



Achieving the net-zero target: A meta-analysis of Turkish energy and climate scenarios

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1. Introduction

The Ministry of Energy and Natural Resources Turkish National Energy Plan modeling horizon is 2035 and based on the net-zero target in 2053. The energy and climate scenarios included in the official reports are:

- Energy Security Scenario (MENR, 2022)
- Baseline and Net-Zero Scenarios (IPC, 2022), and
- Baseline, Optimistic and Pessimistic Scenarios (Akalın et al., 2012).

The capacity projections in the Energy Security Scenario (MENR, 2022) are illustrated in Table 1 with data from Baseline and Net-Zero Scenarios (IPC, 2022) given in parantheses.

	Installed capacity	unit	2030	2035	2055
Solar power	GW			52.9 (59.7)	
Wind power	GW			29.6 (50.1)	
Nuclear power	GW			7.2 (4.8)	
New installed capacity	GW			96.9	
Total installed capacity	GW			189.7 (202.1)	
Battery storage	GW			7.5	
Electrolyser	GW	1.9	5.0	70.0	
Demand side management	GW	0.9	1.7		

Table 1: Capacity projections from Energy Security Scenario (MENR, 2022) and Baseline and Net-Zero Scenarios (IPC, 2022) (in parantheses)

2. Carbon emissions

The Energy Security Scenario (MENR, 2022), illustrated in Figure 1, shows a peak fossil year of 2030 and a rapid expansion of renewable energy and nuclear power beyond 2050.

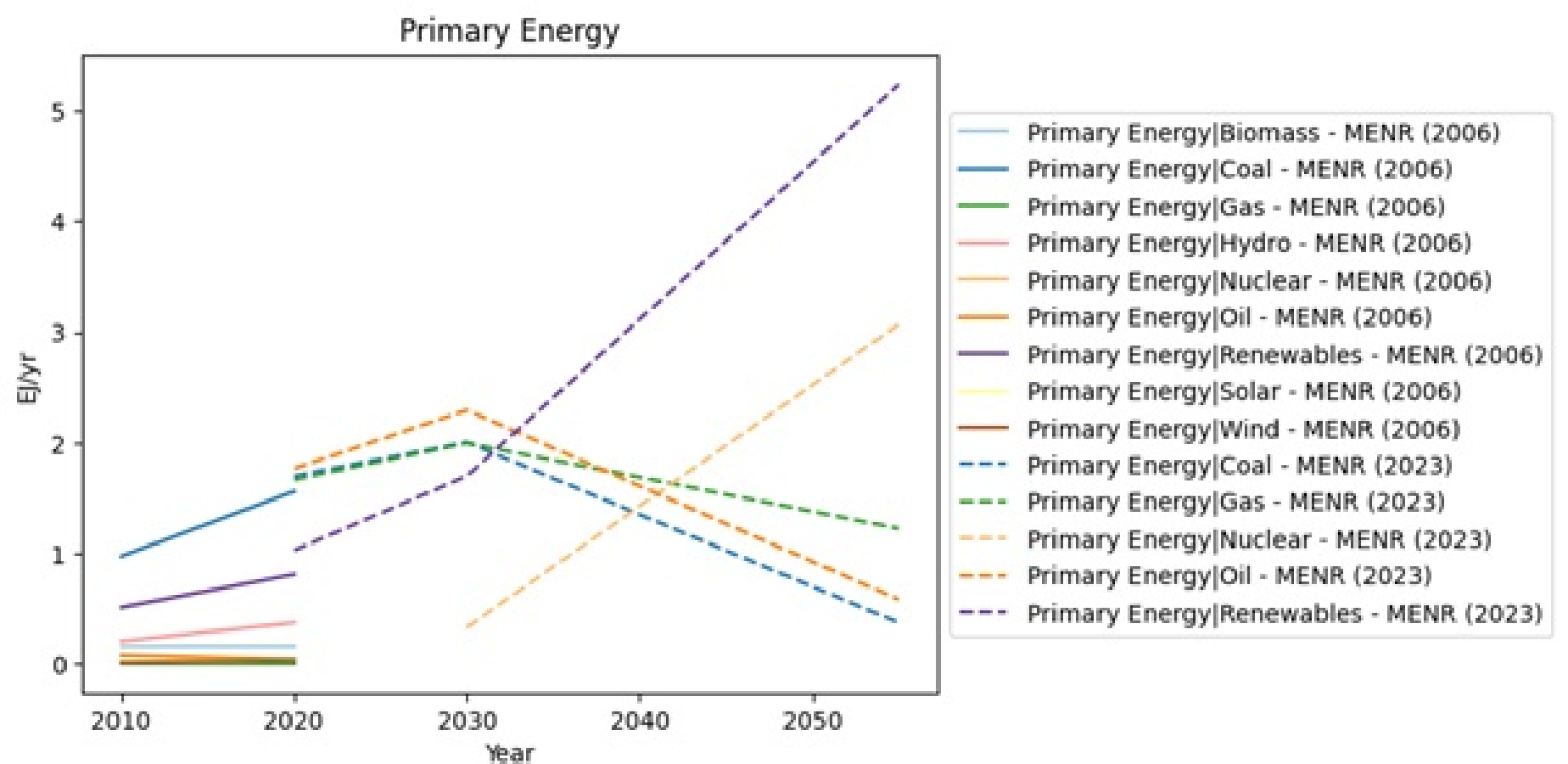


Figure 1: Primary energy supply projections from Turkish national plans

Estimated CO2 emissions from the official reports are illustrated in Figure 2. MENR (2023) is related with the NDC of Turkey (MoEUCC, 2023). Gungor and Sari (2020) assess the role of nuclear power for climate change mitigation strategy of Turkey. IPC (2022) net-zero scenario combines multiple energy supply and demand policies with labor market policies for a just low-carbon transition. Supply or market based strategies shift the emissions towards saturation, whereas multiple scenarios are required to achive the net-zero target.

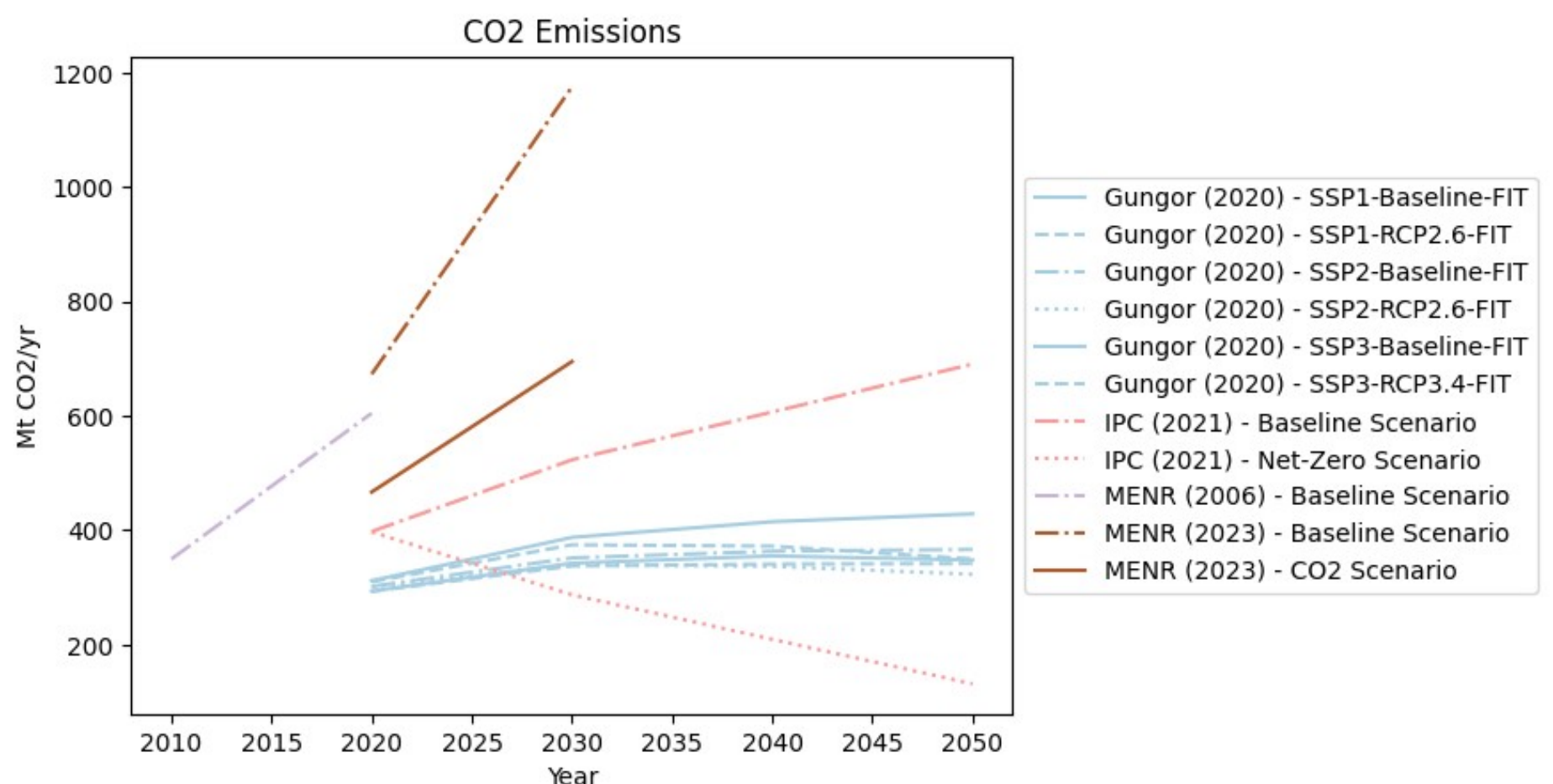


Figure 2: Carbon emission pathways

3. Data availability

The data and scripts are available at GitHub repository under the Apache-2.0 License.

4. Categorization of scenarios by their fossil fuel shares

Although the fossil fuel reserves are modest in Turkey, their share in primary energy supply is above 80% (OECD, 2020). The expansion of renewable energy requires the electrification of hard-to-abate sectors such as industry, residential and transport. The authors select the share of coal as meta-data. The primary energy supply illustrated in Figure 3 shows trade-off between reduction in CO2 emissions and savings in primary energy supply in all scenarios.

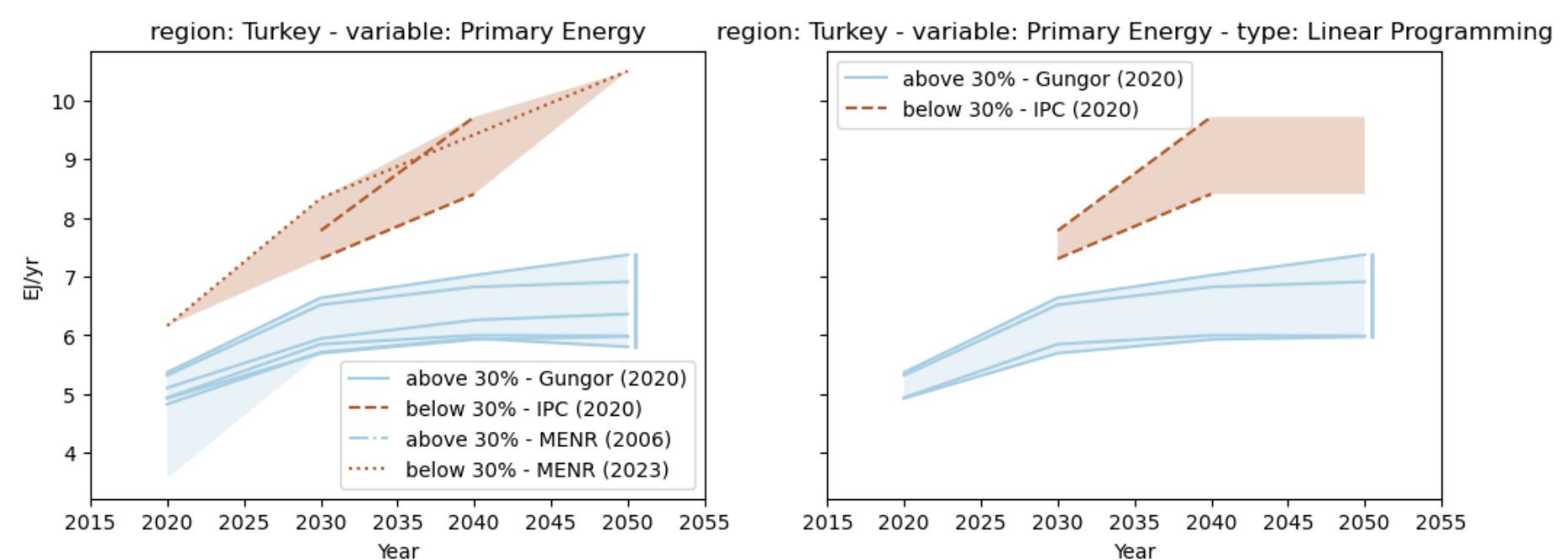


Figure 3: Primary energy supply, including (left) and excluding (right) extremely high and low emission scenarios

References

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