

Development of Market Penetration for High Energy Efficiency Technologies in Alberta's Residential Sector

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Abstract : Market penetration of high energy efficiency technologies has key impacts on energy consumption and GHG mitigation. Also, it will be useful to manage the policies formulated by public or private organizations to achieve energy or environmental targets. Energy intensity in residential sector of Alberta was 148.8 GJ per household in 2012 which is 39% more than the average of Canada 106.6 GJ, it was the highest amount among the provinces on per household energy consumption. Energy intensity by appliances of Alberta was 15.3 GJ per household in 2012 which is 14% higher than average value of other provinces and territories in energy demand intensity by appliances in Canada. In this research, a framework has been developed to analyze the market penetration and market share of high energy efficiency technologies in residential sector. The overall methodology was based on development of data-intensive models' estimation of the market penetration of the appliances in the residential sector over a time period. The developed models were a function of a number of macroeconomic and technical parameters. Developed mathematical equations were developed based on twenty-two years of historical data (1990-2011). The models were analyzed through a series of statistical tests. The market shares of high efficiency appliances were estimated based on the related variables such as capital and operating costs, discount rate, appliance's life time, annual interest rate, incentives and maximum achievable efficiency in the period of 2015 to 2050. Results show that the market penetration of refrigerators is higher than that of other appliances. The stocks of refrigerators per household are anticipated to increase from 1.28 in 2012 to 1.314 and 1.328 in 2030 and 2050, respectively. Modelling results show that the market penetration rate of stand-alone freezers will decrease between 2012 and 2050. Freezer stock per household will decline from 0.634 in 2012 to 0.556 and 0.515 in 2030 and 2050, respectively. The stock of dishwashers per household is expected to increase from 0.761 in 2012 to 0.865 and 0.960 in 2030 and 2050, respectively. The increase in the market penetration rate of clothes washers and clothes dryers is nearly parallel. The stock of clothes washers and clothes dryers per household is expected to rise from 0.893 and 0.979 in 2012 to 0.960 and 1.0 in 2050, respectively. This proposed presentation will include detailed discussion on the modelling methodology and results.

Keywords : appliances efficiency improvement, energy star, market penetration, residential sector

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