMS2 DGEC**	**LTECV Times**
Industry	-11.7%	-10.2%
Building	-28.8%	-37.8%
Agriculture	-30.1%	3.2%
Transport	-17.8%	-18.1%
Total	**-21.7%**	**-25.3%**

Mtep	Scenario	
Sector	**AMS2 DGEC**	**LTECV Times**
Industry	-3.9	-2.9
Building	-19.5	-27.5
Agriculture	-1.3	0.1
Transport	-8.8	-8.9
Total	**-33.5**	**-39.2**

REDUCING BY 50% THE FINAL ENERGY CONSUMPTION IN 2050 IS THE MOST CONSTRAINING

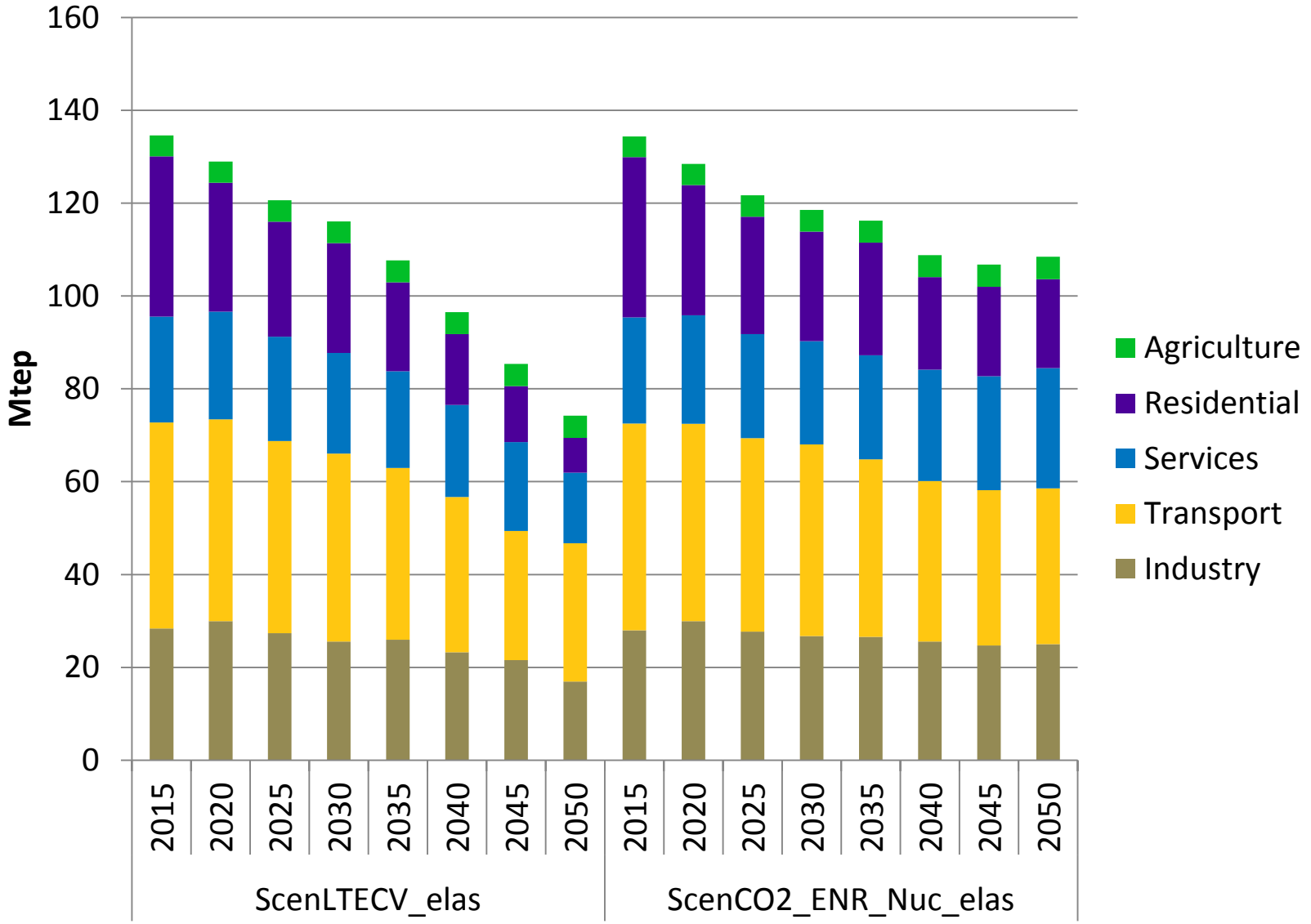
- This target can not be achieved by the model without elasticity
  → Should be consistent with a reduction of the demand
- French national debate (DNTE) : 4 scenarios
  – At the moment : no sobriety considered → inconsistency



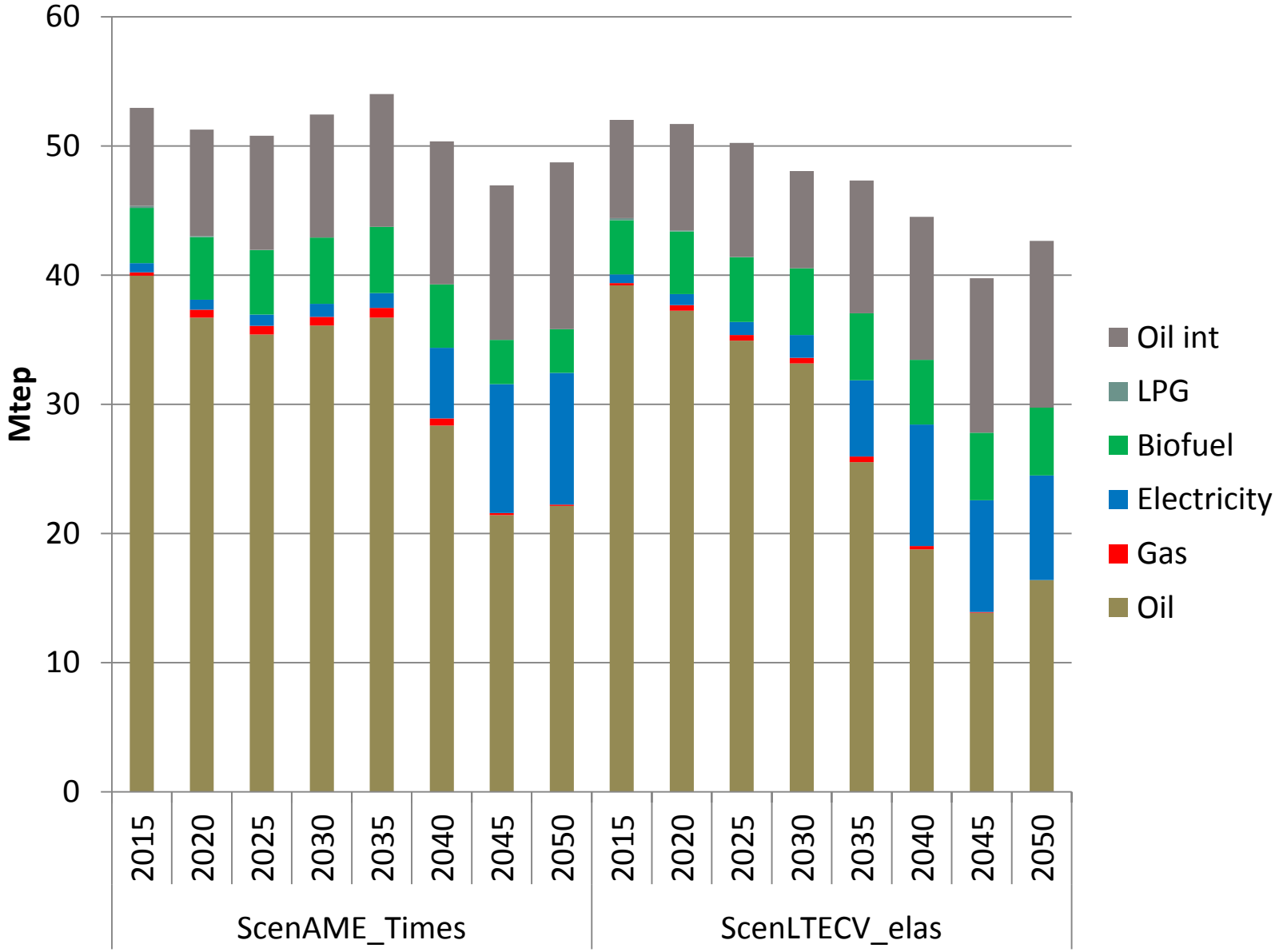
Source: *groupe de travailGT2 « Scénarios et mix énergétique » du DNTE, juillet 2013*

SOBriety	***EFFiciency***	***DIVersity***	***DECarbonization***
NégaWatt	*ADEME*	*ANCREdiv*	*Négatep*
Greenpeace	GRDF	RTEnouvmix	RTEmed
WWF	ANCREsob	DGECams-o	ANCREele
Global Chance	ENCILOCARBrenf		UFE

FINAL ENERGY CONSUMPTION

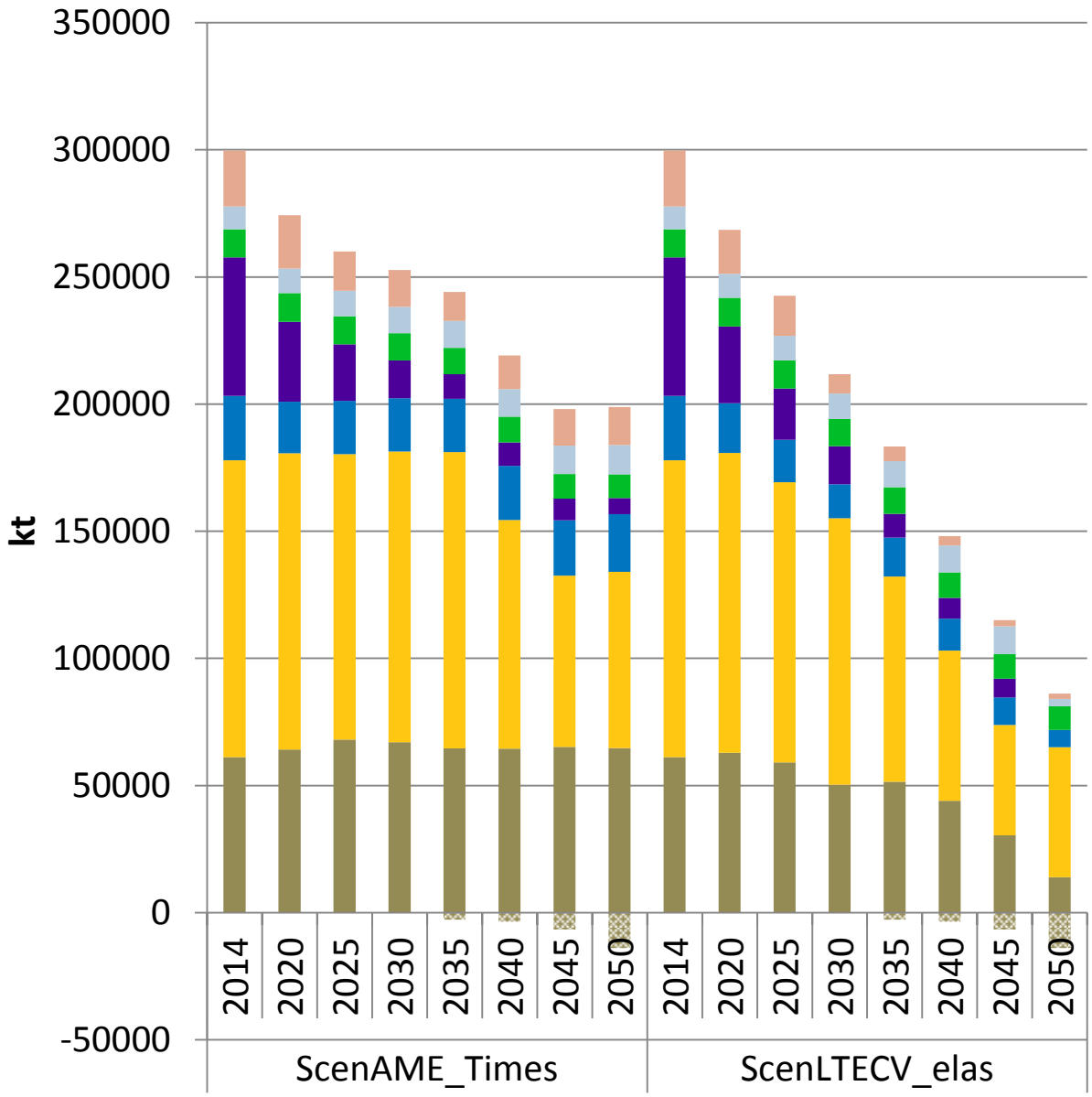


FOCUS ON THE TRANSPORT SECTOR



CO2 EMISSIONS

EMISSIONS CO2



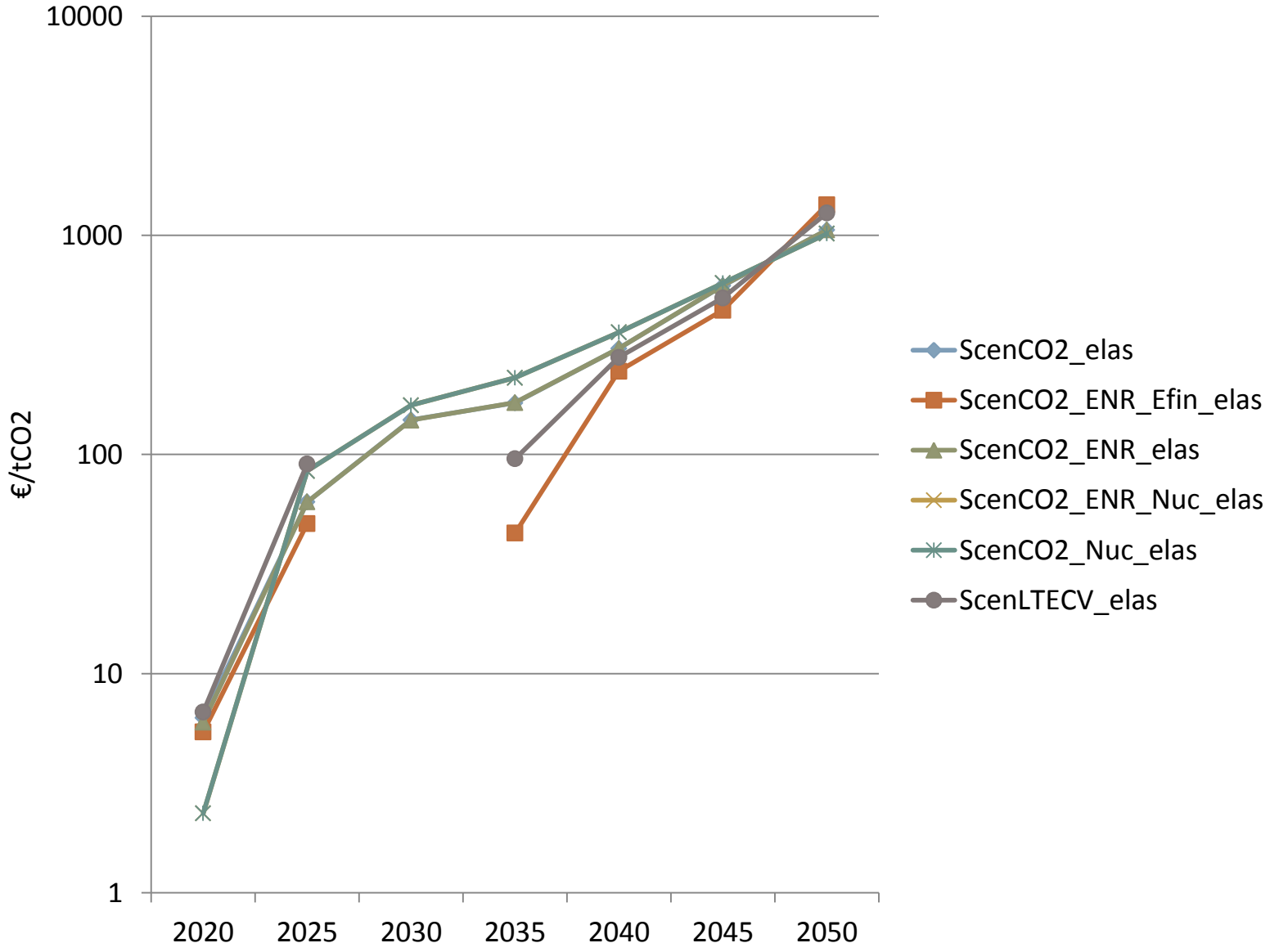
WHAT SAYS THE REFERENCE SCENARIO OF THE SNBC ?

Variation between 2035 and 2010

(%)	Scenario	
Sector	**AMS2 DGEC**	**LTECV Times**
Transport	-43%	-39%
Energy industries	-52%	-74%
Building & Agriculture	-73%	-67%
Industry	-47%	-23%
Total	**-54%**	**-50%**

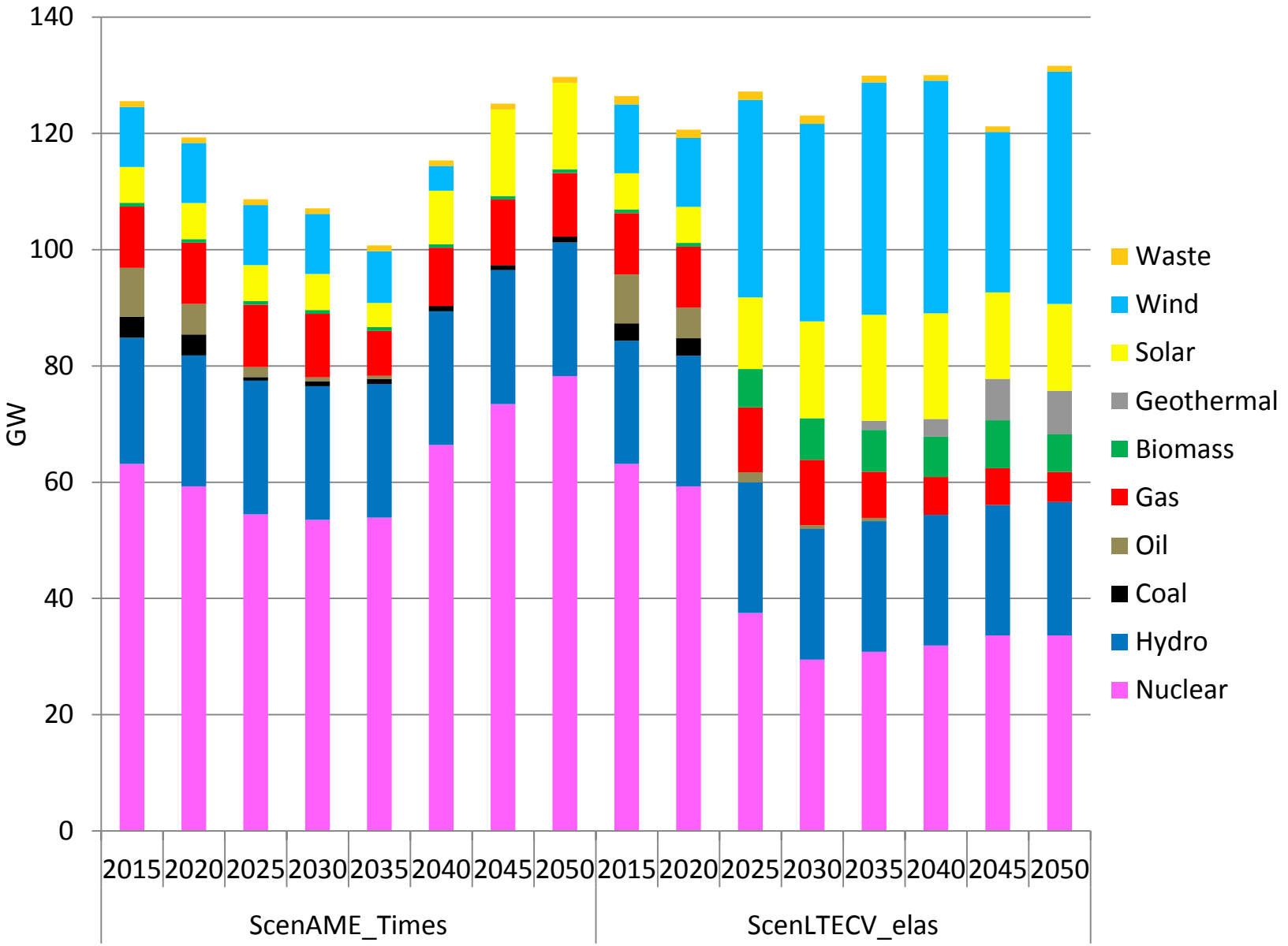
kt	Scenario	
Sector	**AMS2 DGEC**	**LTECV Times**
Transport	55079	51475
Energy industries	28236	44298
Building & Agriculture	73842	70599
Industry	31462	14045
Total	**188620**	**180418**

MARGINAL COST OF CO2

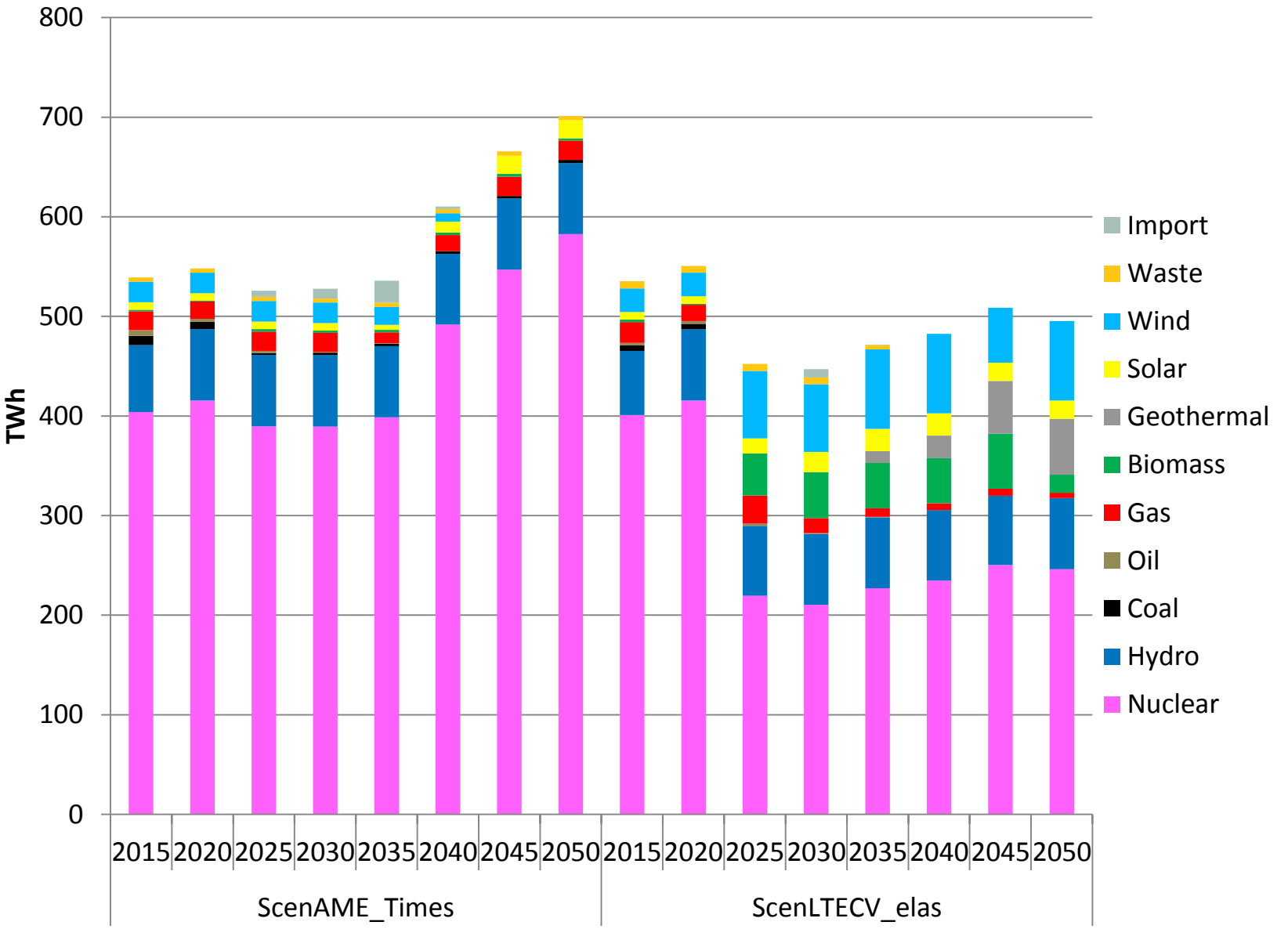


ELECTRICITY SECTOR

CAPACITY IN THE ELECTRICITY SECTOR

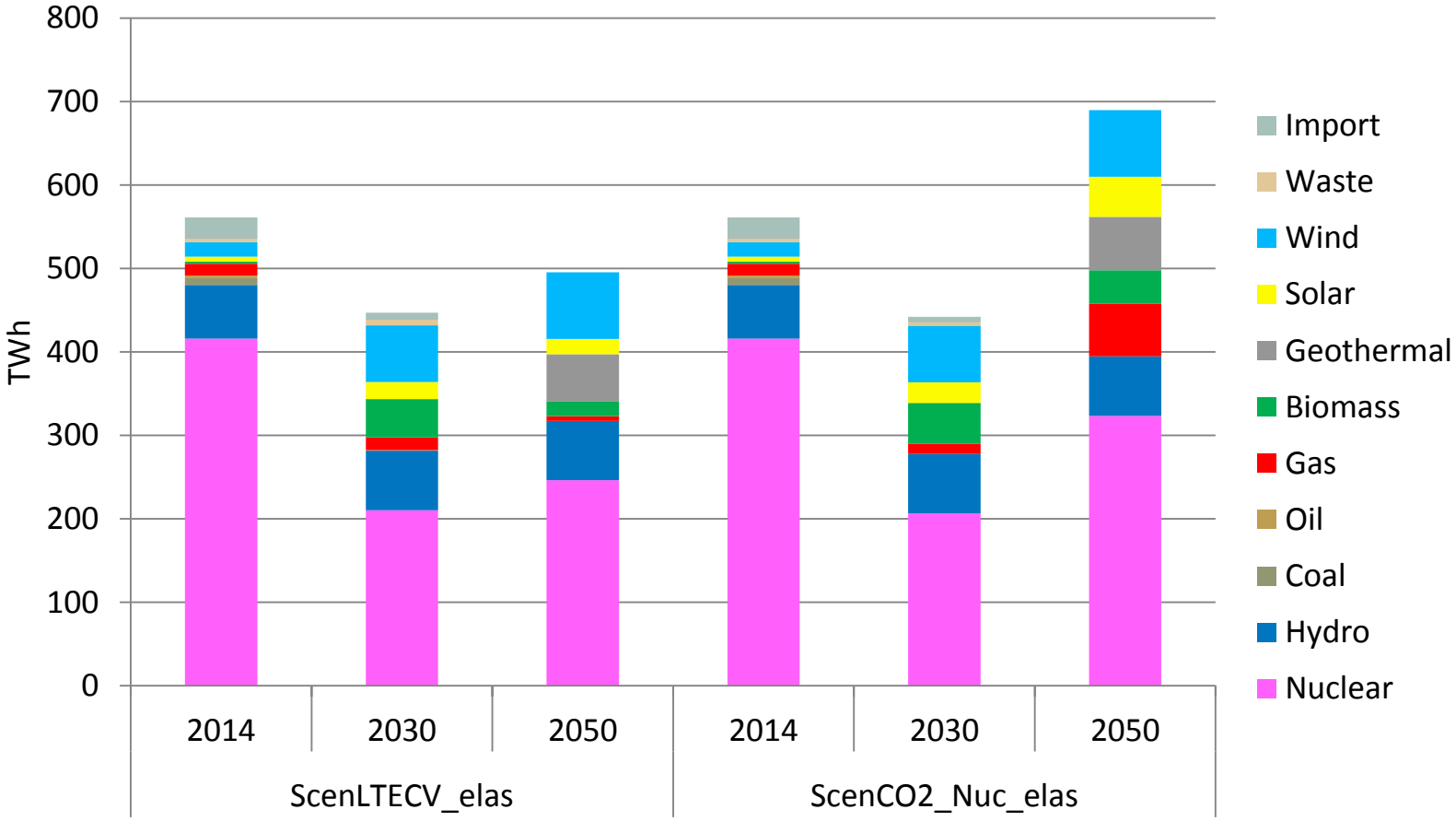


PRODUCTION

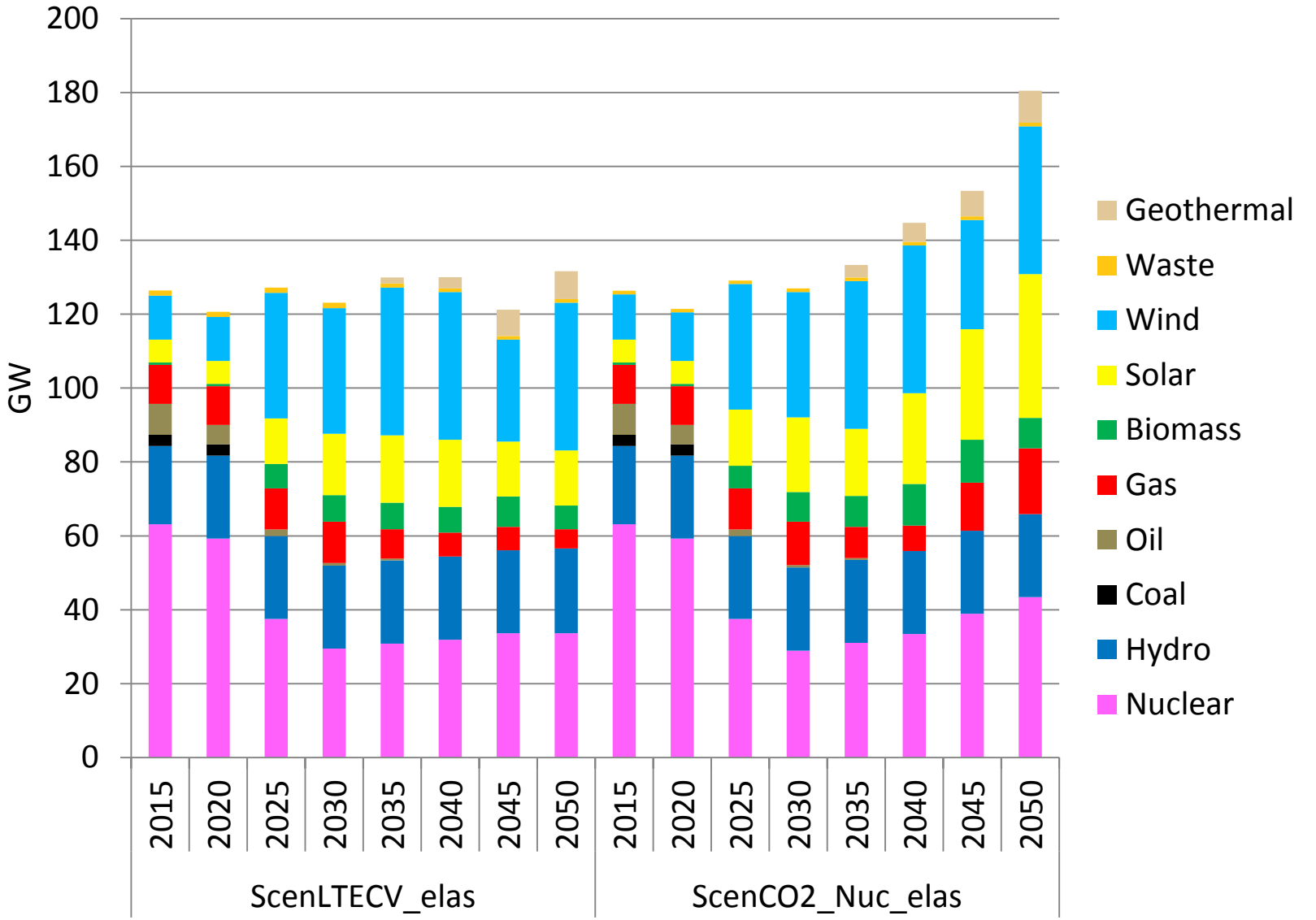

800
700
600
500
400
300
200
100
0
TWh
2015 2020 2025 2030 2035 2040 2045 2050 2015 2020 2025 2030 2035 2040 2045 2050
ScenAME_Times
ScenLTECV_elas
Import
Waste
Wind
Solar
Geothermal
Biomass
Gas
Oil
Coal
Hydro
Nuclear

If we put 2 constraints on CO2 emissions and nuclear capacity, then…

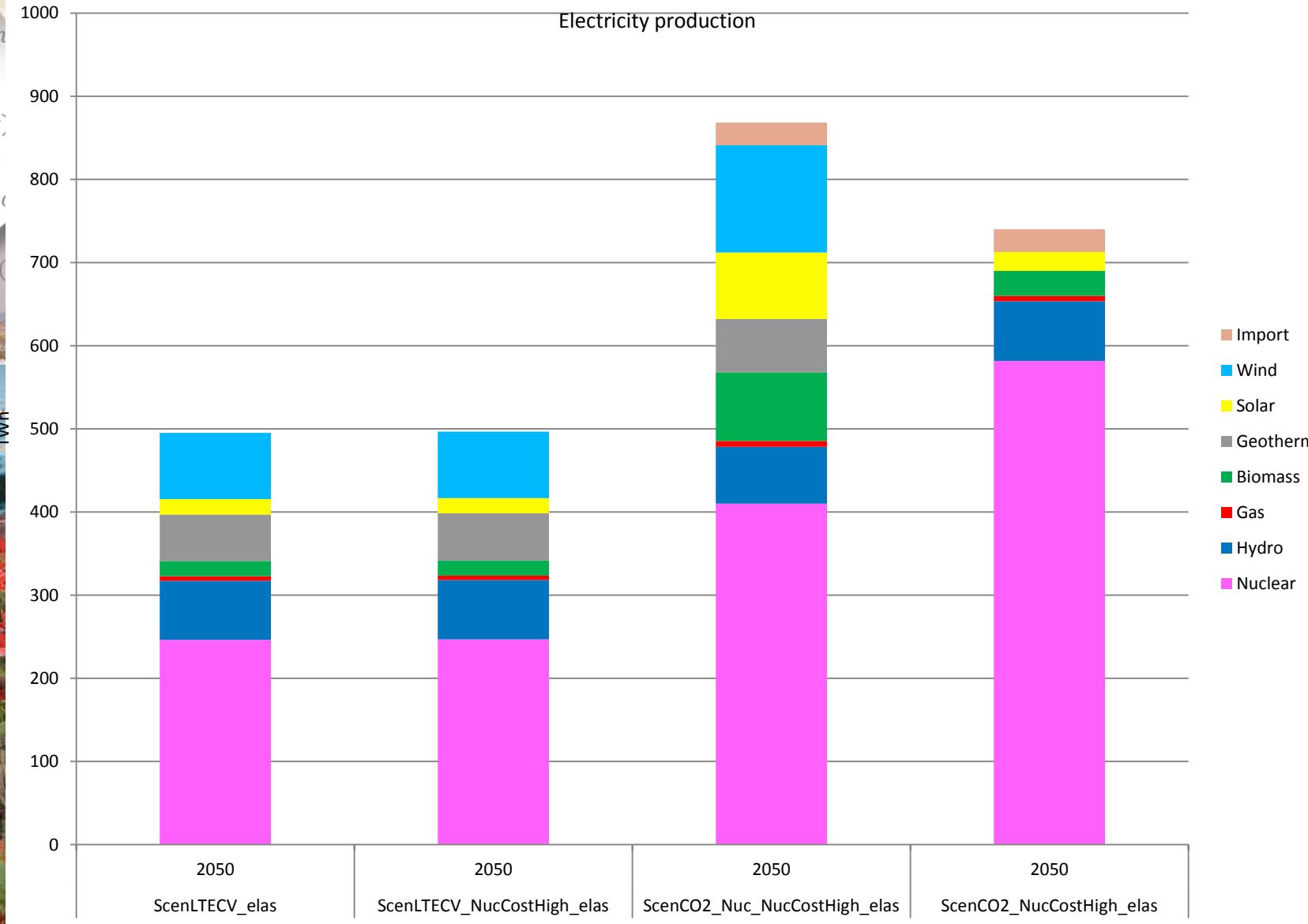
- Share of ENR in electricity production : 49% in 2030 > 40% (target of the law)



CAPACITY


200
180
160
140
120
100
80
60
40
20
0
GW
2015
2020
2025
2030
2035
2040
2045
2050
2015
2020
2025
2030
2035
2040
2045
2050
ScenLTECV_elas
ScenCO2_Nuc_elas
Geothermal
Waste
Wind
Solar
Biomass
Gas
Oil
Coal
Hydro
Nuclear

WHAT HAPPENS IF THE NUCLEAR COST IS HIGH ?



CONCLUSION

CONCLUSION

- Main findings :
  - Projection of the demand should be lower than expected if we want to meet the targets of the law
  - The target or reducing by 50% the final energy consumption is very constraining

→ Lack of consistency in the long term between the targets of the law and the associated vision that was underlying the prospective modelling

- Limits of this evaluation and further work :
  - Projection of the demand until 2050
  - Updating of the scenarios by the french ministry of ecology → new assumptions ?