EnerNOC model for compensating Demand Side Participation in the wholesale market

Explanatory briefing note for Stakeholder reference group

Power of Choice Review

Stakeholder Reference Group for Power of Choice Review – meeting 4
28 May 2012

EnerNOC model

- EnerNOC has raised a new model for facilitating the sale of demand response into the wholesale market.
- EnerNOC submission to the Power of Choice Directions Paper provides a description of the model. EnerNOC also presented an overview of its new model at an AEMC industry workshop on aggregation of load for wholesale and ancillary services (held on 27 April)
- EnerNOC has been asked to present on their new model at the Stakeholder reference group meeting on the 28 May.
- These briefing slides provide an explanation of the model with some worked examples. The purpose of which is to aid SRG members understanding of the EnerNOC model in preparation for the meeting.

EnerNOC model – objective

- EnerNOC model seeks to facilitate demand side bidding into the NEM in a manner which is consistent with the following principles:

  a) Consumers should have the choice to treat their Demand Resource (DR) capabilities as a resource that they can make available to the wholesale market in a comparable manner to a peaking generator

  b) Consumers should be able to do this independently of their choice of retailer, either by participating directly, or by contracting with another party

  c) DR resources should be treated as part of the bid stack, in a comparable manner to a scheduled peaking generator

  d) DR resources should be paid the spot price for the DR they deliver to the wholesale market

  e) If a consumer chooses to sell its DR into the wholesale market then the retailer should be unaffected by the DR actions of the consumer—i.e. the financial effect on their retailer should be the same as if the consumer was not taking any DR actions

EnerNOC model – how it will work

- Under the model the consumer DR can be either scheduled or non scheduled in the AEMO scheduling and dispatch process.
- Calculation of spot price would continue as it does now where the marginal scheduled band(s) of generation or demand side would be the basis for spot price.
- If scheduled, the consumer DR is dispatched when it is efficient to do so (i.e., when its bid is equal to or less than the marginal bid). Scheduled DR would need to fulfil certain operational obligations.
- If the DR is non-scheduled, the DR participant will decide the timing of interruption in the same way a market, non-scheduled generator can decide when to generate.

EnerNOC model – how it will work (2)

- In both scheduled and non-scheduled cases the DR consumer would receive the prevailing spot market for its quantity of demand response
- That quantity of demand response is calculated based upon a baseline consumption estimate (i.e. the consumption that would have occurred at the consumer site without any DR) and the actual metered consumption at the site, during the trading interval when the consumer is providing DR
- The methodology for determining the baseline consumption is important and could be a source of risk to retailers. EnerNOC believe that this should be an entirely automated process, based on pre-agreed algorithms. This could be determined by AEMO or by industry.

EnerNOC model – how it will work (3)

- The retailer at the DR consumer site is required to pay AEMO based upon the baseline consumption at the site (i.e. what would have happened without the DR)
- The DR consumer is required to continue to pay the retailer this same counterfactual volume at its retail contract price
- AEMO pays the DR consumer the spot price. Hence the consumer pockets the difference between the **spot price** and the **retail contract price**
- AEMO over-recovers in the settlement process but is left neutral after paying the DR consumer the spot price
- In theory, the retailer is unaffected by the actions of the DR consumer: when the DR consumer reduces its consumption, it makes no difference to the amount of energy it buys from the spot market or bills the consumer for.

EnerNOC model – how it will work (4)

- With respect to the network charge component of the retail tariff, under the model the DR consumer will pay the network charge based upon its actual consumption and not its baseline consumption.
- This means that retailer billing system will need to be cope with different quantities when assessing network and energy charges and also the consumer will need to understand the value of the energy component of the retail tariff.

EnerNOC model – potential economic value

Allows the consumer to have “selective” exposure to the spot price when it considers that the spot price is more than its value of consuming electricity.

Therefore the consumer has the ability to arbitrage between its price in its retail contract and the spot price. Hence could be a means to overcome the lack of cost reflective prices in the NEM

Potential economic benefits:

- Reduced generation costs – in the sense that the DR resource displaces more expensive supply side resources. This benefit is shared by all retailers, and competition should lead to it being shared with consumers, once it flows through to contract prices
- Value for the DR consumer: Difference between the [spot price - retail contract price] and [value of lost consumption – operating costs savings from not consuming]
- Could provide a platform for DR consumer to offer DR to networks

Potential economic costs:

- Higher transaction costs to verify and monitor the baseline consumption calculation

EnerNOC model – issues

Can the DR be scheduled or non-scheduled?

- AEMO dispatch system may not cope with significant amount of un-scheduled demand response. Therefore likely need for DR to be scheduled and also for the DR to be treated the same as generators wrt to dispatch.
- But what should be the technical and operational requirements? Should the DR resource be required to be schedulable within 1MW blocks (same as generation), “self commit” any minimum reduction or it may use the FSIP facility – the fast start inflexibility profile provided for under the NER?
- **What metering and settlement arrangements are needed?** Requires the consumer to be able to unbundle its consumption from its demand response.

EnerNOC model – issues (2)

How will it affect Retailers' commercial behaviour?

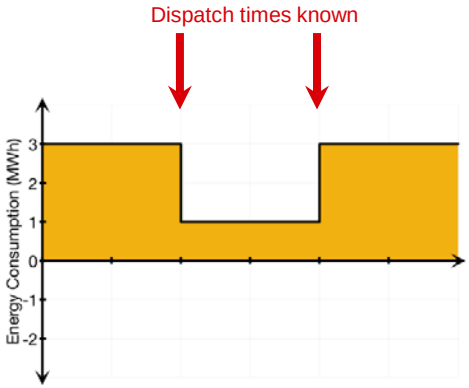
- A crucial element of the proposal is that the DR MUST be a customer of a Retailer who will be obliged to continue to pay the spot price to AEMO for the DR load as if it continued to consume, even when the DR is activated.
- From a commercial perspective, presumably the Retailer will account for the probability of high prices at full volume in its risk management strategy and tariff setting process, as it does in the absence of DR arrangements.

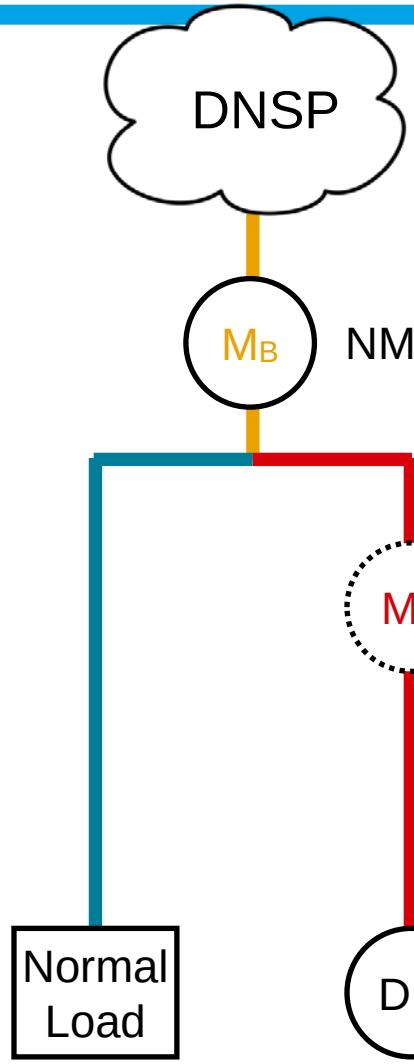
How will it affect generator's behaviour?

- It is likely to increase the dispatch risk for generators (similar to a new generator entering the market)
- Generator can avoid this by bidding in at or below the cap strike price in its retail contract.

Worked examples of EnerNOC model

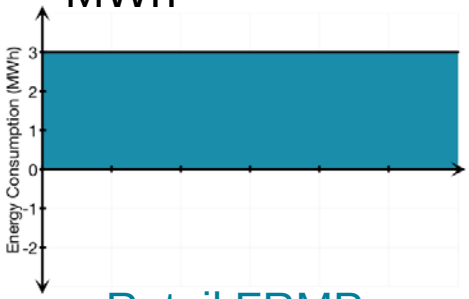
EnerNOC model – worked example





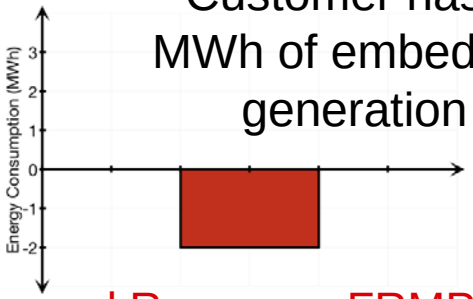
Overall system demand is 100 MWh

Baseline consumption is 3 MWh



Retail FRMP

Customer has 2 MWh of embedded generation



Demand Response FRMP

Worked Example

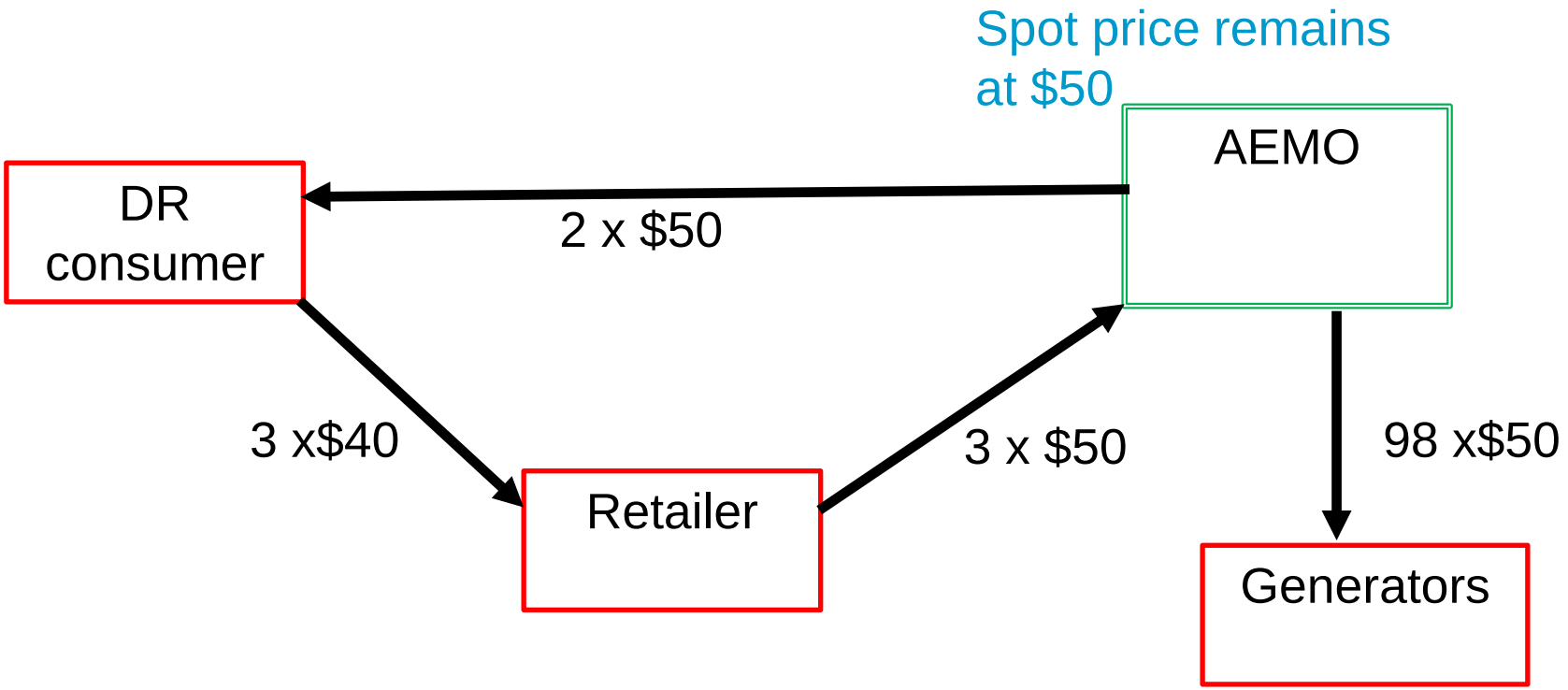
- Overall system demand is 100 MWh
- DR consumer baseline consumption is 3 MWh
- Customer has 2 MWh of embedded generation
- Retail contact price with DR consumer is $40 per MWh

<u>Scenario 1: assume no change to spot price:</u>

- DR consumer runs 2 MWh of embedded generation for 1 hour
- Retailer is settled based upon 3 MWh baseline consumption
- Spot price remains at $50 (i.e., DR does not affect the marginal bid)

Scenario 1: no change to spot price	No demand response	Scheduled DR
Normal consumption (MWh)	3	3
DR Amount (Mwh)	0	2
Actual load during DR Dispatch	3	1
Total physical demand	100	98
Total demand settled by AEMO (seen by market)	100	100
Spot price	**$50**	**$50**
Retail contract price	$40	$40
Retailer pays AEMO	$150	$150
Consumer pays retailer	$120	$120
AEMO pays consumer	$0	$100
Consumer net position	-$120	-$20
Retailer net position	-$30	-$30

Worked example: Scenario 1 – no change to spot price – payment flows



DR consumer net position is -$20 compared to -$120 without DR

Worked example: Scenario 1 – how does it compare to current arrangements

- Under EnerNOC model the DR consumer is $100 better off by doing the DR, because DR consumer net position is -$20 compared to -$120 without DR
- Under current arrangements, the DR consumer does not receive any spot price payment from AEMO but instead gets the benefit of avoided retail price when it decides to reduce consumption
- Therefore in this example, this would save the DR consumer, $80 ($40 x2)
- Hence compared to the current arrangements, the consumer is now better off by a net $20.

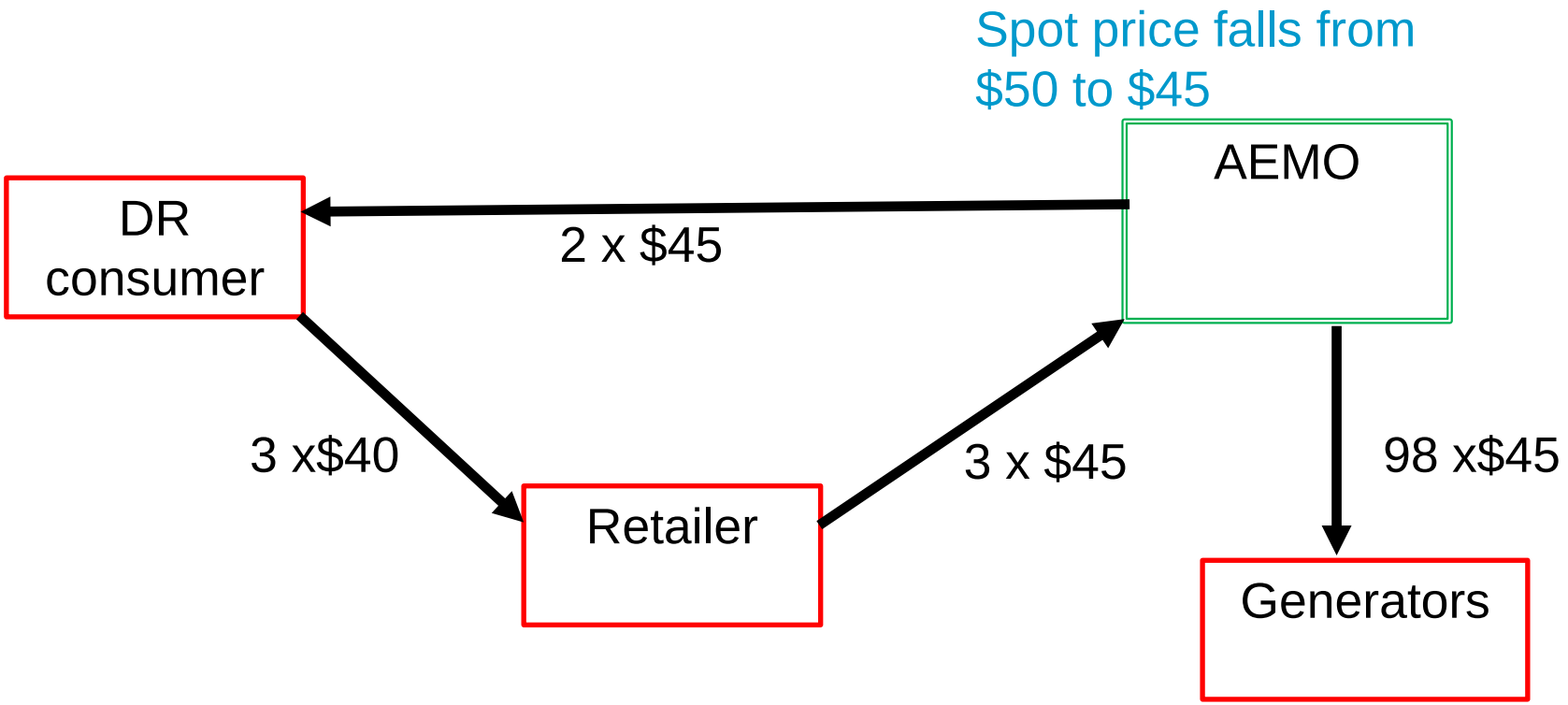
Worked Example

Scenario 2: Scheduled DR under EnerNOC model leads to a reduction in spot price

- DR consumer runs 2 MWh of embedded generation for 1 hour
- Retailer is settled based upon 3 MWh baseline consumption
- Impact of the scheduled DR is to reduce spot price from $50 to $45, due to the shift in the supply curve
- Retail contract price remains at $40
- Retailer pays $135 to AEMO of which consumer is paid $90 from AEMO to reflect 2 MWh of DR and the remaining $45 is paid to generators.

Scenario 2: change to spot price	No demand response	Scheduled DR
Normal consumption (MWh) (C)	3	3
DR Amount (MWh) (D)	0	2
Actual load during DR Dispatch	3	1
Total physical demand	100	98
Total demand settled by AEMO (seen by market)	100	100
Spot price (A)	**$50**	**$45**
Retail contract price (B)	$40	$40
Retailer pays AEMO (E)	$150 (A x C)	$135 (A x C)
Consumer pays retailer (F)	$120 (B x C)	$120 (B x C)
AEMO pays consumer (G)	$0	$90 (A x D)
Consumer net position	-$120 (G - F)	-$30 (G - F)
Retailer net position	-$30 (E-F)	-$15 (E –F)

Worked example: Scenario 2 – change to spot price. Payment flows under EnerNOC model



DR consumer net position is -$30 compared to -$120 without DR

EnerNOC model – further details

EnerNOC model – Comparison with the FERC approach in USA

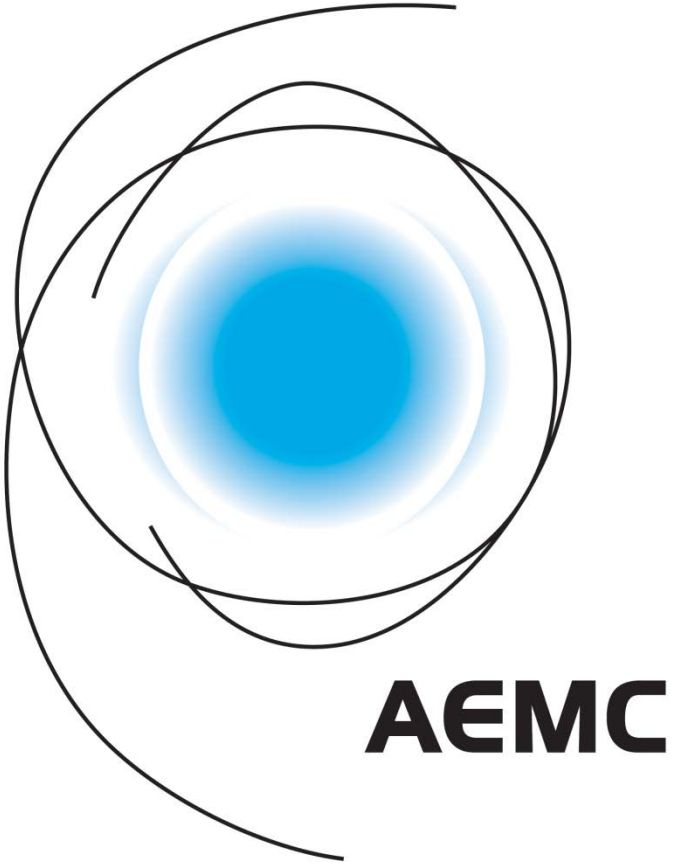
- Federal Energy Regulation Commission has mandated a decision that DR responses are paid the spot price
- The difference with this model is that the DR consumer only pays their retailer for their actual consumption, not their baseline.
- This leaves the market operator to fund the payment to the DR resource, out of market fees.
- Two conditions applied to this 1) that the DR resources can be used to offset generation in the dispatch and 2) that the DR resource passes a cost effectiveness test (like the California Net Resource test).

EnerNOC model – further detail

EnerNOC model is analogous to the current treatment of embedded generators that are co-sited with consumer load and yet seek to participate in the wholesale market.

In this case, the embedded network functionality within the Market Settlement and Transfer Solution ("MSATS") is used to perform parent-child, or subtractive, metering, with the Retailer's boundary meter becoming the parent meter and a new child meter, associated with a different Market Participant, being installed on the generator.

The NERA and KEMA submissions to the Power of Choice Review provide supporting material to the EnerNOC model.


AEMC