Load profiling for settlement of accumulation meters

Power of Choice Stakeholders Reference Group
Third Meeting
Melbourne, 11 May 2012
Current AEMO procedure

• Used to settle non-interval metered consumption in the half-hourly wholesale market

• Applies to second tier customers with consumption less than
  - 160 MWhpa in VIC, SA, ACT
  - 150 MWhpa in NSW
  - 100 MWhpa in QLD

• NSLP for a given profile area is created as follows:

\[
\text{Energy inflows to the profile area} \times \text{MLF} + \text{Energy generated within the profile area} \times \text{MLF} \times \text{DLF} - \text{Half-hourly load within the profile area} \times \text{MLF} \times \text{DLF}
\]

• Controlled loads are separately profiled; the CLP is subtracted from the remaining consumption of customers with controlled loads
The UK approach

- ‘Profiling Taskforce’ established in 1994 to define the number and types of profiles to be used in the Electricity Pool

- Why: “to avoid the huge and prohibitive costs of putting Half-Hourly metering into every supply market customer”

- Applies to all customers below 100 kW Maximum Demand

- ‘8 generic Profile Classes were chosen as they represented large populations of similar customers’

- All profiles are at half-hour interval level

- Samples are stratified by consumption and weighted by 12 GSP areas)

- Profiles are created for
  - 3 day types (weekdays, Saturday, and Sunday)
  - 5 ‘seasons’ (Autumn, Winter, Spring, High Summer, Summer)

UK profile classes

• Half-hourly electricity daily load profiles for 8 standard UK profile class definitions
  - 01 Domestic Unrestricted
  - 02 Domestic Economy 7
  - 03 Non-domestic Unrestricted
  - 04 Non-domestic Economy 7
  - 05 Non-domestic Maximum Demand 0-20% Load Factor
  - 06 Non-domestic Maximum Demand 20-30% Load Factor
  - 07 Non-domestic Maximum Demand 30-40% Load Factor
  - 08 Non-domestic Maximum Demand >40% Load Factor)

• Important differences to the NEM:
  - Monthly bills
  - Demand register meters

• Also worth noting that UK has since made a significant commitment to interval metering - currently engaged in a national rollout whereby all households expected to have smart meters and IHDs by 2020
A proposed alternative - NEDRI (US 2003)

• Cited an important opportunity as being:

  “the role that short-term, price-responsive load can play in real-time and day-ahead power markets . . .

  Experience [has] demonstrated that a relatively small amount of price-responsive load can enhance system reliability if there are reserve shortfalls and substantially reduce market-clearing prices during tight market conditions, producing significant benefits to consumers.”

• Noted that profiling is a barrier:

  - Reduces incentive to the individual customer - any reduction in energy use at times of peak (or in any interval) is effectively spread over all hours of the billing period -- the load reduction is not credited to the appropriate hour

  - Provides no incentive to the Retailer to change customers’ load profile, as the benefit will be shared with all retailers

• Identified a number of recommendations required to

  “create sufficient price-responsive load so as to improve the performance, efficiency and reliability of wholesale electricity markets”
NEDRI recommendations for how load profiles could assist

• Regulator should consider requiring DBs to establish and maintain “special” load profiles to ensure that non-interval metered customers who want to participate in demand response programs receive the full financial benefits available from those programs

• Load profiles should be adequate to support “rate design, class and subclass settlement, and other purposes (such as interruptible programs)”

• Assumes the load profiles would be used to:
  - verify the load reductions of the participating customers on a statistical basis, and
  - ensure the Retailer gets the full benefit of the load reduction in the wholesale market (part of which would presumably be shared with the customer to encourage participation)

• Noted that:
  - “Implementation details may need to be worked out”
  - Benefits and costs would need to be considered: *i.e.*, do smaller customers have the potential to reduce their load to a degree great enough to warrant the effort that would be required to establish the new load profiles?
Possible rationale and criteria for profiling in the NEM

• Accuracy (user pays/fairness)
• Provide price signals to inform consumer decision-making
• Provide basis for demand management programs for non-interval metered customers
• Least cost (avoid the cost of metering where profiling can provide an acceptable alternative considering the other criteria)
• Does not create a barrier to further technological improvement
How does current profiling approach stack up?

• Accuracy (user pays/fairness)

**POOR -- Significant inter- and intra-class subsidies**

- Small commercial probably subsidising residential customers
  - Commercial shape flattens residential shape
- Intra-class subsidies likely between, for example:
  - AC and non-AC residential customers
  - Residential customers with different household occupancy patterns
  - Commercial customers with different operating schedules

• Provide price signals to inform consumer decision-making

**POOR**

• Provide basis for demand management programs for non-interval metered customers

**POOR**
Composition of Energex system peak demand (24 Jan 2006)

系统高峰负荷（24 1月 2006）
How does current profiling approach stack up?

• Least cost (avoid the cost of metering where profiling can provide an acceptable alternative considering the other criteria)

  *Mixed* - Has avoided the cost of metering - but performance on other criteria is poor

• Does not create a barrier to further technological improvement

  *Good* - No reason to believe the current profiling approach has created a barrier to the use of interval metering
Alternative approaches for load profiling in the NEM

• Break current load profile by residential and non-residential or specific tariff classes that are still on accumulation meters

• Try to create classes that reflect customers with similar load shapes
  - Small commercial
    • 5 day operation primarily business hours
    • 5 day operation extended hours
    • 6+ days
  - Residential
    • Appliance stock (particularly AC, possibly pool pumps and controlled hot water; PV might be of interest)
    • Household occupancy pattern (household composition as a surrogate)
    • Climate zone (addressed to some extent by current profiling by DB area - probably not adequate in larger DB areas)

• Demand response program samples
### How do these alternatives perform against the criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Residential / Small Commercial</th>
<th>Load shape segments</th>
<th>Demand response program samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy (user pays/fairness)</td>
<td>Better than currently</td>
<td>Very good</td>
<td>Good – but mostly limited to participants</td>
</tr>
<tr>
<td>Price signals to inform consumer decision-making</td>
<td>No better than now</td>
<td>No better than now</td>
<td>Good</td>
</tr>
<tr>
<td>Basis for demand management programs</td>
<td>No better than now</td>
<td>Possibly a little bit better than now</td>
<td>Very good</td>
</tr>
<tr>
<td>Incentive to Retailer</td>
<td>No better than now</td>
<td>Possibly a little bit better than now</td>
<td>Very good</td>
</tr>
<tr>
<td>Least cost</td>
<td>Very little incremental cost</td>
<td>Potentially very high costs</td>
<td>Moderate costs</td>
</tr>
<tr>
<td>Avoids technology barrier</td>
<td>Good</td>
<td>Poor</td>
<td>Poor</td>
</tr>
</tbody>
</table>
Implementation issues

• Residential / Small commercial
  - Presumably mandatory
  - Samples for creating the profile could be developed using same general approach as used for control load profile

• Load shape segments
  - Could be mandatory or opt-in
  - Mandatory would be extremely expensive to set up initially and maintain
    • Would require updates whenever facility occupancy, occupancy pattern, or possibly appliance stock changed
    • Probably highly contentious and open to gaming (which would add to cost and backlash)
  - Opt in would make the NSLP increasingly accurate and probably increasingly unappealing
    • Could provide an entry for demand management service providers (including retailers), but would require verification

• Demand response profiles
  - Chicken and egg problem - but could be addressed to the extent that DBs become more active in broad-based DM programs
Final thoughts

- Residential / small commercial
  - Makes nothing worse and some things marginally better
  - Appears to be low cost

- Load shape segments
  - Probably more trouble than they are worth

- Demand response program samples
  - Good if they happen as a by-product

- As in many other aspects of the NEM, it is hard to satisfy all objectives at once

- Questions remain as to:
  - Where we are going with smart meters and how quickly, and
  - And in light of that, how important are the other potential benefits of ‘better’ profiles and over what timeframe?