6. Useful Formulae and Constants

No.	Formula/Constant	Remarks
1.	$P = g \eta Q H$	Output of hydropower in kW. $g = 9.8$ m/s^2, η is 0.7 to 0.8. For example, $P = 9.8$ m/s^2 x 0.73 x 0.65 m^3/s x 69 m = 320 kW
2.	2.5 kg/kWh	Unit consumption of rice husk for power generation by gasification, to be employed in the preliminary planning of village electrification. (Actually it varies depending on the engine capacity and output scale. It is assmued to be in the range of 2.2-2.5 kg/kWh)
3.	$P = C R_{IS} K$	P Output of solar Photo-Voltaic (PV) system, C PV capacity, kWp R_{IS} Insolation, 0.435 kWh/m^2/day K Loss factor in the form of: $K = K_1 K_2 K_3 K_4 K_5 K_m$ $= 0.84 \times 0.9 \times 0.71 \times 0.87 \times 1.00 \times 0.9$ $= 0.42$ where, K_1 Temperature degradation, 0.84 K_2 Degradation by contamination onto panels, 0.9, if any K_3 Battery charge-discharge efficiency, 0.83 x 0.85 = 0.71 K_4 Loss of DC circuit including controllers, 0.87 K_5 Temperature degradation, K_m Miscellaneous loss factor, 0.9 For example, $P = C R_{IS} K$ $= 2$ kWp x 0.435 kWh/m^2/day x 0.42 $= 0.37$
4.	1 kWh = 860 kcal 1 cal = 4.186 J	1kWh = 2,250 kcal of fuel oil input basis in the case of thermal power generation at efficiency of 38.1 % Husk LHV (Low Heat Value) = 3,000 kcal/kg Bagasse LHV = 1,840 kcal/kg Wood LHV = around 5,000 kcal/kg depending on the wood
	Calorific value of crude oil	9,250 kcal/l 1 kl of crude oil = 0.925 TOE

7. Unit Conversion

No.	Myanma System	Metric System
1.	cusec, ft^3/s	0.02832 m^3/s = 28.32 liter/s
2.	Imperial gallon	4.5460 liters
3.	mile	= 1,760 yards = 1,760 x 3 feet = 1.609 km
4.	sq. mile, $mile^2$	= 2.589 km^2
5.	feet	0.3048 m
6.	1 basket = 41 liter	Specific gravity: Paddy: 0.51 ~ 0.55 depending on the quality 1 basket = 46 lbs. = 20.9 kg Rice: 0.83 1 basket = 75 lbs. = 34 kg Husk : 0.12 1 basket = 11 lbs. = 5 kg Note: Specific gravity of husk is usually 0.10-0.11. A higher figure of 0.12 is assumed for the husk placed in the basket.
7.	1 bbl	159 liter
8.	pound	0.454 kg
9.	Insolation	1 $kWh/m^2/day$ = 860.6 $kcal/m^2/day$ 1 $cal/cm^2/day$ = 0.0116144 $kWh/ m^2/day$
10.	TOE	1 TOE = 1 x 10^7 kcal = 4.18 x 10^7 kJ

8. Definition of Technical Terms

No.	Term		Unit	Definition
1.	Discharge	Q	m^3/s liter/s	Rate of the flowing water in the river, expressed as the volume that pass certain section in one second.
2.	Head	H	m	Height difference in the water levels at intake site and power station site.
3.	Power output	P	kW	Power output of turbine.
4.	SHS			SHS is a small independent PV system comprising PV panels, a charge-/discharge-controller, and a battery bank. SHS is used for household electrification. SHS can be applied to Community Centers, streetlights, clinics, village offices, etc.
5.	BCS			BCS is a system of PV panels and a charge controller. Many SHSs merged and integrated into one large PV power generation system is BCS. People carry their own batteries to BCS for charging and bring them back to their homes.
6.	Biomass	kg/ton		Agricultural residues such as rice husk, bagasse, firewood, cob of maize, stalks, etc
7.	Over-charging			To leave batteries on charge after they have reached their full (100%) state of charge. This will cause the life of batteries shortened.
8.	Over-discharging			Excessive use of the electric energy stored in batteries. This will cause the life of batteries shortened.
9.	Solar radiation		W/m^2, kW/ m^2	Sunshine reaches the earth as a type of energy called radiation. Depending on the amount of energy it carries, solar radiation falls into infrared, visible and ultraviolet radiation. Not all energy reaches the earth's surface due to absorption or reflection through atmosphere or clouds. By the time it reaches the earth's surface, it is reduced to a maximum of about 1,000 W/ m^2 in solar-favored areas.

No.	Term		Unit	Definition
10.	Solar irradiance	R_{IR}	W/m^2, kW/ m^2	Solar irradiance refers to the solar radiation actually striking a surface, or the power received per unit area from the sun.
11.	Insolation	R_{IS}	$kWh/ m^2/day$	Insolation or incident solar radiation is a measure of the solar energy received on a specified area over a specified period of time.
12.	Sunshine hours		hour	Sunshine is direct solar radiation reached on the earth surface, and sunshine hours are the duration of sunshining time recorded. From the point of observation, there is "Sunshine", when the trace of direct solar radiation is recorded on a sunshine recorder, but there exists a considerable difference according to the type of sunshine recorders. The type of Campbell-Stokes sunshine recorder, adopted with thermal effect, has been used as an international standard.
13.	Wind speed	V	m/sec	One of the most important indexes used in estimating the output power from wind turbine systems. Usually, the "on-the-ground" wind speed is measured at 10 m above the ground. A mean wind speed is calculated by using a distribution of occurrences of graded instantaneous wind speed data measured for a given period of time. This index varies in many expressions such as monthly Mean Wind Speed, daily MWS or yearly MWS. Monthly MWS data for several years are necessary for planning a wind turbine system.