Residential Time-of-Use tariff:

Statistical evaluation of the domestic customer load response to the pricing signals

Domestic Electric Loads:
Consumption, Demand and Profiles Seminar

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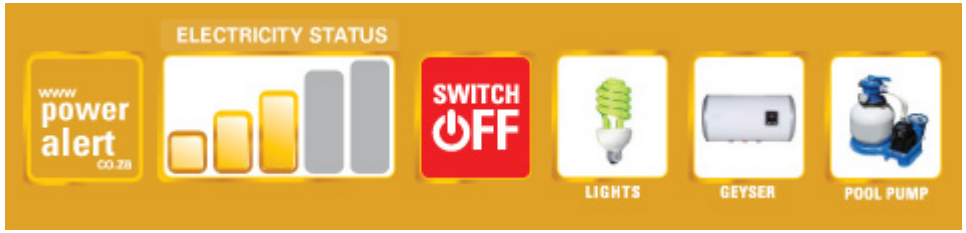
Powering your world

Introduction

- Familiar presence of Power Alert system on SABC, eTV - also on DStv

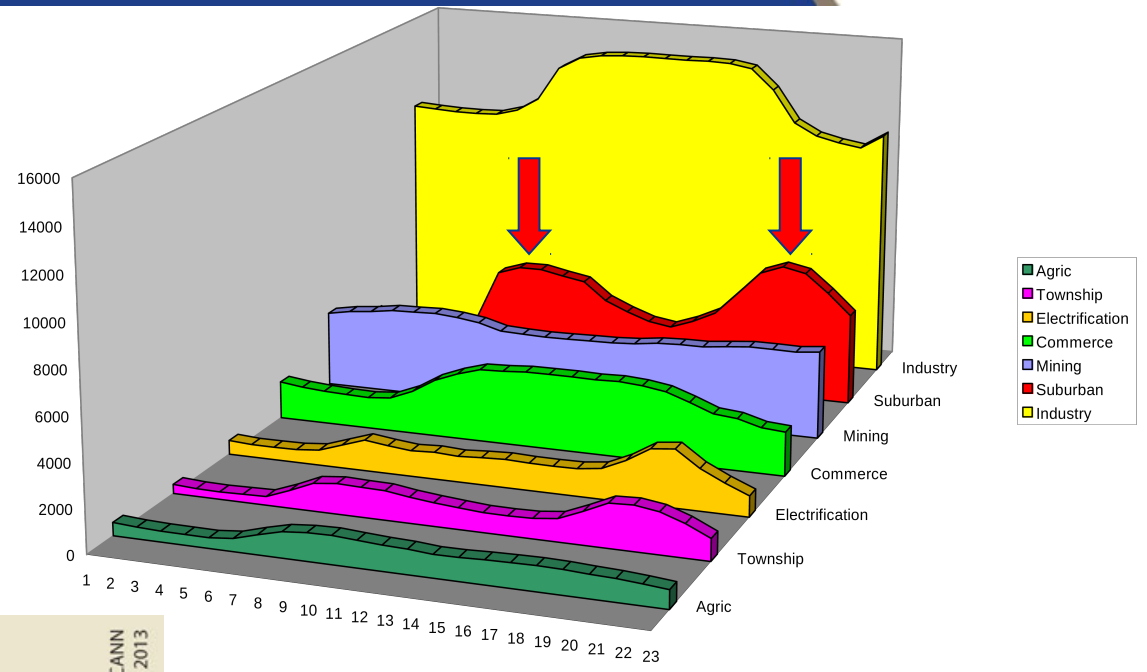


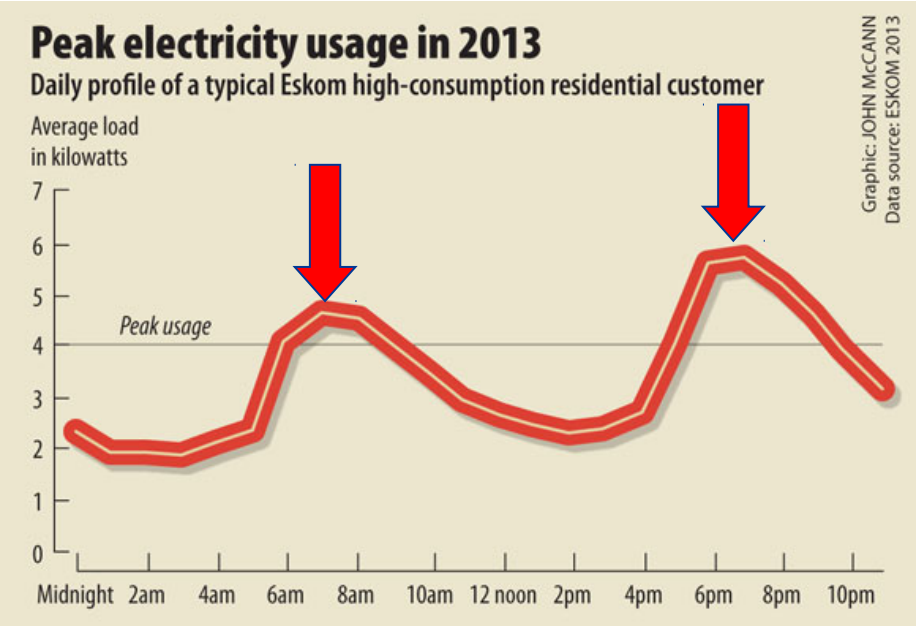
- 49m National Campaign

- What does these have to do with Residential Time-of-Use (TOU) tariffs?

Average weekday peak electricity usage of a typical residential suburban customer

- The residential sector uses about 17% of the total electricity generated in South Africa



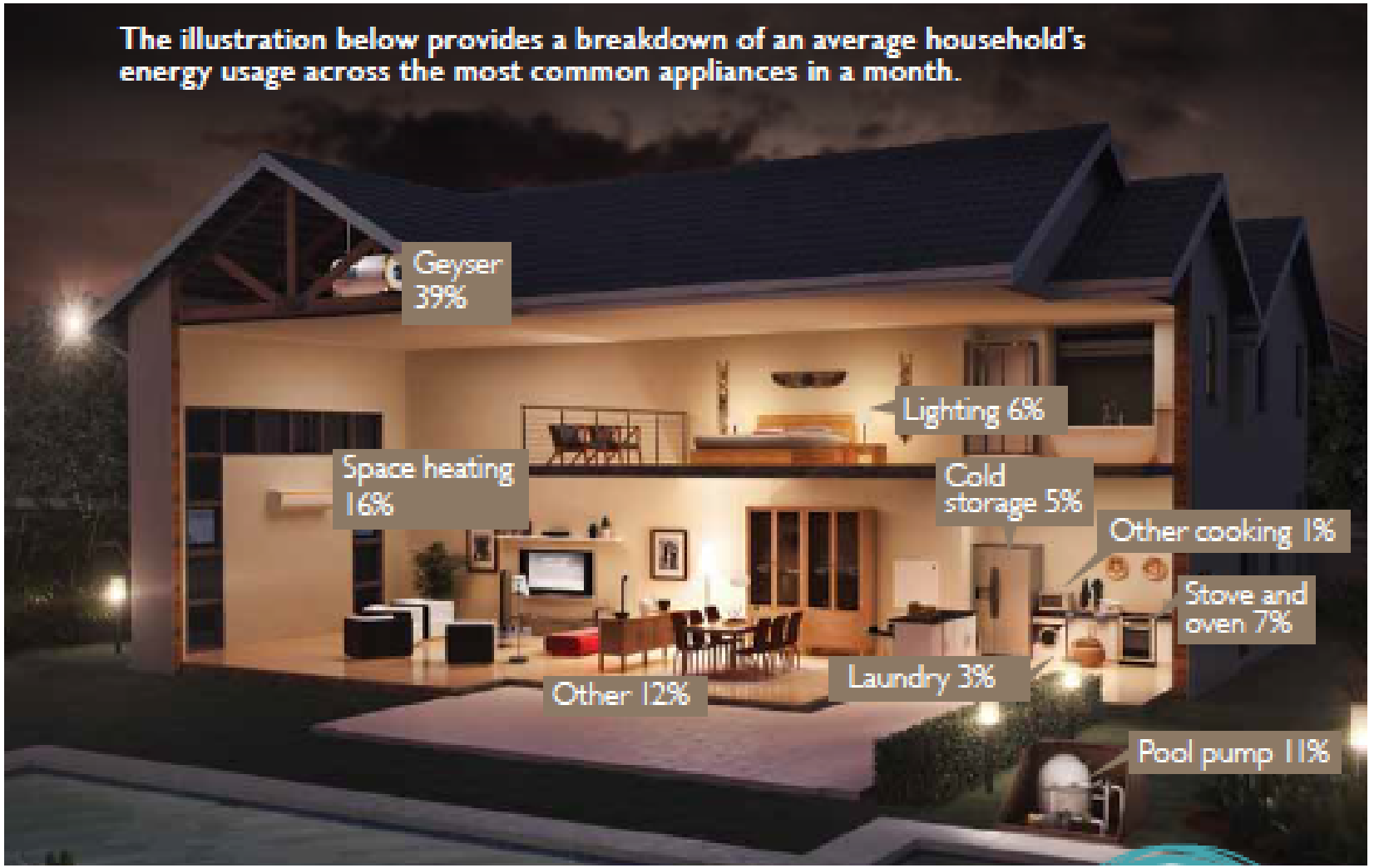


- From 7am to 10am in the morning, and 5pm to 9pm in the evening – periods of peak demand in South Africa – residential demand is up to 35% of the total demand required.

Source:

- Total End Use Consumption – Eskom ISEP/DSM
- Eskom Integrated Demand Management

Average residential (suburban) appliance usage



Source: Eskom Integrated Demand Management

Objective of a Residential Time-of-use tariff

- Eskom identified the need for the introduction of a Time of Use tariff for residential customers many years.
- Since that time a tariff (Homeflex) was developed and various pilot projects were run.
- The objective of the Homeflex Pilot Project
  - is to develop and introduce a residential time-of-use tariff that will penetrate the market; and
  - provide incentives and benefits to customers;
  - which will ultimately result in the optimization of the country's peak demand curve profile.

Market Drivers

- The continued increase in Eskom's peak demand and requirements for reduce consumption during peak periods (especially the evening peak).
- A requirement for increased sales in off-peak times.
- Increased customer needs for flexibility and lower costs - increase in customer service due to reduced bills and more value adding options.
- Load shifting in an all electric market reduces the Distributor's purchase costs and increase profitability.
- Better alignment to the purchase tariff - increased incentive to shift load, resulting in improved net contribution for the Distributor.

Market Drivers

- A target market exists for medium to high residential consumers who have ability to shift load.
- The Energy Policy White Paper and DoE's Electricity Pricing Policy
  - stipulations for time-of-use tariffs, cost reflective tariffs, differentiated capacity charges and sophisticated tariffs for the upper market.
- Compulsory Norms as promulgated in terms of the Electricity Regulation Act of 2008 Regulation no. 773 (amended in 2009)
  - customers consuming over 1000kWh/month to be on a time-of-use tariff.
- Major market for residential time-of-use tariff lies in municipal areas (still benefits industry as a whole).

Pilot objectives

- Primary objective - to determine whether a time-of-use pricing signal would encourage customers to shift their electricity consumption from peak to off peak periods.
- Other aspects tested:
  - Customer's acceptance of and response to the tariff and load management technologies.
  - The Distributor's support structures required for the implementation of the tariff e.g. Metering, Billing, Contact Centre, Field Services.

Pilot Testing

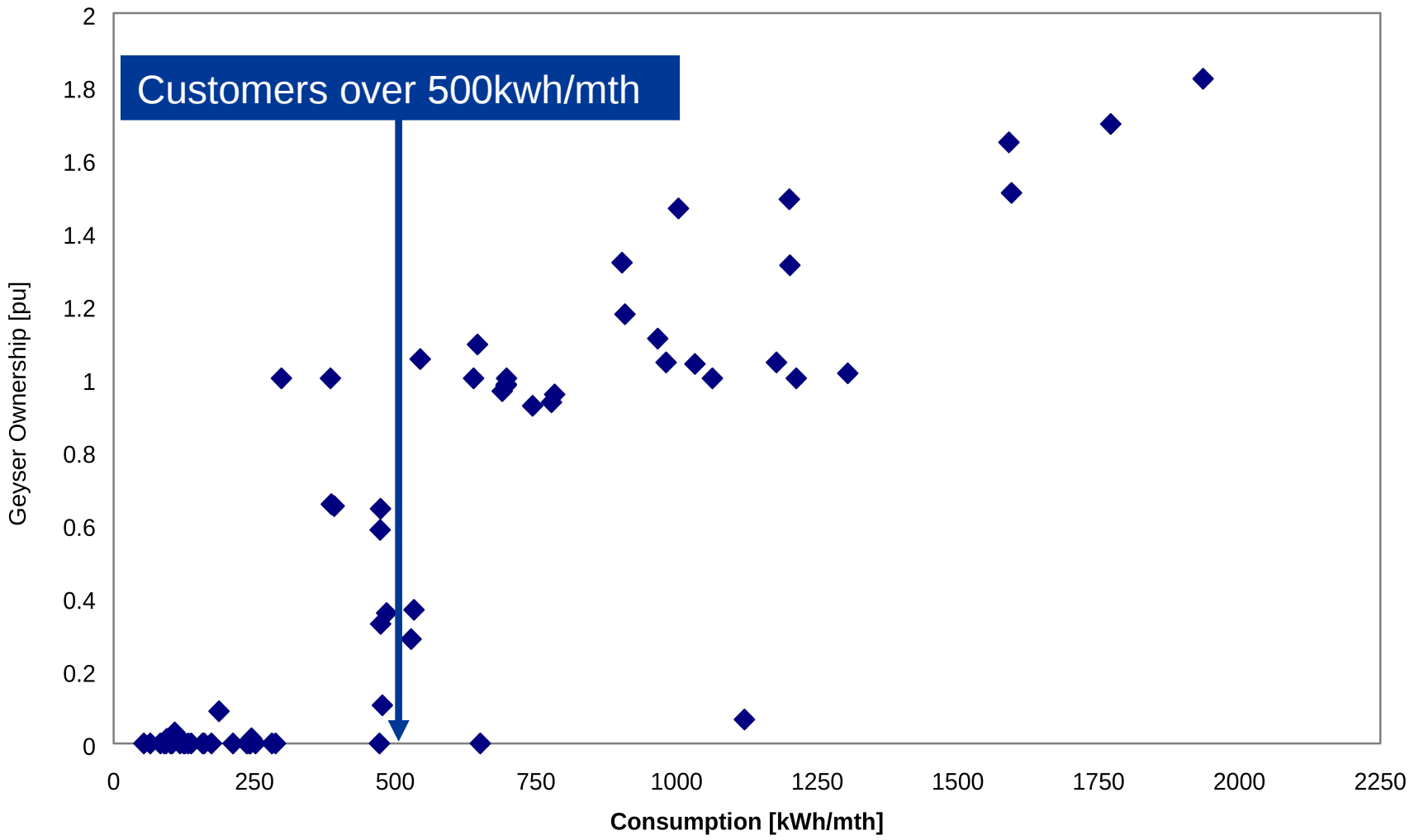
- Three pilots were run - Tableview, Sandton and Durban Metro.
- Each Pilot sample was made up of
  - 50 Test customer on 2 Part Homeflex tariff,
  - 50 Test customers on 3 Part Homeflex tariff,
  - 50 Control customers (on Homepower)
- An load research installed at each together with current domestic meter.

Pilot Testing

- Durban Metro pilot (customer controlled load management - timers used).
- Tableview Pilot (utility controlled load management – radio ripple system used).
- The Sandton pilot (customer controlled load management - timers used).

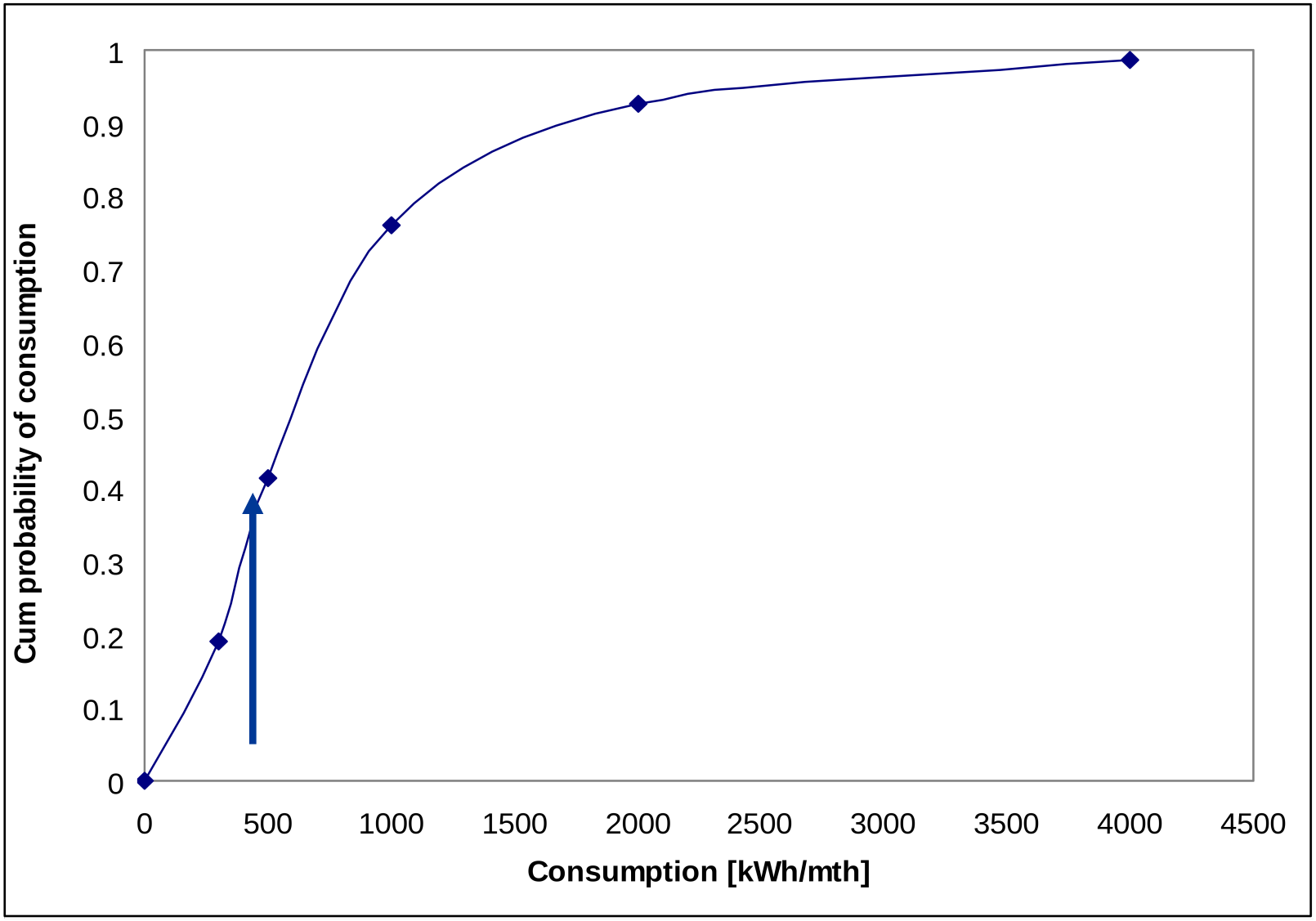
Pilot load response analysis and results...

Who has a geyser?



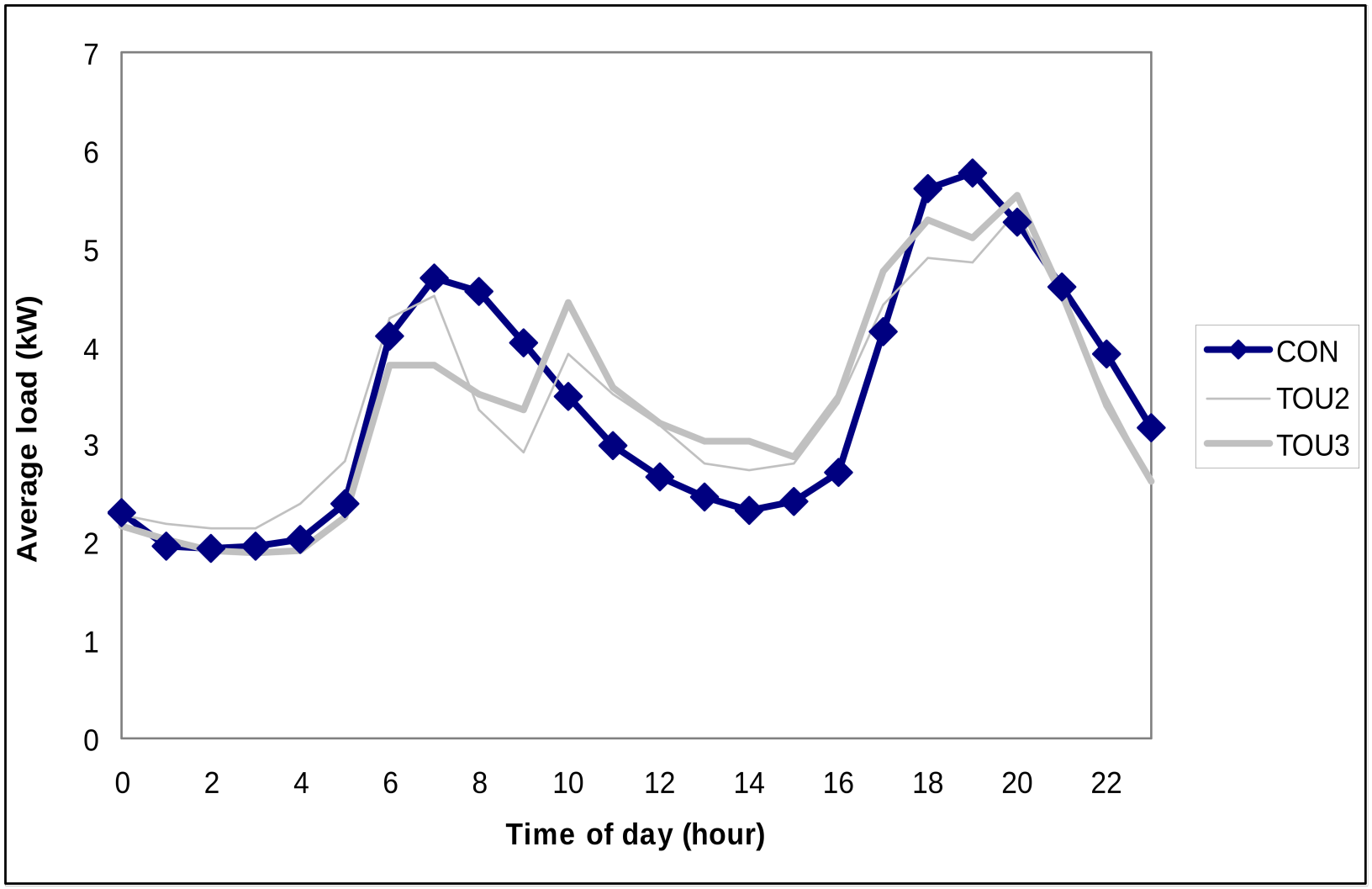
Source: NRS/TSI LR projects 1994-2003

Who is the target?



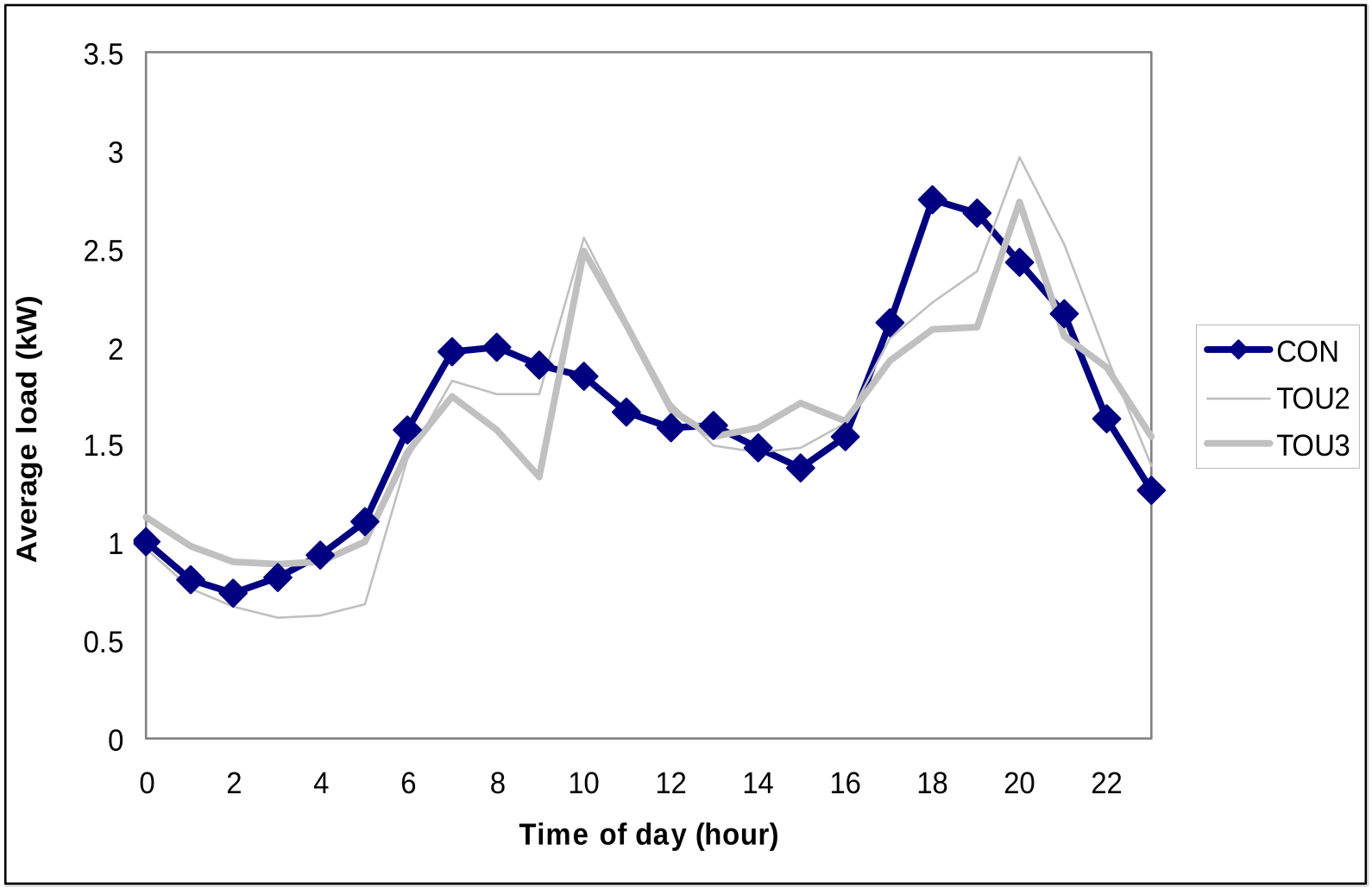
Source: Analysis of C1,C2,C3 sales Y2002

Load shift: Sandton



Avg. Winter weekday, 2002

Load shift: Tableview



Avg. Winter weekday, 2002

*Where there were indications of come-back load, this would to be managed.

Summary of load shift*

	AM 07h00-10h00	PM 18h00-20h00
Sandton	0.9 kW/hh (-17%)	0.5 kW/hh (-7%)
Tableview	0.7 kW/hh (-30%)	0.9 kW/hh (-29%)
Eskom target market	0.76 kW/hh (-23%) -86MW	0.72kW/hh (-18%) -82MW

*Avg. high season weekday per model. Highest mean saving of PSO peak-slot shown.

Summary (Contd.)

- TOU2/TOU3 does not affect consumption.
- Profile of TOU2/TOU3 the same.
- Profile of TOU2/3 different from Homepower control. Geyser control is profile modifier.
- Difference between local/remote load control.
- Elasticity not modelled.

Findings from the pilot test

- Homeflex may be usefully practiced on consumers using more than 500kWh/month.
- Response to a 2 part or 3 part tariff is not distinguishable, but was distinguishable from the control groups.
- The introduction of the tariff did not change the levels of consumption.
- Maximum load shift was achieved when the tariff is combined with an automated load management device.
  - Average peak demand reduction is forecasted at 0.7kW.
- The tariff is the “glue” that keeps the load shedding devices in place, operating normally and untampered.
- To make load management strategy most successful, customer must see direct benefits. A time-of-use tariff is an extremely effective strategy which provides immediate incentives for customers shift peak usage.

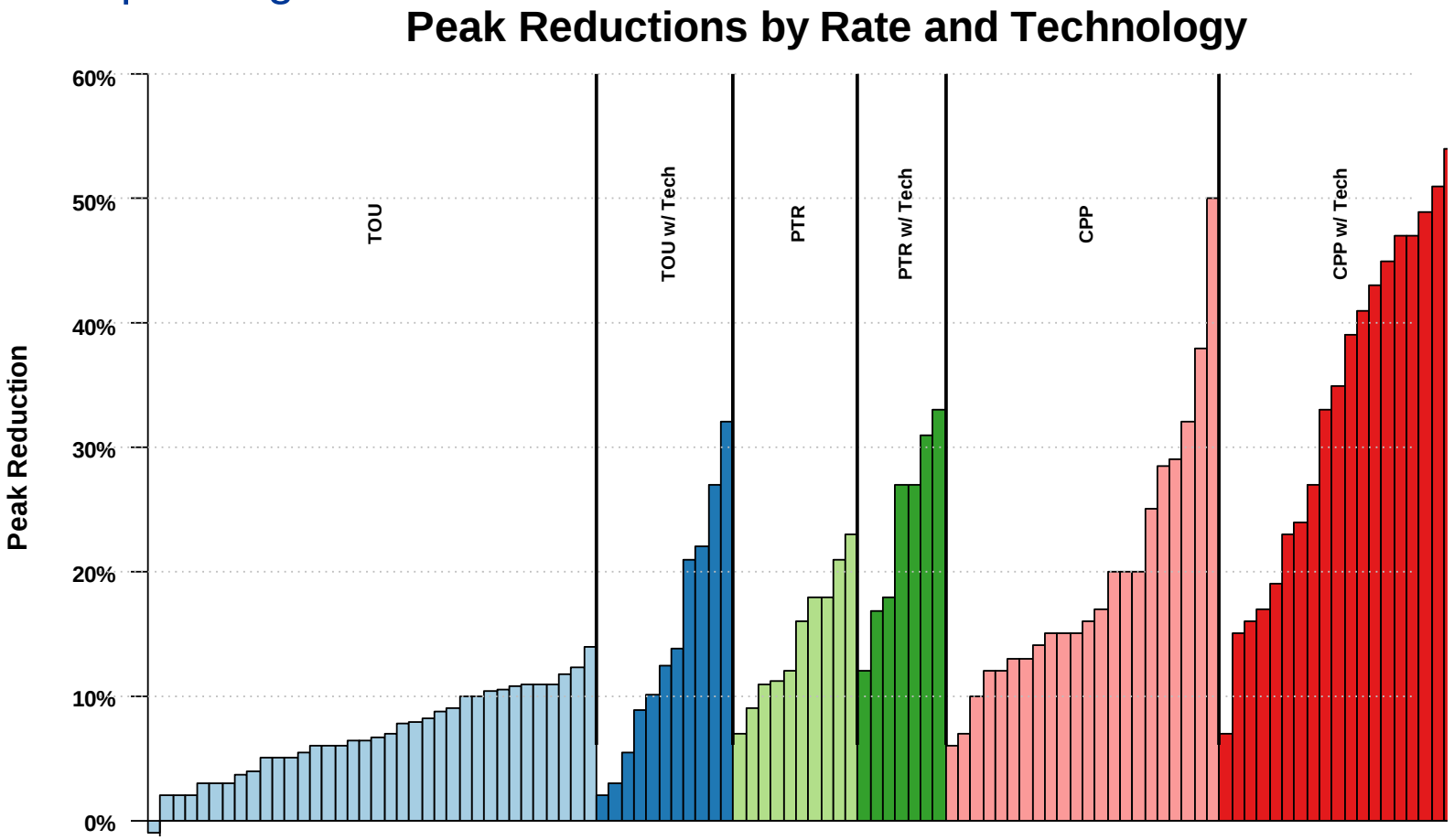
National impact of pilot findings

- Potential of 86MW can be shifted out of peak, if implemented to Eskom's residential suburban target market for tariff (120 000 customers).
- If implemented to Eskom's 360 000 residential suburban, agricultural and commercial customers, the estimated average peak demand is 252MW.
- The nearly 5,4 million electric geysers in South Africa contribute about 2,940MW of electricity to the evening peak*
  - enough to free-up five units of a 'six-pack' power station or power a big city the size of Durban.
- Based on pilot results, Eskom decided on a two-part TOU tariff, with enabling meter/technology as part of an integrated Pricing/Demand-Side Management (DSM) load management suite of offerings.
  - phased implementation
- NERSA approved the implementation of first phase (10 000 customers) in 2009.

Source: Eskom Integrated Demand Management

International best practices: similar finding to pilot results

- More than 140 rates have been tested in 31 experiments spanning 7 countries in 4 continents



Source: Primer on Demand-Side Management, prepared for the World Bank, 2005 by Charles River Associates; Time Varying and Dynamic Rate Design; Global Power Best Practice Series, Brattle Group, 2012

Time-of-use tariffs around the world

- EDF operates the most successful example of TOU pricing.
- Currently, a third of its population of 30 million customers on TOU pricing.
- First introduced for residential customers in 1965 on a voluntary basis

Source: The Implementation of Residential Time-of-Use Tariffs around the world, Shirley Salvoldi, Eskom, Electricity Pricing, 2005

Conclusions

- Operational challenges experienced with first phase deployment.
  - Pilot results, lessons learnt first phase and work from other related technologies/residential demand management strategies are being aligned into the bigger Eskom Demand Response portfolio.
- Critical value of load profiling work
  - Understanding of current and forecasted customer segment impact on national system profile
  - Measuring the quantitative and qualitative changes from customer responses to pricing signals – informs decision making
  - Has a vital role in the tariff design process – impacts revenue recovery
  - Impacts the balancing act between financial sustainability, demand response and/or other strategic objectives
- “Keeping the lights on” is an Eskom Strategic Imperative
  - Demand management requirements for peak demand reduction, energy efficiency, optimisation of the country” load profile
- Residential time-of-use tariff is still on the “burning platform” as a solution ir

Thank you

Questions?