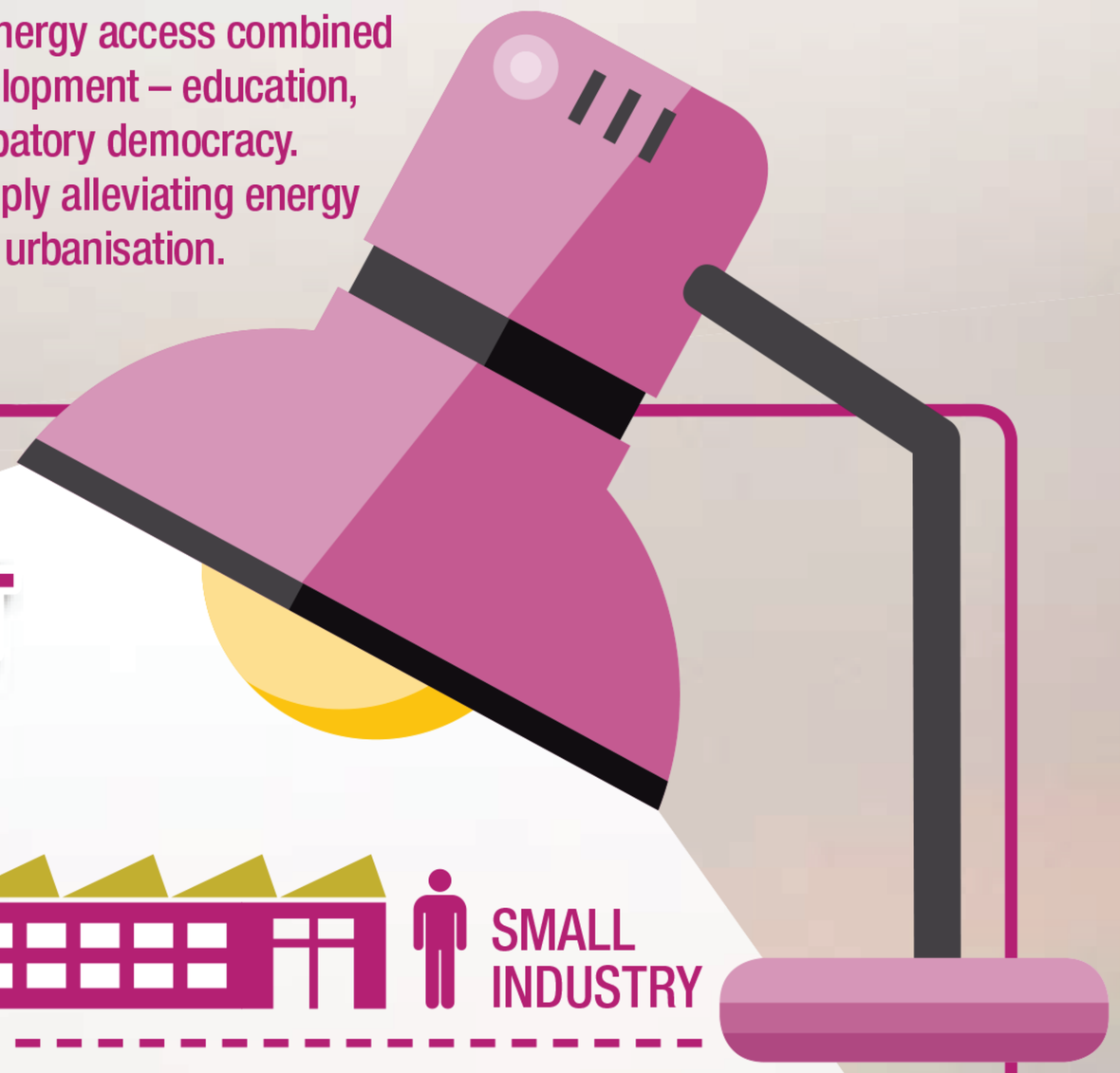
SMART VILLAGES:
NEW THINKING FOR OFF-GRID COMMUNITIES WORLDWIDE

SMART VILLAGES
New thinking for off-grid communities worldwide

Smart Villages is a new global initiative exploring the concept that energy access combined with modern technology can as major catalysts for sustainable development – education, health, food security, productive enterprise, environment and participatory democracy. Through Smart Villages we thus aim to move the debate beyond simply alleviating energy poverty by providing a real alternative to the seeming inevitability of urbanisation.



SMART VILLAGES - THE STARTING POINT

TYPICAL ENERGY USE IN A MEDIUM SIZED EAST AFRICAN VILLAGE

SMALL AND MICRO ENTERPRISES

Customer Type		Total Consumption (kWh/day)	Total Consumption per customer (kWh/day)
Retail & repair shops	64	82.96	1.30
Grain Mills	3	72.28	24.09
Petrol stations and welding garages	7	43.53	6.22
Bars, lodgings and hotels	5	39.43	7.89
Carpentry workshops	2	18.07	9.04
Small tea/ food café	20	9.86	0.49
(sub)total	101	266.13	

HOUSEHOLD

Customer Type		Total Consumption (kWh/day)	Total Consumption per customer (kWh/day)
High-demand households (>2.92 kWh/day)	23	108.42	4.71
Medium-demand households (0.7 - 2.89 kWh/day)	22	43.37	1.97
Low-demand households (0 - 0.69 kWh/day)	60	47.31	0.79
(sub)total	105	199.10	

SMALL INDUSTRY

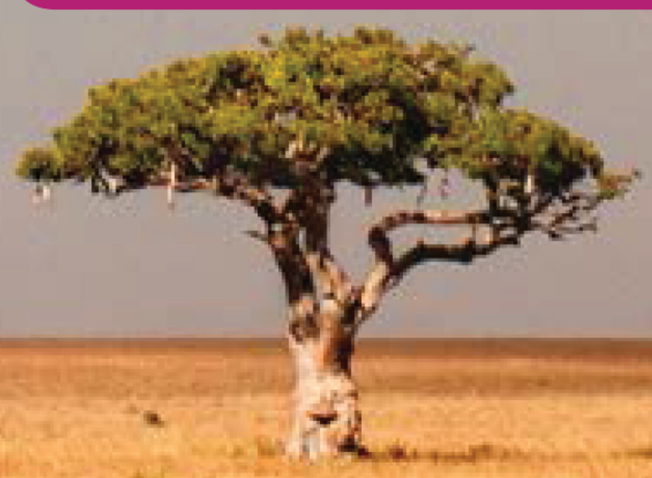
Customer Type		Total Consumption (kWh/day)	Total Consumption per customer (kWh/day)
Cotton ginnery	1	36.96	36.96
(sub)total	1	36.96	

INSTITUTIONS

Customer Type		Total Consumption (kWh/day)	Total Consumption per customer (kWh/day)
Secondary school	1	88.71	88.71
Hospital	1	23.00	23.00
Church/Mosque	4	16.26	4.07
Cell phone company	1	6.57	6.57
NGOs	2	4.93	2.47
Youth polytechnic	1	4.11	4.11
Post Office	1	4.11	4.11
Police station	1	2.96	2.96
Commercial bank	1	2.46	2.46
District Officer's Office	1	2.46	2.46
(sub)total	14	155.57	

ENERGY REQUIREMENTS: MPEKETONI VILLAGE, KENYA

Data based on Kirubi et al. (2009)



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THE BASICS

ENERGY USE (HOUSEHOLD-LEVEL)

Sources: energyusecalculator.com and nvenergy.com

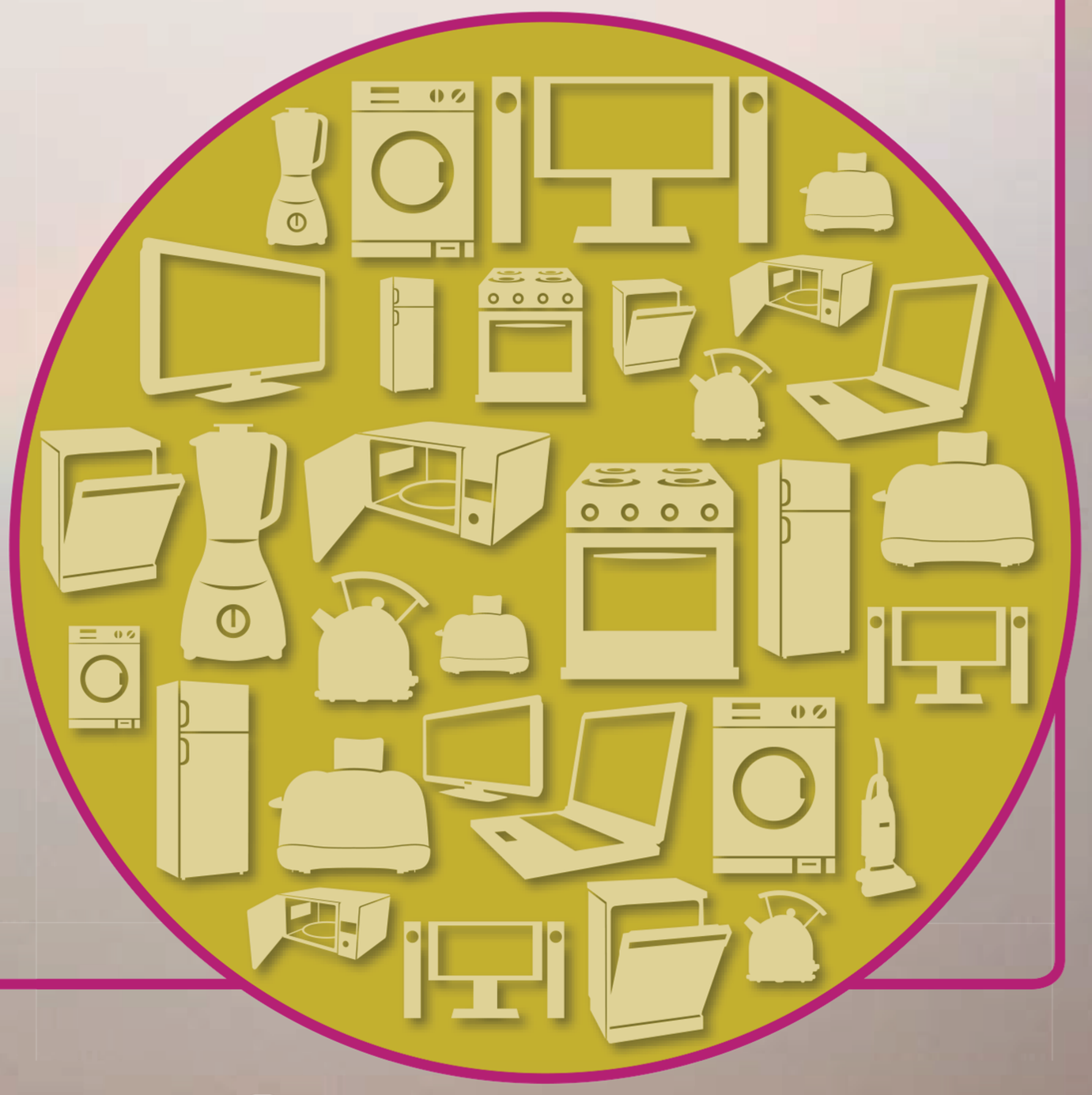
Appliance	Average energy use (kWh/day)
CFL lightbulab	0.07
Incandescent lightbulb	0.3
22” LCD/LED Display	0.15
CRT display monitor	0.38
Desktop computer	0.60
Laptop	0.36
Wi-Fi router	0.14
Printer	0.01
Cell phone charger	0.01
Electric furnace (central heating system)	36
Space heater	7.5
Water heater	12
Central air conditioner	10.5
Air conditioner	3
Washing machine	0.75
Clothes dryer	3
Electric cooking stove top	3
Oven	2.4
Dishwasher	1.8
Freezer (stand-alone)	4.8
Refrigerator	4.32
Coffee maker	0.26
Microwave	0.6
Electric iron	0.28
Sewing machine	0.075
Vacuum	0.35
Ceiling fan	0.22

THE SUPPLY OPTIONS

ELECTRICITY SUPPLY OPTIONS TO GENERATE 5 KWH/DAY

Sources: Based on USAID n.d. and Practical Action (2013)

Technology	System size	Capital (US$)	Operating cost (US$/year)
Solar PV system with batteries	1,200 W panels 20 kWh batteries	$12,000 system $2,000 batteries	$500
Wind turbine with batteries	1,750 W turbine 20 kWh batteries	$10,000 system $2,000 batteries	$600
Diesel engine generator	2.5 kW	$2,000	$1,400
Hybrid system	1,200 W panels 10 kWh batteries 500 W engine	$12,000 system $1,000 batteries $500 generator	$450
Grid extension	n/a	$10,000+ per mile	$200



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