



Dubai , the new location for BSRN station in Middle East/Arabian Peninsula

17-July -2018

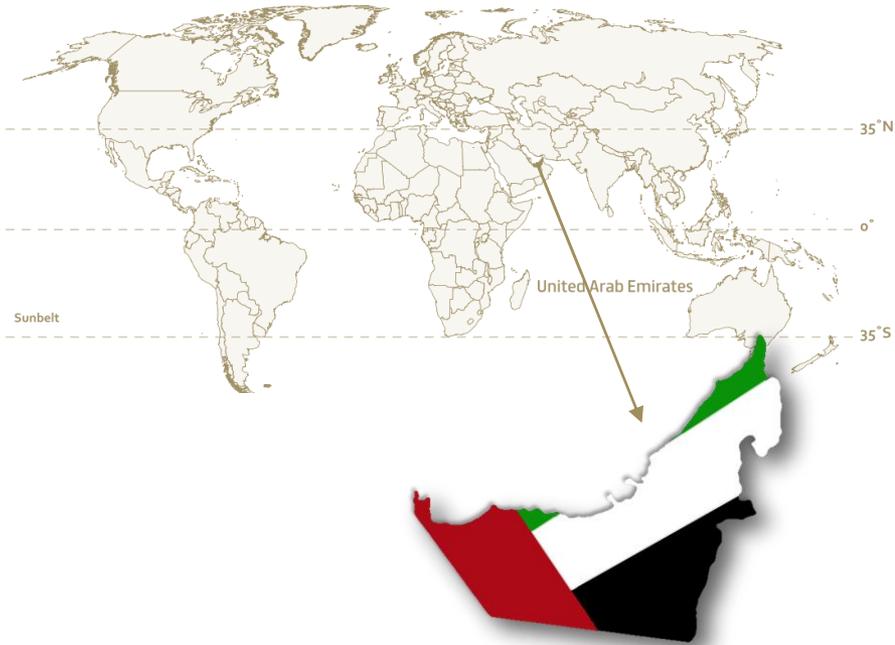


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Introduction to DEWA

About Dubai/UAE



- Dubai is the largest and most populous city in UAE
- Dubai is a global city and a business hub of the middle east
- It attracted world attention through the construction of the world tallest building
- The location of the United Arab Emirates and Dubai within the Sunbelt highlights solar energy's major role as a renewable source of energy.



About DEWA

Our Vision

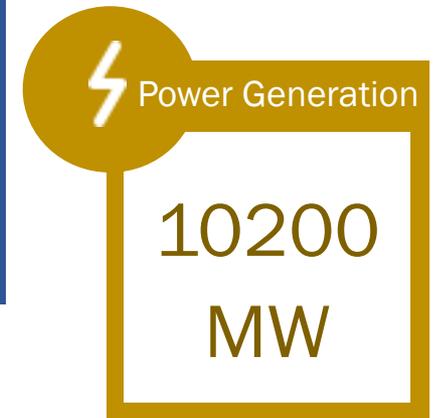
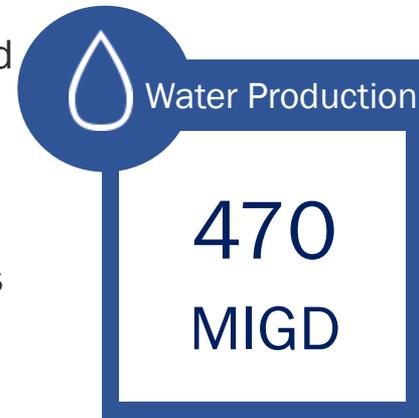
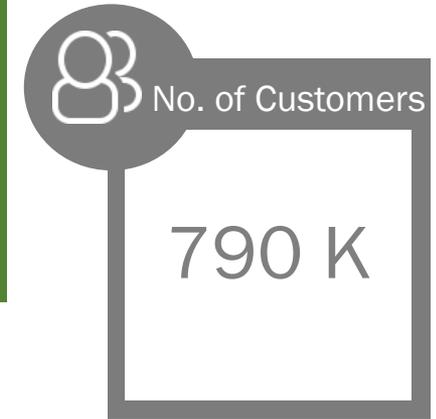
A sustainable Innovative world-class utility

Our Mission

We are committed to the happiness of our stakeholders and promoting Dubai's vision through the delivery of sustainable electricity and water services at a world-class level of reliability, efficiency and safety in an environment that nurtures innovation with a competent workforce and effective partnerships; supporting resources sustainability.

Our Motto

For Generations To Come.



Mohammed Bin Rashid Solar Park



7.30
Cent/KWh
Lowest Price
World Wide for CSP

2.99
Cent/KWh
Lowest Price
World Wide for PV

800 MW
Third Phase, In construction
(PV)

200 MW
Second Phase Completed
(PV)

13 MW
First Phase Completed
(PV)

700 MW
Fourth Phase ,PPA signing-Q4
(CSP)

5000 MW
Solar Park total installed capacity by 2030
(PV + CSP)



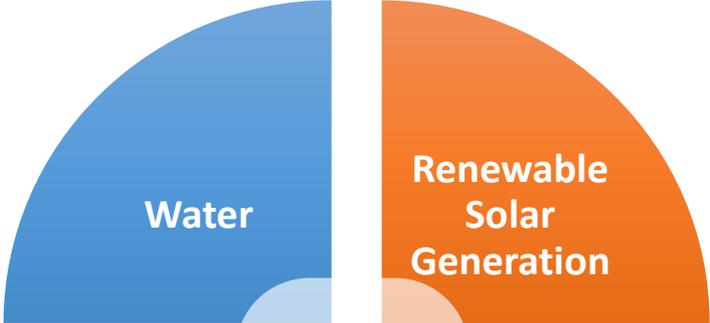
25%
renewables
generation
capacity
target by
2030,
& **75%** by
2050

DEWA's R&D Center



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PART OF MOHAMMED BIN RASHID AL MAKTUM
SOLAR PARK

DEWA R&D center programs



- Water recovery and technologies and its efficient use
- Solar water treatment technologies

- Renewable energy resource analysis as a key for efficient technology development
- Innovative generation technologies that adapt efficiently and reliably to the region
- Technologies that will drive the high penetration of renewable proposals

- Smart grid technologies for future growth and adoption
- Big Data Analytics
- Grid-open integration of renewable technologies
- Substation automation

- Building technologies for environmental integration and element innovation
- Demand response and demand side management analysis



Solar Research



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PV Module Performance and Reliability Testing



Soiling Effect on PV modules



Solar Resource Assessment & Forecasting



Other Solar Technology Performance Testing



Solar Research



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PV Module Performance and Reliability Testing

Soiling Effect on PV modules

Solar Resource Assessment & Forecasting

Concentrated Solar Technology Performance Testing



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Solar Research



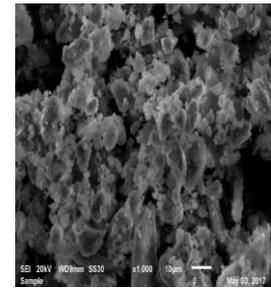
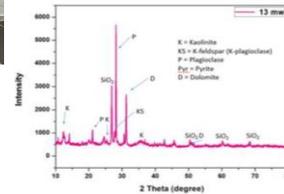
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PV Module Performance and Reliability Testing

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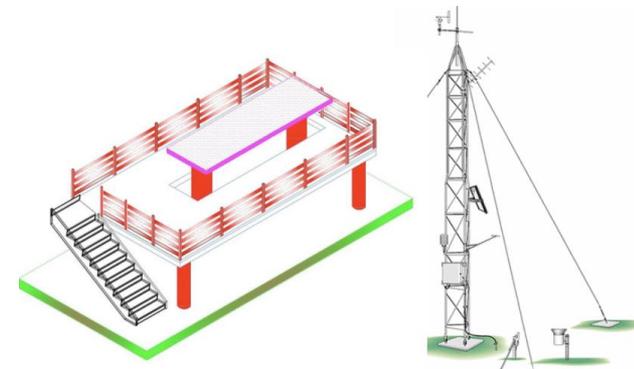
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PV Module Performance and Reliability Testing

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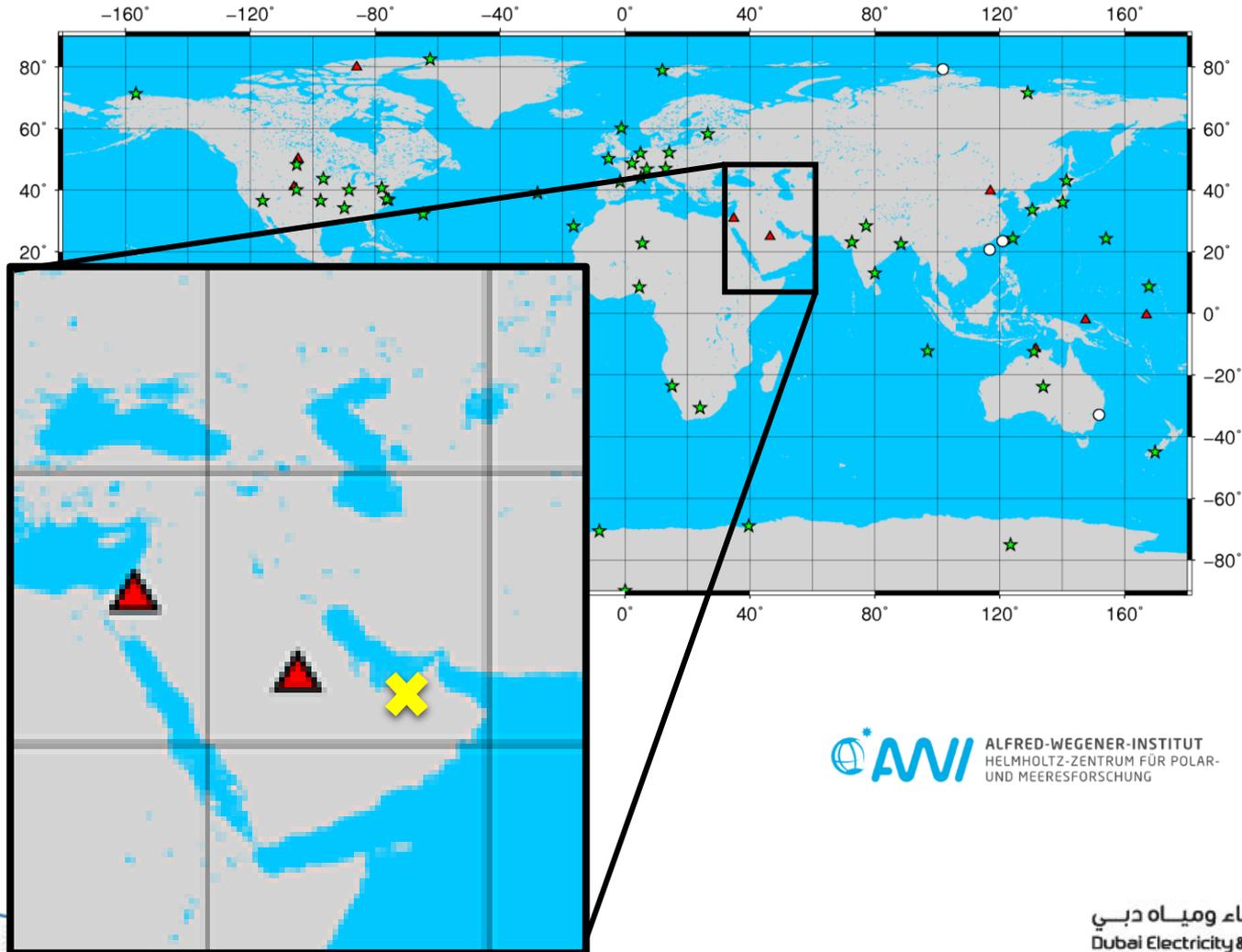
Motivation for Joining BSRN

Motivation



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Running, planned, and closed BSRN Stations, April 2018



 ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR-
UND MEERESFORSCHUNG

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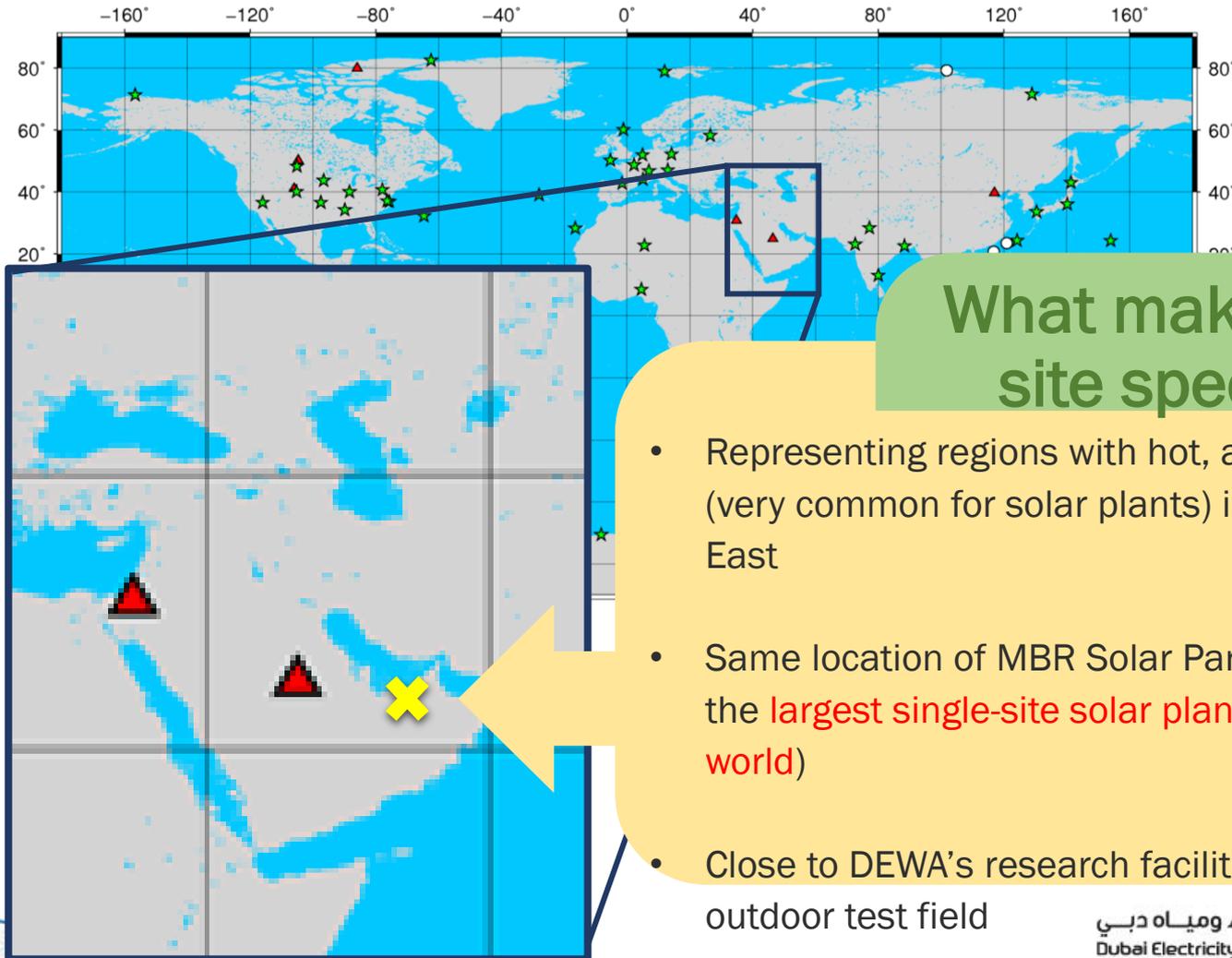


Motivation



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Running, planned, and closed BSRN Stations, April 2018



What makes the site special?

- Representing regions with hot, arid climates (very common for solar plants) in Middle East
- Same location of MBR Solar Park (one of the **largest single-site solar plant in the world**)
- Close to DEWA's research facilities and outdoor test field

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Objectives

- Supporting the afore-mentioned research activities with high quality meteorological data (especially radiation data)
- Supporting DEWA's long-term plan for 5 GW of solar plants (both PV and CSP) with a total area of about 100 km², with accurate assessment of solar resource
- For a successful integration of large PV plants in a stable electric grid, short term precise forecasting (e.g. 10 minutes to 1 hour) of future plant performance
- Conduct research studies related to assessment and forecasting of solar radiation (e.g. cloud nowcasting, sandstorm forecasting, validation/data assimilation for numerical weather prediction with respect to forecasts of PV production, validation of satellite-based solar radiation models)
- Exchange and potential participation in joint projects with the international community



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Source: <http://frv.com/en/projects/>

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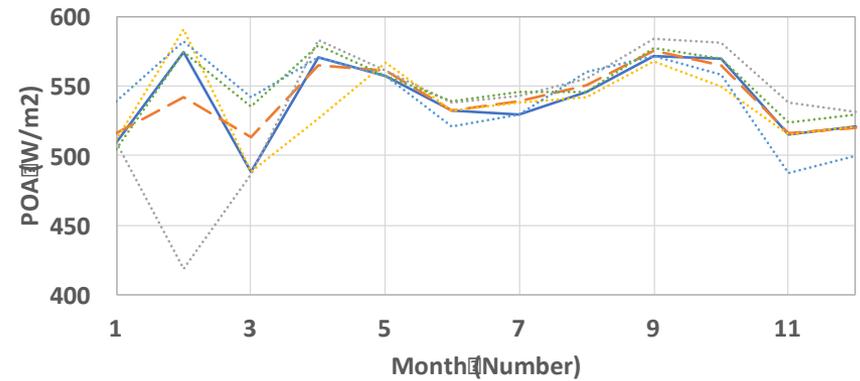
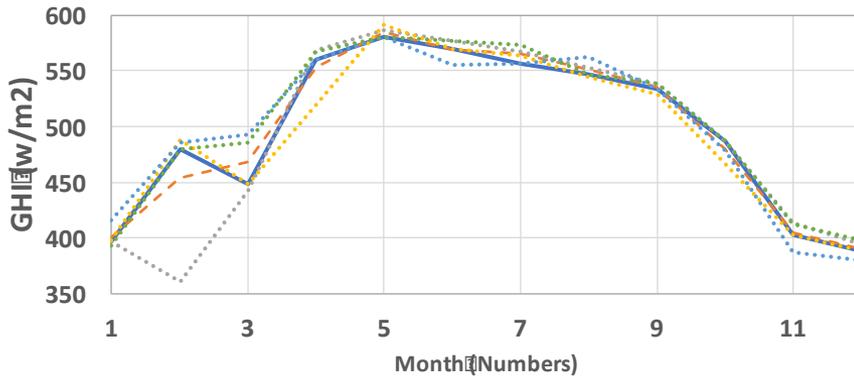
Existing Station Descriptions



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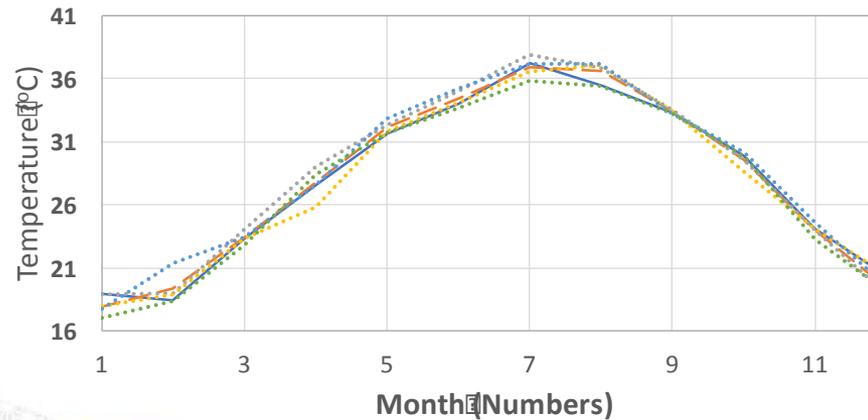
Weather station at the 13 MW power plant

Typical metrological Year data



— TMY — Long Term — 2017 — 2016 — 2015 — 2014

— TMY — Long Term — 2017 — 2016 — 2015 — 2014



— TMY — Long Term — 2017 — 2016 — 2015 — 2014

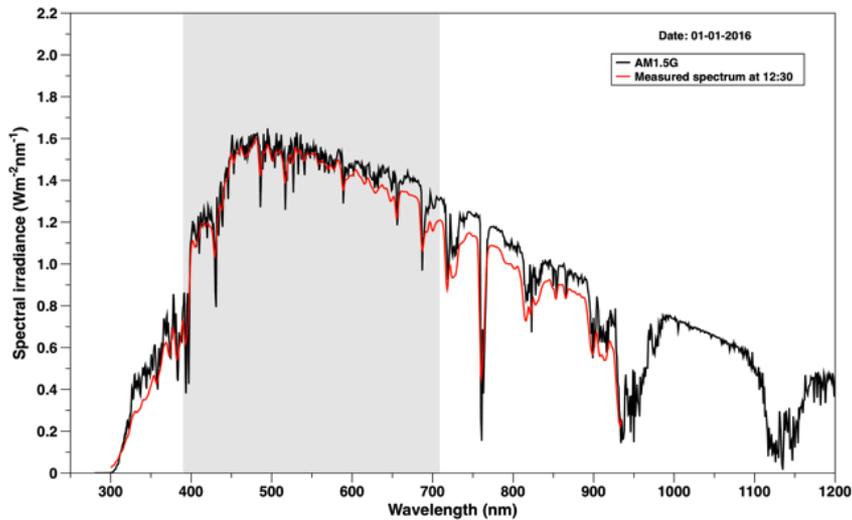
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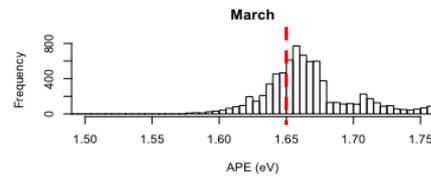
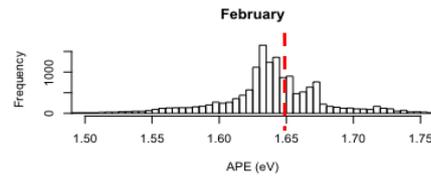
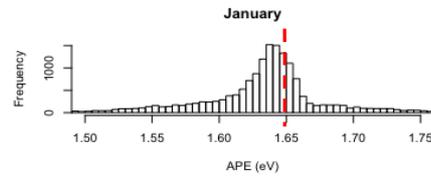
Existing Station Descriptions

Analyzing the seasonal variation in Solar Spectrum

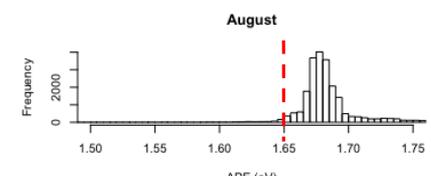
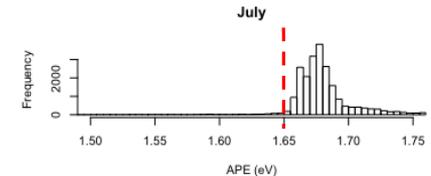
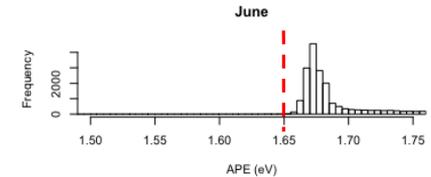
Study the impact of solar spectrum distribution on the outdoor performance of different PV module technologies



Winter



Summer



Red-rich spectrum

Blue-rich spectrum

- Effect of spectral irradiance distribution on the outdoor performance of PV modules in the UAE (to be submitted to progress in photovoltaics)

Manpower Plan



Manpower plan



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Marco Stefancich, PhD
BSRN Station manager
over 20 years experience in solar field



Jim Joseph John,
PhD

over 10 years
experience in
solar field



Aasha
Alnuaimi, PhD

over 7 years
experience in
solar field



Ammar Elnosh,
M.Sc

over 7 years
experience in
solar field



Muhammed
Perves

Station
Technician with
more
than 5 years
experience in
O&M and
calibration

- More than 35 years of experience in Photovoltaics
- More than 250 engineers working worldwide in the business field
- More than 20 measurement stations built in international projects with focus on Solar irradiation
- 7 international irradiation stations presently run by TUV, partly under remote control

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BSRN site Description



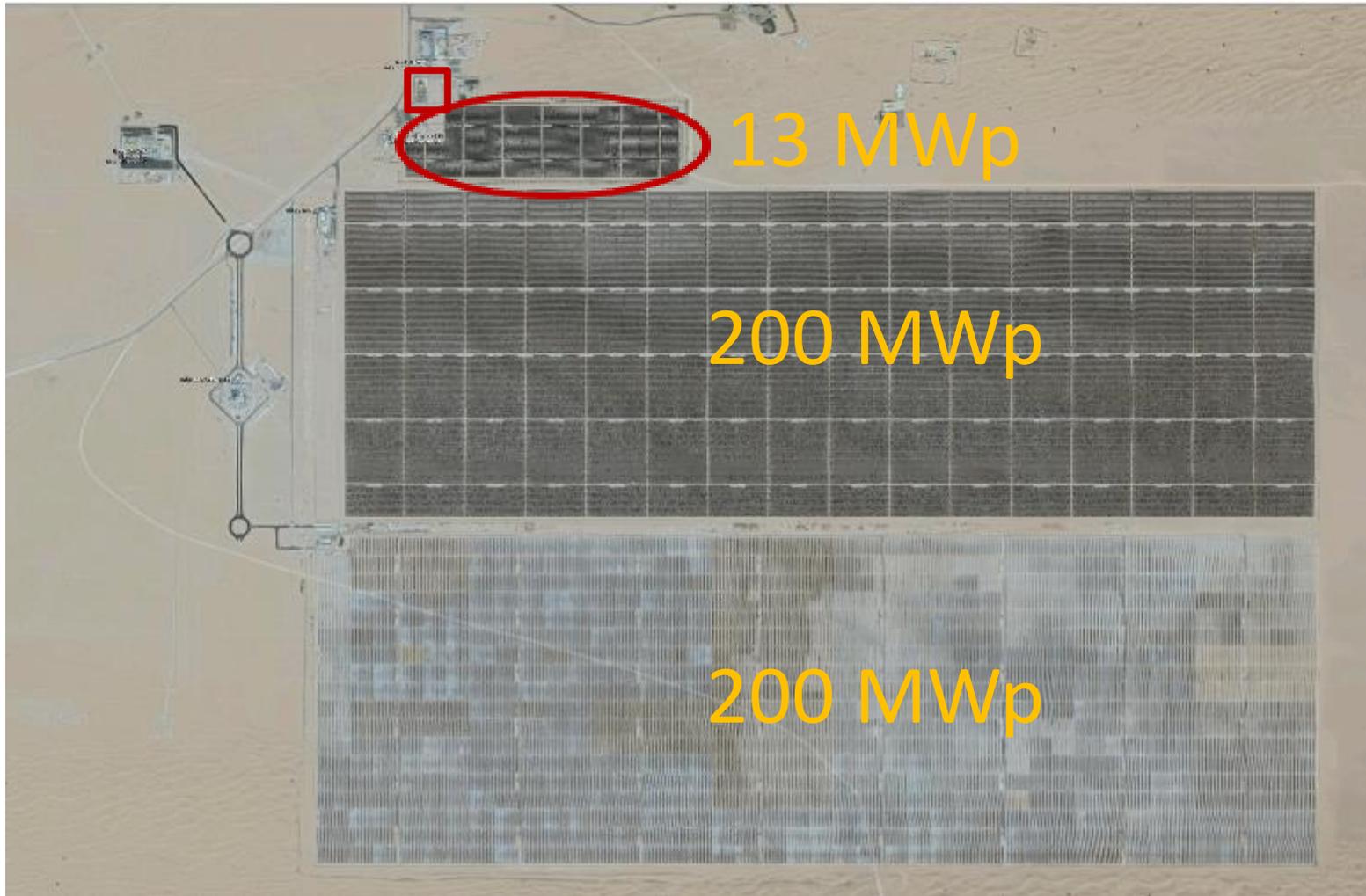
BSRN Site description



Source: maps.google.com



BSRN Site description



Source: maps.google.com

BSRN Site description



Source: maps.google.com



Site completely fenced, security present 24/7



BSRN Site description



Source: maps.google.com



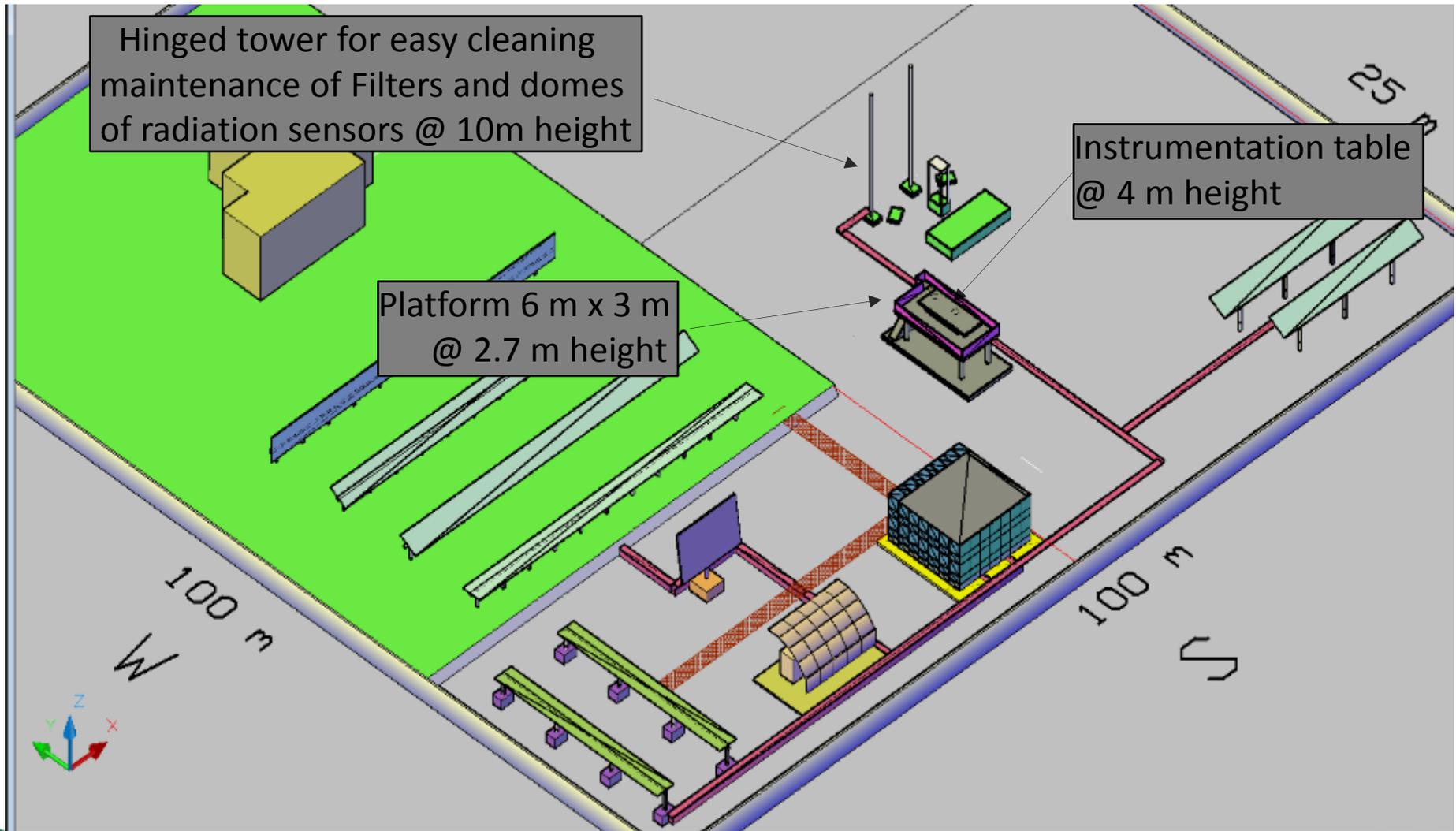
Existing Meteorological Station (Geonica)



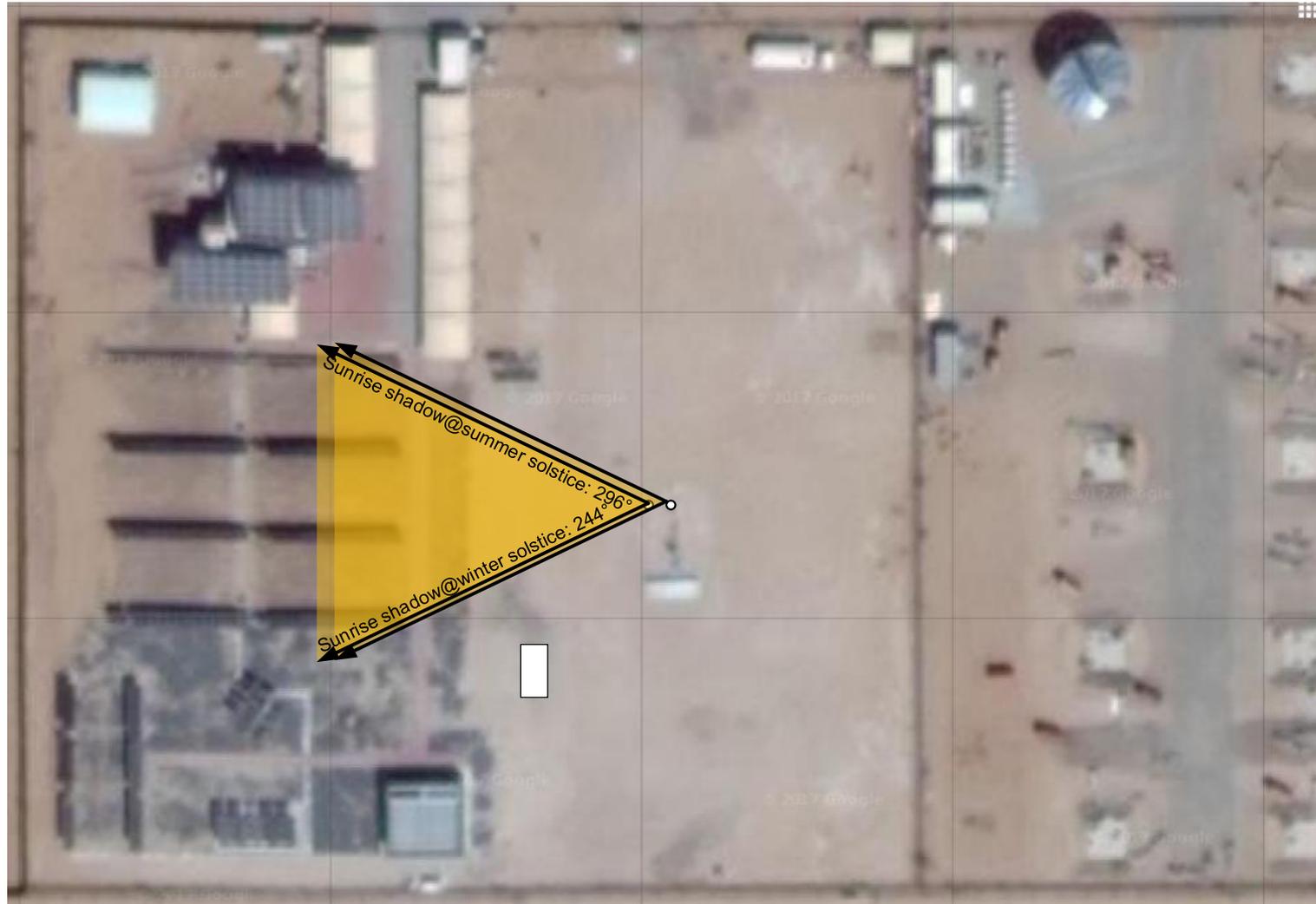
Source: maps.google.com



Platform and Post Position



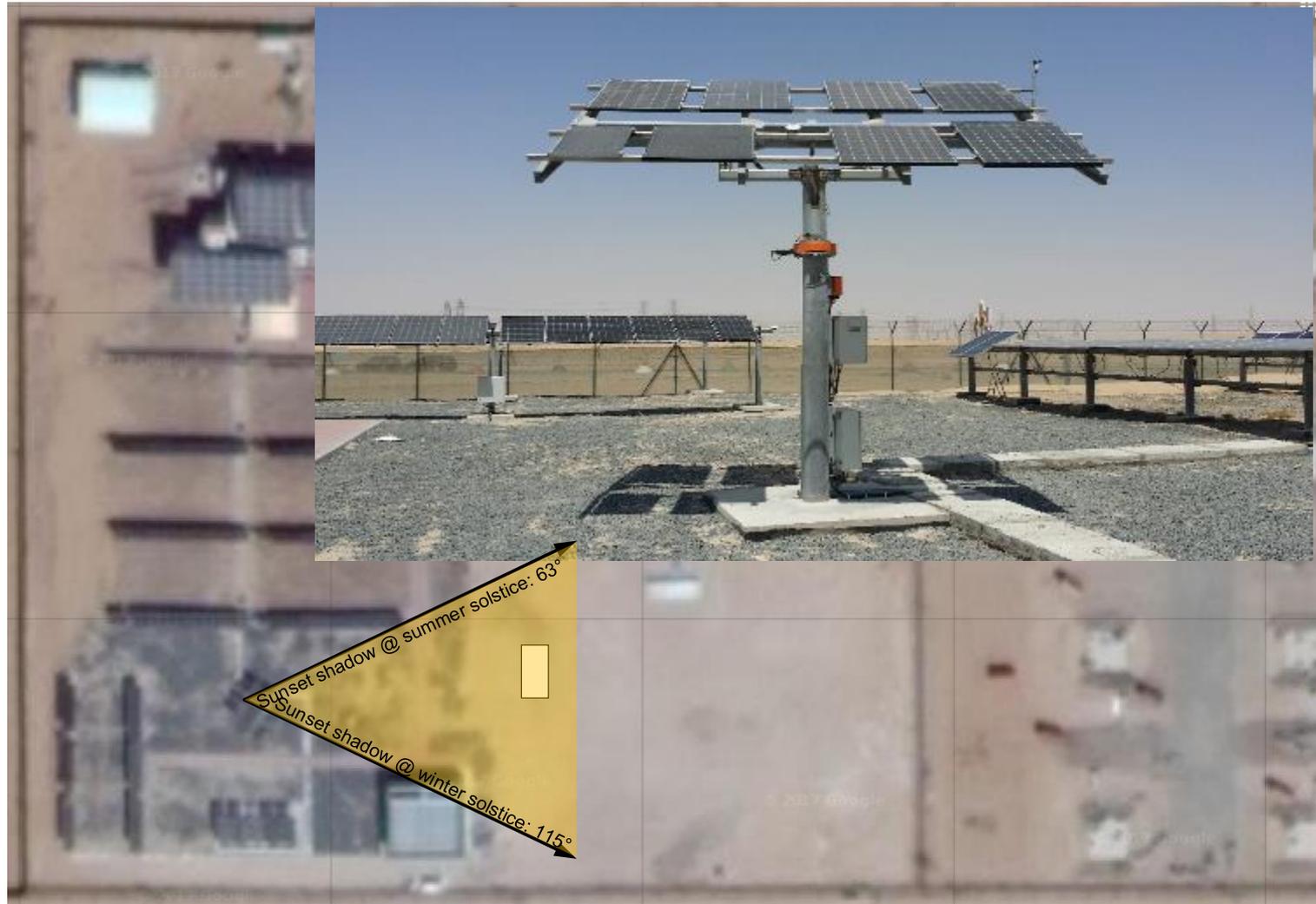
Shadow, reflections and horizon analysis



Shadow, reflections and horizon analysis



Shadow, reflections and horizon analysis

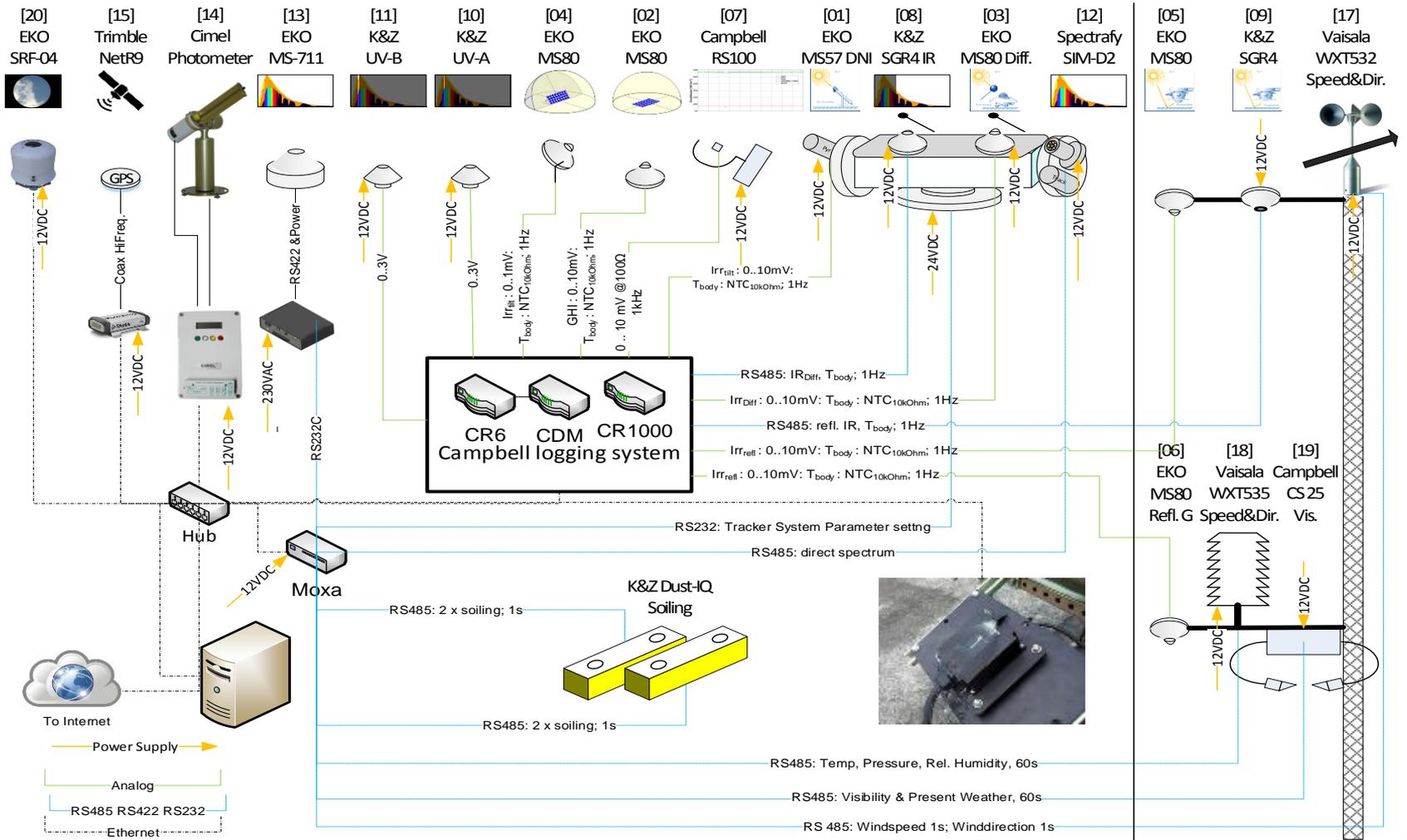




Instrumentation and Data Structure



Solar Resource Station Instrumentation



Basic Irradiation measurement

DNI	First Class Pyrheliometer	EKO MS-57
GHI	Secondary Standard Pyranometer	EKO MS-80 + MV-01
DHI	Secondary Standard Pyranometer	EKO MS-80 + MV-01
IR _{down}	Pyrgeometer	K&Z SGR4-A + CVF4
UV (A&B)	UV-Sensors	K&Z UVS-A/B-T
	Active Tracker	EKO STR-22G

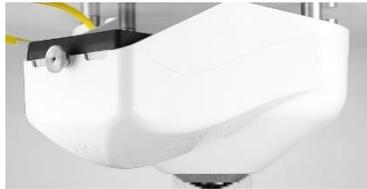
→ All irradiation sensors Ventilated

→ All irradiation sensors calibrated with tracability to Davos Standard



Extended Irradiation measurement

Reflected Solar Radiation @ 10m height	EKO MS-80 + MV-01
Reflected Solar Radiation @ 1.5m height	EKO MS-80 + MV-01
Up-welling Infrared Radiation @ 10m height	K&Z SGR4-A + CVF4
DNI Spectral Irradiance	Spectrafy SolarSIM-D2
GHI Spectral Irradiance	EKO MS-711
Rotating Shadowband Radiometer	Campbell RS-100



Meteorological measurement

Wind speed and wind direction@ 10m height	Vaisala WXT 532
Pressure, temperature, humidity & precipitation @ 1.5m	Vaisala WXT 535
Visibility and present weather	Campbell CS125
GPS Perceptable Water Vapor measurement	Javad Delta 3
Sky Camera	EKO SRF-04
Automatic Sun Tracking Photometer	Cimel CE318



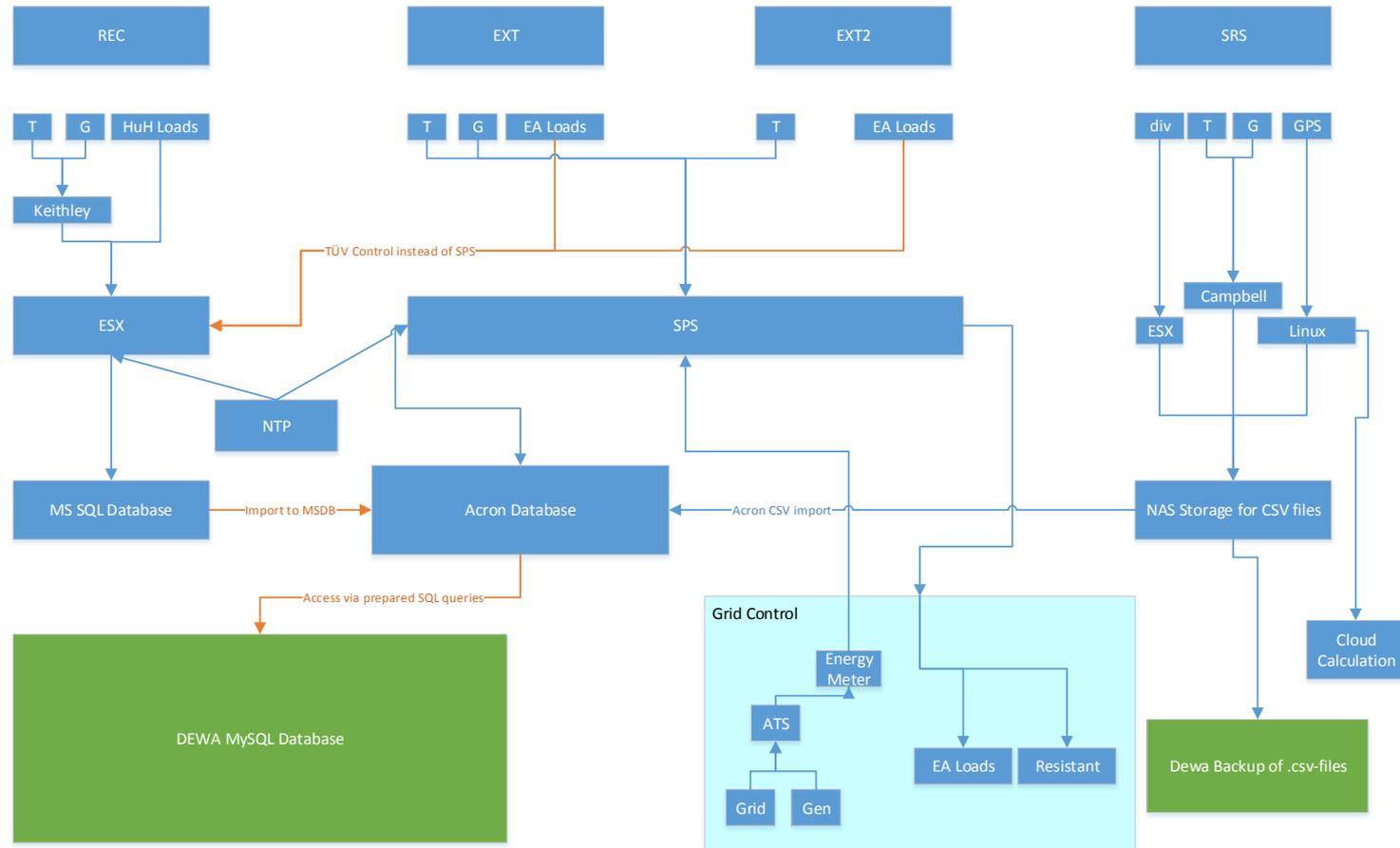
Additional Sensors

Soiling Station	Atonometrics
Presence switch	
Cameras	



Data handling and storage system

Measurement, Data handling and storage system at the Photovoltaic Test Site in Dubai





O&M and Calibration Plan



O&M of Data and System

- Short interval maintenance:
Dewa Technician onsite 6 d/week (Checking and cleaning)
- Long-term maintenance & annual calibration:
TUV Rheinland contracted
- Automatic warnings in case readings fail BSRN recommended QC-tests
 - extremely rare or physically possible
 - Ratio of Global SW / Sum SW
 - Ratio of Dif SW / Global SW
 - SWup to Sum SW comparison
 - LW to Tair comparison
 - ...

Calibration procedures



- Secondary set of identical irradiation sensors
- Calibrated in Davos in two years interval
 - Serve for spare
 - Serve for on site calibration in one year intervals
- Photometer sent to NASA for calibration



THANK YOU