Malawi Community Energy Sustainability Extension

Market Assessment Training

20th – 22nd January 2016

Lilongwe

Introductions and Overview

Aran Eales

Contents

- Introductions
- Background to this project
- Overview of Training
- Timetable

Introductions

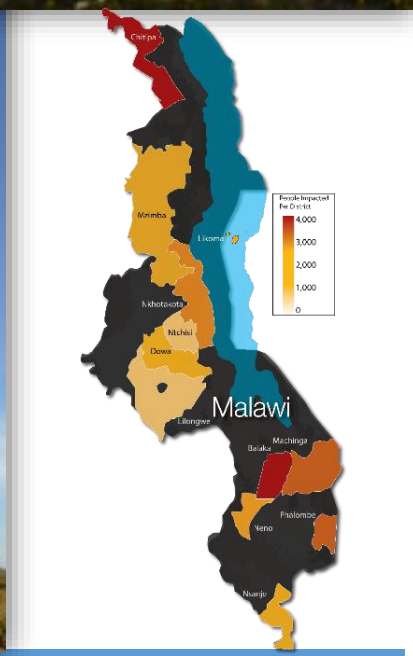
- **University of Strathclyde**
  - Aran Eales
- **CEM Staff**
  - Edgar
  - Morton
  - Francis
  - Louis
  - Berius
  - Chawesi
  - Max
  - Memory
  - Leticia
- **Wind Empowerment Staff**
  - Jon Sumanik-Leary (UK)
  - Madis Org (Estonia)
  - Clement (Malawi)
  - Jon Persson (Sweden)
  - Matthew Little (UK)

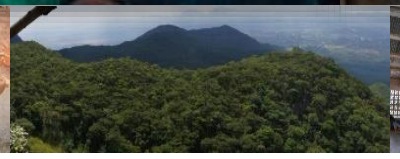
Energy for Development

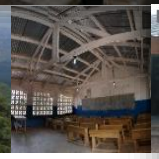
University of Strathclyde Engineering

Impact

The UoS has been working on off-grid community energy access in developing countries for over a decade. Our emphasis has been on appropriate engineering, reducing energy poverty, improving sustainability of rural systems, and building technology to support monitoring and evaluation of energy systems. Our projects have deployed over 120 Renewable Energy Systems and improved energy access for over 80,000 people







Research

The UoS has led a portfolio of grants worth £2.85m including the Scottish Government's flagship Malawi Renewable Energy Acceleration Programme. Our work has encompassed community energy deployment models, sustainability analysis, monitoring and evaluation of off-grid energy projects and renewable energy system design and optimisation

Wind EMPOWERMENT

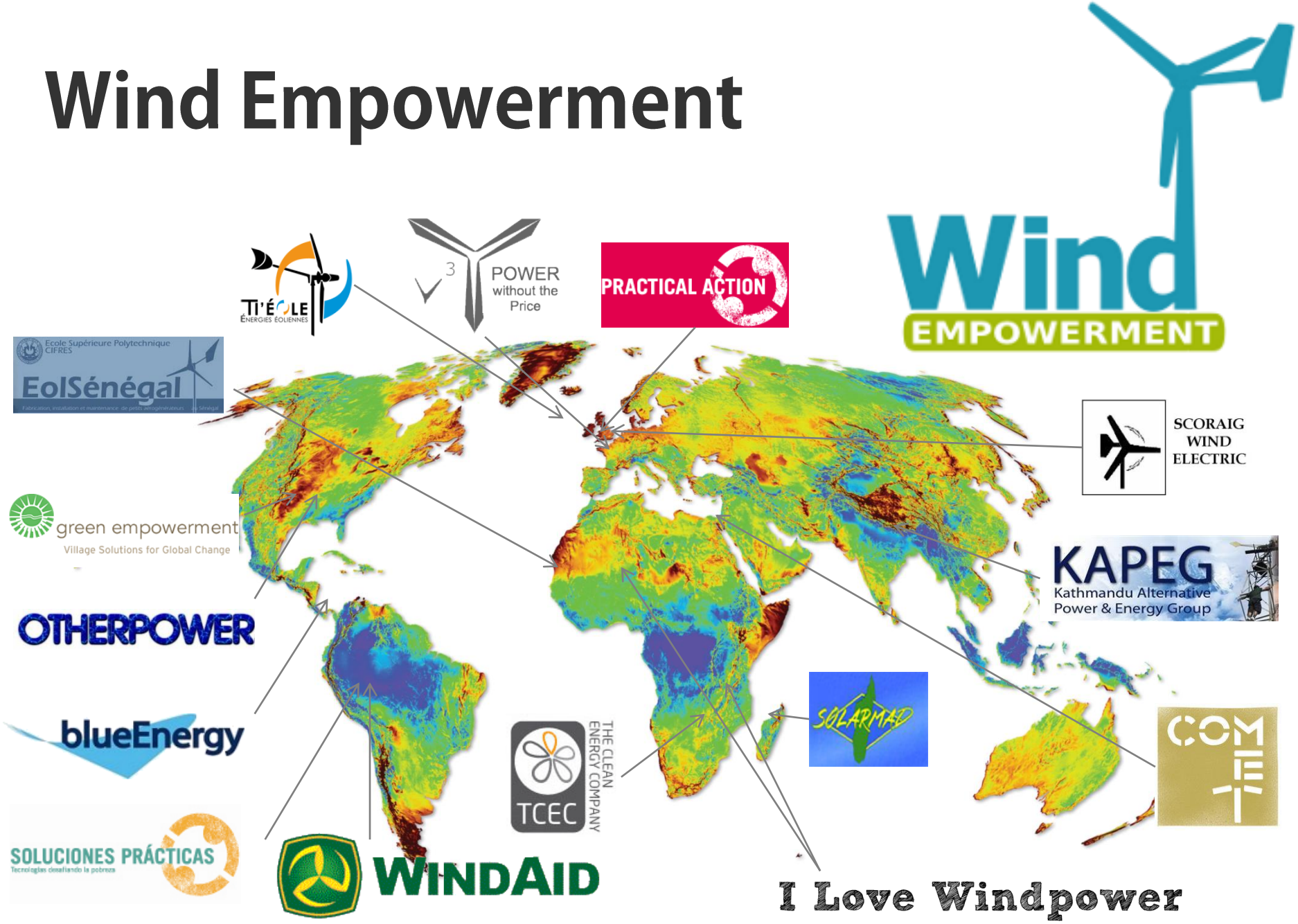
Association for the development of locally built small wind turbines for sustainable rural electrification.



- Started in Senegal, 2011
- Charitable Incorporated Organisation in UK

V3 COMTE nea guinea 500 RPM WINDAID TI'ÉOLE ÉNERGIES ÉOLIENNES green empowerment Village Solutions for Global Change

Wind Empowerment



University of Strathclyde and CEM

- CRED – Community Renewable Energy Development 2008 - 2010
- MREAP – Malawi Renewable Energy Acceleration Programme 2012 – now
  - CEDP – Community Energy Development Programme 2013 – 2015
  - CEM formed in CEDP
  - **Malawi Community Energy Sustainability Extension August 2015 – March 2016**

MREAP Programme: I

Partnership

University of Strathclyde Glasgow

IOD PARC

sgurr energy
Sustainable Engineering Worldwide

Community Energy Scotland

WASHTED

MuREA
Mulanje Renewable Energy Agency

concern universal

Mzuzu University
Self Reliance Service Perfection

Renew Able Malawi

Effective date: Jan 2012 – Mar 2015

Funding: £1.7m (initially), extended to £2.3m

Programme Streams

- Community Energy Development
- Renewable Energy Capacity Building
- Institutional Support
- Wind Energy Preparation

Objective

- Accelerate the growth of community and renewable energy development in Malawi through multiple, targeted and coordinated activities with good potential to provide a platform for that growth

MREAP Programme: II

- Interesting Innovations
  - Bottom-up Community Energy Development Model
  - Creation of a community-centric support organization (Community Energy Malawi)
  - Integrated programme (action, research, learning, capacity building, dissemination)
- Big Impacts
  - Nearly 80,000 with improved access to energy
  - 50 community energy projects developed
  - 16 reports published to document process and learning

Programme Strands

ISP Institutional Support

- Malawian **institutions have evidence and systems** to support the effective development of the renewable energy sector to provide development benefits for Malawian communities.

CEDP Community Energy Development

- Effective **community renewable energy deployments** are facilitated by capable stakeholders who support & empower communities to develop and own renewable energy projects and in so doing support the effective development of the renewable energy sector to provide development benefits for Malawian communities.

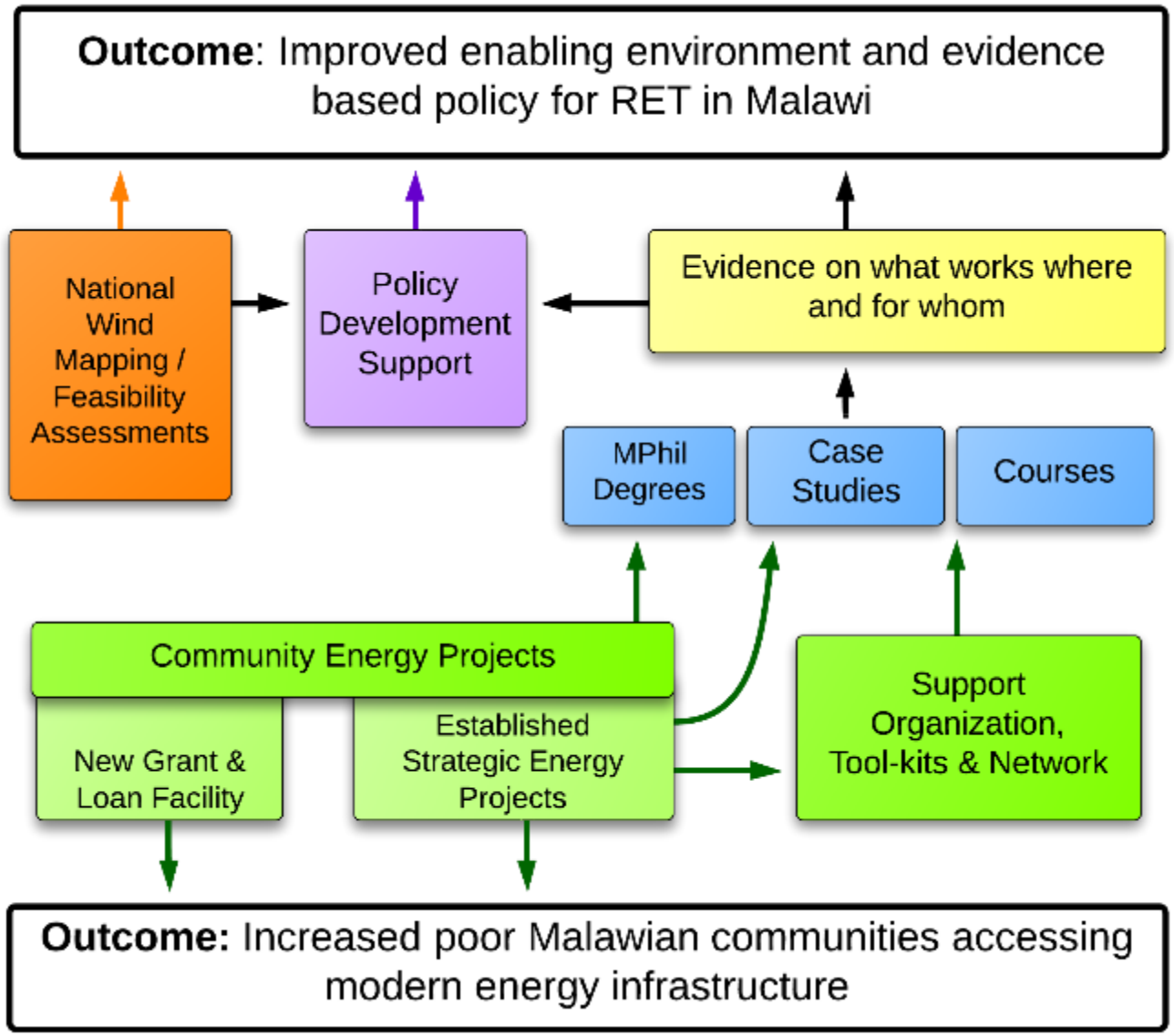
RECBP Renewable Energy Capacity Building

- **Higher Education Institutions, trainers and entrepreneurs** have the **knowledge of renewable energy** to support the effective development of the renewable energy sector to provide development benefits for rural communities.

WEPP Wind Energy Preparation

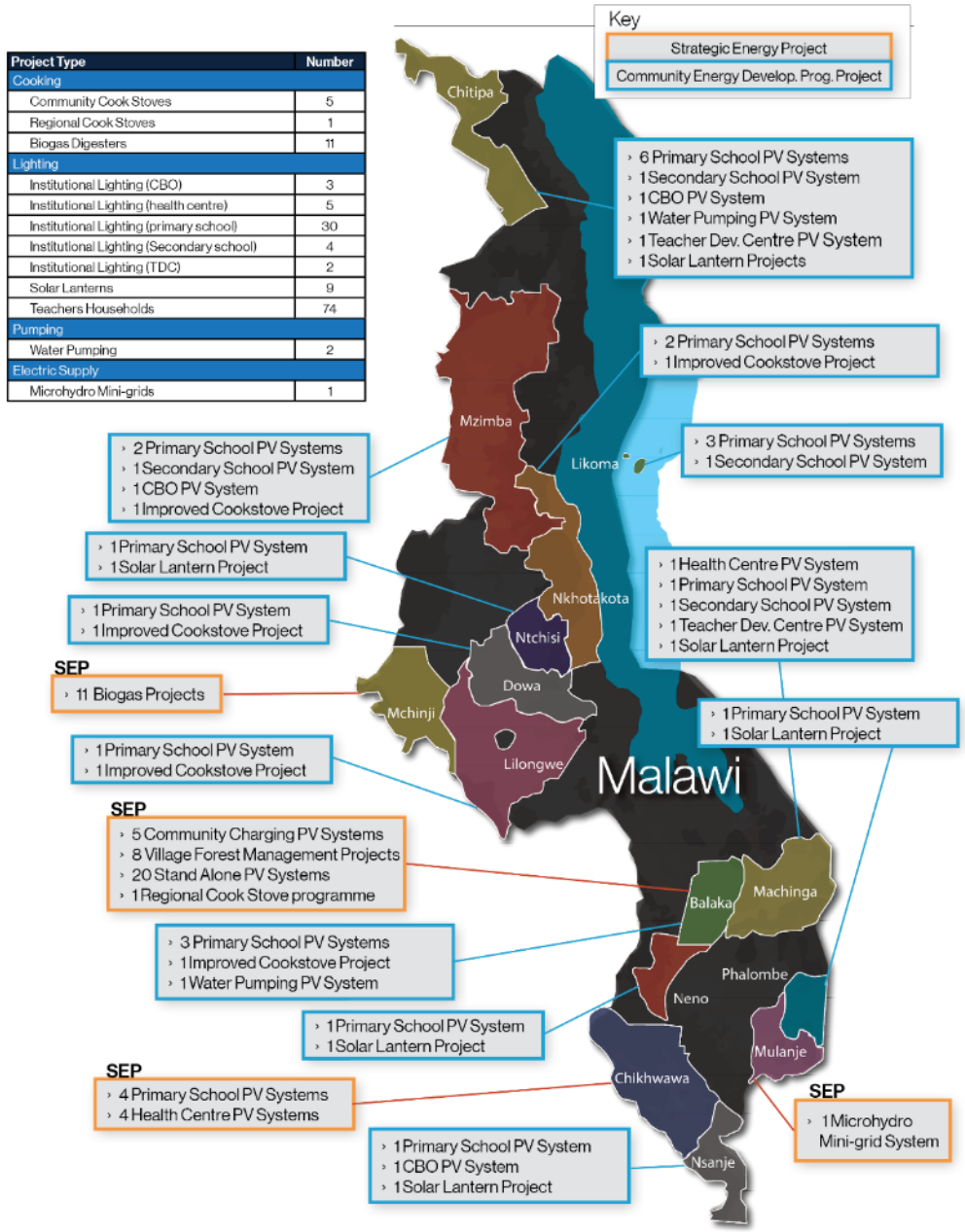
- Effective **wind power resources are deployed** by capable stakeholders within government, civil society, communities and private sector to support the effective development of the renewable energy sector to provide development benefits for rural communities.

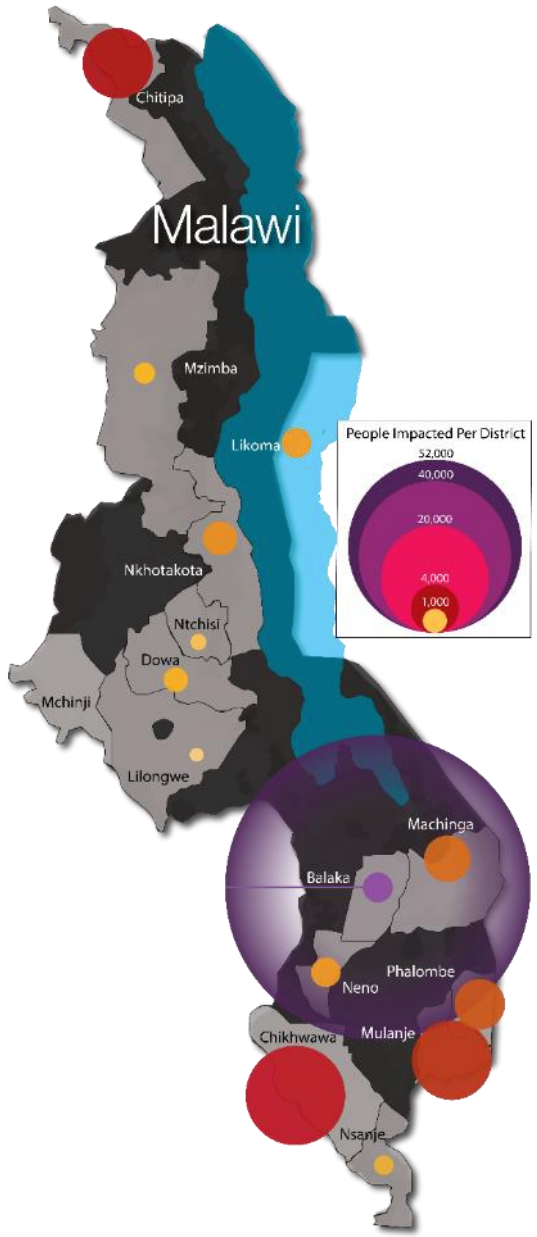
Programme Strands (Visually)



Strategic Energy Projects

Project Type	Number
Cooking	
Community Cook Stoves	5
Regional Cook Stoves	1
Biogas Digesters	11
Lighting	
Institutional Lighting (CBO)	3
Institutional Lighting (health centre)	5
Institutional Lighting (primary school)	30
Institutional Lighting (Secondary school)	4
Institutional Lighting (TDC)	2
Solar Lanterns	9
Teachers Households	74
Pumping	
Water Pumping	2
Electric Supply	
Microhydro Mini-grids	1





Community Energy Malawi

CEM Staff and Board with MREAP team - Apr 2014

- Community Energy Malawi (CEM) was setup and support MREAP community energy projects.
- With Community Energy Scotland (CES) – developed 46 projects under MREAP!
- Produced the Community Energy Toolkit
- Held 1st ever Community Energy Conference in Malawi

http://www.communityenergymalawi.org/

Community Energy Malawi

Community Energy Malawi is a membership based organisation which aims to:

"To enable communities in Malawi to create sustainable renewable energy solutions to meet their energy needs"

One of the ways in which it aims to do this is through:

- The creation and facilitation of a mutually supportive network of community group members

- Representing members in making the case for the creation of a supportive Government policy and regulatory framework

Malawi Community Energy Sustainability Extension (December 2015 - March 2016)

Work Area 1: New Project Development

- New CBO Identification
- Market Assessments

Work Area 2: Capacity Building

- CBO Training
- Learning Journeys and District Learning Links

Work Area 3: Research & Knowledge Dissemination

- Evaluation of Previous Projects

Work Area 4: CEM Technical Support

- Fundraising and Business Development

Work Area 5: Toolkit Development

- UN Toolkit for Off Grid Communities

Market Assessment for Renewable Energy Technologies

- A market assessment methodology developed and piloted
- Inclusively involve CEM to understand, identify, and exploit any market opportunities that emerge.
- CEM to utilise ‘market-ready’ opportunities to connect to funding calls.
- All the technologies identified are gap areas for the country.
- Completing the market assessments fills the gap and prepares communities to pursue opportunities.
- The market assessments all have an element of training for CEM in them,
  - associated focus on capacity building for the organisation,
  - leaves CEM in a strong position to conduct further Market Assessments and act on the results of them in the future.

Purpose of Training

- Increase skills to conduct Market Assessments
- MA conducted to identify opportunities for CEM
- Conducting a MA is a consultancy service that CEM can offer
- Technical skills useful in doing feasibility studies/consultancy

Renewable Energy Technologies

- Small Wind Turbines
- Community Owned Renewable Energy Based Mini-grids
- Productive Use of Solar PV
- Solar Pumping for Potable Water
- Biogas

Small Wind Turbines

- Lead by Wind Empowerment
- Supported by Louis and Max
- Training – This week
- Data logger installation – next week
- Social and Economic Data gathering
- Report write up

Productive Use of Solar PV

- Institutional uses are currently the predominant loads for solar PV in Malawi.
- Off grid systems serving an “anchor load”, or businesses earning money from the electricity produced (productive uses of energy) tend to be more financially independent and more sustainable.
- Identify case studies of solar power for productive uses
- Determine what has worked in other countries and whether a market exists for such systems in Malawi.
- Interviews and Questionnaires conducted with community members to find out load profiles of small businesses currently connected to the grid or served by diesel generators that could be replicated in rural areas,
- Determining if a viable source of energy was present in off grid areas, what green-field businesses communities could start.

Solar Pumping for Potable Water

- An application for solar PV system for solar pumping has been identified in the Dowa region
- Market assessment completed to find out
  - the cost of implementation,
  - who will be the users of the system,
  - how it will be financed
  - who will complete the maintenance of the system.
- The market assessment can then be used as a template to be carried out in other areas for similar projects incorporating solar pumping for potable water.

Biogas

- Training given by Mzuzu University
- Evaluation carried out of systems installed during MREAP
- SUDESO (Independent Contractor) assisting with
- No specific training given this week

UN Toolkit

- Developed for UN by SG
- *"Develop and produce a community renewables toolkit which will provide rural sub-Saharan African communities with user-friendly information on the social and economic energy services opportunities available to them through new renewable electricity connections, and with guidance on how to bring these opportunities to life."*

1. Clear, concise and simple information on potential energy service opportunities for rural sub-Saharan communities. This will be expected to include:
   - Economic opportunities – business start-up (e.g. maize mill, hairdressing, mobile phone charging, mini-cinema); agriculture improvements (e.g. agro-processing, irrigation)
   - Educational benefits Health benefits – e.g. lighting for clinics enabling safer delivery of babies at night, refrigeration of medicines in clinics
   - Social benefits – e.g. television, radio, computing equipment
2. Step-by-step guidance on how to put these opportunities in place.
   - business development support,
   - sourcing funding,
   - saving money,
   - creating dedicated community or business development groups.

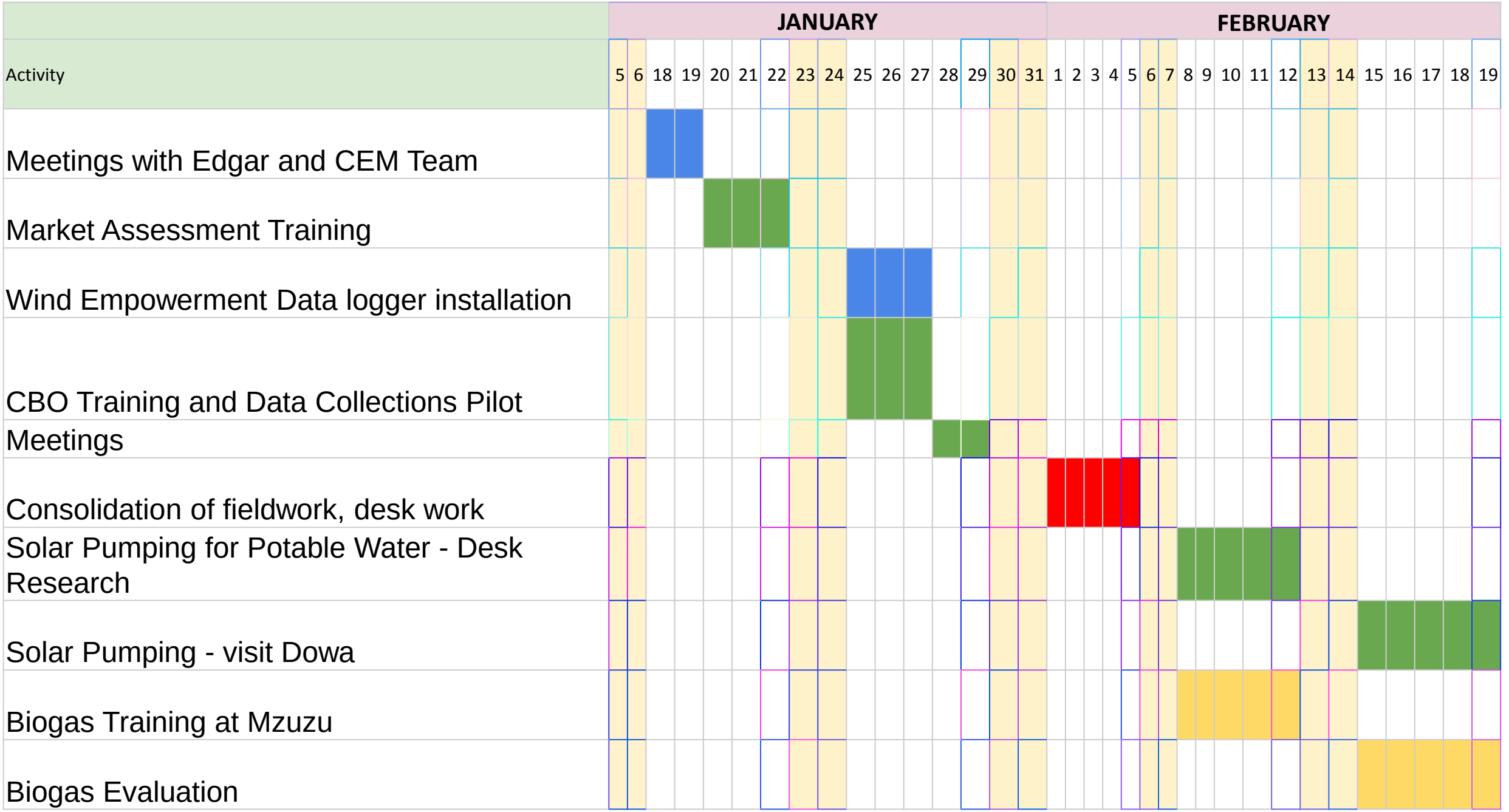
UN Toolkit

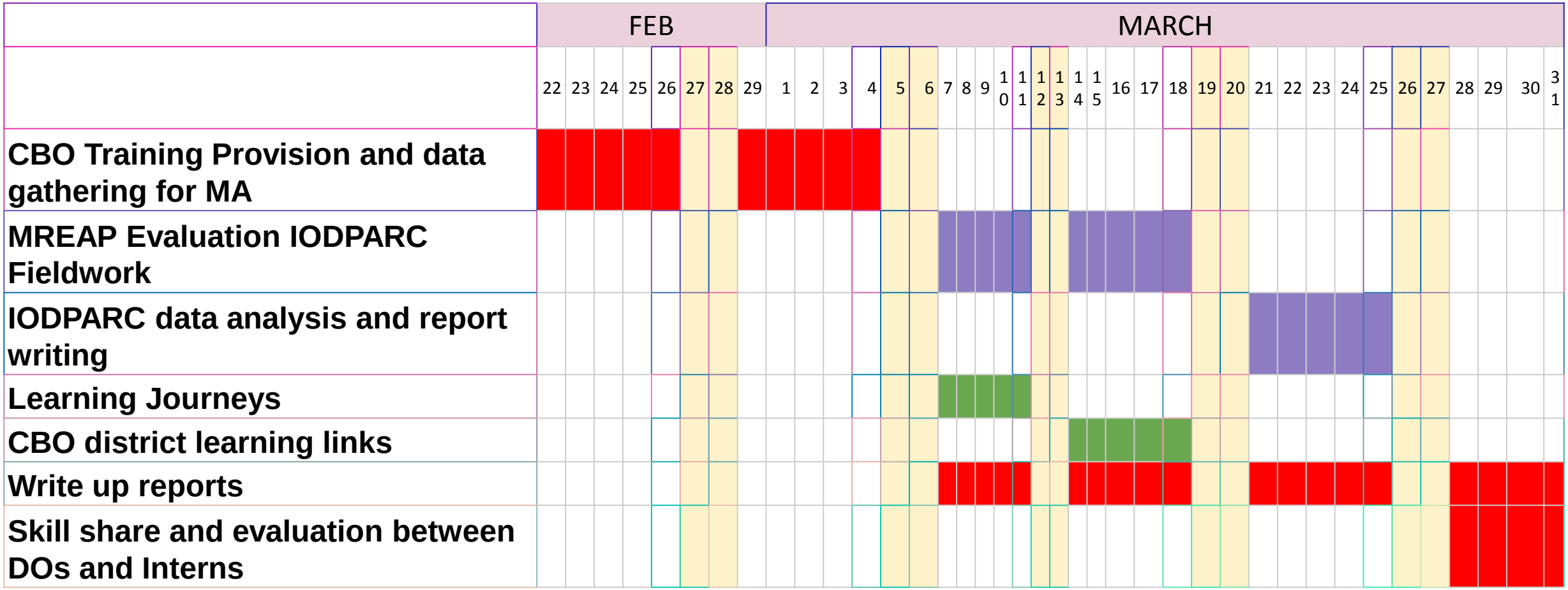
- Case studies
  - Productive Use of Energy
  - Institutional Energy (schools)
  - Household Energy
- Pictures, stories, figures
- Keep an eye out for case studies and examples throughout your work

Logical Framework (LogFrame) Summary

	Technology	Output
2.1	Small Wind Turbines	Training completed by Wind Empowerment for CEM staff members. Market Assessment for small wind turbines report delivered by Wind Empowerment. 4 Wind data loggers installed.
2.2	Community Owned Renewable Energy Mini-grids (COREMG)	Training delivered by UoS on COREMG. Report written outlining feasibility for COREMG. Report written on commercial potential of COREMG for CEM Trading.
2.3	Productive Use of Solar PV	Report written outlining feasibility for PUSPV including 4 case studies. Report written on commercial potential of PUSP for CEM Trading.
2.4	Solar Pumping for Potable Water	Report written outlining feasibility for SPPW including 2 case studies. Report written on commercial potential of SPPW for CEM Trading.
2.5	Biogas	12 biogas sites evaluated, Report written outlining feasibility for Biogas. Report written on commercial potential of Biogas or CEM Trading.

- This is what we need to deliver to SG


JANUARY
FEBRUARY
Activity
5 6 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
Meetings with Edgar and CEM Team
Market Assessment Training
Wind Empowerment Data logger installation
CBO Training and Data Collections Pilot
Meetings
Consolidation of fieldwork, desk work
Solar Pumping for Potable Water - Desk Research
Solar Pumping - visit Dowa
Biogas Training at Mzuzu
Biogas Evaluation



Ongoing:

- Community Energy Malawi Support Centre
- Development of CEM Trading Arm
- Develop a Community Renewable Energy Toolkit

Time	WED 20th	THUR 21st	FRI 22nd	
	ALL	**ALL**	**Wind Empowerment, Louis and Max**	**Aran, Berius, Memory, Chawezi, Latecia**
9.00 am – 10.30 am	Introductions and Overview - Aran	Questionnaires - Aran	Small Wind Basics and SW Market Assessment - Jon	Productive Use of Solar - Aran
Break				
11.00 am – 12.30 am	Market Assessment Basics - Jon	HOMER – Matt	Wind Resource Assessment - Matt	Solar Pumping - Aran
Lunch				
1.30 am – 3.00 pm	Energy Landscape in Malawi -	GIS - Madis	Datalogging - Matt	Minigrids - Aran
Break				
3.30pm – 5.00 pm	Market Assessments of Other technologies in Malawi -	GIS/HOMER practical – Madis, Matt, Aran, Jon	Skill share between groups and next Steps – DO's and Interns present	

Date	Day	Aran and Edgar	CEM	Wind Empowerment
20	Wed	Training		
21	Thur	Training		
22	Fri	Training		
23	Sat	Additional training/meetings if required		
24	Sun	Day Off		
25	Mon	Training, Dowa	Louis and Max with WE Other staff with Aran	Data logger installation, Dowa
26	Tue	Market Assessment Research, Dowa	Louis and Max with WE Other staff with Aran	Data logger installation, Mzimba
27	Wed	Training, Lilongwe rural	Louis and Max with WE Other staff with Aran	Meetings and planning
28	Thur	Market Assessment, Lilongwe rural	With Aran	Data Gathering
29	Fri	Meetings and planning next steps		
30	Sat	Day Off		
31	Sun	Travel Home	Day Off	Travel Home

Reporting

- Think Evidence
- Make Notes
- Write up as you go
- Take plenty of Pictures
- Useful for SG, but also for funding bids

Summary

- There are many options to take CEM forward
- It is up to you (with our help) to decide
  - What to do
  - How to take it forward
- An exciting time for CEM!

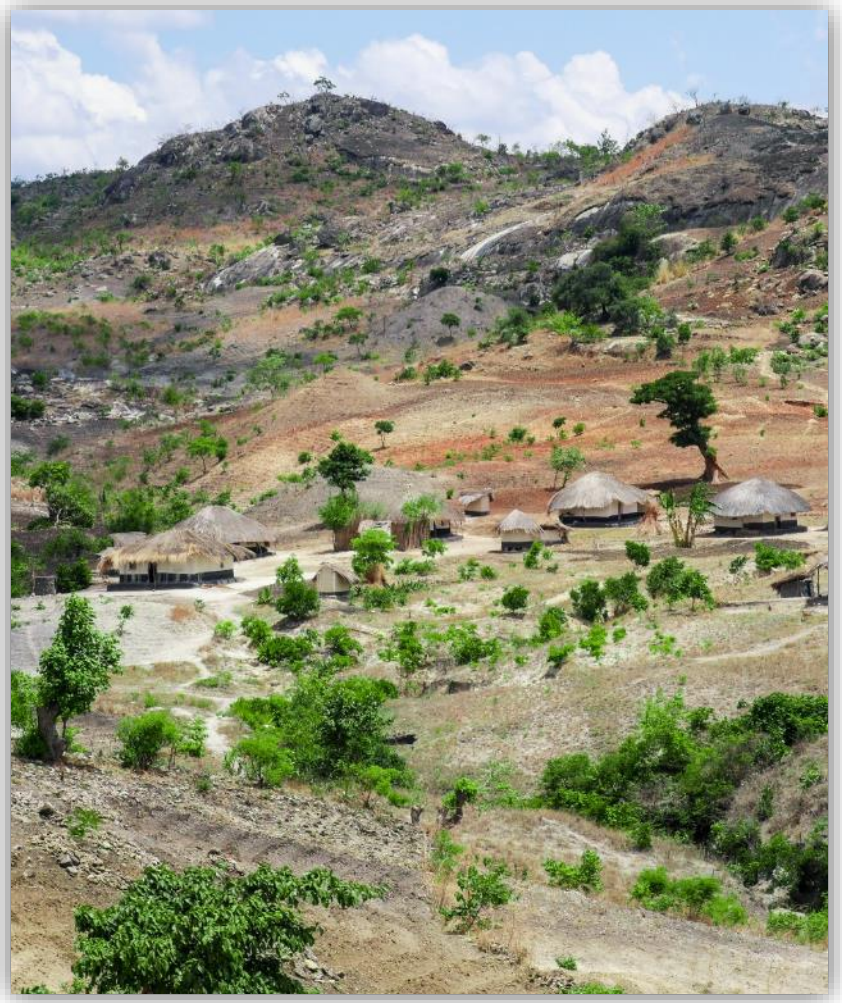
Questions?

Country overview

- Landlocked country in SEA, with an area of 118,484 sq.km;
- Has a population of approx. 14 million, growing at 2.7% annually- 85% rural based;
- Agro based economy which has been growing steadily- recently seeing increasing contribution from mining sector;
- Ranked 171/181 UNHDR (2011);
- Will probably meet 5/8 MDGs by 2015.

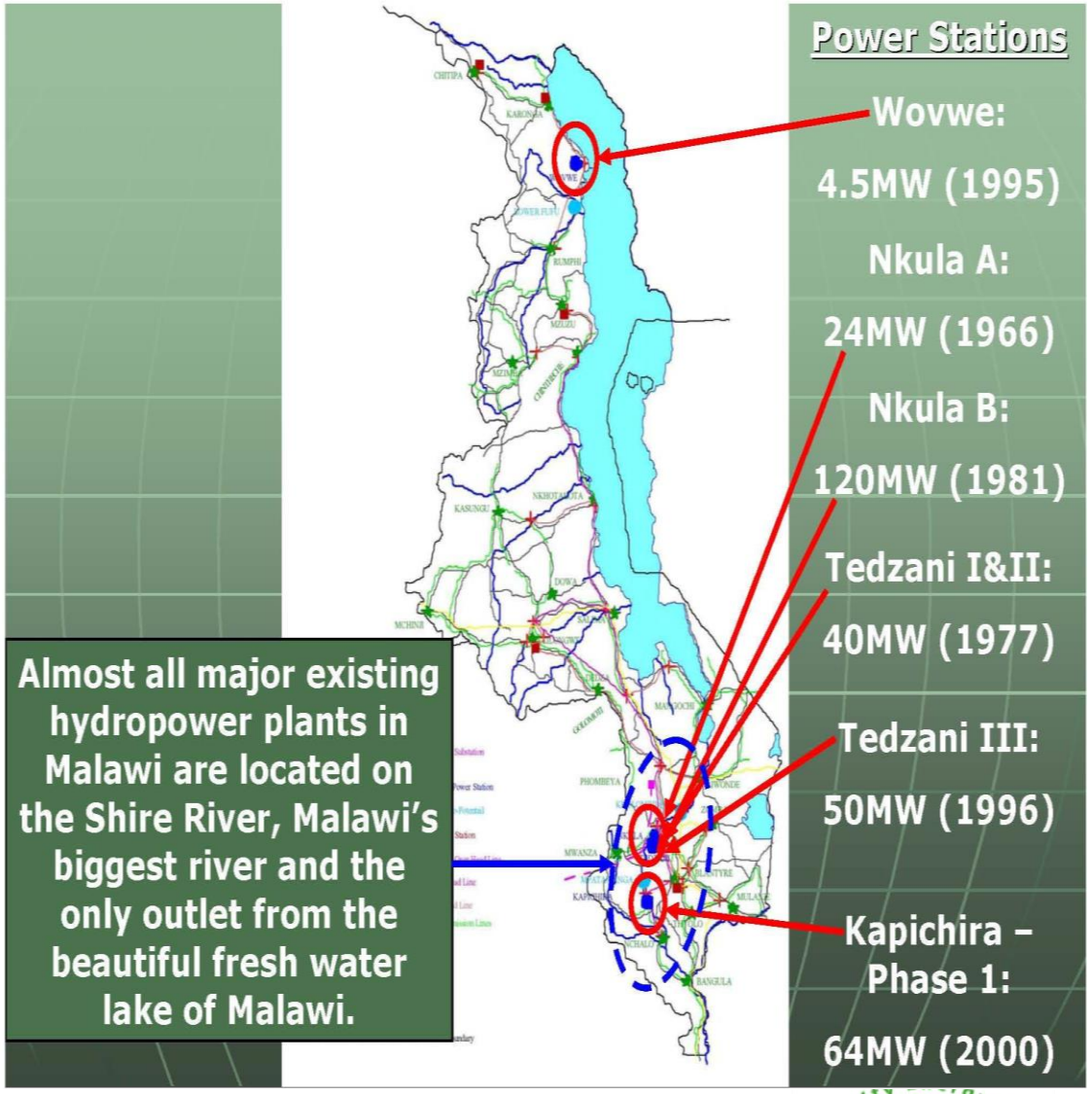
Energy in Malawi

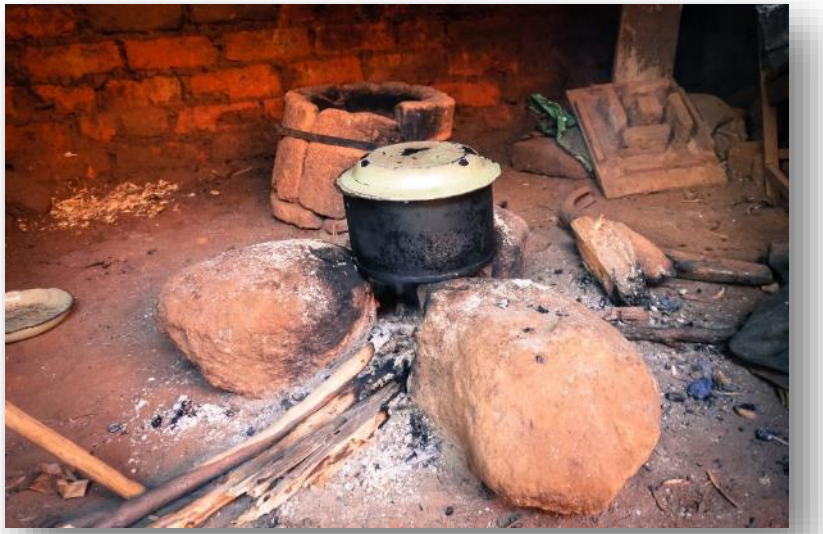
- 9% / 1% (Overall/Rural) Electricity Access = 13.6m without
- Development virtually impossible without energy – health, education, business development, tourism, infrastructure all depend on it → ***BKM Golden Thread***
- Malawi has considerable renewable resources that give it an opportunity to meet current challenges



Energy in Malawi

- Grid electricity is principally hydro along the middle Shire River- an outlet of L Malawi;
- Generation capacity is at 282.5MW against suppressed demand of 344.





University of Strathclyde Engineering

CEM Market Assessment Training January 2015

Drive for Energy Access

- UN SE4ALL: Renewable Energy, ⬆Efficiency, Universal Access ⬆
- IEA: $50 billion investment needed per year until 2030!
- Benefits: “Cross-cutting” benefits, HDI
- Approaches: grid extension, mini-grids, SHS, PSPs
- Leap-frogging?

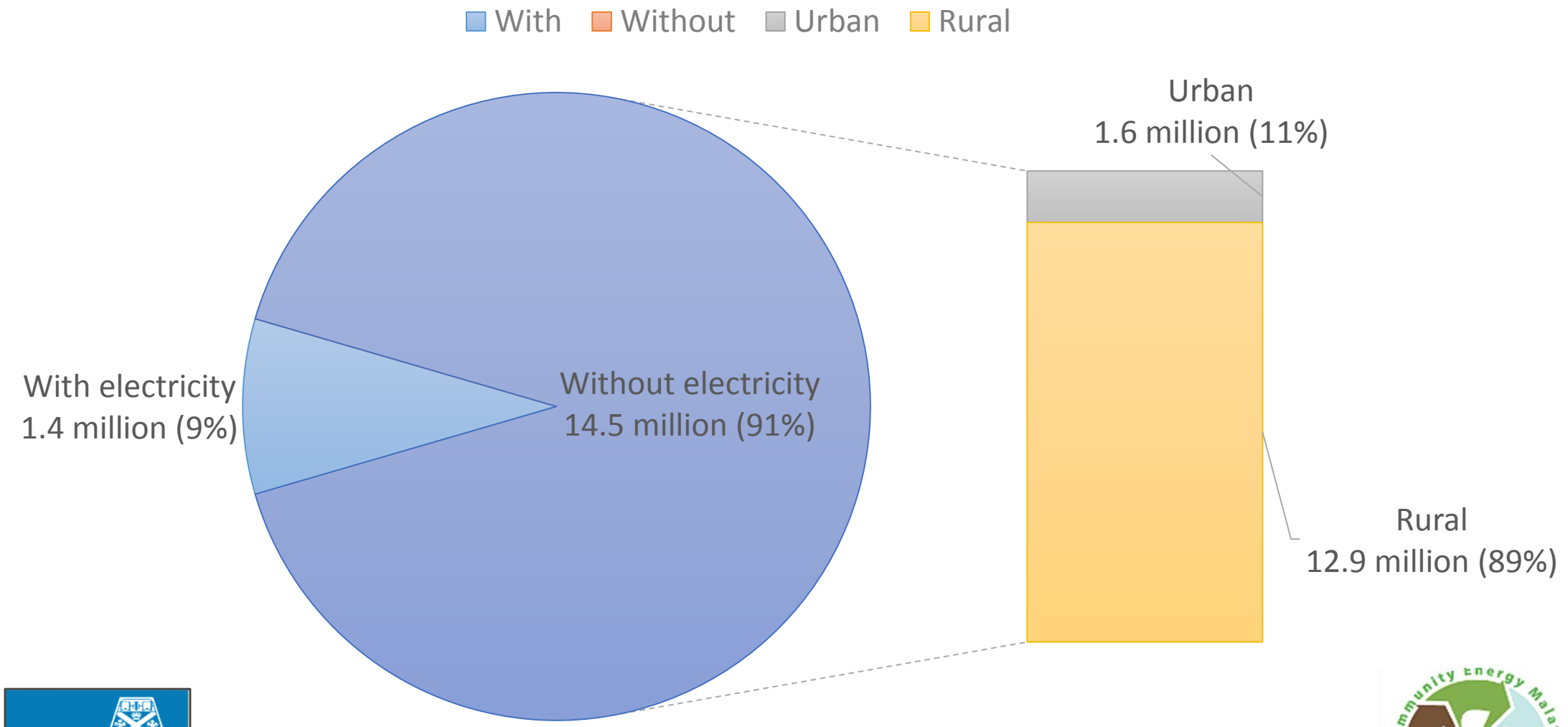
	Population living at less than 5km from medium-voltage line	**Population living at more than 5km from medium-voltage line**	**Total**
population living where density <250hab/km²	2,285,822 14% **SA?**	4,508,842 27% **SA**	6,794,664 40%
population living where density >= 250hab/km²	5,437,076 32% **Extension of grid**	4,545,807 27% **Mini-grids**	9,982,883 60%
Total	7,722,898 (46%)	9,054,649 (54%)	16,777,547

(DFID 2013)

How is electricity deficit in Malawi being addressed?

- Government of Malawi extending grid – primarily with hydro – but slow and likely many decades before whole population connected
- Power sector reform underway
- International donors: funding off-grid and mini-grid projects across the country
- Huge opportunities for hydro, solar and potentially for wind – in off-grid and mini-grid development

Access to Electricity in Malawi



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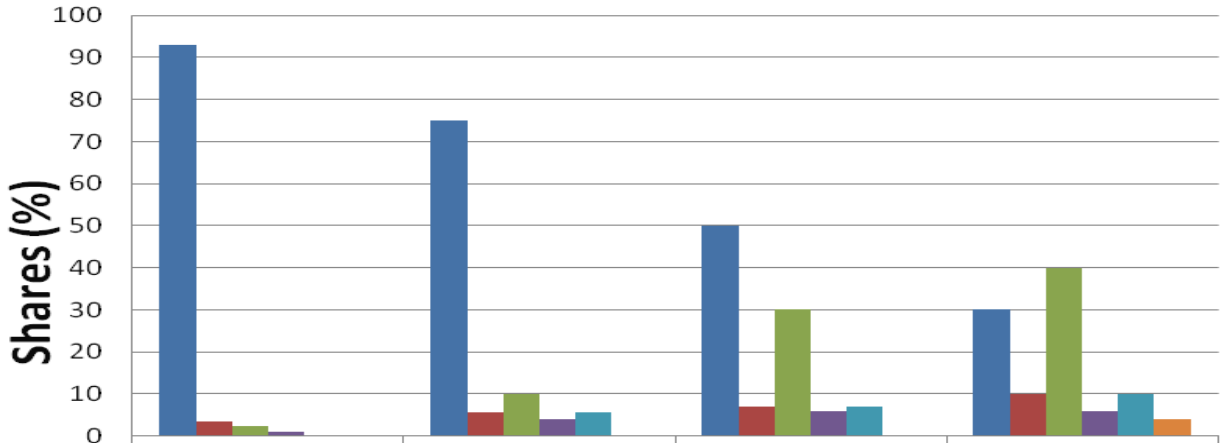
CEM Market Assessment Training January 2015

Community Energy Malawi

Energy situation

- Malawi's energy mix is biased towards biomass.
- Current status is probably closer to 2000 scenario than 2010 scenario



	2000	2010	2020	2050
Biomass	93	75	50	30
Liquid Fuels	3.5	5.5	7	10
Electricity	2.3	10	30	40
Coal	1	4	6	6
Renewable Energy Technologies	0.2	5.5	7	10
Nuclear	0	0	0	4

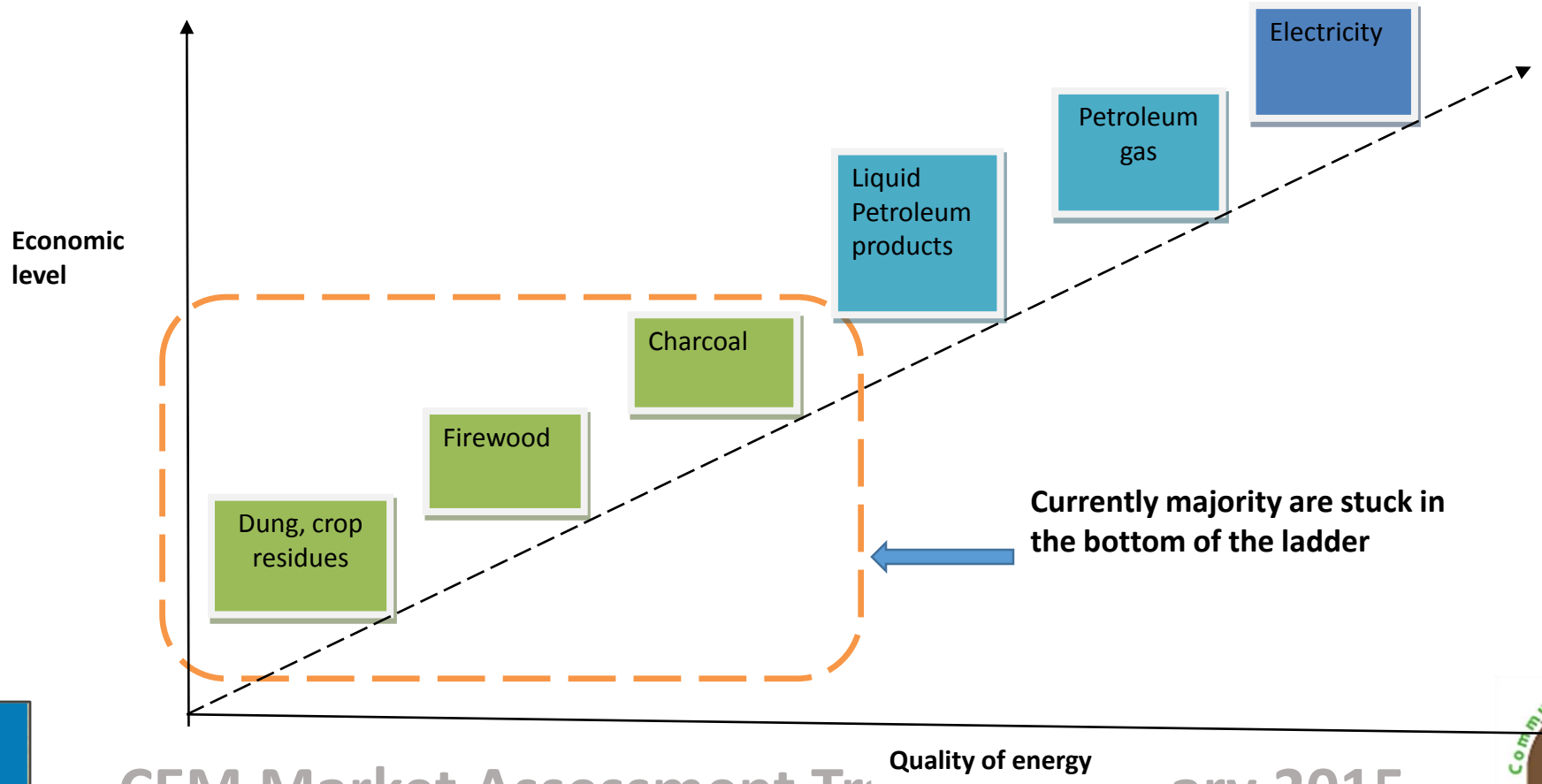
Energy projections- MEP (2003)

Energy Access

- The 2003 MEP objective was clear;
- The situation on the ground has not changed much;
- Malawi has one of the lowest grid electricity access rate 9% (with rural at 1%) against sub-Saharan average of 25% (10%);
- Various programmes in the past have promoted us of solar PV system in rural areas;
- Firewood & charcoal are mostly from unsustainable sources resulting in heavy deforestation.

Energy Access

- The majority of our folks have no/few alternatives to move to as they attempt to climb the energy ladder



Sustainable Energy for All

- Sustainable Energy for All (SE4All) is a global initiative led by the United Nations and the World Bank to achieve universal energy access, improve energy efficiency and increase use of renewable energy.

- The initiative mobilizes action from in support of three inter-linked objectives:
  - Providing universal access to modern energy services;
  - Doubling the global rate of improvement in energy efficiency; and
  - Doubling the share of renewable energy in the global energy mix

- Both developed countries and more than 85 developing countries - including Malawi - have partnered with SE4All to advance the three objectives at a country level.

- SE4All is set up as a multi-stakeholder partnership between governments, the private sector and civil society.

Malawi Renewable energy

- Malawi is endowed with a number of renewable energy sources;
- Most of firewood and charcoal used in MW are from ‘non-renewable sources’;
- BARREM project primed the Solar PV market;
- Micro-Mini hydro: progress is slow but positive;
- Wind energy: progress is slow- work on wind mapping is on going;
- Geothermal- some studies have been initiated (Mzuni);
- Solar thermal application still low

SE4ALL Goals

Global targets

- Ensure universal access modern energy services;
- Double the rate of improvement in energy efficiency;
- Double the share of RE in the global energy mix.

• MW's specific targets

- To improve access to electricity to 15% by 2015, 20% by 2020 and 30% by 2030.
- To improve the use of energy efficient end-use devices by 1% by 2015, 5% by 2020 and 10% by 2030.
- To increase the contribution of RES in the mix by 1% by 2015, 3% by 2020 and 6% by 2030.

Levels of electrification—it is not all or nothing!

ATTRIBUTES	Tier-0	Tier-1	Tier-2	Tier-3	Tier-4	Tier-5
Peak Available Capacity (W_{eq})	-	>1	>20	>200	>2000	>2000
Duration (Hrs)	-	≥4	≥4	≥8	≥16	≥22
Evening Supply (Hrs)	-	≥2	≥2	≥2	≥4	≥4
Formality (Legality)	-	-	-	√	√	√
Quality (Voltage)	-	-	-	√	√	√
Appliances and services	Task Lighting	Task Lighting AND Phone Charging	General Lighting AND Television AND Fan	Tier-2 AND any low-power appliances	Tier-3 AND any medium-power appliances	Tier-4 AND any high-power appliances
Possible electricity supply technologies	Dry Cell (DC) Solar Lantern (DC) Recharg. Batteries (DC)	Solar Lantern (DC) Recharg. Batteries (DC)	Recharg. Batteries (DC) SHS (DC)	SHS (DC or AC) Micro-grid (DC or AC) Mini-Grid(AC)	Mini-Grid(AC) Grid (AC)	Mini-Grid(AC) Grid (AC)

Concluding remarks

- There is need to address **HR and institutional capacity** constraints at various levels (this should have been highlighted as one of the cross cutting barriers in 3.4);
- How do we deal with issues of **gender and vulnerable groups-** do they require specific strategies?
- **Social and/or cultural barrier** to technology adoption…may be the reason why some technologies fail to take root despite a mix of push and pull strategies?
- How do we deal with the issue of **climate change and sustainable energy**?
- Malawi has implemented a number of programmes/ projects in the line of SE4ALL initiatives – but do we have transferable **local lessons/ best practices** that we can adopt to scale-up the activities under SE4ALL programme?