

# **Alternative Pricing Regimes in Ontario: Exploring the Impacts**

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presentation at the CEATI Workshop on  
'Understanding Customer Response'  
11-12 May 2006, Toronto, ON

# Introduction and Purpose

*Given the changing regulatory environment in Ontario's electricity system, the purpose of this presentation is to explore the extent to which changing pricing structures could affect residential customers in this province.*

# Outline

- introduction and purpose
  - pricing regimes
  - the Ontario electricity system
  - study context
  - results
  - moving forward
  - summary and conclusions
-

# Pricing regimes

- the purpose of alternative pricing regimes is, at least in part, to help to achieve the goals laid out for the particular electricity system
- in Ontario ...
  - legislative goals include (Bill 100 (Ontario), 2004):
    - ‘... adequacy and reliability ...’
    - ‘... quality of electricity service ...’
    - ‘... economic efficiency ...’
  - ‘... distribution rates for each customer class remain just and reasonable.’ (OEB, ‘Cost Allocation Review: Staff Discussion Paper’, September 2005)



# Pricing regimes

- 'flat rate'
  - customers pay the same per unit of electricity regardless of when they 'consume' the electricity or how much electricity they use in a given time-period
    - historically, the usual pricing structure for low-volume consumers
    - simple and familiar
    - continues to be used in many jurisdictions

# Pricing regimes

- 'time-of-use'
  - customers' payment for electricity is dependent upon the time at which they 'consume' the electricity → usually a limited number of 'bands' during which prices vary (higher prices for what have historically been periods of higher system-wide demand)
    - pricing approaches marginal cost of electricity generation
    - potentially increase system-wide efficiency (through the flattening of load-curve) and fairness
    - new infrastructure requirements and new 'thinking' among customers also needed
    - oft-cited examples include Princeton Light and Power (British Columbia)

<http://www.plpower.com/>



# Pricing regimes

- 'real-time'
  - customers' payment for electricity is even more dependent upon the time at which they 'consume' the electricity → prices changes, for example, hourly, more closely reflecting actual market activity regarding electricity supply and demand
    - increased reflection of 'true costs' in the market place
    - potentially even larger prompts to encourage efficiency and fairness
    - continued infrastructure requirements and greater demands upon customers to monitor market (demand, supply, price) and consumption developments
    - oft-cited examples include the Energy-Smart Pricing Plan (Chicago)

<http://www.energycooperative.org/>



# Pricing regimes

- ‘critical peak pricing’
  - a blend of the previous two systems: while customers are usually on ‘time-of-use’ rates, the utility may identify a limited number of periods during which – with some advance notice – prices rise substantially
    - trying to strike a balance between simplicity and efficiency
    - oft-cited examples include Gulf Power (Florida)

<http://www.southernco.com/gulfpower/>



# The Ontario electricity system

**Ontario's electricity generation, 2003  
(by source, percentage of total)**

Nuclear	41.3%
Hydro	24.0%
Coal	23.9%
Natural Gas	9.0%
Oil	1.0%
Other	0.8%

**Ontario's end-use electricity demand, 2003  
(by sector, percentage of total)**

Commercial	39.1%
Residential	33.3%
Industrial	29.3%
Transportation	0.3%

Total electricity output = 150.0 TWhr

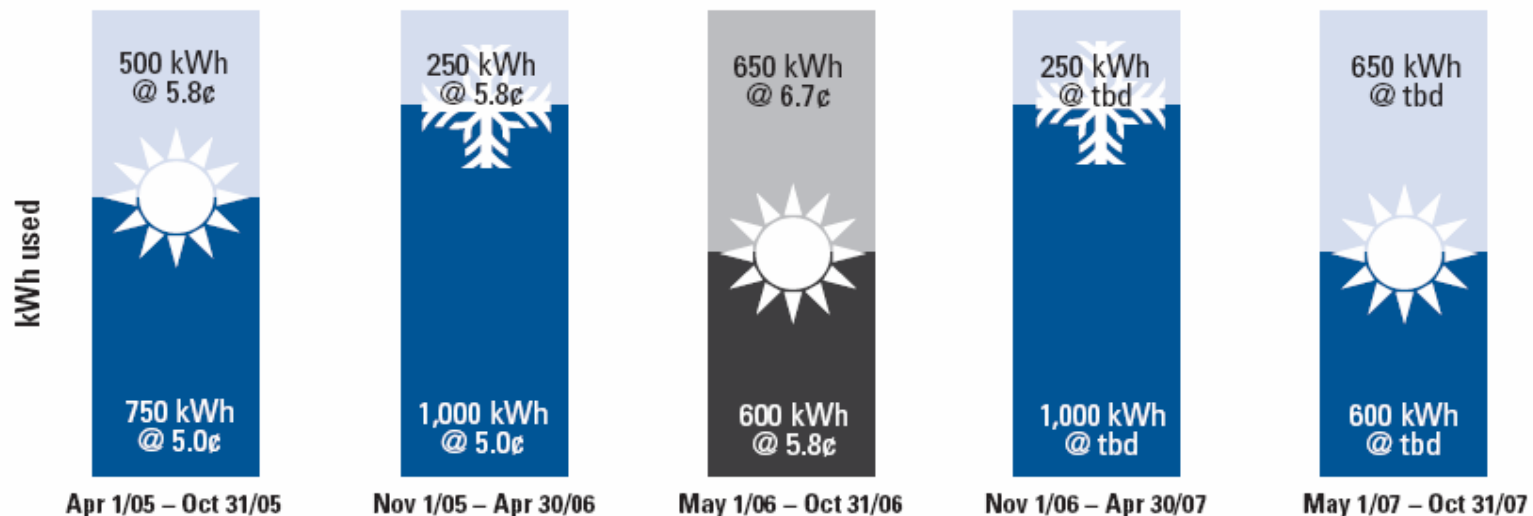
Total end-use demand = 142.9 TWhr

source: Ontario Energy Board

# The Ontario electricity system

## Residential Rates and Thresholds by Season

(for a residential customer using 1,250 kilowatt hours/month)

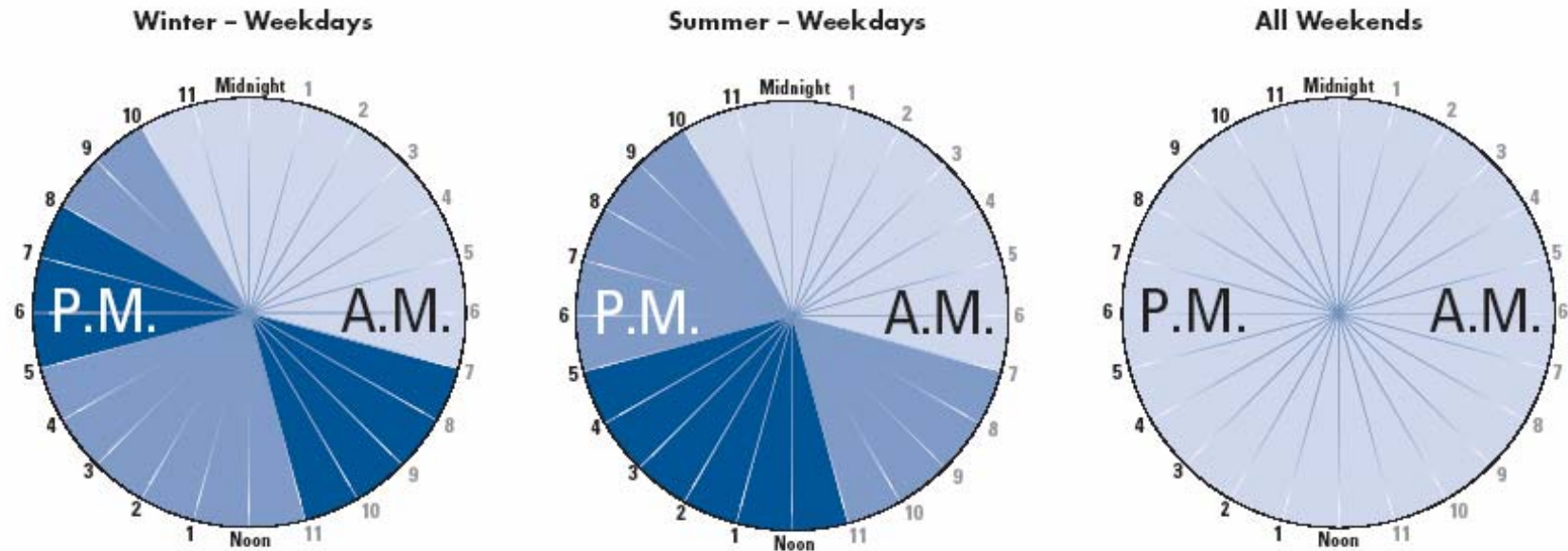


***The regime to which the vast majority of Ontario's low-volume customers are still subject.***




source: Ontario Energy Board



# The Ontario electricity system



*recently increased from 2.9¢/6.4¢/9.3¢*

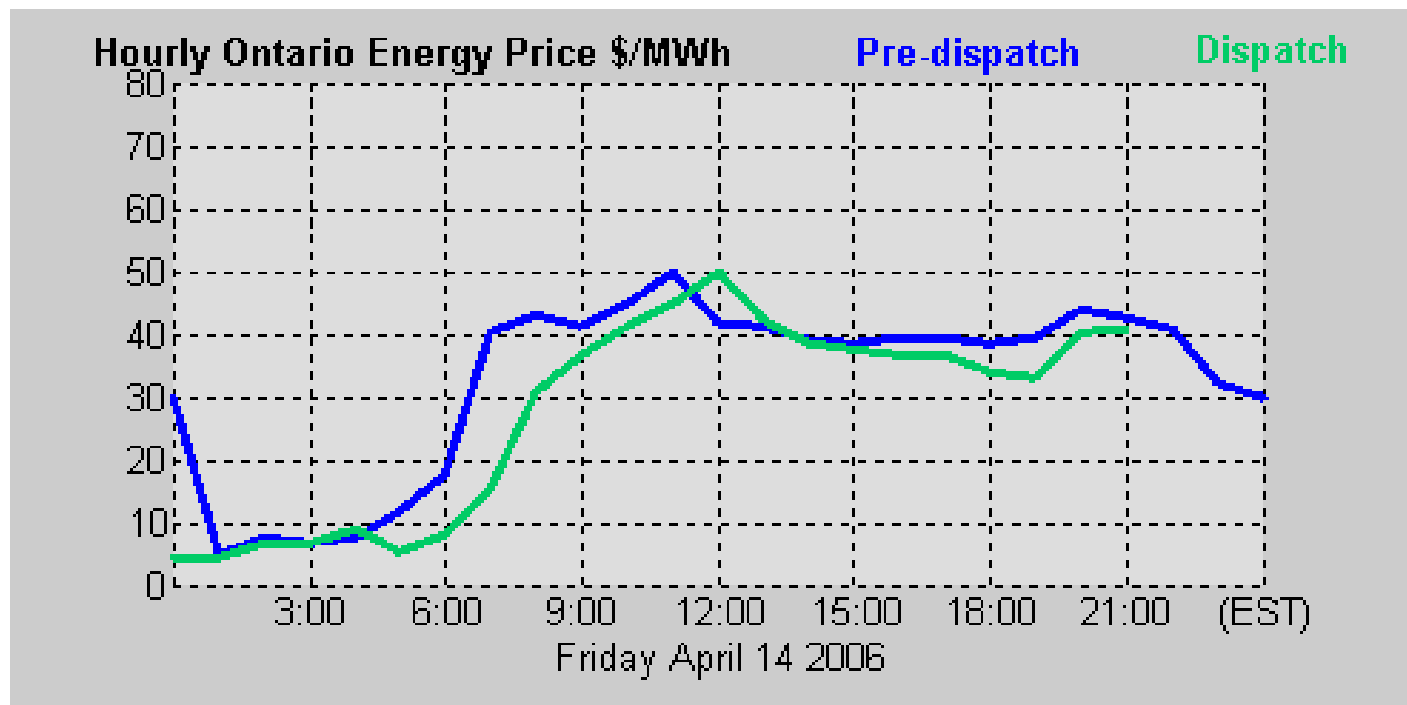
Time-of-Use Periods of the Day	
	Off-Peak: 3.5 cents per kilowatt hour
	Mid-Peak: 7.5 cents per kilowatt hour
	On-Peak: 10.5 cents per kilowatt hour

source: Ontario Energy Board

***In limited use (for low-volume customers), but more to come?***

# The Ontario electricity system

*'Hourly Ontario Energy Price (HOEP) is the hourly price that is charged to Local Distributing Companies and other non-dispatchable loads.'*



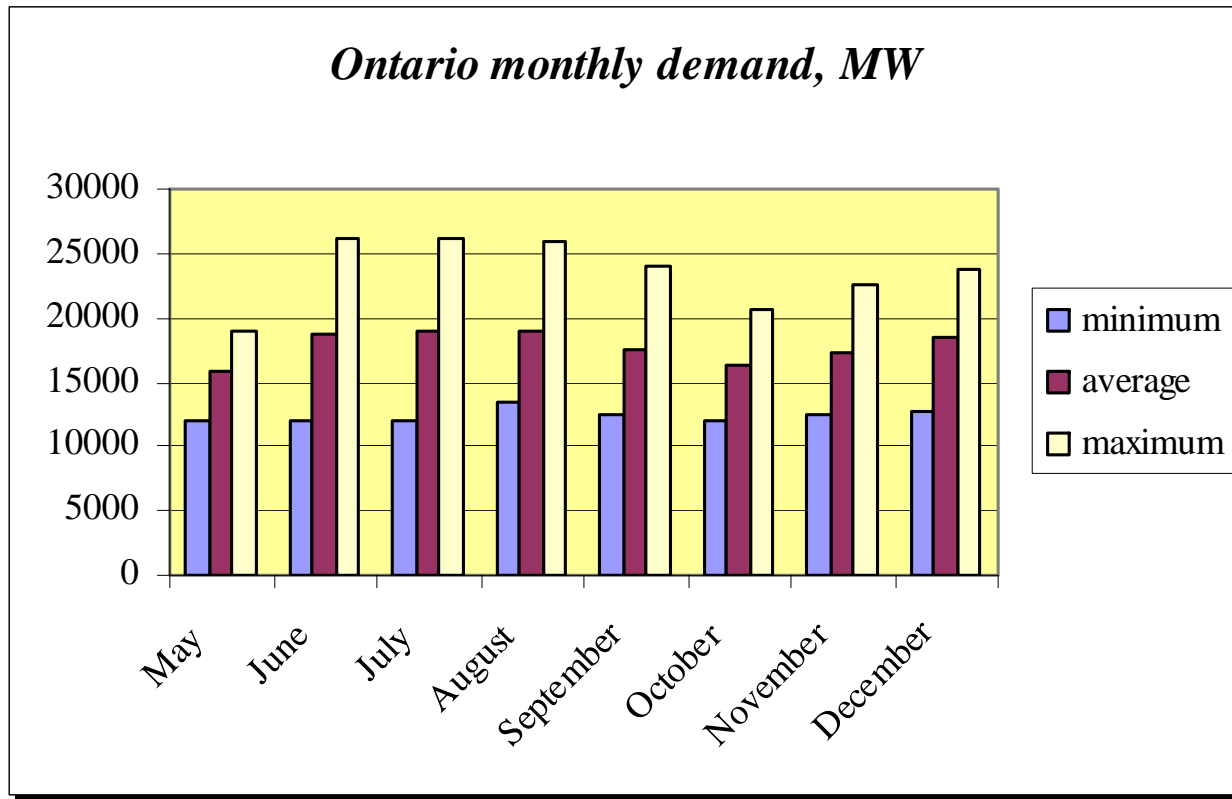
source: Independent Electricity System Operator (Ontario)

# Study context

- period investigated
    - May to December 2005, inclusive (8 months)
  - physical location
    - Ontario
    - town of Milton
  - kinds of customers
    - residential class
    - neither ‘random’ nor ‘representative’
    - instead, a particular subset thereof
-

# Study context

- Ontario electricity system

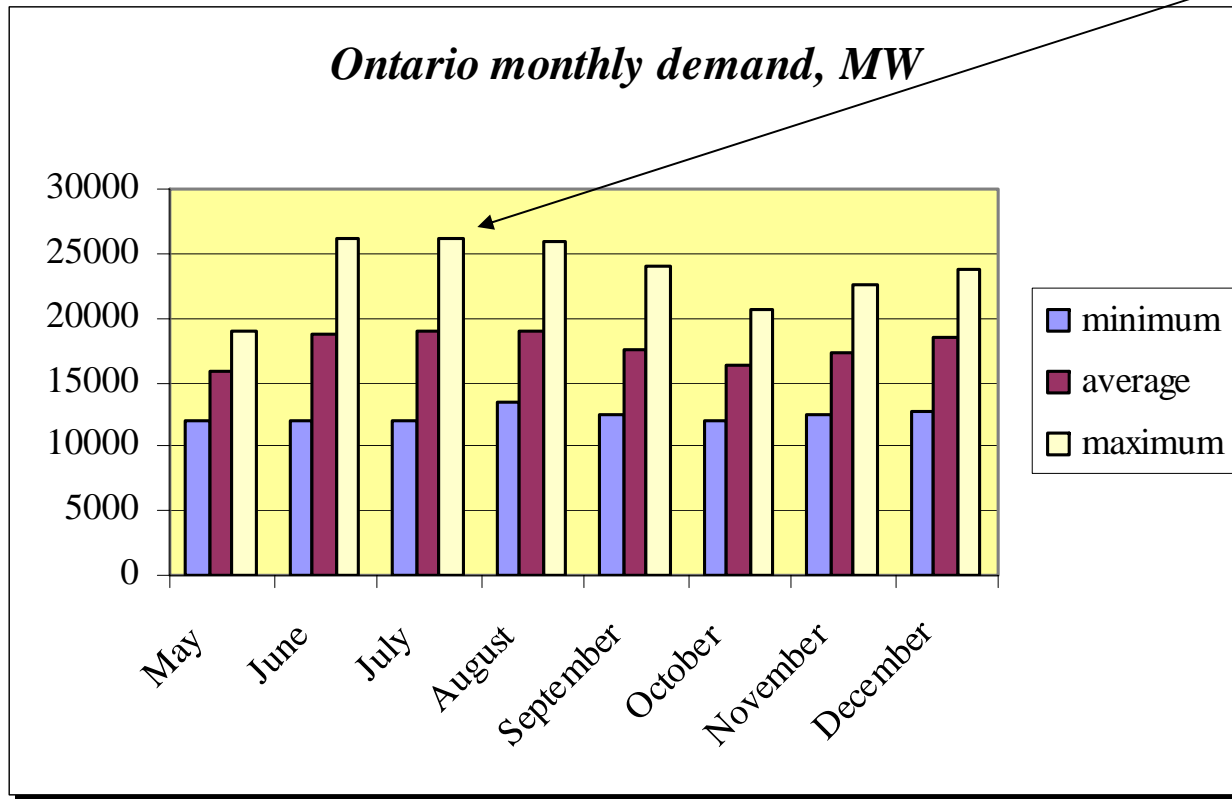


source: Independent Electricity System Operator (Ontario)

# Study context

- Ontario electricity system

*highest value:  
13 July, 5pm EDT,  
26,160 MW*

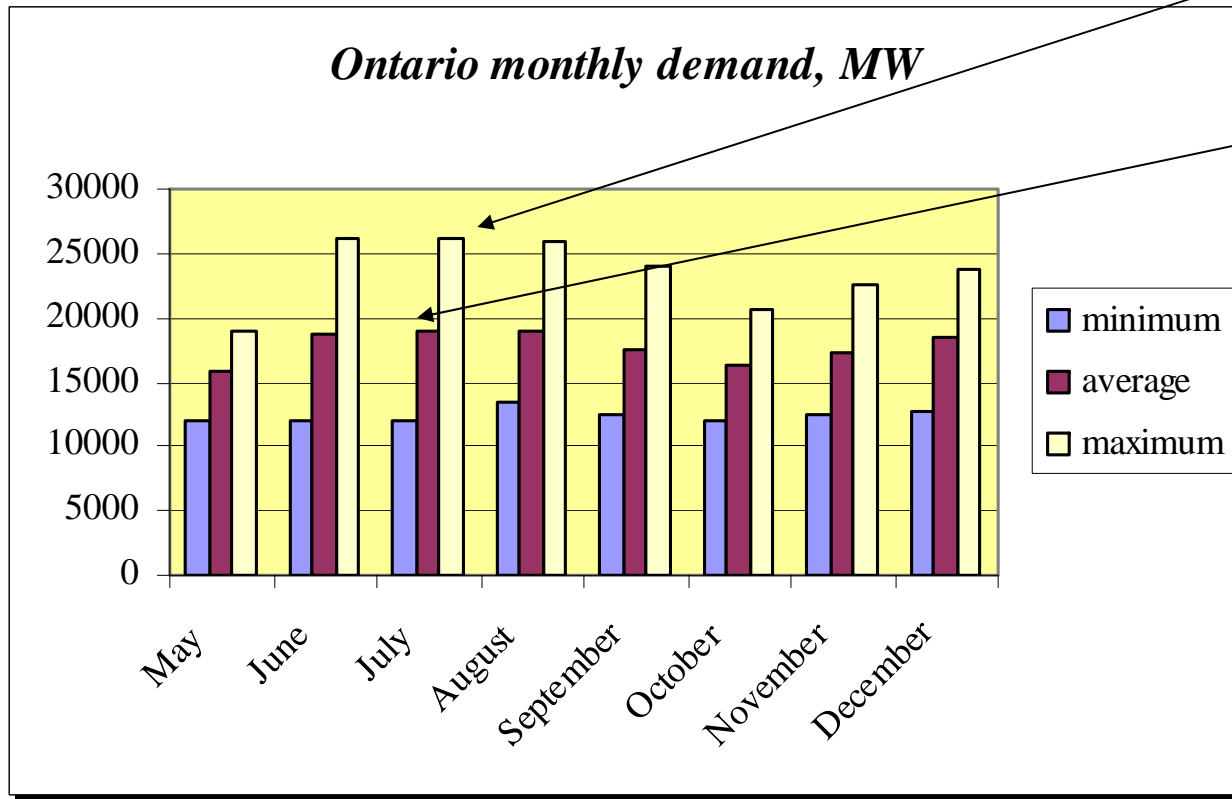


source: Independent Electricity System Operator (Ontario)

# Study context

- Ontario electricity system

*highest value:  
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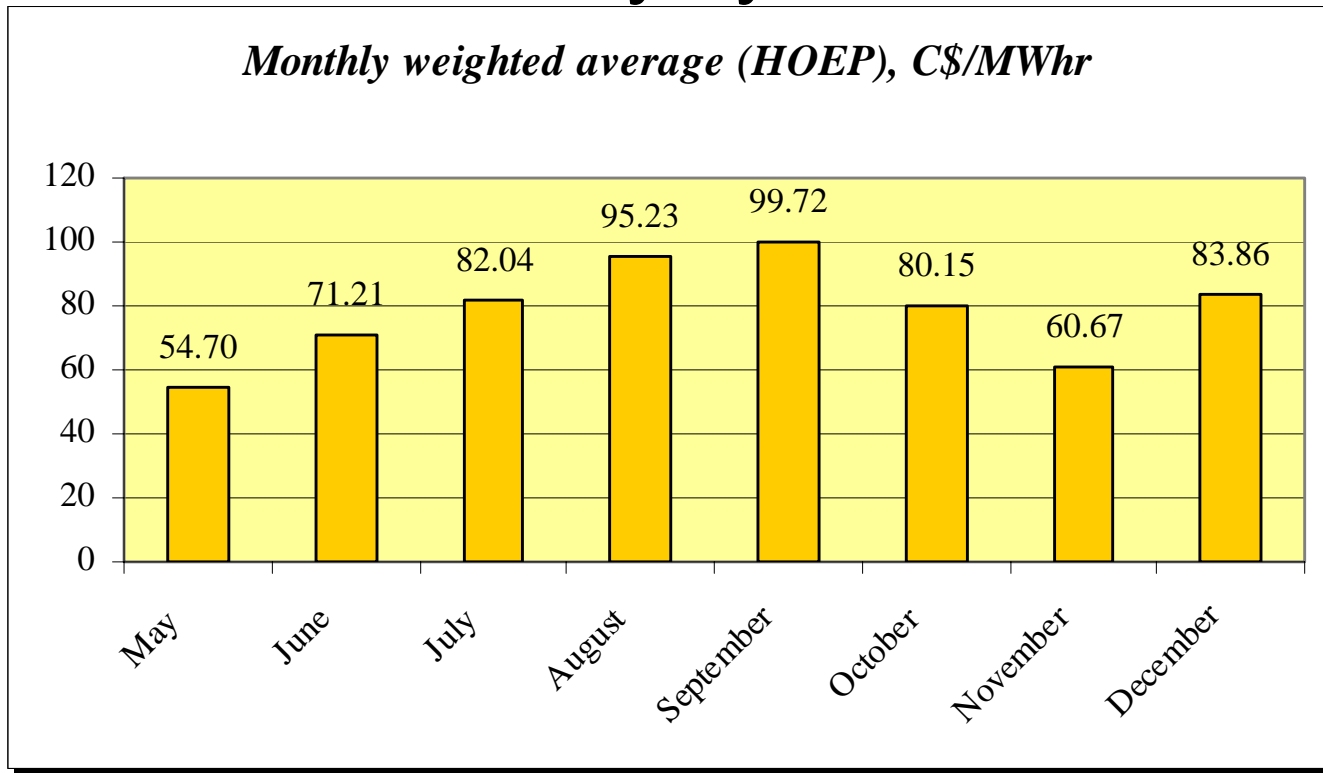


*highest value:  
July  
18,945 MW*

source: Independent Electricity System Operator (Ontario)

# Study context

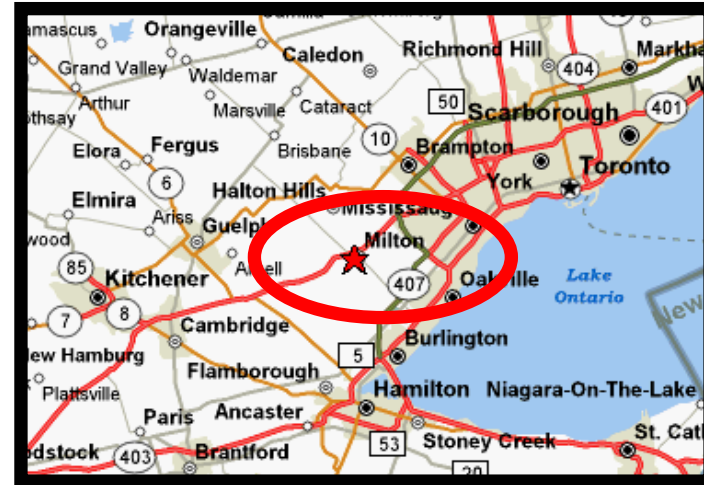
- Ontario electricity system



source: Independent Electricity System Operator (Ontario)

# Study context

- Milton, Ontario



# Study context

- residential customers
  - customers with interval meters
    - largely in newer subdivisions
    - those with electric heating (n≈25) removed from sample

*Number of  
customer  
accounts for  
each month  
(2005)*

May	1,226
June	1,316
July	1,488
August	1,551
September	1,558
October	1,472
November	1,584
December	1,584

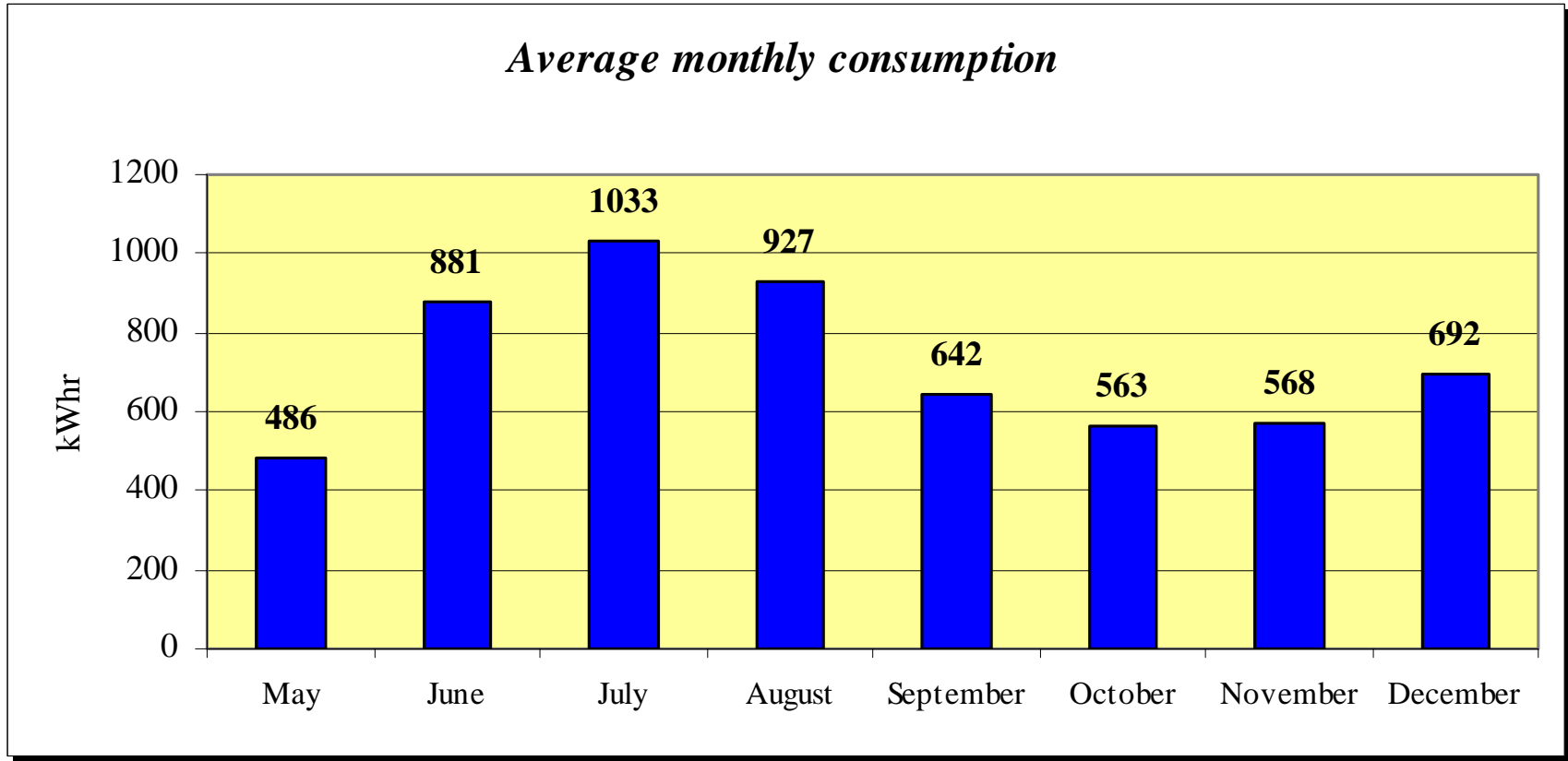


# Study context

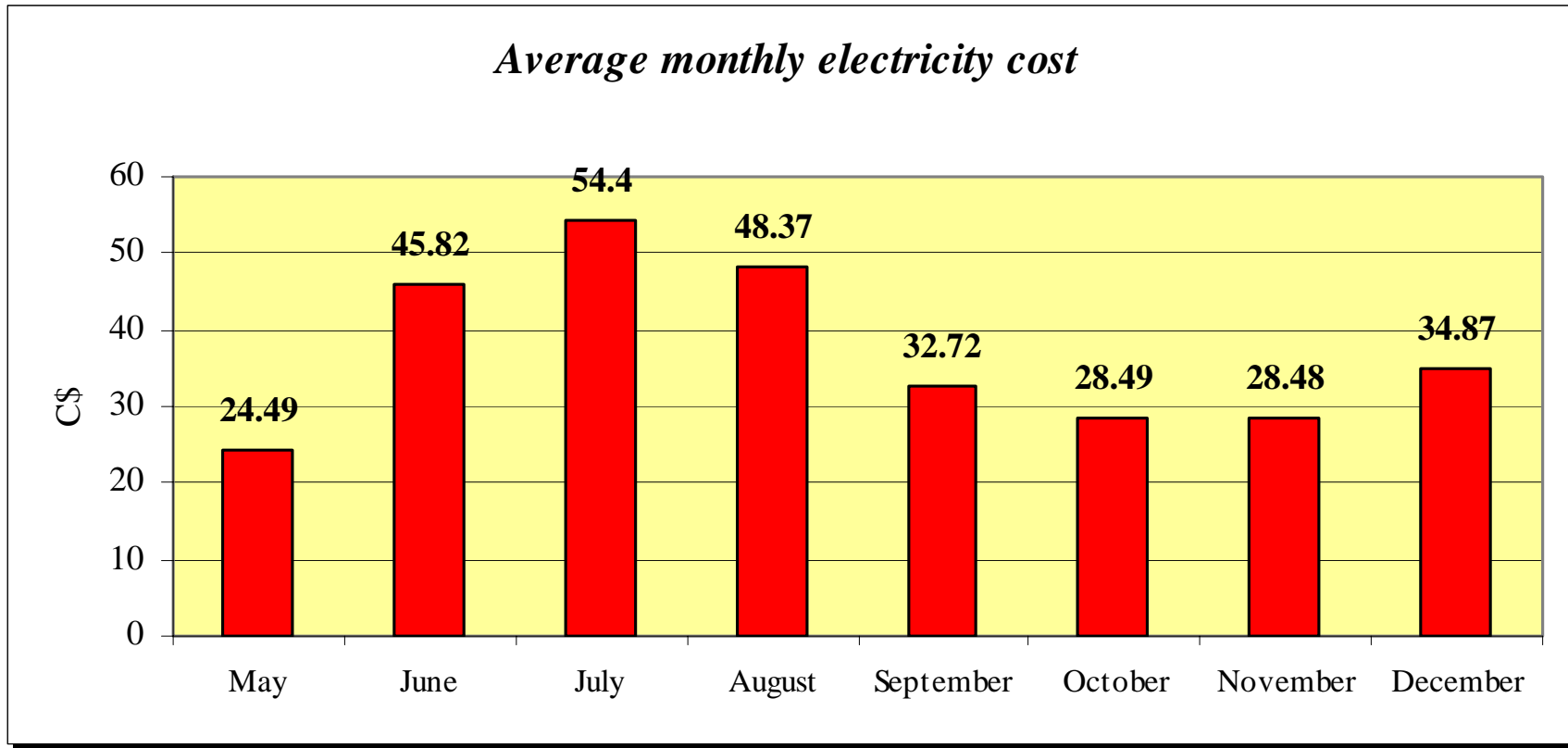
- residential customers
  - subject to different regulated price plan
    - many moved from flat rate to time-of-use during study period (October 2005)
    - small number continue to be on flat rate
  - study limitations
    - not a representative sample
    - subject to different price incentives over time



# Results – monthly consumption

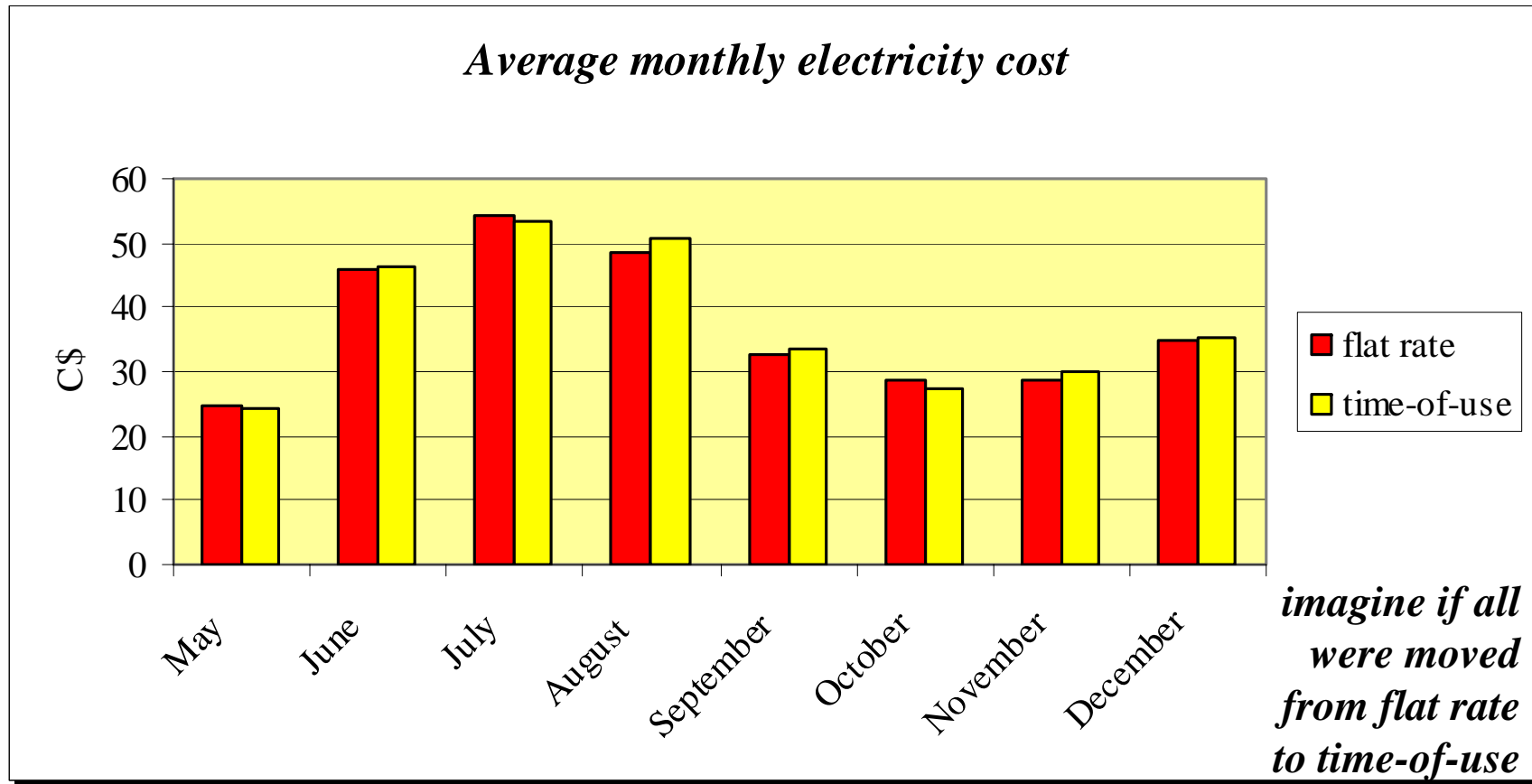


# Results – ‘flat rate’

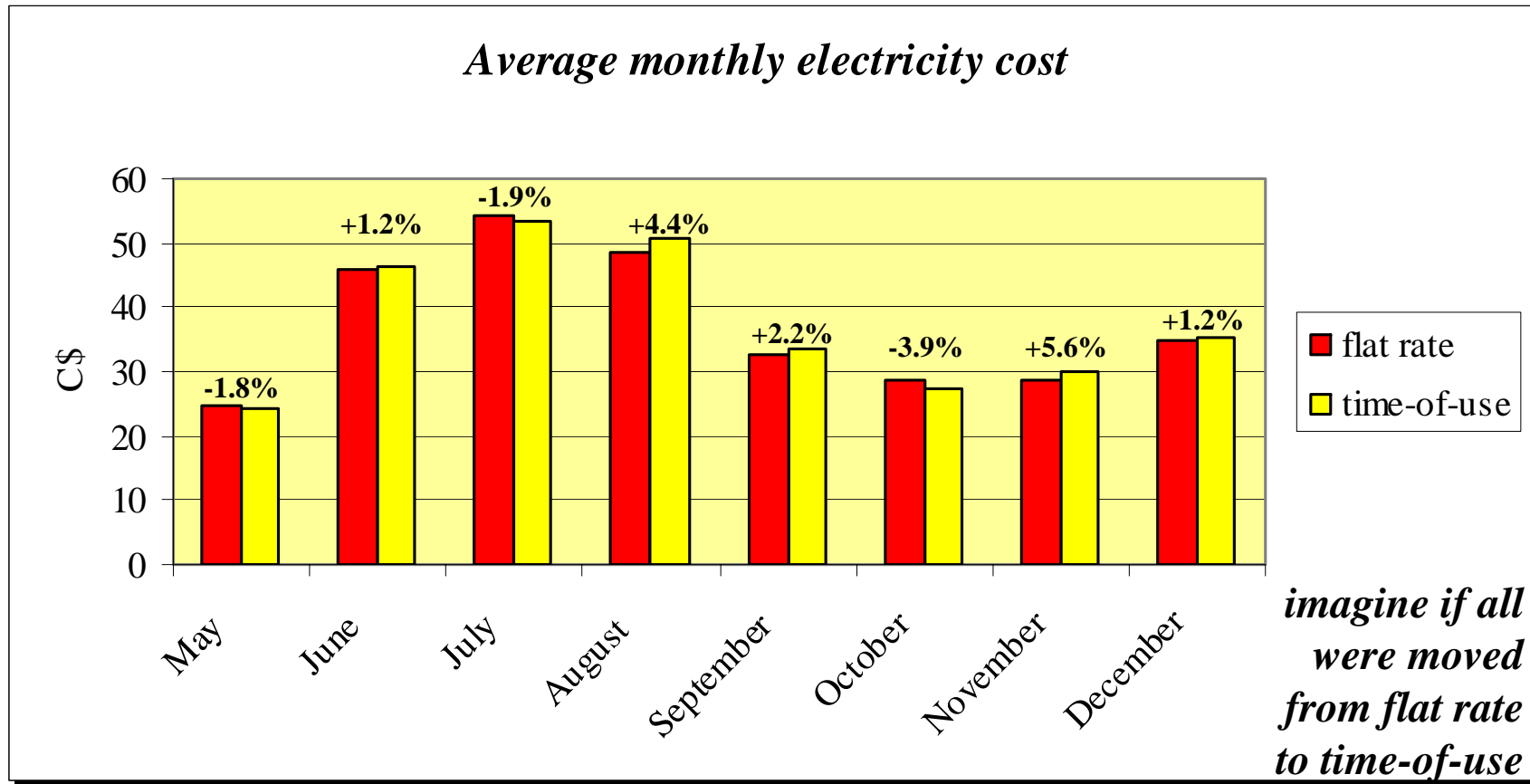


*only considering the cost of the commodity*

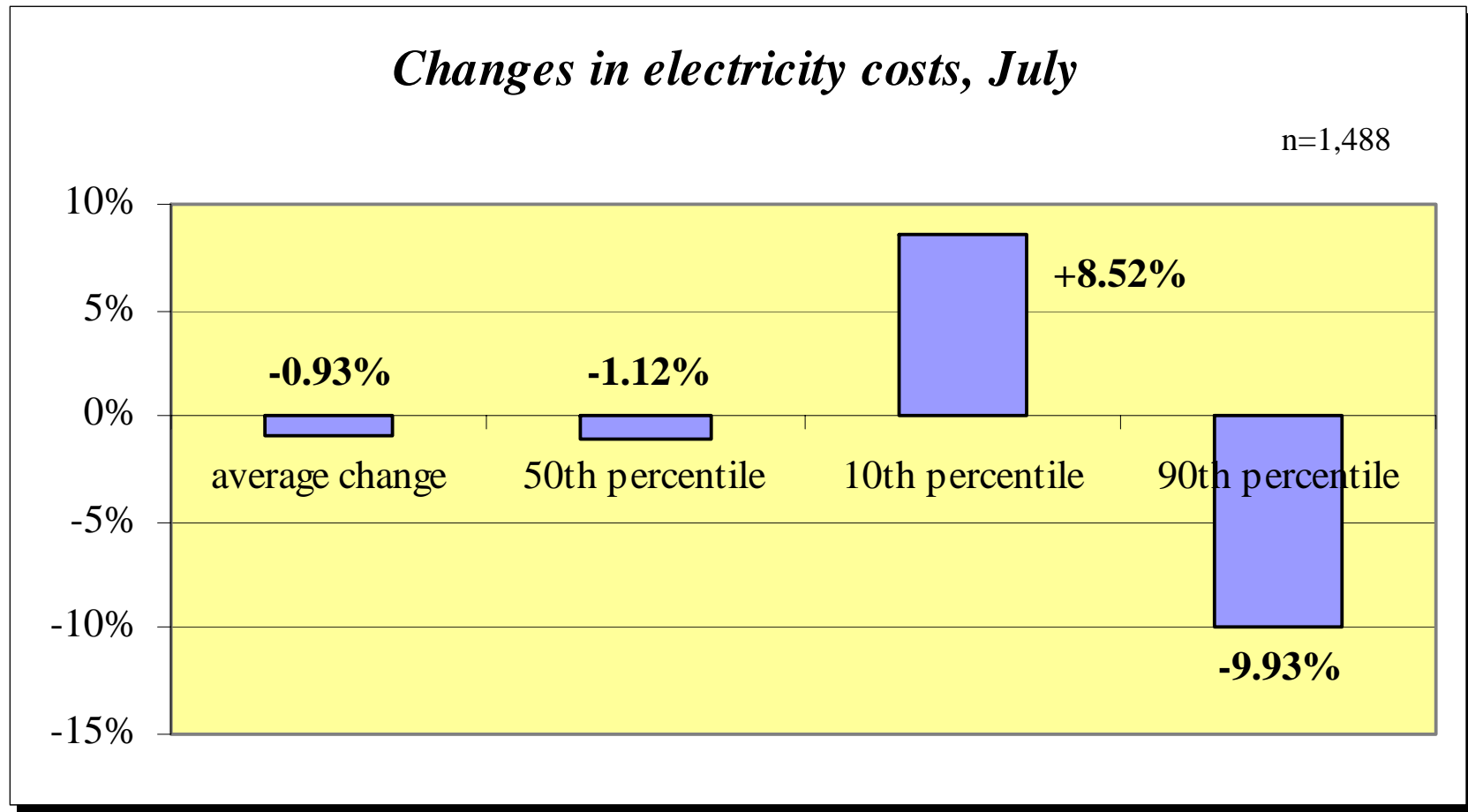
# Results – ‘time-of-use’



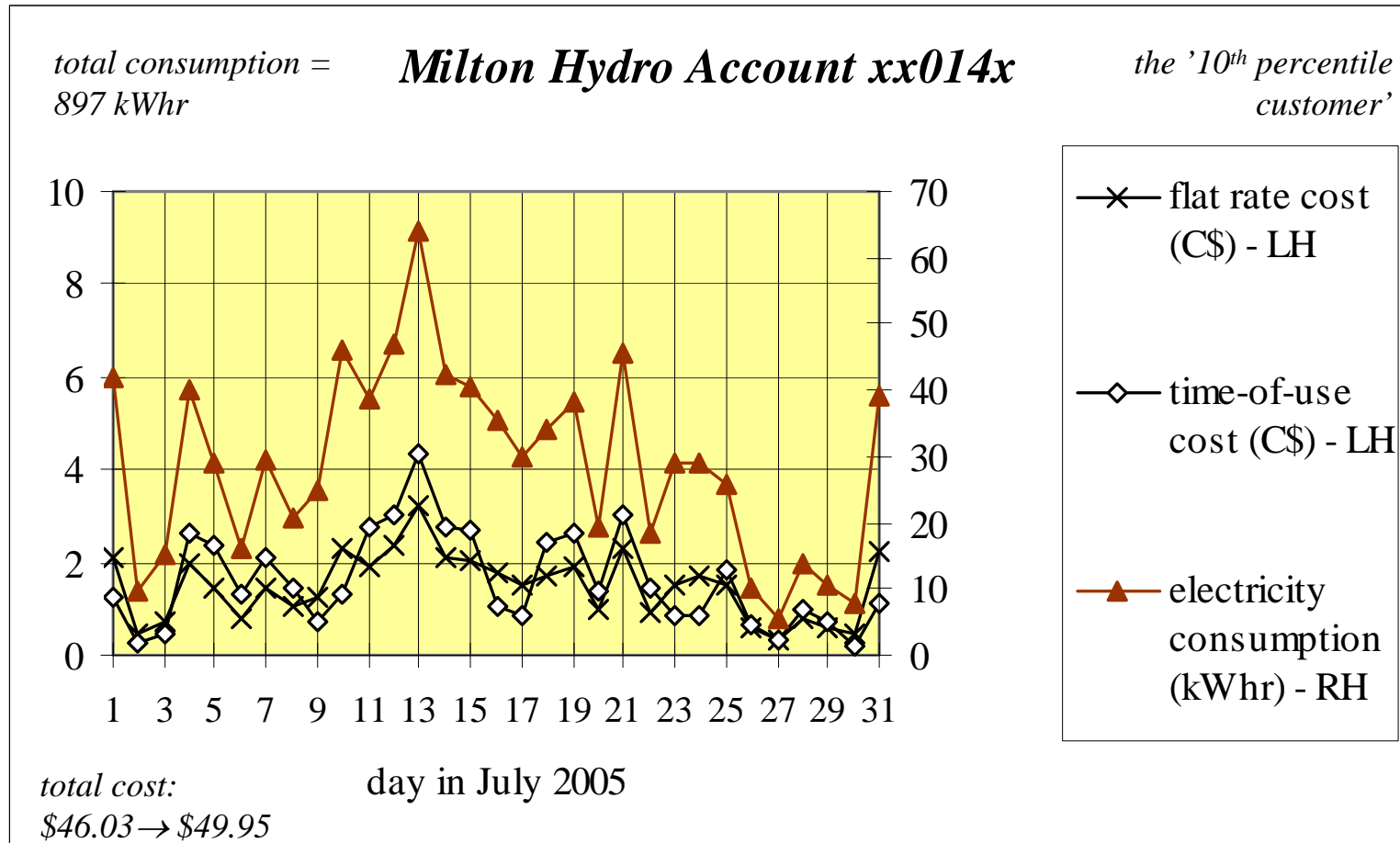
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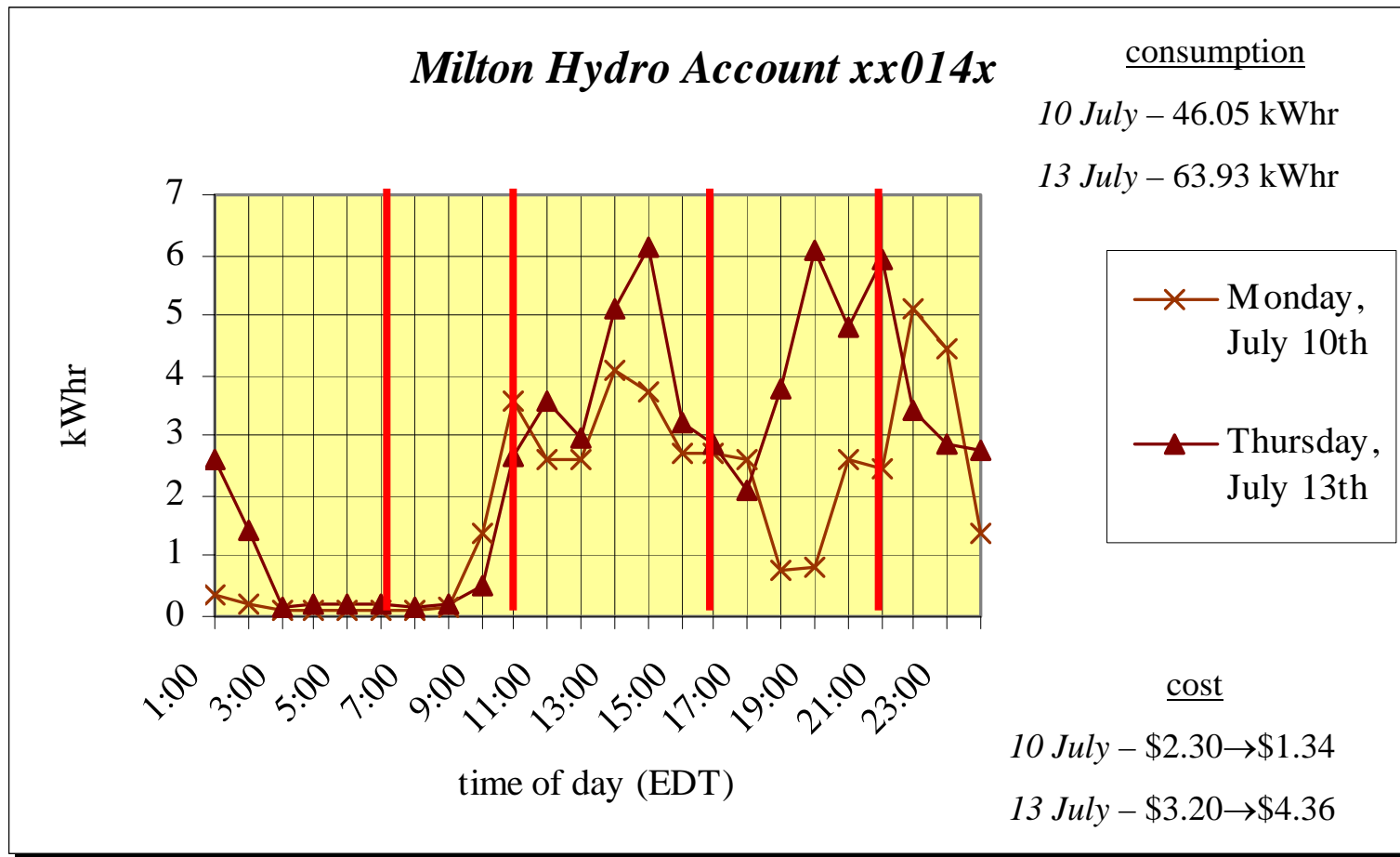
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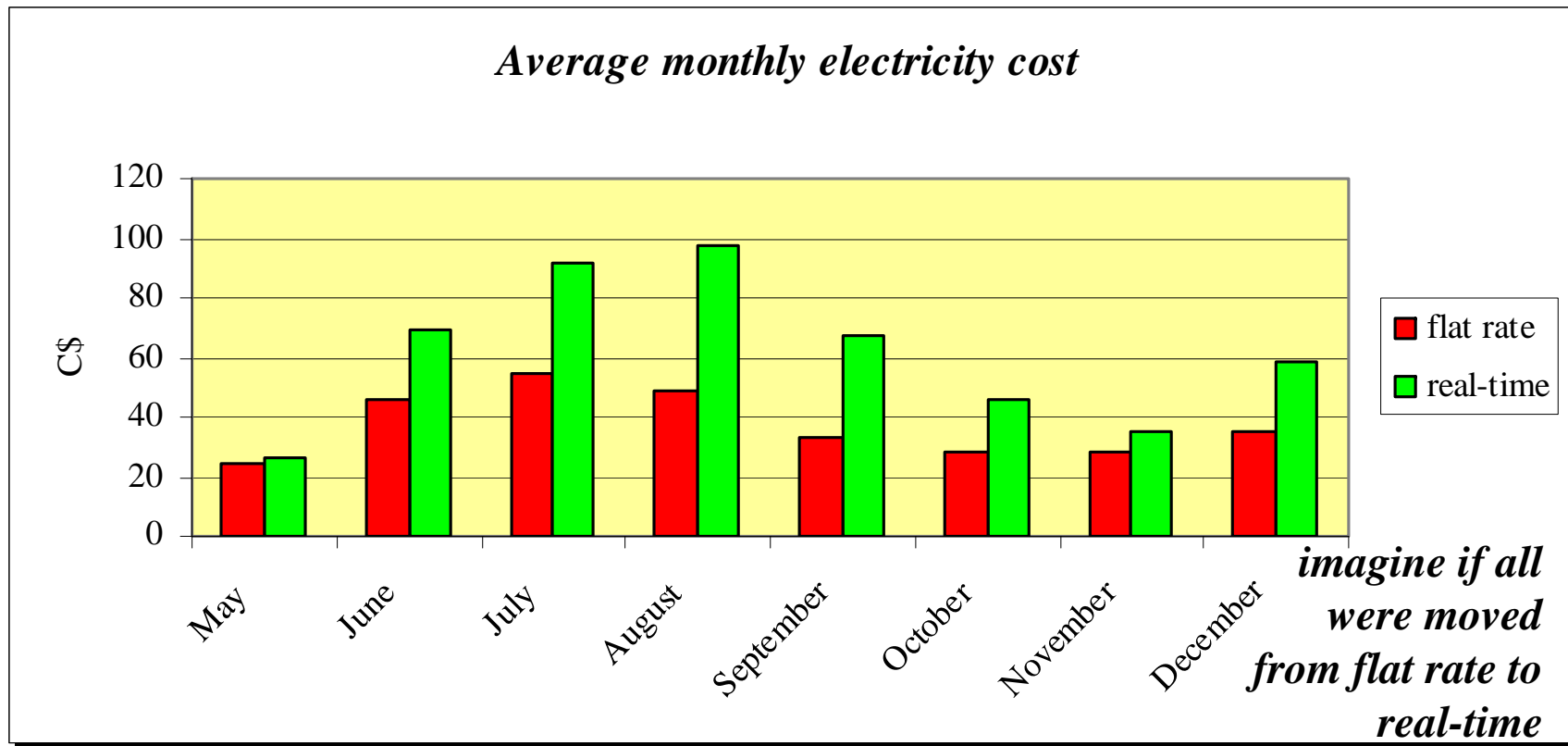
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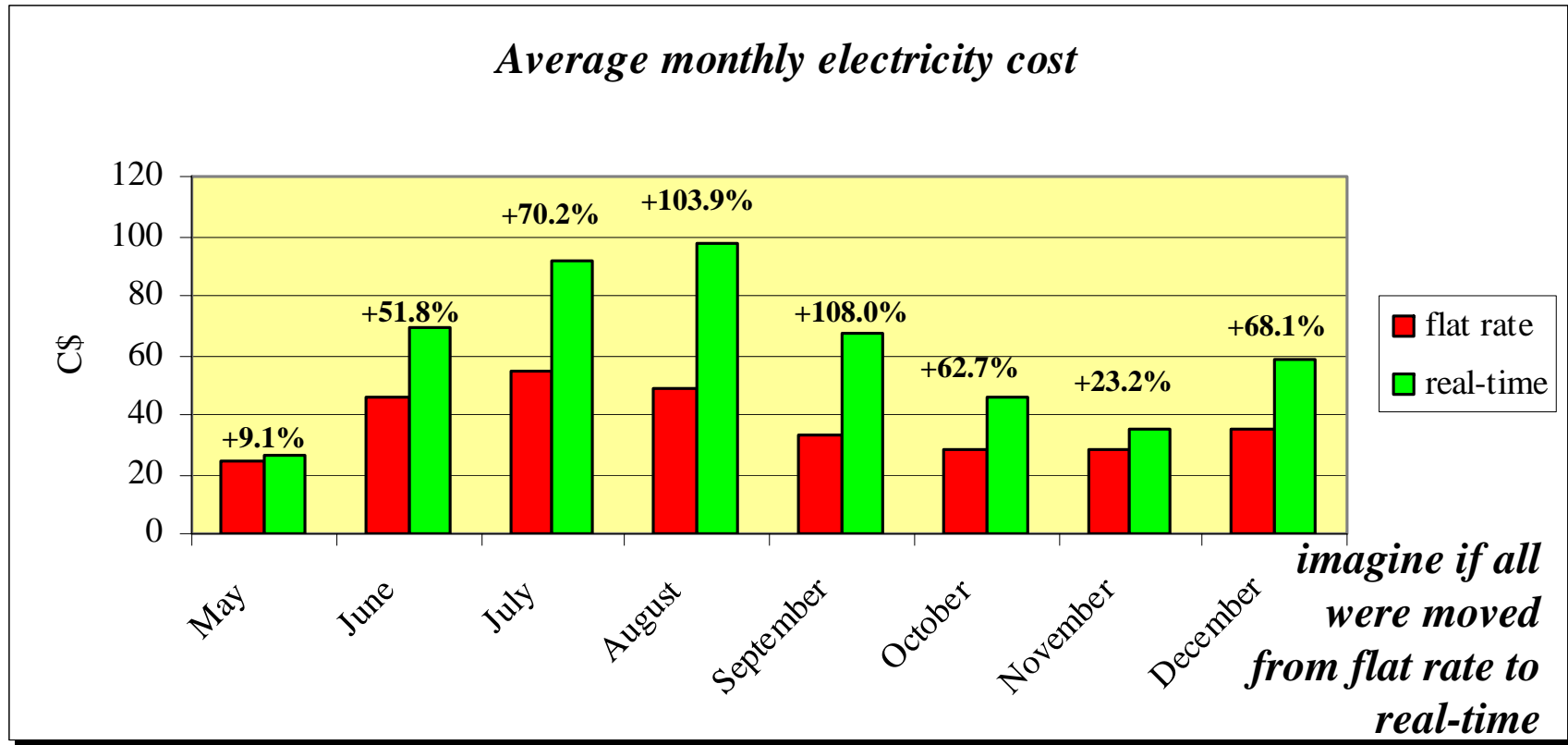
# Results – ‘time-of-use’

- average values, of course, can mask significant differences in the ‘extreme’ or ‘outlier’ values
- in this case, 104 customers (7.7% of total) have cost increases of >10%
- 145 customers (9.7% of total) have cost decreases of >10%
- those who have ‘above average’ changes (generally paying more) have lower total consumption values
  - 914 kWhr versus 1,144 kWhr

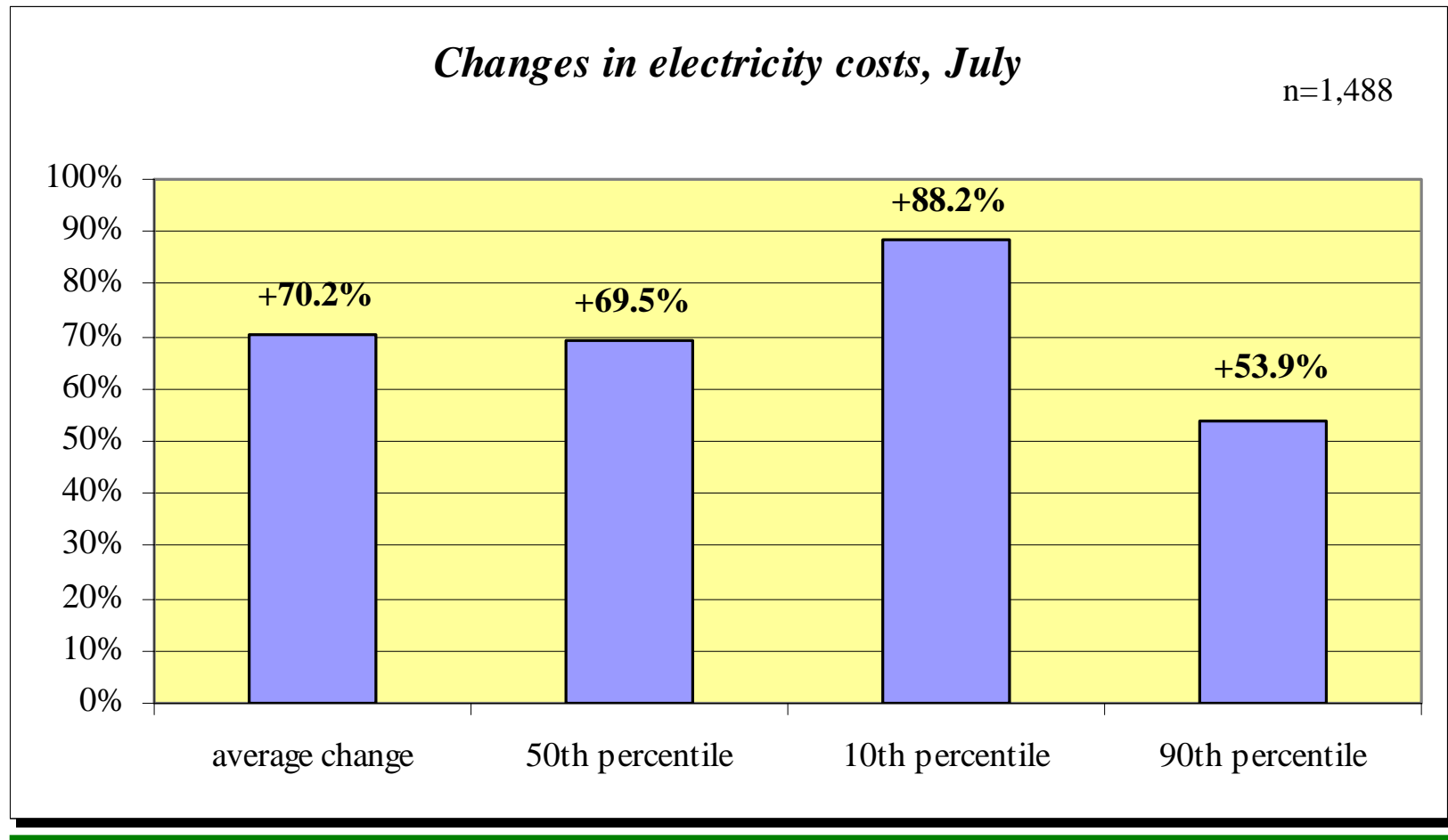
# Results – ‘real-time’



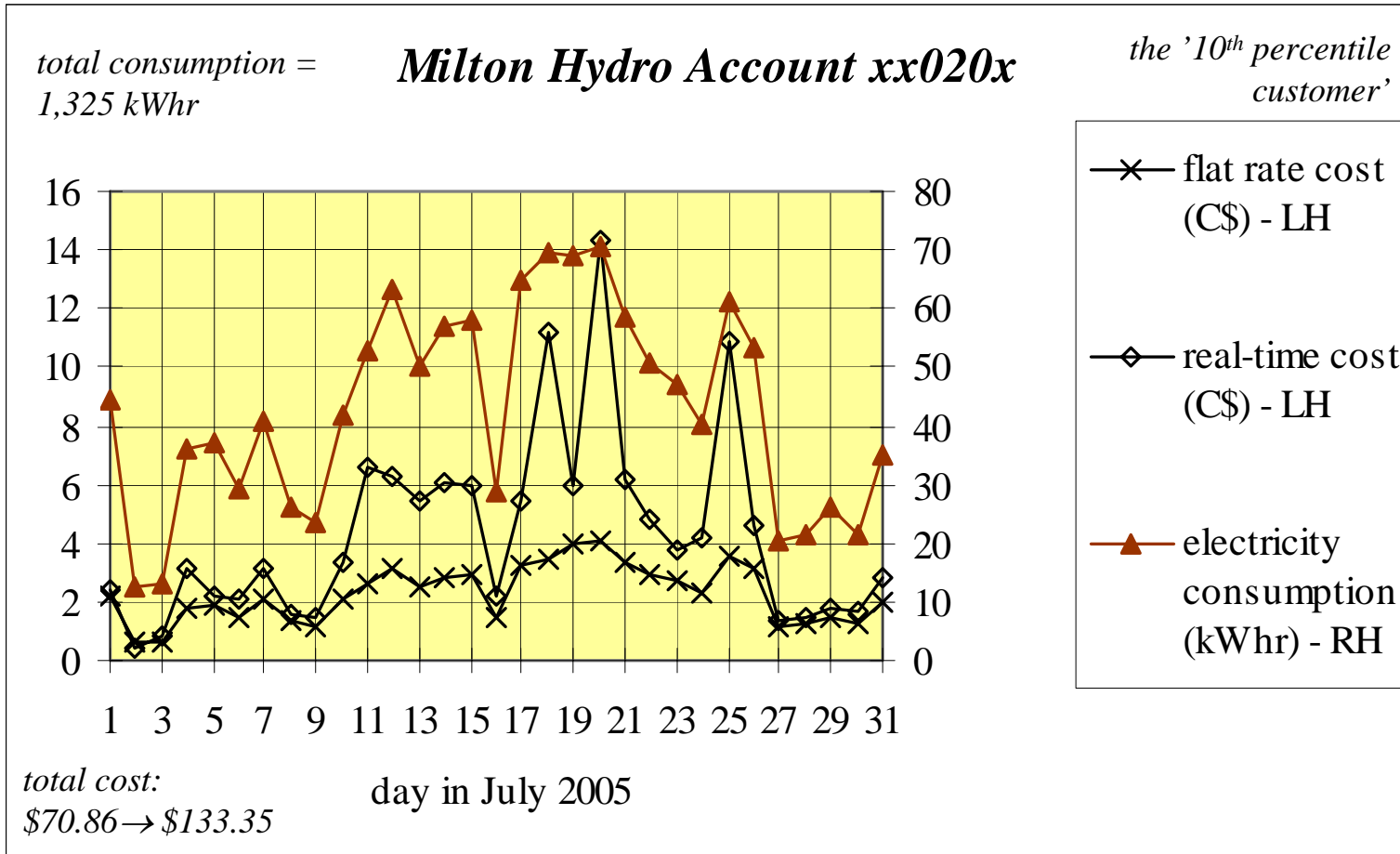
# Results – ‘real-time’



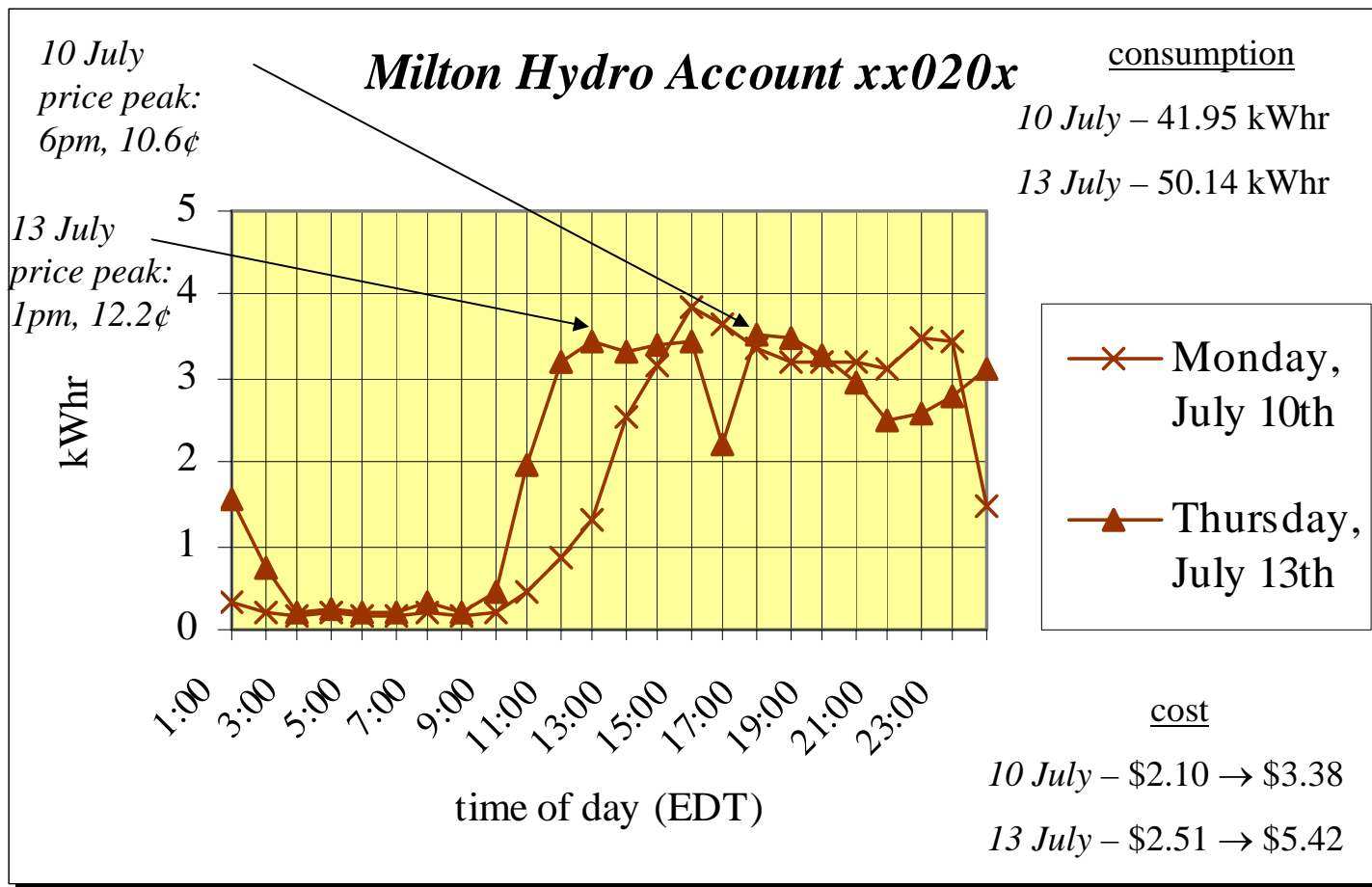
# Results – ‘real-time’



# Results – ‘real-time’



# Results – ‘real-time’



# Results – ‘real-time’

- even the average values – alone – reveal significant changes in electricity costs
- 31 customers (2.1% of total) have cost increases of >100% (with the highest being 114%)
- 1,418 customers (95.3% of total) have cost increases of >50%
- those who have ‘above average’ changes (generally paying much more) have lower total consumption values
  - 906 kWhr versus 1,148 kWhr

# Results – critical periods

*‘Power Warnings alert the public that the IESO is about to take urgent measures to maintain the balance of supply and demand. These measures may include making emergency purchases from outside Ontario and reducing voltage along the transmission lines by 3 to 5 per cent. These levels of voltage reductions are usually not noticeable to most consumers. A power warning also indicates that rotating blackouts might be necessary if all other measures are not sufficient to manage demand. The IESO will make every effort to provide advance notice of rotating blackouts, although this may not always be possible.’*

**June 2005**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

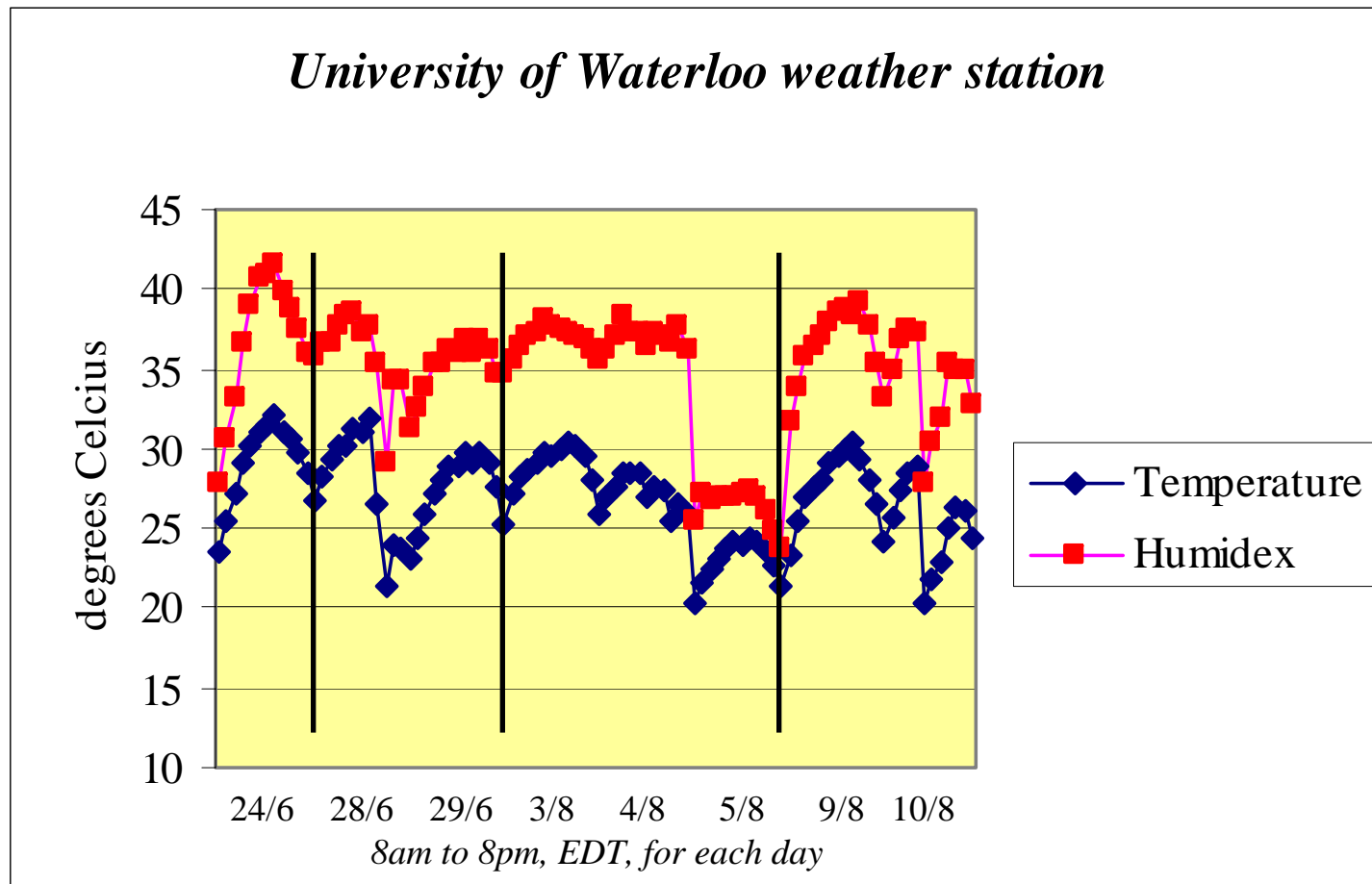
**July 2005**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
	31					

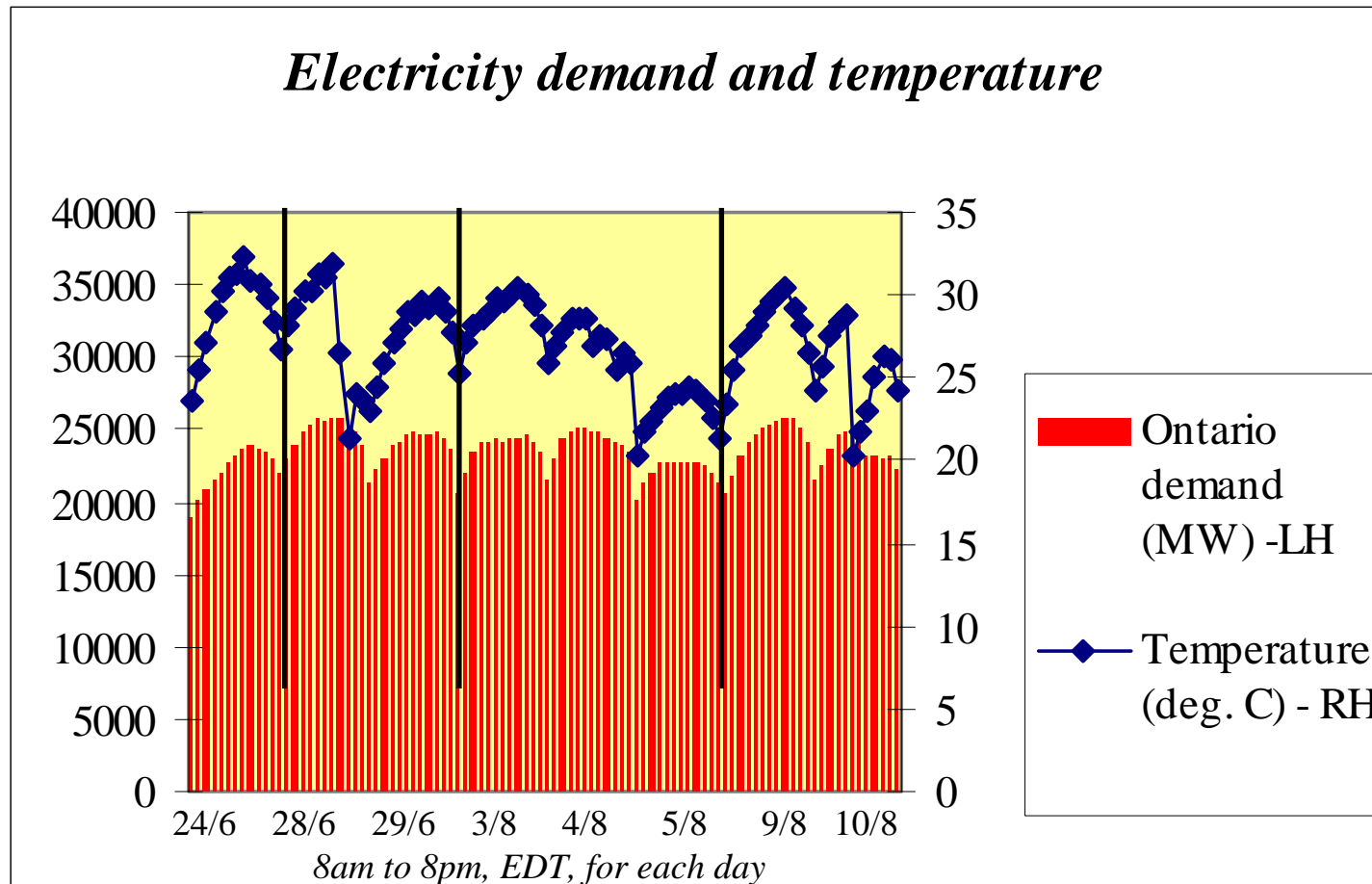
**August 2005**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

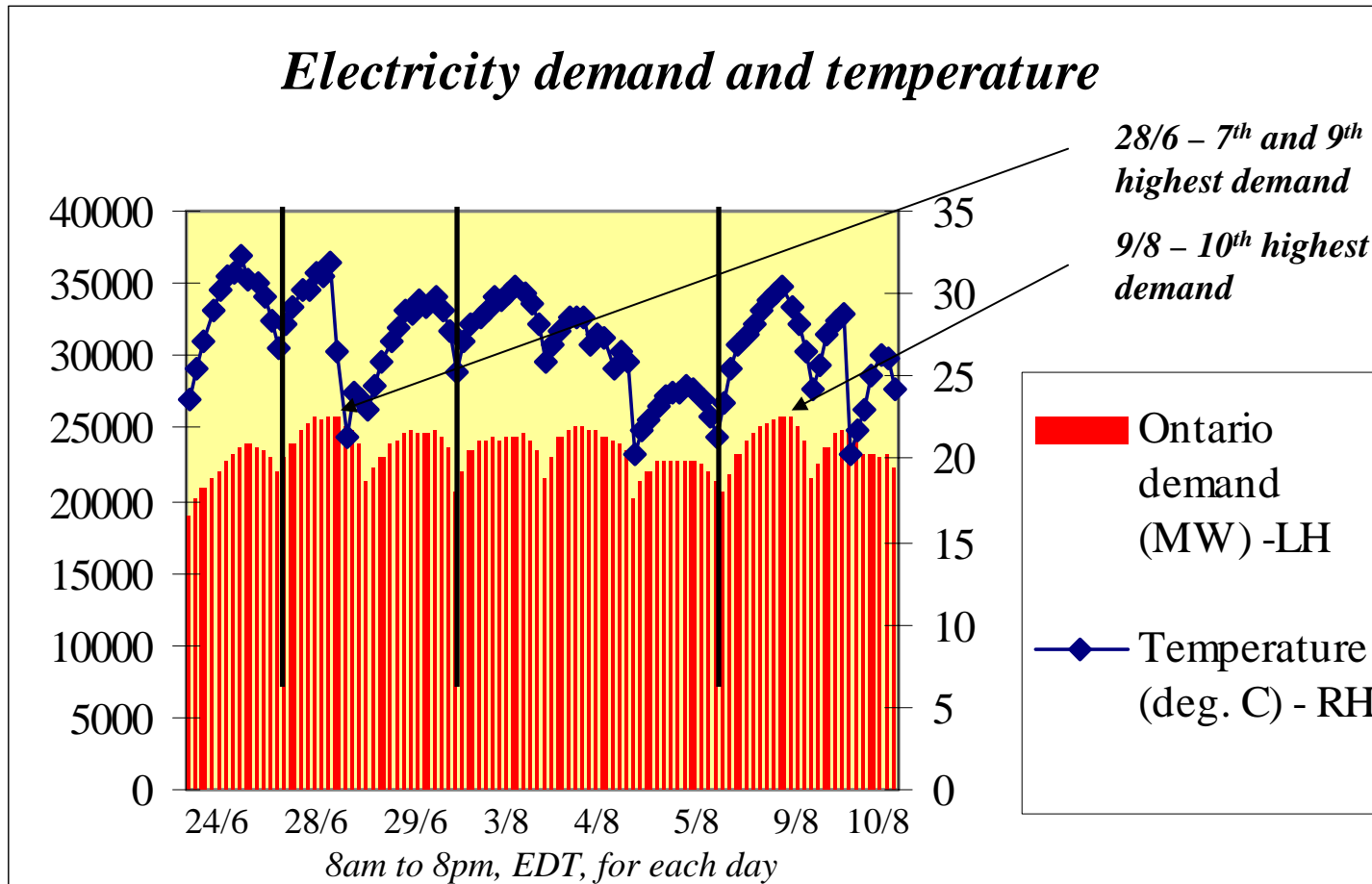
# Results – critical periods



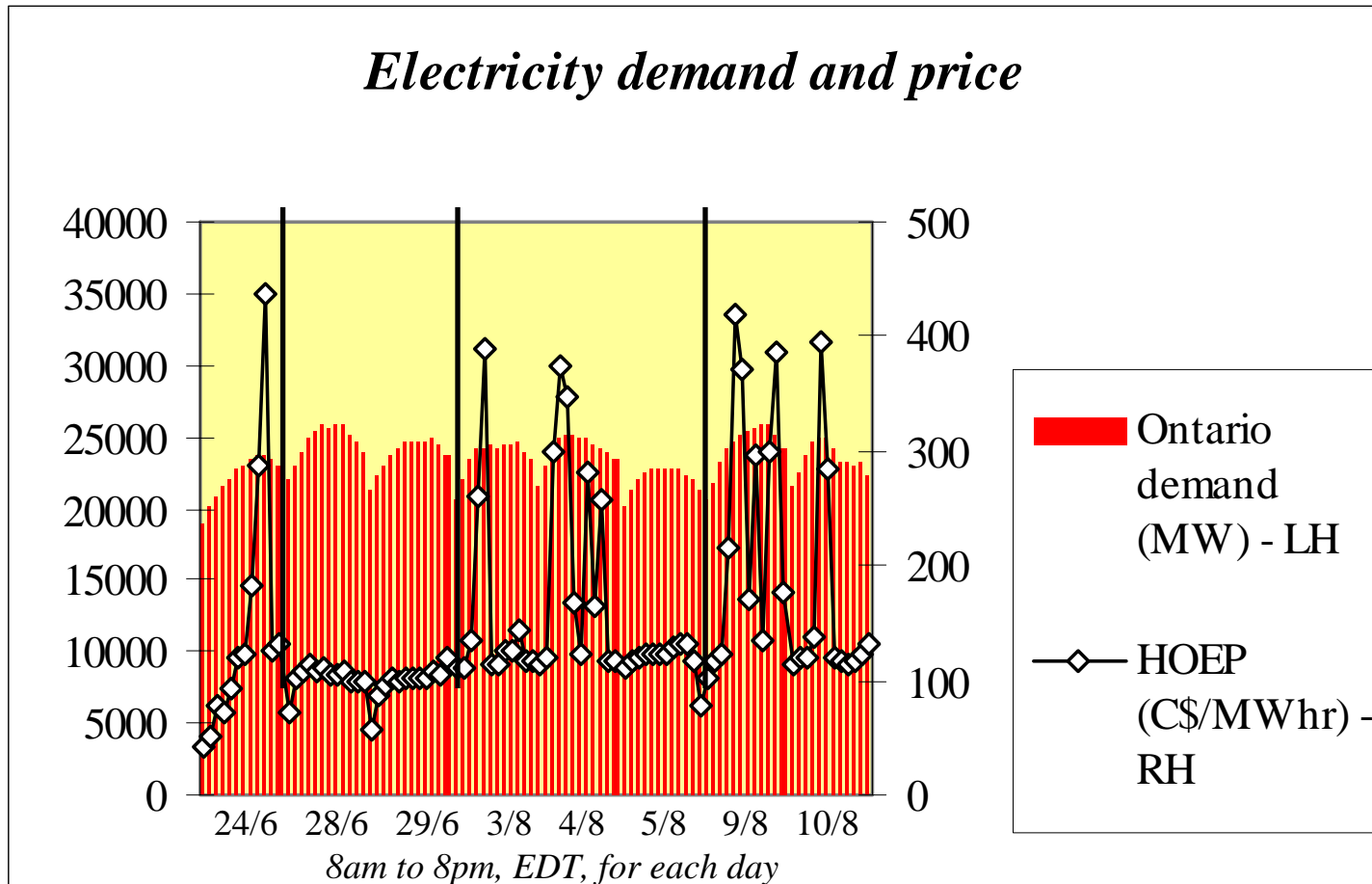
# Results – critical periods



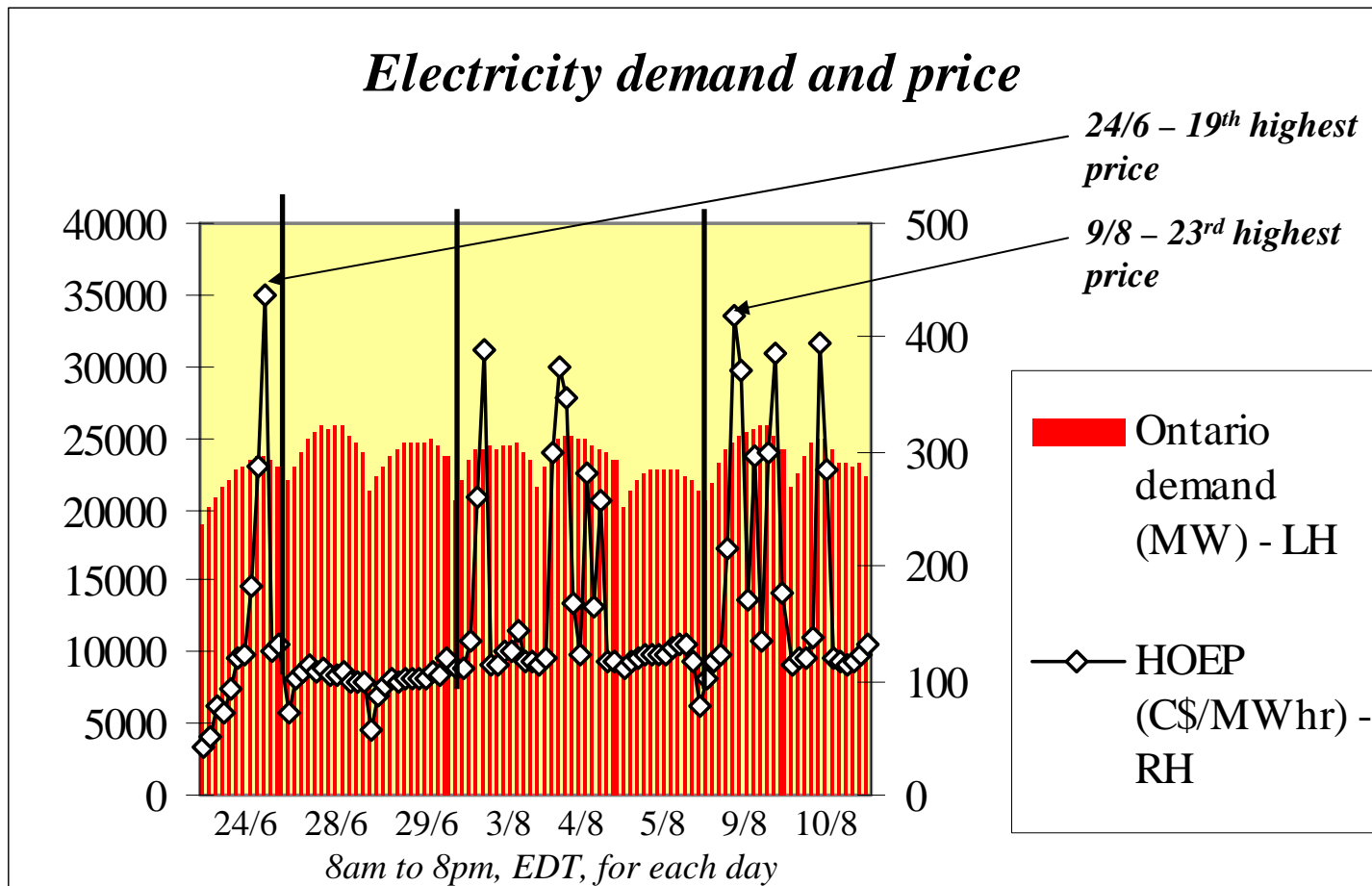
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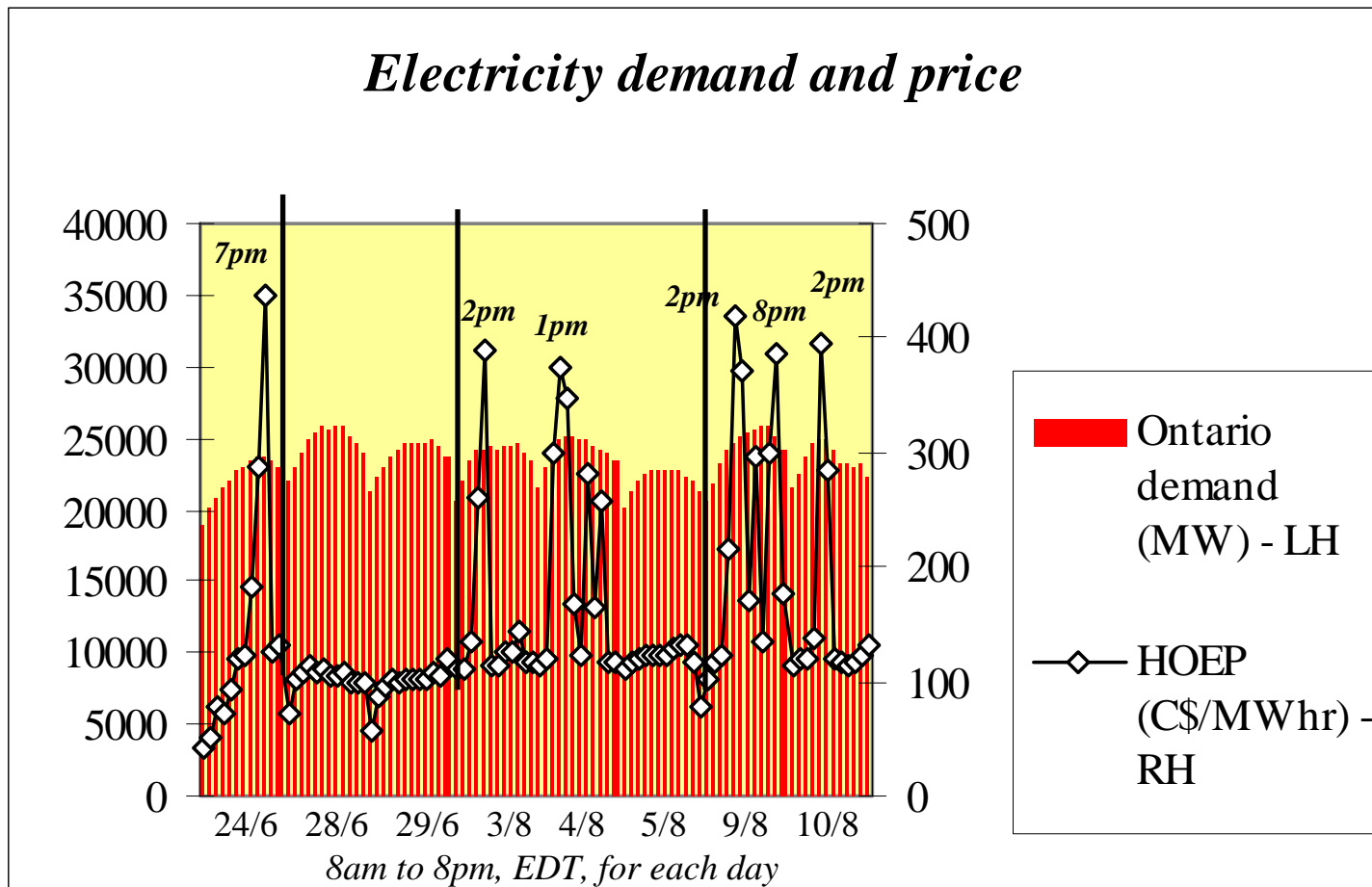
# Results – critical periods



# Results – critical periods



# Results – critical periods



# Results – critical periods

- what happens to costs during these ‘critical periods’ (96 hours in total across the eight days) if we change the price regime?
- going from ‘flat rate’ to ‘time-of-use’
  - costs go up, on average, 57% for this period
- going from a ‘flat rate’ to ‘real time’
  - costs go up, on average, 196% for this period

# Results – critical periods

- Consider periods during these power advisories when the three-hour ahead pre-dispatch price was  $\geq$  \$500/MWhr
  - two periods:
    - 4 August from 2-5pm (EDT)
    - 10 August from 12-5pm (EDT)
  - during these two days, the average consumption of our sample of houses was 45.4 kWhr/day
    - as compared with an overall August average of 29.9 kWhr/day
  - if a ‘critical peak price’ of 50¢/kWhr were implemented for these eight hours, then movement from a ‘flat rate’ to a ‘time-of-use plus critical peak pricing’ rate would result in a (on average) 327% increase in costs
    - for these two 12-hour periods (8am-8pm, 4 and 10 August)
-

# Forthcoming

- Achieving the aforementioned goals for the provincial electricity system
- Developing the ‘conservation culture’
- Commitment to install 800,000 smart meters by 2007, and in all homes and small businesses by 2010
- OPA development of ‘The Integrated Power System Plan’
- Demand response initiatives by the IESO and the OPA
- Potential price adjustments on 1 Nov. 2006

# Forthcoming

- Research activities at the University of Waterloo
    - improving our understanding of consumer behaviour and potential
      - consumers in terms of residential, commercial/institutional and industrial customers
      - examining motivations, strategies, needs, wants, etc.
    - exploring policy implications
      - sustainability consequences of alternatives
-

# Summary and conclusions

- this presentation has explored some issues arising from changing pricing structures
  - it found that even when there might be, 'on average', no changes, there could still be significant shifts 'at the edges'
  - it highlighted issues associated with the cost of providing electricity in Ontario
  - it identified the kinds of issues that could arise as Ontario increasingly moves to time-of-use (generally, marginal cost) pricing
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# Acknowledgements

- Ontario Centres of Excellence:  
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- Andrew Peers, Milton Hydro



Ontario Centres of  
Excellence

Centre for Energy



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