ENERGY TRANSITION: HOW TO MODEL THE BENEFITS OF BEHAVIORAL SHIFTS?

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Overview

Current policies to combat climate change fail to put Canada and Quebec on a path that is compatible with the achievement of their targets (whose objective is to limit global warming to 2°C by 2100). The measures envisaged today do not respond to the urgency of the situation: the technological solutions considered are insufficient and too expensive to carry out an energy transition in due course. On the other hand, changes in human behavior are seldom, if at all, integrated into energy policies, whereas they could reduce the cost of the transition [1–3].

Methods

In this study, we integrate behavioral shifts in the North American TIMES Energy Model (NATEM). NATEM is an energy sector optimization model. Its optimizations are based on the minimization of the different costs of the technologies, taking into account the final energy demands, the physical resources and the limits fixed by the energy policies [4]. This study proposes two ways of introducing behavioral shifts in the model: modeling a shift in consumption (reduction of final energy demand) and modeling a shift in demand with cross-priced elasticities (allowing a consumer to change his way to consume) [5,6]. These developments aims to quantify how changes in human behavior can have an impact on the energy transition of a region. These developments are currently implemented in the transportation sector and compared to two others scenarios: a “technology disruptive” scenario, in which a wide range of technological choices (thanks to the introduction of disruptive technologies) is available; and a “constraint on greenhouse gases (GHG)” scenario, in which the levels of GHG are limited by 80% in 2050.

Results

The preliminary results show that with a technological disruption only, the model chooses individual hydrogen and electric vehicles, without considering public transportation. With a constraint on the final level of GHG, choice is determined by the level of GHG constraint, and greater levels of hybrid, electric and biofueled individual cars are implemented in 2050. As for the introduction of a behavioural shift, the model should propose a switch between modes (especially on a long term horizon), differentiating short and long distances.

Conclusions

These firsts results tend to show that behavioral shifts can be introduced in an optimization model such as NATEM. The results also suggest complementarity of technological and behavioral shifts. It seems that a technological disruption alone is not enough to achieve the environmental objectives; and that in the same way, a behavioral shift only in the transportation sector modifies the way of consuming, but does not make it possible to reach the objectives without technological support.

References

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