

Insights from the Standard Compliance and Quality Assessment of Renewable Energy Equipment and Systems in Central, and Northern Malawi

TEST AND TRAINING CENTRE FOR RENEWABLE ENERGY TECHNOLOGIES (TCRET)

December 2017

Background

- ▶ Significant progress on training by TCRET
- ▶ No tangible progress on certification tests of renewable energy equipment

Objective of Standard Compliance Assessment Assignment

- ▶ Awareness of testing and quality assessment services to renewable energy equipment suppliers
- ▶ Demonstrate what certification tests TCRET can do
- ▶ Awareness of quality and standard compliance to RE installers

Certification of RE Equipment and Standards

Example of Visual Inspection Criteria for Qualifying a PV Module

DESCRIPTIVE	RESPONSE	
	Yes	No
PV technology type –mono-crystalline or poly-crystalline		
PV Panel equipped with sealable waterproof junction box		
PV panel has bypass diode		
PV panel framed with aluminium frame super straight structure		
PV panel has mounting holes and grounding hole		
Label presence		
INFORMATION ON LABEL		
Manufacturer's address		
Model number		
Serial number		
Ratings: W_p , I_{mp} , V_{mp} , I_{sc} , V_{oc} , at STC		
STC information indicated: Irradiance, and Temperature		
Country of origin		
Date of manufacture (month and year)		
10 years minimum warranty period		

Certification of RE Equipment and Standards

Example of Visual Inspection Criteria for Qualifying an Energy Storage Battery

PARAMETER PROVIDED?	RESPONSE	
	Yes	No
Rated capacity with indications of several discharge rates (at least C/20 discharge rate)		
Cycle life at several depth of discharge (at least 30% depth of discharge)		
Self discharge rate per month		
Maximum charging voltage (cycling and floating)		
Final Voltage		
Terminal are bolt-nut		
Label presence		
INFORMATION ON LABEL		
Manufacturer's name and address		
Model number		
Serial number		
Rated voltage		
Rated capacity with an indication discharge rate		
Country of origin		
Date of manufacture (month and year)		
1 year minimum warranty period		

Certification of RE Equipment and Standards

Example of Visual Inspection Criteria for Qualifying an Inverter

DESCRIPTIVE	RESPONSE	
	Yes	No
Efficiency is in excess of 85 % at above 50% load output		
Has maximum surge current capacity in one minute or equivalent short period indicated		
Surge current capacity: minimum of 200% of the continuous rating for one minute		
Has reverse polarity protection		
Has short circuit protection		
Continuous output capacity indicated		
Type of waveform indicated		
Output waveform is pure sine wave		
Has low voltage shutdown capability		
Low voltage shutdown voltage indicated		
Kind of protections indicated (short circuit, overload, low voltage shutdown, reverse polarity protection etc.)		
Label presence		
INFORMATION ON LABEL		
Manufacturer's name and address		
Model number		
Serial number		
Ratings: Continuous operating power, maximum operating power in one minute		
Country of origin		
Date of manufacture (month and year)		
1 year minimum warranty period		

Approach of the Assessment

- ▶ Convenience sampling of shops around Mzuzu (8 modules, 4 batteries, 4 inverters)
- ▶ Convenience and purposive sampling of installed systems
- ▶ Multimeter, cameras
- ▶ Visual inspection and measurements

Summary of Findings on PV Modules

- ▶ labels present – some with questionable quality and with missing information
- ▶ Different patterns of cells
- ▶ Polarity indicated on junction box but for some – colour codes for the cables was not followed
- ▶ Measured open circuit voltage consistent with nameplate values



Summary of Findings on Batteries

- ▶ Missing information labels – discharge cycle information

Summary of Findings on Inverters

- ▶ Missing information on labels
- ▶ Mostly output voltage consistent with nameplate values
- ▶ Output wave was not checked



Quality of RE Installations and Standard Compliance of RE Systems

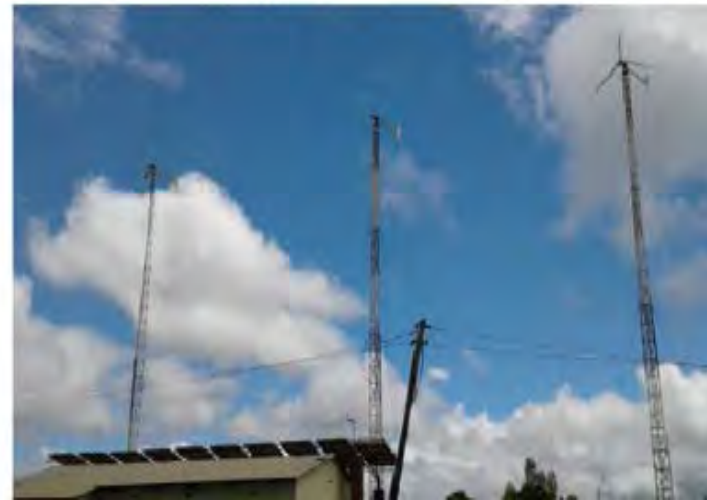
Energy Practitioner Behaviour – Innovation & Entrepreneurship



(a)



(b)



Energy Practitioner Behaviour – Innovation & Entrepreneurship



(e)



(f)



Energy Practitioner Behaviour – Innovation & Entrepreneurship



(i)



(ii)



(iii)



(iv)

Energy Practitioner Behaviour - Professionalism



(a)



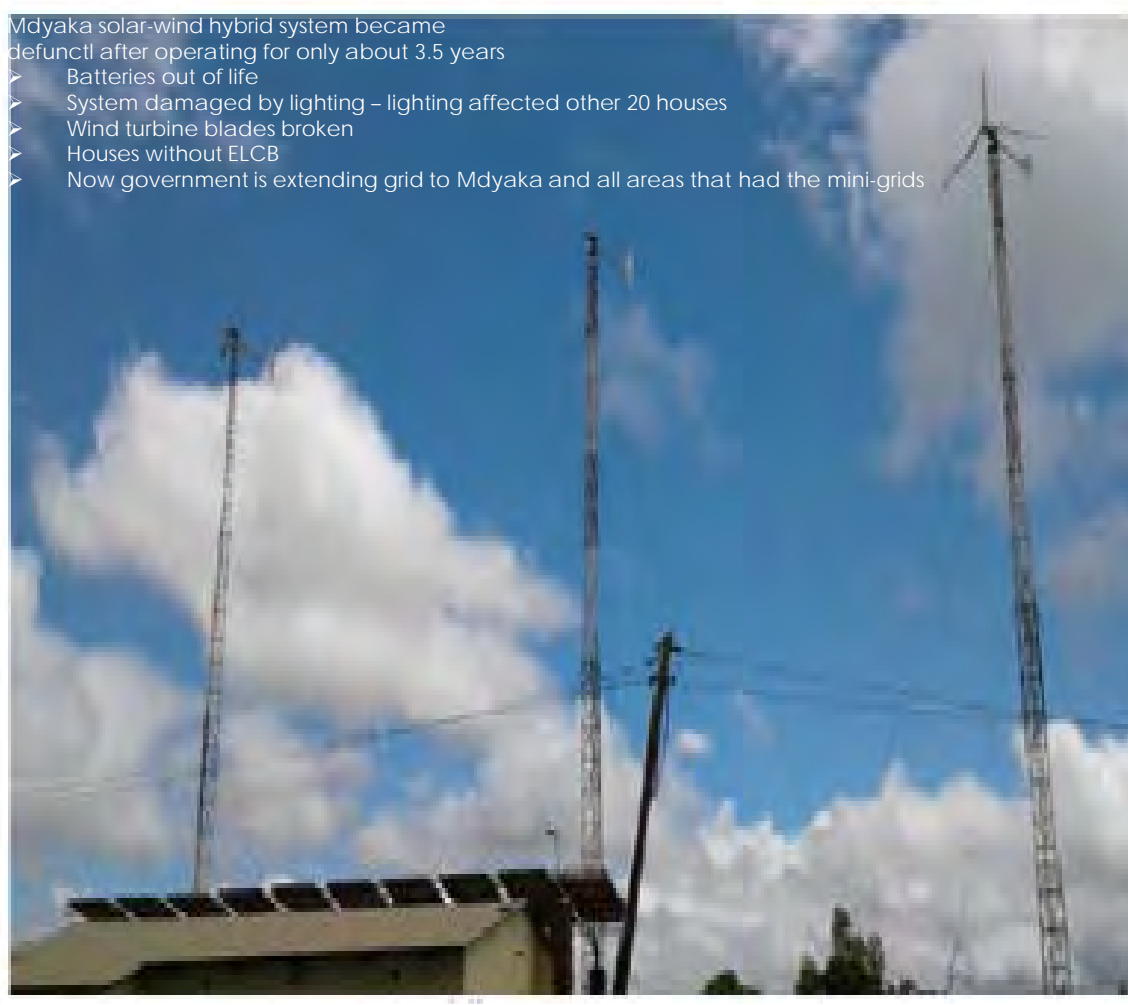
(b)



Limited compliance to professional standards

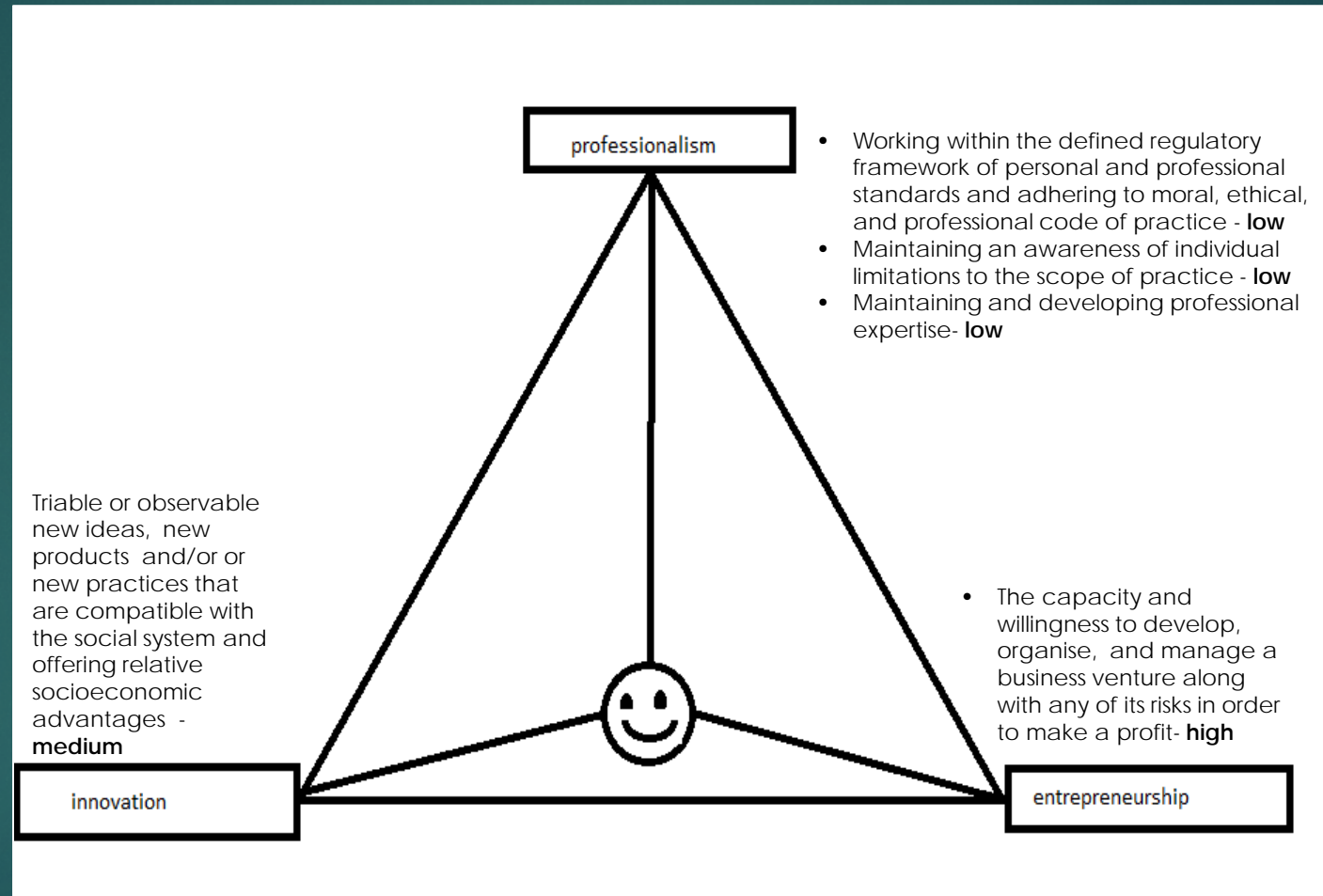
Energy Practitioner Behaviour - Professionalism

- Mdyaka solar-wind hybrid system became defunct after operating for only about 3.5 years
- ▶ Batteries out of life
 - ▶ System damaged by lightning – lightning affected other 20 houses
 - ▶ Wind turbine blades broken
 - ▶ Houses without ELCB
 - ▶ Now government is extending grid to Mdyaka and all areas that had the mini-grids



55 % of the areas (outlined by stakeholders) that could have been done better in the micro-grid power system relate to professional standards and code of practice

The RE Practitioner Trilemma among Professionalism, Innovation & Entrepreneurship



Conclusions

- ▶ Sampled products did not pass the first stage of certification –visual inspection
- ▶ Findings confirm concerns of proliferation of substandard products
- ▶ Renewable energy practitioners in Malawi are skewed towards entrepreneurship and innovation but compromise on professionalism

Recommendations

Recommendation	Responsible Actor
Produce copies of recognised/ registered/deregistered RE equipment suppliers for distribution to each VDC	MERA
Extend professional expertise to the awareness of the legal framework governing the practice of electrical and renewable energy related activities	Renewable energy practitioners
Organise training for RE equipment importers on identification of substandard products	MERA, MBS, TCRET
Increase awareness on identification of substandard RE equipment	MERA
Finalise institutional and technical arrangements so that certification of RE equipment should begin in 2018	TCRET, MRA and MBS
Enforce separation of roles of different practitioners in the development of renewable energy projects	Malawi Board of Engineers, Malawi Institution of Engineers, Renewable Energy Industry Association of Malawi, National Construction Industry Council, and Malawi Energy Regulatory Authority
Undertake mass registration/deregistration of RE equipment suppliers in all districts in Malawi	MERA
Monitor technical and engineering colleges/universities to ensure engineering related curricula are up-to-date on content of industry professional standards and regulatory instruments	Malawi Board Engineers/MIE
Collaborate with NSO in the next census to track where Malawians purchase their RE equipment and associated challenges met	MERA

Final Words

A pie is a mouth
watering dish



Let us have appetite for
pie (professionalism,
innovation, and
entrepreneurship) as
a savoury dish