

Order of Losses

Revenue Metering Standing Committee
Robert Stancu
May 16, 2007



Losses Order

- **Totalization Table Registration process may require the application of multiple meter adjustments (MEC, SSLA, TLF, etc).**
- **Losses may be applied to a physical meter or a summary meter using a Voltage Code.**
- **A Voltage Code consists of one or more Loss Factors:**
 - MEC and TLF are Fixed Factor Losses
 - SSLAs are Equation Type Losses
- **The order of precedence in which losses are applied is critical.**

This was noticed when applying a MEC after the SSLA to a meter reading zero load. Based on this example, when the metered load is zero, the DP should result in the No-Load Loss value of the SSLA, regardless whether a MEC is applied or not. The results were different depending on the precedence of the Loss Factors.



Incorrect Application

Correct Application

Criteria: Voltage Code: 976, Description: [empty]

Applied Losses:

Order Type	Name	Description	Start Date	End Date
2	E E1061	A=0.0010618; B=1.0662	2000/10/01 00:00	
3	E E1735	A=0; B=1.7357	2000/10/01 00:00	
1	F 1000000000-M	1000000000-M	2007/04/05 00:00	

Criteria: Voltage Code: 976, Description: [empty]

Applied Losses:

Order Type	Name	Description	Start Date	End Date
1	F 1000000000-M	1000000000-M	2007/04/05 00:00	
2	E E1061	A=0.0010618; B=1.0662	2000/10/01 00:00	
3	E E1735	A=0; B=1.7357	2000/10/01 00:00	

Criteria: Metering System: 1000000, Channel Number: 1, Meter Type: CP

Schedule Day	Reading Total	Volt	Total	Flag	Day Total	Night Total
2007/03/29	733.42	269	269	N		
2007/03/28	733.42	269	269	N		
2007/03/27	733.42	269	269	A		
2007/04/07	733.32	200	200	A		
2007/04/06	733.32	200	200	A		
2007/04/05	733.32	200	200	N		
2007/04/04	733.42	269	269	M		
2007/04/03	733.42	269	269	M		
2007/04/02	733.42	269	269	M		
2007/04/01	733.42	269	269	M		
2007/03/31	733.42	269	269	M		
2007/03/30	733.42	269	269	M		
2007/03/29	733.42	269	269	M		
2007/03/28	733.42	269	269	M		
2007/03/27	733.42	269	269	M		
2007/03/26	733.42	269	269	M		
2007/03/25	733.42	269	269	M		
2007/03/24	733.42	269	269	M		
2007/03/23	733.42	269	269	M		
2007/03/22	733.42	269	269	M		
2007/03/21	733.42	269	269	M		
2007/03/20	733.42	269	269	M		
2007/03/19	733.42	269	269	M		
2007/03/18	733.42	269	269	M		
2007/03/17	733.42	269	269	M		
2007/03/16	733.42	269	269	M		
2007/03/15	733.42	269	269	M		
2007/03/14	733.42	269	269	M		
2007/03/13	733.42	269	269	M		
2007/03/12	733.42	269	269	M		
2007/03/11	733.42	269	269	M		
2007/03/10	733.42	269	269	M		
2007/03/09	733.42	269	269	M		
2007/03/08	733.42	269	269	M		
2007/03/07	733.42	269	269	M		
2007/03/06	733.42	269	269	M		
2007/03/05	733.42	269	269	M		
2007/03/04	733.42	269	269	M		
2007/03/03	733.42	269	269	M		
2007/03/02	733.42	269	269	M		
2007/03/01	733.42	269	269	M		
2007/02/28	733.42	269	269	M		
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2007/02/17	733.42	269	269	M		
2007/02/16	733.42	269	269	M		
2007/02/15	733.42	269	269	M		
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2006/10/05	733					

Losses Order

Scenario 1: Tx SSLA and MEC applied to a load S

$$\text{Tx SSLA} = k_1, k_2, k_3 \quad \text{MEC} = m$$

Order: first SSLA second MEC

$$\text{Losses} = (S * \text{SSLA}) * \text{MEC} = (S^2 * k_1 + S * k_2 + k_3) * m = S^2 * m * k_1 + S * m * k_2 + m * k_3$$

Order: first MEC second SSLA

$$\text{Losses} = (S * \text{MEC}) * \text{SSLA} = (S * m)^2 * k_1 + (S * m) * k_2 + k_3 = S^2 * m^2 * k_1 + S * m * k_2 + k_3$$

Scenario 2: Transformer SSLA and Radial line SSLA applied to a load S

$$\text{Tx SSLA} = k_1, k_2, k_3 \quad \text{Rad line SSLA} = k_1', k_2', k_3'$$

Order: first SSLA_{Tx} second SSLA_{Rad}

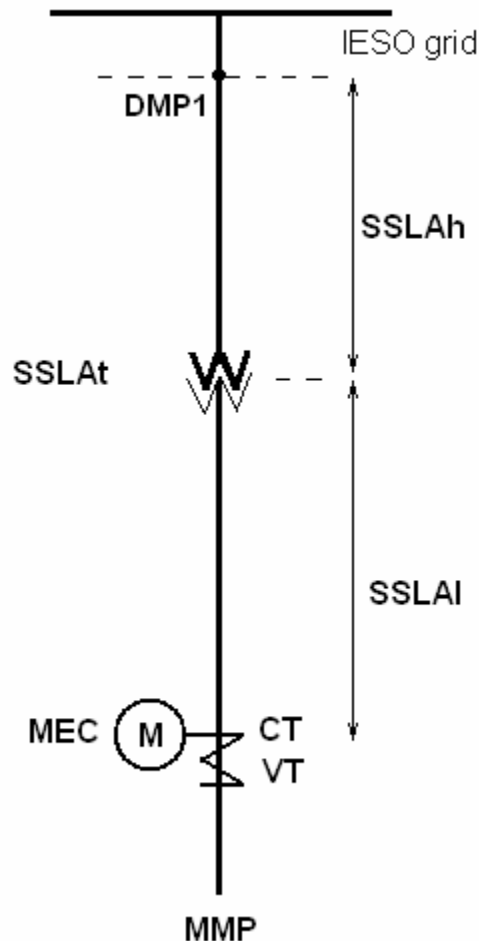
$$\text{Losses} = (S * \text{SSLA}_{\text{Tx}}) * \text{SSLA}_{\text{Rad}} = (S^2 * k_1 + S * k_2 + k_3) * \text{SSLA}_{\text{Rad}} = (S^2 * k_1 + S * k_2 + k_3)^2 * k_1' + (S^2 * k_1 + S * k_2 + k_3) * k_2' + k_3'$$

Order: first SSLA_{Rad} second SSLA_{Tx}

$$\text{Losses} = (S * \text{SSLA}_{\text{Rad}}) * \text{SSLA}_{\text{Tx}} = (S^2 * k_1' + S * k_2' + k_3) * \text{SSLA}_{\text{Tx}} = (S^2 * k_1' + S * k_2' + k_3)^2 * k_1 + (S^2 * k_1' + S * k_2' + k_3) * k_2 + k_3$$

Conclusion: The loss values differ; the order of Loss Factors affects the resultant.

Losses Order



Assuming the follow scenario: a meter installation on the low voltage side of a Tx.

The Loss Factors must be applied from the Meter to the DMP, in the following order:

1. MEC measurement error correction
2. Radial line $SSLA_l$ for low voltage side circuit
3. Transformer $SSLA_t$
4. Radial line $SSLA_h$ for the high voltage side circuit

If all SSLAs are replaced by a TLF, the order of MEC and TLF does not affect the resultant losses (both are fix factors).

For consistency, the same order from MI to DMP will be applied: first the MEC, then the TLF.

If necessary, IESO Metering Group may request the distances from MI to Tx and from the Tx to DMP, for SSLA sanity check purpose; the SLD registration requirement is to show total distance between MI and the grid.

Losses Order

The order of losses must be established before the Totalization Table is built.
It is verified and approved by the MSP signing the Site Registration Report.

The attached SRR shows the MEC loss factor 10000XXXX-M has “Precedence 1” into the Voltage Code 976 even was added the last (year 2007).

10000XXXX

→

10000XXXX

→

10000XXXX

→

10000XXXX

Legend: Delivery Point Summary channel Meter Point

Delivery point: 10000XXXX associated with 10000XXXX from Thu Dec 27 11:11:00 EST 2007 edition and date

Channel summary for 10000XXXX:

- 1) 5 minutes, Summary channel, UOE 1, Power Flow I, Voltage Code None
- 2) 5 minutes, Summary channel, UOE 1, Power Flow E, Voltage Code None

Detailed channel information for 10000XXXX:

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10000XXXX : Channel 1, 5 minutes, Summary channel, UOE 1, Power Flow I, Voltage Code None
- UOE 1 of 10000XXXX : Channel 1: Contribution DateRange Sun Oct 01 00:00:00 EST 2000 - no end date
5 minutes, Summary channel, UOE 1, Power Flow I, Voltage Code 976
assumed voltage:120.0 assumed PF:0.950000 CT:120.0 PT:15.0 ServiceType:0
- UOE 2 of 10000XXXX : Channel 1: Contribution DateRange Sun Oct 01 00:00:00 EST 2000 - no end date
5 minutes, E channel, UOE 1, Power Flow I, Voltage Code None
10000XXXX : Channel 2, 5 minutes, Summary channel, UOE 1, Power Flow E, Voltage Code None
- UOE 3 of 10000XXXX : Channel 2: Contribution DateRange Sun Oct 01 00:00:00 EST 2000 - no end date
5 minutes, Summary channel, UOE 1, Power Flow E, Voltage Code 976
assumed voltage:120.0 assumed PF:0.950000 CT:120.0 PT:15.0 ServiceType:0
- UOE 4 of 10000XXXX : Channel 2: Contribution DateRange Sun Oct 01 00:00:00 EST 2000 - no end date
1 minutes, E channel, UOE 1, Power Flow E, Voltage Code None
    
```

Voltage code information

Voltage code ID#	Precedence	Code	(Expiration date)	2000/10/01 00:00	no end date	0*(IEN)	1.0552*(IENB)	0*(VME)	0.000000*(VRE)	1
Precedence 3, E173E	(Expiration date)	2000/10/01 00:00	no end date	0*(IEN)	1.7357*(IENB)	0*(VME)	0*(VRE)	1	0	
Precedence 1, 10000XXXX-M	(Fixed code)	2007/04/05 00:00	no end date	Factor 0.03						

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