

# Implications of biogas and electric cooking technologies in Nepal: A long-term analysis using AIM/Enduse model

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## BACKGROUND

- The residential sector in Nepal accounts for more than 80 percent of energy consumption in Nepal.
- The traditional biomass is the major source of fuel and accounted for 95% of the total energy consumption in the residential sector.
- Almost half of the energy consumption in Nepal is used for residential cooking.
- Nepal has huge potential of untapped hydro resource.

Figure 1: Energy Mix

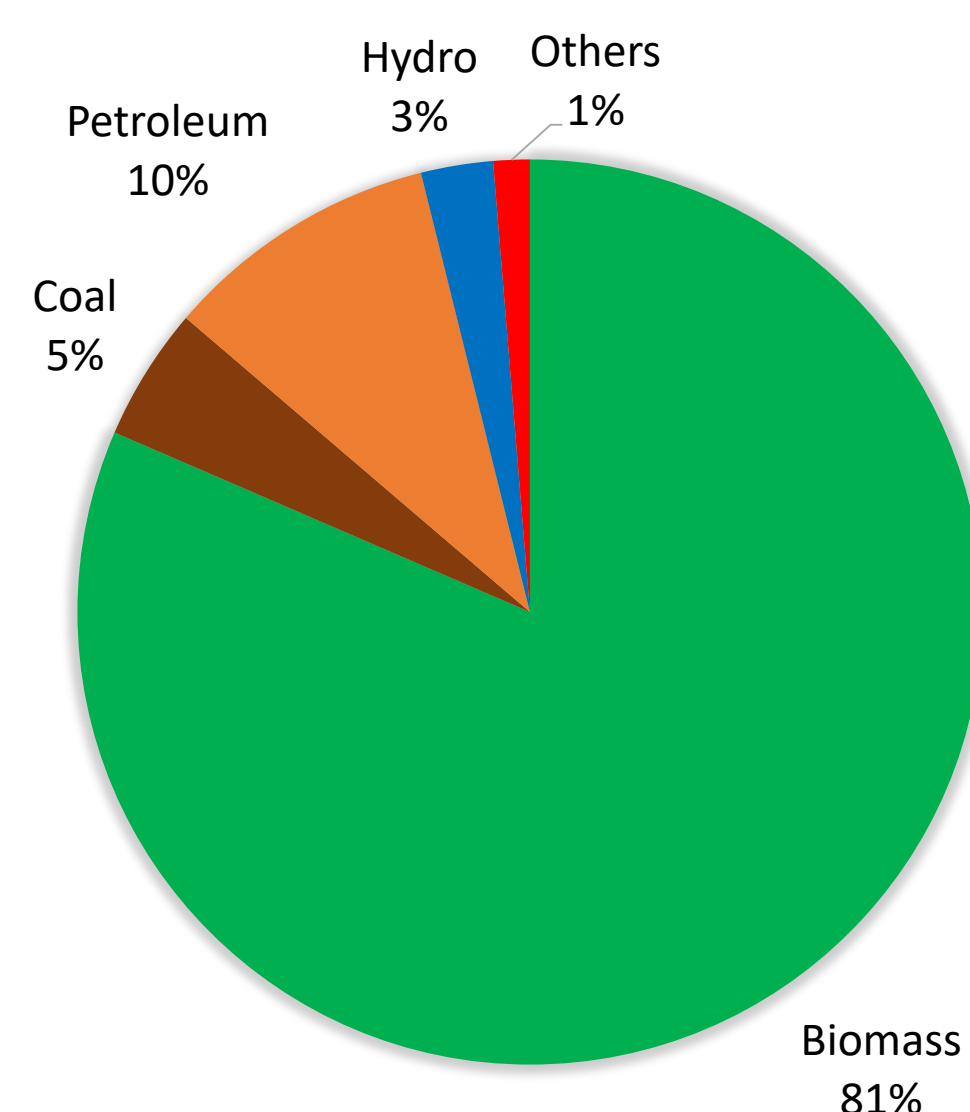
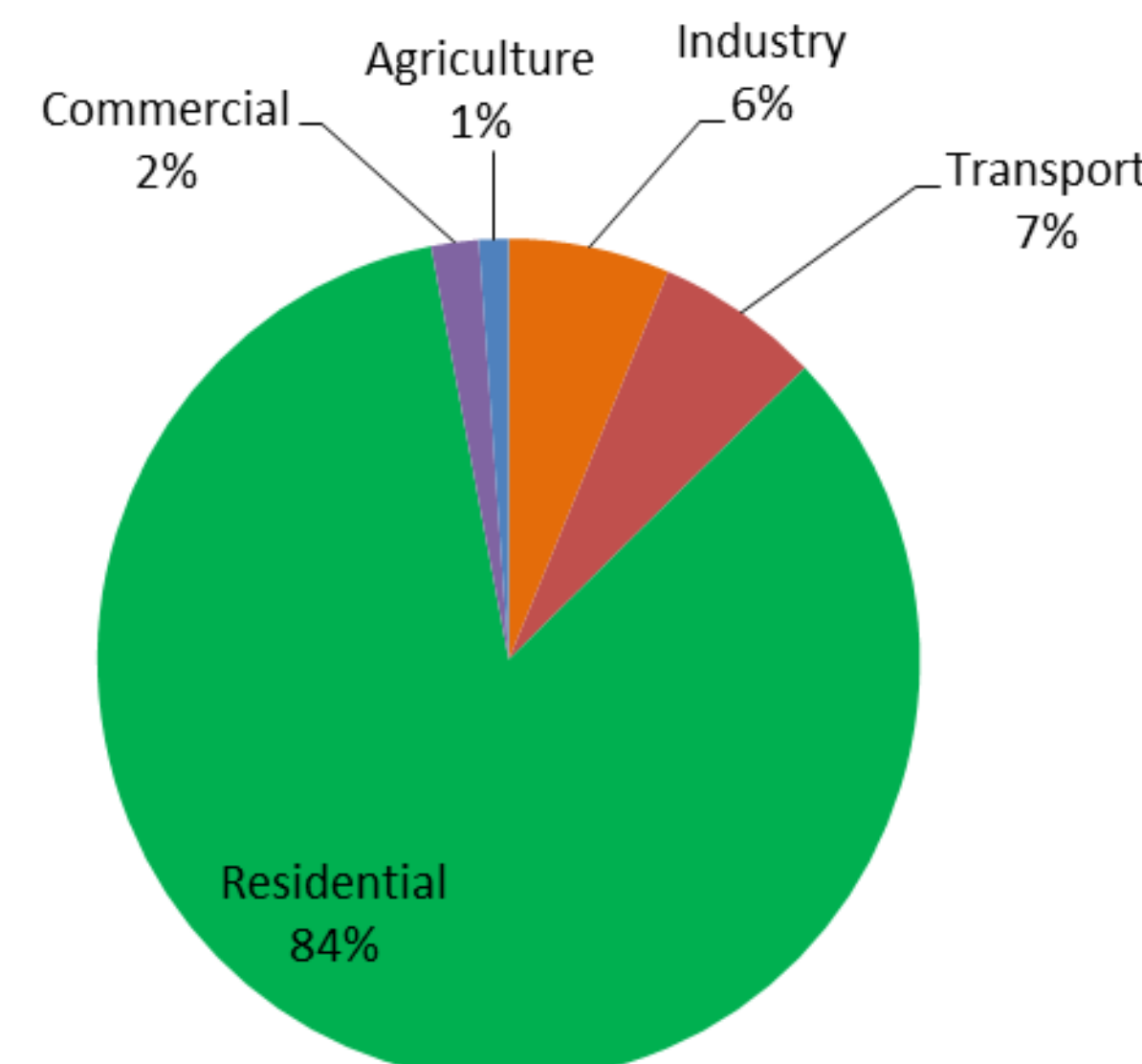


Figure 2: Energy Consumption by sector



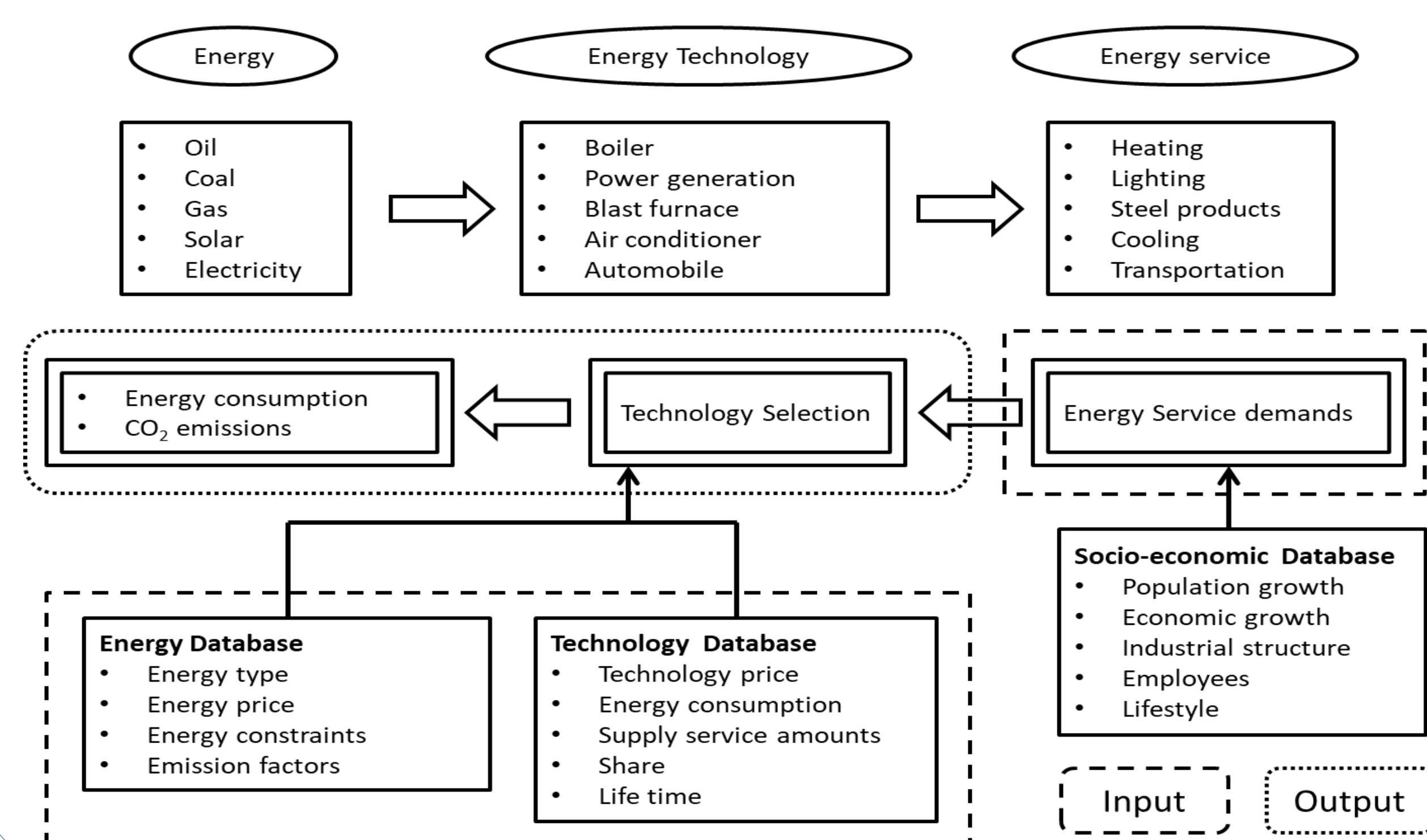
## OBJECTIVES

- Analyze the effects of biogas and electricity cooking technologies on energy use and greenhouse gas (GHG) emissions in residential sector during 2010-2050 in the case of Nepal

## METHODOLOGY

- The study uses long-term energy system model developed under AIM/Enduse framework.
- One BAU and three alternative scenarios (CL, CM and CH) are developed.
- Three different level of electricity and biogas cooking are considered in alternative scenarios

Figure 3: AIM/Enduse Framework



## SCENARIO DESCRIPTION

Table 1: Level of electricity and biogas use in cooking (%)

Scenarios	Sector/Sub-sectors	Technology (Cooking)	Shares in end-use service (%)			
			2020	2030	2040	2050
High (CH)	Urban	Electric	25	40	60	80
		Biogas	10	20	25	30
	Rural	Biogas	20	35	50	65
Medium (CM)	Urban	Electric	20	35	50	65
		Biogas	7.5	15	20	25
	Rural	Biogas	15	25	35	50
Low (CL)	Urban	Electric	12.5	20	30	40
		Biogas	5	10	15	20
	Rural	Biogas	12.5	20	30	40

## RESULTS AND DISCUSSION: BAU SCENARIO

Figure 4: Energy Consumption in Residential Cooking

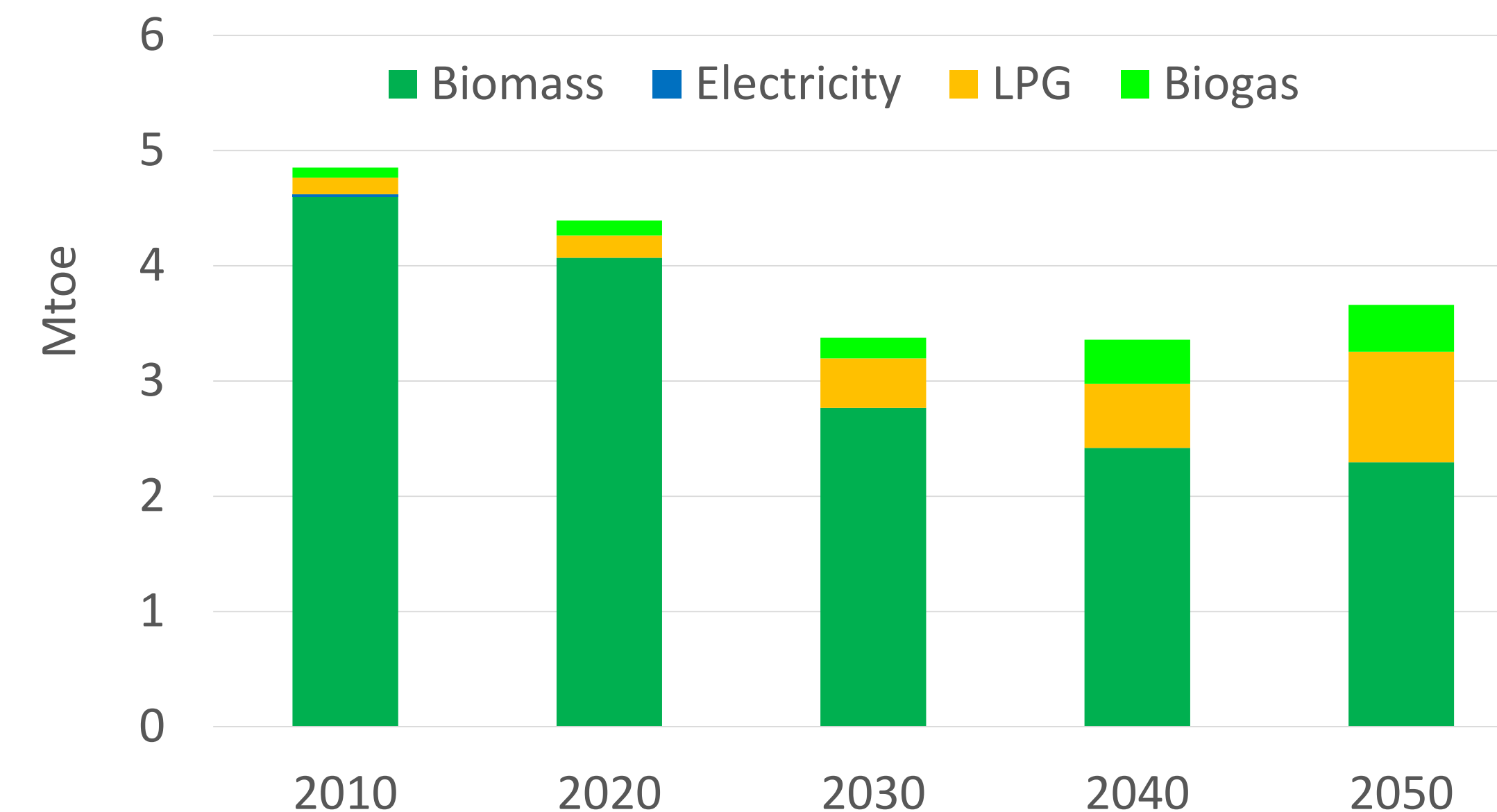
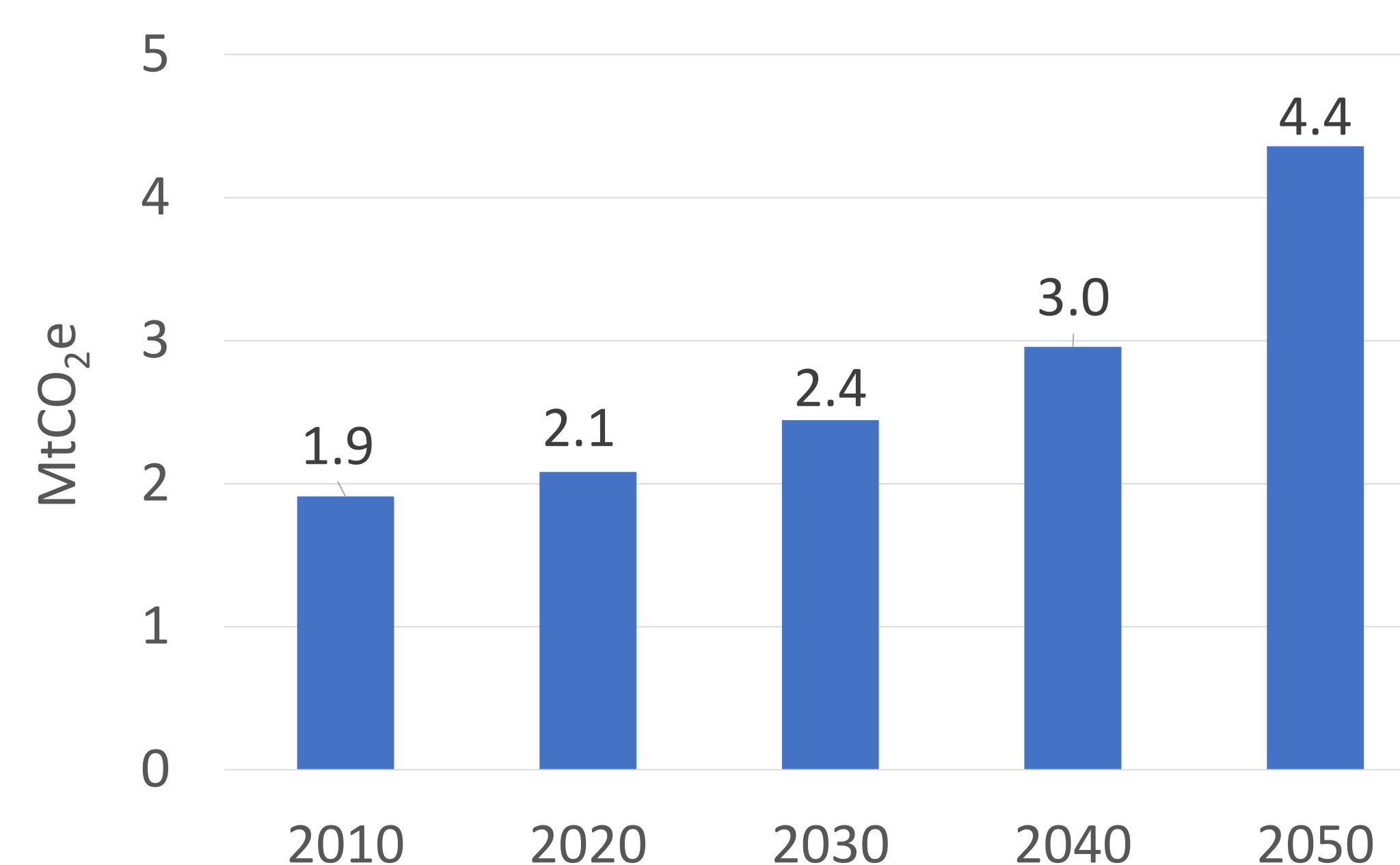
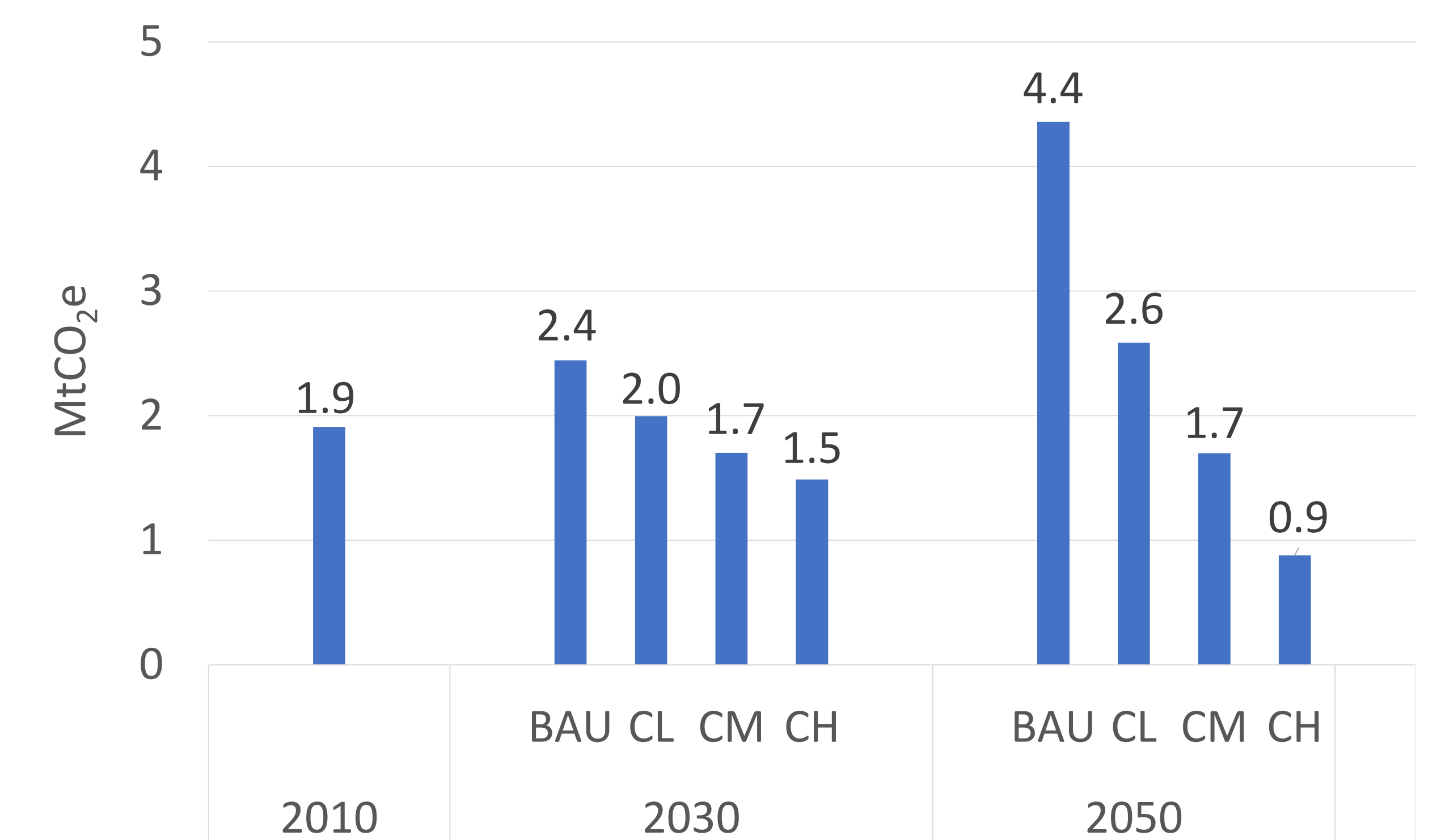
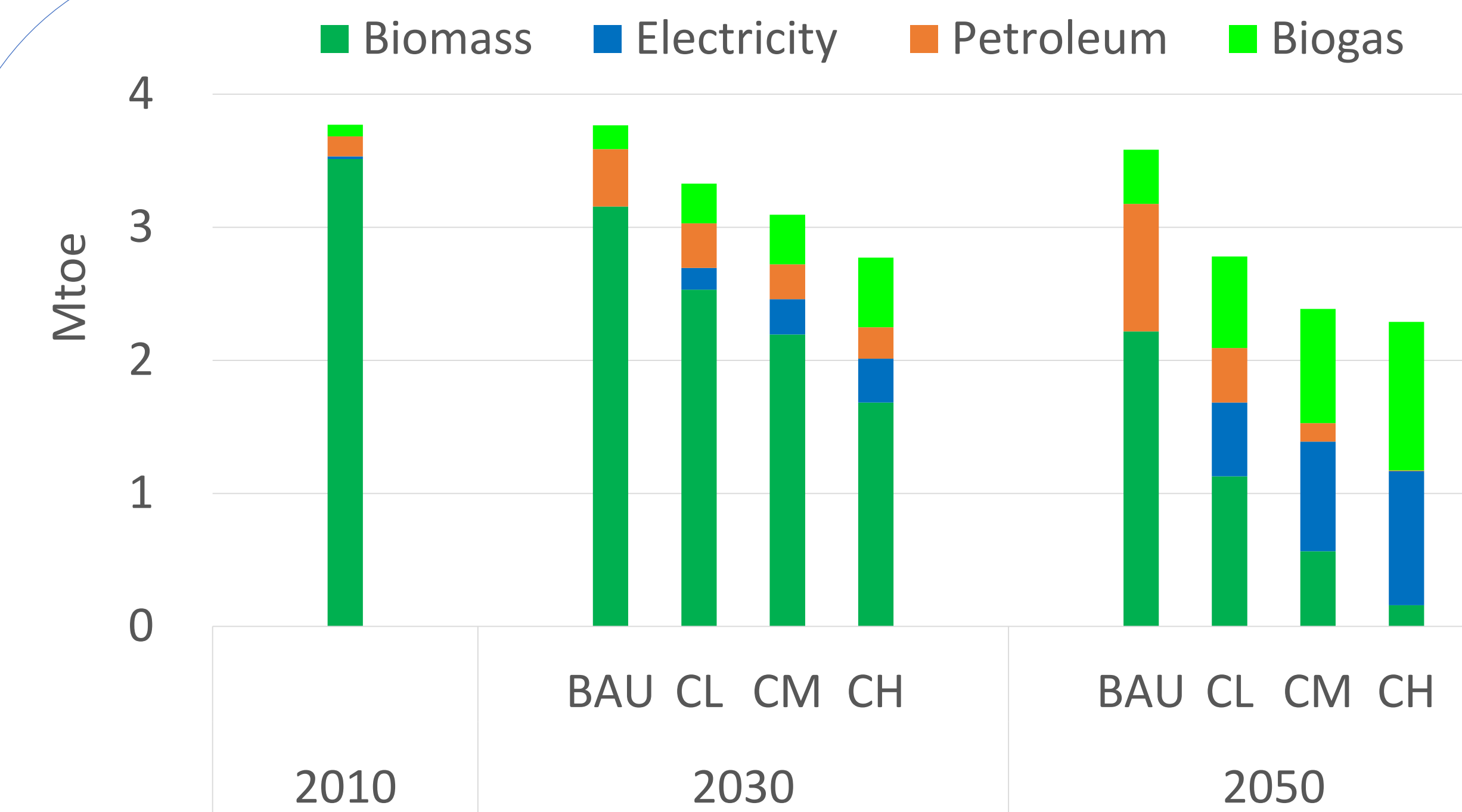


Figure 5: GHG Emissions from Residential Cooking



- Biomass consumption would decrease in BAU, while biogas and LPG would increase during 2010-2050
- Final energy consumption (FEC) in cooking would decrease
- GHG emissions from cooking would increase at compound annual growth rate (CAGR) of 2.1%



- Compared to BAU, in 2030, FEC for cooking would decrease by 11.6%, 17.8% and 26.4% in CL, CM and CH respectively.
- In 2050, FEC would decrease by 22.4%, 33.4% and 36.1% respectively in CL, CM and CH respectively.
- Biomass consumption would decrease compared to BAU by 49% in CL, 75% in CM and 93% in CH.
- LPG use would decrease by 57% in CL, 86% in CM and 99% in CH.
- GHG emissions from cooking in 2050 would decrease by 40.7% in CL, 61.0% in CM and 79.8% in CH scenarios.

## CONCLUSION

- Dissemination of biogas cooking in rural can save biomass significantly, thereby reducing deforestations
- Use of electricity for cooking can replace the use of LPG and reduce the country's import dependency
- Untapped hydropower will be utilized with the electrification of cooking sector
- GHG emissions from cooking can be decreased substantially

Pradhan, B.B., Limmeechokchai, B. and Shrestha, R.M., 2019, Implications of biogas and electric cooking technologies in residential cooking – A long terms perspective using AIM/Enduse model, Renewable Energy, Vol. 143.