

EL.ADAPT: Impacts of Climate Change on Electricity Demand

Töglhofer C.^{1,2*}, Habsburg-Lothringen C.², Prettenhaler F.², Rogler N.², Themessl M.¹

Power generation is not only an important source of carbon emissions, it is also vulnerable to climate change both due to the growing share of renewables and due to temperature related changes in seasonal demand patterns. The project EL.Adapt investigates the climate change impacts on the electricity industry and the influence of adaptation strategies on the Austrian economy up to 2050. In this contribution, we provide information on the shift from electricity demand for heating services in winter to electricity demand for cooling services in summer by (1) using four different climate scenarios from the Ensembles project, (2) doing calculations for 16 continental European countries and their NUTS-3 regions, and (3) working with daily load data from ENTSO-E. The latter allows both considering the non-linearity of temperature impacts on electricity demand by the means of statistical models such as Logarithmic Smooth Transition Regression Models and correcting data for non-temperature related effects such as summer holiday or Christmas time effects.

For Austria, results reveal that climate change will lead to a significant reduction in electricity demand. Dependent on the climate scenario, the temperature induced change in consumption for the scenario period 2011-50 compared to the reference period 1961-90 lies between -7 % and -14 % for heating and between +37% and +144% for cooling (Figure 1). Assuming current consumption patterns, the net effect accounts to -270 GWh to -670 GWh, which equals -0.5% to -1.2% of the total electricity consumption. However, a temperature-induced demand reduction is even estimated when correcting for other factors than climate in assuming a rapidly growing cooling demand (higher market penetration, changes in behavior etc.) and a decreasing heating electricity demand (better insulation, change to other heating fuels etc.). While this also holds true for most other central European countries, patterns are different for South European countries and the Austrian electricity systems might be heavily affected by a strong increase in Italian electricity demand for cooling purposes in summer. Altogether, a cross-country comparison heavily suggests that climate is not the main driver for the amount of electricity used for heating and cooling purposes, but it is energy policy.

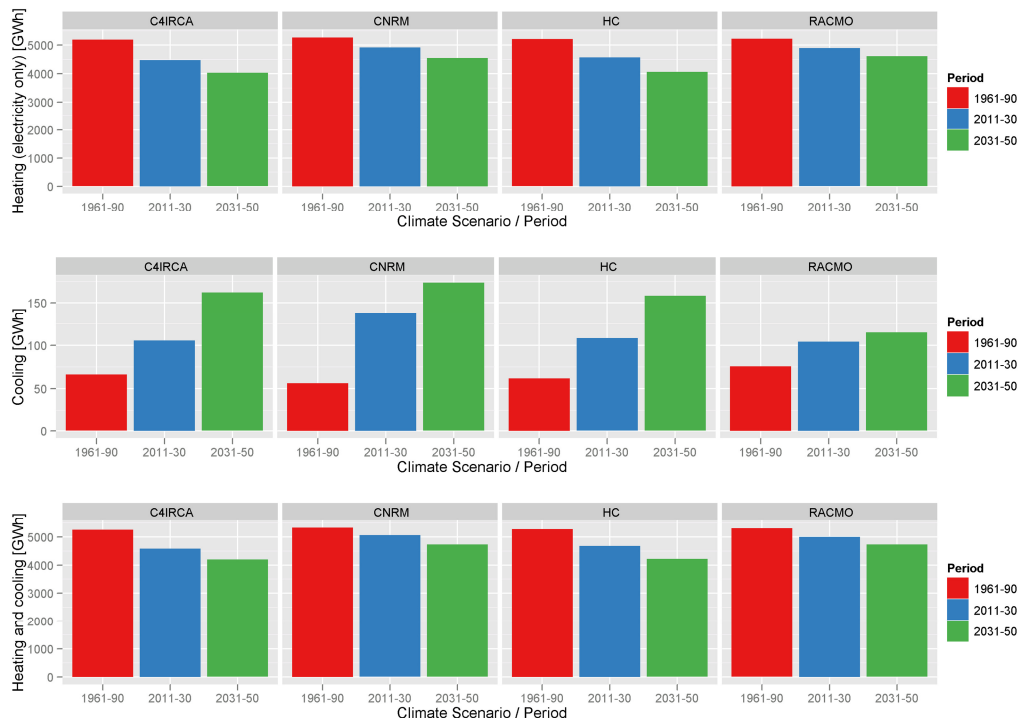


Figure 1: Climate induced change in annual electricity use for heating and cooling services in Austria

¹Wegener Center for Climate and Global Change, University of Graz (WegCenter/UniGraz), Leechgasse 25, A-8010 Graz, Austria, Phone: +43-316-380-8446, Fax: +43-316-380-9830, christoph.toegelhofer@gmail.com, www.wegcenter.at, http://www.uni-graz.at/igam7www_eladapt.htm, * Main Author: Dr. Christoph Töglhofer (<30 Years).

²Joanneum Research, Centre for Economic and Innovation Research, Leonhardstraße 59, 8010 Graz, franz.prettenhaler@joanneum.at, www.joanneum.at/policies