Measurement Problem Involving Electricity Meters with Detent Feature

Measurement Canada has discovered a measurement deficiency in metering applications involving some electricity meters containing a “detent” feature, which can result in inaccurate measurement under certain service conditions (note: the detent feature allows measurement of energy to occur in only one direction of energy flow).

In the case of a specific electronic 2-element meter, it was discovered that each measuring element was individually detented prior to the summation of their energy values, instead of detenting the net value of the energy in the two elements as is the correct practice. This caused a discrepancy between the energy registered by the electronic meter and the energy that should have been recorded as the true value, whenever the current was more than 90 degrees out of phase with the associated voltage in either element.

Meters designed in this manner will over-register whenever the power factor is less than 0.5 under balanced conditions, and may over-register at power factors up to 0.866 under unbalanced conditions. The loading conditions that cause the problem are much less common with 2.5 or 3 element wye metering configurations than with 2-element delta configurations, and typically will only occur under line-to-line loading. The error will generally occur under low loading conditions resulting in a weighted error over time that is much less than the actual error when it occurs.

Registered contractors who make use of multiple customer metering systems pursuant to the Electricity and Gas Inspection Act should be aware that such errors may be a contributing factor to “high consumption” complaints of sub-metered electricity purchasers. As such, those contractors are advised of their obligations to ensure that electricity trade transactions comply with all relevant provisions of the Act and Regulations, including accuracy requirements. Residential sub-metering installations (such as apartments or condominium units) are not as likely to be affected by this problem due to the typical load characteristics expected at these types of installations. However, property owners are advised to review their respective sub-metering installations to ensure compliance with the above noted statutory obligations.

Questions related to whether a given meter type is designed in the manner indicated above should be directed to the applicable meter manufacturer.

Measurement Canada has addressed this problem for future meter approvals by implementing the following amendment to Measurement Canada specification S-E-06 (which amends LMB-EG-07 - Specifications for Approval of Type of Electricity Meters, Instrument Transformers and Auxiliary Devices):

Polyphase meters incorporating a unidirectional register or pulse output shall sum the energy in all elements prior to applying any detent function which prevents registration or pulse outputs when energy is applied through the meter in the reverse direction.

An examination will be performed during type approval evaluation in order to assess meters for compliance with this requirement.
The above specification became effective on January 1, 2011. Notice of Approvals for existing meter patterns which do not comply with this requirement have been amended to identify unapproved conditions of use of those meters in service.

Meter owners are advised to review their stock of meters and ensure that any affected meters are installed in services appropriate for the identified restrictions pertaining to conditions of use.

For further information, please contact:

Mike Abraham  
Senior Program Officer - Electricity  
Program Development Directorate  
Measurement Canada  
Tel.: 613-946-3387  
Fax: 613-952-1736  
E-mail: michael.abraham@ic.gc.ca