

# OPC UA Success Stories within Energy

OPC Day Finland 2023

**Espen Krogh,**  
**Senior Technical Advisor, TGS**



# Solar PV operations is becoming very competitive

Electrons: the ultimate commodity

Continuous optimization of asset utilization and cost reduction is essential

...across the portfolio

Portfolio Asset Management



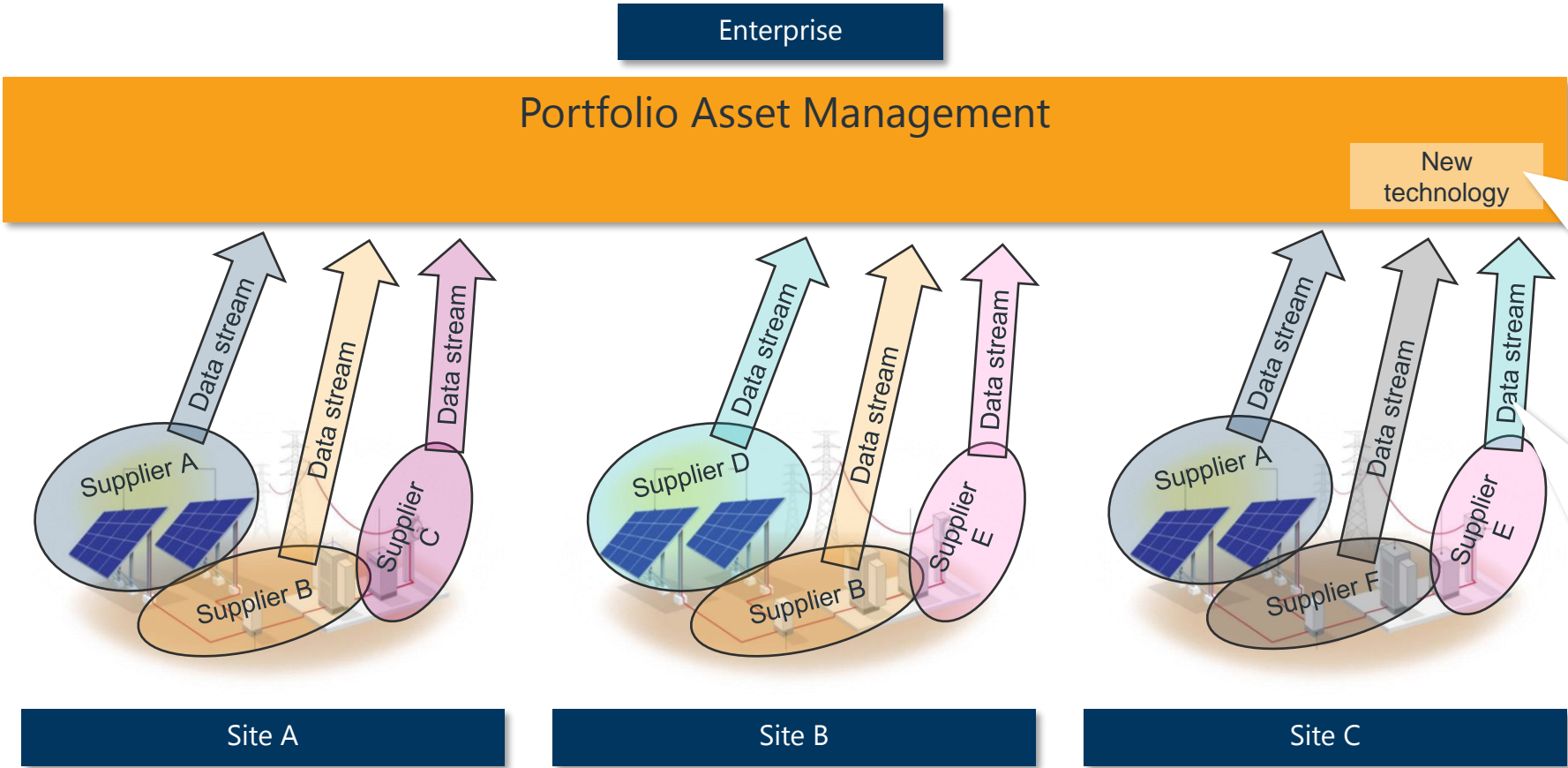
# Assuring sustained relevance of a Solar PV portfolio asset management strategy is a challenge



Ability to onboard and adopt new methods and technologies is essential.

Renewable asset management is-, and will be a very dynamic and evolving field in the next decades.

# The diversified supplier set-up in the portfolios cause significant friction in adoption of new technologies



Each piece of new technology must be **manually** integrated to the diversified data streams.

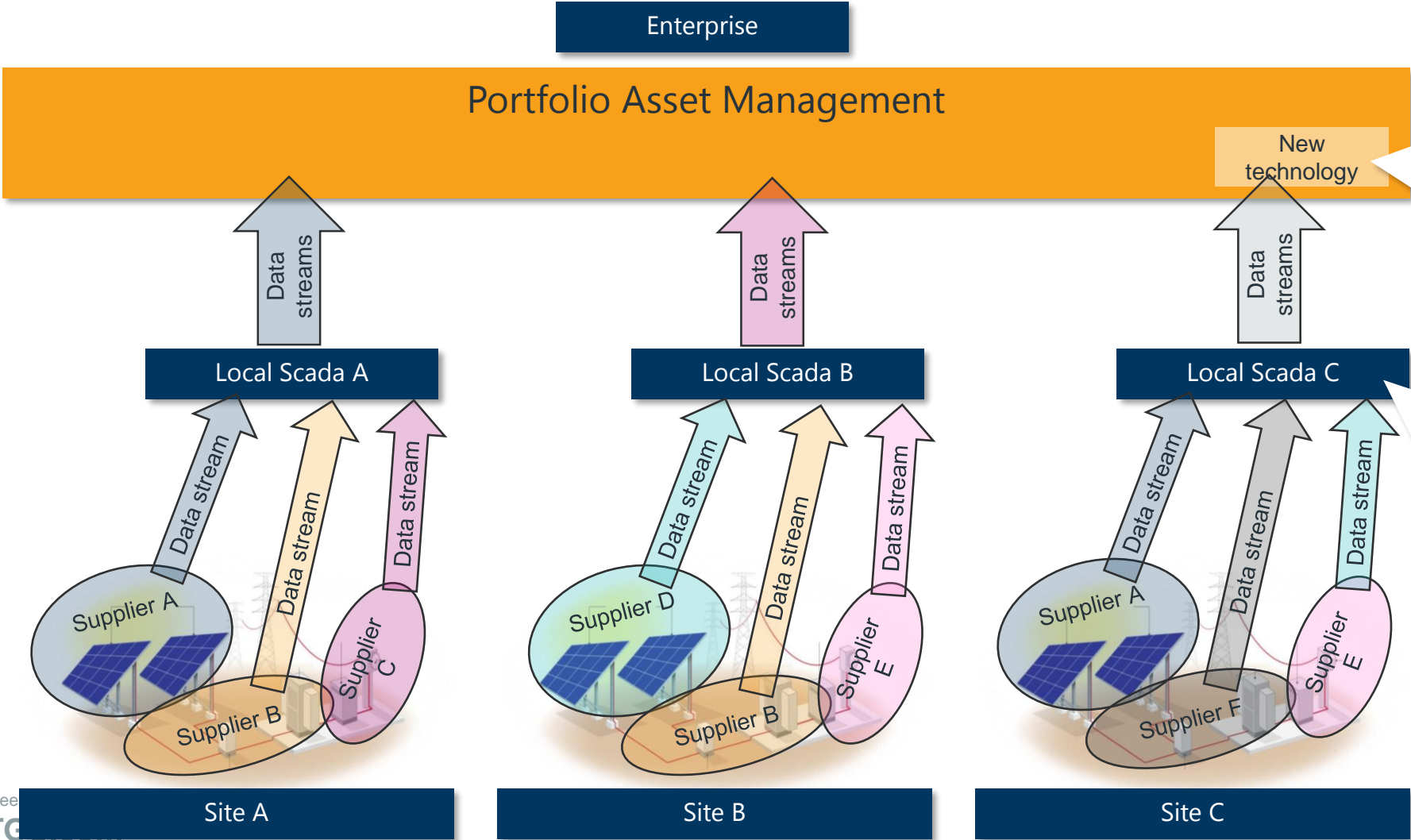
**N** new technologies and **M** different assets causes **N x M** manual integrations. This is “**Integration Hell**”

Each different supplier comes with a different “color” for the data streams:

- different protocols
- different data context / semantics

Choosing to standardize on suppliers is a potential remedy, but brings you to a **lock-in** future with specific suppliers

# The diversified supplier set-up in the portfolios cause significant friction in adoption of new technologies



Each piece of new technology must be **manually** integrated to the diversified data streams.

**N** new technologies and **M** different assets causes **N x M** manual integrations

Establishing local Scada and discipline in choice of such, can mend the situation, but will also provide lock-in with Scada supplier.

...and is not a solution when **consolidation** with other assets portfolios are happening – to bring integrated operations under one roof...

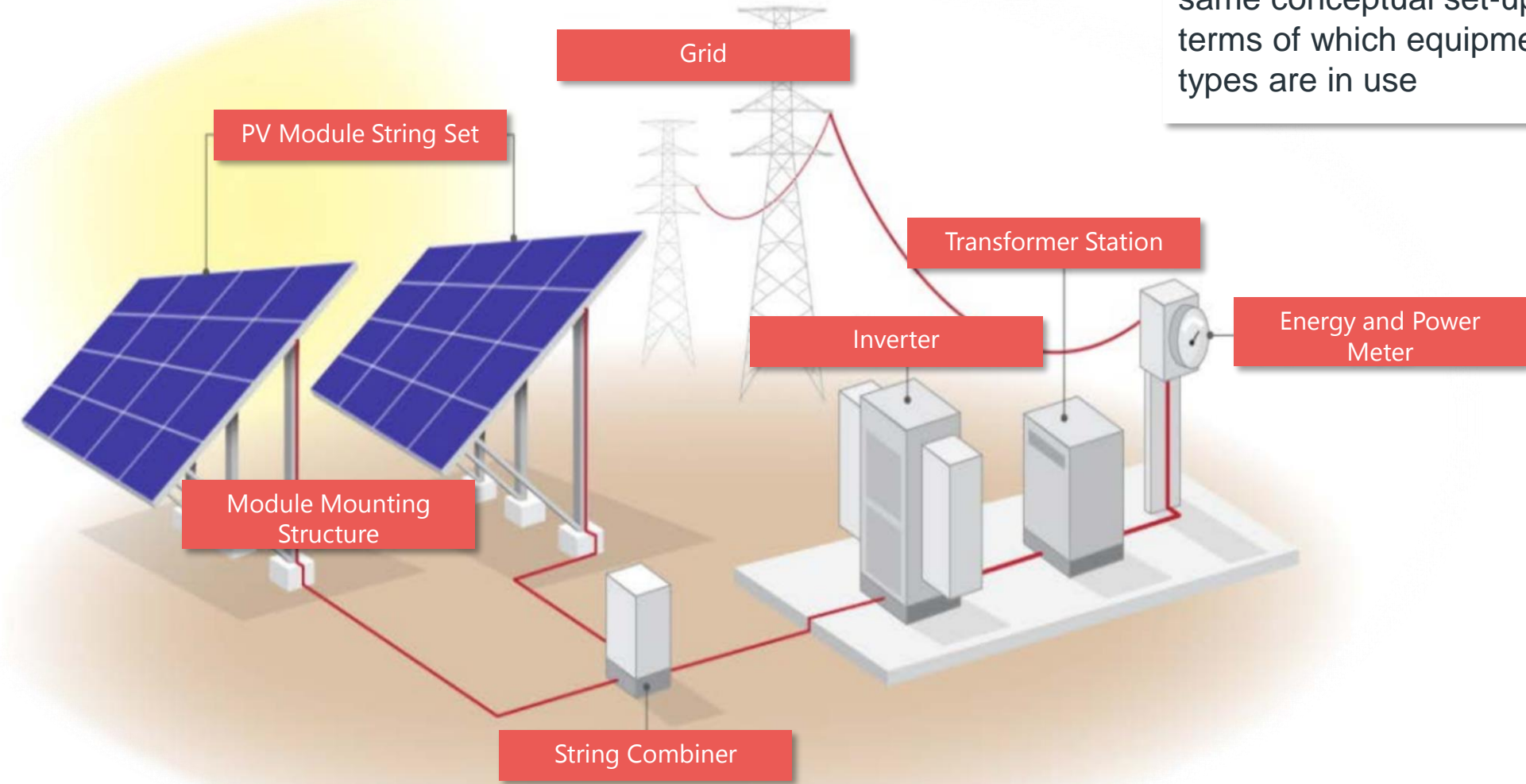
# The solution to the evolving data integration challenges in Solar PV

Portfolio Asset Management

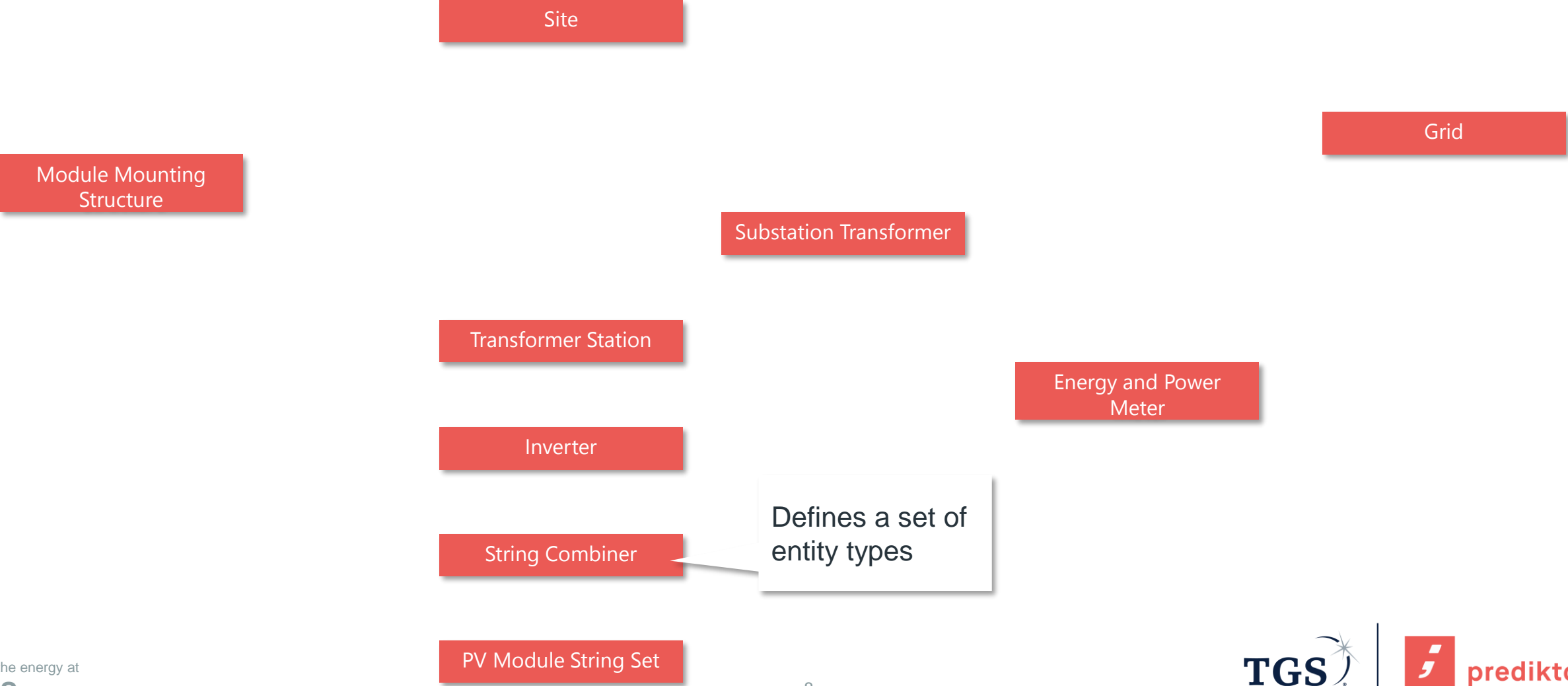


Site

Any PV utility scale assets have more or less the same conceptual set-up in terms of which equipment types are in use

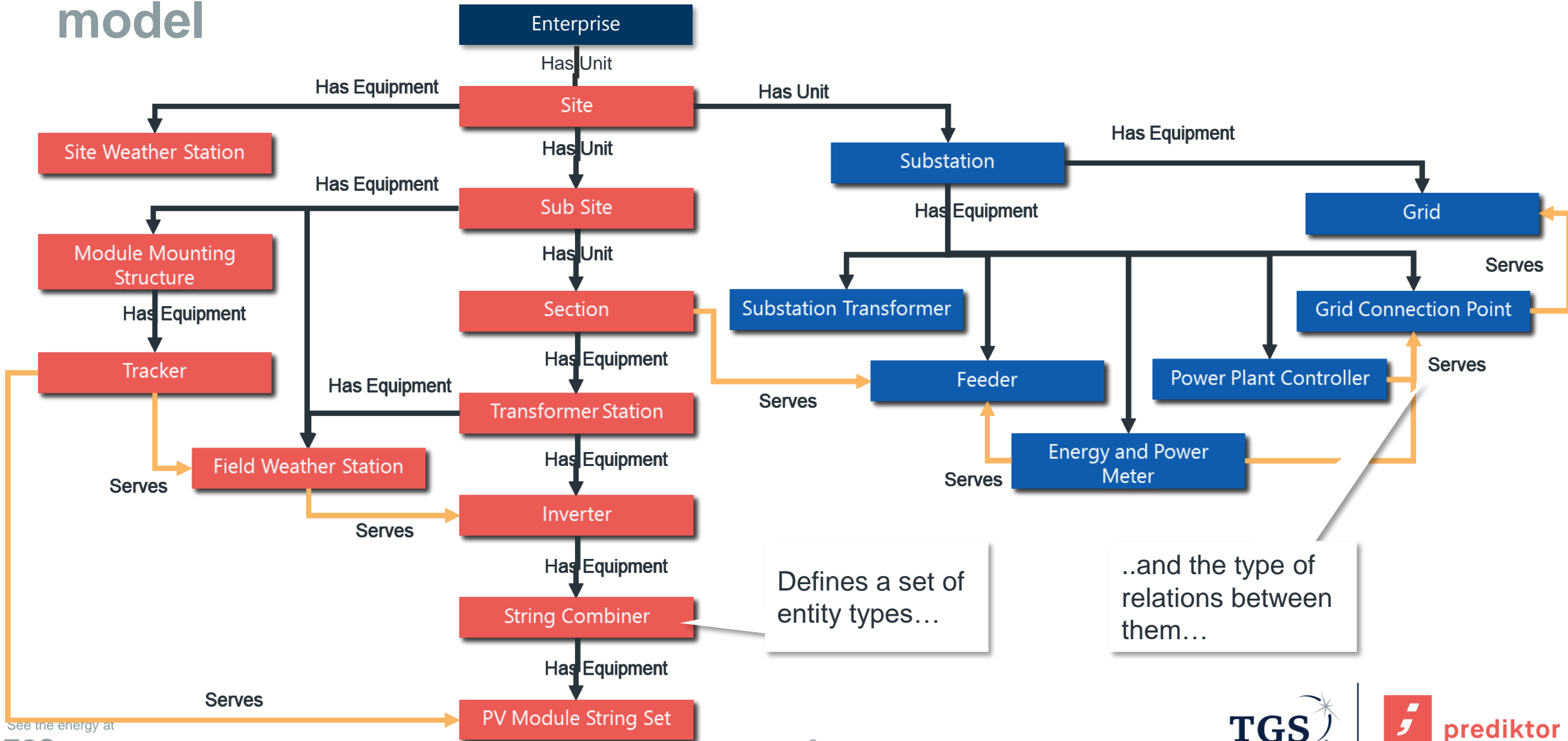


# Establishing a generic, standards based, information model

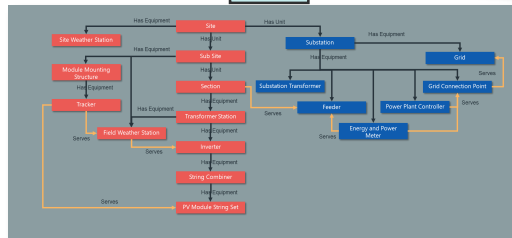
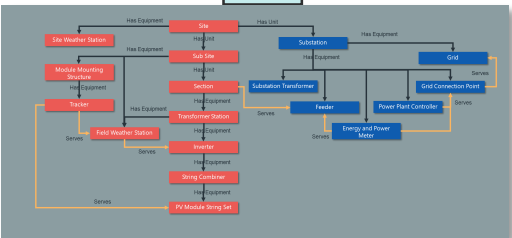
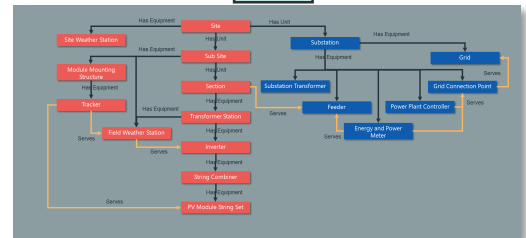
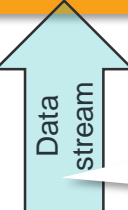
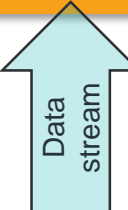
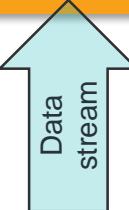
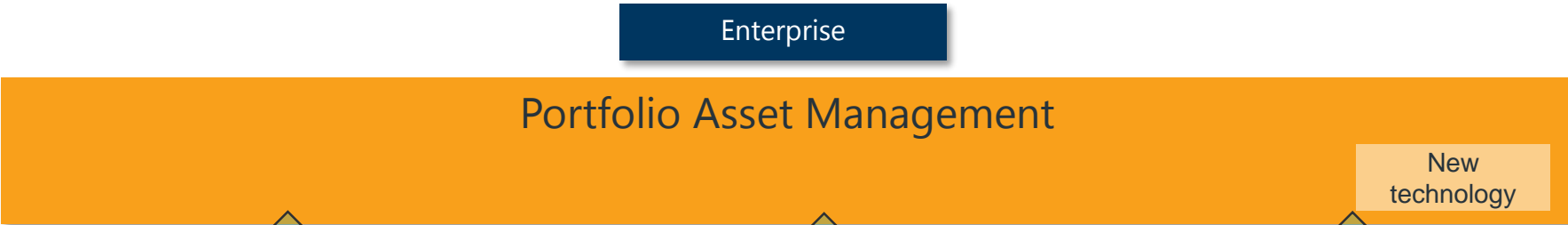




# Establishing a generic, standards based, information model



# Deploy the information model as the standard digital skin across the portfolio (and eventually across the industry)



Each data stream comes through a standardized protocol and standardized context/semantics across the asset portfolio.

Integrating new technology becomes plug&play...





A company leading the way

**Scatec**



## EXAMPLE CLIENT BUSINESS CASE

- A business model to develop, build, own and operate renewable power plants across multiple technologies (Solar, Wind and Hydro)
- 4.6 GW in operation and under construction
- More than 700 employees in 26 countries

**Benban** – the worlds largest solar park, when built

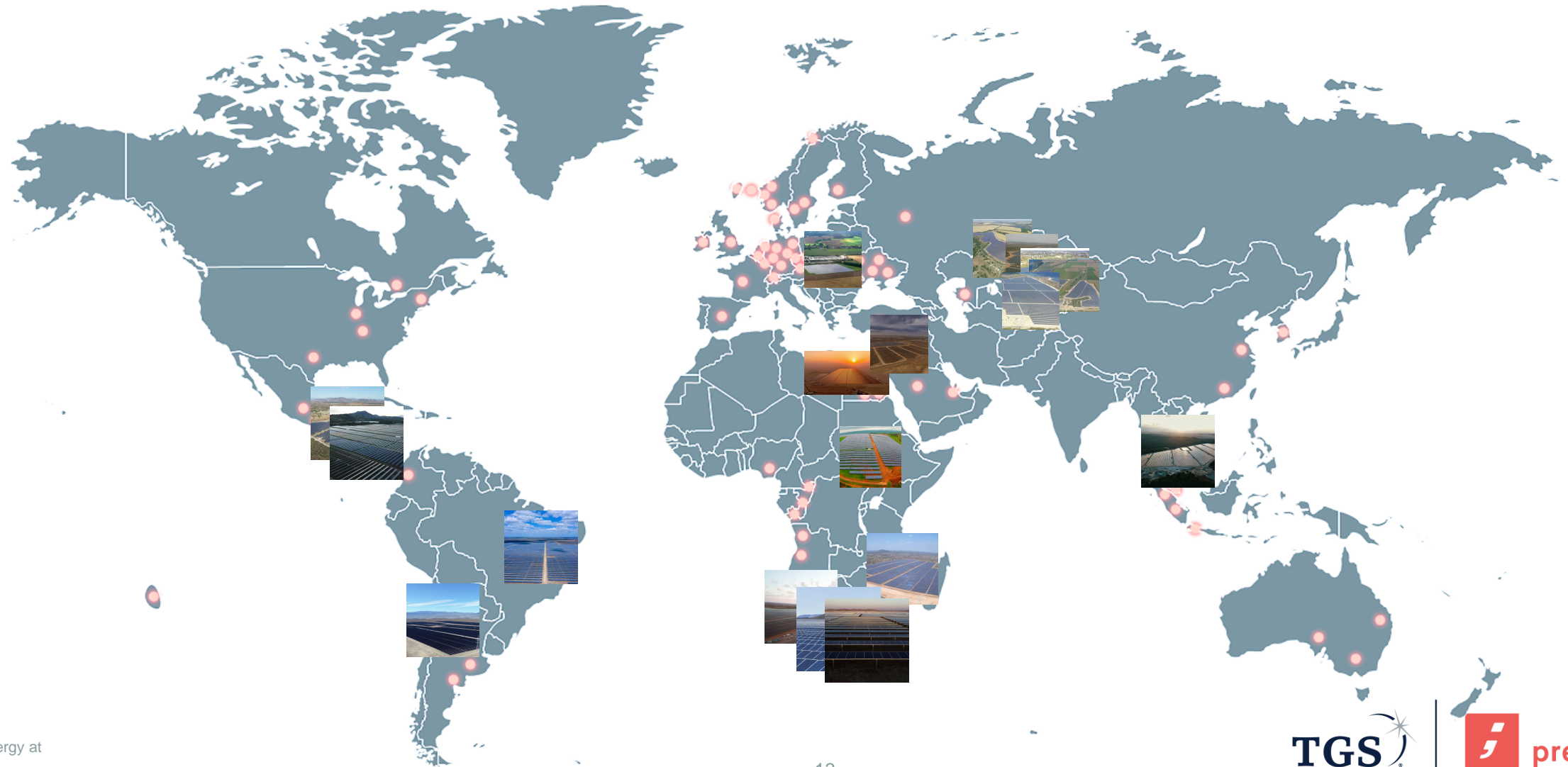
Location: Egyptian desert

Capacity: 1.8 GW, almost the same as the nearby Aswan hydropower dam

Size: 6.2 km x 6km – visible from outer space

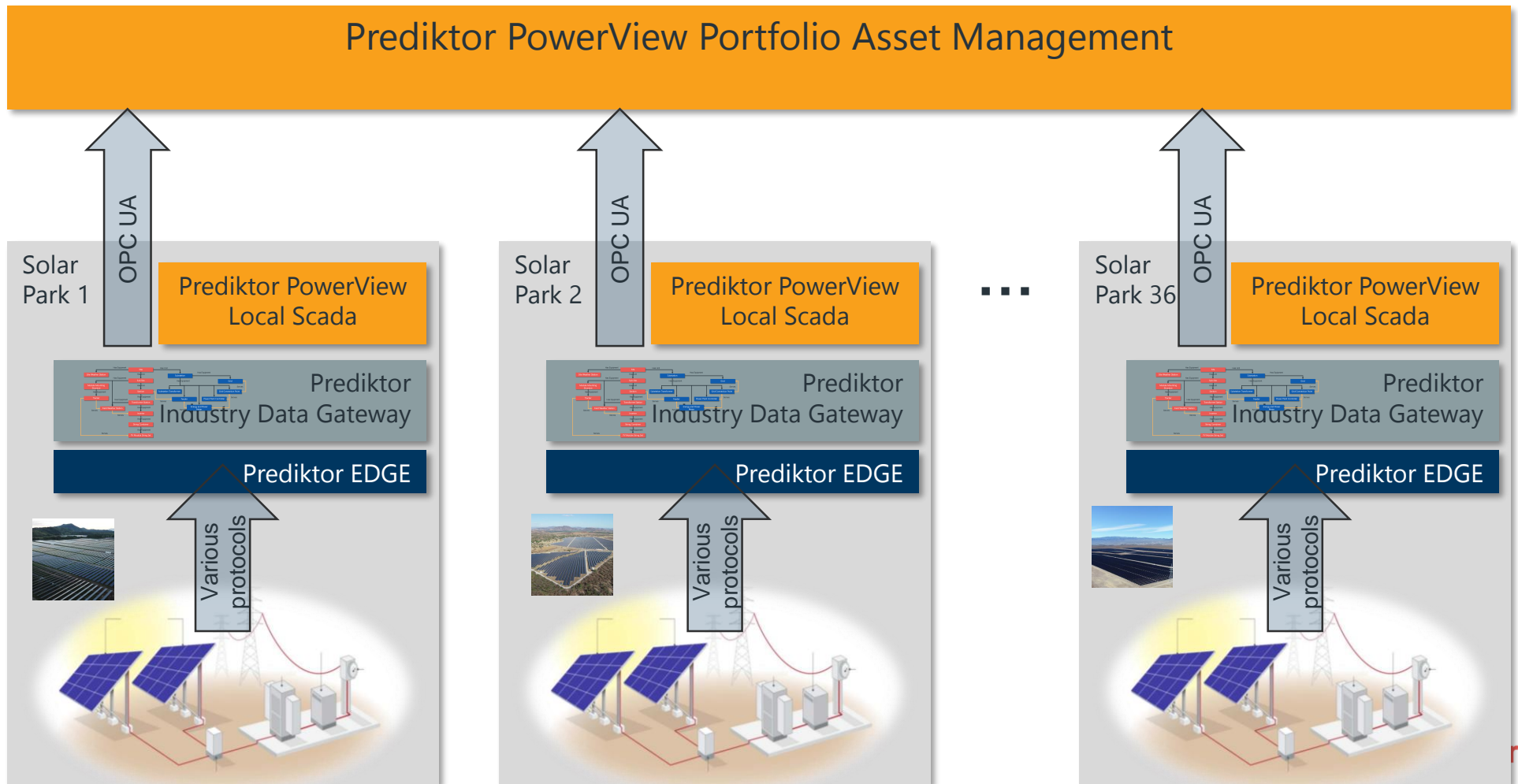


# Scatec own and operate 36 utility scale Solar PV parks across the globe



# Our deliveries to Scatec - enterprise real-time data management, local SCADA and portfolio asset management

- Ca 1 750 000 signals:
  - real-time value
  - time-series
  - alarms / events
- All with standardized context/type according to standard OPC UA information model
- 36 sites
- Ca 2000 point-to-point connections for equipment communication
- Equipment protocols:
  - MODBUS TCP
  - OPC Classic
  - OPC UA
  - IEC 62056
  - IEC 60870-5-104
  - IEC 61850
  - ..and more...



# Benefits of current system architecture and services

Facilitate easy consolidation and “asset play” with separation of data management and asset management using industrial standards.

Move operational tasks centrally to reduce cost on site

### Cape Town/South Africa: Global Control and Monitoring Center



Best practice

Oslo/Norway:  
Data Analysts work with high quality data lakes and AI tools

TGS Data Lake  
as a service

New AI-, ML  
algorithms

Prediktor PowerView Portfolio Asset Management

New Function  
Ready to Use

Solar Park 1

OPC UA

Prediktor PowerView Local Scada

Prediktor Industry Data Gateway

Prediktor EDGE

Solar Park 2

OPC UA

Prediktor PowerView Local Scada

Prediktor Industry Data Gateway

Prediktor EDGE

Solar Park 36

OPC UA

Prediktor PowerView Local Scada

Prediktor Industry Data Gateway

Prediktor EDGE

OPC UA

New consolidated Solar Parks

Prediktor Industry Data Gateway

3rd party Scada



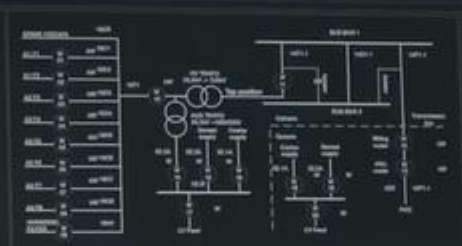


Step 2

Navigation icons: Home, Back, Forward, Refresh, Stop, Print, Full Screen, Help, Settings, Search, etc.


POWER AND YIELD

	POWER	YIELD DAY
Grid feed in active power	000	0000
Grid feed in reactive power	000	0000
Consumption active power	000	0000
Consumption reactive power	000	0000
Auxiliary power Calcaris	00	0000
Auxiliary power Outlets	00	0000
Grid power factor	000	0000
Inverter active power	000	0000
Loss inverter to grid	00	0000
FPC active control mode		
FPC reactive control mode		



- TRACKER STATUS
- If in defense position
  - If reaching the max
  - If move to a target
  - If move to the East
  - If move to the West
  - If stop the motor

APL101	APL102	APL103	APL104	APL105	APL106	APL107	APL108	APL109	APL110
000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000
000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000
X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X
APL101	APL102	APL103	APL104	APL105	APL106	APL107	APL108	APL109	APL110
000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000
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X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X
APL101	APL102	APL103	APL104	APL105	APL106	APL107	APL108	APL109	APL110
000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000
000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000
X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X
APL101	APL102	APL103	APL104	APL105	APL106	APL107	APL108	APL109	APL110
000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000
000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000	000 000
X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X

A middle-aged man with a receding hairline, wearing a dark blue suit jacket over a grey turtleneck sweater, is speaking. He has a serious expression and is looking slightly to the right of the camera. The background is a blurred, light-colored wall with vertical lines.

**OPC UA and a Solar PV information model across all plants, is a fundamental strategic layer for Scatec**

*Terje Melaa, SVP Engineering and Technology, Scatec*

[https://vimeo.com/561309064?embedded=true&source=vimeo\\_logo&owner=103004073](https://vimeo.com/561309064?embedded=true&source=vimeo_logo&owner=103004073)

**It's a competitive advantage for us going forward.**



# Example





Johan Sverdrup, the most important industrial asset for Norwegian economy, recently built

Produces about 30% of Norwegian O&G production

# OPC UA S95 based information model – type system

Solution Explorer

hive://localhost

- hive://localhost/
  - Apis Event Server
  - Information Modelling
    - Indexing
    - Perspectives
      - Asset Registry
      - OPC UA
        - Objects
        - Types
          - DataTypes
          - EventTypes
          - ObjectTypes
            - BaseObjectType
            - ReferenceTypes
            - VariableTypes
          - Views
    - Modules

Property Editor

Adaptive

SemanticsObjects [1] BaseObjectType

Search

**General**

NodeId	0:0:58
NodeClass	ObjectType
DisplayName	BaseObjectType
BrowseName	0, BaseObjectType
Description	The base type for all object nodes.
Namespace	http://opcfoundation.org/UA/

**Parent**

Parents	ObjectTypes[Organizes]
---------	------------------------

**Rights**

WriteMask	
UserWriteMask	

**Type**

IsAbstract	False
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**Namespace**

Belongs to namespace

Refresh Help

- ISA95ClassType
  - EquipmentClassType
    - <Property Name>
    - EquipmentLevel
    - StIS95EqClassType
    - StIS95ConditionMonitoringClassType
    - StI62904CMFBGenericClassType
    - StIS95MeasurementDocumentsAPClassType
    - StIS95TilstandomaticClassType
    - StIS95CorrosionDetectorClassType
    - StIS95GenAnalyserClassType
    - StIS95GenElectroAlarmClassType
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    - StIS95PrManifoldClassType
    - StIS95PrMeteringClassType
    - StIS95PrMixerClassType
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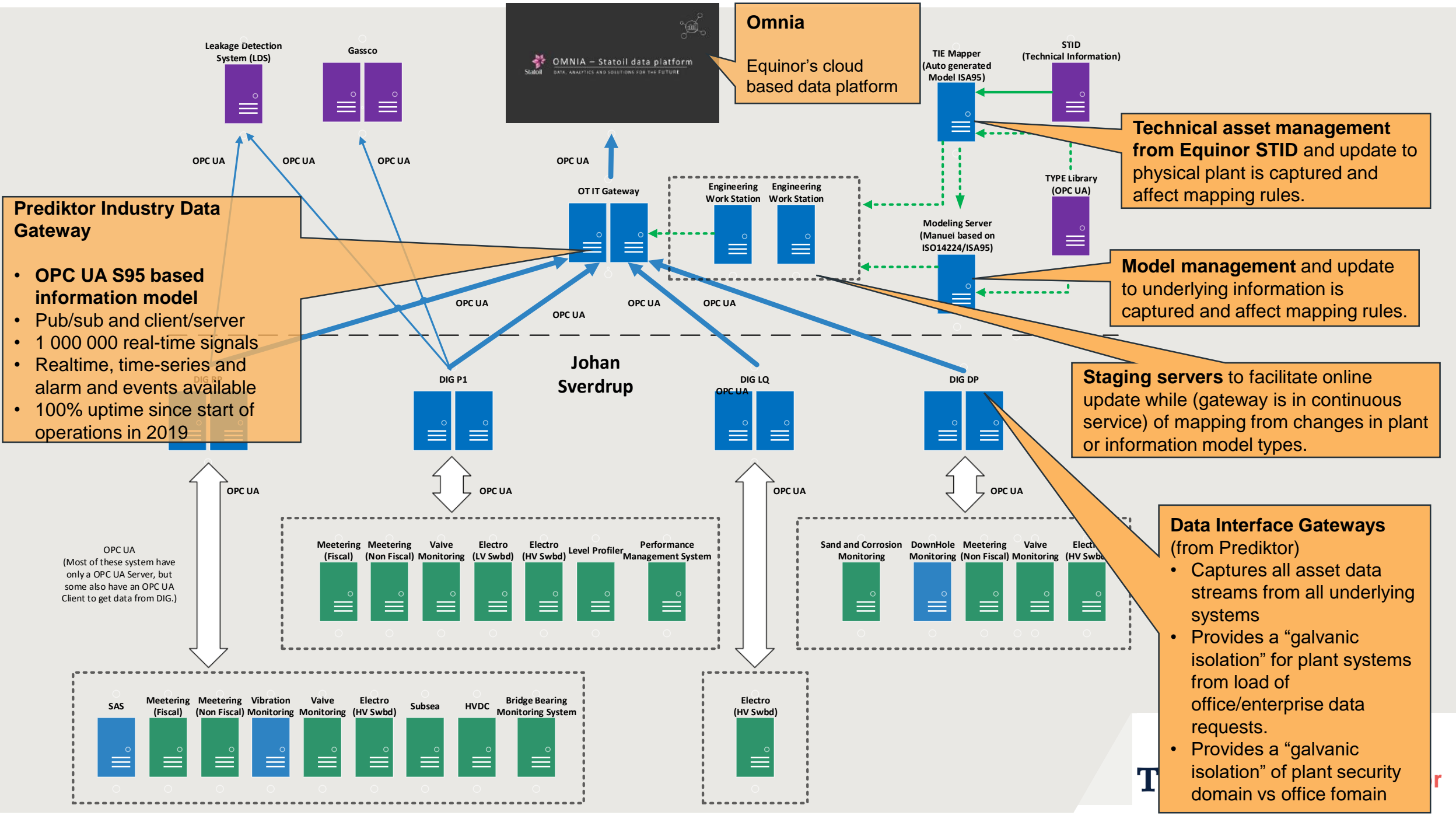
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- StIS95AlarmPSLL
- StIS95AlarmTSH
- StIS95AlarmTSHH
- StIS95AlarmTSL
- StIS95AlarmZSH
- StIS95AlarmZSL

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- StIS95SystemType
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  - External
  - Gas
  - Internal
  - Metering
  - Oil
  - Signals
  - StIS95TankTA
  - StIS95TankTB
  - StIS95TankTX
  - StIS95TankTZ
  - StIS95TankVL
  - StIS95TankVX
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- StIS95TransformerType
- StIS95TurbineType
- StIS95UnitType
- StIS95UPSType
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  - StIS95ValvePDV
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- MaterialSublotType
- PersonType
- PhysicalAssetType
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- ModellingRuleType
- NamespaceMetadataType
- NamespacesType
- NetworkAddressType
- OrderedListType
- PriorityMappingTableType
- ProvisionableDeviceType
- PublishedDataSetType
- PubSubCapabilitiesType
- PubSubConnectionType
- PubSubDiagnosticsType
- PubSubGroupType
- PubSubKeyPushTargetType
- PubSubKeyServiceType
- PubSubStatusType
- ReaderGroupMessageType
- ReaderGroupTransportType
- RoleSetType
- RoleType
- SecurityGroupType
- ServerCapabilitiesType
- ServerConfigurationType
- ServerDiagnosticsType
- ServerRedundancyType
- ServerType





**Prediktor Industry Data Gateway**

- OPC UA S95 based information model
- Pub/sub and client/server
- 1 000 000 real-time signals
- Realtime, time-series and alarm and events available
- 100% uptime since start of operations in 2019

**Omnia**  
Equinor's cloud based data platform

**Technical asset management from Equinor STID** and update to physical plant is captured and affect mapping rules.

**Model management and update** to underlying information is captured and affect mapping rules.

**Staging servers** to facilitate online update while (gateway is in continuous service) of mapping from changes in plant or information model types.

**Data Interface Gateways (from Prediktor)**

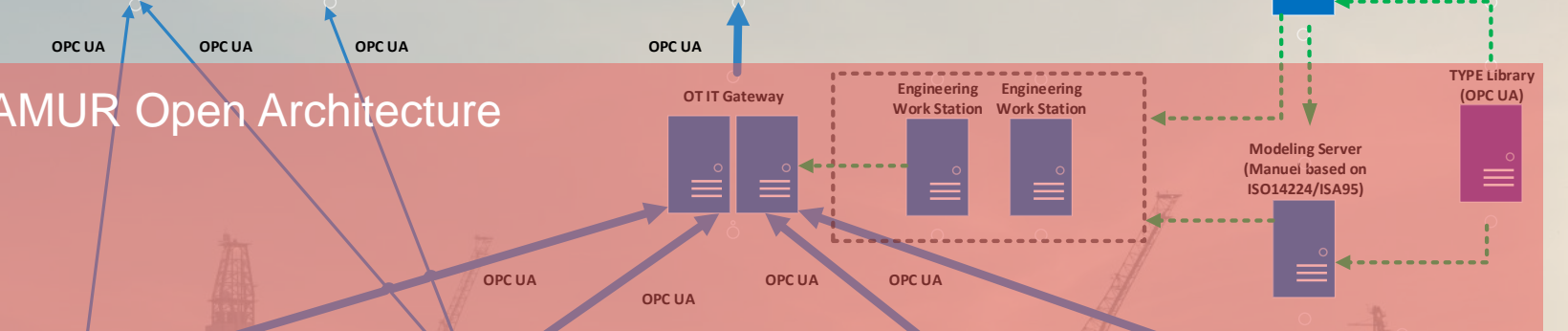
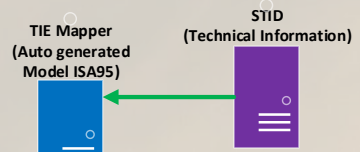
- Captures all asset data streams from all underlying systems
- Provides a "galvanic isolation" for plant systems from load of office/enterprise data requests.
- Provides a "galvanic isolation" of plant security domain vs office fomain

OPC UA  
(Most of these system have only a OPC UA Server, but some also have an OPC UA Client to get data from DIG.)





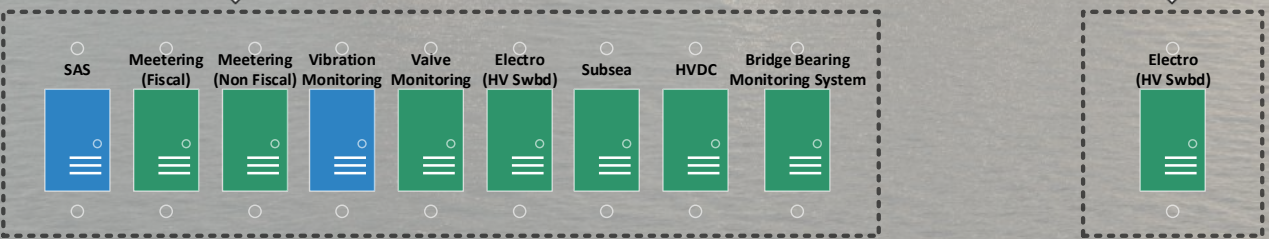
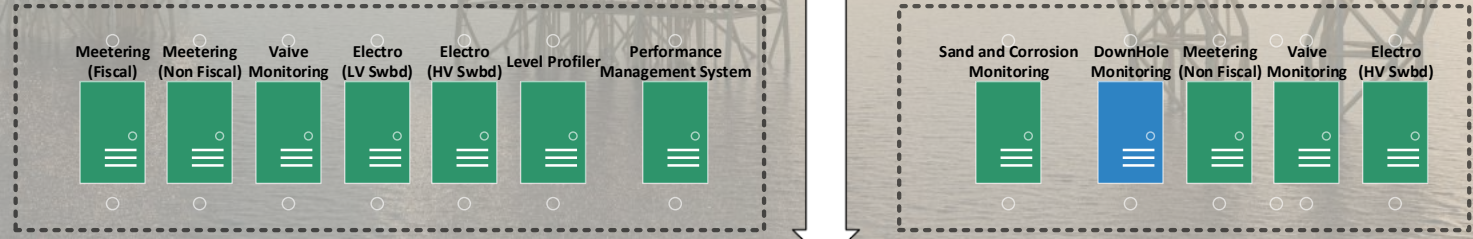
# NAMUR Open Architecture



## Johan Sverdrup



OPC UA  
(Most of these system have only a OPC UA Server, but some also have an OPC UA Client to get data from DIG.)



# Magat Dam in the Philippines, operated by SNAP: combine hydro power with storage and floating solar



# Magat Dam in the Philippines, operated by SNAP: combine hydro power with storage and floating solar

Hydro power



Floating solar

**Magat Dam in the Philippines, operated by SNAP: combine hydro power with storage and floating solar**



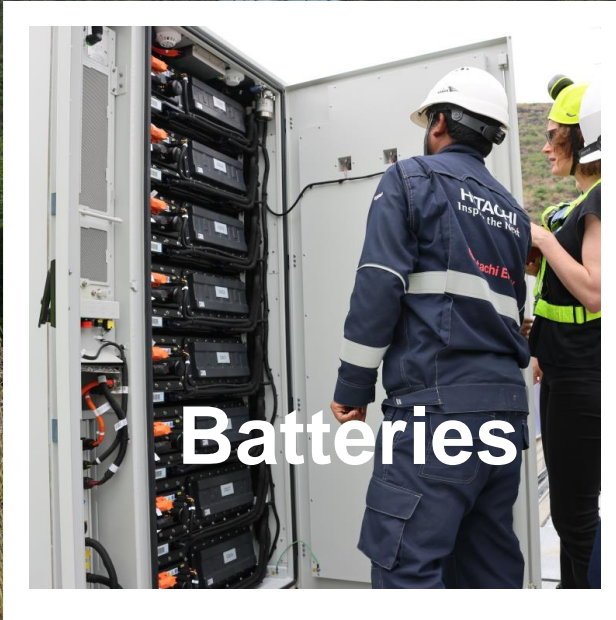


**Hydro power**

**Floating solar**

**Batteries**

**Grid connection**

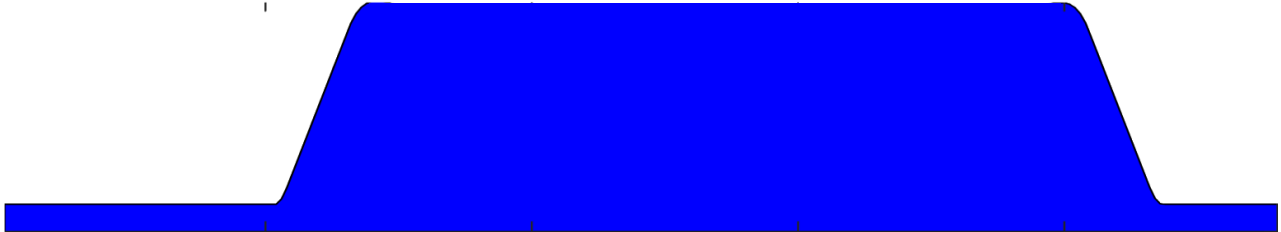


# A hybrid renewable energy system combining hydropower, batteries and floating solar



Hydropower production

Contracted daily powerprofile with TSO



00:00 05:00 10:00 15:00 20:00



# Reservoir energy usage is saved by adding floating solar to the dam

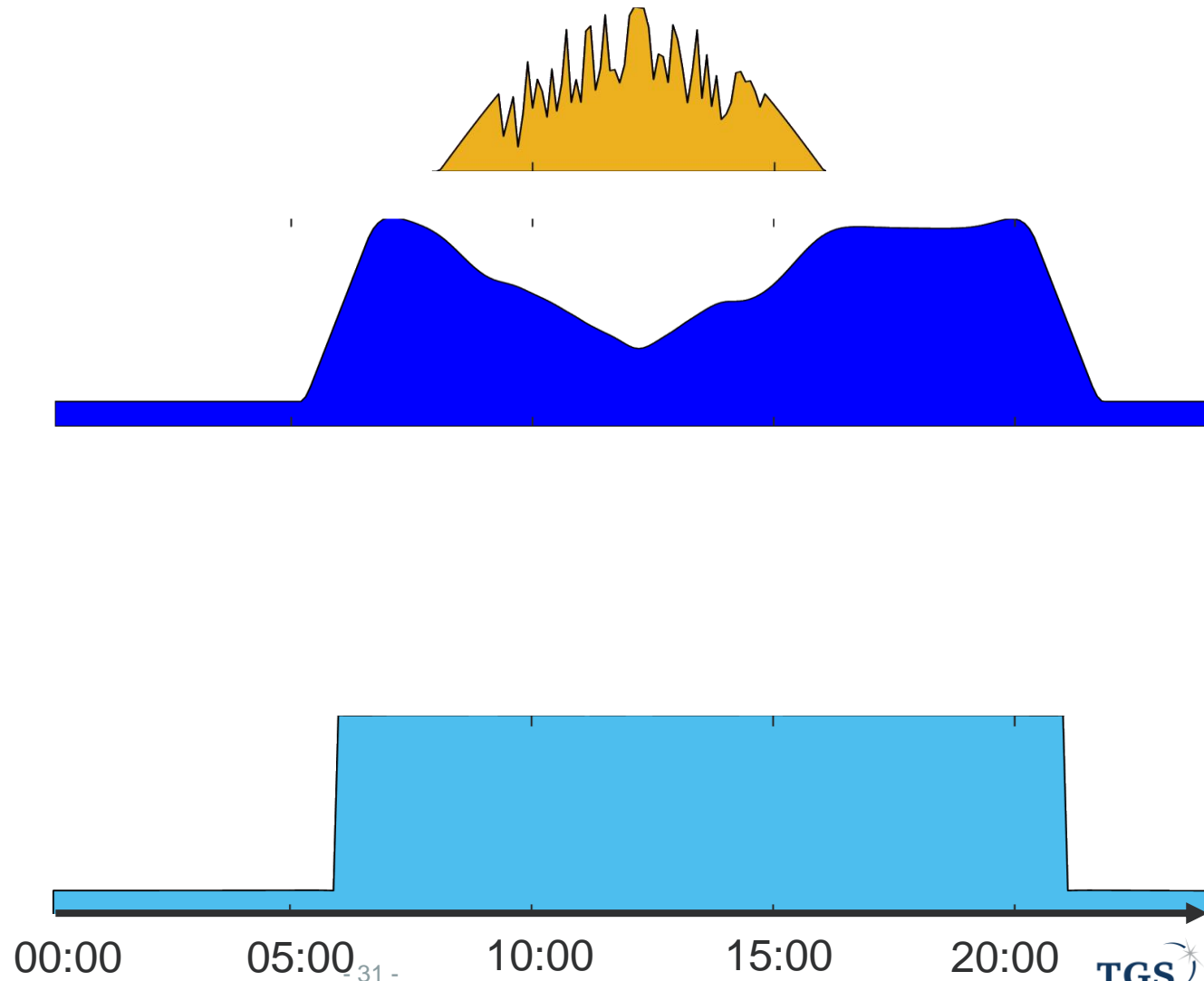
Solarpower production



Hydropower production



Contracted daily powerprofile with TSO



# A battery energy system is added to handle sudden changes in solar energy production

Solarpower production



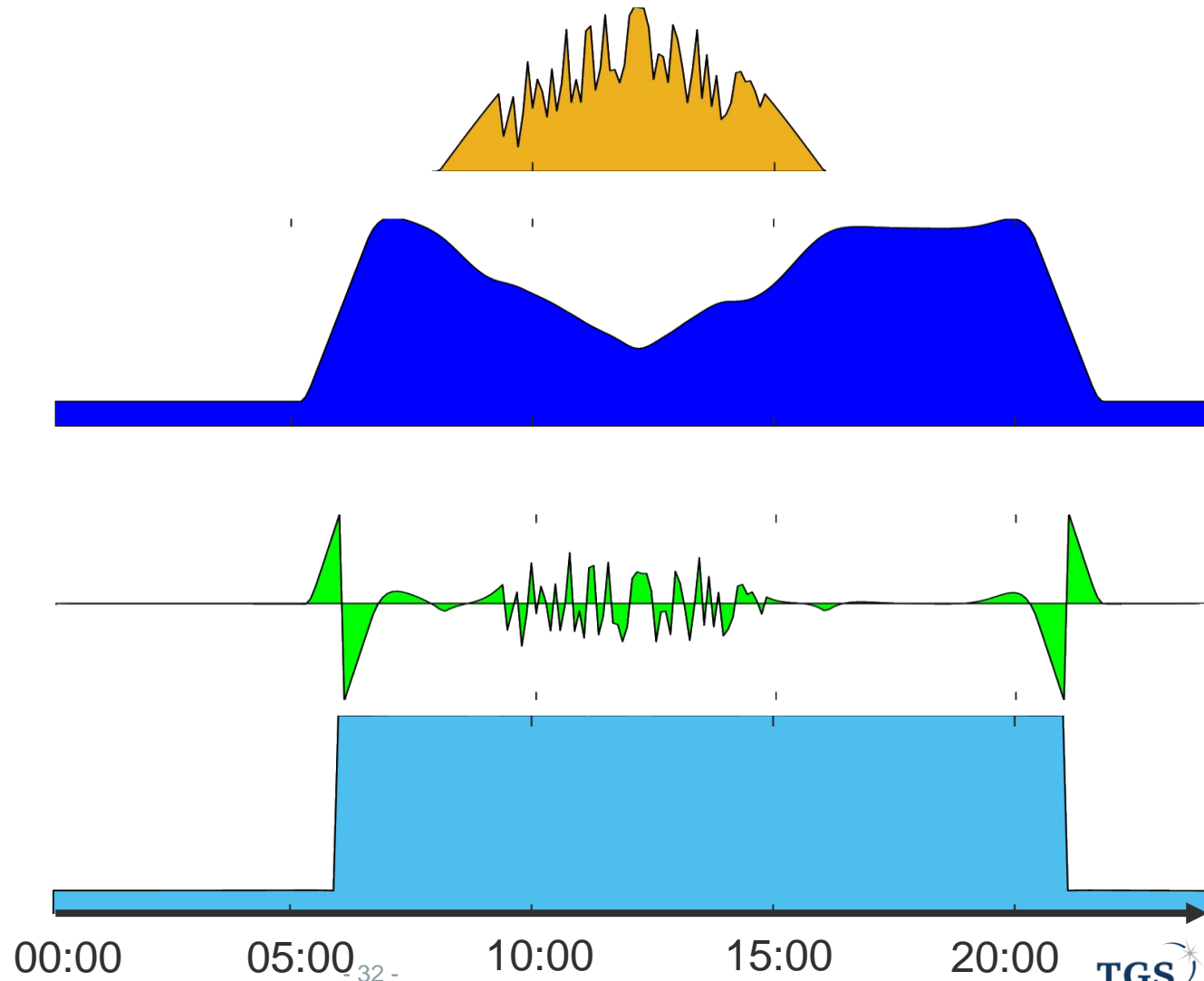
Hydropower production



Battery Energy Storage System

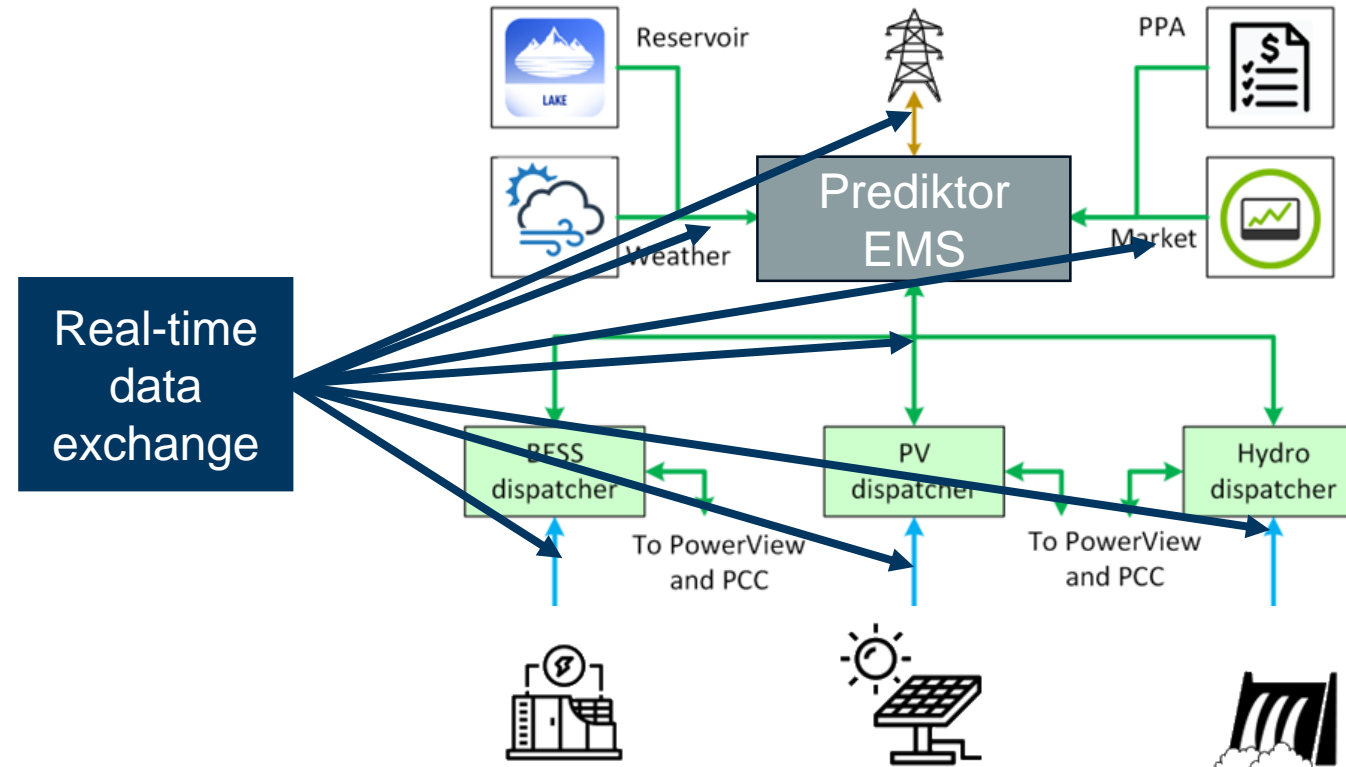


Contracted daily powerprofile with TSO





# The operation of such new hybrid power plants become more complex



# Thank You!

- TGS Prediktor is a provider of software solutions for:
  - Technical asset management
  - Real-time data management
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