



Natural Resources Canada

**Using Discrete Choice Experiments in
Energy Program Evaluations:
The Case of EnerGuide**

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EnerGuide Evaluation: Presentation Overview

- Background
- Study Objectives
- Methodology
 - Consumer survey
 - DCT Analysis
- Results
- Conclusions



Background

- 1997
 - Canada's Auditor General recommended that NRCan's Office of Energy Efficiency improve the performance reporting information of its energy efficiency initiatives by:
 - **estimating the energy and greenhouse gas (GHG) emissions impacts of its programs, and**
 - **linking the GHG impacts of its programs to Canada's climate change commitments**



Response from NRCan

- 1999
 - The Office of Energy Efficiency successfully addressed the Auditor General's requirements
 - Indicated our commitment to addressing the challenging question of program attribution:
 - Defined as effects that can be solely attributable to a program
- 2001
 - Two studies commissioned
 - CIPEC
 - **EnerGuide for Equipement**



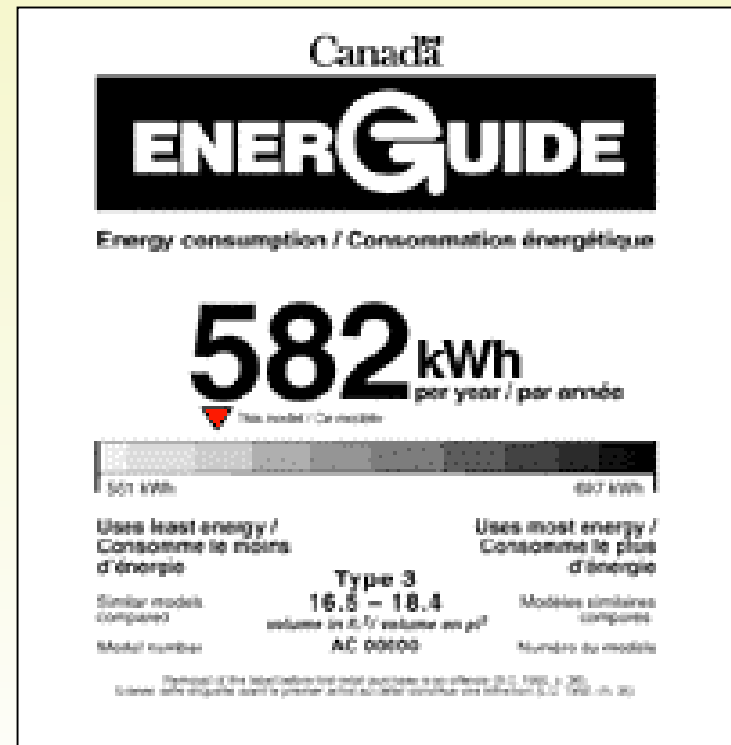
Study Objectives

- Estimate the percentage of overall market effects attributable to EnerGuide
- Develop/apply discrete choice methodology
- Quantify impact of EGE on energy savings and GHG reductions



EGE Program

- EnerGuide labelling introduced (1978) to increase energy efficiency and reduce energy demand
- The EnerGuide label:
 - Annual Energy consumption for the product
 - Relative energy consumption within the relevant appliances class



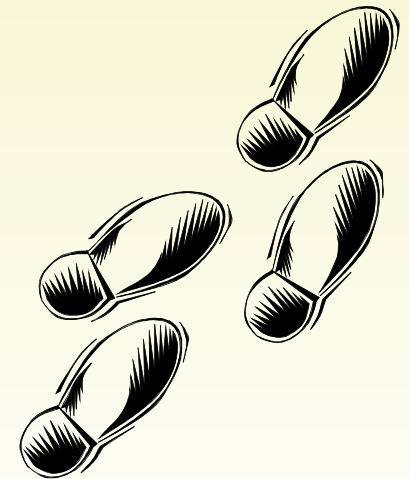
EGE Program Rationale

- Program rationale is based on premise that there are significant market barriers that can be addressed through labelling
 - Inadequate knowledge about energy efficiency
 - Lack of information on appliance energy consumption
- The program encourages consumers to
 - Purchase more energy efficient appliances
 - Use these appliances in the appropriate manner



Consumer Survey: Study Approach

- Step 1. Assess consumer views of purchase factors
- Step 2. Define experimental design and alternative choice scenarios
- Step 3. Measurement of preferences
- Step 4. Estimate program attribution
- Step 5. Estimate program impact



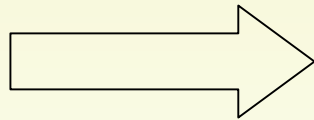
Step 1. Assess consumer views of purchase factors

- Two Focus Groups: Montréal and Toronto
- Purchase Factors identified
 - Price of the Appliance
 - Types of appliances
 - Consumption levels
 - Energy prices



Step 2. Define experimental design and alternative scenarios

- Goal - Replicate the appliance purchase process in a controlled setting where access to the EnerGuide label could be controlled (one-half were shown the label)
 - The appliance models in the survey varied by:
 - Appliance type (2), level of energy consumption (2), appliance price (2)
 - Two prices of energy



16 possible alternatives

- Respondants were asked to rank the appliances in order of preference
 - « None of the alternatives » was among choices

Step 3. Measurement of preferences

- Telephone recruit followed by mail back survey - 1074 completions on 1400 mail outs
- Variables for the consumer logit model

Variable	Description
Appchoice	Choose minimum or higher efficiency appliance (0 or 1)
Label	Respondent is not shown or is shown EnerGuide label (0 or 1)
Elecprice	Current or twice current electricity price (cents per kWh)
Caprice	Difference in capital cost between minimum efficiency and high efficiency models (dollars)
Income	Household income (thousand dollars)
Education	Highest education level converted to years (years)



Results of Step 4: Estimating program attribution

- Net effect:
Logit model partial effects associated with the labelling program
- Gross effect:
Average share of those selecting the most efficient appliance in choice set

	Net	Gross	Net to Gross
Refrigerators	.078	.639	.122
Freezers	.055	.354	.155
Clothes Washers	.100	.435	.229
Clothes Dryers	.133	.465	.286
Dishwashers	.094	.822	.114
Electric Ranges	.113	.623	.181



Results of Step 5.

Estimating program impact

- Demand side impact =
total demand impact * demand net to gross ratio

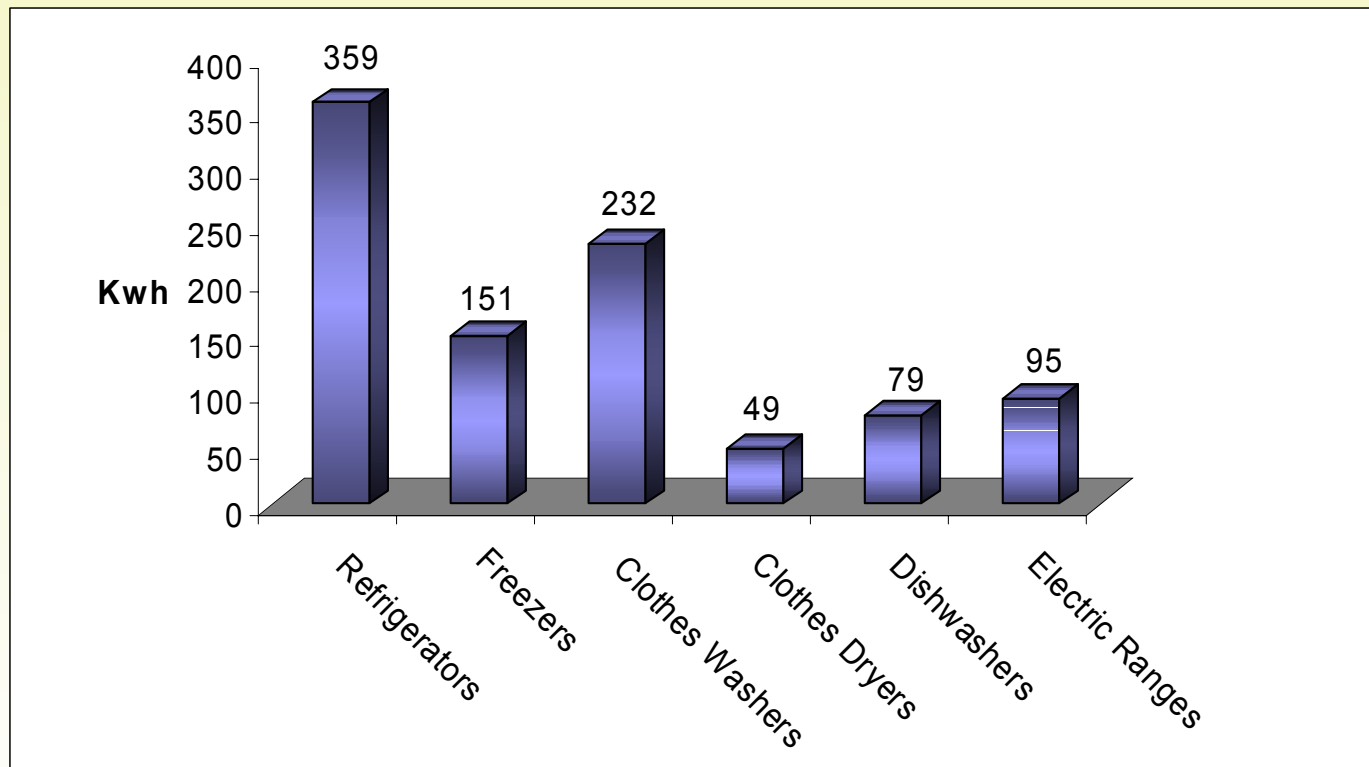
	Total Demand For Efficient Appliances ('000 units)	Net/ Gross Ratios	Net Demand For Efficient Appliances ('000 units)
Refrigerators	524.3	0.122	64.0
Freezers	131.0	0.155	20.3
Clothes Washers	322.0	0.229	73.7
Clothes Dryers	201.9	0.286	57.7
Dishwashers	226.2	0.114	25.8
Electric Ranges	238.1	0.181	43.1
Total	1653.5	-	284.6



Results of Step 5.

Estimating program impact

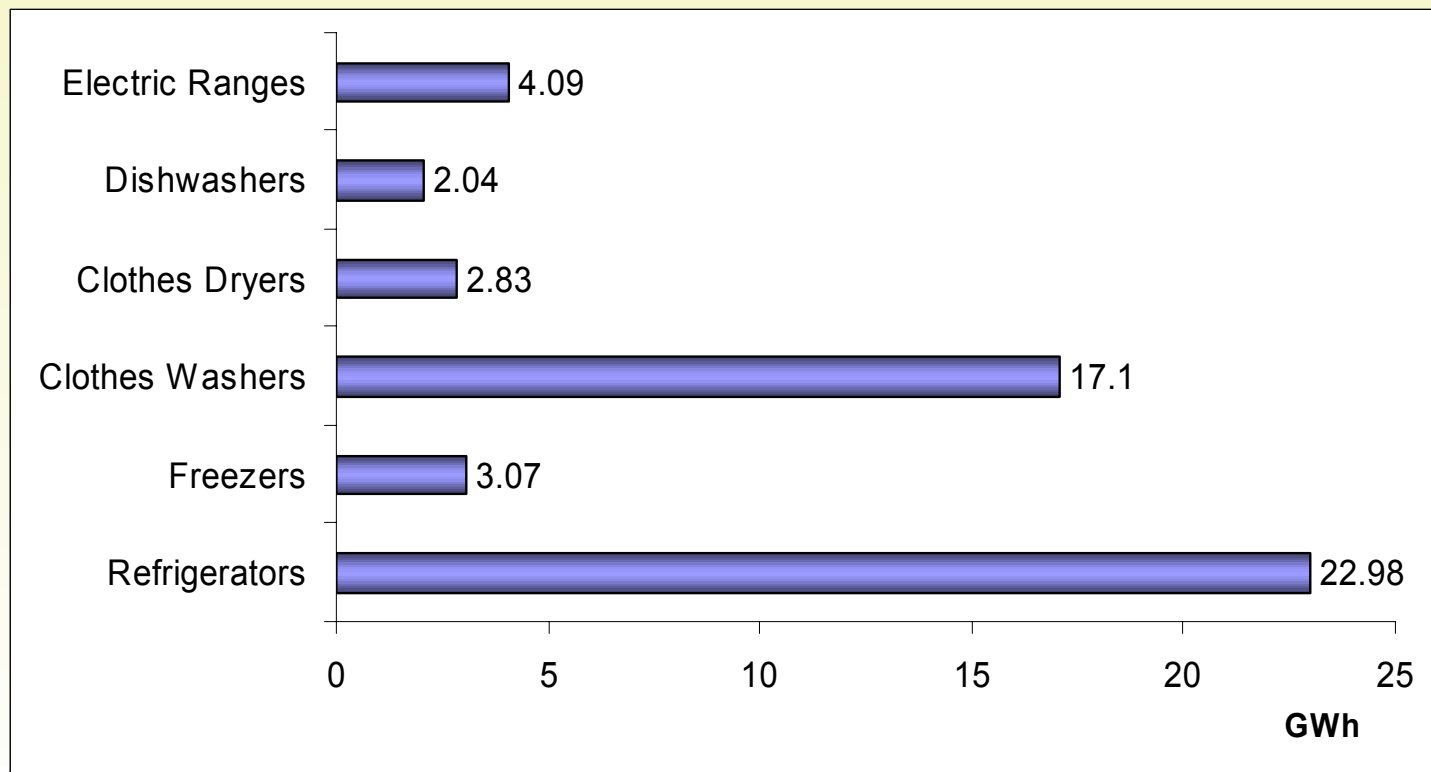
- Savings per Unit in 2000
 - Estimated from the distribution of appliances by consumption levels



Results of Step 5.

Estimating program impact

- Demand Side Energy Savings in 2000



Conclusions

- Choice experiments are a feasible and valid method
 - Particularly when:
 - No pre-program baseline established
 - Poor respondent recall on purchasing behavior exists
 - There are difficulties associated with establishing a control group – when everybody is exposed to the EnerGuide Label
- DCT provides a powerful and potentially unifying methodology for the evaluation of energy conservation programs



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