





# Doctor for solar plant

Making the solar panel greener using IoT and Intelligent Software











# Our Journey So Far: Doctor of Solar panels



Launched

Nov, 2019

Lausanne, Switzerland



Team of PhDs and MS from

Top Swiss, German, Indian and US Universities











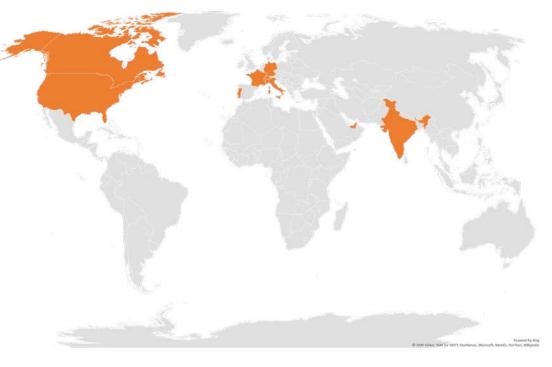
Raised: USD 450 k Next round: USD 2 Million, Q4 2021

2+ GW of Assets from rooftop to utility scale assessed Globally in just 1 year

40+ Partners in

North America, Europe,

Middle East and Asia





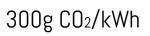
SmartHelio was awarded as "Technology of the Year"

- Solar by Solar Quarter in Oct '20

#### Life of a Solar Plant!

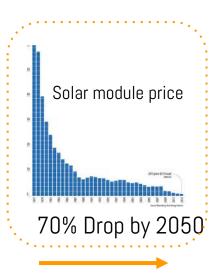








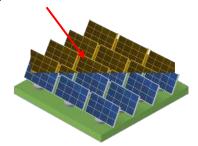
50g CO<sub>2</sub>/kWh



Solar Plant Owners prefer to replace a panel as soon as performance goes below 5%.



Replaced Panels



100-150g CO<sub>2</sub>/kWh (through the life span of the plant)



"Solar plant e-waste (60 Million Ton) could be 10% of global e-waste by 2050"- PV Magazine



## **Our Solution**



60% of low

performing panel

can be reused



Identifying Panel Level Faults is a Daunting and Cost Intensive Task





~5%

~95%

A Cost Effective Technology to easily identify faults in solar panels and prescribe steps to increase the life of the solar panels





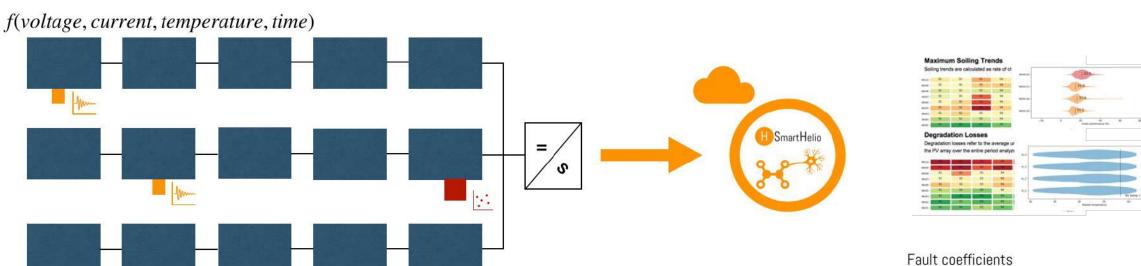




# R&D: Edge Computing based Fault analysis



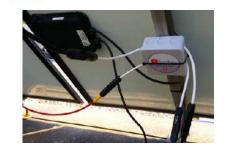
Patent pending: fault detection using edge computing in solar plants

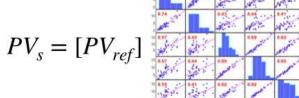


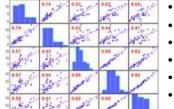


# Distributed Edge computing

- Bi-directional communication
- Down-size data transfer (80%): Anomaly data sent to cloud





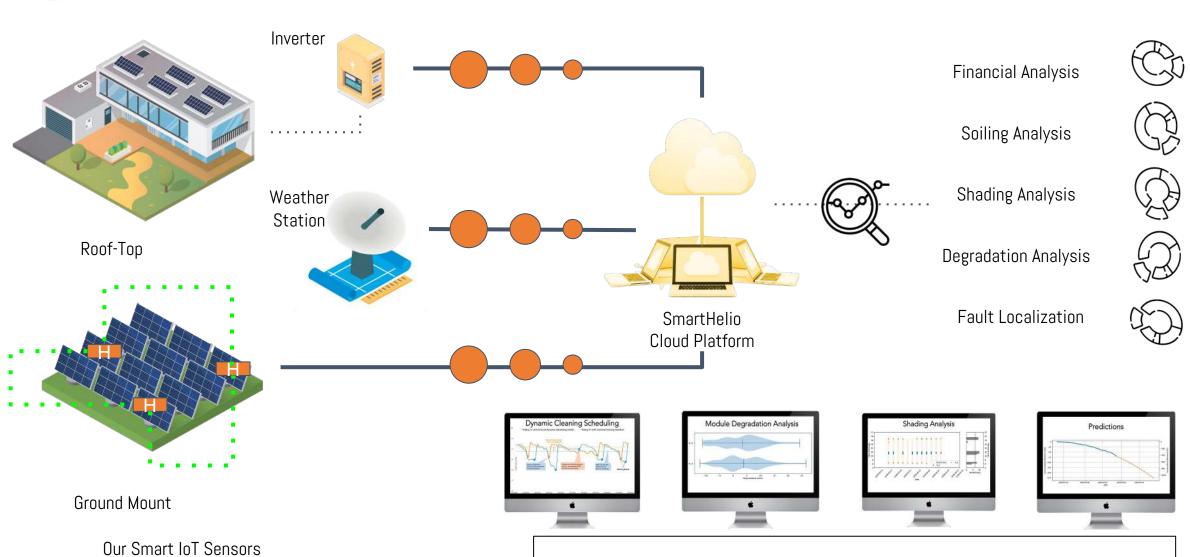


- Soiling
- Full shading
- Partial Shading
- Connector
- Wire rust
- Wire insulation
  - PID
- Hotspot
- by-pass diode
- Inverter heating
- etc...(30+)

Our models are physics (80%) and AI (20%) based No long term data required

# Our Technology - HelioHealth Sensor and Cloud Platform

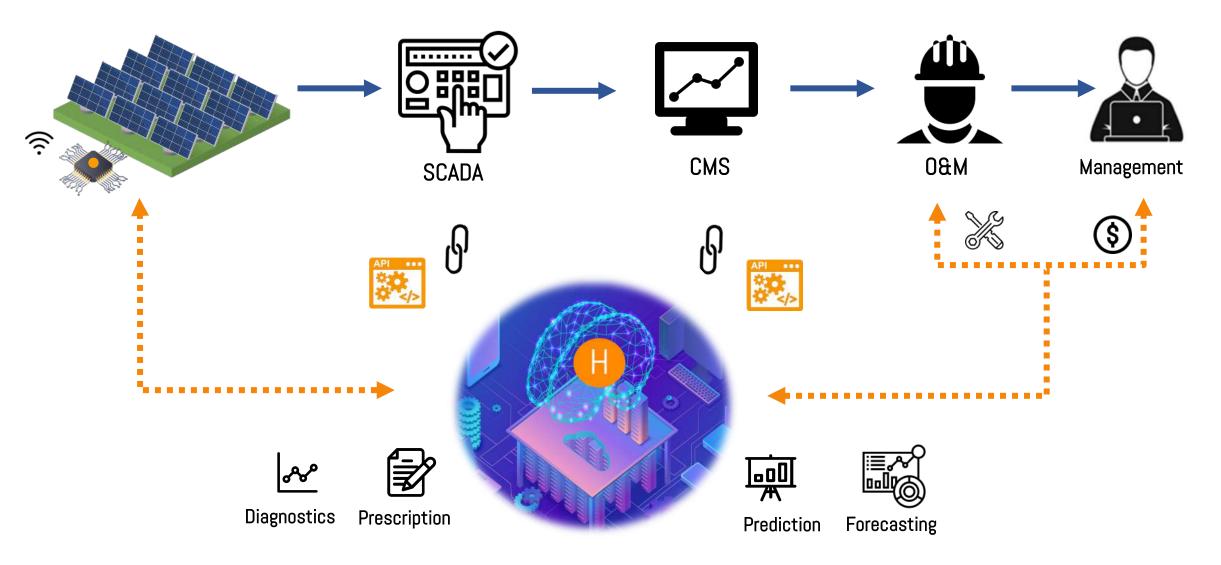




Our Smart IoT Sensors stay connected and learn from each other

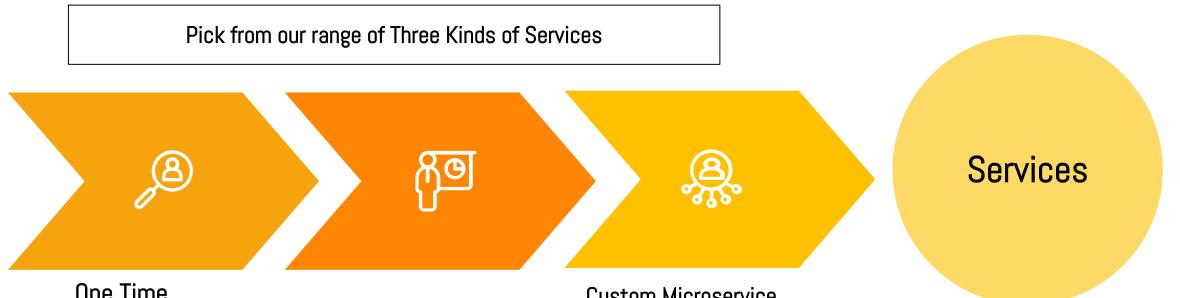
We Collect -> Sanitize -> Validate -> Process your data to provide intelligent insights to all the stakeholders within your company





#### Our Offer





One Time Diagnostics

Give us your data from underperforming plant and we will provide full diagnostic with prescription.

One Click Dashboard

Your team can drag and drop data from any plant into this self-serving dashboard and get diagnostic 24x7 Custom Microservice Integration

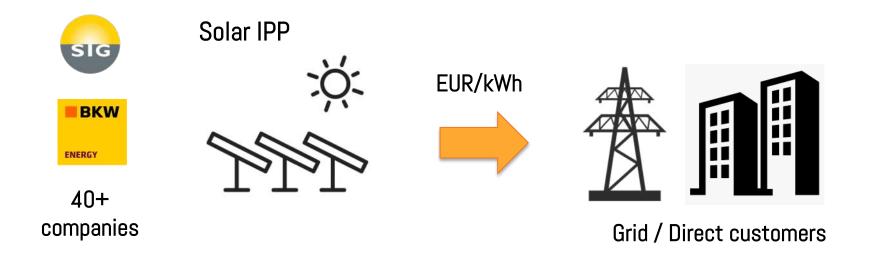
Relevant for GWs Asset owners

We will integrate our micro-service/s to your own monitoring platform for a real-time, automated analysis of your plant's performance.

Our tech is developed with a decade of research data from top R&D centers in Europe, putting your existing monitoring system on steroids!



# Service model (SaaS): Improve plant performance and reduce e-waste



Customer gain

10% increase in revenue

Less waste of solar panels

The solution pays for itself by delivering impacts beyond just financial gains

"The analysis of SmartHelio can provide insights into a solar plant, previously not available at all, or if, only with an onsite inspection".

"SmartHelio detected faults in few days which took us months to identify. It feels like Magic!

# Our Team: Diversity and impact oriented









#### Operations





#### **Data Scientists**





Hardware Team





Solar Researchers





Data Analysts







Shalini Sharin Alliance for an Energy Efficient Economy



Peter Pauli Ex-CE0 Meyer Burger



**Advisors** 

Eric Plan C00

CleantechAlps



Walter Steinmann

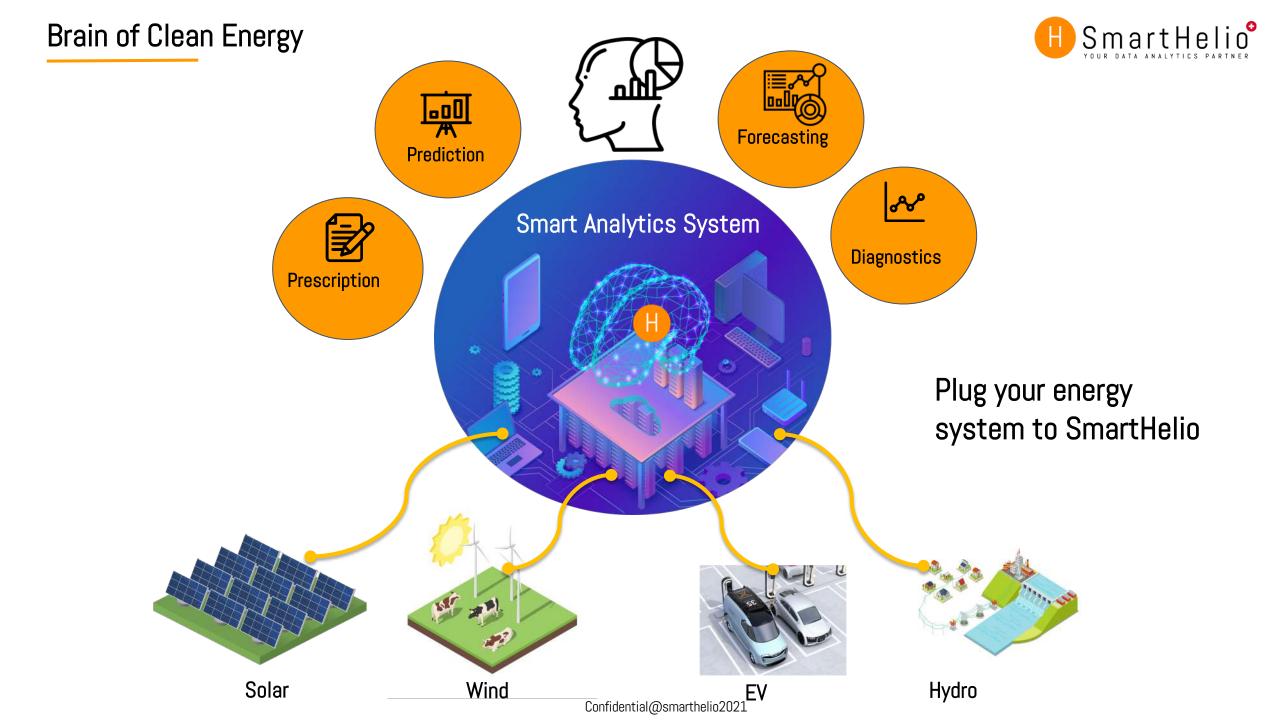


Credit Suisse Energy

Director ResponsAbility Fund

Sarah Djari

Confidential@smarthelio2021



# Awards and Recognitions

























Scuola universitaria professionale della Svizzera italiana









Supported by the federal Swiss Innovation Promotion Agency

SmartHelio was awarded as "Technology of the Year - Solar (Big Data and Analytics) by Solar Quarter in Oct '20

# Module + BOS Degradation Analysis





#### **Problem Statement**

Inveter-29 had significantly lower production as compared to the rest of the system



#### Use Case

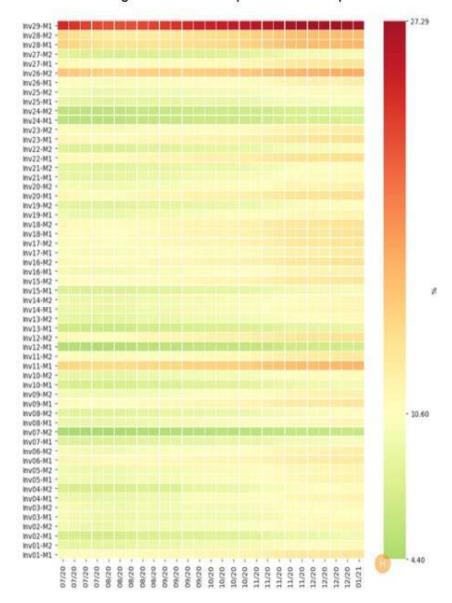
4.9% but inverter 29 showed a degradation of 10%. This degradation caused by frequent shading activating the by-pass diode of ~40% modules in the string. Early degradation was also observed in Inverters 11,26 and 28



## Result

Manual inspection was conducted and faulty panels were found in both strings. Power production from these two inverters increased by 0.8%

#### Module Degradation Weekly Evolution Map



# **Projected Power Production**





#### **Problem Statement**

How would the current losses impact plant's production in the future (2021-2022)?



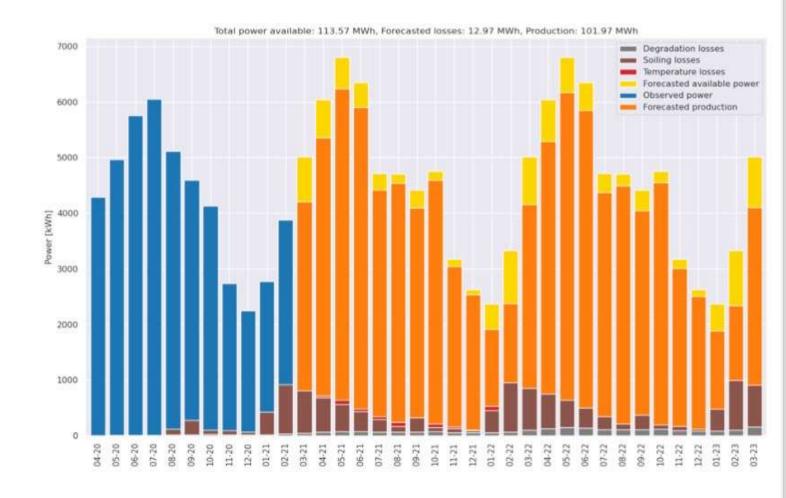
# Use Case

Projection of plant production in coming years considering all the projected losses, i.e., Degradation, Soiling, Temperature, and Voltage.



#### Result

The projections were used to adjust the initial production estimates and the ROI.



# Temperature Coefficient Check





## **Problem Statement**

Check the accuracy of thermal coefficient of the panel as claimed by the OEM



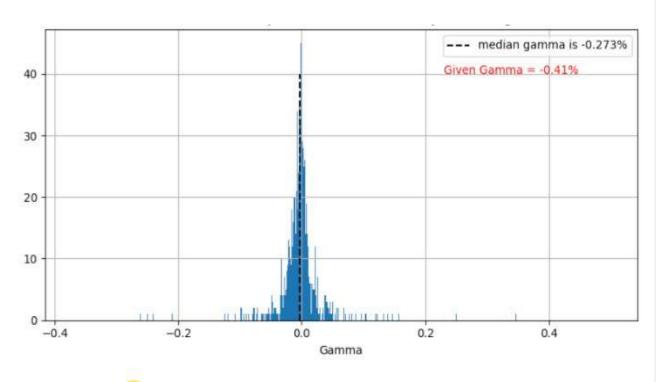
## Use Case

Upon one year of operation of the sensor, with the panel level voltage, irradiance and temperature information, thermal coefficient was checked.



#### Result

The thermal coefficient of the panel was found to be -0.31 %/C. Based on our climatic modelling, production estimates and degradation projections were created.



	T	EMP	ERAT	URE	RAT	INGS
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Normal Module Operating Temperature:	44 C (22
Temperature coefficient of P <sub>MAX</sub> :	-0.26 %/°C
Temperature coefficient of V <sub>oc</sub>	-0.24 %/°C
Temperature coefficient of I <sub>sc</sub> :	0.049///2

The temperature coefficients stated are linear values



Please wear mask and get vaccination.

#corona

# Lets make solar panels greener and healthier!

Thank you

govinda@smarthelio.com