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Northwestern Switzerland

Digitalization for solar  
installers

Prof. Dr. Renato Minamisawa  
Digital Powerlab

FHNW & SOLEXTRON


Lausanne, 22<sup>nd</sup> March 2024



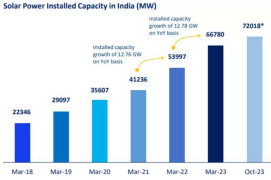
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Solar installed capacity growth  
Distributed solar is booming!

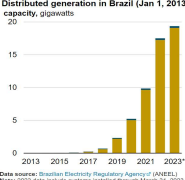



Solar Power Installed Capacity in India (MW)



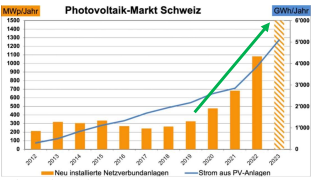


Distributed generation in Brazil (Jan 1, 2013)





Photovoltaik-Markt Schweiz



Avg. growth ~7 GW/yr

From 5 to 20 GW in 5yr

Doubled in last 2yrs

All nice, but... is this growth sustainable?

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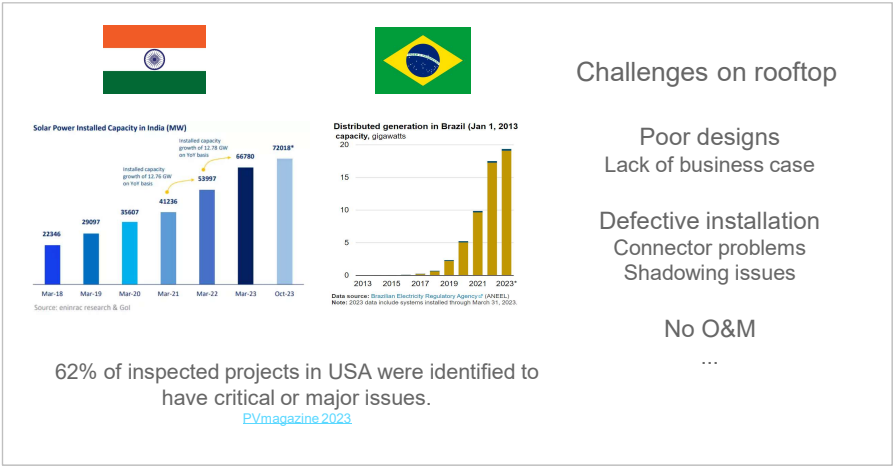
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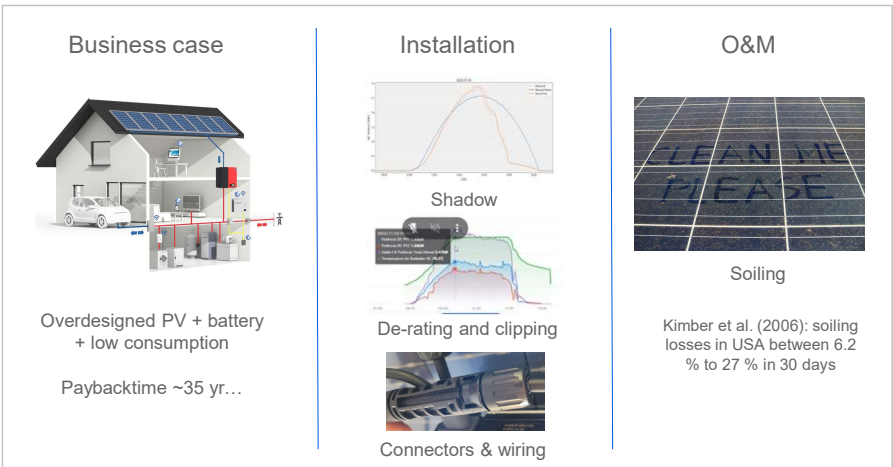
PV challenges

Why is PV rooftop scaling so fast?



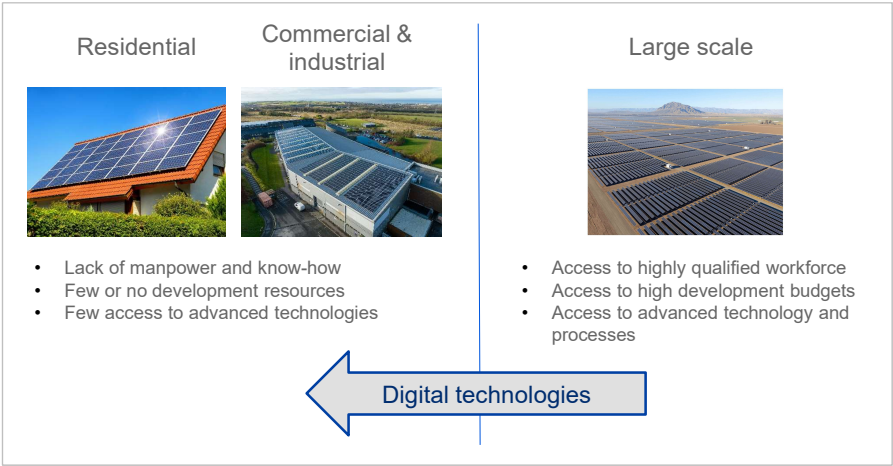
PV challenges

Have I seen that before?



## PV opportunities

### Learning with the big players



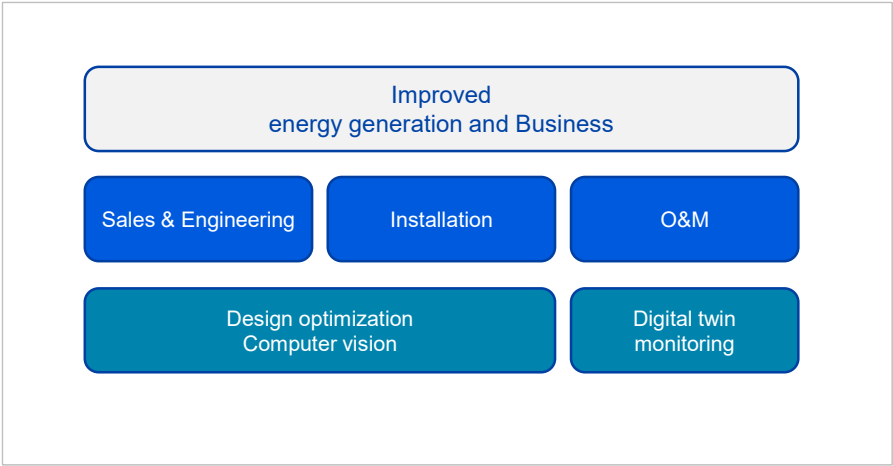
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## PV digitalization

### Digital transformation for solar installers



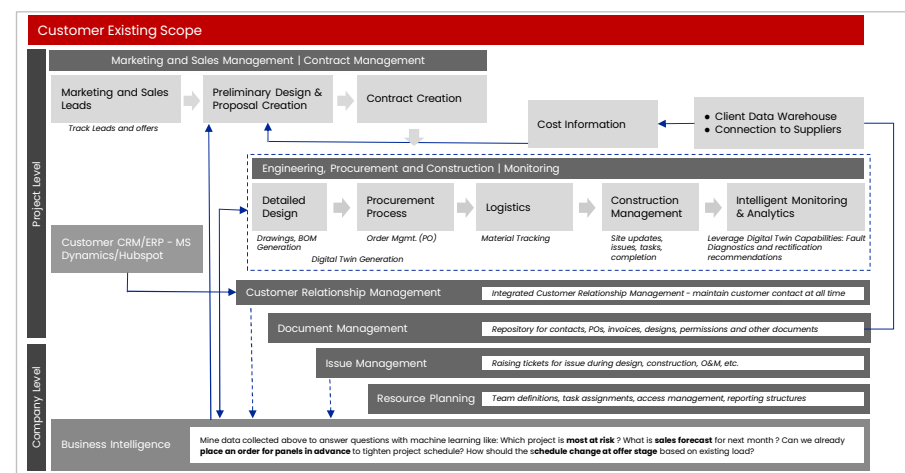
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## PV digitalization

### Process integration



## PV digitalization

### Design optimization



Goal: Recommend design based on energy and financial KPIs



## PV digitalization

### Digital twin monitoring

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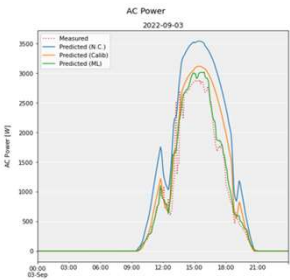
Goal: Performance tracking – is your plant performing as it should?  
Failure recognition

#### Data driven

It correlates  
historical energy  
production with  
weather data and  
predicts

#### Model driven

It performs quasi real-  
time simulations  
delivering energy  
prediction based on  
weather data



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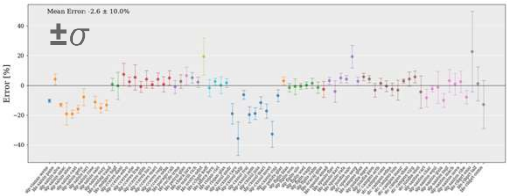
## PV digitalization

### Digital twin monitoring

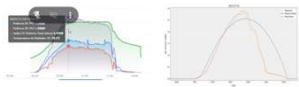
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#### Data driven



Month-to-month deviation →  $\pm 2\sigma = 20-40\%$



#### Issues:

- It requires at ~1 year training.
- It is a relative comparison, if the data is bad, it will say the installation is good.
- “It does not reflect the EEC. Losses have no meaning.”

solytic solar analytics



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## PV digitalization

### Digital twin monitoring



Model driven

#### DIGITAL TWIN

- It does not require training.
- It reflects the EEC in several levels
- It can recognize specific failures



#### ADVANTADGES

- 1) Calibration of loss parameters
- 2) Calibration of cloud coverage factor for design energy forecast



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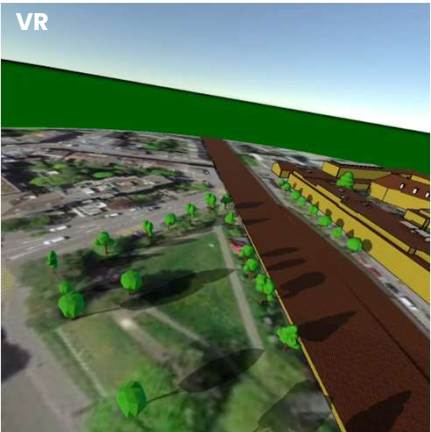
## PV digitalization

### Computer vision AR/VR



#### ADVANTADGES

- 1) Realistic visualization for customers (BIPV) and city authorities, with real time interaction
- 2) Collaborative planning and interaction between electrical companies and roof installers



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## PV digitalization

### Conclusions

- The fast scaling of solar rooftop installations lags behind in technology compared to centralized segment, which often result in a lack of optimum/correct designs and O&M.
- Design optimization can recommend the right sizing of solar (and battery) in order to optimize energy and financial results.
- Digital twin monitoring indicates the real health status of the solar plant, and assist to diagnostic the installation. It also enable to determine loss parameters and cloud coverage factor for localized installation planning.
- The development of computer vision tools open possibilities for novel interactive sales and engineering processes.

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## PV digitalization

Thank you!



[renato.minamisawa@fhnw.ch](mailto:renato.minamisawa@fhnw.ch)

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