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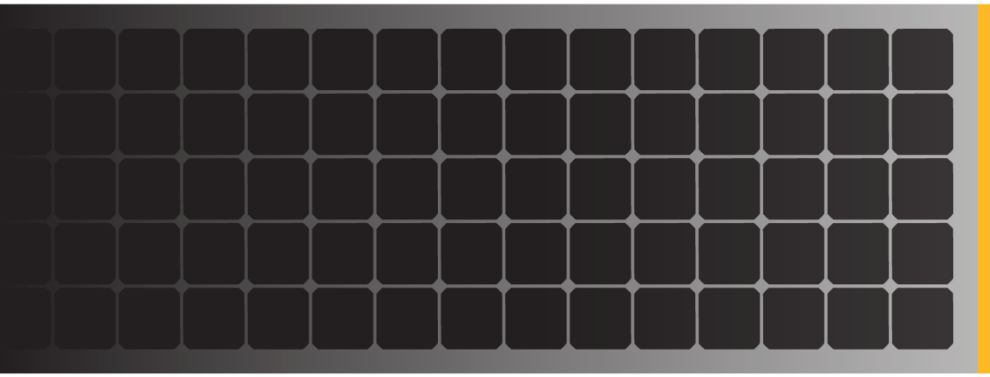

System Losses and Derates in PVSim:
Balance of System Loss Modeling

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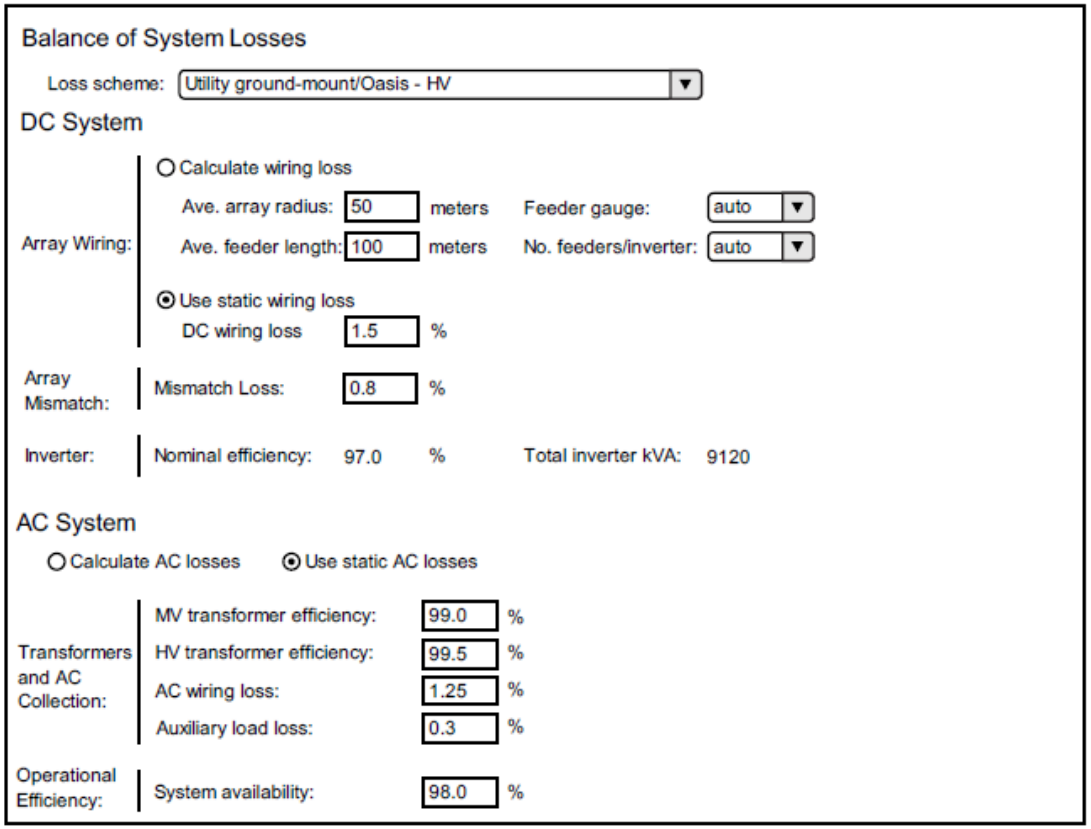
Presented at the 2013 Sandia PV Performance Modeling Workshop
Santa Clara, CA. May 1-2, 2013
Published by Sandia National Laboratories with the Permission of the Author

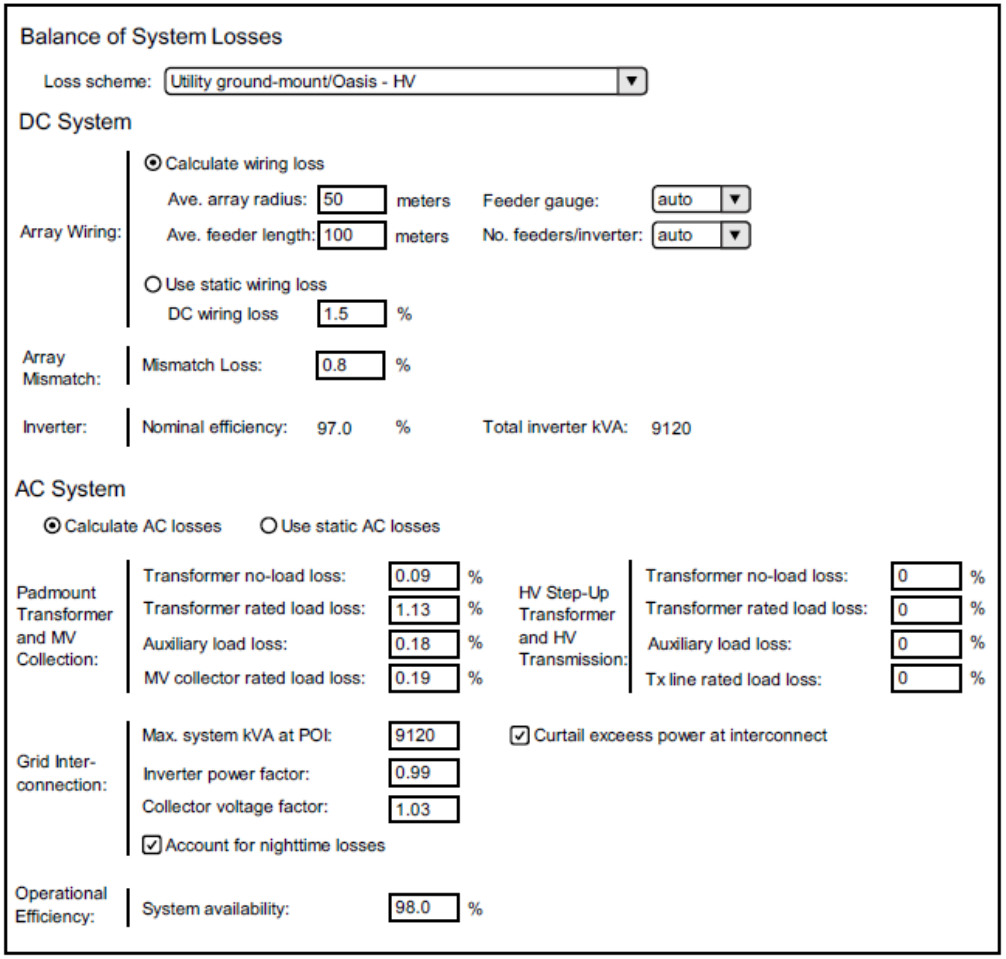
PVSim Balance of System Loss Inputs

- Static model option:

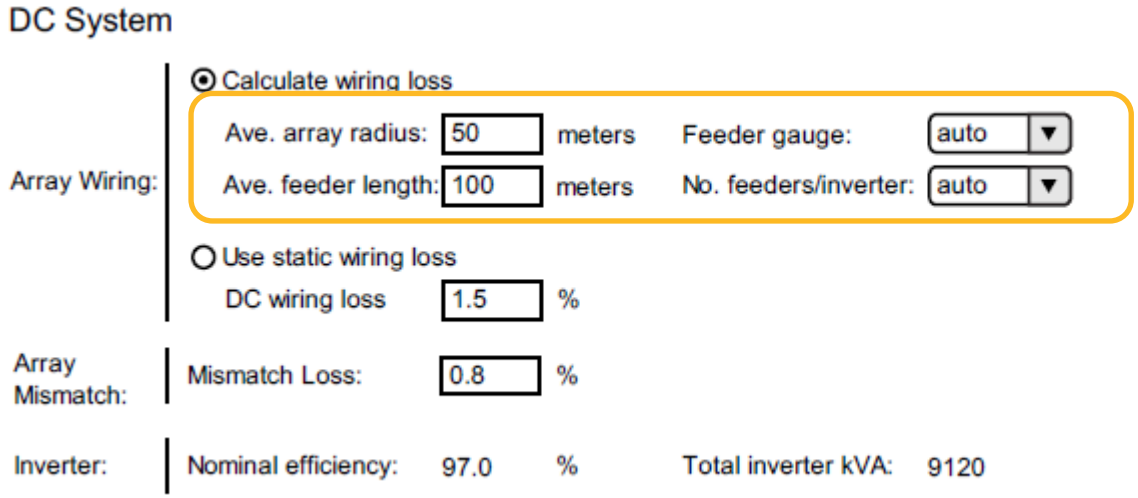


PVSim Balance of System Loss Inputs

- Dynamic model option:



DC Wiring Loss Model

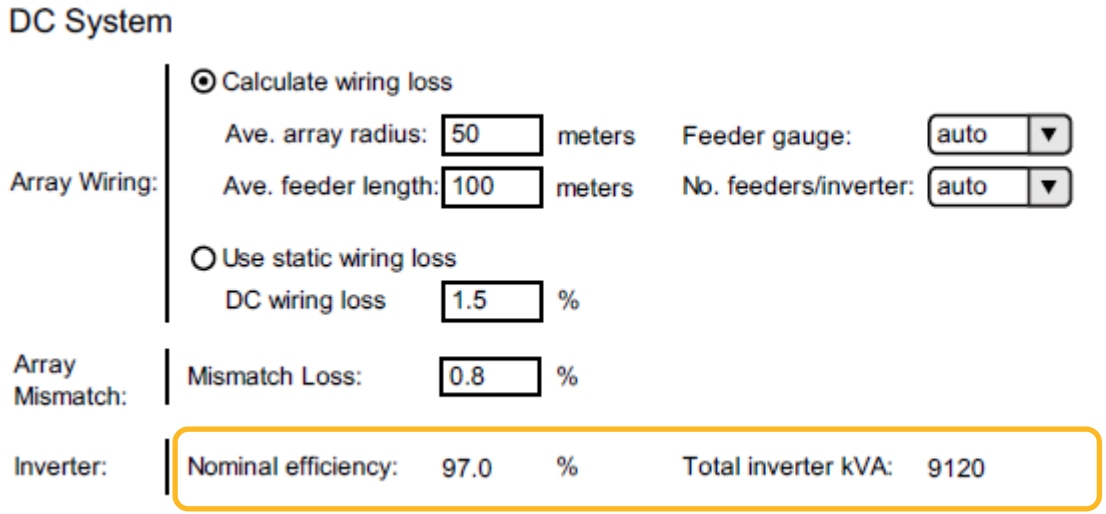


- Voltage drop calculated across strings and feeders:

$$P_{loss} = \sum\left(V_{drop\_string} * I_{string}\right) + \sum\left(V_{drop\_feeder} * I_{feeder}\right)$$

- Conductor sizing estimated from max short-circuit current if the user is unsure of exact parameters

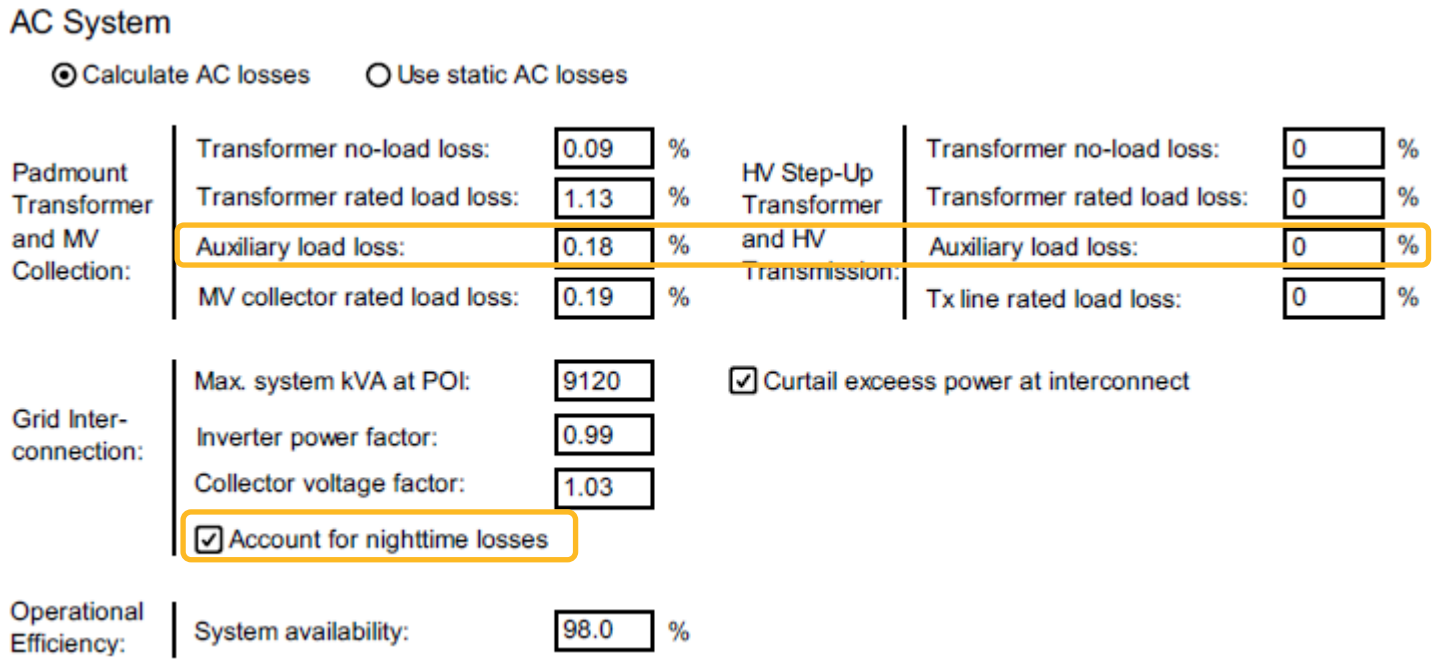
Inverter Efficiency & Clipping



- Sandia Performance Model for Grid-Connected Photovoltaic Inverters[1]
- Dynamic (with temperature) AC capacity model

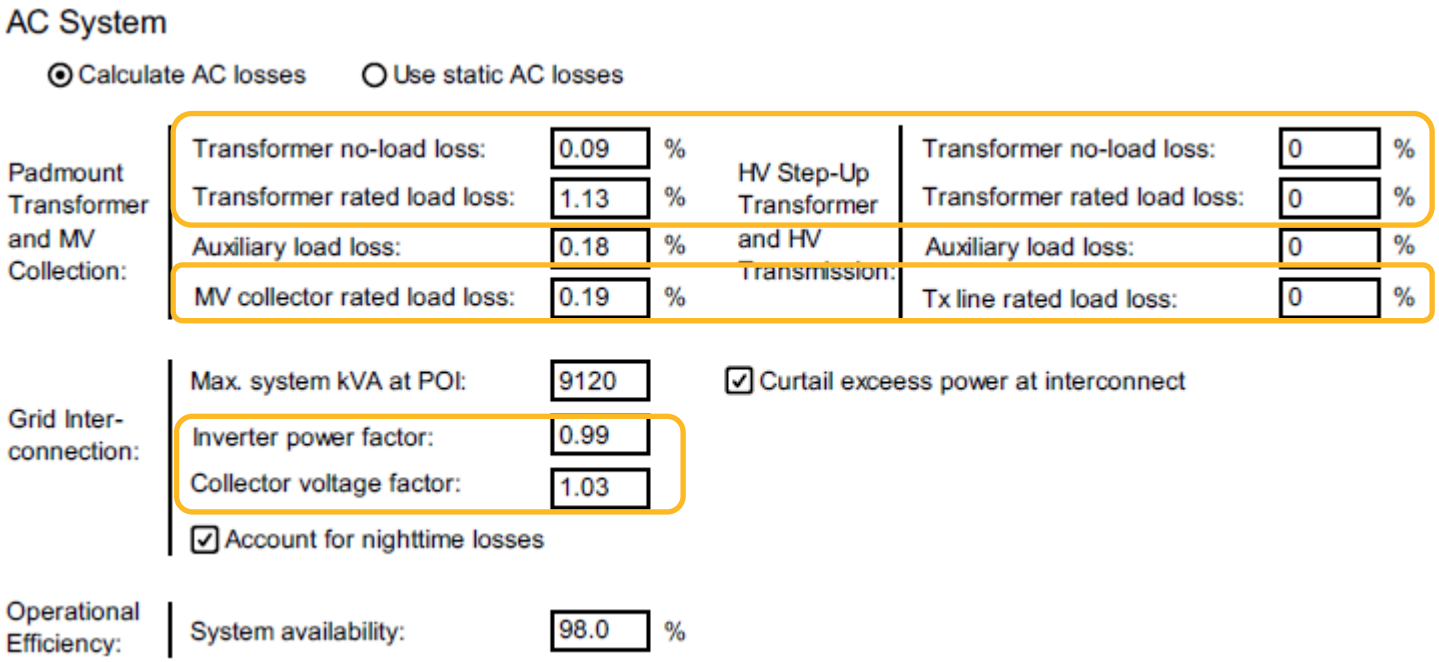
[1] King, D. Gonzalez, S., Galbraith, G., Boyson, W., 2007, Performance Model for Grid-Connected Photovoltaic Inverters

Auxiliary Load Loss



- Auxiliary loads are modeled as a constant reduction in output
- User can choose whether or not to include nighttime losses

Transformer & AC Line Losses



- Transformer loss:

$$P_{loss} = P_{no\_load\_loss} + P_{variable\_load\_loss}$$

- AC line loss:

$$P_{loss} = P_{variable\_load\_loss}$$

- Variable loss calculation:

$$P_{variable\_load\_loss} = P_{rated\_load\_loss} * \left(\frac{P_{in}}{PF * VF * P_{rated}}\right)^2$$

Balance of System Loss Accounting

Annual Losses & Adjustments vs. STC (%)	
Inter-Array Shading Loss	0.00
Site Shading Loss	0.00
Soiling Loss	-3.00
Tracker Misalignment Loss	0.00
Angle-of-Incidence Loss	-0.97
Air Mass Adjustment	0.16
Operating Temperature Adjustment	-7.23
Efficiency vs. Irradiance Adjustment	-1.47
Module Flash Adjustment	0.23
Module Light-Induced Degradation Adjustment	0.00
Module Mismatch Loss	-1.00
DC Wiring Loss	-1.50
Inverter DC Limit Loss	0.00
Inverter Efficiency Adjustment	-1.68
Inverter AC-Capacity Clipping Loss	-0.01
LV Auxiliary Load Loss	-0.01
Padmount Transformer Loss	-1.00
MV Collector Loss	-0.20
MV Auxiliary Load Loss	-0.20
HV Step-Up Transformer Loss	-0.20
Transmission Line Loss	-0.60
Interconnect Curtailment Loss	0.00
Annual Availability	98.0

End-of-Interval Timestamp	Array Losses		AC Balance of System Losses						
Time Stamp	Wiring Loss (W)	Mismatch Loss (W)	LV Aux. Load Loss (kW)	Padmount Transformer Loss (kW)	MV Collector Loss (kW)	Substation Aux. Load Loss (kW)	HV Step-Up Transformer Loss (kW)	Transmission Line Loss (kW)	Interconnection Curtailment Loss (kW)
01/01 10:00:00	45.0	30.1	0.10	0.21	0.40	0.05	0.10	0.34	0

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