

# SETTLEMENT FOR RESIDENTIAL DR RESOURCES

Demand Response Working Group  
Meeting #5

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November 22, 2016

# Settlement

- Residential DR will participate in the energy market as Hourly Demand Response (HDR) resources
- Availability payments will be calculated in the same way as for all other HDR resources
- The performance of residential HDR resources will be measured using a new M&V approach, which requires:
  - A new baseline method: Randomized Control Trials
  - New contributor management processes
  - Different application of non-performance charges

# Availability Payment (CT 1314)

- Availability payment is the same as for any resource with a DR capacity obligation
- Participants with DR Capacity Obligations will receive a monthly Availability Payment for each zone calculated as follows:

$$\sum_{d=1}^n DRCO_k \times DRACP$$

– Where:

- ‘d’ is a business day in the month
- ‘n’ is the number of applicable business days in the month
- $DRCO_k$  is the DR Capacity Obligation (MW) on day ‘d’
- DRACP is the DR Auction Clearing Price

# Availability Payment Calculation

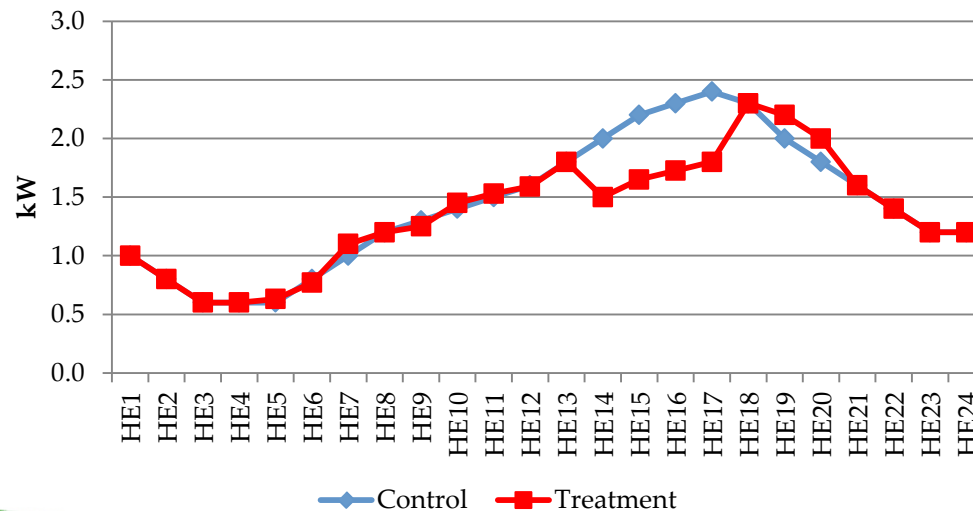
$$AP = \sum_{d=1}^n DRCO_k \times DRACP$$

$$AP = 21 \text{ business days (May 2016)} \times 4 \text{ MW} \times \$378.21 \text{ MW-day}$$

$$\text{Availability Payment} = \$31,769.64$$

# Randomized Control Trial (RCT)

- Two groups are established within a resource:
  - A “treatment” group which receives the DR standby and activation notices
  - A randomized “control” group which receives no notification and serves as a proxy for baseline consumption
- RCT evaluates the average consumption difference between the two groups to determine the amount of DR delivered



# Contributor Management

Monthly, the Participant provides:

1. DR capacity for the treatment group for the month
  2. Number of contributors in each group (control & treatment)
  3. Contributor list, flagging control group contributors for the month
- The contributor information for each month must be received a specified number of days prior to that month
  - If information is not received in time, the resource is not allowed to participate in the energy market, a natural result of which is calculation of the Availability Charge (discussed later)

Note: Participant must retain documents establishing contributor agreement to participate as well as consent to share measurement data with the aggregator; Consent must also grant permission for the aggregator to share measurement data with the IESO for audit purposes.

# Proposed Control Group Requirements

- The control group load represents what the treatment group contributors would have consumed in the absence of an event
- There were mixed stakeholder views regarding the size of control group, perhaps depending on the method of load reduction (behavioural DR, direct load control)
- The IESO has considered stakeholder feedback and best practices for DR with a large, homogenous population
- For each resource with 1 MW minimum DR capacity, the IESO proposes a minimum control group size of 350 contributors (which is expected to deliver approximately 95% confidence level with a margin of error of 5%)
- Note that DR capacity for the control group is not included in the 1 MW minimum

# Non-Performance Charges

- Non-performance charges promote compliance with DR Capacity Obligations
- Three types of non-performance charges may apply for residential HDR resources:
  - Availability Charge
  - Administration Charge
  - Capacity Charge
- No dispatch charge since compliance with dispatch is a 5 minute evaluation whereas residential DR performance is evaluated at an hourly granularity



# Availability Charge (CT 1315)

- Availability charge is the same as for any resource with a DR capacity obligation
- You are required to submit and maintain DR Energy Bids for every hour of the Availability Window for your obligated capacity from DACP until real-time as required, or be subject to an Availability Charge
- DR Energy Bids that must be submitted for at least a four hour consecutive hour block; otherwise the availability charge will apply as if no bids were submitted

# Availability Charge (CT 1315)

If availability requirement is not met, a daily Availability Charge would apply as follows:

$$\sum_{h=1}^n -1 \times \text{Max}(0, \text{DRCO}_k - \text{DREBQ}_h) \times \text{DRACP}_h \times \text{DRNPF}$$

– Where:

- ‘ $\text{DRCO}_k$ ’ is the DR Capacity Obligation (MW) on day ‘d’
- ‘ $\text{DREBQ}_h$ ’ is the DR Energy Bid Quantity calculated as the sum of the quantity of DR capacity provided by registered DR resources
- ‘ $\text{DRACP}_h$ ’ is the hourly DR Auction Clearing Price
- ‘DRNPF’ is the Non-Performance Factor for the month

# Non-Performance Factors

- Non-Performance Factors are designed to encourage availability during periods of peak demand, when demand response is needed most
- Factors are published in Market Manual 12

Summer	NP Factor	Winter	NP Factor
May	1.0	November	1.0
June	1.5	December	1.5
July	2.0	January	2.0
August	2.0	February	2.0
September	1.5	March	1.5
October	1.0	April	1.0

# Administration Charge (CT 1316)

- In the event of a DR activation, aggregated measurement data must be submitted for control group and treatment group separately, by hour, for all hours (HE1-HE24) of the event day
- Data must be submitted at least 6 business days (BD) prior to the end of the month following the month in which the event occurred, with opportunity to correct erroneous data up to 2 BD before end of month  
e.g. June settlement data must be submitted at least 6 BD prior to end of July
- Failure to submit data by the applicable deadline will result in an Administration Charge equal to the monthly Availability Payment for the zone (*see note on next slide*)

The above application of the Administration Charge applies only to Residential DR resources. Other HDR resources will continue to submit measurement data every month for baseline purposes.

# Capacity Charge (CT 1318)

- Capacity Charges are settlement charges applied to DR market participants for non-performance of capacity delivery including test activations and/or in-market activations
- The charge is capped at one per month, equal to the monthly Availability Payment for the zone; non-compliance is also flagged to the IESO's compliance department
- The Capacity Charge for residential HDR resources will use the RCT baseline methodology to determine performance

NOTE: Since a DRMP may now have more than one virtual resource in a zone (due to separation of Residential and C&I resources for baseline purposes), both resources would need to meet their respective obligations, otherwise the charge would apply to the entire capacity obligation for the zone. This is also true for the Administration Charge. We are considering this matter and will address it in the upcoming meeting on November 30th.

# Capacity Charge (CT 1318)

A Capacity Charge equal to the Availability Payment for the month is applied when:



Where:

- 'i' is an hour of the DR activation period
- Adjusted Control Group Load<sub>i</sub> is the actual consumption per contributor within the control group adjusted by the same-day adjustment
- Treatment Group Load<sub>i</sub> is the actual consumption per contributor within the treatment group
- Total Bid Qty<sub>i</sub> is the energy bid quantity submitted by the HDR resource
- Schedule<sub>i</sub> is the real-time constrained energy schedule

# **CAPACITY CHARGE EXAMPLE USING RANDOMIZED CONTROL TRIAL**

**FOR ILLUSTRATIVE PURPOSES ONLY**

# Contributor Information

Month-Year	May-16		
DR Capacity for Treatment Group MW	3.0		
Number of Treatment Group Contributors	5000		
Number of Control Group Contributors	350		
Contributor address	LDC name	LDC account #	Control Group Flag
1	a	1a	yes
2	b	2b	
3	c	3c	
4	a	4a	
5	b	5b	yes
-	-	-	-
5350	a	5350a	



# Consumption for Event Day

<u>Hour Ending</u>	<u>Control Group Aggregated kWh</u>	<u>Treatment Group Aggregated kWh</u>
1	280	4000
-	-	-
9	385	5500
10	420	6250
11	490	7000
12	490	7250
13	504	9000
14	560	6000
15	616	6600
16	644	6900
17	672	7200
18	644	9500
-	-	-
24	336	5000

- Adjustment hours
- DR Activation hours

# Same-Day Adjustment

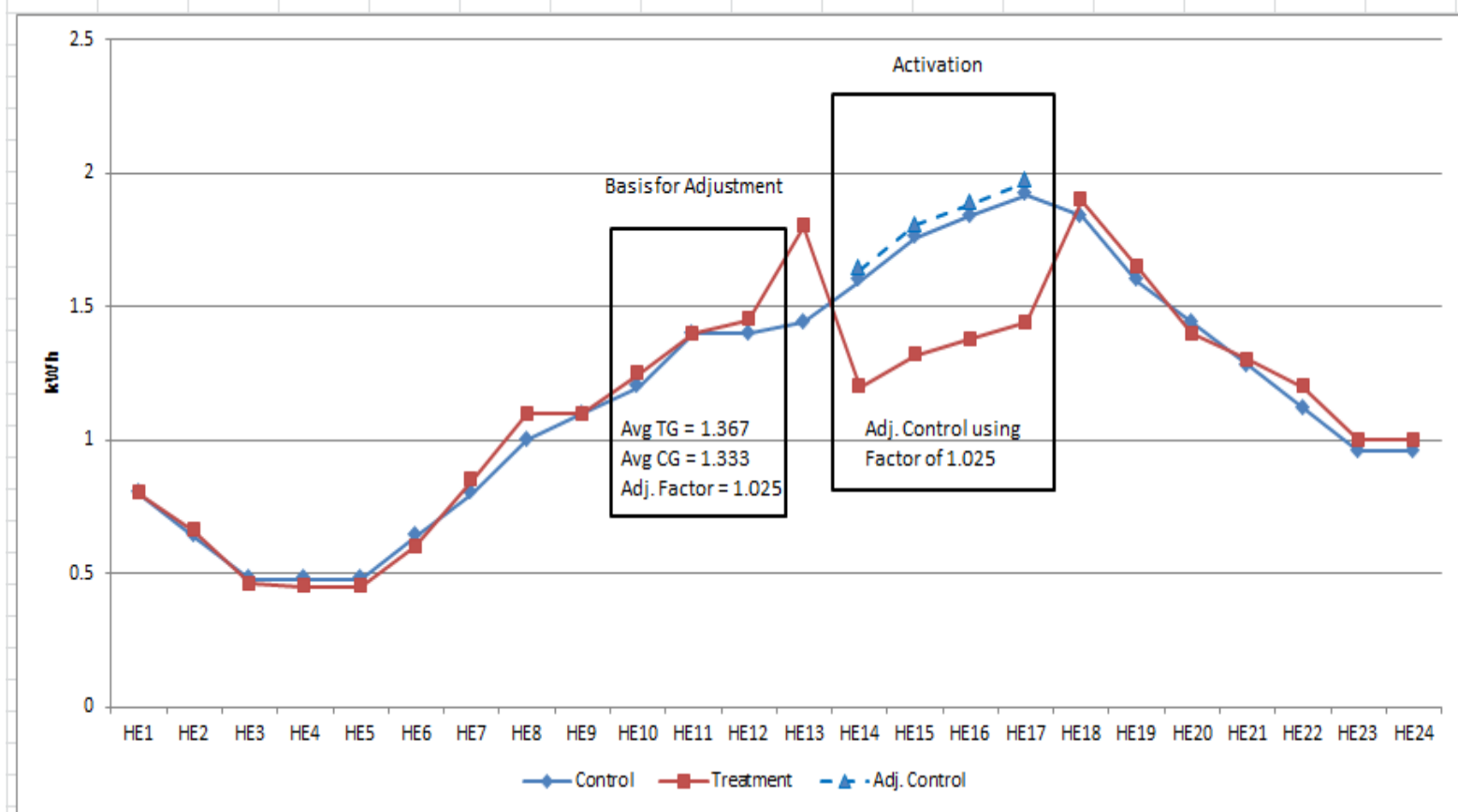
Adjustment Ratio =

$$\frac{3 \text{ hour avg Treatment Group Load } \textit{per contributor}, 1 \text{ hour prior to dispatch}}{3 \text{ hour avg Control Group load } \textit{per contributor}, 1 \text{ hour prior to dispatch}}$$

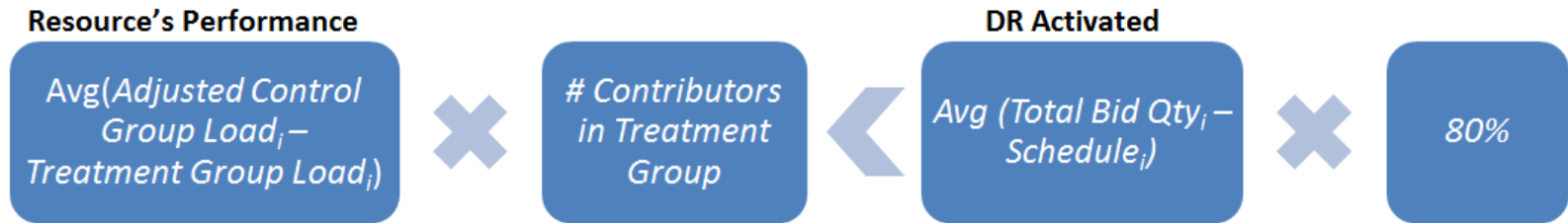
HE9	HE10	HE11	HE12	HE13	HE14	HE15	HE16	HE17	HE18
	Adjustment window				Activation Period				

- The average treatment group load per contributor =  $(6250 + 7000 + 7250) / 3 \text{ hours} / 5000 \text{ treatment group contributors} = 1.367$
- The average control group load per contributor =  $(420 + 490 + 490) / 3 \text{ hours} / 350 \text{ control group contributors} = 1.333$
- The adjustment ratio =  $1.367 / 1.333 = 1.025$

# Graphical Representation



# Resource Performance

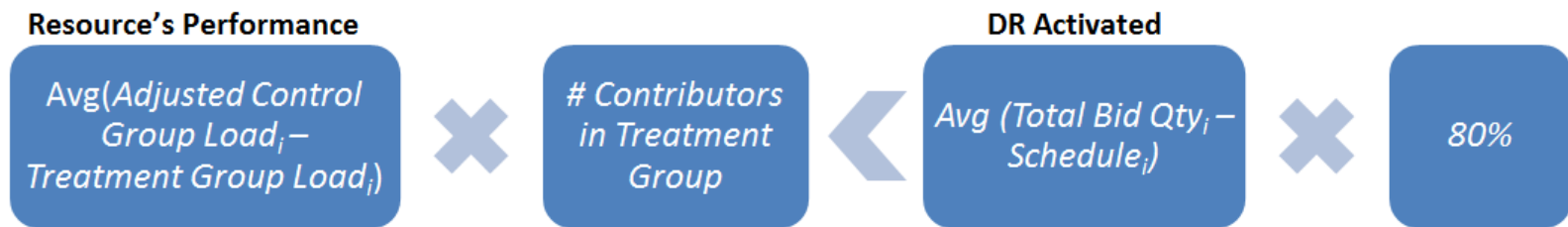


- Adjusted control group load per contributor for the event =  $1.025 \times (560+616+ 644+672)/350$  contributors = 7.30 kW
- Treatment group load per contributor for the event =  $(6000+6600+6900+7200)/5000$  contributors = 5.34 kW
- Resource performance per contributor for the event = 1.96 kW
- Average hourly resource performance per contributor for the event:  
 = Average(Adjusted Control Group Load<sub>i</sub> – Treatment Group Load<sub>i</sub>)  
 = (7.30 – 5.34) kW / 4 hours in the event = 0.49 kWh

Therefore, the DR capacity provided is 0.49 kWh per treatment group contributor.

# Capacity Charge

Capacity charge is applicable if:



- Resource Performance x # contributors in treatment group = DR capacity provided of 0.49 kWh x 5000 contributors = 2,450 kWh = 2.45 MWh
- DR Activated x 80% = Total Bid Quantity of 3 MWh less Schedule of 0 MWh (for all event hours) = 3 MWh x 80% = 2.4 MWh

Since 2.45 MWh total resource performance is *greater* than 2.4 MWh minimum DR required, the Capacity Charge is not applicable.

# Feedback

- Please provide written feedback by December 2
- To provide feedback, contact [engagement@ieso.ca](mailto:engagement@ieso.ca)