



European Bank
for Reconstruction and Development



SECOND UKRAINIAN NDC TO THE PARIS AGREEMENT: Modelling Approach and Results

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“Support to the GoU on updating its NDC to Paris Agreement”

EBRD supported technical assistance project under its NDC Support Programme: “Support to the GoU on updating its Nationally Determined Contribution (NDC),” funded by SIDA.

- **Project Timeline:**

November 12, 2018 – August 31, 2021

- **Project Team:**

Institute for Economics and Forecasting of National Academy of Sciences of Ukraine, external national and international experts

- **Project Beneficiary:**

Ministry of Environmental Protection and Natural Resources of Ukraine

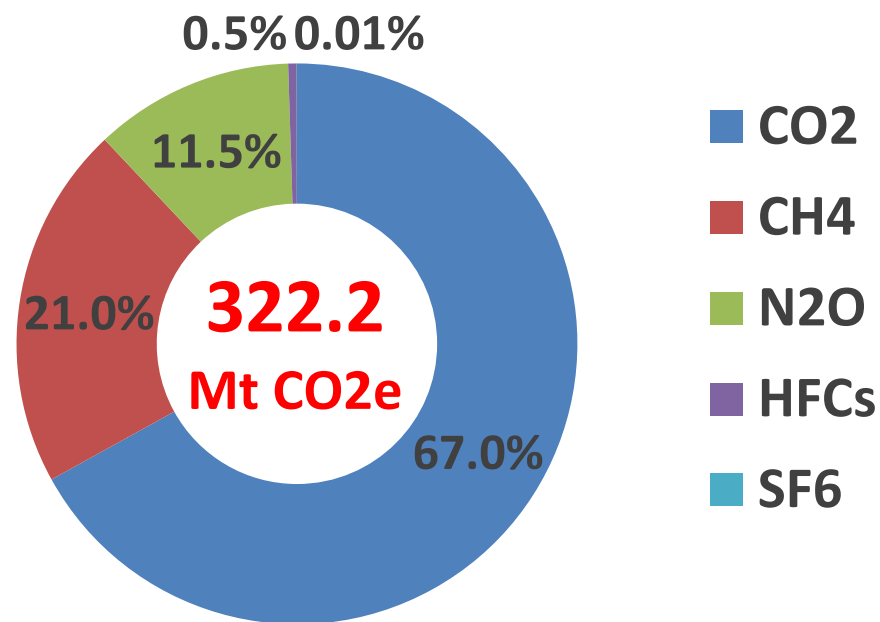
GHG Emissions Structure in Ukraine in 2019

Sectors	Share
1. Energy	66%
2. Industrial processes and product use	18%
3. Agriculture	13%
4. Land use, land-use change and forestry	0%
5. Waste	4%

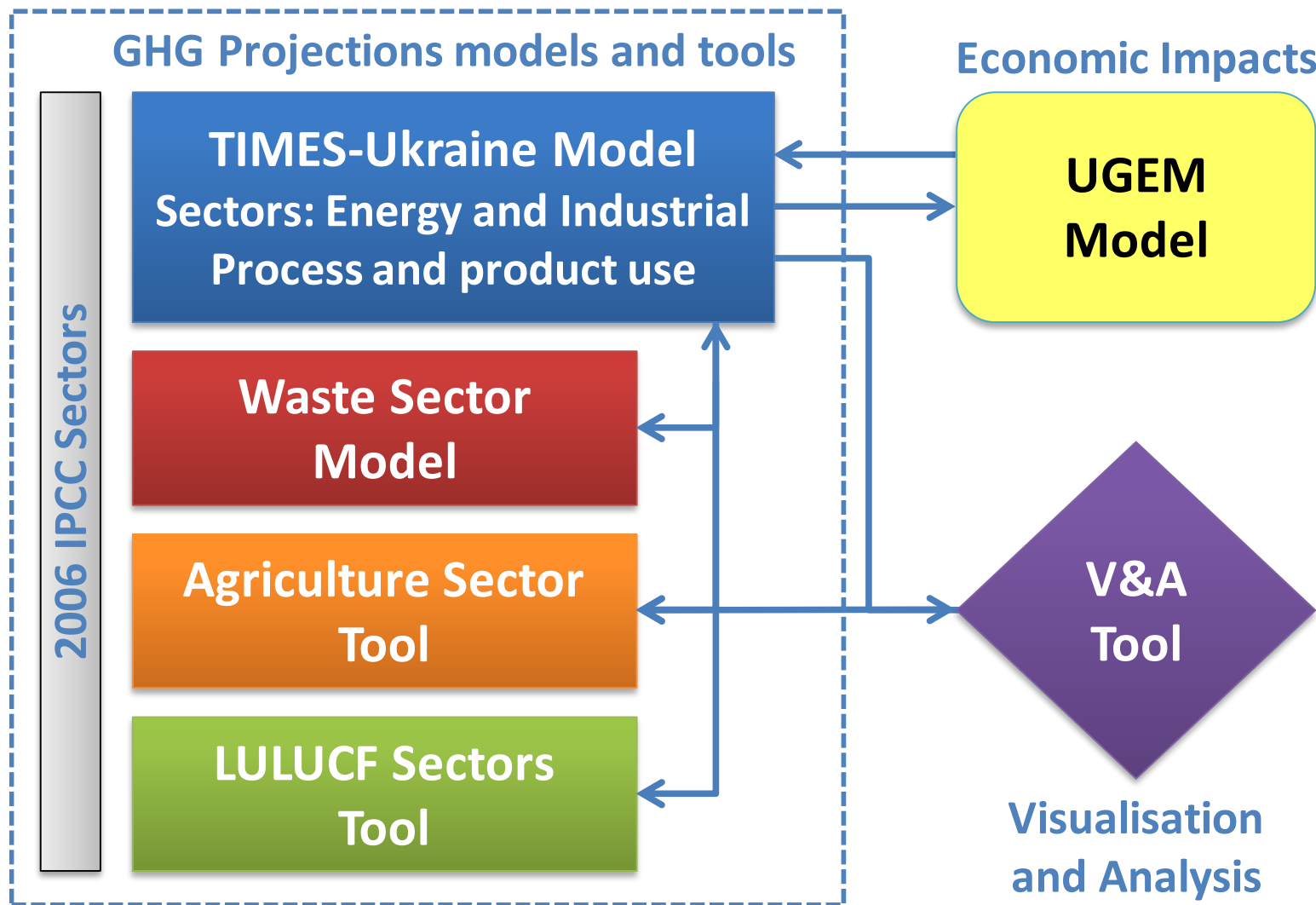
Data Source: Ukraine's greenhouse gas inventory 1990-2019

Annual National Inventory Report for Submission under the United Nations Framework Convention on Climate Change and the Kyoto Protocol

<https://unfccc.int/ghg-inventories-annex-i-parties/2021>



GHG Emissions Pathway Modelling Approach



Paris Agreement and IPCC

Paris Agreement, Article 4

“In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty.”

	Well below 2°C	1.5°C
Global 2050 GHG emissions per person (tCO ₂ e/year)	0.8 - 3.2	-0.4 - 1.7

Source: IPCC SR1.5 scenario database.

Notes: The range shown is the minimum and maximum across the full range of the IPCC scenario groupings with a >66% probability of warming below 2°C and a >50% probability of 1.5°C with no or low overshoot. CO₂e refers to aggregation of different greenhouse gases to a CO₂-equivalent basis using GWP₁₀₀ values from the IPCC 4th Assessment Report.

Ukraine's Second NDC GHG Pathways Scenarios Design

Macroeconomic Scenarios (Base and Optimistic)

Sensitivity scenarios

Scenario 1: Business as Usual (BAU)

Partial implementation of existing legislation, without structural changes in the economy and energy sectors

Scenario 2: Reference Scenario

Full implementation of existing legislation as of 1/09/2019, including Energy Strategy, Waste Management Strategy, EE and RE Action Plans, Environmental Strategy, LEDS and others

Scenario 3: Climate Neutral Economy

“consistent” with IEA and IPCC scenarios, assuming that GHG emissions in 2050 will not be higher than 1.7 t CO₂e/capita, and will achieve net-zero GHG emissions in 2070.

Combined Sensitivity Scenario

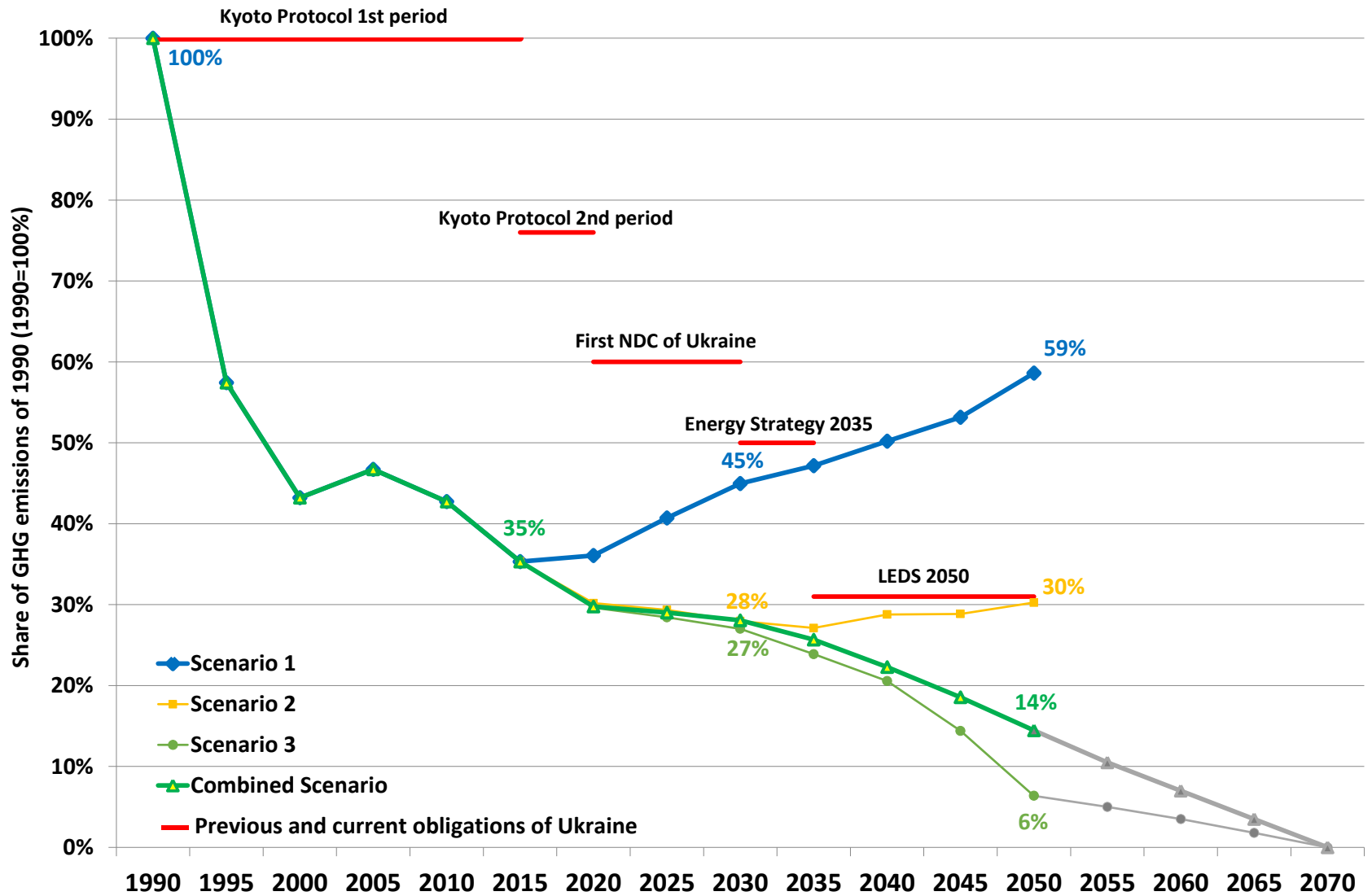
In order to avoid investments burden in Scenario 3, developed Combined Sensitivity Scenario, which also “consistent” with IPCC scenarios, and will achieve net-zero GHG emissions in 2070.

Combined Scenario for the Ukraine's Second NDC

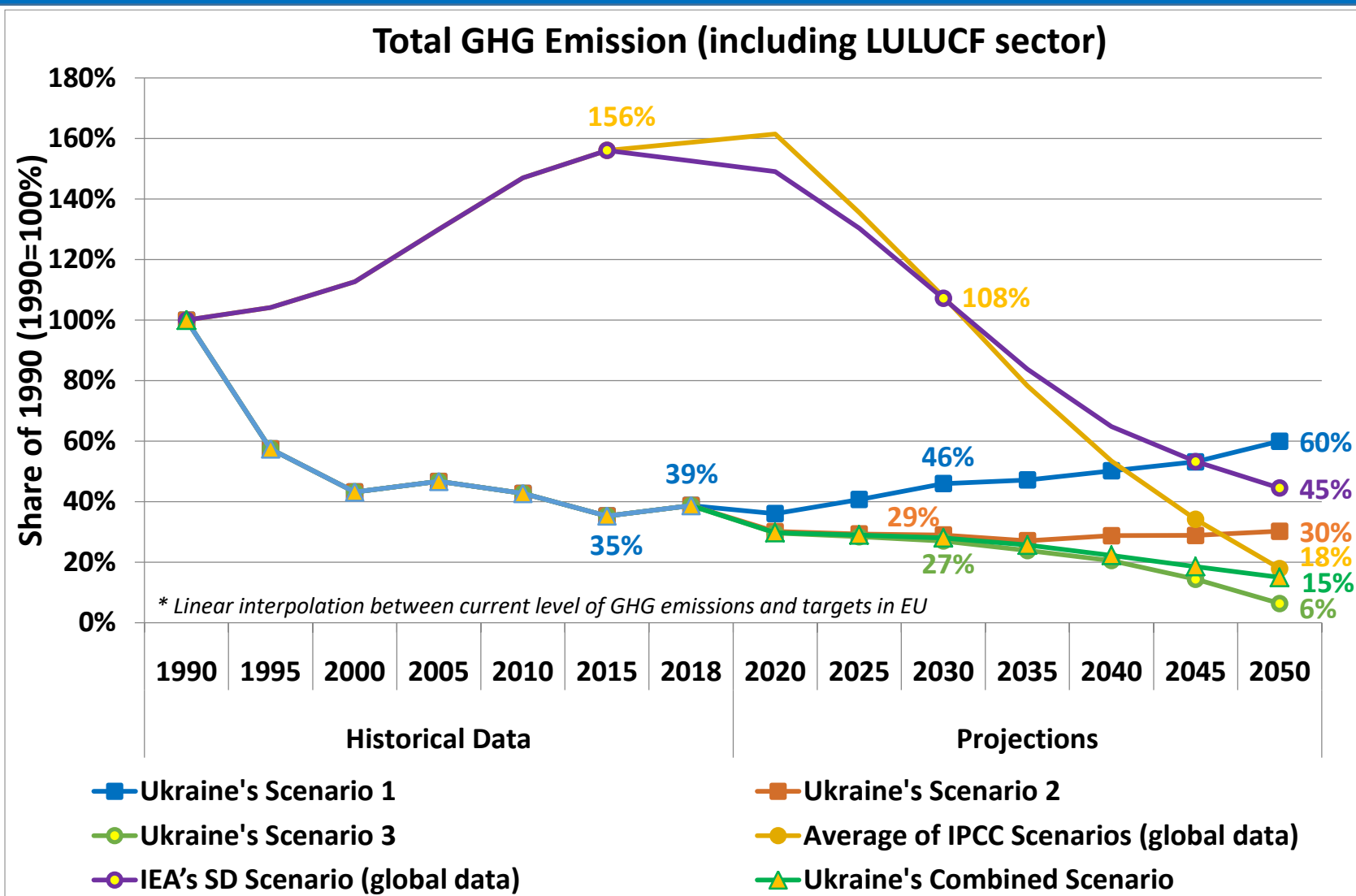
Assumptions

A1	Macroeconomic Baseline Scenario
B	Carbon Tax
C	New GHG emissions trajectory till 2050
F1	Higher (international) CAPEX level for new nuclear units construction
F2	Extension of lifetime period for existing nuclear units
F3	Lower load factor for existing and new nuclear units
G2	Lower balancing capacities requirements for new renewable energy generation
H	Limited implementation of Waste Sector legislation
J	Scenario 2 for Agriculture Сценарій 2 для сектору «Сільське господарство»
K	Scenario 2 for LULUCF

GHG Emissions Scenarios and Targets in Ukraine



Total Ukraine's GHG Emissions Pathways

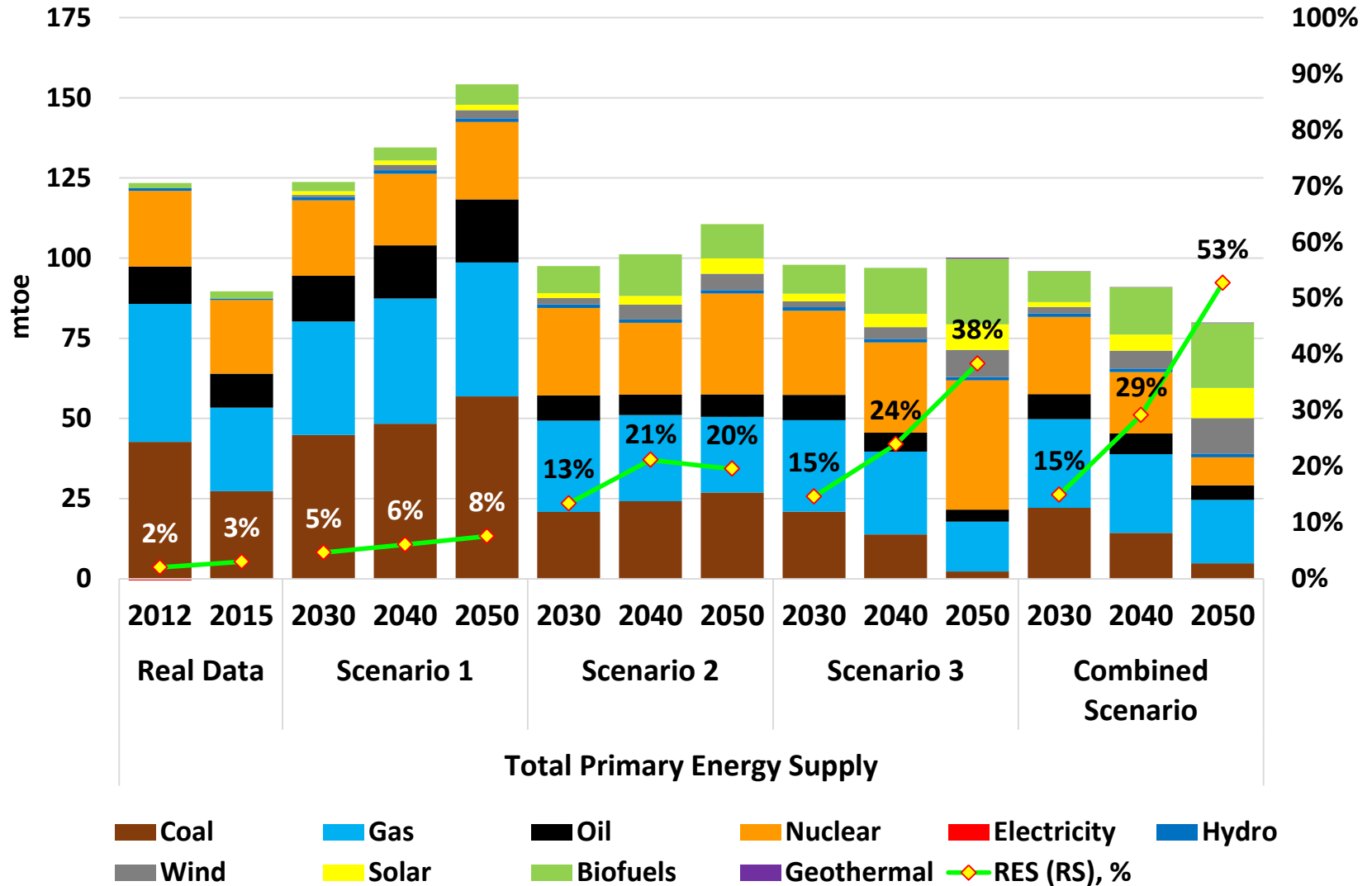


NDC2 Scenarios GHG Emissions: Modelling Results

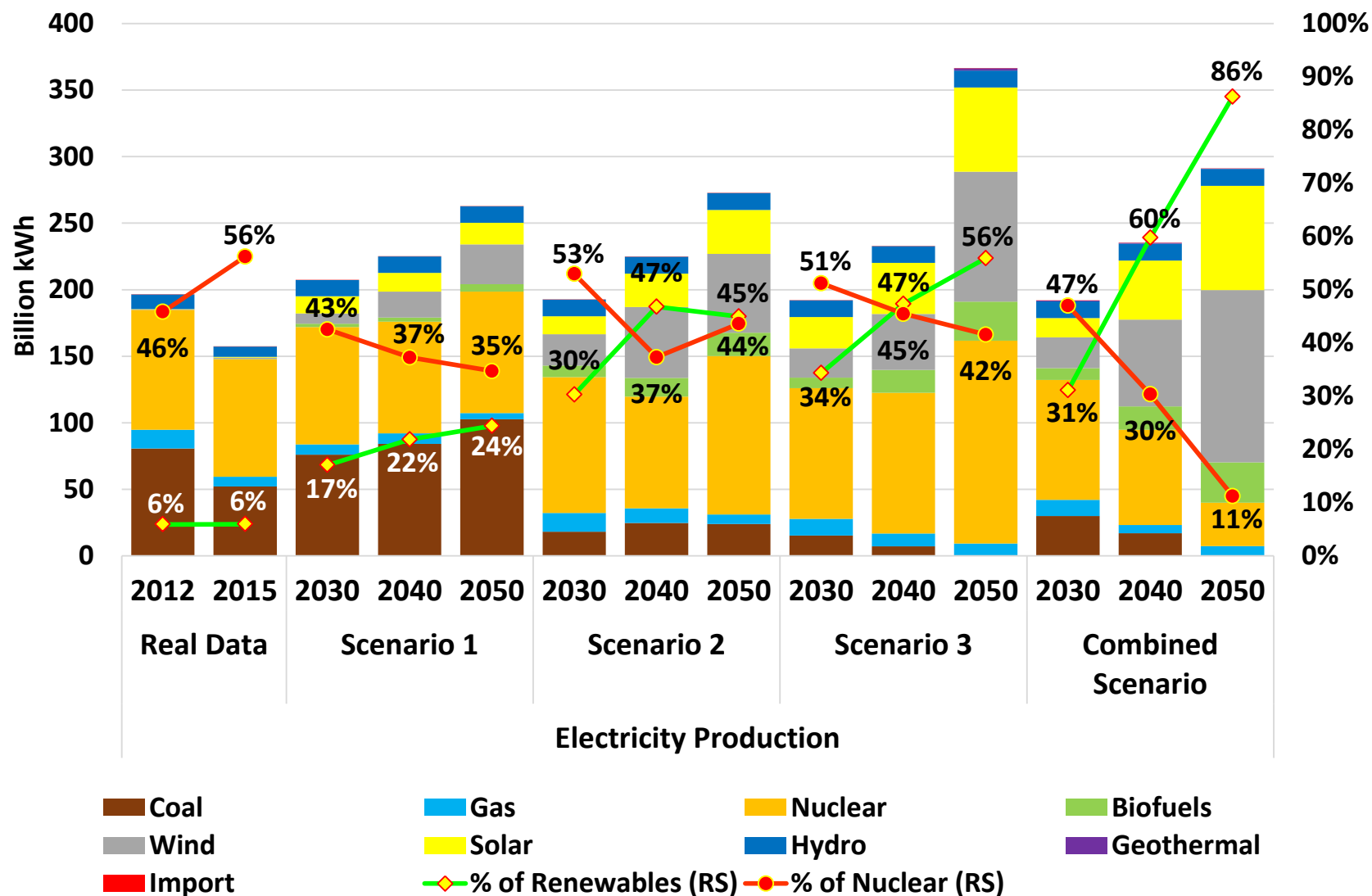
Sector	#	Scenario	GHG emissions reduction compared to 1990 level (share of 1990 level)		
			2018	2030	2050
Energy and Industrial Process	1	BAU Scenario	- 66% (34% level)	- 57% (43% level)	- 45% (55% level)
	2	Reference Scenario		- 74% (26% level)	- 70% (30% level)
	3	Climate Neutral Economy Scen.		- 75% (25% level)	- 93% (7% level)
	4	Combined Sensitivity Scenario		- 75% (25% level)	- 86% (14% level)
Agriculture	1	BAU Scenario	- 49% (51% level)	- 52% (48% level)	- 52% (48% level)
	2	Reference Scenario		- 54% (46% level)	- 56% (44% level)
	3	Climate Neutral Economy Scen.		- 56% (44% level)	- 60% (40% level)
	4	Combined Sensitivity Scenario		- 54% (46% level)	- 56% (44% level)
LULUCF*	1	BAU Scenario	+104%*	+ 95% (5% level)	+ 105%*
	2	Reference Scenario		+ 79% (21% level)	+ 59% (41% level)
	3	Climate Neutral Economy Scen.		+ 69% (31% level)	+ 39% (61% level)
	4	Combined Sensitivity Scenario		+ 79% (21% level)	+ 59% (41% level)
Waste	1	BAU Scenario	+2% (102% level)	+7% (107% level)	+23% (123% level)
	2	Reference Scenario		- 18% (82% level)	- 49% (51% level)
	3	Climate Neutral Economy Scen.		- 35% (65% level)	- 81% (19% level)
	4	Combined Sensitivity Scenario		- 15% (85% level)	- 66% (34% level)
Economy-wide	1	BAU Scenario	- 66% (34% level)	- 54% (46% level)	- 40% (60% level)
	2	Reference Scenario		- 71% (29% level)	- 70% (30% level)
	3	Climate Neutral Economy Scen.		- 73% (27% level)	- 94% (6% level)
	4	Combined Sensitivity Scenario		- 72% (28% level)	- 85% (15% level)

***The absolute value of GHG emissions in LULUCF sector is positive, while in 1990 it was negative**

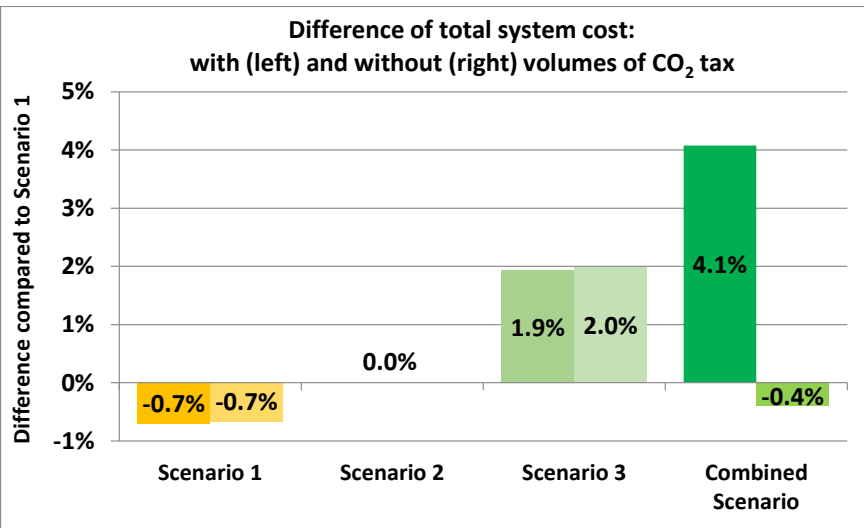
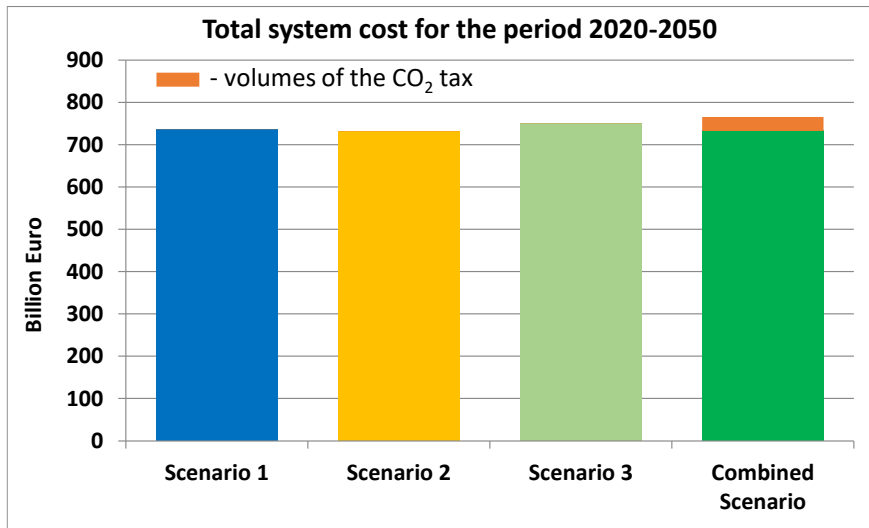
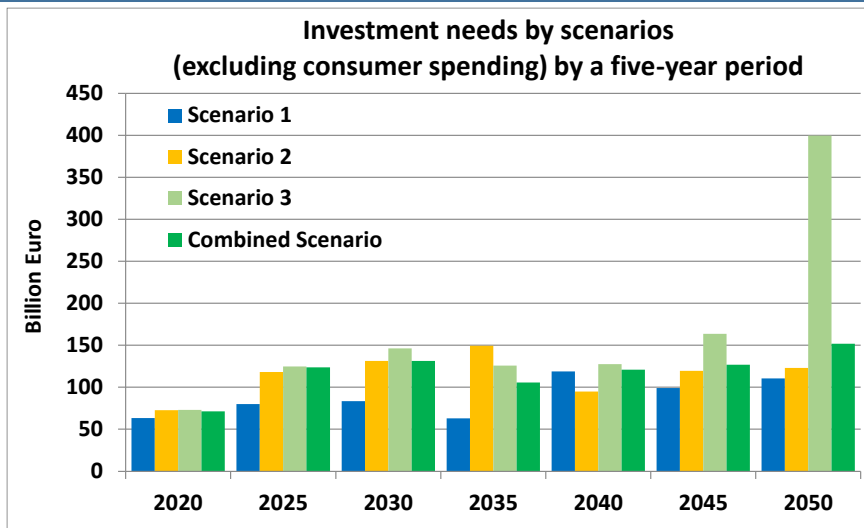
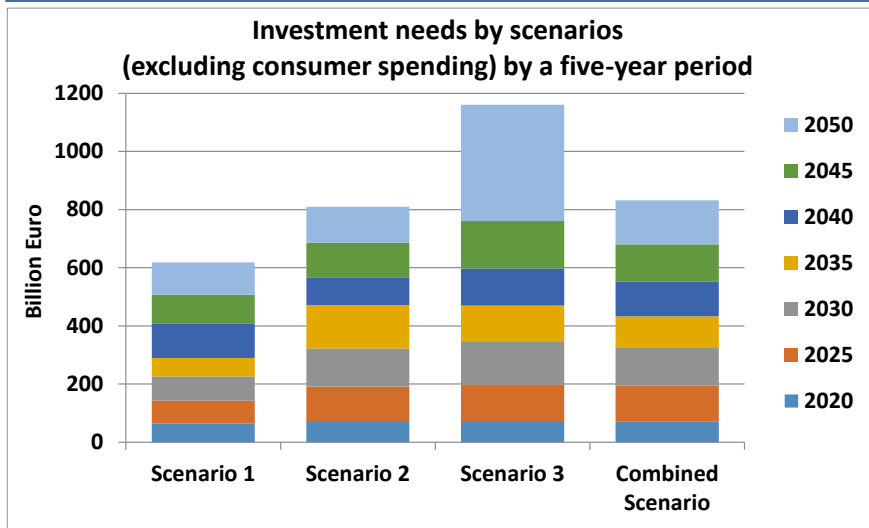
Core and Combined Scenarios: TPES Changes



Core and Combined Sensitivity Scenarios: Electricity Production

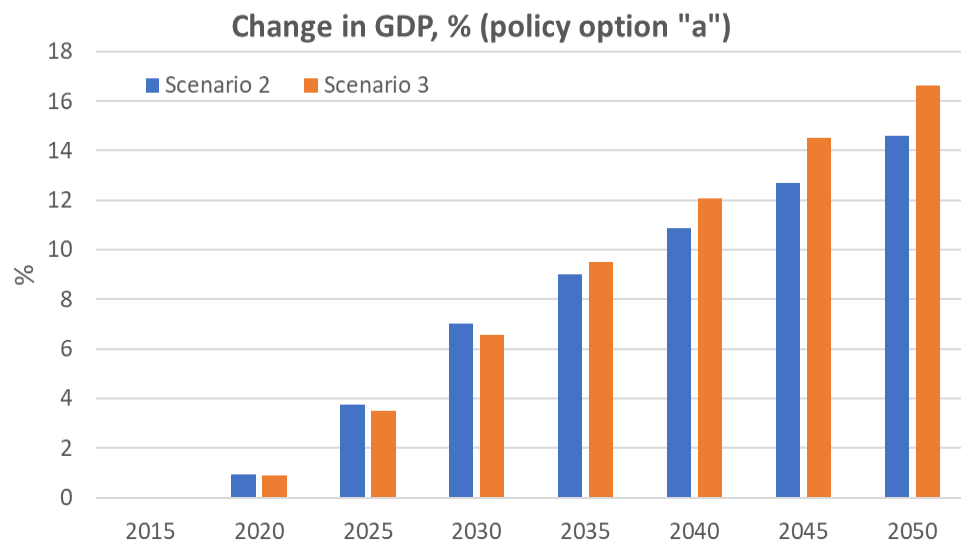


Ukraine's NDC2 Scenarios: Investment Needs Assessment*



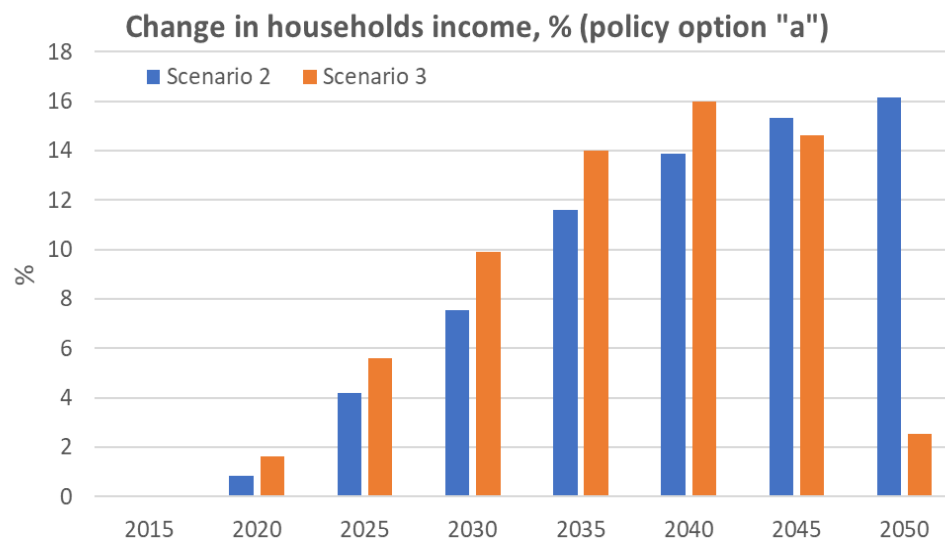
* Investment here includes only the cost of energy production and use technologies, some of which can be interpreted as final consumer costs, production or other costs. The total cost of energy system operation is the sum of discounted annual capital investment (including service life), operational costs, costs of production and supply (import) of energy resources, taxes and subsidies (e.g. CO₂ tax and "green tariffs"), etc. but it does not include population utilities or coal mines state support.

Macroeconomic Impact Assessment Results (1)

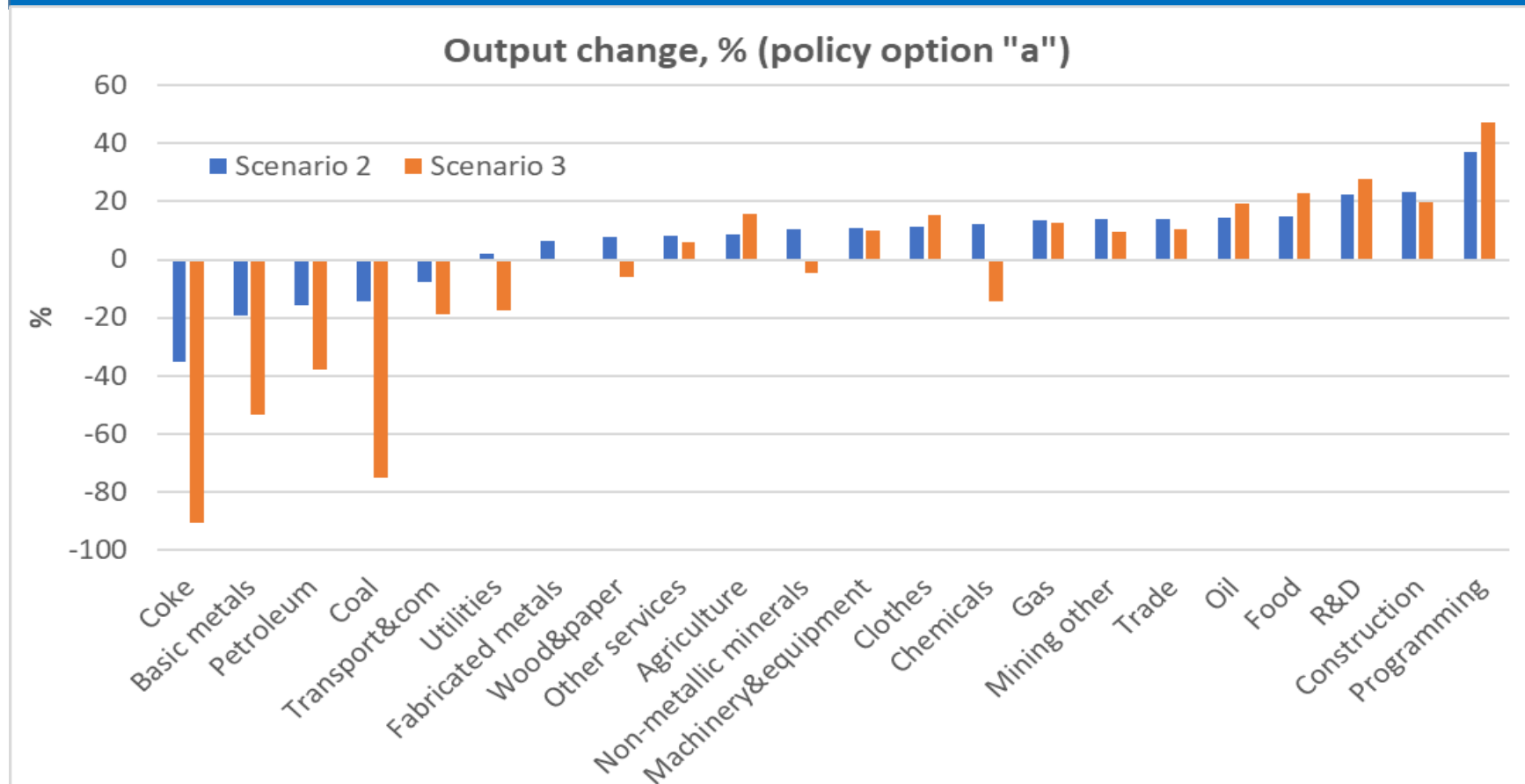


Analysed policy options confirm that investment-intensive pathway with strong energy efficiency improvements can deliver positive macroeconomic impacts in the longer run (GDP growth by 14%-16%).

Similar positive trend is observed in the households' income, although Scenario 2 results in a higher growth, as residential consumers face much higher carbon prices in Scenario 3 (up to \$1300/ton CO₂-eq. in 2050), which impacts their cost of consumption.



Macroeconomic Impact Assessment Results (2)



- Significant transformations in the output structure, especially for Scenario 3, as production of coke and coal fall by over 75% in 2050, relative to baseline.
- Other energy intensive sectors, also significantly reduce their output.
- Can observe a shift towards services and new investment generating sectors.

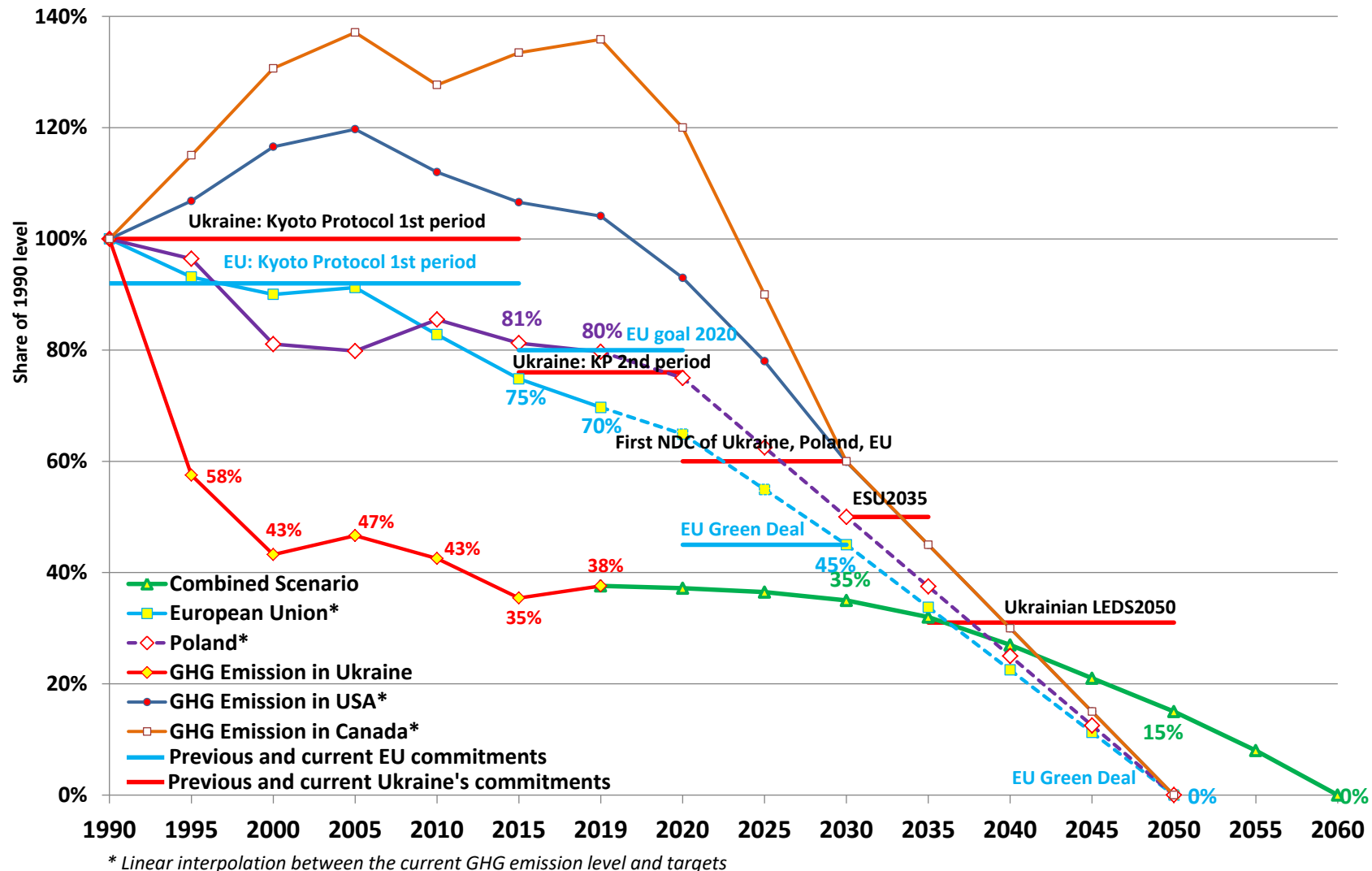
Key conclusions from the modelling

- The current pathway (BAU) **will not** result in the decoupling of economic growth and GHG emissions.
- However, modelling results show that it is clearly **possible** for Ukraine to shift to a sustainable low-carbon and climate resilient economy with deep emission cuts consistent with the Paris Agreement goals.
- **By focusing in the short and medium term, full implementation of existing and planned policies and measure, this can be achieved.**
- The analysis shows no significant altering of the current economic composition is necessary to achieve this.
- Long-term climate ambitions shows that it will open up the country to not only transform into a climate neutral economy, but also **foster innovation and competitiveness**, driven by clean technologies and services and avoiding capital lock-in into inefficient and stranded assets.
- To achieve long-term climate neutrality, the significant investment cost will be incurred towards mid-century with the need to adopt new technologies like CCS, hydrogen that are to-date expensive, but other market mechanisms will be considered within the project to offer solutions in managing the transition.

What does this mean so far?

- Ukraine has the foundation to deliver low carbon and climate resilient economy between now and 2030.
- For it to happen, policies and targets in place must be fully implemented.
- The model already informs on some of the main areas of changes to ensure transition into a climate neutral economy:
 - Increase in renewable energy installed capacity
 - Early adoption of new technologies e.g. hydrogen, CCS
 - Significant increase in energy efficiency in buildings
 - Increase in electrifications of transports
 - Better waste management and water use
 - Increased organic crop production and methane reduction in agriculture
 - Increased carbon sink through afforestation

Total Ukraine's and Others GHG Emissions Pathways



Thank You for Attention!



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