

Using PERC1 Model For Modeling Large Data Centers

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Presentation at WECC MVS

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NERC Issues Level 3 Alert, Reliability Guideline Focused on Large Load Challenges

May 04, 2026 • Headlines

WASHINGTON, D.C. – As the grid faces unprecedented challenges from a surge in large power consumers, NERC is taking significant steps to ensure the reliability of the bulk power system (BPS). NERC released a [Level 3 Essential Action Alert, Computational Load Modeling, Studies, Instrumentation, Commissioning, Operations, Protection, and Control](#), outlining seven actions registered entities must implement to address immediate risks posed by computational loads interfacing with the BPS. The Level 3 Alert was issued as NERC observed customer-initiated large load reductions and significant oscillations that occur in seconds, leaving little or no room for real-time responses, threatening BPS reliability. The deadline for registered entities to submit their responses is August 3, 2026.

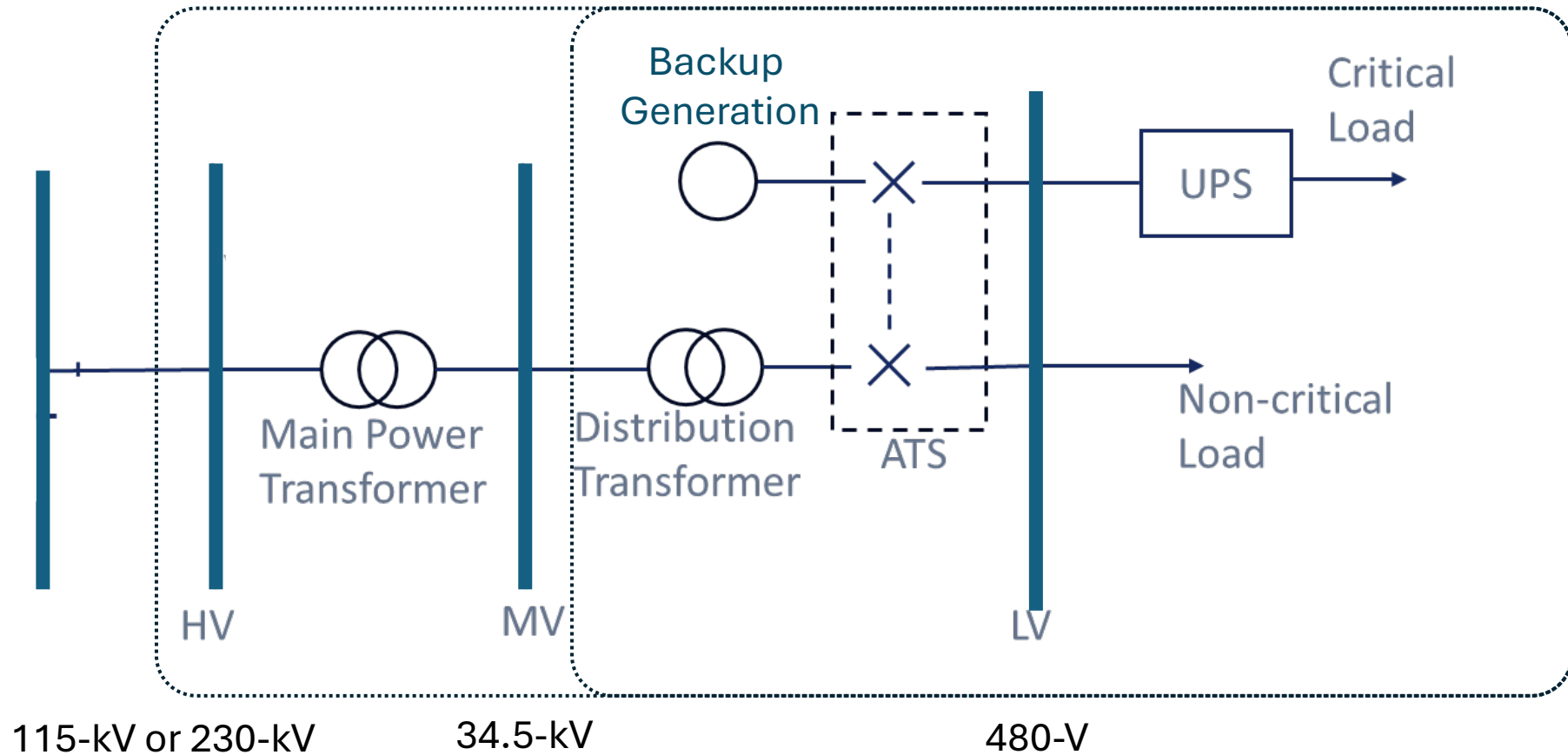
<https://www.nerc.com/newsroom/nerc-issues-level-3-alert-reliability-guideline-focused-on-large-load-challenges>

NERC Level 3 Alert Essential Action #1

<https://www.nerc.com/globalassets/programs/bpsa/alerts/level-3-computational-load-alert.pdf>

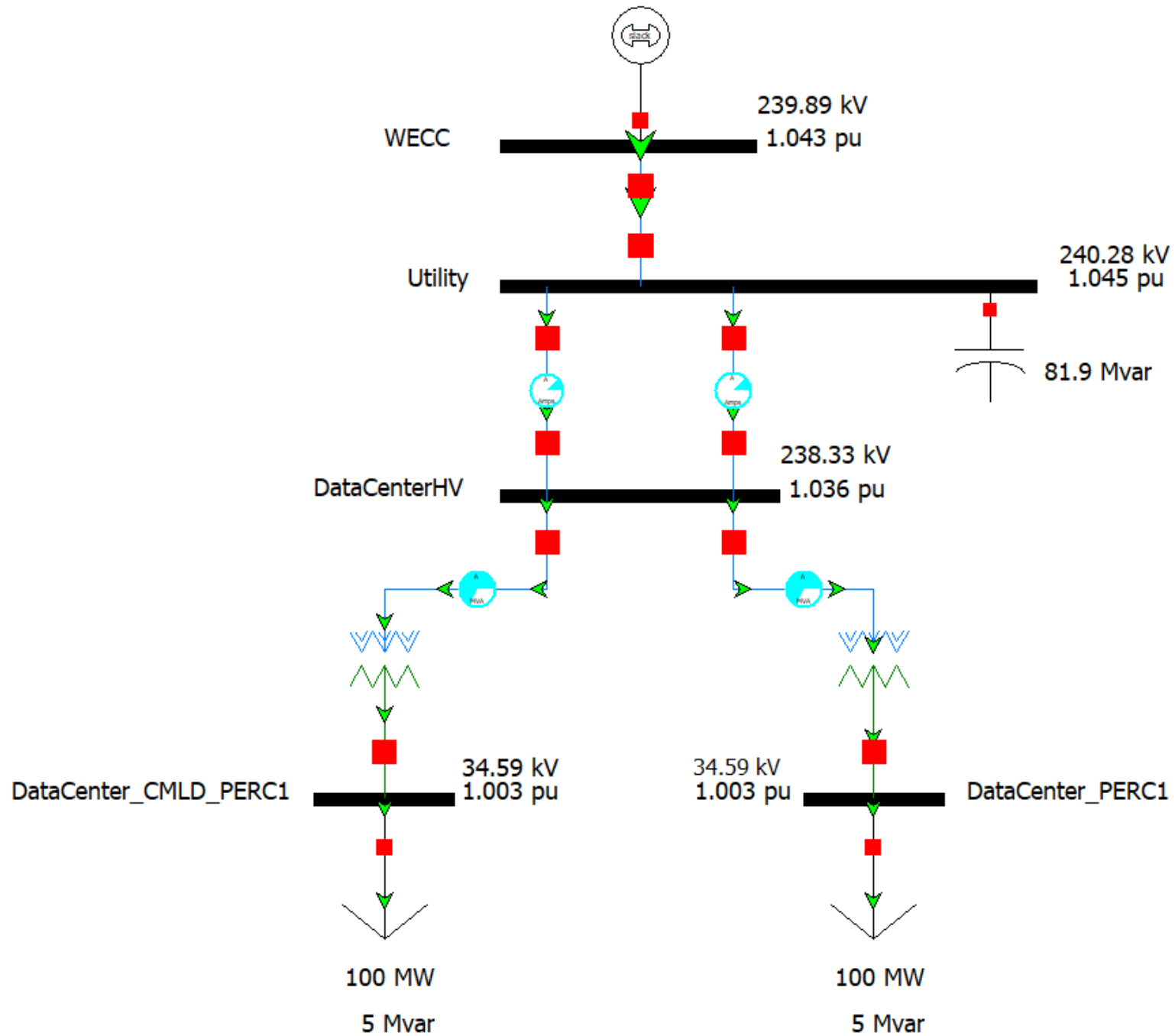
- TPs and PCs should develop a detailed list of modeling data, settings, and parameters needed from computational loads and distribute this to TOs in their footprint. TOs should reflect this in their facility interconnection requirements.
- TPs and PCs should use the PERC1 (Power Electronic Reconnecting and Ceasing) model, or a model with equivalent or better capabilities, at minimum, as a base for these requirements
- Model the computational load records separate from other industrial loads. Model the computational load facility's Information Technology (IT) load separate from the non-IT load
- **Current data center model IND_SRF is no longer adequate in representing data center response to voltage sags**

Electrical Overview of Data Centers



Credit: NERC, modified

PowerWorld



Modeling Data Centers in PowerWorld – Option 1

Load Model Group – IND_DC1

Distribution Equivalent to represent a 34.5kV/ 480V Tx and a short feeder

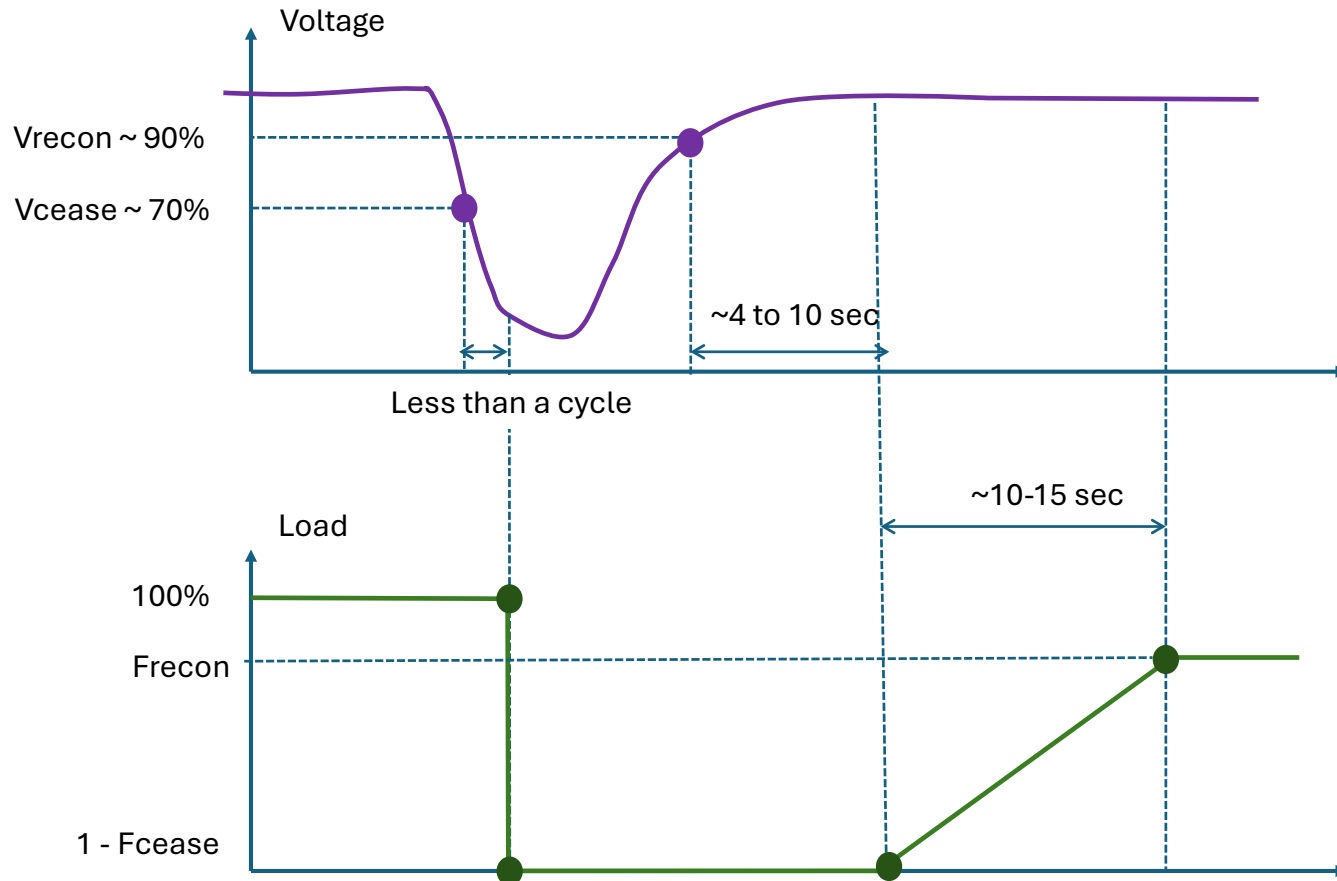
UPS is represented with PERC1, 100% of data center load is assigned to PERC1

Component	Value
Comp0	UPS
Comp1	none
Comp2	none
Comp3	none
Comp4	none
Comp5	none
Comp6	none

Parameter	Value
f0	1.00000
f1	0.00000
f2	0.00000
f3	0.00000
f4	0.00000
f5	0.00000
f6	0.00000
f7	0.00000
f8	0.00000
f9	0.00000

UPS / PERC1 Modeling

NERC LMWG reached out to UPS OEMs and data center operators to parametrize PERC1 model



The screenshot shows a software dialog box titled "Load Characteristic Information" for a "LoadComponent UPS". It has two tabs: "Load Characteristics" (selected) and "Terminal and State Values".

Buttons at the top: Insert, Delete, Show Block Diagram, Set to Defaults.

Type: Active - PERC1 (dropdown), Active (Only One Active, Except for Supplementary Models)

Parameters section:

Lfm	0.80000	Taq	0.00000	Tdelay	0.00000
QPratio	0.00000	Tbq	0.00000	Vrecon	0.95000
Dbfh	0.00000	nP	0.00000	Trecon	5.00000
Dbfh	0.00000	nQ	2.00000	Tramp	10.00000
Kdroop	0.00000	Ipmax	1.00000	Frecon	1.00000
Kvp	0.00000	Ipmin	0.00000	Tt	0.02000
Tvp	0.00000	Iqmax	0.00000	Tv	0.02000
Kvq	0.00000	Iqmin	0.00000	Tf	0.02000
Tvq	0.00000	Fcease	1.00000		
Tap	0.00000	Vcease	0.70000		
Tbp	0.00000	Tcease	0.02000		

Buttons at the bottom: Show Torque Speed Dialog, OK, Save, Cancel.

Modeling Data Centers in PowerWorld – Option2

Distribution Equivalent to represent a 34.5kV/ 480V Tx and a short feeder

PERC1 model is used to represent a data center

Load Information | OPF Load Dispatch | Custom | Stability | GIC

Load Model Group: none [Remove] [Change...]

Dist Equivalent: Data Center [Remove] [Change...]

Dist Equiv MVABase: 0.000 Zero means to default to Mbase of Dist Equivalent Model

Load Characteristics | Load Relays | Distributed Gen | Terminal and State Values

[Insert] [Delete] [Show Block Diagram] [Set to Defaults]

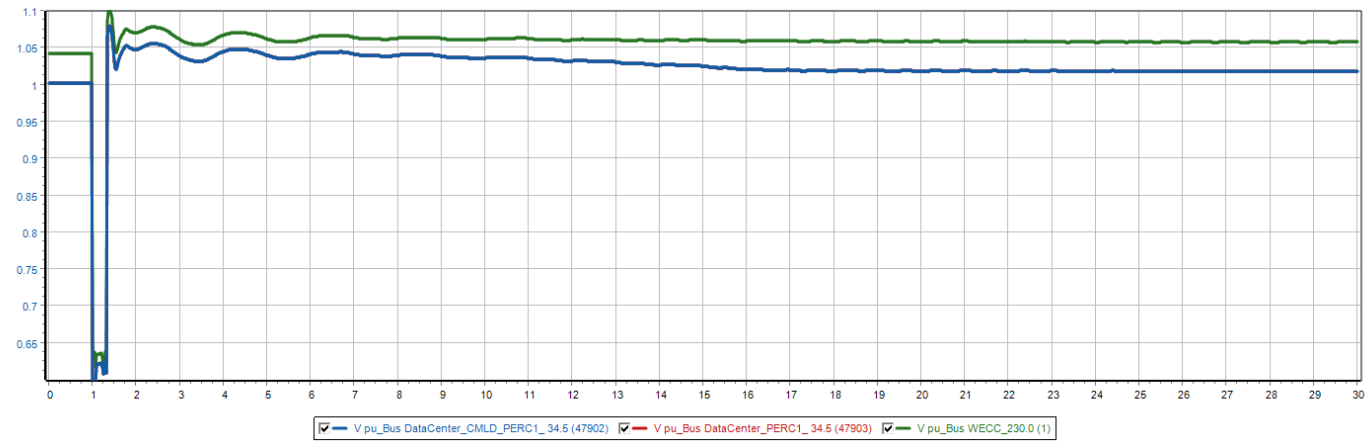
Type: Active - PERC1 [Active] (Only One Active, Except for Supplementary Models)

Parameters

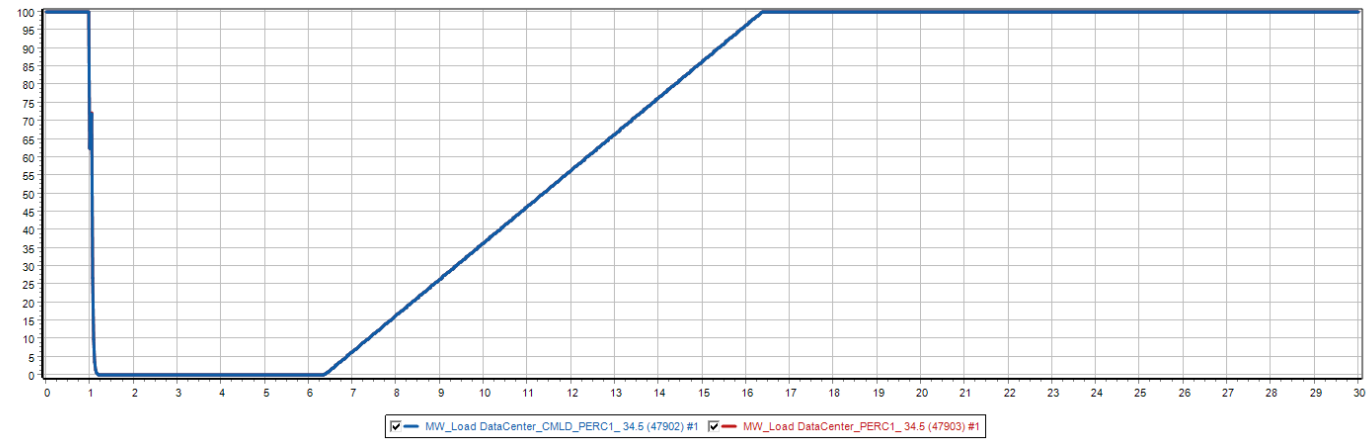
Lfm	0.80000	Tvp	0.00000	Tbq	0.00000	Iqmin	0.00000
QPratio	0.00000	Kvq	0.00000	nP	0.00000	Fcease	1.00000
Dbfi	0.00000	Tvq	0.00000	nQ	2.00000	Vcease	0.70000
Dbfh	0.00000	Tap	0.00000	Ipmax	1.00000	Tcease	0.02000
Kdroop	0.00000	Tbp	0.00000	Ipmin	0.00000	Tdelay	0.00000
Kvp	0.00000	Taq	0.00000	Iqmax	0.00000	Vrecon	0.95000

Voltage Sag Response

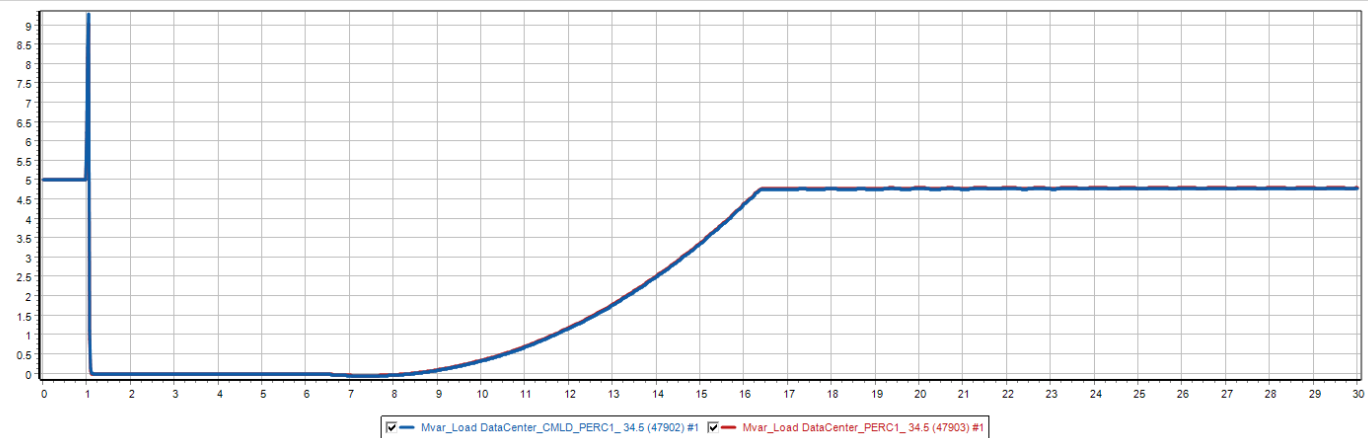
Voltages



Active Power

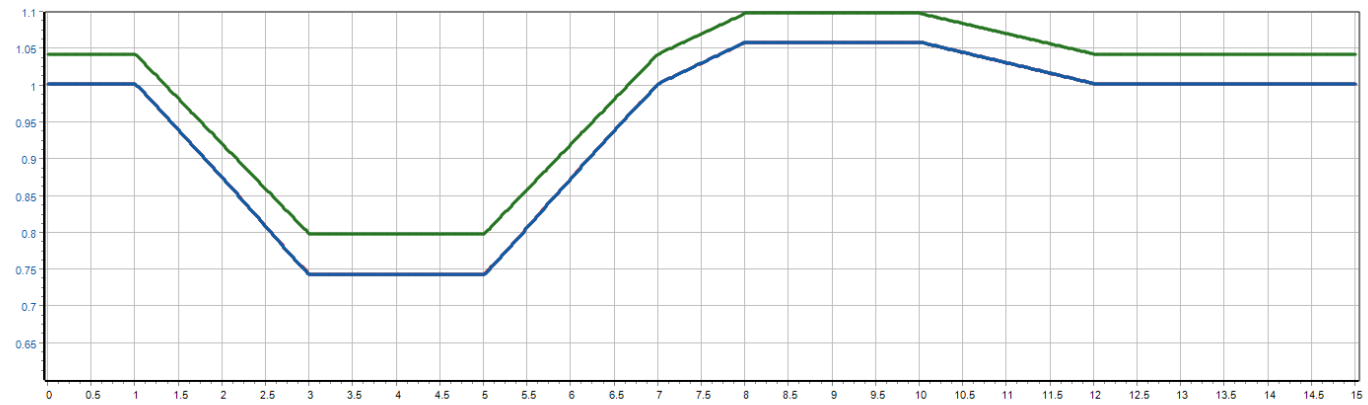


Reactive Power

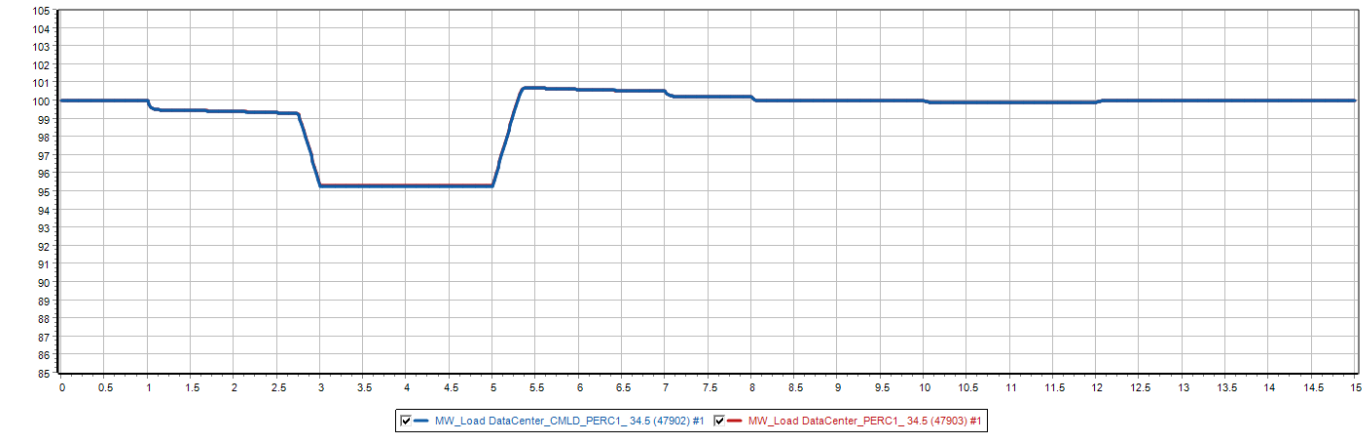


Voltage Swing Response

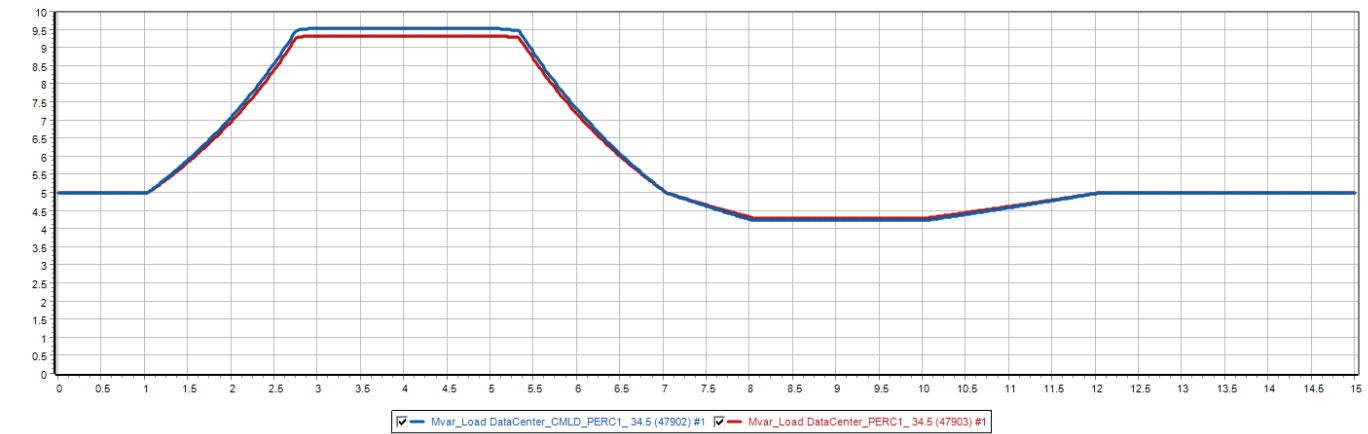
Voltages



Active Power



Reactive Power



NERC Activities

- NERC LMWG drafted **Data Center Load Modeling Technical Reference** document
- NERC LMWG developed **Data Center Information Collection** questionnaire to help transmission planners to collect plant-specific data for modeling data centers
- NERC LMWG has been engaged with OEMs on developing **PERC2** model required to represent emerging disturbance ride-through requirements
- NERC LMWG will have industry-wide workshop on September 15, 2026
<https://www.nerc.com/events/09-15-26-lmwg-workshop>
- NERC launched Project 2026-02 Computational Loads
<https://www.nerc.com/standards/reliability-standards-under-development/2026-02-computational-loads>