



ALL-IN-ONE TOOL FOR MODULE DESIGN AND ANALYSIS

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ABOUT CSEM



In Neuchatel (not too far from here)!

Part of the Sustainable Energy Center

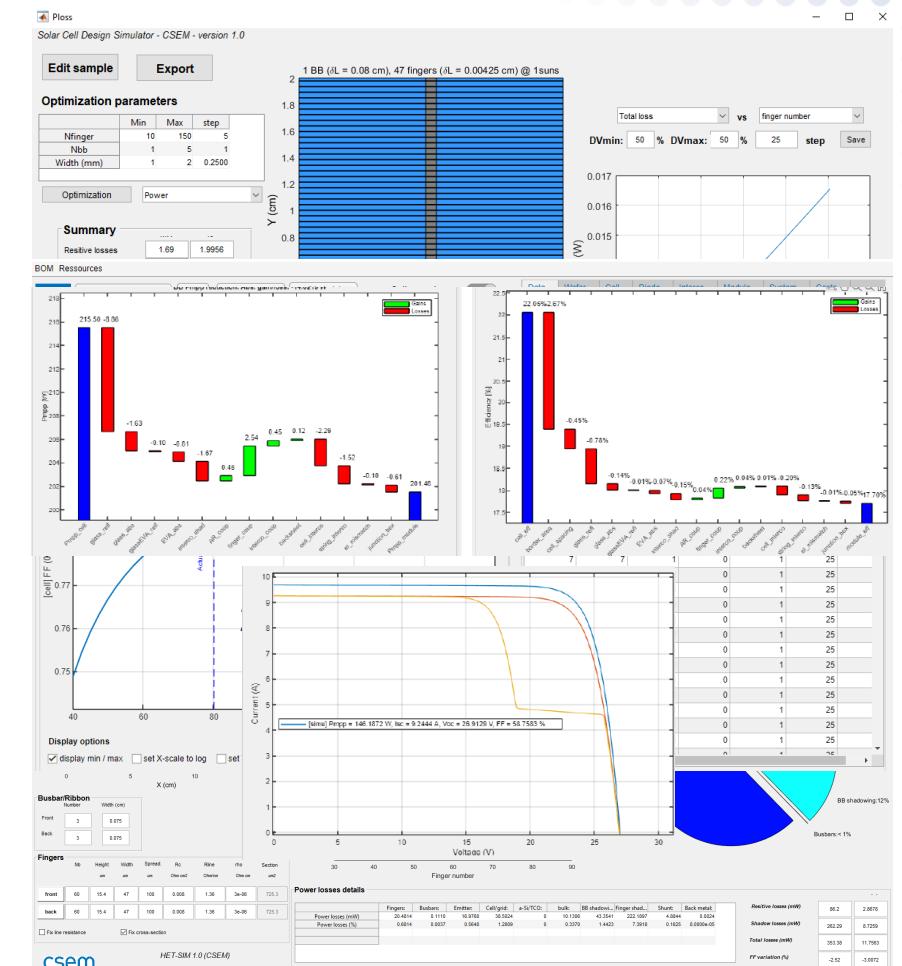
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HETSIM – CSEM-MADE TOOL

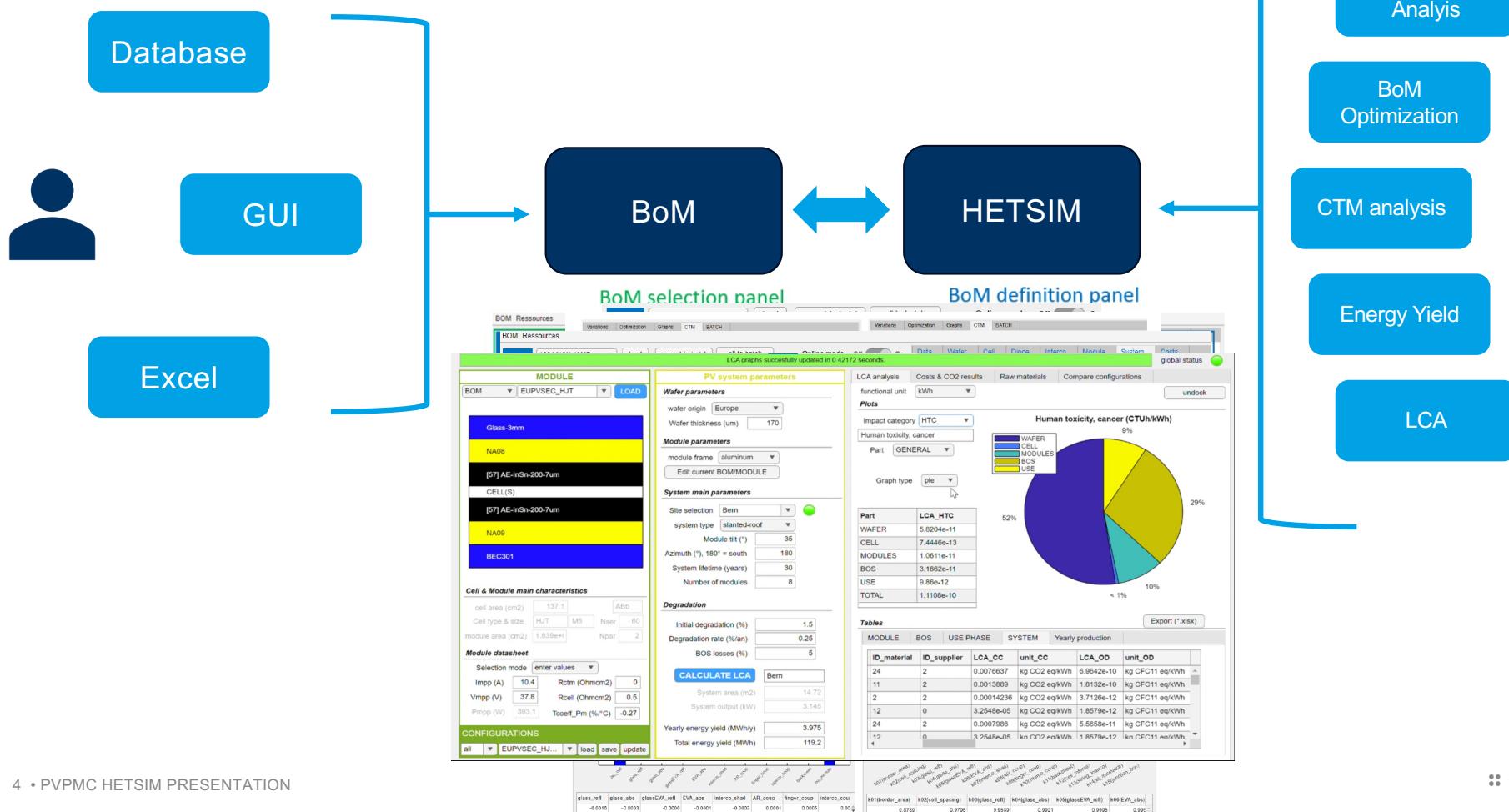
- At first, power loss analysis for cell design optimization
- Rapidly, module level simulation tool was developed
- Power simulation accounting for CtM, BPD, shading and bifaciality impact, etc...

Today Complex tool with many functionalities and backed up with powerful database

Goal: Easy Design Optimization !



HETSIM IN A NUTSHELL

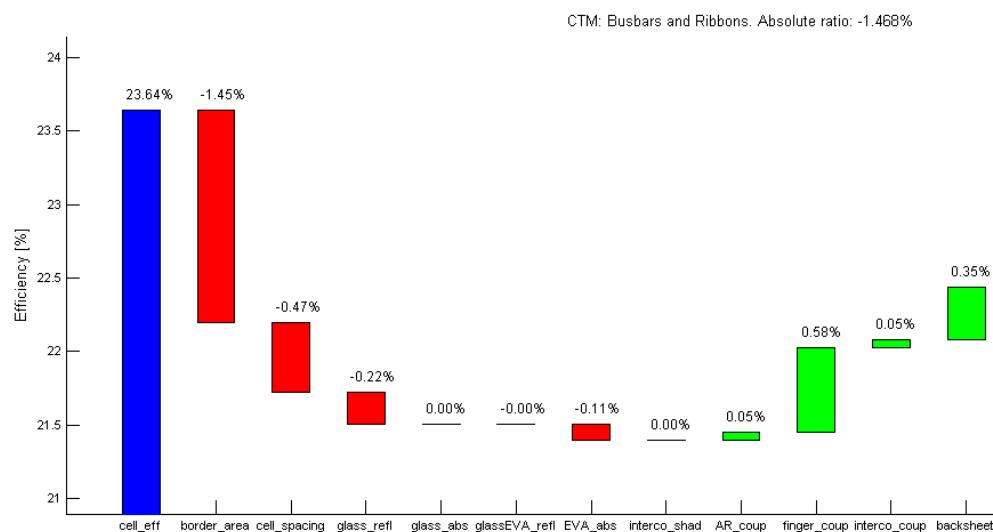


CELL DESIGN FIXED

**MODULE PERFORMANCES
OPTIMIZATION**

OPTIMIZATION TOOL - CTM

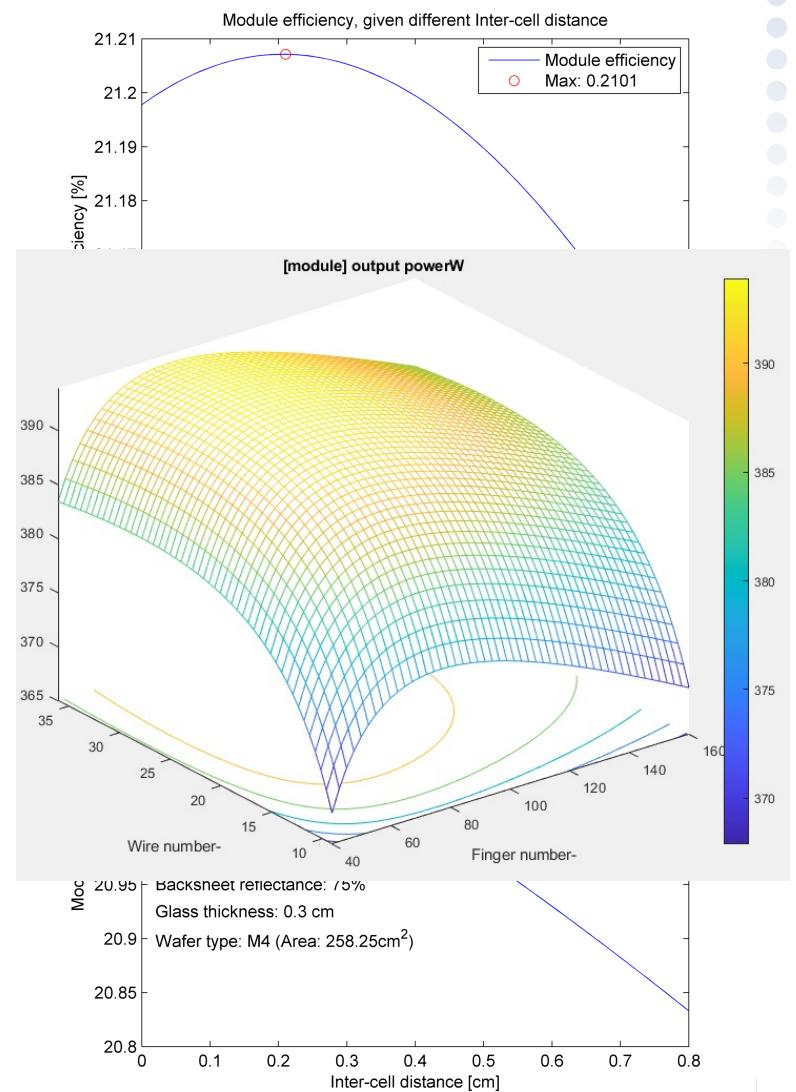
- CtM losses can also be computed according to the used stack (based on [2])
- Each contribution are either given by the user or calculated ac
- Optimization



Label	Factor number	Model
Module border	k(1)	Analytical
Cell spacing	k(2)	Analytical
Glass reflection	k(3)	Spectral
Glass absorption	k(4)	Spectral
GlassEVA reflection	k(5)	Spectral
EVA absorption	k(6)	Spectral
Interco shading	k(7)	Analytical
AR coupling	k(8)	Literature value
Finger coupling	k(9)	Analytical
Interco coupling	k(10)	Analytical
Backsheet coupling	k(11)	Measured data
Cell interconection	k(12)	Analytical
String interconnection	k(13)	Analytical
Elect. mismatch	k(14)	Analytical
Junction box, cabling	k(15)	Literature value

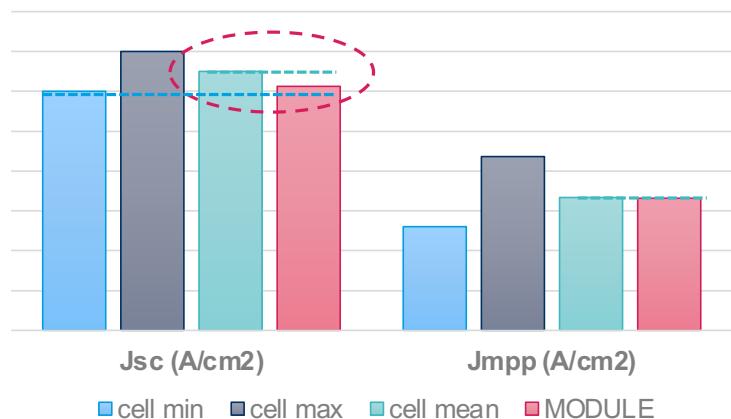
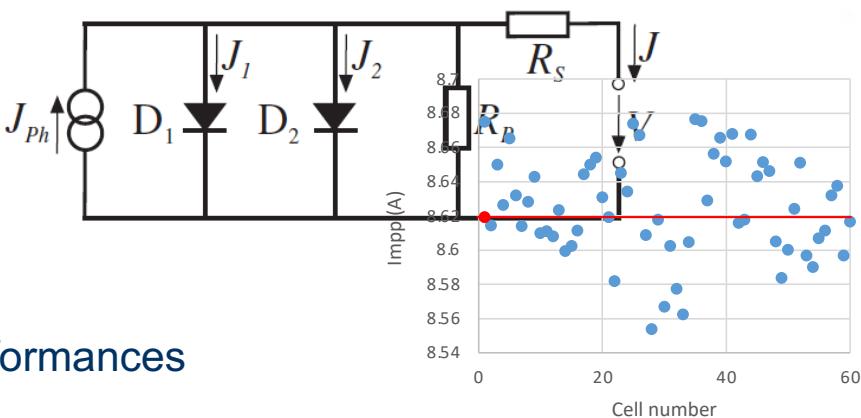
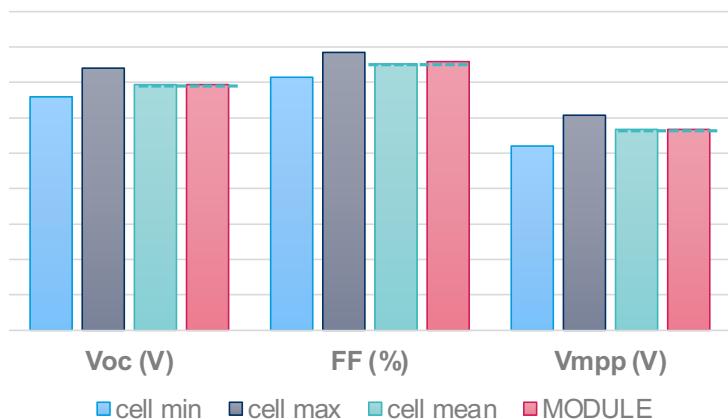
OPTIMIZATION TOOL

- Single parameter optimization tool
 - Quantitative evaluation of parameter variation impact
- Multiparametric optimization with optimum extraction and easy visualization !



KEY FIGURES PREDICTION

- Simulation based on a Two-diode model with Quick simulations (ref [1])
- Simple and interesting example here:
Variation of key figure → impact on module performances

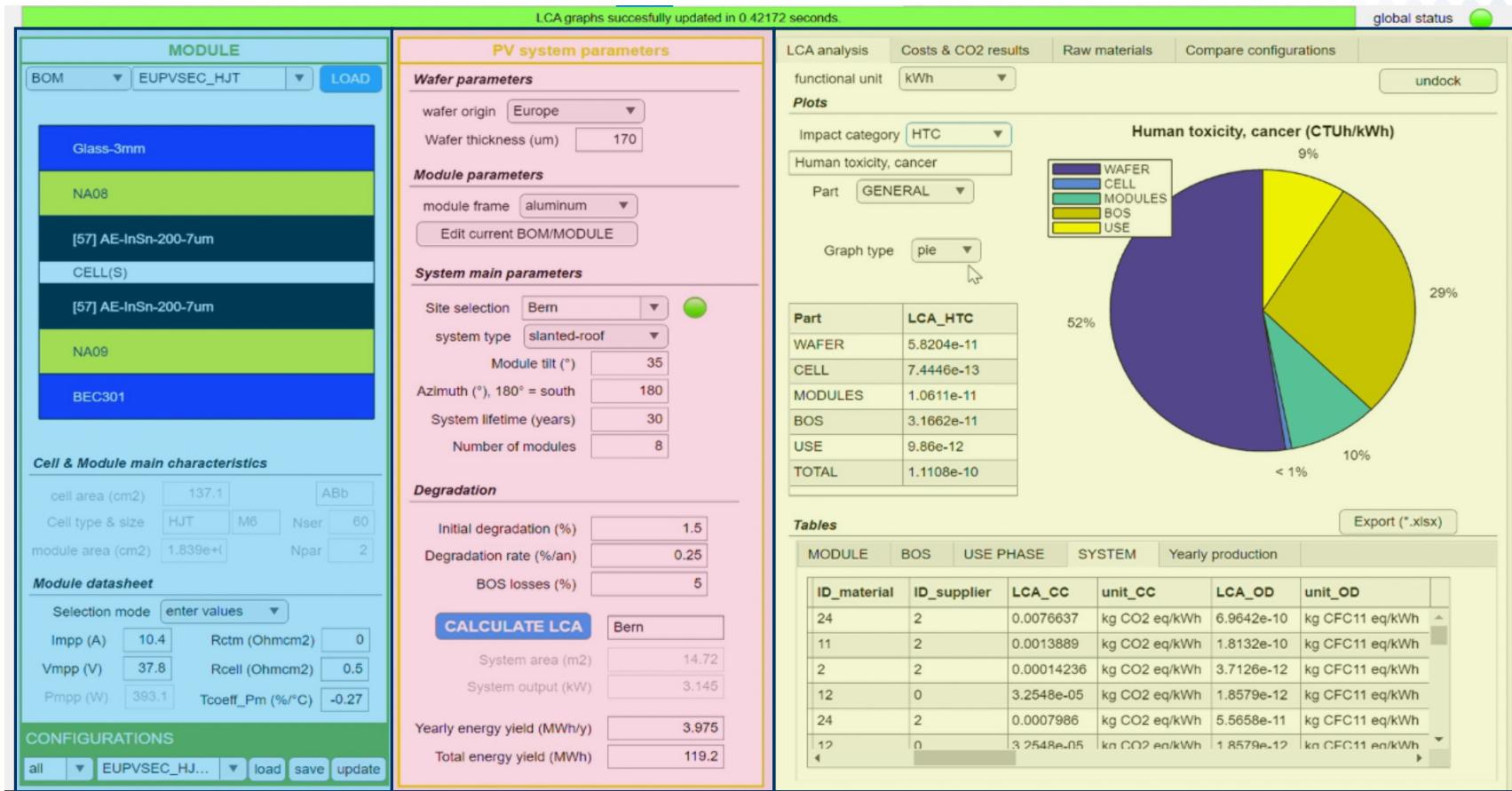


LCA

Module and cell level parameters

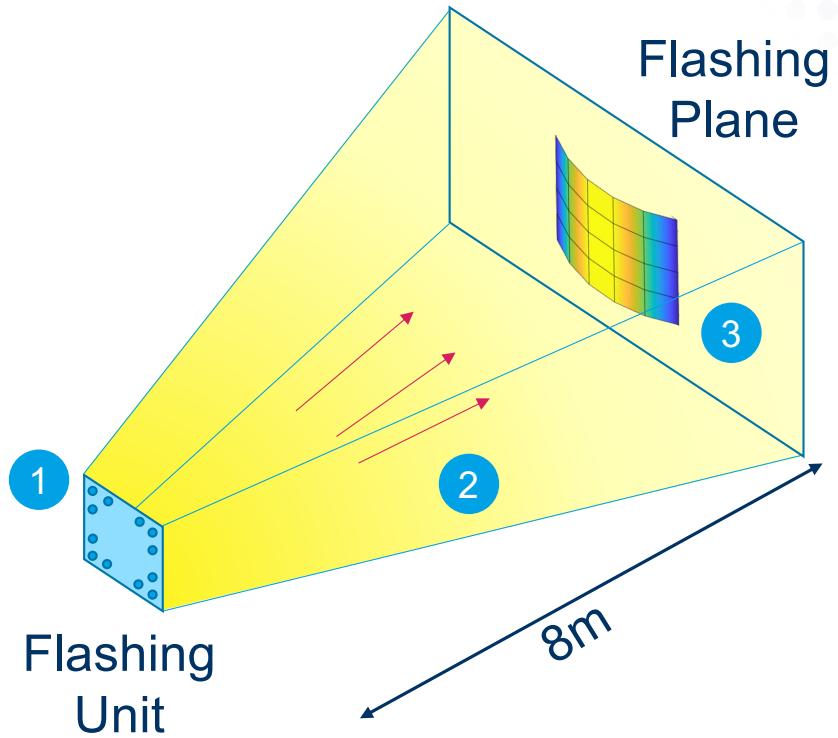
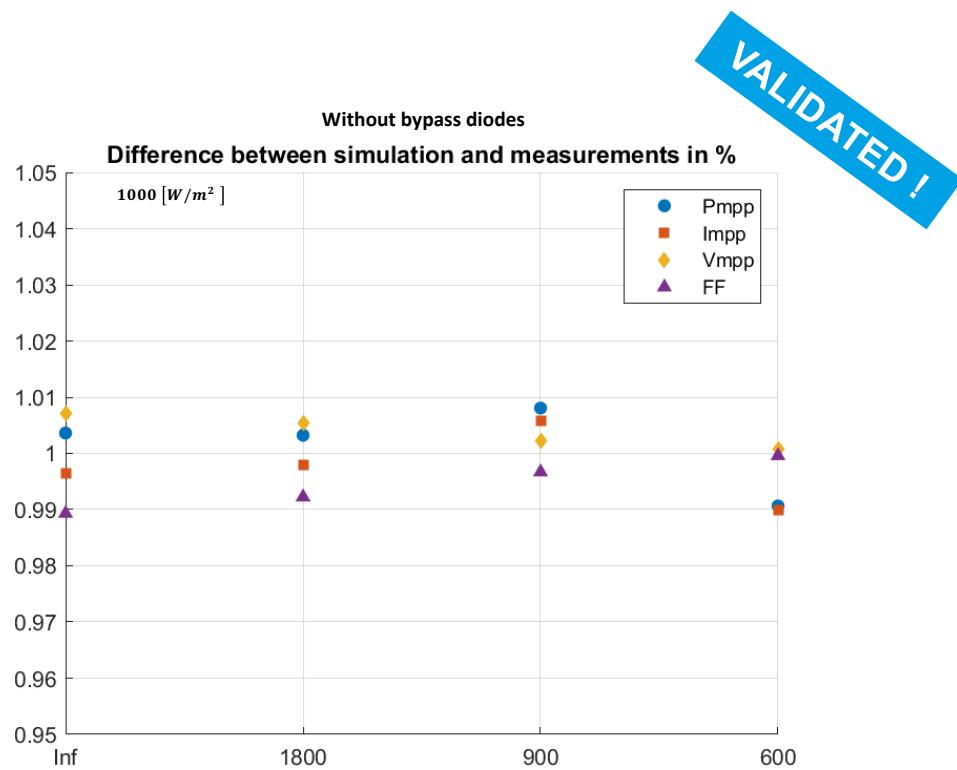
System level parameters

Results View



OUTLOOKS – CURRENT DEVELOPING FEATURES

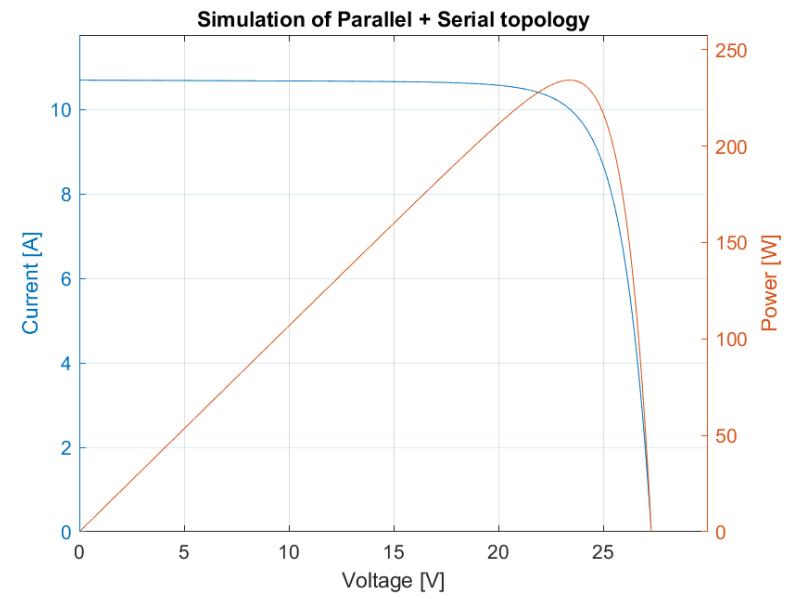
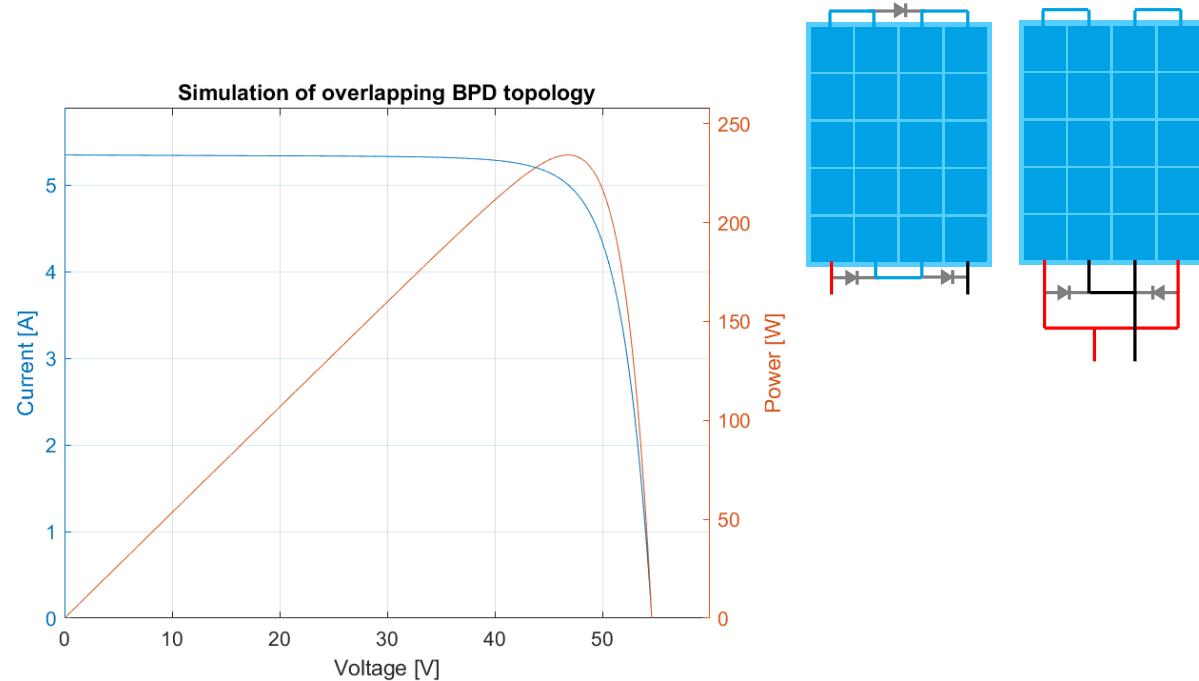
OUTLOOKS CUVRED MODULES



OUTLOOKS

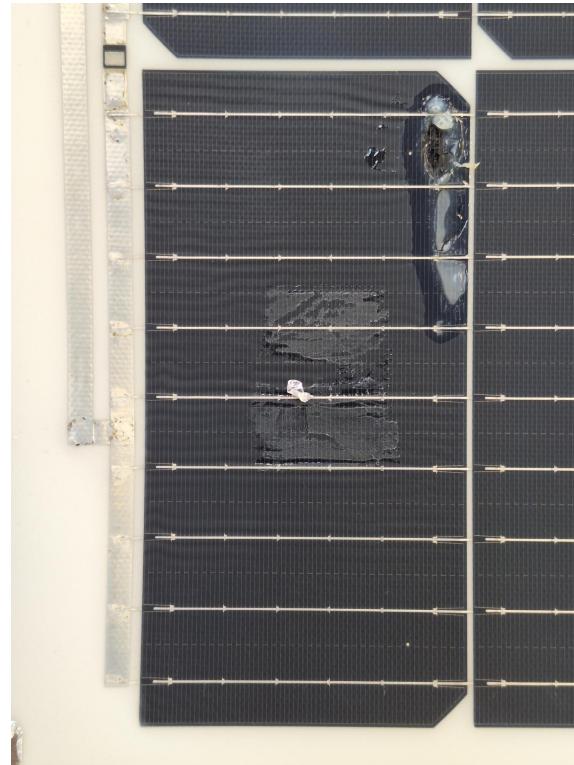
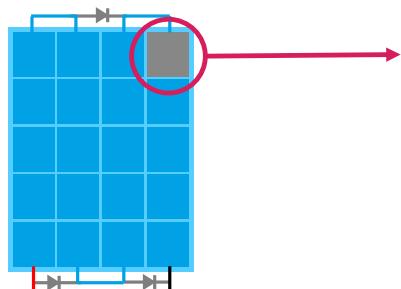
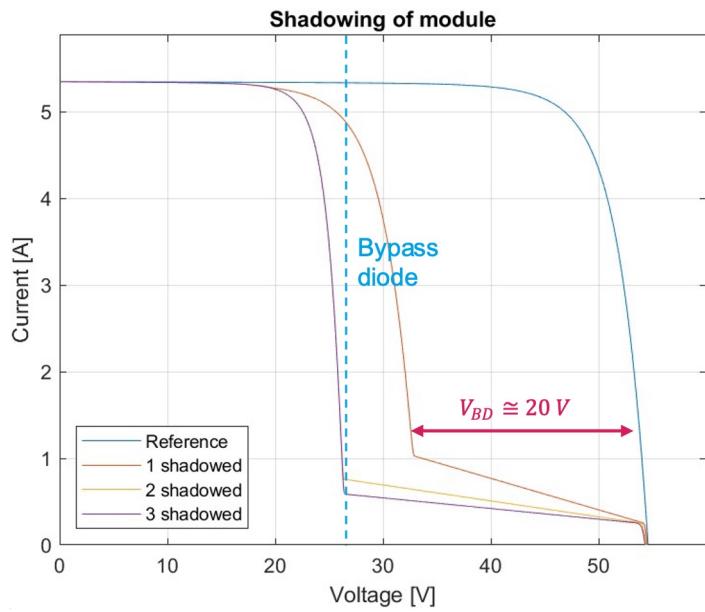
SIMULATING ARBITRARY TOPOLOGIES

- Simulation of unconventional topologies

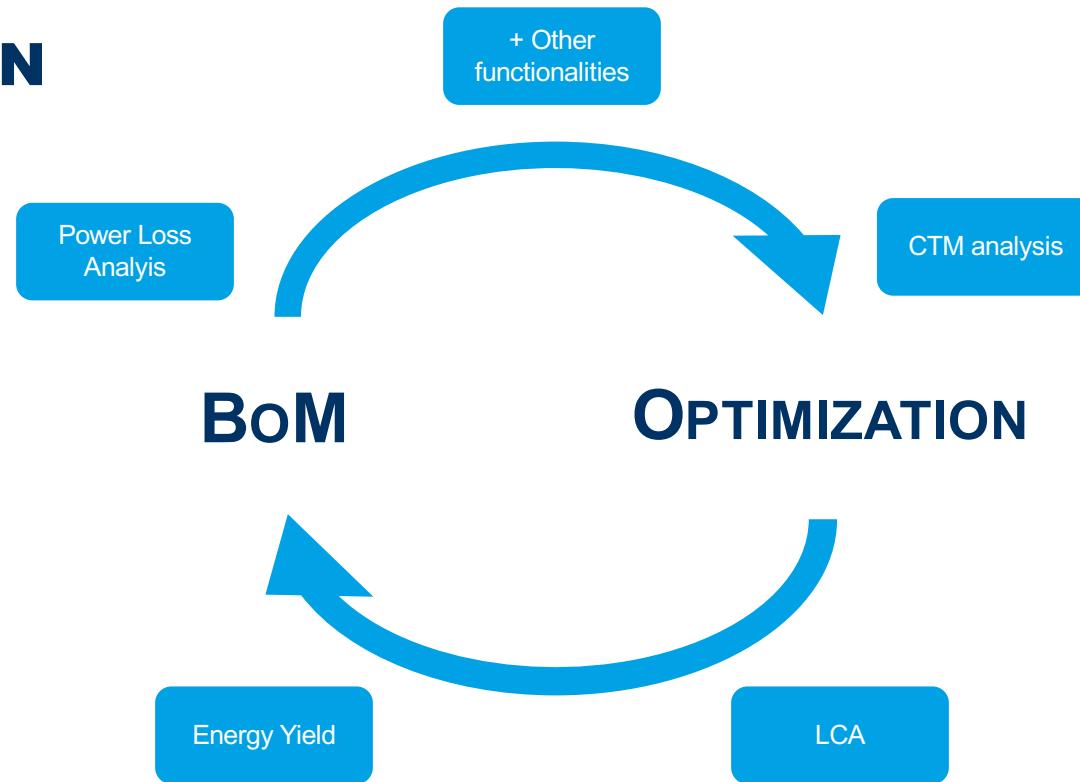


OUTLOOKS SIMULATING ARBITRARY TOPOLOGIES

- Simulation of unconventional topologies



CONCLUSION



Offers an all-in-one centralized solution !

CONTACT US FOR ANY QUESTIONS

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