

THE CONCEPT OF THE MTF AND ITS RELEVANCE FOR IMPACTS

LESSONS LEARNT FROM THE ENERGISING DEVELOPMENT
PROGRAM (ENDEV) – ENDEV.INFO

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STARTING POINT OF THE MTF CONCEPT

SUSTAINABLE ENERGY FOR ALL (SE4ALL) INITIATIVE launched in 2011



Achieve 'universal access to modern energy services by 2030'

But what does 'access to modern energy services' mean?

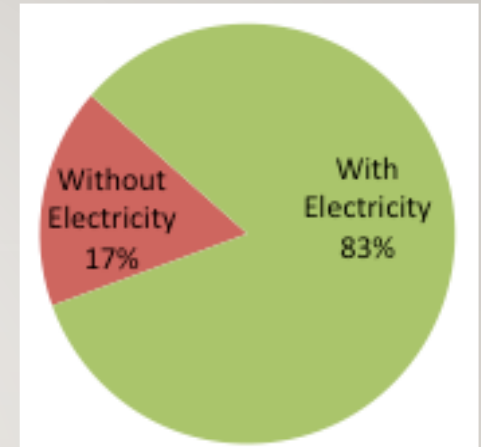
- There was/is no universally accepted definition of access
- No clear methodology of measuring any definition in a precise manner

*MTF = **MULTI-TIER FRAMEWORK** TO MONITOR AND EVALUATE ENERGY ACCESS BY FOLLOWING A MULTIDIMENSIONAL APPROACH

CLASSICAL ACCESS DEFINITION

Binary definition:

‘having electricity or not having electricity’



Underlying data:

- household surveys (Does your household have an electricity connection? or What is the primary source of lighting?)
- household connection data obtained from utilities
- grid extension and residential consumption information at the country level

WEAKNESSES OF CLASSICAL ACCESS DEFINITION

Household surveys may fail because:

- Off-grid HH may have more reliable and sustainable electricity than connected HH
- HH may be connected but is not using electricity as primary source of lighting due to lack of reliable supply

Connection data obtained from utilities may fail because:

They do not capture

- decentralized forms of electrification in rural areas and
- illegal access to electricity in urban areas.

Grid extension and residential consumption information at the country level may fail because:

- Grid connection is often not affordable even if the grid is close

NEW DEFINITION

Access to energy is the ability to avail energy that is adequate, available, reliable, of good quality, affordable, legal, convenient, healthy & safe, for all required energy services across household, productive and community uses.*

7 AFFORDABLE AND
CLEAN ENERGY



SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all

Attributes of the energy supply**

1. Capacity
2. Duration/
Availability
3. Reliability
4. Quality
5. Affordability
6. Legality
7. Convenience
8. Health and Safety

THE MTF FOR HOUSEHOLDS



		TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5	**
ATTRIBUTES	1. Capacity	Power ¹	Very Low Power Min 3 W	Low Power Min 50 W	Medium Power Min 200 W	High Power Min 800 W	Very High Power Min 2 kW	
		AND Daily Capacity	Min 12 Wh	Min 200 Wh	Min 1.0 kWh	Min 3.4 kWh	Min 8.2 kWh	
		OR Services	Lighting of 1,000 lmhrs per day and phone charging	Electrical lighting, air circulation, television, and phone charging are possible				
	2. Duration	Hours per day	Min 4 hrs	Min 4 hrs	Min 8 hrs	Min 16 hrs	Min 23 hrs	
		Hours per evening	Min 1 hrs	Min 2 hrs	Min 3 hrs	Min 4 hrs	Min 4 hrs	
	3. Reliability					Max 14 disruptions per week	Max 3 disruptions per week of total duration < 2 hours	
	4. Quality					Voltage problems do not affect the use of desired appliances		
5. Affordability					Cost of a standard consumption package of 365 kWh per annum is less than 5% of household income			
6. Legality					Bill is paid to the utility, prepaid card seller, or authorized representative			
7. Health and Safety					Absence of past accidents and perception of high risk in the future			

* source: worldbank, picture taken from <https://www.lightingafrica.org/improving-accuracy-impact-reporting-multi-tier-framework/>

** source: Beyond Connections: Energy Access Redefined, ESMAP

POLITICAL DIMENSION OF THE MTF

Binary metrics still form the base for tracking SDG7

MTF is a complementary approach allowing governments:

- To define minimum access targets for poor household, productive and community use
- To define general access targets covering all households, enterprises and institutions in a given region based on a detailed gap analysis and a calculated index



LEAVE NO ONE BEHIND GOAL

Everybody should have access to electricity at level I+

Pro-argument - positive impacts of tier I access are significant and visible such as

- HH can reduce their expenditures on kerosene and dry cell batteries
- HH are less exposed to fumes of kerosene lamps, causing coughing and cold/flu symptoms
- HH are not subject to burns or home fires from the kerosene lamps
- HH feel more comfortable and safe bright light (general welfare)
- Studying conditions for children are better and more flexible
- Daily housework task can be arranged more flexible
- Mobile phones can be used more frequently for private and commercial purposes

Con-argument – these effects are too small

- If you cannot power a TV, a fridge, a stove and an air conditioner, it cannot be regarded as access to modern energy.

DEVELOPMENT GOAL FOR THE SECTOR

Energy Access Index shall increase by 0.8 (e.g. from 2.7 to 3.5)

Pro-argument – it promotes a balanced development of the sector

- Supporting only access at high level neglecting the many poor will not lead to the intended high index
- Supporting only access at low level neglecting the higher tiers will also affect the increase of the index

Con-argument – the index is giving too much weight to the residential sector

- Residential electricity accounts for only about 5% of global energy consumption and one-quarter of the world's electricity
- Basic household access cannot solve energy poverty in industry, commerce, agriculture and transport.

MTF FOR PRODUCTIVE USE

		TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5	
1. Capacity	Electricity	Power		Min 3 W	Min 50 W	Min 200 W	Min 800 W	Min 2 kW
		Daily supply capacity		Min 12 Wh	Min 200 Wh	Min 1.0 kWh	Min 3.4 kWh	Min 8.2 kWh
		Typical source		Solar lanterns	Solar home systems	Generator or mini-grid	Generator or grid	Grid
	Non-electric				Available non-electric energy partially meets requirements	Available non-electric energy largely meets requirements	Available non-electric energy fully meets all requirements	
Both				No relevant application is absent solely due to energy supply constraints				
2. Duration of daily supply	Electricity		Min 2 hrs	Min 4 hrs	Min 50% of working hours	Most of working hours (Min 75%)	Almost all of working hours (Min 95%)	
	Non-electric				Available non-electric energy partially meets requirements	Available non-electric energy largely meets all requirements	Available non-electric energy fully meets all requirements	
	Both				Longer working hours are not prevented solely by lack of adequate energy (capacity or duration)			
3. Reliability						No reliability issues that have severe impact	No reliability issues or little impact	
4. Quality						No quality issues that have severe impact	No quality issues or little impact	
5. Affordability						Variable cost of energy is less than two times the grid tariff	Variable cost of energy is less than grid tariff	
6. Legality						Energy bill is paid to the utility/pre-paid card seller/authorized representative/legal market operator		
7. Convenience						Time and effort in securing and preparing energy does not cause severe impact	No convenience issues or little impact	
8. Health (Indoor air quality from use of fuels)	PM2.5 (µg/m3)		[To be specified by competent agency such as WHO]	[To be specified by competent agency such as WHO]	[To be specified by competent agency such as WHO]	< 35 (WHO, IT-1)	< 10 (WHO Guideline)	
	CO (mg/m3)					<7 (WHO Guideline)	<7 (WHO Guideline)	
	OR Use of Fuels (BLEENS)			Use of non-BLEENS solutions (if any) for heating in the open or with smoke extraction		Use of BLEENS or equivalent solutions only (if any)		
9. Safety						Energy supply solutions have not caused any accidents over the past year that required professional medical assistance	Energy supply solutions have not caused any accidents over the past year	

ATTRIBUTES

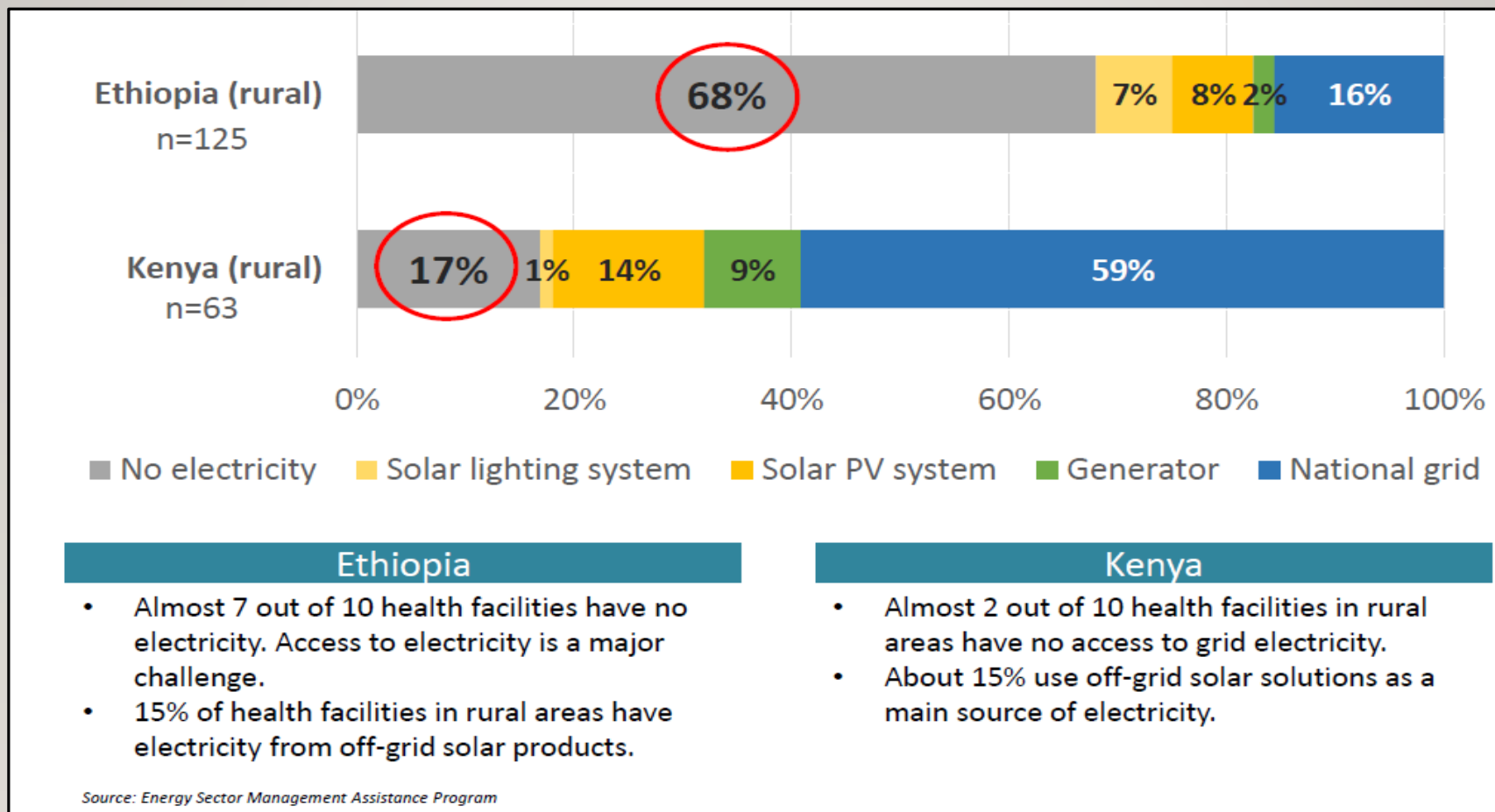
MTF FOR COMMUNITY USE

			TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5	
1. Capacity	Electricity	Power		Min 3 W	Min 50 W	Min 200 W	Min 800 W (Min 2 kilowatt-hours (kW) for institutions)	Min 2 kW (Min 10kW for institutions)	
		Daily supply capacity		Min 12 Wh	Min 200 Wh	Min 1.0 kWh	Min 3.4 kWh	Min 8.2 kWh	
		Typical source		Solar lanterns	Solar home systems	Generator or mini-grid	Generator or grid	Grid	
	Nonelectric						Available nonelectric energy partially meets requirements	Available nonelectric energy largely meets requirements	Available nonelectric energy fully meets all requirements
	Both						No relevant application is absent solely due to energy supply constraints		
2. Duration of Daily Supply	Electricity			Min 2 hrs	Min 4 hrs	Min 50% of working hours	Most of working hours (Min 75% of working hours)	Almost all of working hours (Min 95% of working hours)	
	Nonelectric						Available nonelectric energy partially meets requirements	Available nonelectric energy largely meets all requirements	Available nonelectric energy fully meets all requirements
	Both						Longer working hours are not prevented solely by lack of adequate energy (capacity or duration)		
3. Reliability								No reliability issues that have severe impact	No reliability issues or little impact
4. Quality								No quality issues that have severe impact	No quality issues or little impact
5. Affordability								Variable cost of energy is less than 2 times the grid tariff	Variable cost of energy is less than grid tariff
6. Legality								Energy bill is paid to the utility, prepaid card seller, authorized representative, or legal market operator	
7. Convenience								Time and effort in securing and preparing energy does not cause major inconvenience	No convenience issues or little impact
8. Health and Safety	Health: Use of fuels (BLEENS)				Use of non-BLEENS solutions (if any) for heating in the open or with smoke extraction		Use of BLEENS or equivalent solutions only (if any)		
	Safety							Energy supply solutions have not caused any accidents over the past year that required professional medical assistance.	Energy supply solutions have not caused any accidents over the last one year

ATTRIBUTES

ACCESS TO ELECTRICITY OF HEALTH FACILITIES

Uganda: Access to basic electricity HC II (41%), HC III (72%), HC IV (100%)

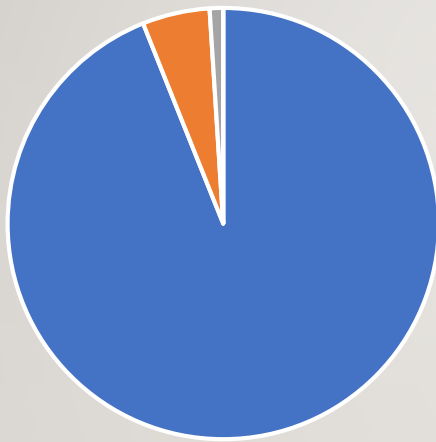


INDICATIVE ELECTRIC DEVICES AND POWER REQUIREMENTS FOR HEALTH SERVICES

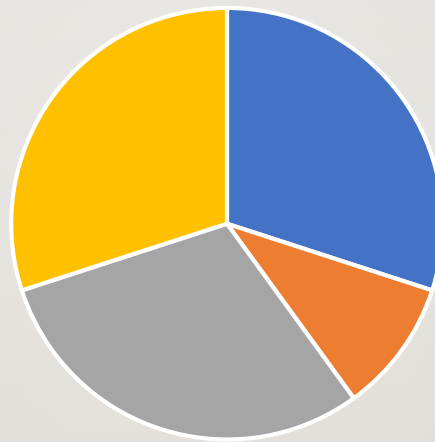
Level	Electric Devices	Peak Power Consumption	Mean daily power consumption
District (Hospital)	air conditioner, electric space heater, oxygen concentrator, pulse oximeters, suction apparatus, Vacuum aspirator, Neo-natal incubator, Ultrasound, hematology analysers, fluorescens microscop, incubator, ELISA test reader, electrocardiograph, defibrillator, anaesthesia machine, (X-ray machine)	10.000 - 20.000 W	30 - 75 kWh/d
Sub-regions (HC)	water purifier, nebulizer, neo-natal infant warmer, fetal heart monitor (Doppler), centrifuge,	1.500 - 2.500 W	3 - 6 kWh/d
Communes (HC)	Basic lighting, Mobile phones/tablets, PC/laptops, printer, VHF radio receiver, ceiling fan, refrigerator, sterilizer/autoclave, water pump, light microscop	500 - 1.200 W	1 - 3 kWh/d
Village (Health workers)	Mobile phone, tablets (charging)		20 Wh/d

MOST COST EFFICIENT POWER SUPPLY FOR HEALTH FACILITIES

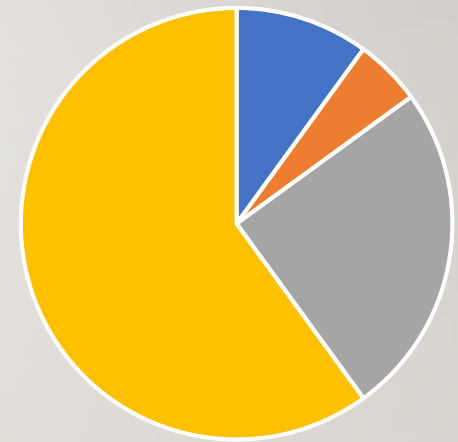
Hospital



HC sub-regional



HC communes



■ grid ■ mini-grid ■ PV hybrid ■ PV ■ grid ■ mini-grid ■ PV hybrid ■ PV ■ grid ■ mini-grid ■ PV hybrid ■ PV

PRODUCTIVE USE IN RURAL AREAS



Farming activities

- agriculture,
- livestock,
- forestry
- fishing



Non-farm activities

- manufacturing (metal, wood, leather, pottery, tailoring)
- construction,
- commerce
- transportation and storage
- recreation, entertainment
- food services
- services (information, communication, finance, insurance, administration, education, health and social work, professional and technical services)
- other activities (tourism, Real Estate, mining, quarrying, electricity, water supply and accommodation)



factors influencing work performance

- education,
- Knowledge
- information
- health
- working environment
- social recognition and
- self-esteem

ENERGY NEEDS FOR PRODUCTIVE USE

The energy needs of the different areas of productive use comprise six basic types of energy applications:

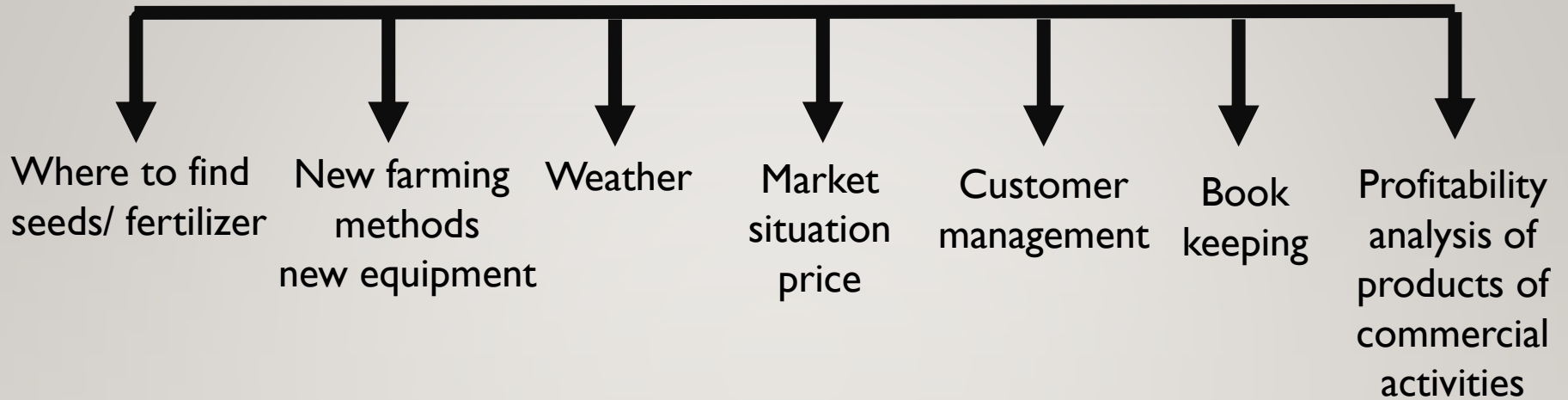
- (1) Lighting
- (2) Information and Communication Technologies
- (3) Motive power
 - a) low power
 - b) medium power
 - c) high power
- (4) Space heating
- (5) Product heating
- (6) Product cooling (adsorption/absorption)

Energy requirements depend on:

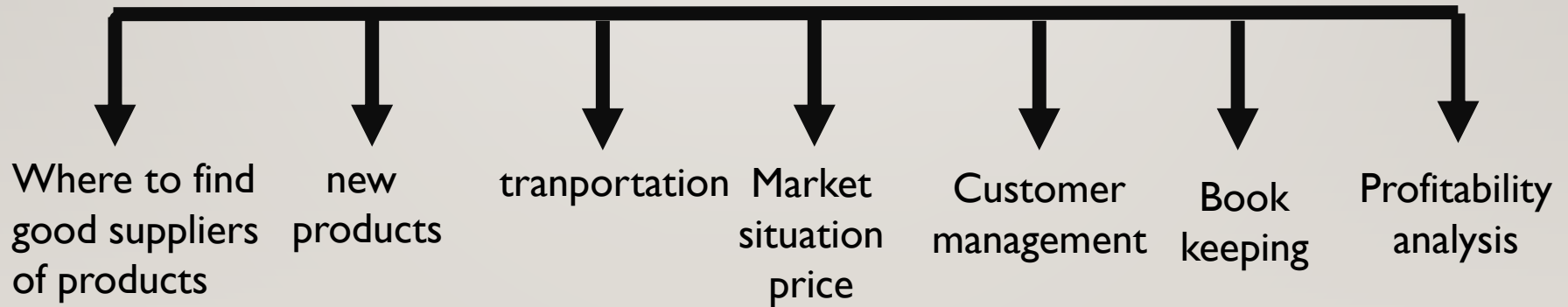
- What are the key factors for achieving a higher business performance?

ROLE OF INFORMATION AND COMMUNICATION

Agricultural Activities

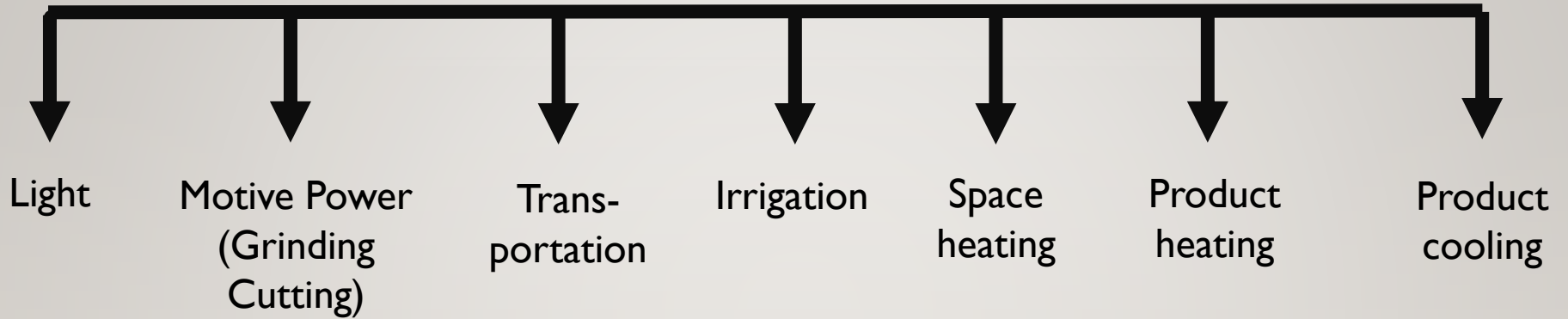


Small village stores

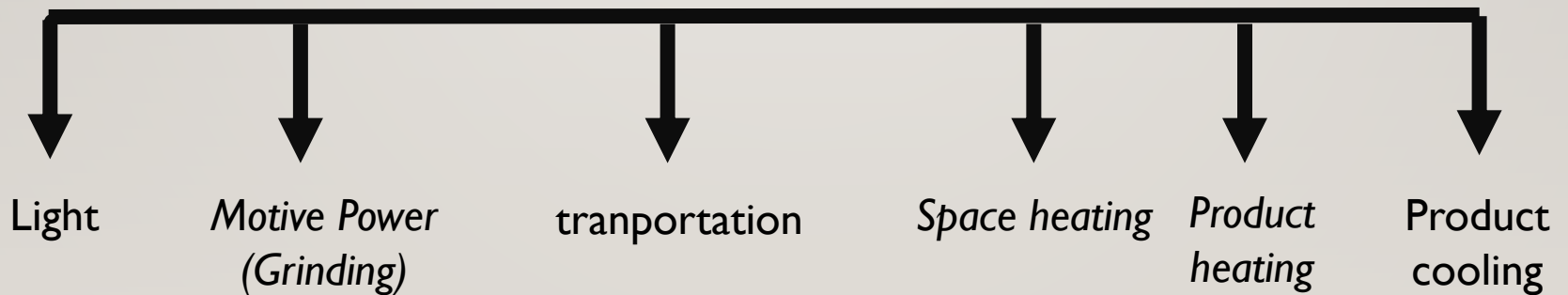


ADDITIONAL ENERGY NEEDS

Agricultural Activities



Small village stores



MTF FOR PRODUCTIVE AND COMMUNITY USE

Attribute	Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
capacity		Energy meets some basic requirements	Energy partially meets the requirements	Energy largely meets the requirements	Energy fully meets the requirements	Energy is available more than currently required
availability		25% of working hours	50% of working hours	75% of working hours	All working hours	All working hours

GENERAL CONCLUSIONS

- Assessment of the level of access to energy for productive and community use (MTF) should depend on specific energy requirements and availability of different forms of energy (electricity, mechanical energy, thermal energy)
- Economic performance and social services can be significantly improved even with low amounts of energy
- Energy access requires additional complementary measures to stimulate rural development and improved social services (integrated approach – for example www.produse.org)

Thank you very much for your attention

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