



Using Behavioral Research at BC Hydro

Ken Tiedemann
Iris Sulyma
Marc Pedersen

Power Smart Evaluation

Overview

- Role of Behavioral Research
- Residential End Use Survey
- Psychographic Segmentation
- Business Behavioral Panel Survey
- Lessons Learned

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Role of Behavioral Research

- Research on energy conservation has been dominated by an **engineering economics** paradigm, in which agents adopt technologies and practices which are cost effective
- Analysis of opportunities typically proceeds by estimating life cycle costs and assuming that the technologies and practices with the best **life cycle costs** will be the ones adopted
- The rich **behavioral literature** on how customers actually make decisions on choice of technologies has had, until recently, relatively little impact on conservation policies

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Behavioral Measurement Framework

Cultural change encompasses a complex set of factors surrounding energy use & conservation

- **Planned action model**, where respondent attitudes, norms & constraints determine energy conservation **choices** and adoption of **behavior**
- **Adoption model**, where the conditions surrounding decisions and actions, and the capacity and commitment of respondents determine energy conservation **choices** and adoption of **behaviors**
- These relationships can be modeled / estimated using data on respondent attitudes, norms, constraints, behavior, consumption, engineering algorithms, end-use UECs

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Three Key Measurement Elements

- **Residential End Use Survey (REUS)**
 - > Behavioral segmentation
 - > Evolving to include more **behavioral elements by end use**
- **Psychographic Segmentation**
 - > Market can be most effectively segmented using **k-means** clustering analysis
 - > Criteria are measurable, accessible, differentiable and actionable
- **Behavioral Panel Survey**
 - > Initially to support the Conservation Potential Review (CPR)
 - > Both residential and commercial behaviors addressed
 - > Evolving into ongoing **tracking** surveys

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Residential End Use
Survey

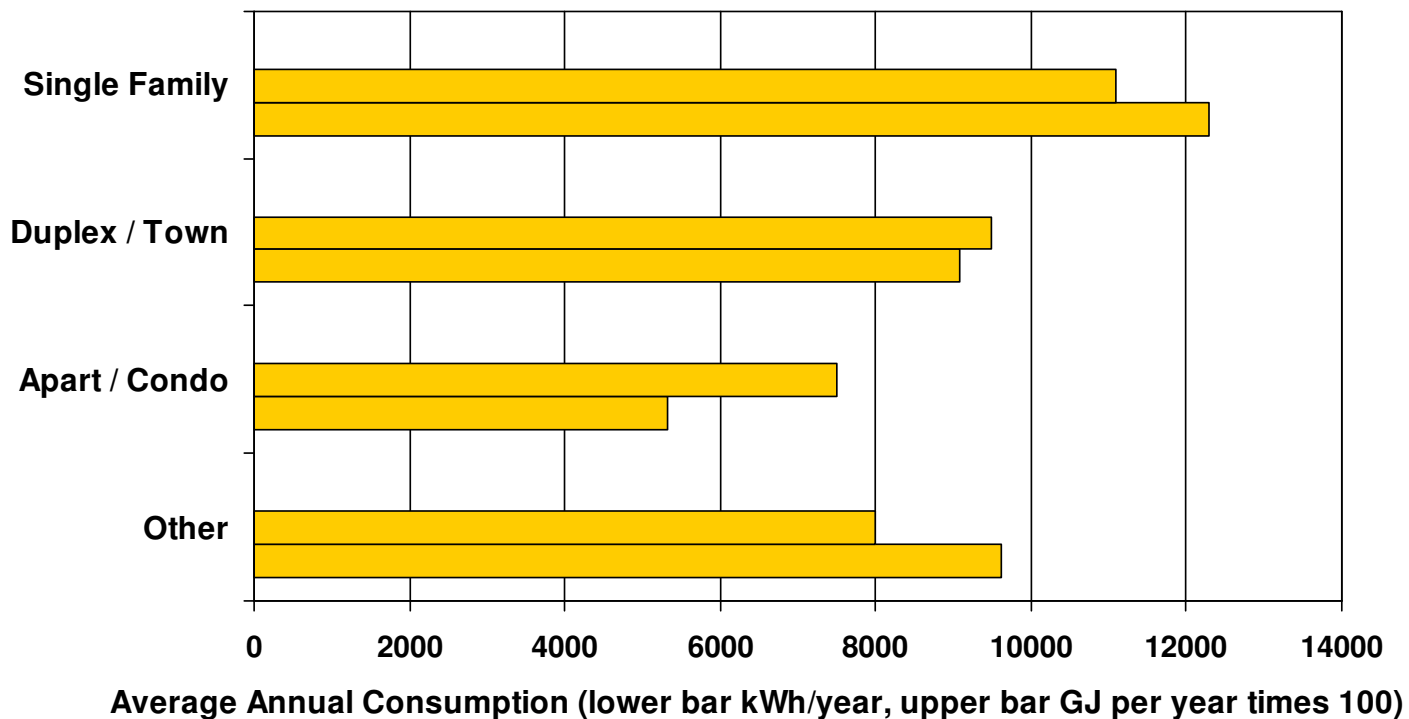
Residential End Use Survey Scope

- Purpose of this **biannual** study is to collect, and **track** over time, detailed information on
 - > home and household characteristics
 - > customer attitudes, opinions, norms and behaviors pertaining to energy use
- The **information is used for:**
 - > residential DSM program planning
 - > segmentation
 - > load forecasting
 - > DSM program evaluation
 - > reporting to the Board and BC Utilities Commission

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Energy Consumption by Dwelling Type

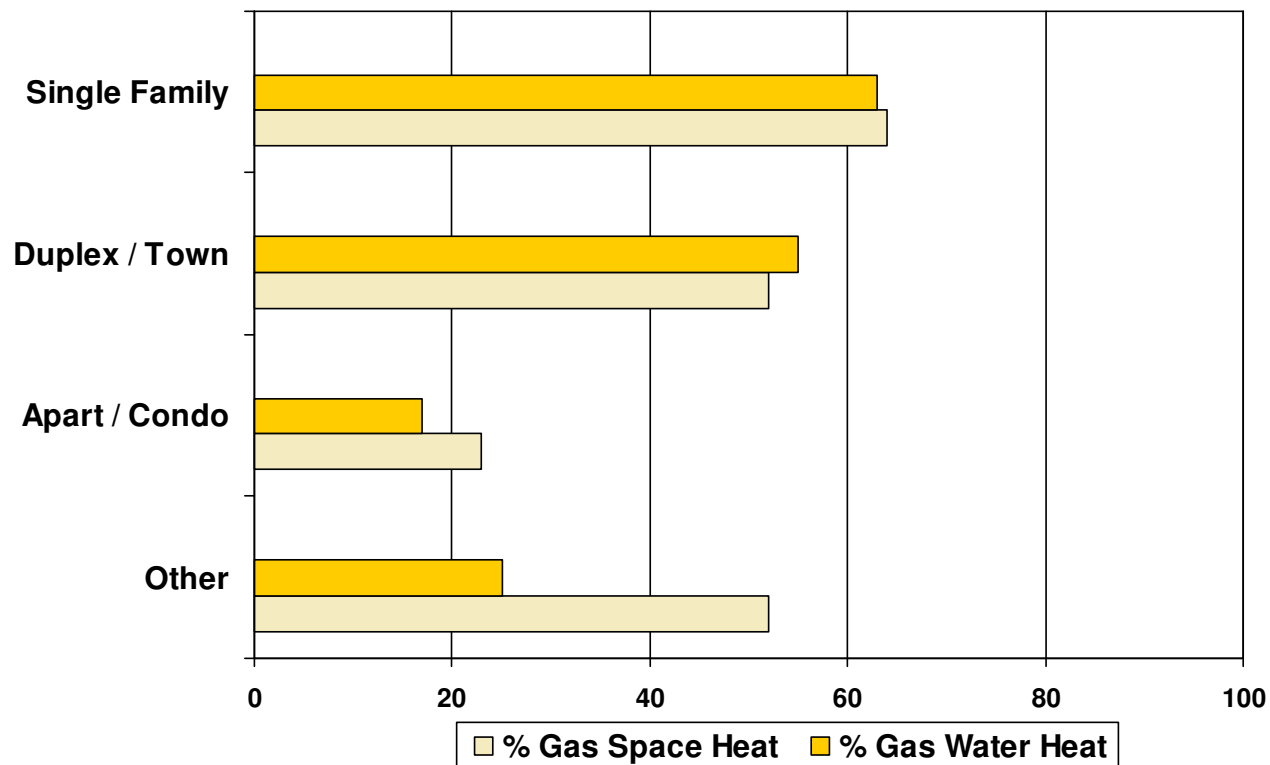
Annual electricity consumption varies from 5,300 kWh for apartment type units to 12,300 kWh for single family dwellings while annual natural gas consumption varies from 75 GJ for apartments and 111 GJ for single family dwellings



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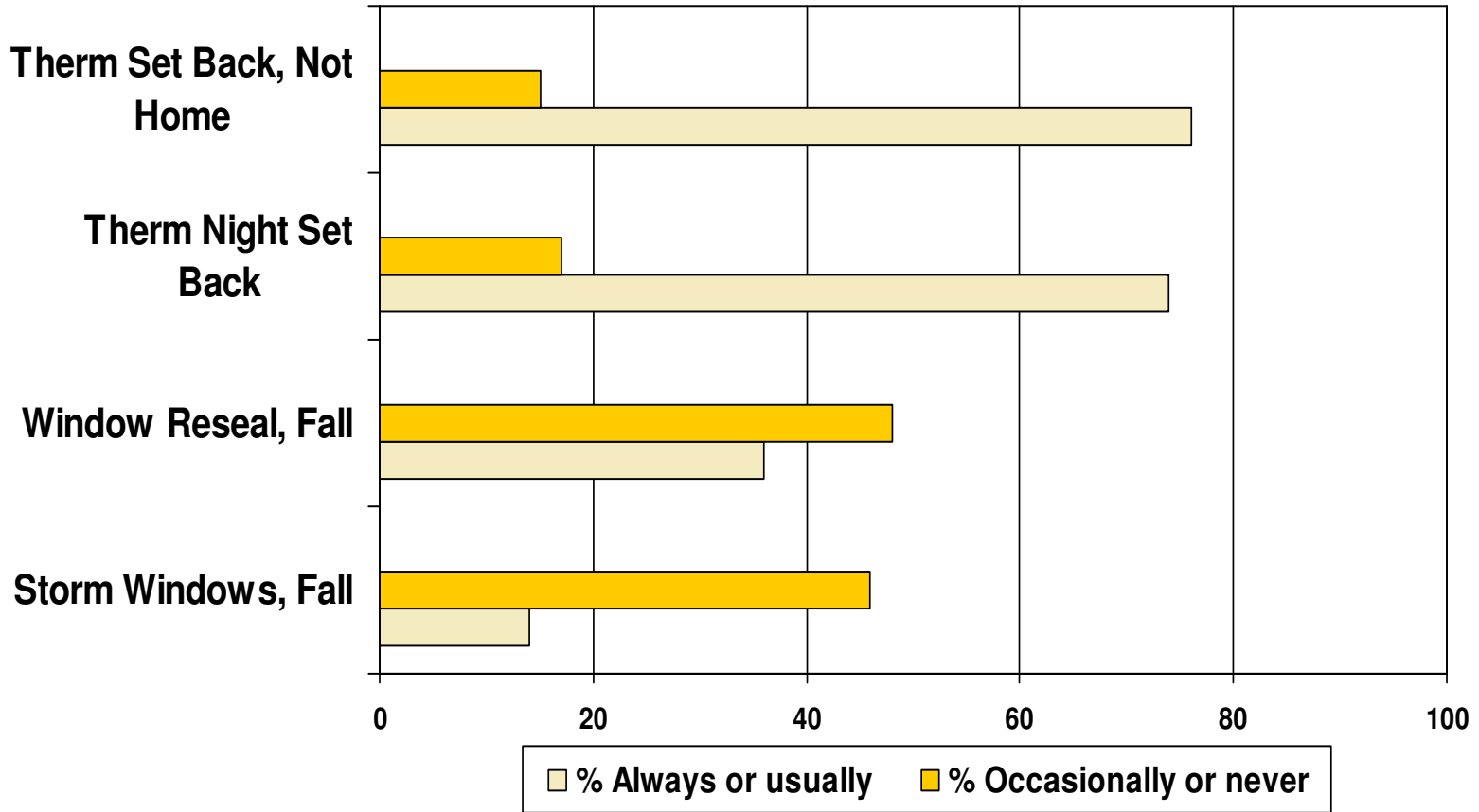
Main Heating Fuels (%)

Electricity is the space and water heating fuel of choice for apartments because of lower capital costs \Rightarrow implications for future loads, as apartments are the majority of the new housing stock



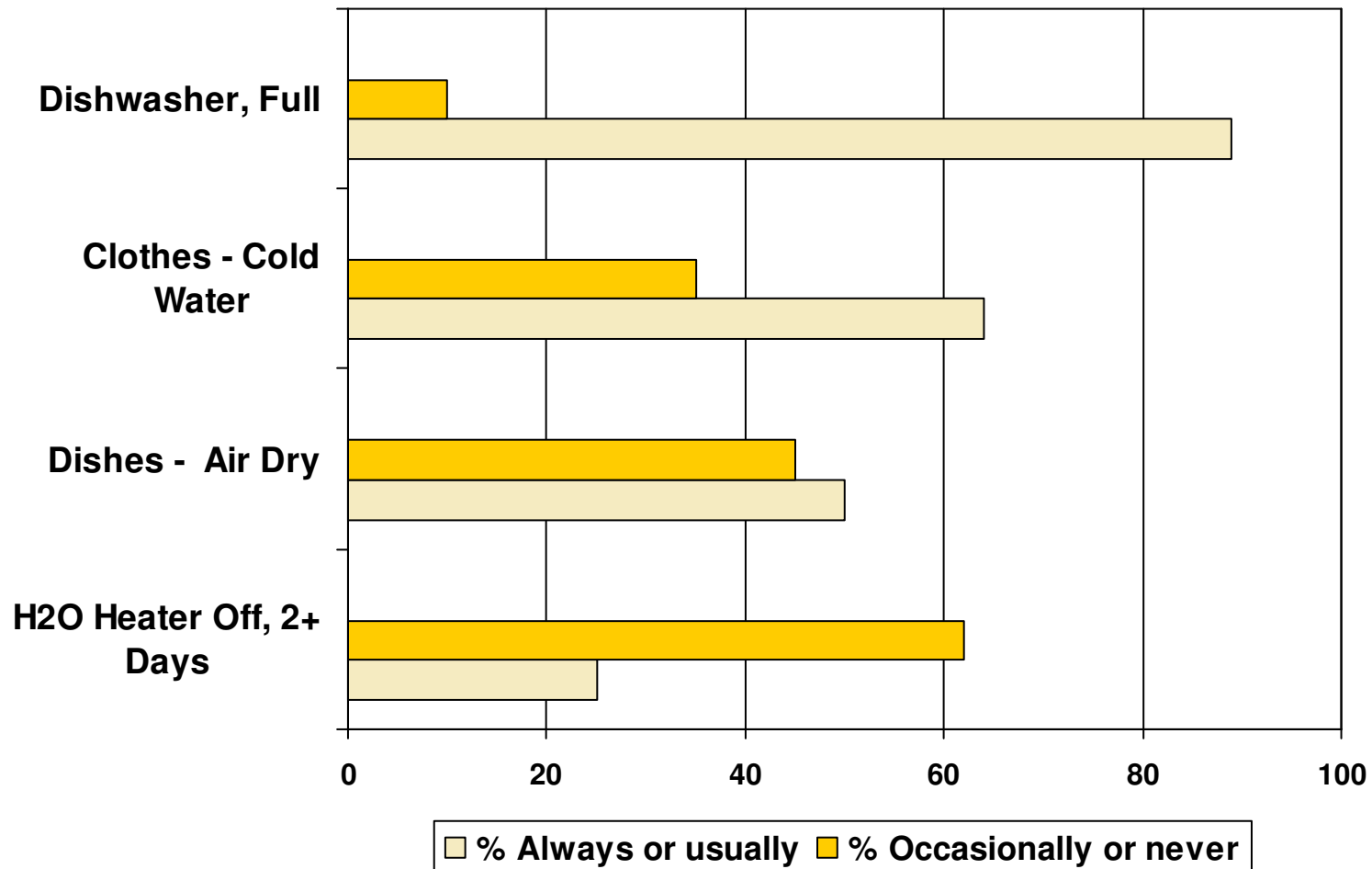
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Space Heating Behaviors (%)



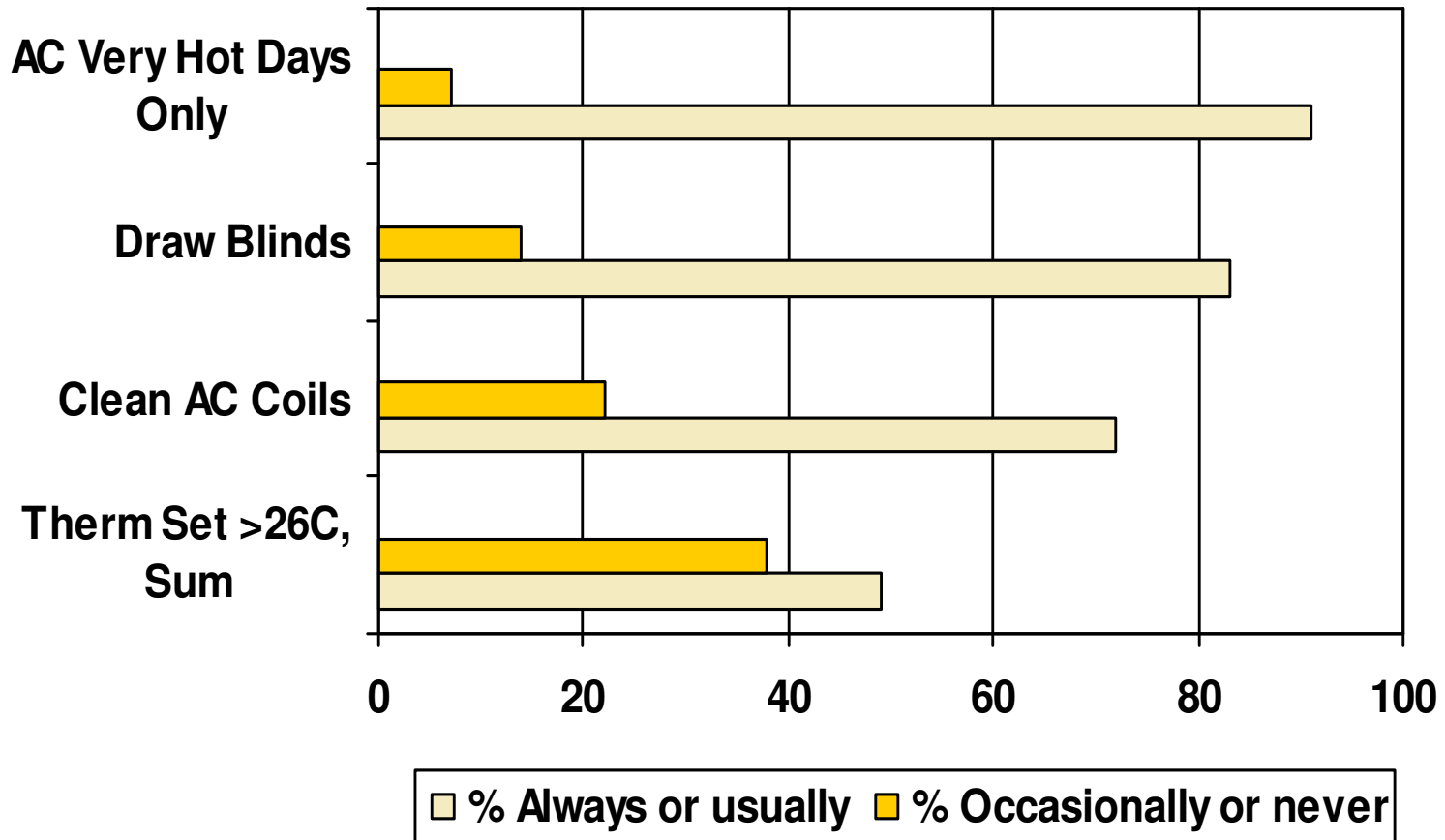
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Water Heating Behaviors (%)



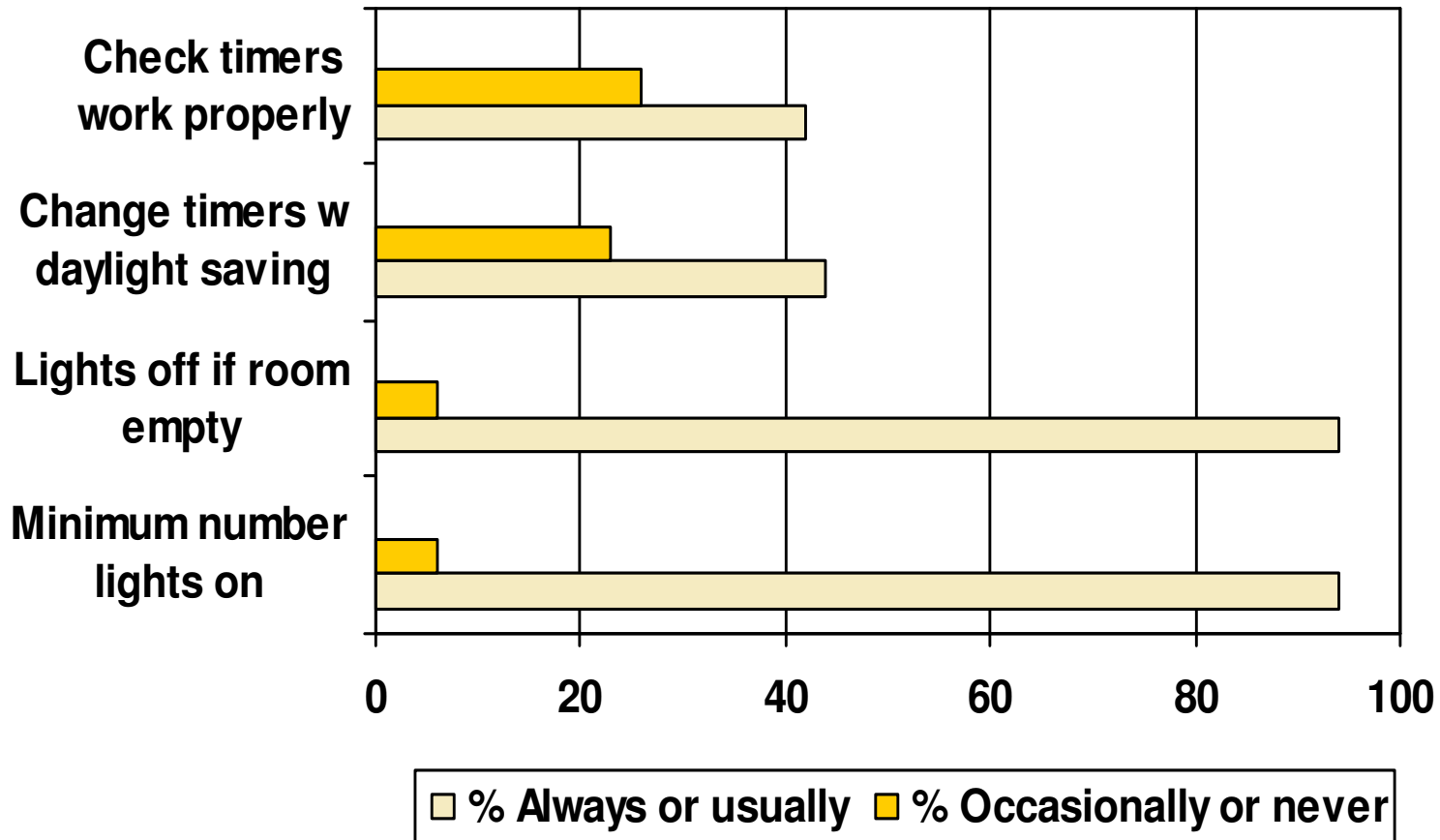
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Space Cooling Behaviors (%)



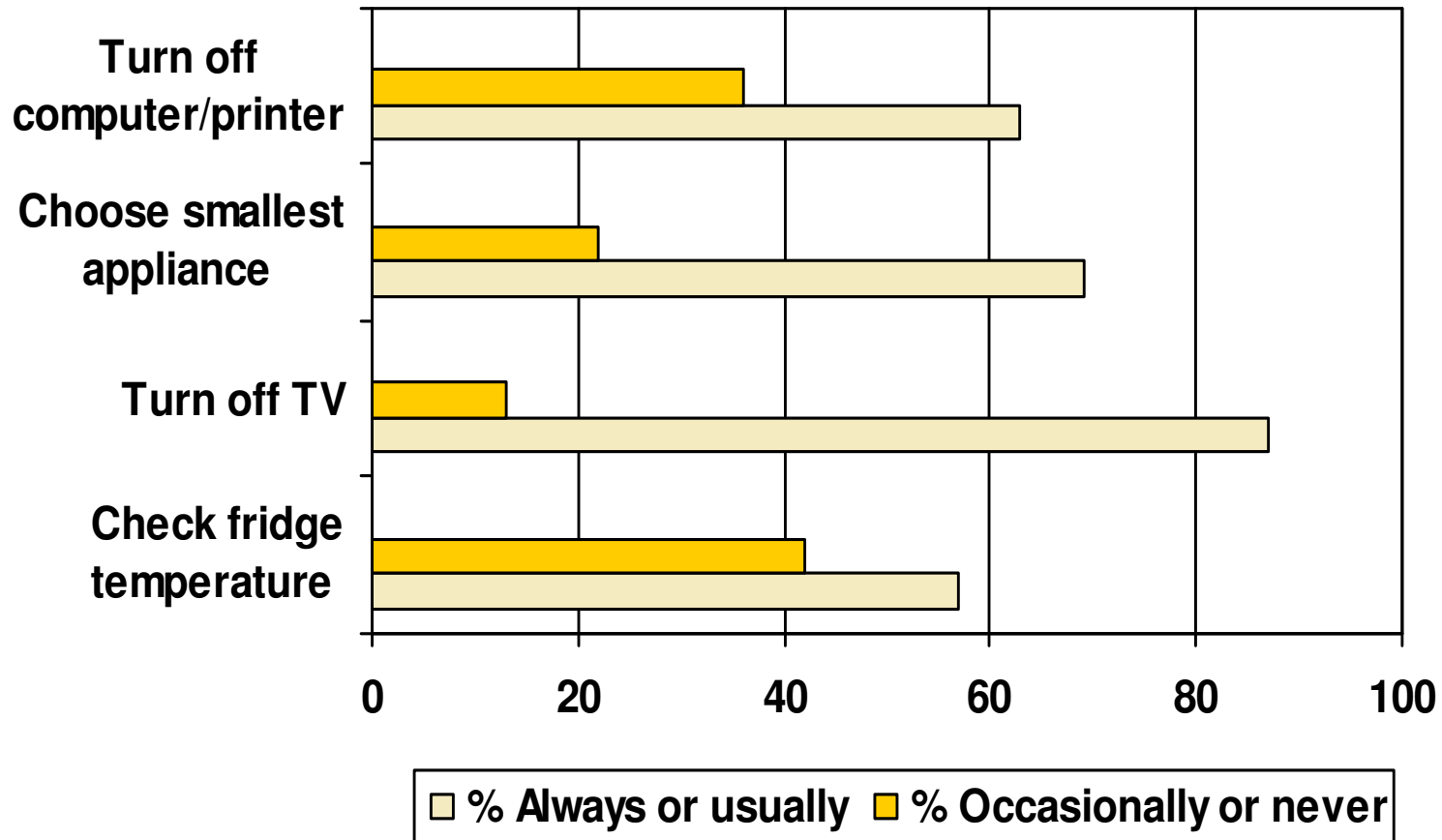
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Lighting Behaviors (%)



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Other Behaviors (%)



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Psychographic
Segmentation

Psychographic Segmentation

- Purpose of this **psychographic segmentation** is to classify residential customers on the basis of their conservation ethic
 - > segmentation based on bill payer's attitudes and behaviours as they relate to electricity, conservation and the environment
 - > segments are then profiled on basis of their demographics, household characteristics, end-uses, electricity consumption
- Data collected in June 2006 and analyzed using advanced **k-means statistical software**
 - > total of 4,338 surveys were used (2,995 mail and 1,343 internet)
 - > sample weighted to population on basis of regions/housing types
 - > 33 dimensions were used in developing the segments using ClustanGraphics Focal Point clustering analysis
 - > six cluster (segment) solution had just 235 unclassified cases

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Psychographic Segments

- **Tuned-out & Carefree (13%)**
 - > Disengaged, located at undesirable end of conservation spectrum
 - > Highest billed consumption controlling for housing size and so on
- **Stumbling Proponents (20%)**
 - > Conflicted in sense that energy use behaviours do not follow their positive attitudes to energy conservation
 - > Among worst offenders for not undertaking simple actions
- **Comfort Seekers (9%)**
 - > Again conflicted in that behaviours do not follow positive attitudes
 - > Actions around space heating and cooling behaviours best described as lackadaisical

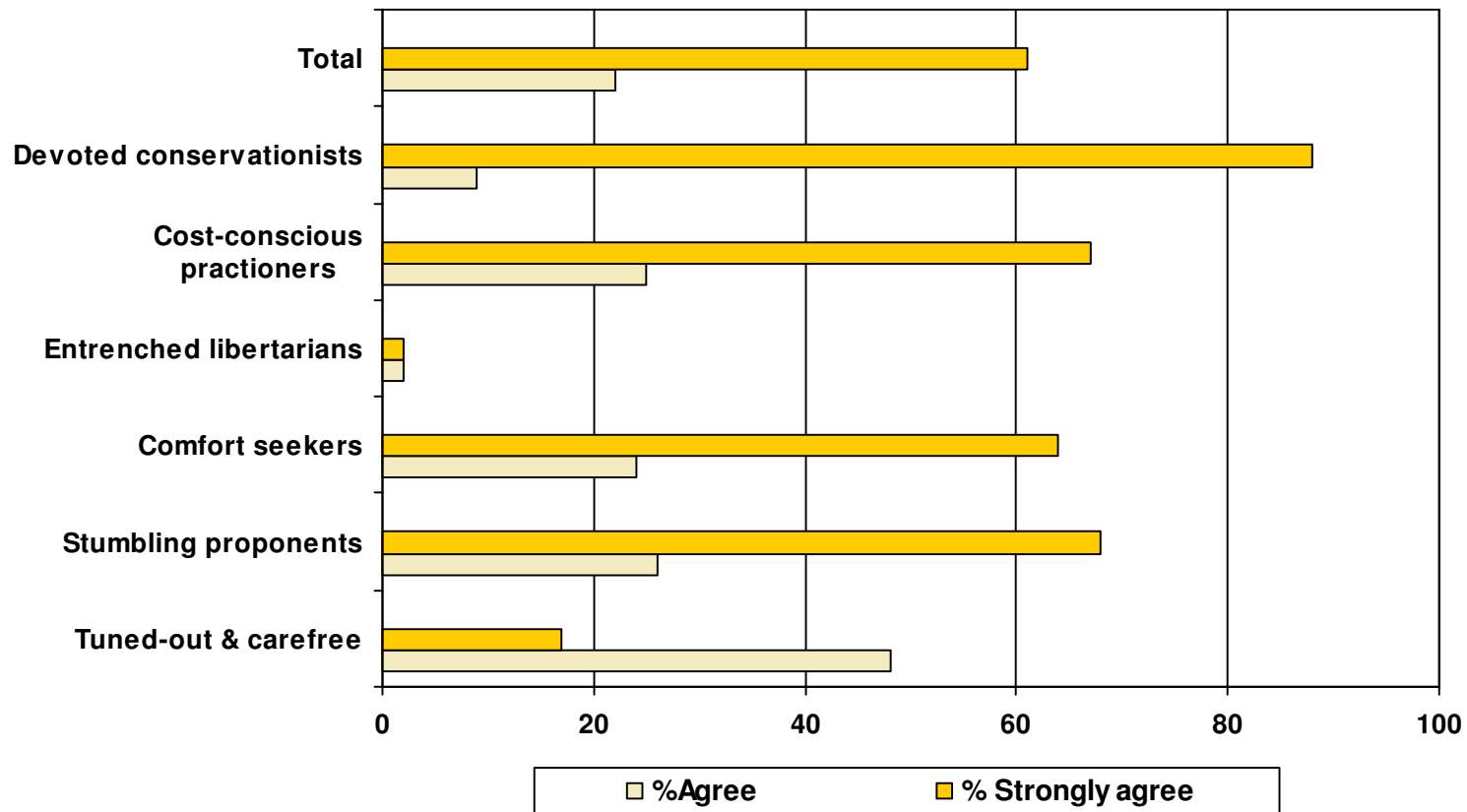
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Psychographic Segments

- **Entrenched Libertarians (5%)**
 - > Off side with idea that customers have moral obligation to conserve, that efforts can have big effects, or home use affects environment
 - > Actual energy behaviours (as opposed to attitudes) are quite good
- **Cost Conscious Practitioners (22%)**
 - > Don't talk about energy conservation as much as some other segments
 - > Conservation behaviours are second best for this group
- **Devoted Conservationists (26%)**
 - > Attitudes, behaviours and actions are best for this group
 - > Actual energy use is lowest of six segments

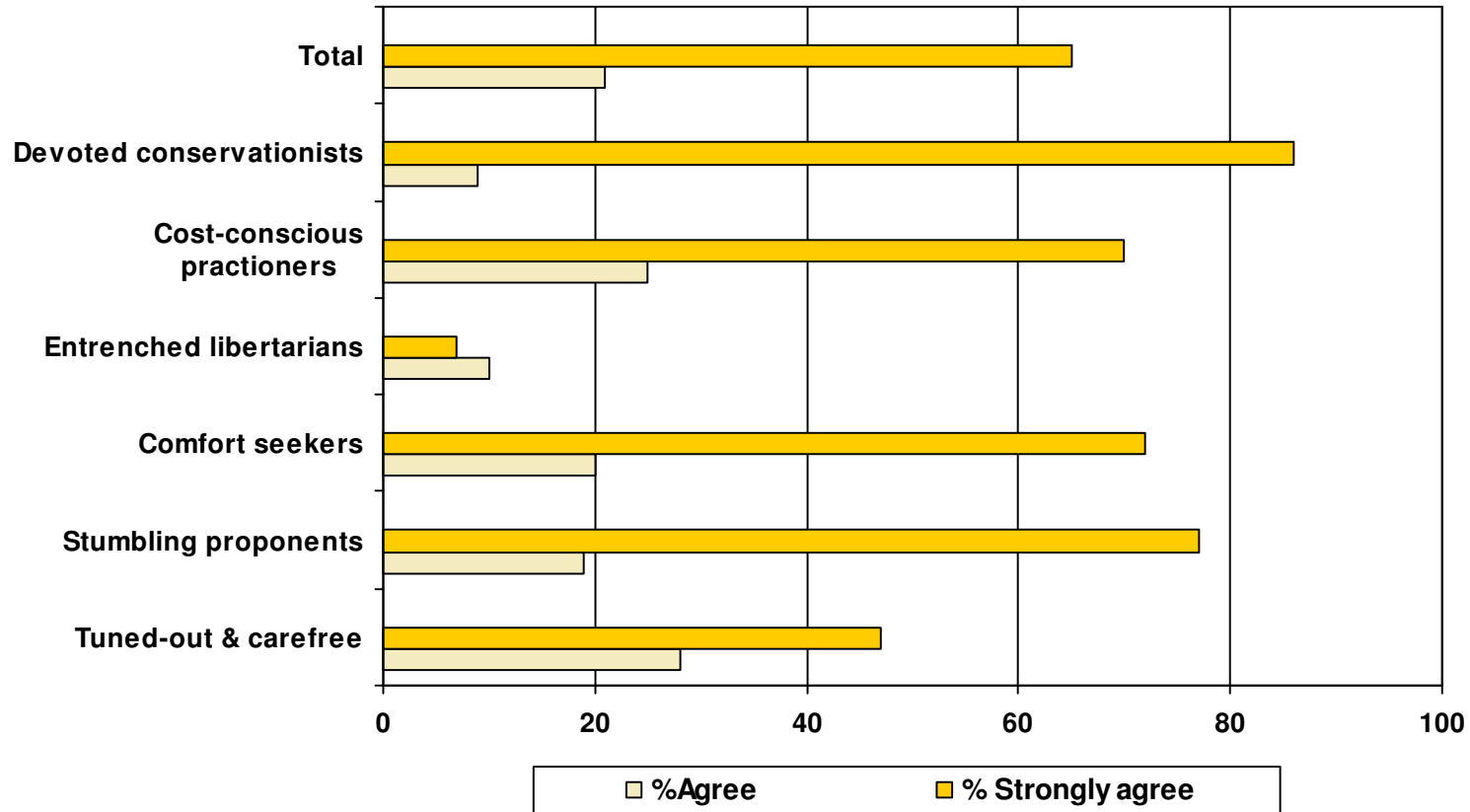
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Moral Obligation: Regardless of whether it makes a difference, everyone has moral obligation to do the best they can to conserve energy



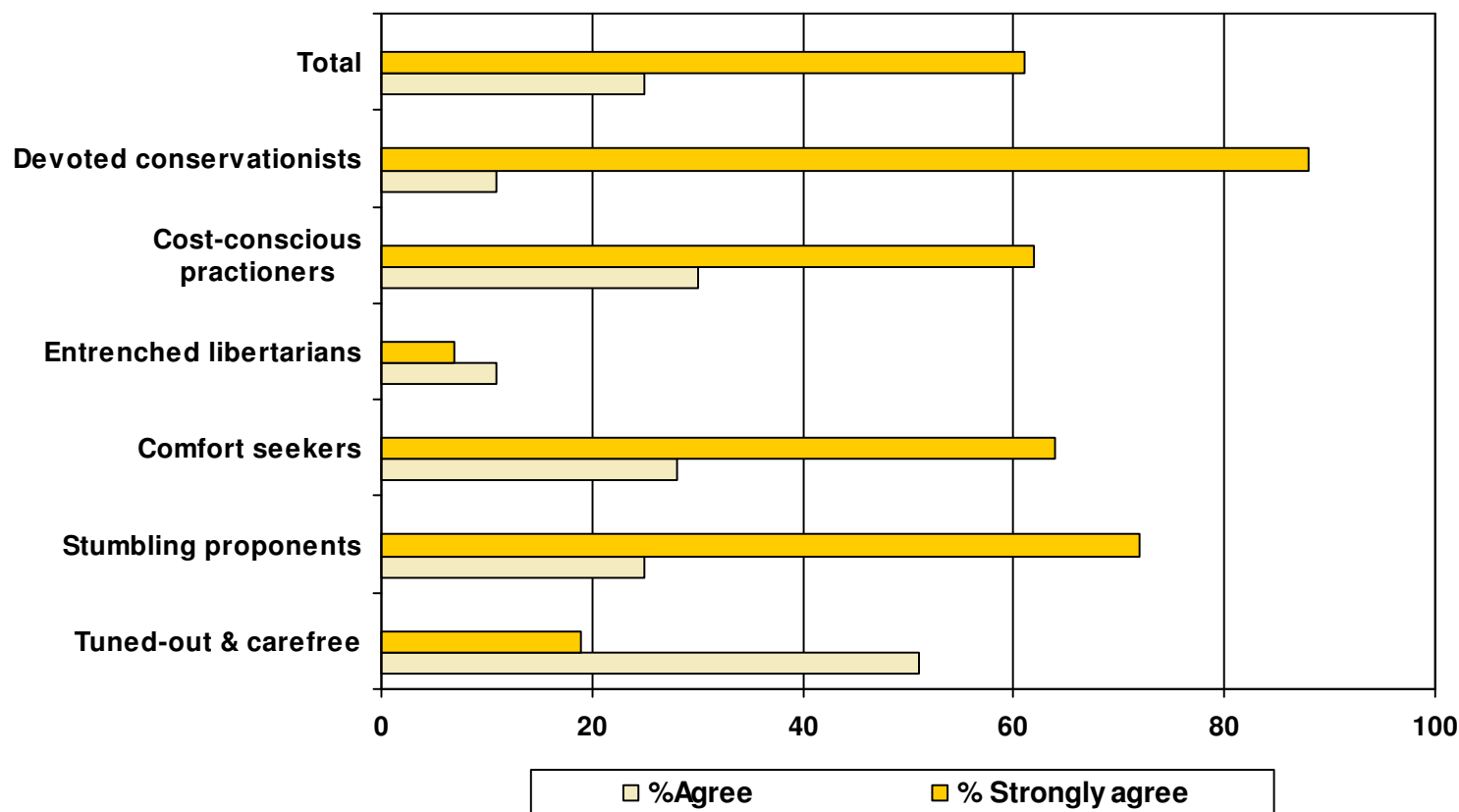
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Make a Difference: If many people conserved, we could make a big difference overall



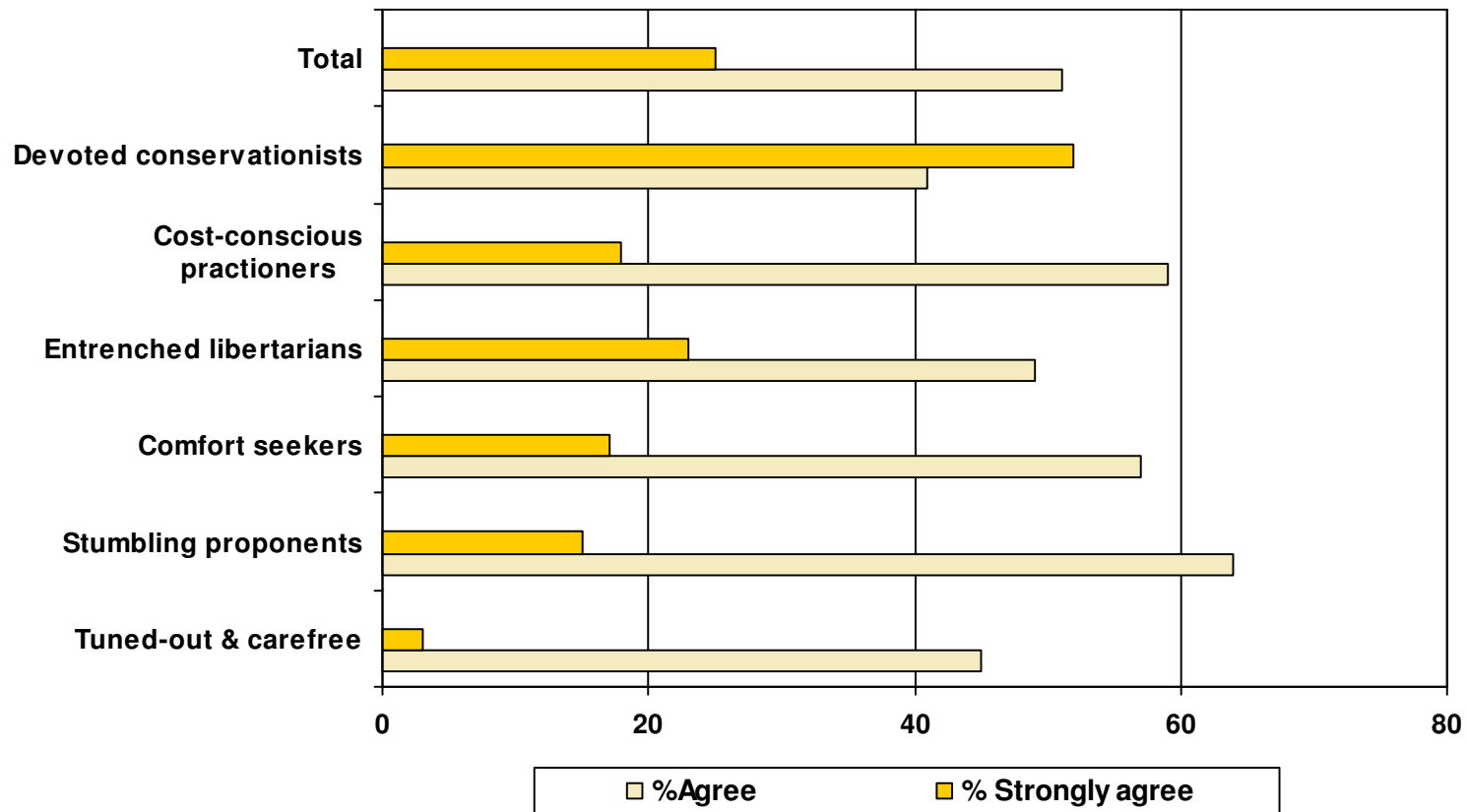
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Home Energy Efficiency: By making my home energy efficient, I am helping do my part for the environment



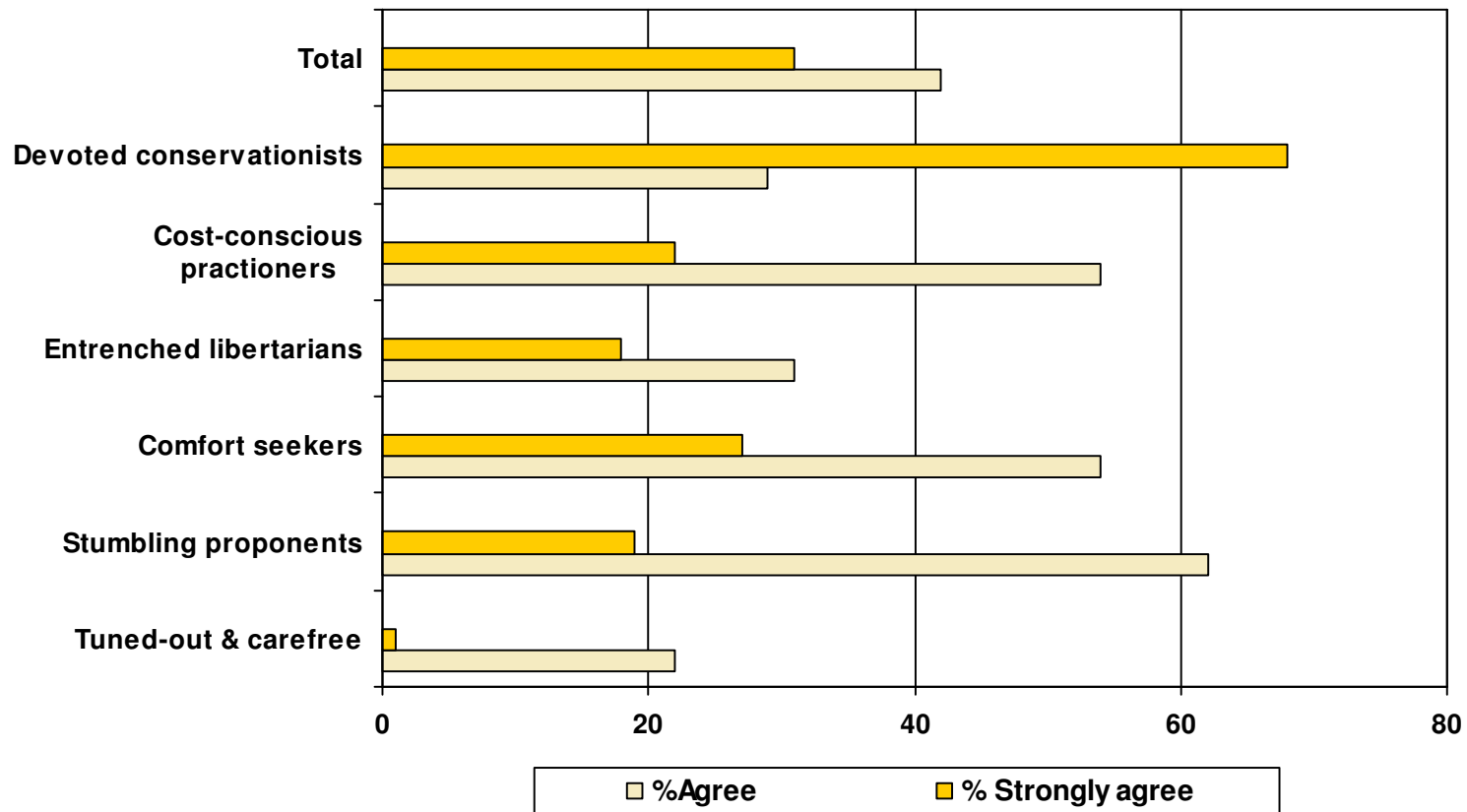
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Energy Efficiency Knowledge: I am knowledgeable about ways to save electricity around my home



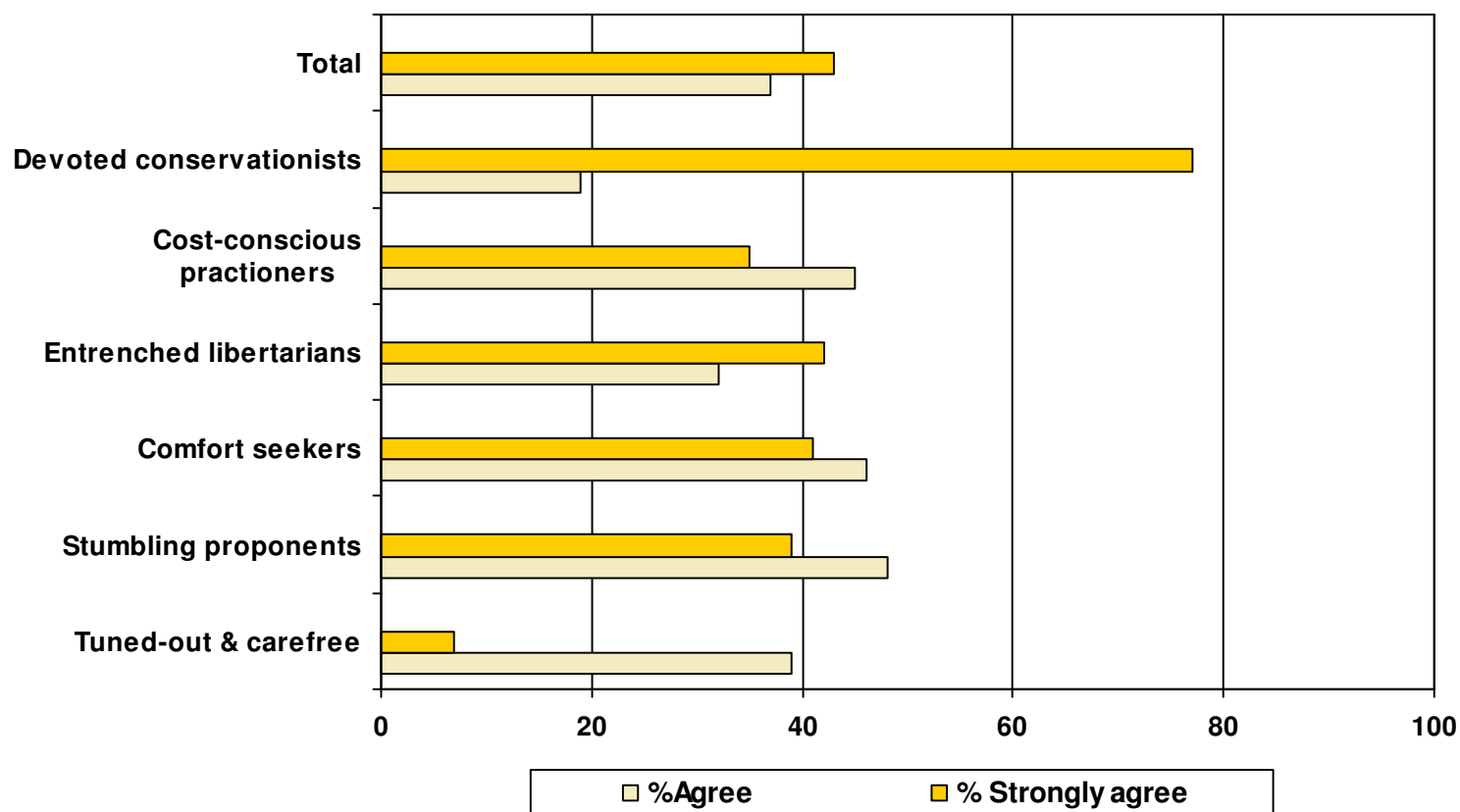
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Energy Efficiency Practitioner: I am an active energy conserver who looks for opportunities to save energy



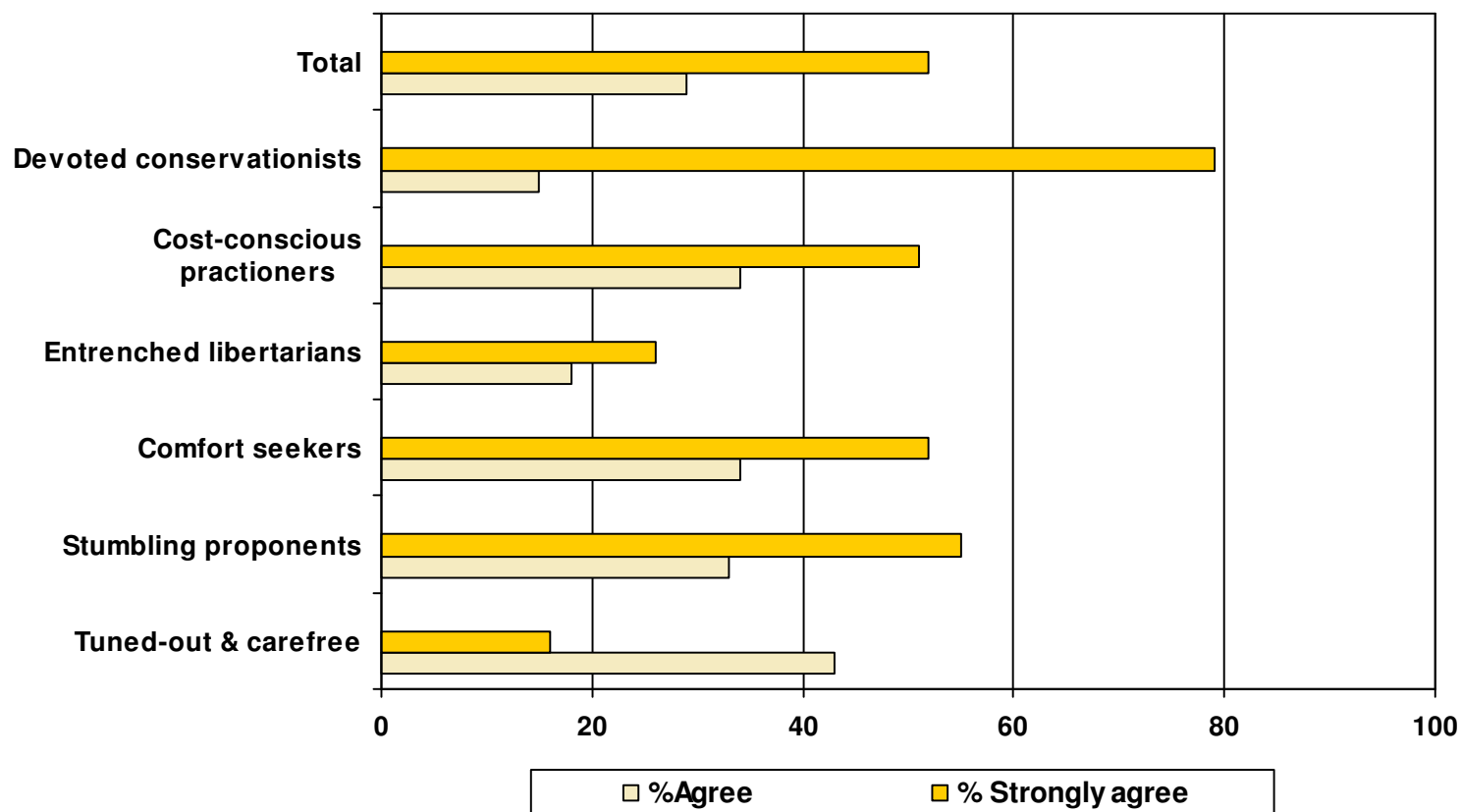
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Appliance Purchases: When buying a new appliance, energy consumption is an important consideration in the decision



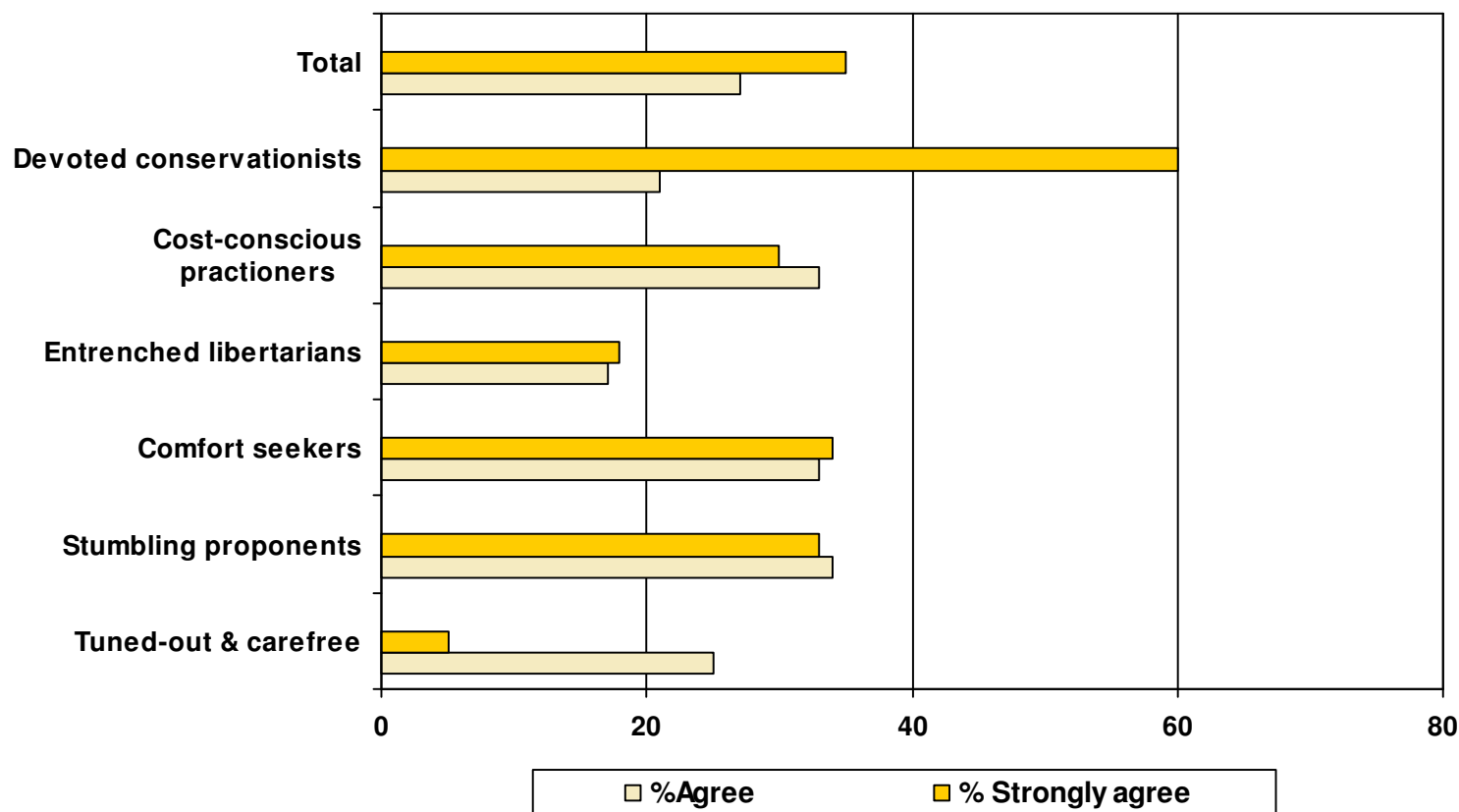
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Conserve to Mitigate Imports: Willing to do my part to reduce my usage of electricity to reduce imports



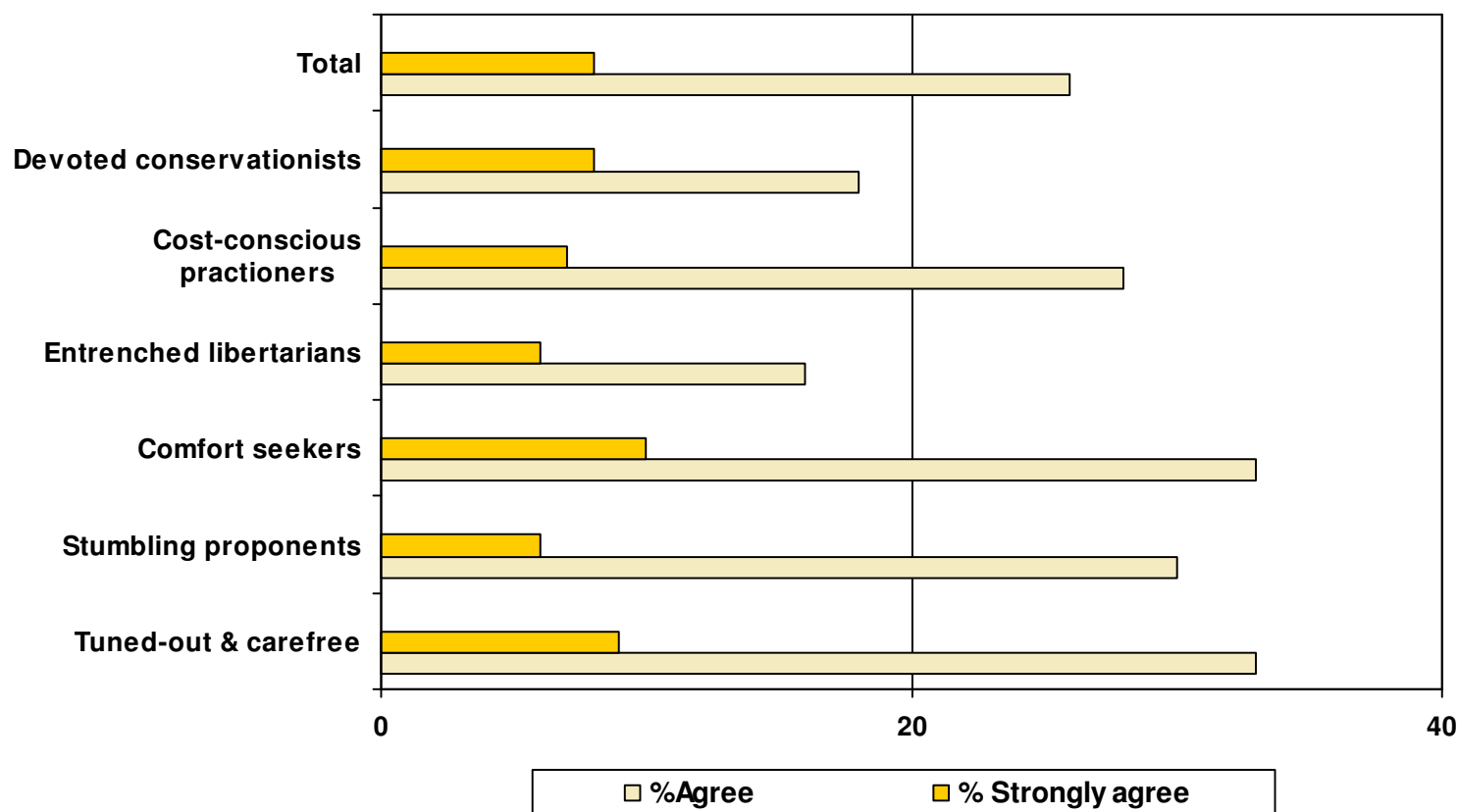
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Conserve to Mitigate Construction: Willing to reduce my usage of electricity to delay construction of new generation



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Too Hurried to Save: Always on the go with little time to research ways to save electricity in the home



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Business Behavioral
Panel

Business Behavioral Panel Survey: Scope

- The study was undertaken to support the behavioral component of the **Conservation Potential Review (CPR)** which aimed at assessing electricity energy and capacity savings available from:
 - > existing and emerging technologies
 - > operations and maintenance
 - > lifestyle
 - > alternative distributed energy sources
 - > fuel choice
 - > behavior

- Scope **included energy behaviors in homes and businesses**, but excluded operations and management activities in businesses because of potential overlap with the O&M component of the CPR, O&M is addressed in the Power Smart Commercial End Use Survey

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Behavioral Panel Survey: Methodology

- Project team developed a list of 24 residential behaviors and 18 business behaviors which significantly affect energy use
- Detailed survey instrument was developed and pre-tested, and then administered to sample of 1,000 respondents on a commercial internet panel for British Columbia
- Some 281 respondents also qualified for the business portion of the survey
- Included demographics, limited firmographics as relevant, capacity to perform an action, actions and behaviors performed, enablers and barriers

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Business Lighting

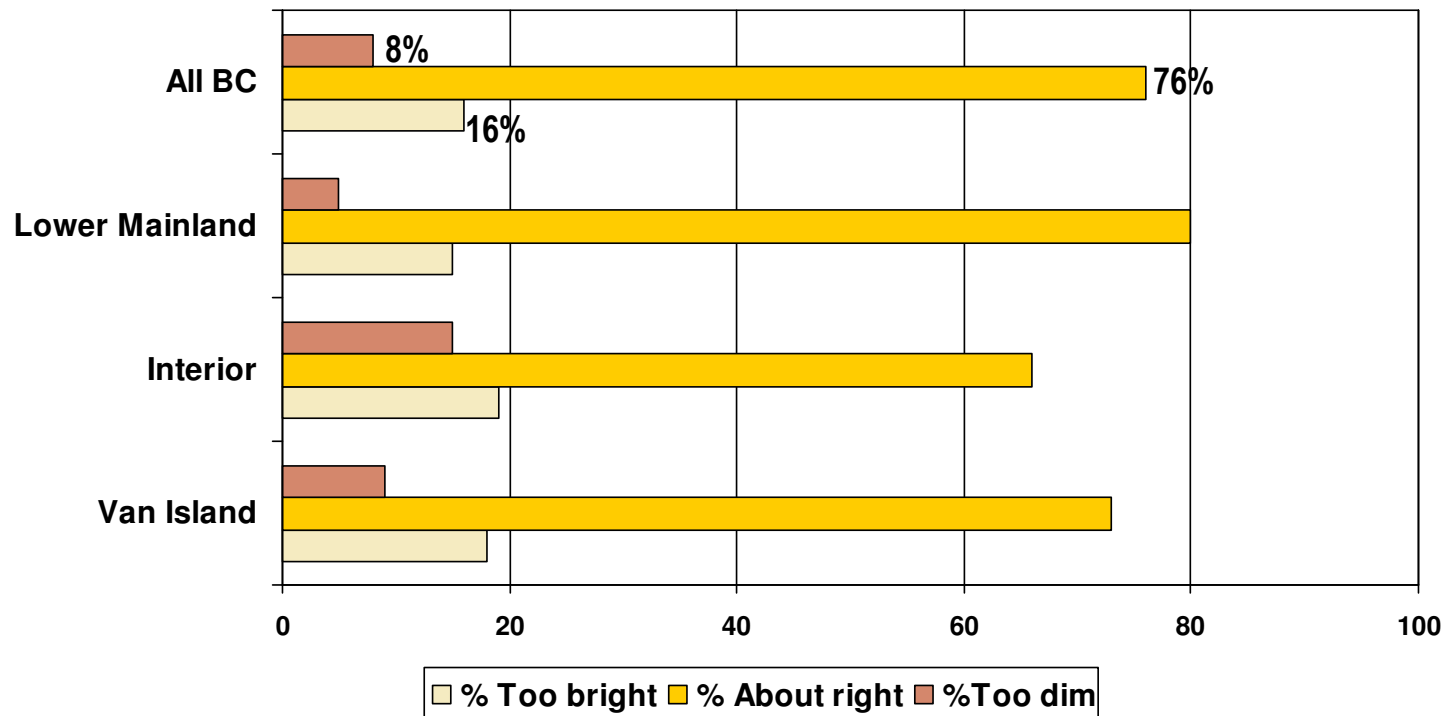
Our **adoption model** argues that adoption of conservation and energy efficiency actions and practices depends on:

- **Conditions** – refers to the typical; lighting situation in the work place, that is are light levels too bright, too dim or just right
- **Capacity** - refers to the capacity or capability of the respondent to undertake actions (behaviors) to modify or change the lighting conditions
- **Commitment** - refers to the frequency with which the respondent undertakes actions to modify conditions

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Lighting Conditions

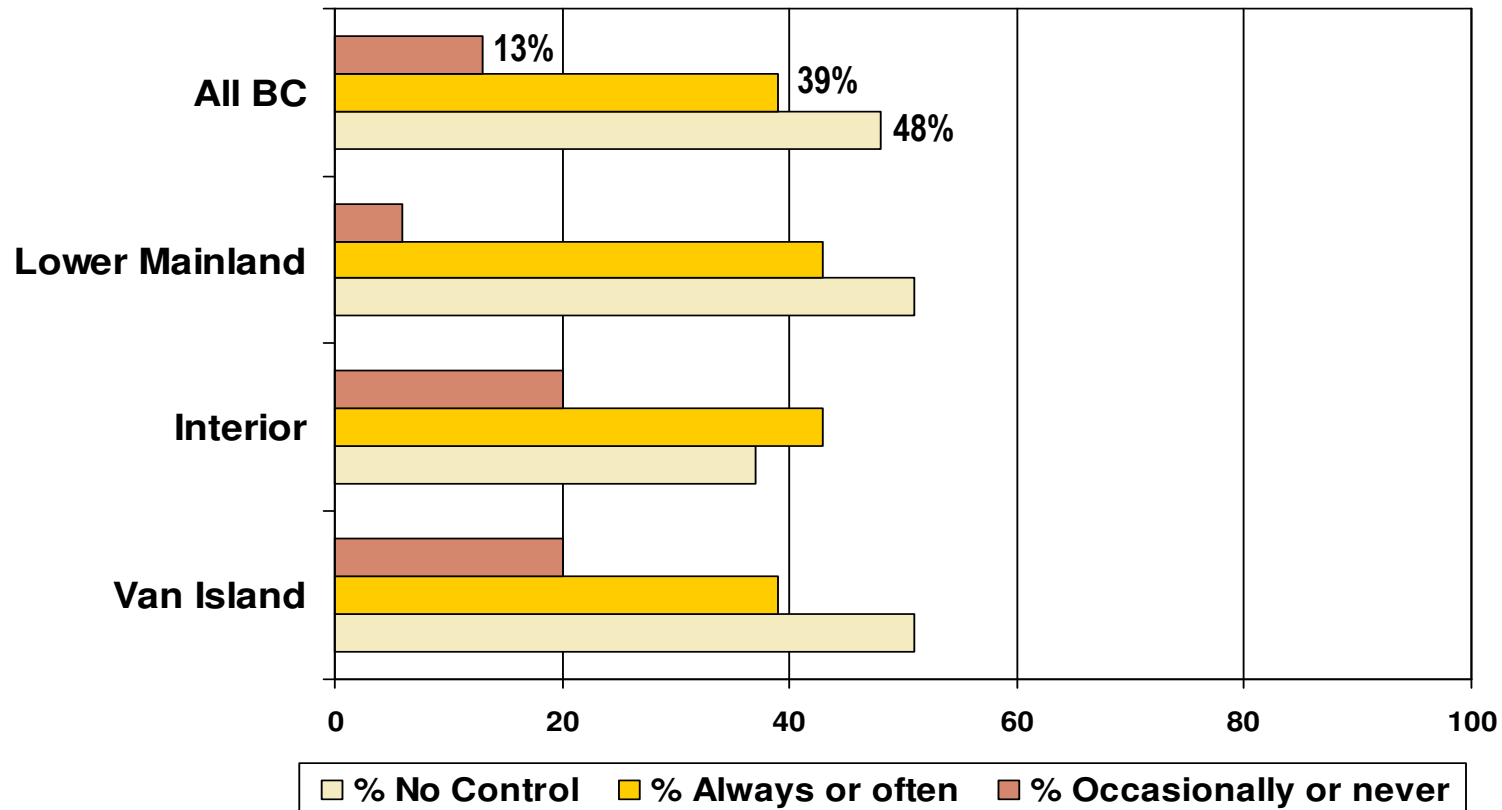
Appropriateness of Lighting Levels At Work (%)



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Use of Lighting

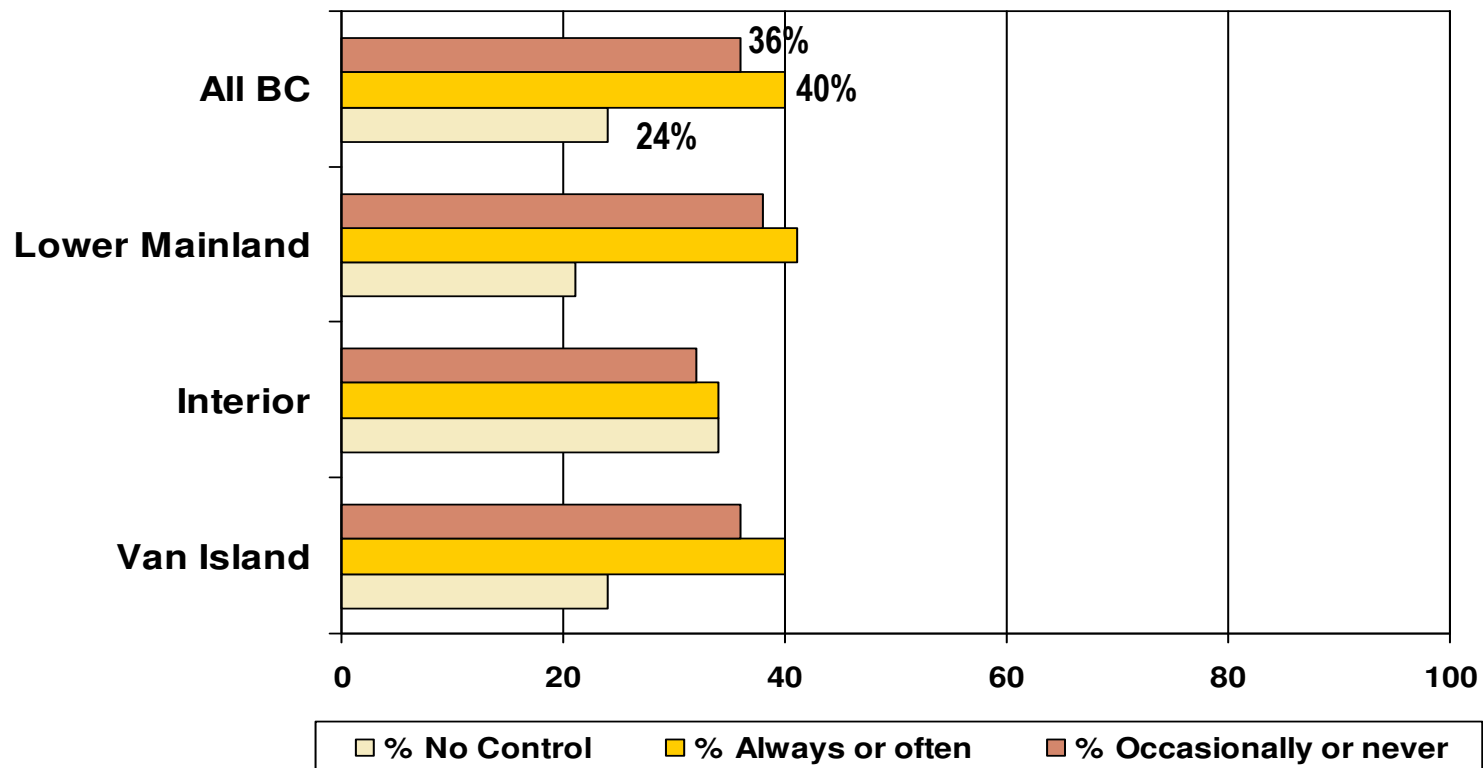
- Behavioral Target **13%** who said they only occasionally or never turned off lights



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Use of Day Lighting

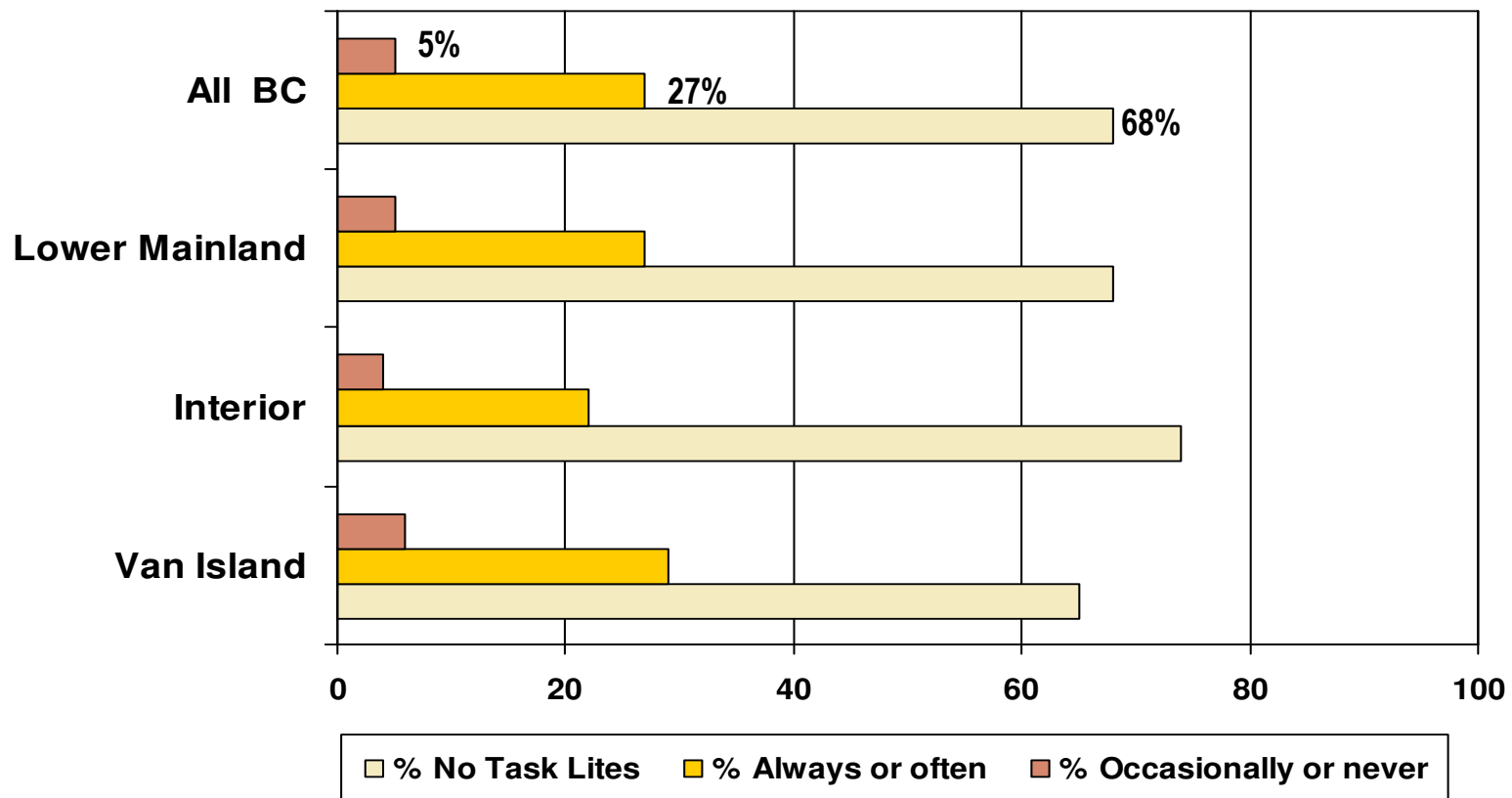
- Behavioral Target **36%** who said they only occasionally or never made use of day-lighting



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Use of Task Lighting

- Behavioral Target **5%** who said they only occasionally or never turned off task lighting



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Lighting Conditions, Capacity & Commitment

Percent (%) All Business Respondents

	Conditions % lighting levels about right	Capacity % with capacity to perform task	Commitment % doing the task	Behavioral Target % occasionally or never doing the task
Turn lights off	76%	52%	39%	13%
Day Lighting	76%	76%	40%	36%
Task lighting	76%	32%	27%	5%

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Business Lighting : Implications

- Even in an area as straight forward as business lighting, this research has useful implications
- About three-quarters of respondents state that lighting conditions are about right, and they may require a persuasive argument to consider change and get involved
- About one-half of respondents have no control over (main) lighting conditions, so campaigns aimed at reducing lighting use will need to target both O&M behavior and individual behavior
- Behavioral change might focus on the area with the greatest potential for change, such as greater use of day lighting

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Lessons Learned

Lesson 1: Conduct rigorous research on technologies and how they are used

- Conduct research on new technologies, products and programs to understand benefits and costs, customer acceptance and trade ally acceptance
- Estimating potential market share for a new technology, product or service is difficult, but risks can be mitigated by beginning with a pilot program designed as an explicit experiment which can be used to identify, understand mitigate issues that emerge
- Collaborate with other utilities, government bodies, and energy efficiency groups (CEE, ACEEE, AESP) to cost effectively leverage individual utility or government research efforts

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Lesson 2: Target program interventions at customer decision making points

- Focussed, purposeful and targeted communications is a key tool for engaging customers, and ignoring this can lead to poor program take up, lost opportunities and unhappy customers
- Target programs at customer decision points to maximize and leverage customer interest, maximize take up and improve cost effectiveness – programs targeted at the wrong customer or at the wrong time or place have little impact on purchase and use decisions
- Incentives are important but they are neither a necessary or a sufficient condition for a successful program

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Lesson 3: Use trade allies to build program support and delivery capability

- Trade allies are the key firms and individuals who offer energy using goods and services to residential and business customers
- Engaging trade allies is the key to program success, because they are the market actors who provide energy efficient lamps, appliances and equipment, efficient new and retrofit construction and advice on product choice and use
- Engage and leverage trade allies during program design, implementation and evaluation since trade allies have unique insights, implementation roles and impacts
- Information, education, training and incentives aimed at trade allies may be the best way to achieve market transformation in some markets

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Lesson 4: Go beyond customer satisfaction to understand needs, values, attitudes and behaviours

- Customer satisfaction information is important, but program planning and evaluation require a lot more than responses to routine customer satisfaction questions, even if they are benchmarked against other companies or programs
- Typically customers report that they are satisfied unless they run up against an issue such as unnecessary red tape, limited program offerings, poor communications or low incentive levels
- Going beyond customer satisfaction metrics is necessary to understand where true opportunities for increasing program reach and program impact lie
- Drill down to understand customer, needs, values, attitudes and behaviours at both the total market and the segment level

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