

# Econ 366 – Energy Economics

Fall 2012

Residential Energy Demand:  
CBEDAC studies

# The Effects of Price on Household Demand for Energy

- Do people even know what the price of energy is?  
"Electricity awareness survey", by Lucie Maruejols and David L. Ryan [CBEEEDAC 2010-RP-02](#).
- What if utilities are included in the rent?  
"Energy use in Canadian multifamily dwellings", by Lucie Maruejols and Denise Young [CBEEEDAC 2010-RP-01](#)

# Electricity awareness survey

- *The derivation of a household's demand curve assumed that the household knows (and therefore reacts to) the price of energy*
- CBEEDAC survey
  - What do people know about the price of electricity?
  - Survey undertaken in local malls during February and March 2010
  - Approximately 1000 completed survey forms

# Electricity awareness survey

- **3) At home, do you or does someone else in your household receive and pay electricity bills?**
- Yes – I or someone else in my household pays the electricity bills
  - No – Someone else pays for my electricity (such as a landlord, or it is included in the rent, or condo fees, etc.)
- Don't know
- **4) Do you have a contract with an electricity provider (*Enmax, Direct Energy, Just Energy Alberta, Spot Power*) or do you pay through the default Regulated Rate Option (RRO) with EPCOR?**
- Regulated Rate Option with EPCOR
- Contract with \_\_\_\_\_
- Don't know

# Electricity awareness survey

- **In Alberta, the electricity bills sent out by EPCOR also include water charges and garbage collection fees, etc. In the next questions, we would like you to focus just on the electricity part of this bill (e.g., from EPCOR only if using the Regulated Rate Option, or from EPCOR and another provider if you have an electricity contract).**
- **5) Do you know, or can you provide an estimate of, the total amount of your last monthly electricity bill? (Answer all that are relevant)**
- Total amount of electricity bill last month from EPCOR: \$ \_\_\_\_\_
- **AND**  Total amount of electricity bill last month from my contracted electricity provider \$ \_\_\_\_\_
  - Don't know
- **6) Do you know, or can you provide an estimate of, the total quantity of electricity your household consumed last month?**
- Quantity consumed was \_\_\_\_\_ kWh (kilowatt hours)
  - Don't know

# Electricity awareness survey

- Electricity charges are composed of the unit price of electricity (the energy charge), which may change every month unless you have an electricity contract, and some additional charges such as administration fees, distribution and transmission charges, etc.
- **7) Do you know the price that you paid per unit (kWh) of electricity? (Answer all that are appropriate).**
  - Energy charge only: \_\_\_\_\_ cents/kWh
  - OR  Total Electricity charge: \_\_\_\_\_ cents/kWh
  - Don't Know
- **8) Do you know what the electricity price was at the same time last year or how much it has changed over the last 12 months?**
  - Last year at this time it was \_\_\_\_\_ cents/kWh (Energy charge only)
  - OR \_\_\_\_\_ cents/kWh (Total charge)
  - OR  Since last year at this time it has **Increased by** \_\_\_\_\_ %
    - **Decreased by** \_\_\_\_\_ %
  - Don't Know

# Electricity awareness survey

- **9) How do you know when the price of electricity changes?**
  - I read it in a newspaper
  - Someone tells me (family, friend, coworker...)
  - I notice the new rate on my electricity bill
  - Other
- 
- Don't know
  - I'm not aware when the price changes

# Electricity awareness survey

- **10) When you notice that the electricity price has increased, do you adjust your use of electricity?**
- Never
- Only if the change is large enough, say more than \_\_\_\_\_%
- Always
- Don't know

# More on the purpose of the survey

- Are policies that focus on the price of energy likely to be effective in reducing greenhouse gas emissions?
  - This would require that consumers be aware of energy prices and react to them
- Restructuring of the electricity markets in Alberta have resulted in different households paying different prices (depending on contract, if any)

# Options for Alberta households

- Contract with a fixed price per kWh over a specified duration of time
- OR
- Regulated Rate Option which fluctuates from month to month (on EPCOR bill water, sewage, garbage charges also appear)
  - In addition there are: administrative fees, distribution and transmission charges, municipal charges (may not all be on same bill for those with contracts)

# Other complications

- Meters only read occasionally and bills can be based on estimated use instead of actual use if bills are issued more often than meters are read.
- Meter readings are for total energy use → difficult to determine the contributions of various activities / uses to total consumption of electricity.

# Survey Results

- Price:
  - In March 2010, the RRO energy charge was 5.7 c/kWh
  - 68% of respondents who pay their own electricity bills could estimate the amount of their most recent bill but only 5% could provide an estimate of the per unit price
  - These price estimates ranged from 5 to 50 c / kWh

# Survey Results

- Quantity:
  - In 2007, average monthly electricity consumption per household in Alberta was 660 kWh
  - 3.5% of respondents who pay their own electricity bills could provide an estimate of the quantity consumed in the previous month
  - These estimates ranged from 20 to 900 kWh

# Survey Results

- Price Changes:
  - In March 2009, the RRO rate was 9.04 c / kWh → there was a 37% drop
  - 28% of respondents who pay their own electricity bills and 13% of those who don't pay directly for electricity provided an estimate of how prices had changed over the past year
  - among those who pay directly, 17% indicated that price had decreased (with estimates ranging from -5% to -20%)

# Survey Results: Reactions to Price Changes for Direct Payers

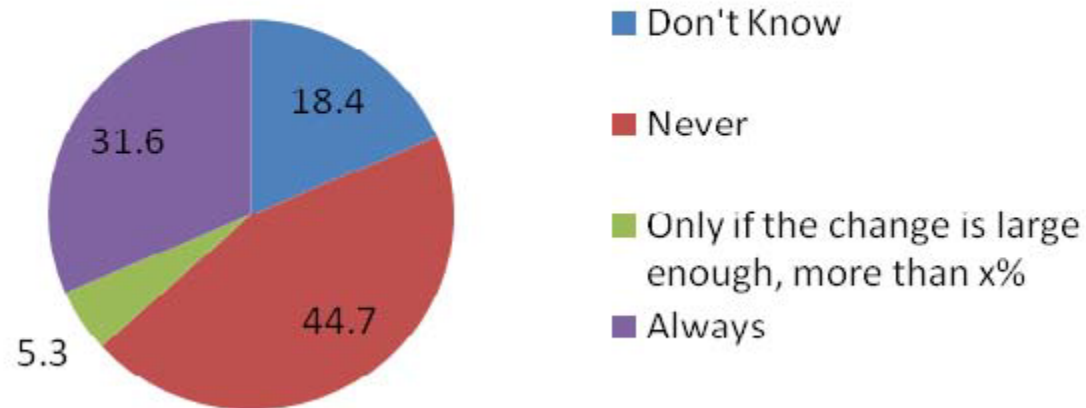
\* For the 16.1% of households that said they would modify their electricity consumption if the price increase was large enough, “large enough” refers to increases that range from 5% to 100%.

**Would you adjust your consumption of electricity if the price was to increase?**



# Survey Results: Reactions to Price Changes for Non-Direct Payers

Would you adjust your consumption of electricity if the price was to increase?



# Behaviour of households who do not pay directly for energy

- "Energy use in Canadian multifamily dwellings", by Lucie Maruejols and Denise Young [CBEEDAC 2010-RP-01](#).
- Many renters
  - (i) do not choose their major appliances; and
  - (ii) do not pay directly for their electricity and/or other utilities (natural gas, heating oil) either because they are included in the rent (or in condo fees)

# Agency Problems associated with rental dwellings – part 1

- Choice of appliances:
  - In many rental dwellings the landlord / owner selects the appliances while the occupant decides on the intensity of use
    - If a landlord purchases the major appliances AND pays for energy use, then both the purchase price and the efficiency of an appliance will be taken into consideration
    - If a landlord purchases the major appliances BUT the occupant pays for energy use, then the major consideration in the choice of appliances will be the purchase price (may consider efficiency if vacancy rates are high and this is likely to attract tenants )

# Agency Problems associated with rental dwellings – part 2

- Intensity of use of appliances:
  - In many rental dwellings (and in some owned dwellings with condo fees) the occupant does not pay directly for energy use.
    - If a landlord (or condo association) pays the energy bills, the occupant faces a zero marginal cost for energy use → energy often treated as a ‘free’ good
    - When a tenant buys small appliances, may not take energy efficiency characteristics into consideration unless planning to move soon to another dwelling where they will have to pay directly for energy use

# Agency Problems Summarized

- **Table: Agency problems in rental dwellings**

	<i>Tenant chooses equipment</i>	<i>Landlord chooses equipment</i>
Tenant pays the bill	Case 1: no principal-agent problem	Case 2: efficiency problem
Landlord pays the bill	Case 4: usage and efficiency problems	Case 3: usage problem

- **Source: American Council for an Energy Efficient Economy (2007) [see CBEEDAC report for full reference]**

# Asymmetric Information Problems

- Landlord may have more information about the energy efficiency of a dwelling than potential tenants
- If tenants pay directly for energy use, they may not be able to accurately assess a given dwelling's energy efficiency
- Therefore, landlords may signal that a dwelling truly is energy efficient by offering to pay the utilities (→ landlord has to deal with an agency problem ... Which one?)

# Why worry about renters and agency problems?

- They provide a complicating factor for residential energy use policy design
- Under-represented in some programs (such as ecoEnergy Retrofit-Homes, formerly EnerGuide for Houses ) even though there is the potential for agency effects to make it less likely that these homes are energy efficient and more likely that occupants 'overuse' energy in comparison to other households

# Study looks at household level data from SHEU 2003

- SHEU: Survey of Household Energy Use
  - In sub-sample of renters, the landlord pays for heat in about 40% of the cases and the landlord pays for electricity in about 24% of cases
- Data Problem: energy use is generally only known for those tenants who pay their own bills (when the landlord pays, units are not usually metered individually) → best to look at other aspects such as appliance age, temperature settings, etc.

# Selected Findings

- In apartment buildings, the heating and hot water systems tend to be a little older when the occupant pays for utilities. (For fridges and stoves, though, the opposite is found.)
- When the occupant pays directly for electricity, more likely to use Energy Star<sup>®</sup> entertainment products
- When the landlord pays for the heat, temperatures are set higher for all times of day (day, evening, night)
- When the occupant pays for heat, households are more likely to change temperatures according to the time of day, and are more likely to program their thermostats (if applicable)

# Selected Findings – part 2

- When the landlord pays, the occupant is:
  - More likely to rinse dishes before using dishwasher
  - More likely to dry dishes with heat on when using dishwasher
  - More likely to use hot or warm water for laundry
  - More likely to use only incandescent bulbs

# Selected Findings – part 3

- Renovations more likely in owned vs rented dwellings, but no evidence of ‘agency’ effects
- Possible barriers:
  - Difficult to renovate when occupied by a tenant
  - Access to investment loans may be difficult for small landlords
  - Access to government incentive programs may be more difficult for landlords