30 April 2019

MEP and ATH forum
Cost of not burdening

Ron Beatty, Principal Adviser Market Services

What does the Authority say?

- Some CTs may be inaccurate when either under or over burdened.
- Memo on burdening 4 April 2016 at https://www.ea.govt.nz/dmsdocument/20592-memo-metering-installation-accuracy
- Certification of a transformer without knowing the actual in use burden as accurate by an approved test house (ATH) means that the certification is valid only if it is used within its calibration range.
- If the measuring transformer is used outside of its burden calibration range, an ATH will need to recertify the measuring transformer

What does the Code say?

- Sets out requirements for changes to metering installation burden
- Sets out metering installation accuracy requirements in table 1 of Schedule 10.1 (maximums not targets)

Schedule 10.1
Tables

cls 10.37 and 10.43

Table 1: Metering installation characteristics and associated requirements

Defining Characteristics				Associated Requirements of active energy metering							
Metering installation category	Primary voltage (V)	Primary current (I)	Measuring transformers	Metering installation certification type	Accuracy tolerances		Selected component metering installation minimum IEC class (more accurate components may be used)		Metering installation certification and inspection		
					Maximum permitted error	Maximum site uncertainty	Meter	Current Transformer	Maximum metering installation certification validity period	Maximum sample inspection and recertification period	Inspection period
1	V < 1kV	I ≤ 160A	None	NHH or HHR	± 2.5%	0.6%	2	N/A	180 months	84 months	120 months ± 6 months
2	V < 1kV	I ≤ 500A	CT	NHH or HHR	± 2.5%	0.6%	2	1	120 months	N/A	120 months ± 6 months
3	V < 1kV	500A < I ≤ 1200A	CT	HHR only	± 1.25%	0.3%	1	0.5	120 months	N/A	60 months ± 3 months
	1kV ≤ V ≤ 11kV	I ≤ 100A	VT & CT				N/A	N/A			
	11kV < V ≤ 22kV	I ≤ 50A					N/A	N/A			
4	V < 1kV	I > 1200A	CT	HHR only	± 1.25%	0.3%	N/A	N/A	60 months	N/A	30 months ± 3 months
	1kV ≤ V ≤ 6.6kV	100A < I ≤ 400A	VT & CT								
	6.6kV < V ≤ 11kV	100A < I ≤ 200A									
	11kV < V ≤ 22kV	50A < I ≤ 100A									
5	1kV ≤ V ≤ 6.6kV	I > 400A	VT & CT	HHR only	± 0.75%	0.2%	N/A	N/A	36 months	N/A	18 months ± 1 month
	6.6kV < V ≤ 11kV	I>200A									
	V > 11kV	I > 100A									
	V > 22kV	Any current									

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1 November 2018

What does the Code say about burden

21 Metering installation accuracy

*An **ATH** must not **certify** a **metering installation** if the **metering installation** exceeds the maximum permitted error for the relevant **metering installation** category set out in Table 1 of Schedule 10.1, after the application of any external **compensation factors**.*

43 Metering components must be certified

*(1) An **ATH** must, before it **certifies** a **metering installation**, ensure that each **metering component** that is required to be **certified** under this Part and which is in the **metering installation**—*

*(a) is **certified** by an **ATH** in accordance with this Part; and*

*(b) since **certification**, has been appropriately stored and not used.*

What does the Code say about burden

Schedule 10.7 Clause 31 Measuring transformer burden and compensation requirements

*(1) An **ATH** may **certify** a **metering installation** for a **point of connection** to the **grid** that includes **error compensation** factors as an alternative to the use of burden resistors, only if the **ATH** is satisfied the **error compensation** factors will provide a more accurate result than the use of burden resistors.*

……..

*(7) An **ATH** must, before it **certifies** a **measuring transformer**, if the in-service burden is less than the lowest burden test point specified in a standard set out in Table 5 of Schedule 10.1,*

- *(a) install burdening resistors to increase the in-service burden to be equal to or greater than the lowest test point specified in the standard; or*
- *(b) confirm that—*
  - *(i) a **class A ATH** has confirmed by **calibration** that the accuracy of the **measuring transformer** will not be adversely affected by the in-service burden being less than the lowest burden test point specified in the standard; or*
  - *(ii) the **measuring transformer's** manufacturer has confirmed that the accuracy of the **metering transformer** will not be adversely affected by the in-service burden being less than the lowest burden test point specified in the standard.*

What does the Code say about burden

Schedule 10.8 Clause 2 Measuring transformer certification requirements

*(1) An **ATH** must, before it **certifies** a **measuring transformer**,—*

*(a) ensure, by testing, that a current **calibration report** sets out the **measuring transformer's** errors at a range of primary values at their rated burdens; and*

*(b) that is a multi-tap current transformer, carry out the **calibration** tests and only **certify** the transformer for the ratios that have been **calibrated** if the test is passed; and*

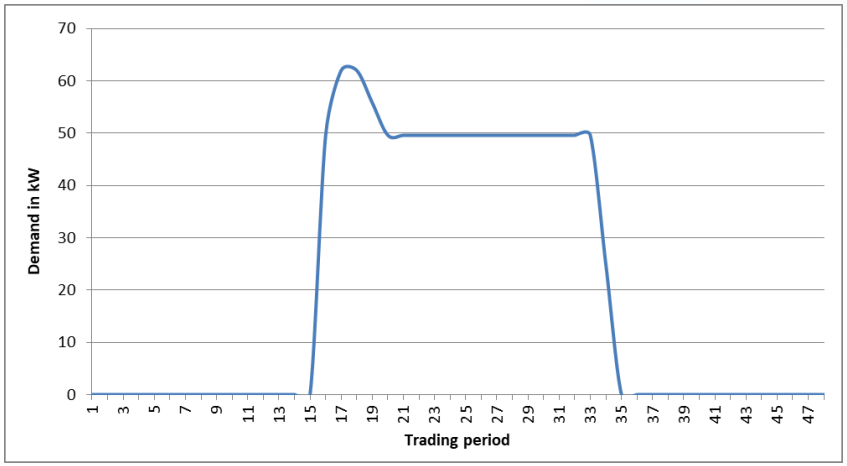
*(c) if the in-service burden is lower than a test point specified in a standard listed in Table 5 of Schedule 10.1, confirm the accuracy of the **measuring transformer** at the in-service burden by—*

*(i) obtaining confirmation of accuracies at the in-service burden from the **measuring transformer's** manufacturer; or*

*(ii) if the primary voltage of the **measuring transformer** is greater than 1kV, a **class A ATH** calibrating the **measuring transformer** at the in-service burden; and*

(d) determine the measuring transformer certification validity period under clause 3(c)(ii).

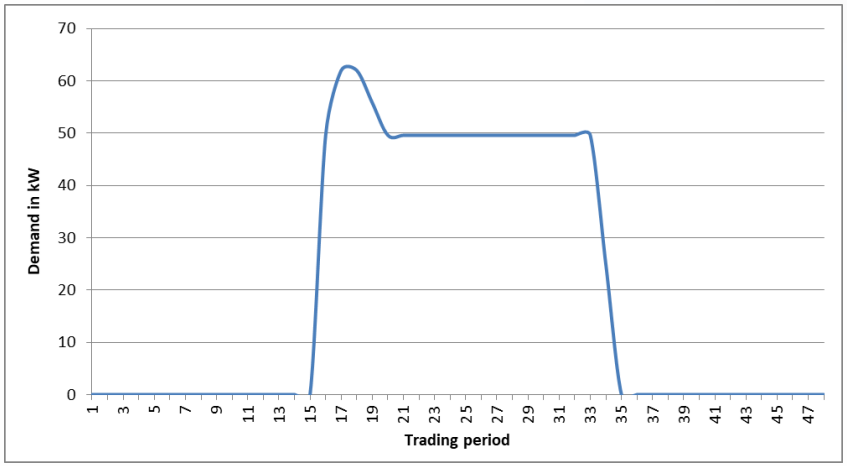
Scenario 1 – small customer



- Lets assume a site with
  - 69kW peak demand
  - daily load factor of 80%
  - site used for 9 hours/day and 5 days/week
- Annual electricity = 129,696 kWh
- Delivered electricity averages 25c/kWh

- Question – what is the cost of burdening resistors?

Scenario 1 – small customer



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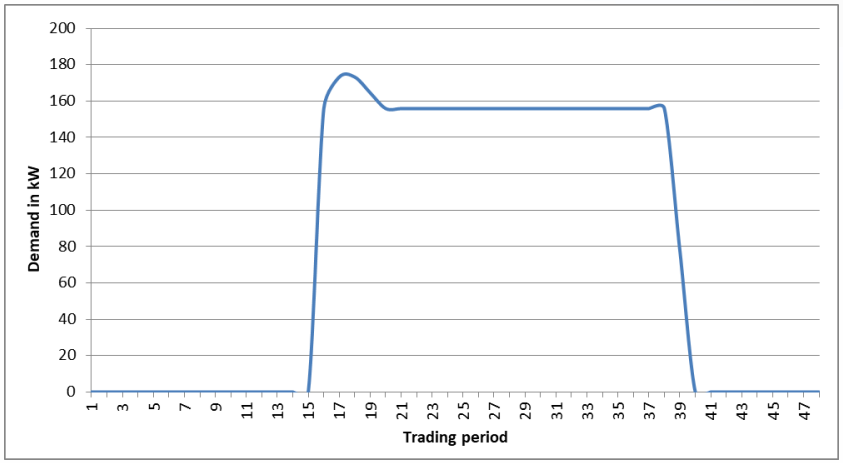
- Question – what is the cost of burdening resistors?
- If adding burdening resistors would contribute to accuracy by 1%, then electricity value of accuracy over 10 years

  10 years x 129,696 annual kWh x 1% x 25c/kWh = **$3,242.40**

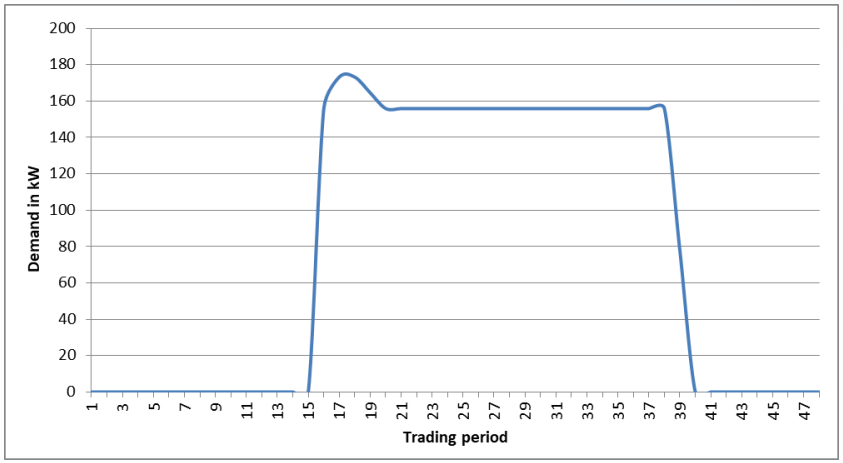
Scenario 2 – medium customer



- Lets assume a site with
  - 173kW peak demand
  - daily load factor of 90%
  - site used for 12 hours/day and 7 days/week
- Annual electricity = 680,904 kWh
- Delivered electricity averages 20c/kWh

- Question – what is the cost of burdening resistors?

Scenario 2 – medium customer

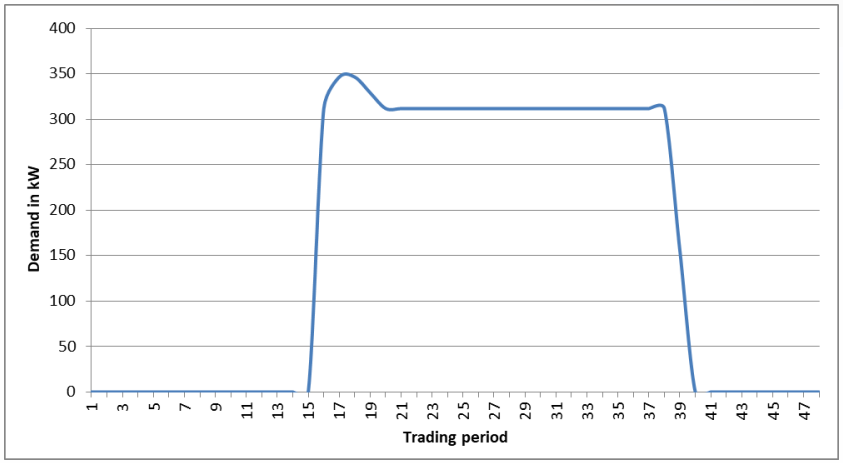


- Lets assume a site with
  - 173kW peak demand
  - daily load factor of 90%
  - site used for 12 hours/day and 7 days/week
- Annual electricity = 680,904 kWh
- Delivered electricity averages 20c/kWh

- Question – what is the cost of burdening resistors?
- If adding burdening resistors would contribute to accuracy by 0.2%, then electricity value of accuracy over 10 years

  10 years x 680,904 annual kWh x 0.2% x 20c/kWh = **$6,809.04**

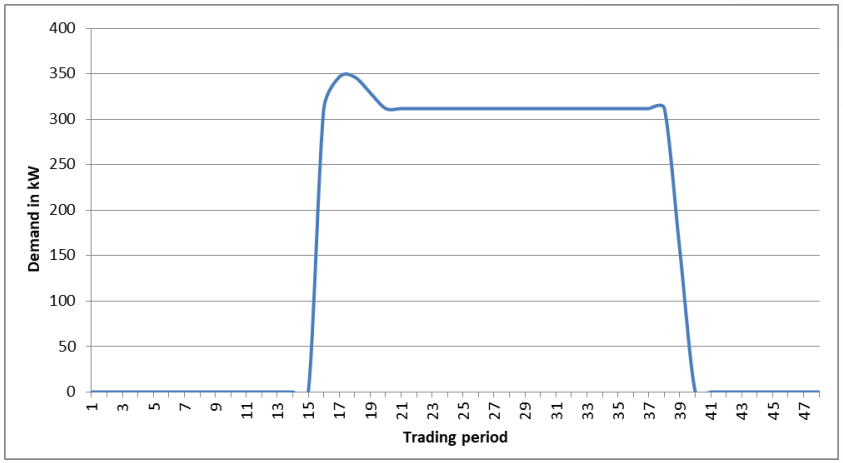
Scenario 3 – larger customer



- Lets assume a site with
  - 346 kW peak demand
  - daily load factor of 85%
  - site used for 12 hours/day and 7 days/week
- Annual electricity = 1,361,808 kWh
- Delivered electricity averages 18c/kWh

- Question – what is the cost of burdening resistors?

Scenario 3 – larger customer



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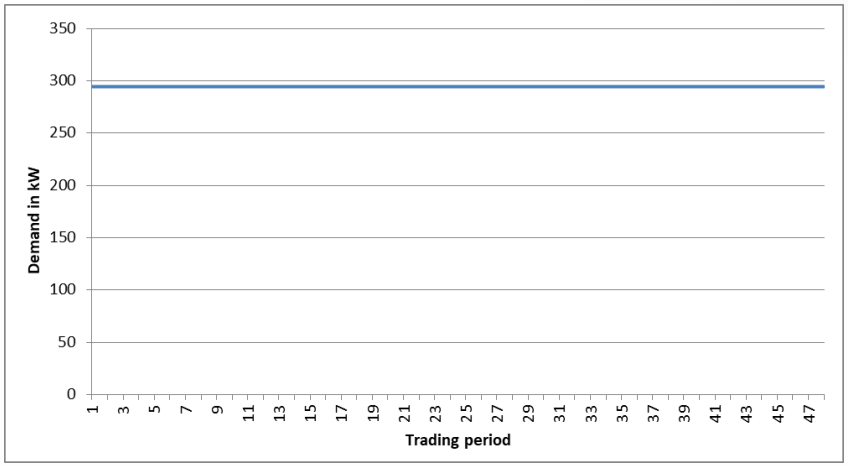
- Question – what is the cost of burdening resistors?
- If adding burdening resistors would contribute to accuracy by 0.2%, then electricity value of accuracy over 10 years

  10 years x 1,361,808 annual kWh x 0.2% x 18c/kWh = **$4,902.51**

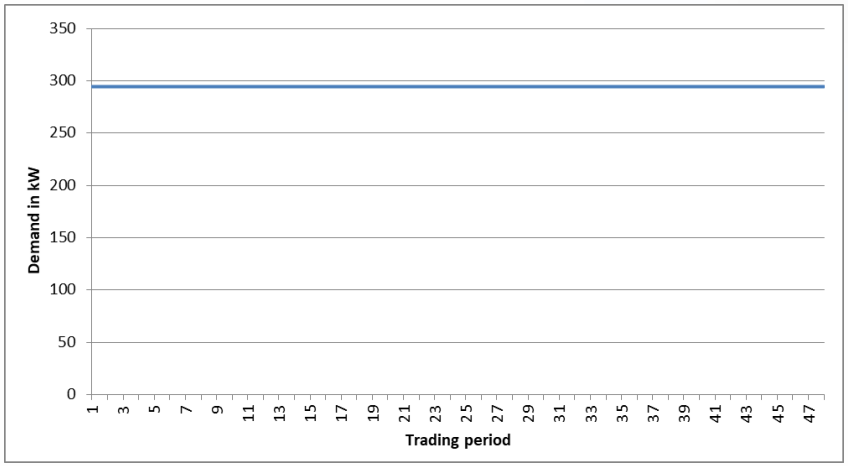
Scenario 4 – larger customer continuous



- Lets assume a site with
  - 327 kW peak demand
  - daily load factor of 100%
  - site used for 24 hours/day and 7 days/week
- Annual electricity = 2,572,303 kWh
- Delivered electricity averages 18c/kWh

- Question – what is the cost of burdening resistors?

Scenario 4 – larger customer continuous

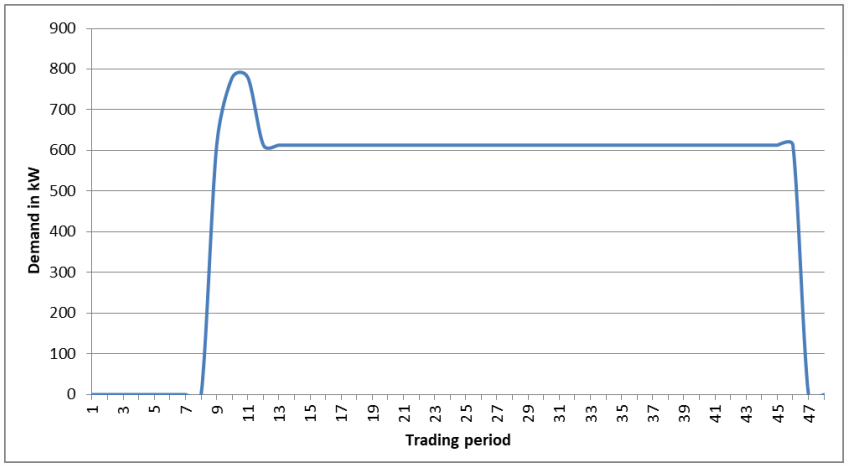


- Lets assume a site with
  - 327 kW peak demand
  - daily load factor of 100%
  - site used for 24 hours/day and 7 days/week
- Annual electricity = 2,572,303 kWh
- Delivered electricity averages 18c/kWh

- Question – what is the cost of burdening resistors?
- If adding burdening resistors would contribute to accuracy by 0.2%, then electricity value of accuracy over 10 years

  10 years x 2,572,303 annual kWh x 0.2% x 18c/kWh = **$9,260.29**

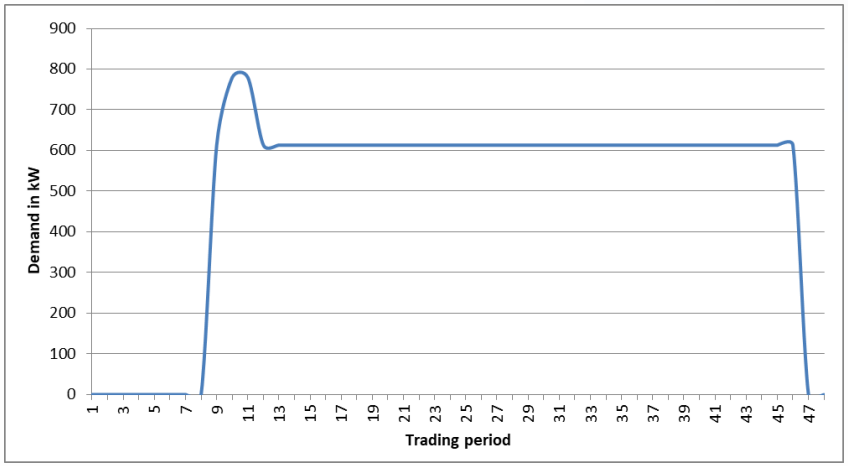
Scenario 5 – even larger customer



- Lets assume a site with 400 volt metering
  - 779 kW peak demand
  - daily load factor of 95%
  - site used for 24 hours/day and 7 days/week
- Annual electricity = 4,312,391 kWh
- Delivered electricity averages 18c/kWh

- Question – what is the cost of burdening resistors?

Scenario 5 – even larger customer



- Lets assume a site with 400 volt metering
  - 779 kW peak demand
  - daily load factor of 95%
  - site used for 24 hours/day and 7 days/week
- Annual electricity = 4,312,391 kWh
- Delivered electricity averages 18c/kWh

- Question – what is the cost of burdening resistors?
- If adding burdening resistors would contribute to accuracy by 0.2%, then electricity value of accuracy over 5 years

  5 years x 4,312,391 annual kWh x 0.2% x 18c/kWh = **$7,762.30**

Industry presentations

- Industry presentations on burdening from
  - Leith Robertson and Graham Wells, Wells
  - Grant Batchelor, Vircom EMS
  - Chris Chambers, Metrix Limited

Discussions

Questions

- Is the Code clear, are more stringent Code requirements necessary?
- Who pays for losses and errors associated with metering installations?
- Are there different burdening requirements for different categories of metering installations?
- What is best practice for installing burdening resistors
- Why are burdening resistors not being installed currently?
- Are best practice guidelines necessary? If so, what form?
- Are test blocks still necessary?