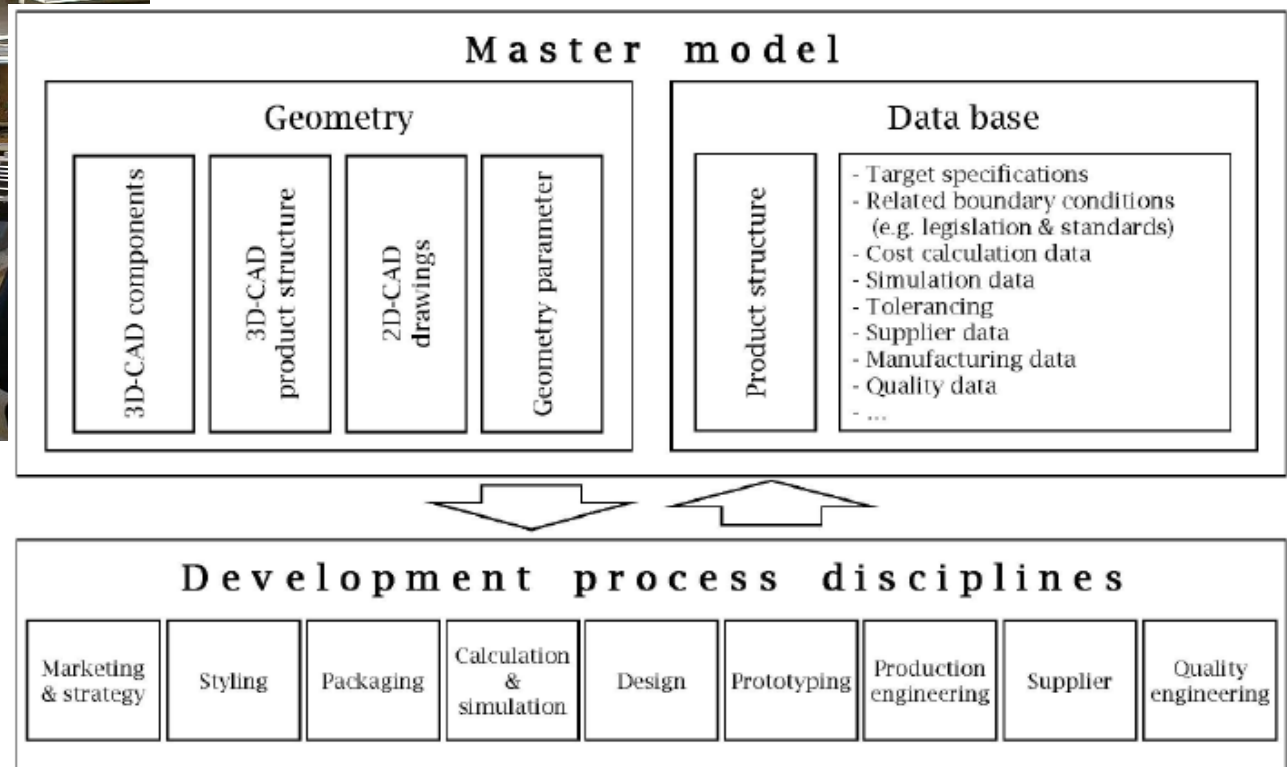


BIM innovation and connections for Architecture, Engineering and Construction

- 1- From “physical Master Model” to “digital BIM Model”
- 2- From Design Data -> ID & Performance data
- 3- Digital thread
- 4- Data, information, ...knowledge are all!
- 5- Digital Twins
- 6- Innovation: Digital twins to ...see the Future, now !

From “physical Master Model” to “digital BIM Model” !

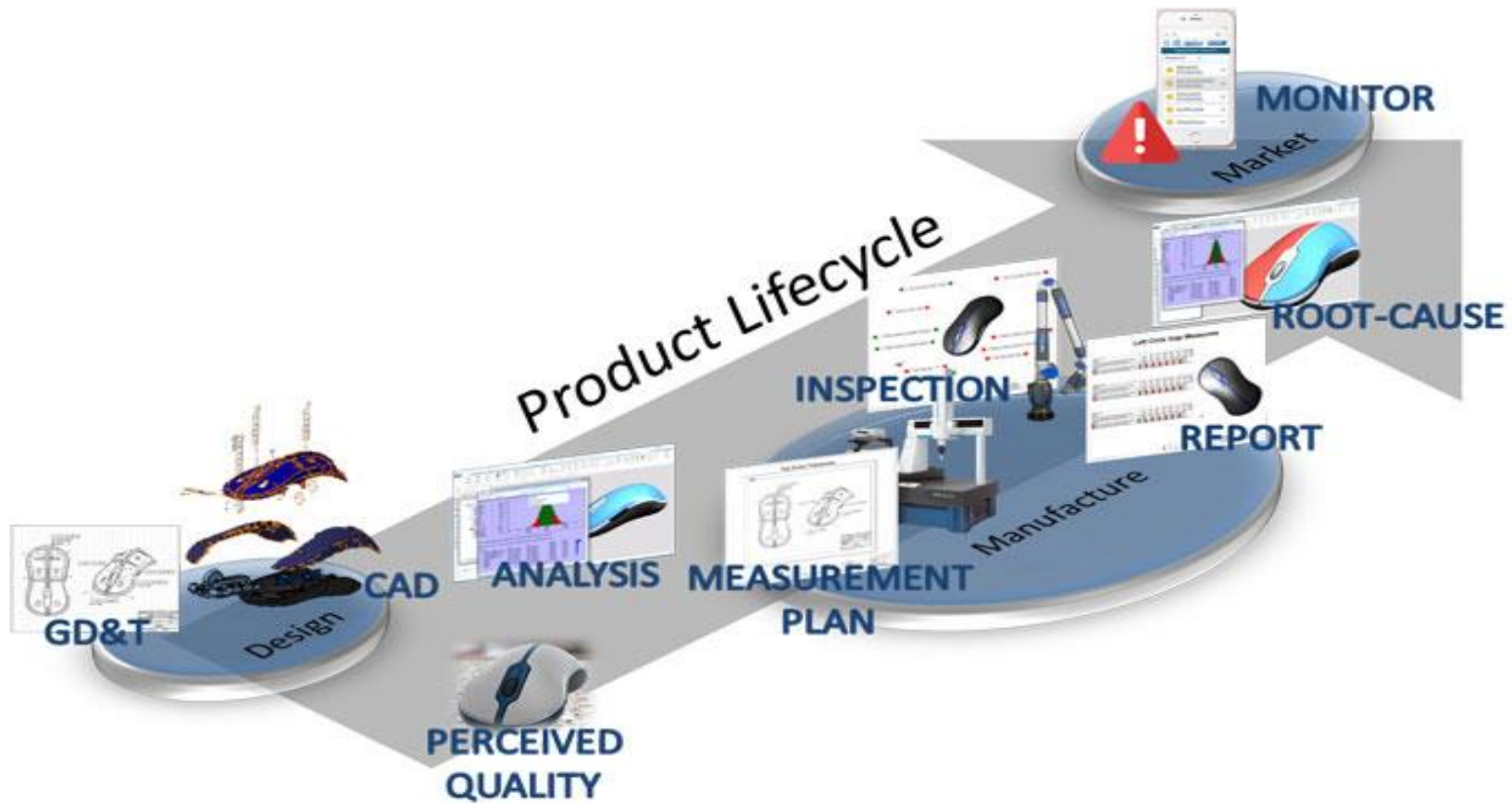
History of the reference **master model** ...from physical to digital



From design data to ID & Performance data

Virtual

Real



Design data

ID data

Performance data
(health)

Digital thread

Record of a **PV plant lifetime**, from its creation to its removal

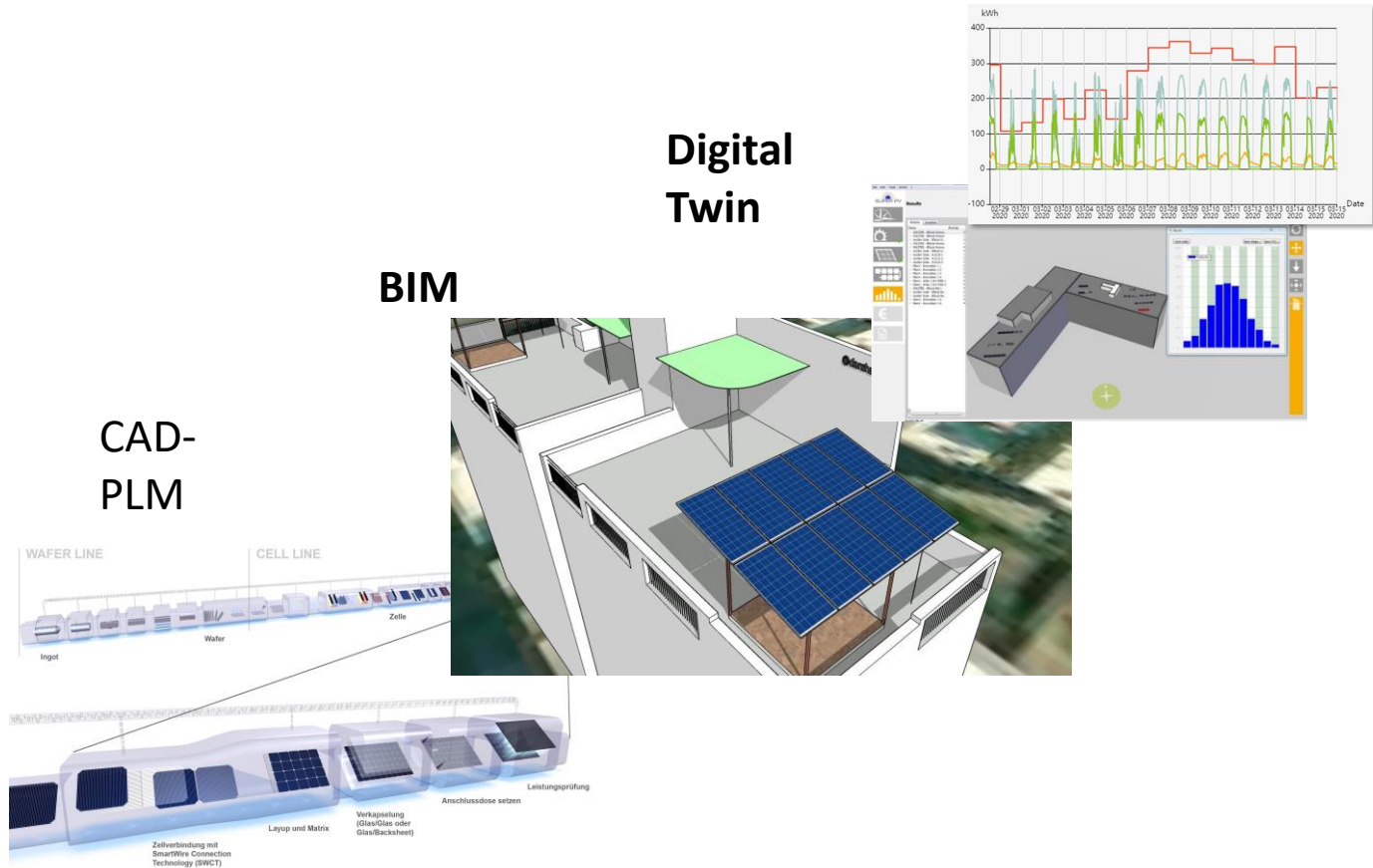
As-Designed → As-Simulated → As-Manufactured → As-installed → As-Monitored...

Digital
Twin

BIM

CAD-
PLM

Word, PDF,
Photoshop...
Documents

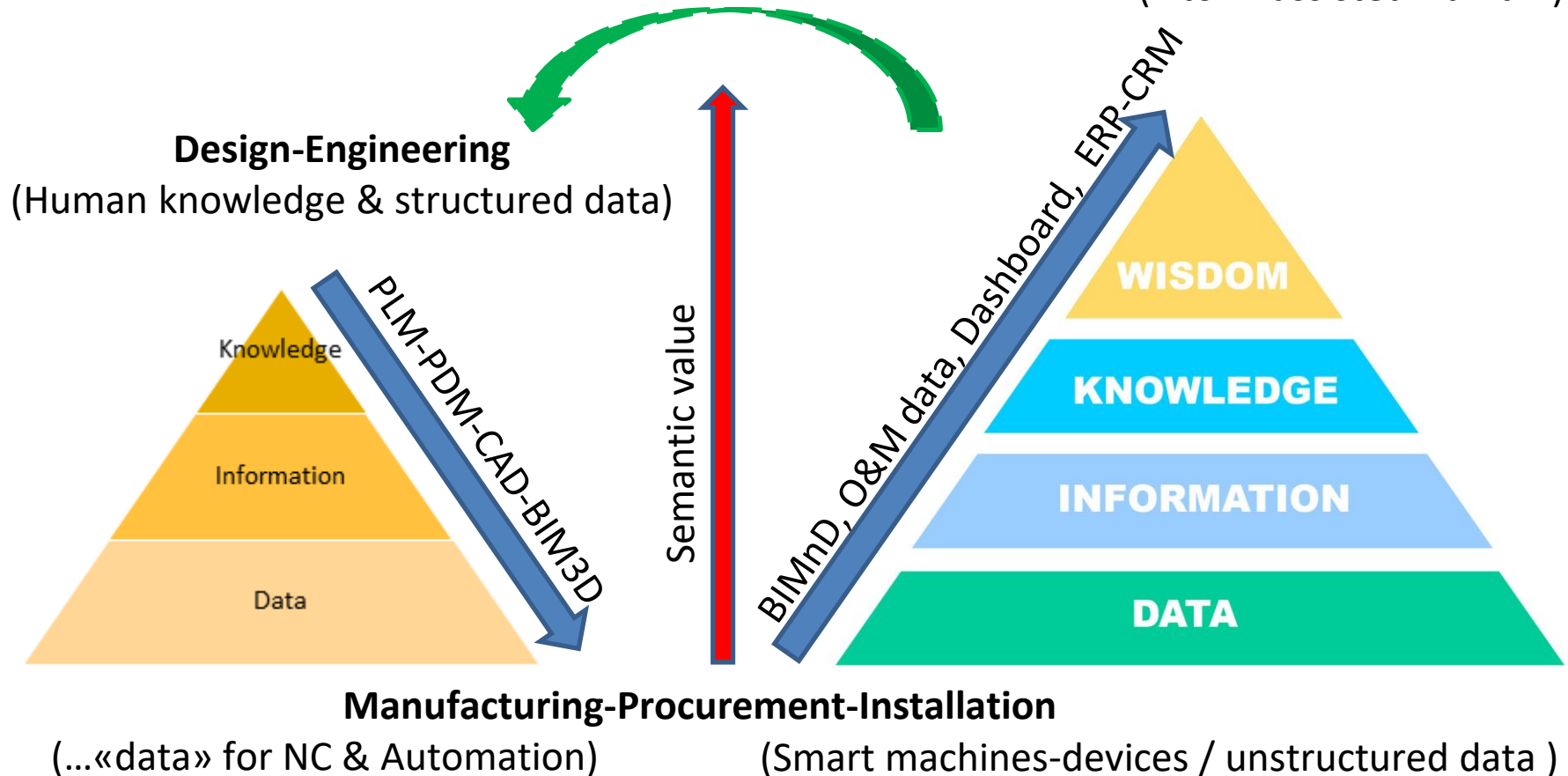


Digital threads and digital twins are the foundations behind a digital transformation

Data, information, knowledge ...are All!

Towards the Future : Closing the circular economy loop

Management-Business
(...to AI assisted Human)



From the Past...

...To the Present

Digital Twins: Current representation of a product or system (PV plant) mimicking its behavior...

Enabled by an «interoperable» Digital Thread

Product & plant Twin

Costs Calculation

W:/Site_Oslo/site_oslo.bis

Cancel Proceed

Investment costs details

Type	Items	Costs (€)
PV modules system	Risom - Innovation 1 4	105.48
PV modules system	Risom - eFlex 1.6m FF60 1	175.80
PV modules system	Risom - eFlex 1.6m FF60 2	175.80
PV modules system	SOLITEK - Bifacial Ref 1	703.20
PV modules system	Apollon Solar - Bifacial Ref 1	351.60
PV modules system	Apollon Solar - Bifacial Ref 2	351.60
PV modules system	Risom - Innovation 1 5	140.64
PV modules system	Risom - Innovation 1 6	140.64
Inverter	ABB - UNO-DM-2.0-TL-PLUS	780.85
Inverter	ABB - UNO-DM-2.0-TL-PLUS	780.85
Inverter	ABB - UNO-DM-2.0-TL-PLUS	780.85
Inverter	ABB - UNO-DM-2.0-TL-PLUS	780.85
Inverter	ABB - UNO-DM-1.2-TL-PLUS	337.76
Inverter	ABB - UNO-DM-1.2-TL-PLUS	337.76

Investment costs (CC): 6202.46 €

Installation costs (IC): 620.25 €

Decommission costs (DC): 620.25 €

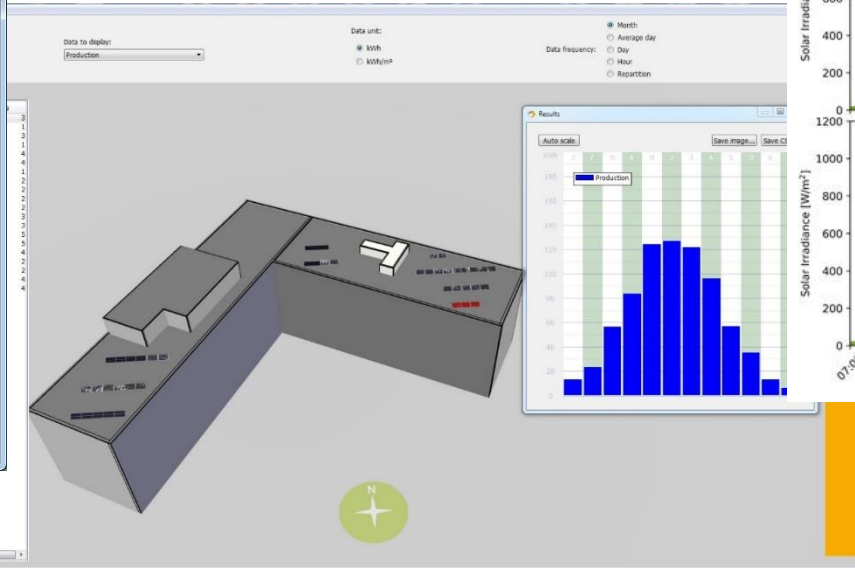
Capital costs (Cap): 341.14 €

Maintenance costs (M): 68.23 €

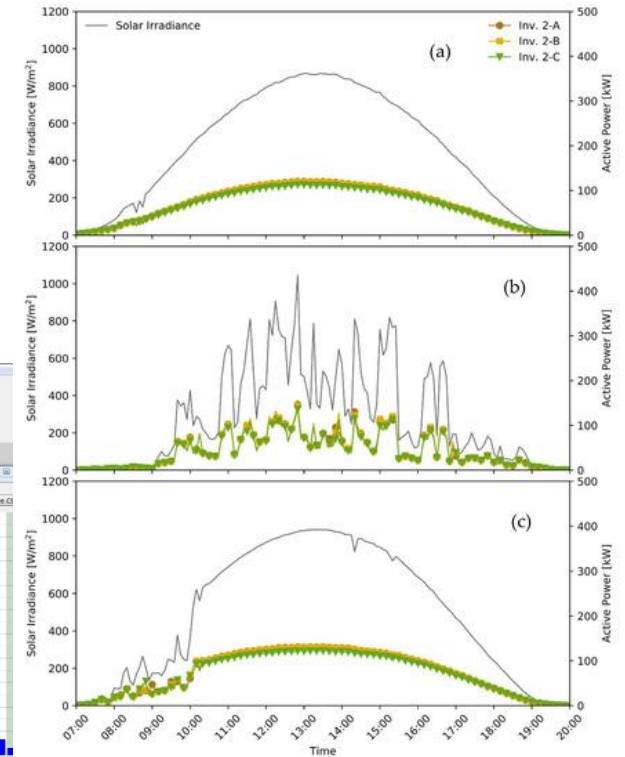
TOTAL costs: 8449.54 €

Production: 174.28 MWh

LCOE: 48.48 €/MWh



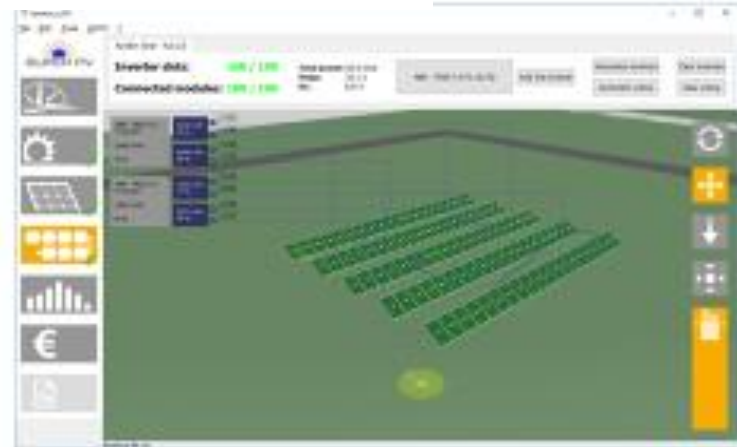
Performance Twin



Innovation

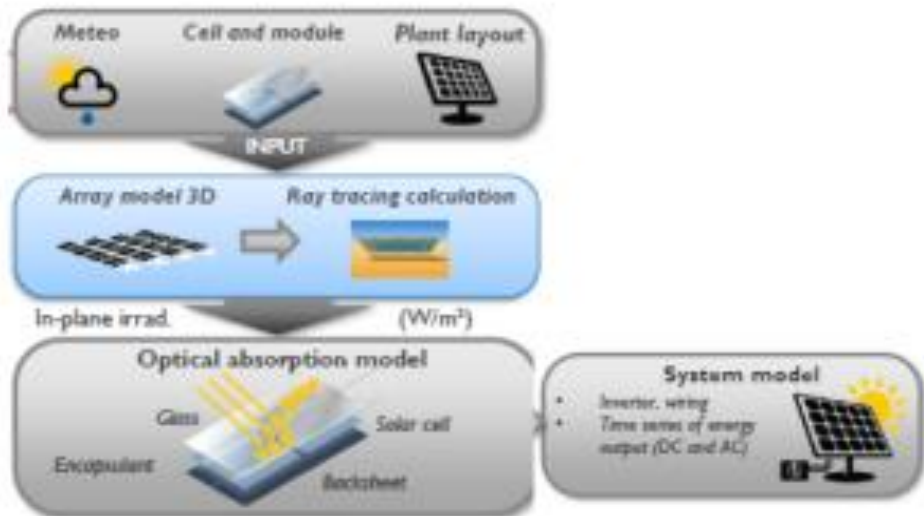
- **PV plant layout design + planning**

- **BIM Data aggregation** : Interoperable, IFC compliant
- **Autodesk software compatible** (CAD, GIS, PLM, Scan)



- **Physics based energy yield model**

- **Ray tracing algorithms** (numerical method versus analogical formulae)
- **Scalable model** : open BIM, configurable, AR/MR enabled, AI, CPS extendable...



Digital Twins

to See the future...Now,
based on a cyber world and sustain the post-Covid «clean growth paradigm»

Facing the downturn of the PV market, we do believe it is now far more relevant moving forward with the **full digitalization towards the DT concept** that could help predict **long term benefit of PV** (LCOE etc...) and “visualizing “ **Energy as a service” triple bottom line virtue** versus oil price yoyo driven by productivity only and many other uncertainties in our global world.

DT would also enable the **reshoring of value chain “last mile”**, e.g. based on **mass customization** : BIPV can particularly fit well this approach !

- The **DT cyberspace** counterparts of physical systems will play an important role to scientifically (CPS) predict the future
- The architecture makes maximum use of **vendor-neutral off-the-shelf IoT software**, as well as secure and open protocols for twin-to-twin communication.

Based on DT, you can definitively sell the (virtual) bear skin before killing it !



**THANKS
FOR YOUR ATTENTION!**

