Public Disclosure Authorized

Public Disclosure Authorized

Public Disclosure Authorized

THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

ESMAP
Energy Sector Management Assistance Program

Solar Resource Mapping in Pakistan

MAINTENANCE VISIT REPORKI-E8D8 : ?@ K#)+Ů

August 2016

This report was prepared by CSP Services, under contract to The World Bank.

It is one of several outputs from the solar resource mapping component of the activity "Renewable Energy Resource Mapping and Geospatial Planning – Pakistan" [Project ID: P146140]. This activity is funded and supported by the Energy Sector Management Assistance Program (ESMAP), a multi-donor trust fund administered by The World Bank, under a global initiative on Renewable Energy Resource Mapping. Further details on the initiative can be obtained from the ESMAP website.

This document is an **interim output** from the above-mentioned project. Users are strongly advised to exercise caution when utilizing the information and data contained, as this has not been subject to full peer review. The final, validated, peer reviewed output from this project will be the Pakistan Solar Atlas, which will be published once the project is completed.

Copyright © 2016 International Bank for Reconstruction and Development / THE WORLD BANK
Washington DC 20433
Telephone: +1-202-473-1000
Internet: www.worldbank.org

This work is a product of the consultants listed, and not of World Bank staff. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of The World Bank, its Board of Executive Directors, or the governments they represent.

The World Bank does not guarantee the accuracy of the data included in this work and accept no responsibility for any consequence of their use. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgment on the part of The World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries.

The material in this work is subject to copyright. Because The World Bank encourages dissemination of its knowledge, this work may be reproduced, in whole or in part, for non-commercial purposes as long as full attribution to this work is given. Any queries on rights and licenses, including subsidiary rights, should be addressed to World Bank Publications, The World Bank Group, 1818 H Street NW, Washington, DC 20433, USA; fax: +1-202-522-2625; e-mail: pubrights@worldbank.org. Furthermore, the ESMAP Program Manager would appreciate receiving a copy of the publication that uses this publication for its source sent in care of the address above, or to esmap@worldbank.org.

CSP Services GmbH, Köln, Germany

CSPS Technical Documentation

ESMAP Tier2 Meteorological Station Maintenance Report: NED University of Engineering and Technology, Karachi, Pakistan

Responsible Authors

Birk Kraas
Muhammad Umer Kamal
Roman Affolter

Author Contact Information:
CSP Services GmbH
Friedrich-Ebert-Ufer 30
51143 Köln/Cologne, Germany
E-Mail: b.kraas@cspservices.de

02 August 2016

CSP Services GmbH

Office Cologne:

Birk Kraas

Friedrich-Ebert-Ufer 30, 51143 Cologne, Germany

Phone: +49 2203 959003 0

b.kraas@cspservices.de

Office Almería:

Roman Affolter

Paseo de Almería 73 – 2°, 04001 Almería, Spain

Phone: +34 950 27 89 92

r.affolter@cspservices.de

PITCO:

Muhammad Umer Kamal

2nd Floor, Al – Maalik, 19 – Davis Road, Lahore, PAKISTAN

umer.kamal@pitcopk.com

CSP Services is a Spin-Off company of the German Aerospace Center (DLR), Institute of Solar Research, and makes use of licensed technology and know-how of DLR.

The contents of this report are strictly confidential. They are only for the use of our client.

The authors have written this report at their best knowledge and it has been rechecked within our quality control system. However, our liability, except in cases of intent, is excluded or limited to the contract conditions.

Summary

Site	
Site:	NED University of Enigneering and Technology, Karachi
Coordinates:	24.933°N, 67.112°E
Station Type:	ESMAP Tier 2 Station
Date of installation:	2015-04-22
Date of maintenance visit:	2016-06-03
Serial Numbers	
Station SN#:	CSPS.MT.14.218
Control Box SN#:	CSPS.CA.14.209.0004
RSI SN# – Drive, PU:	DR.13.0001.001, MS.14.001.009
GHI CMP SN#:	140571
Inspection visit staff	
Inspection performed by (Date, Names and Signatures) Date: 02 August 2016	 Muhammad Umer Kamal, PITCO

The CSP Services (CSPS) ESMAP Project Tier1 meteorological station CSPS.MT.14.218, operational since Apr. 22nd 2015, was inspected and tested for its correct operation by PITCO staff on June 03, 2016.

The station is fully functional. The irradiation sensors showed no significant increase in their irradiation signal upon cleaning of the sensor head.

It is recommended to clean the sensors on a weekly basis in order to reduce the influence of sensor soiling on the irradiance data.

Completed Tasks

- Foundations checked for integrity.
- All parts and sensors of the station examined for damage, dust or condensed humidity, current status recorded and equipment cleaned where necessary.
- Vertical alignment of wind mast checked, wind mast anchorage and wind mast guying ropes checked for stability, secure fixation to the ground and tightness.
- Rotating Shadowband Pyranometer (RSI) and CMP10 pyranometer alignment adjusted and fine-tuned, no perceptible influence on the irradiance data stated.
- Solar irradiation sensors checked for proper operation and functionality; sensors cleaned, impact of cleaning on data recorded.
- Batteries Box and solar panel inspected and correct operation of 12 VDC circuit verified.
- Mounting structure stability checked.
- Datalogger program correct operation verified.
- Measured quantities checked for proper operation and correct values.
- Cleaning inspection button checked for proper functioning.
- Fuses, electrical components and wiring checked.

Pending Tasks / Recommended Tasks for next Maintenance Visit

None

Maintenance Checklist

Component	Work item	Checked/ approved		Comments
		yes	no	
Foundations, fence	Foundations and anchors intact	X		
	Fence and door intact		X	No fence, controlled roof area
	Lock on door intact and usable		X	No fence, controlled roof area
Support structure with control box	Firmly installed	X		
	Grounding cable connected	X		
	All bolts tightened	X		
Wiring, cables	Visual examination	X		
	Fuses ok	X		
	PV Power cable connected	X		
	Electrical connection	X		
Power Supply	PV Panel(s) visual examination	X		Cleaned
	Supply Voltage	X		
	Batteries ok and charging	X		
	All sensors connected	X		
	All cables orderly fixed	X		

Component	Work item	Checked/ approved		Comments
		yes	no	
Barometric Pressure Sensor	Sensor Serial No.	X		Model: Setra 278 SN#:5949014
	Visual examination, operability	X		
T_{amb} / RH	Irradiation shield visual examination	X		
	Sensor probe and chip examination	X		
	Filter cap examination	X		Cleaned
	Sensor Serial No.	X		Model: CS215 SN#: E12264
RSI	Visual examination, operability	X		Dirty on diffuser disc, cleaned
	Drive Unit	X		SN: DR.13.001.0001
	PU Unit	X		SN: MS.14.001.009
	Diffuser disc / LI-COR sensor(s)	X		
	Shadow band	X		
	Horizontal leveling	X		Slightly adjusted
Thermopile Irradiation Sensor Alignment	Pyranometer GHI	X		SN# : 140571, cleaned
	Horizontal leveling	X		Slightly adjusted
Wind tower, wind speed and direc-tion sensors	Visual examination, alignment	X		
	Wind direction sensor serial No.	X		Model: NRG#200 SN#: N/A
	Wind speed sensor serial No.	X		Model: NRG#40C SN#: 1795-00229368
	North Orientation of WD sensor	X		
	Operability of sensors	X		
Modem	SIM card	X		Provider / number: Telenor
	APN, username, password of SIM	X		APN: internet Username: Telenor Password: Telenor
	LED blinking code	X		
Datalogger	Operation system installed	X		Version: Std.27
	Datalogger configuration saved	X		File name: Pk-Kar_2015-04-13.xml
	IP visible in logger configuration	X		IP: dynamic
	Correct sensor constants in program	X		
	Correct coordinates in program	X		
	Datalogger program installed	X		Program name: Pk-Kar-2015-04-14.CR1 Subroutines: ESMAP-Pakistan-MDI-Su-broutines-2014-08-19_str_Enc.CR1
	Program set to “Run always”	X		
	Datalogger clock correct	X		Local standard time, no daylight saving time: UTC+5 Logger time shift detected: 0 s

Photographic documentation

Figure 1: MDI stand with control box (front side, from North)

Figure 2: Control box with datalogger, pressure sensor, modem, connectors, fuses and switches, battery

Figure 3: CMP10 close-up

Figure 4: CMP10 level

Figure 5: Temperature sensor (white) and GPRS antenna (black)

Figure 6: Setra 278 pressure sensor

Figure 7: RSI with Pyranometer unit

Figure 8: RSI Pyranometer unit with water level

Figure 9: Wind sensors on tower, including optional bird accessory

Figure 10: Wind tower

Figure 11: Station overview (from South)