



**the Learning Network on
Sustainable energy systems**



The Learning Network on
Sustainable energy systems
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ACP-EU Edulink II



Implemented by the ACP
Group of States Secretariat



Funded by
the EU



Sustainable energy for all system design tool: the E.DRE tool, Estimator of Distributed Renewable Energy load/need and production potential

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LeNSes project ambition

EU funded project (Edulink 2013-16)

*promoting a new generation of African and European designers (and design educators and researcher) **capable of effectively design** and diffuse systems and services to extend the access to Sustainable Energy for All, based on the promising models of Sustainable Product-Service System and Distributed Renewable Energy system*



System Design for Sustainable energy for All Method

AIM

To support design processes for the development of sustainable PSS applied to DRE, adaptable to specific design requirements and usable in existing design processes

USERS

designer, design office, designer within a company

TOOLS

free to download at lenses.polimi.it

BASED ON

Method for System Design for Sustainability (developed in the LeNS project: lens.polimi.it)

PHASES/PROCESSES

STRATEGIC ANALYSIS

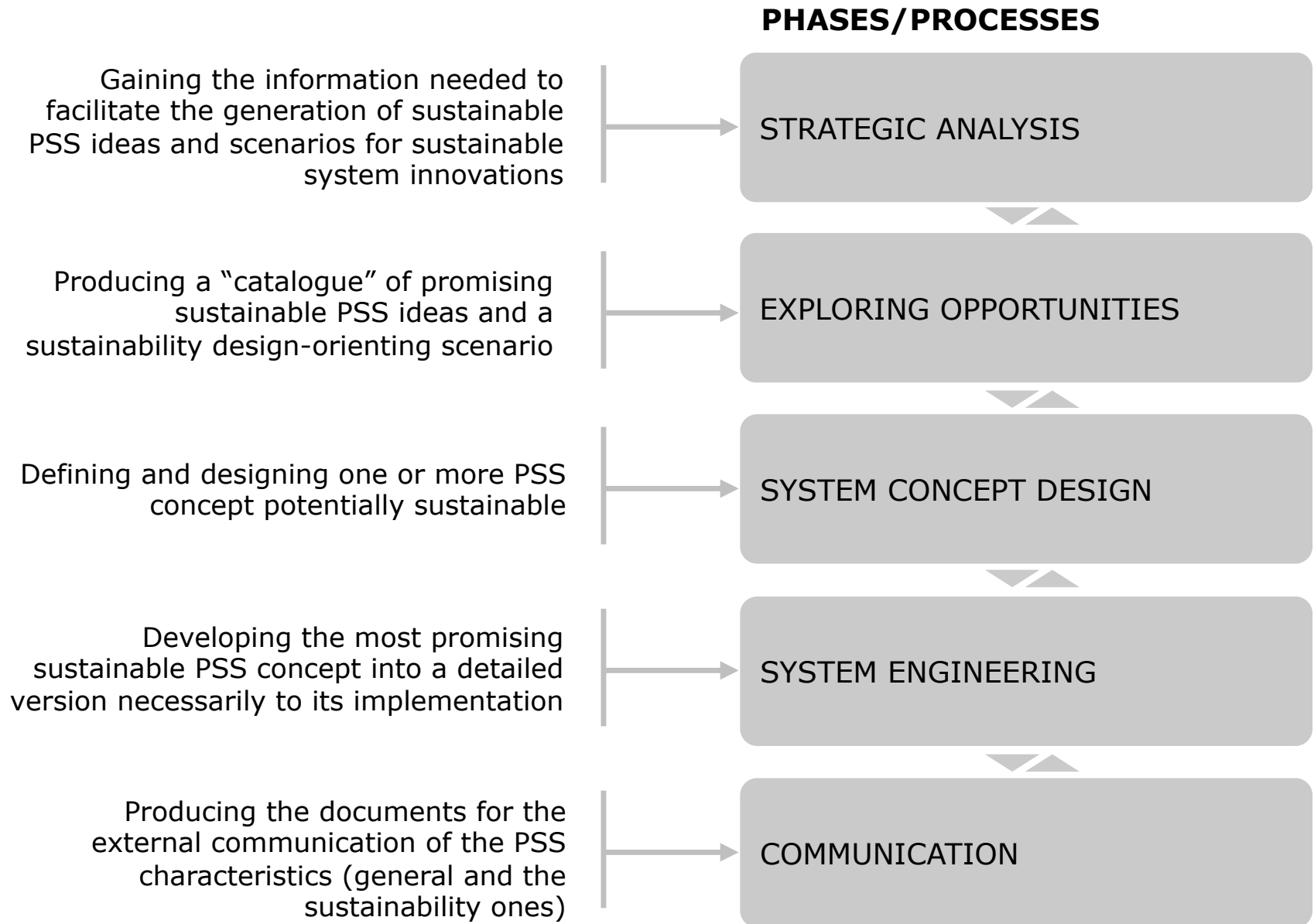
EXPLORING OPPORTUNITIES

SYSTEM CONCEPT DESIGN

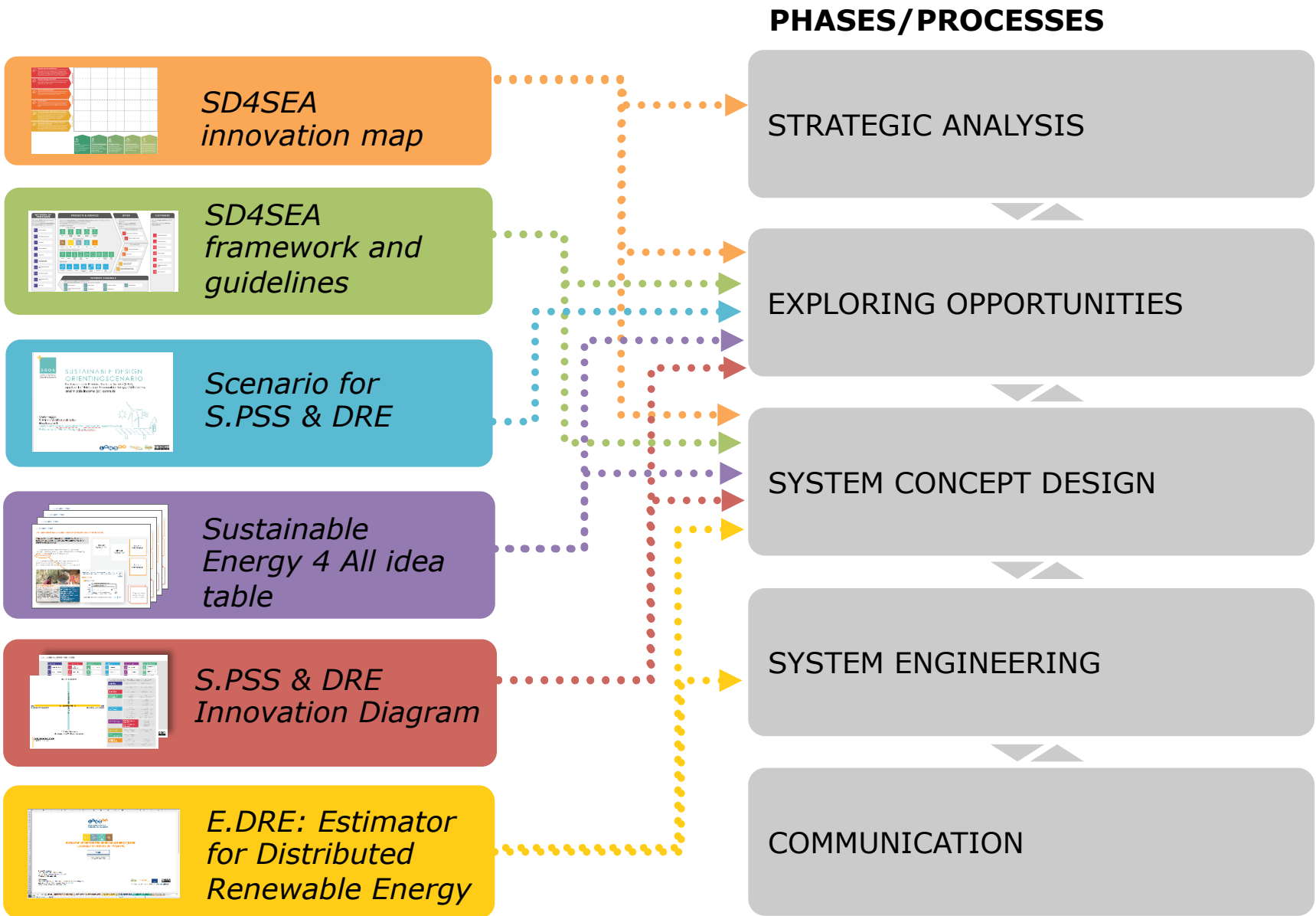
SYSTEM ENGINEERING

COMMUNICATION

Objectives




Tools



Estimator For Distributed Renewable Energy (E.DRE)

Integration in the method



The screenshot shows a web-based interface for the 'Estimator of Distributed Renewable Energy (E.DRE)'. The interface includes the LENSOS logo, a title 'ESTIMATOR OF DISTRIBUTED RENEWABLE ENERGY (E.DRE) LOAD/NEED & PRODUCTION POTENTIAL', and two buttons: 'start' and 'how it works'. The interface is displayed within a browser window with a yellow border.

AIM

- to calculate the user energy load/need
- to estimate the Energy system size and its energy production potential

PHASES/PROCESSES

STRATEGIC ANALYSIS

EXPLORING OPPORTUNITIES

SYSTEM CONCEPT DESIGN

SYSTEM ENGINEERING

COMMUNICATION

Research & study

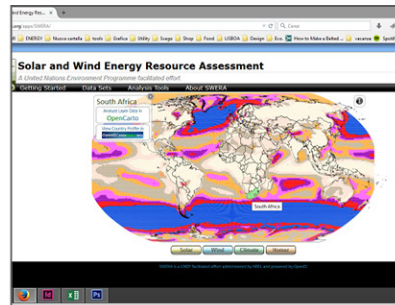
CM SAF Photovoltaic Geographical Information System - Interactive Maps

Installed peak PV power: 1 MWp
Estimated carbon losses: 26,100 t CO₂e

Fixed mounting options:
Mounting position: Free standing
Slope (0-90): 0
Azimuth (-180,180): 0

Tracking options:
Vertical axis: Slope (0-90):
Inclined axis: Slope (0-90):
2-axis tracking:

Output options:
Show graph:
Web page: PDF:



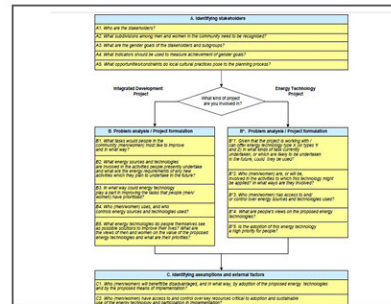
Power Consumption Table

Application	Appliance	Appliance Wattage	Appliance Wattage
Coffee maker	200	Colony	15-50
Refrigerator	100-150	Energy Star	15-20
TV	100-150	Energy Star	15-20
Light bulb	60-100	Energy Star	15-20
Washing machine	300-500	Energy Star	15-20
Dishwasher	1000-1500	Energy Star	15-20



DATA VISUALIZATION

How much power does each appliance use in WATTS?



Biomass potential for biogas

Vegetation	Feed	Area (ha)	Total amount	Lower heating value (LHV) (MJ/kg)	Biogas potential (m ³ /ha/year)	Feed to biogas plant (%)
Corn	100	100	100	100	100	100
Wheat	100	100	100	100	100	100

Watts® Calculator

Started: man | 60 W

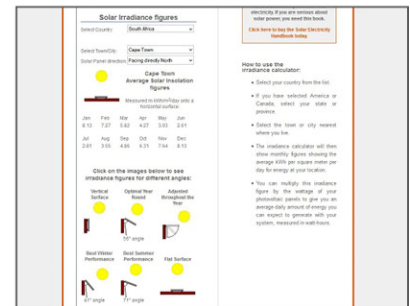
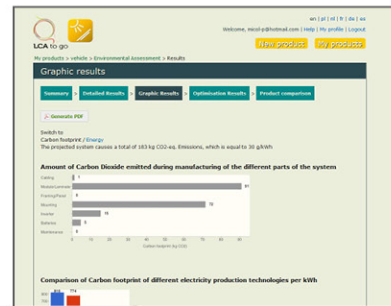
NREL's PVWatts® Calculator

Estimates the energy production and cost of energy of grid-connected photovoltaic (PV) energy systems throughout the world.

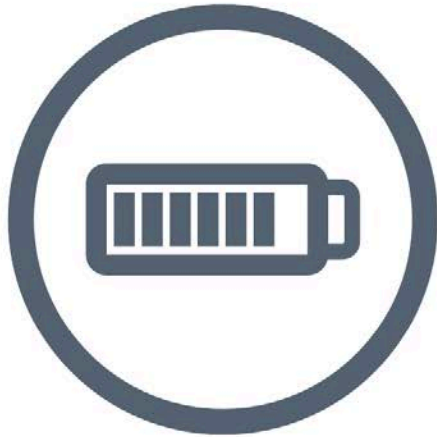
openLCA

openLCA is an open source software for life cycle assessments, footprint, EIO, technology, Product Environmental Footprint and version 1.4.1 now available!

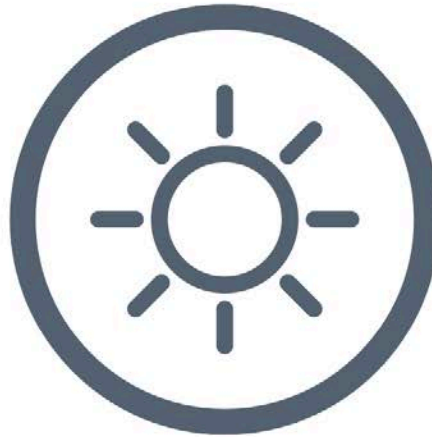
openLCA is a free, professional Life Cycle Assessment (LCA) and footprint software with a broad range of features and many available databases, created by GreenDelta since 2006. It is an open source software; the software and its source code is freely available. The software is fully transparent and can be modified by anyone.



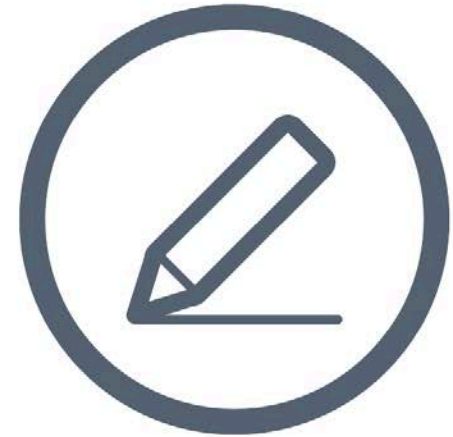
Design



1. determine the energy user need/load



2. resources availability assessment



3. design and sizing of the system

Test and refinement



Test with Students +
Technical review in Nairobi



Test with Students +
Technical review in Milan

Available on lenses.polimi.it

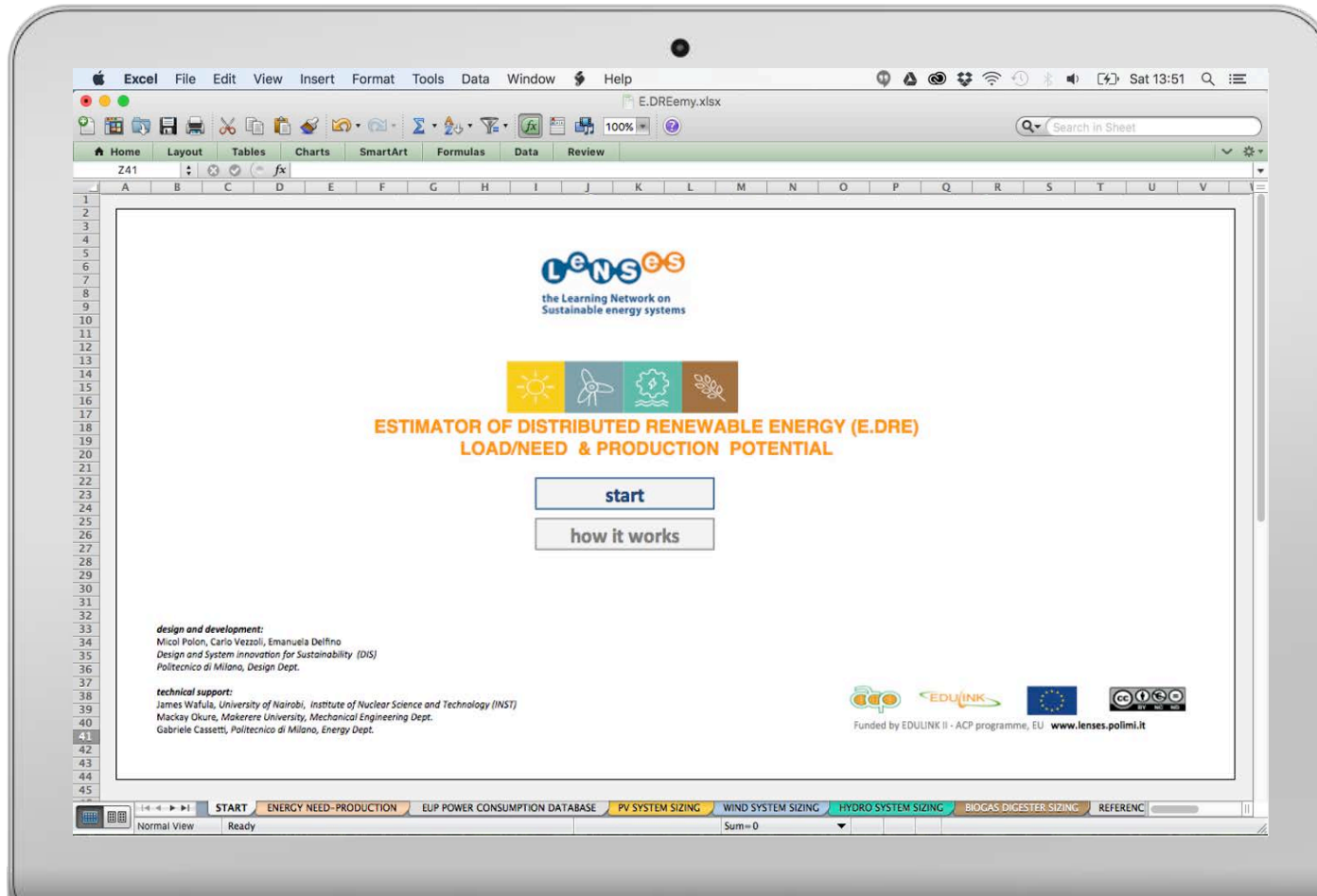
TOOLS section

The screenshot shows the Lenses website interface. At the top, there is a navigation bar with the Lenses logo and the text "the Learning Network on Sustainable energy systems". Below this, there are several menu items: ABOUT LENSES, NETWORK, COURSES, SINGLE LECTURE, TOOLS (highlighted), STUDENTS' PROJECTS, and CASES/CRITERIA. The TOOLS section is active, displaying a table of tools. A large red arrow points to the "DOWNLOAD" button in the table.

CATEGORY ▼	TOOL NAME	DESCRIPTION	DOWNLOAD
	ICS qualitative toolkit (chinese)	Quantitative tool to orientate the design process from the earliest stages of product development (Sustainable Design Concept), composed of: a) checklist for qualitative assessment of an existing product, b) board for qualitative assessment of design priorities/improvements, c) eco-Ideas tables (with guidelines), d) checklists for qualitative assessment of LCD strategies pursuing (simplified/normal/depth) and e) multi-strategy radar.	Download file 0.46 MB
Sustainability-orienting system design	Stakeholder' Motivation and Sustainability table	Tool to define main motivations and benefits (economic, socio-ethical, environmental) that each actor of the system can have/bring in a offer syste	Download file 1.61 MB
	Sustainability Design-Orienting (SDO)	On-line version click here Toolkit to orientate system design process towards sustainable solutions (environmental, socio-ethical, economic). It is a modular software toolkit supporting the following processes: A: existing system qualitative sustaina... analysis prioritisation of sustainability criteria/guidelines B: best practices analysis/... analysis sustainable e... sustainability...	Download file 29.4 MB
Sustainable energy for all design orienting tools	E,DRE - Estimator for Distributed Renewable Energy	Tool to estim... Renewable E...	Download file 3.17 MB
	S,PSS and DRE CARDS with case studies (support tool for SE4A Idea Tables)	Design tool t... support in the idea generation phase for S,PSS	Download file 28.47 MB
	S,PSS and DRE concept description form	To describe and characterize Sustainable Product Service System (S,PSS) applied to Distributed Renewable Energy (DRE) concepts	Download file 0.27 MB
	S,PSS and DRE Innovation Diagram	To select, map and cluster most promising ideas and create and characterize the profile of the Sustainable Product Service System (S,PSS) applied to Distributed Renewable Energy (DRE) concepts	Download file 0.33 MB

At the bottom of the page, there are logos for the European Union, EDU/INK, and Creative Commons license (CC BY-NC-ND).

Homepage



1. Energy need and production

The screenshot displays an Excel spreadsheet with two main tables: 'ENERGY LOAD/NEED' and 'ENERGY PRODUCTION POTENTIAL'. The spreadsheet interface includes the standard Excel menu bar, a toolbar, and a worksheet grid with columns A through V and rows 1 through 45.

ENERGY LOAD/NEED

ENERGY LOAD/NEED						
TOTAL ENERGY NEED (Kwh/year)						0
TOTAL GAS NEED (m³/year)						0
TYPE OF APPLIANCE <small>[DATABASE]</small>	POWER (W)	GAS CONSUMPTION (m ³)	NUMBER OF APPLIANCES (unit)	HOURS OF USAGE PER DAY (h/day)	ELECTRICITY CONSUMPTION PER DAY (kWh/day)	GAS CONSUMPTION PER DAY (m ³ /day)
Select appliance						
Click here to copy and paste the icon	0	0			0	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0

ENERGY PRODUCTION POTENTIAL

ENERGY PRODUCTION POTENTIAL			
TOTAL ENERGY PRODUCTION POTENTIAL (Kwh/year)			0,00
TOTAL GAS PRODUCTION POTENTIAL (m³/year)			0,00
TYPE OF DRE RESOURCES	DRE GENERAL CHARACTERISTICS	DRE SYSTEM POWER	TOTAL DRE PRODUCTION POTENTIAL
PHOTOVOLTAIC ENERGY	Describe the general characteristics of the DRE system		kWh 0,00 0,00 0,00
WIND ENERGY	Describe the general characteristics of the DRE system		kWh 0,00 0,00
HYDRO ENERGY	Describe the general characteristics of the DRE system		kWh 0,00 0,00 0,00
BIOGAS ENERGY	Describe the general characteristics of the DRE system		m ³ 0,00
OTHER TYPE OF DRE	Describe the general characteristics of the DRE system		

Comparison: <=

To add new rows select last row and drag it down from the angle at the bottom right.

The spreadsheet also shows a worksheet tab bar at the bottom with tabs for 'START', 'ENERGY NEED-PRODUCTION', 'EUP POWER CONSUMPTION DATABASE', 'PV SYSTEM SIZING', 'WIND SYSTEM SIZING', 'HYDRO SYSTEM SIZING', 'BIOGAS DIGESTER SIZING', and 'REFERENC'. The status bar at the bottom indicates 'Normal View' and 'Ready'.

2. Energy using product (EUP) consumption database

The screenshot shows an Excel spreadsheet with a 'POWER CONSUMPTION DATABASE' table. The table is organized into several categories, each with a header row and a grid of appliance icons and their power consumption values in Watts (W).

POWER CONSUMPTION DATABASE									
Kitchen									
Oven	Refrigerator	Freezer	Cooking range	Dishwasher	Microwave	Toaster	Coffee machine	Blender	Stand mixer
2300 W	188 W	273 W	1000 W	1800 W	1500 W	1100 W	360 W	300 W	100 W
Laundry/Cleaning									
Washing m.	Clothes dryer	Iron	Sewing machine	Vacuum cleaner	Vapor cleaner				
425 W	3400 W	1100 W	100 W	650 W	800 W				
Office									
Monitor	Computer	Laptop	Printer	Wifi Router	Phone charger	Phone			
150 W	120 W	50 W	45 W	7 W	4 W	3 W			
Lights									
Incandescent bulb (60 Watt)	CFL bulb (60 W equivalent)	Led bulb (60 W equivalent)	Halogen (60 W)	Neon tube					
60 W	18 W	10 W	60 W	20 W					
Heating/Cooling									
Water heater	Space heater	Air conditioner (central)	Air conditioner (room)	Ceiling fan	Table fan				
479 W	1500 W	5000 W	1000 W	75 W	25 W				
Water system									
Drip irrigation system	Water Pump	Water purifier (9L - domestic)	UV water purifier (60 LPM) ¹						

At the bottom of the spreadsheet, there is a navigation bar with the following tabs: START, ENERGY NEED-PRODUCTION, EUP POWER CONSUMPTION DATABASE (selected), PV SYSTEM SIZING, WIND SYSTEM SIZING, HYDRO SYSTEM SIZING, BIOGAS DIGESTER SIZING, and REFERENC. The status bar at the very bottom shows 'Normal View' and 'Ready'.

3. Photovoltaic system sizing

The screenshot displays an Excel spreadsheet for photovoltaic system sizing. The spreadsheet is organized into several sections:

- Site Information:**
 - MONTHLY GLOBAL SOLAR IRRADIATION: Wh/m²/day
 - ANNUAL IRRADIATION: kWh/m²/year (0)
 - Average of system losses (nBOS): 0,76
 - Inclination and Orientation: 0
- Losses details (depend of site, technology, and sizing of the system):**

Inverter losses (6% to 15%)	8%
Temperature losses (5% to 15%)	8%
DC cables losses (1 to 3%)	2%
AC cables losses (1 to 3%)	2%
Shadings 0% to 40% (depends of site)	3%
Losses weak irradiation 3% or 7%	3%
Losses due to dust, snow... (2%)	2%
Other Losses	0%
- Global formula:** $E = S \cdot \eta(PV) \cdot H \cdot \eta(BOS)$
- Legend:**
 - Enter your own data
 - Result (do not change the value)
 - Calculated value (do not change the value)
- STARTING FROM YOUR ENERGY LOAD/NEED:**
 - E= ENERGY NEED: kWh/year (0)
 - N= NOMINAL POWER: kWp (#DIV/0!)
 - S= SURFACE NEEDED: m² (#DIV/0!)
 - AVERAGE COST OF THE SYSTEM: € (#DIV/0!)
- Do you have an available surface different from the one calculated?:**
 - S= AVAILABLE SURFACE: m²
 - N= NOMINAL POWER: kWp (0,000)
 - E= ESTIMATED ENERGY PRODUCTION: kWh/year (0,00)
 - AVERAGE COST OF THE SYSTEM: € (0,00)
- Do you have a less or greater budget than that calculated?:**
 - B= BUDGET: €
 - N= NOMINAL POWER: kWp (0,000)
 - E= ESTIMATED ENERGY PRODUCTION: kWh/year (0,00)
 - S= SURFACE NEEDED: m² (#DIV/0!)
- Is your system off-grid?:**
 - INVERTER SIZE (W): AC+DC loads (0,0)
 - ENERGY DAILY USAGE (Wh): (0,00)
 - DAYS OF AUTONOMY (suggested from 2 to 5 days): 3
 - SYSTEM VOLTAGE: Small daily loads < 1kW = 12V, Intermediate daily loads < 3-4 kW = 24V, Larger loads > 4 kW = 48V
 - MAXIMUM DEPTH OF DISCHARGE (60%): 0,6
 - BATTERY BANK CAPACITY (Ah): #DIV/0!
 - NUMBERS OF BATTERIES
 - BATTERY TYPE: Lead-acid
 - AVERAGE COST OF THE BATTERY (€): 0,00

Source: Technical Design Guidelines Off-Grid PV Systems, IRENA

4. Wind system sizing

The screenshot shows an Excel spreadsheet titled "WIND SYSTEM SIZING" with the following sections:

Site

ρ =AIR DENSITY	kg/m ³	1,20
v =MINIMUM WIND SPEED	m/s	
POWER COEFFICIENT		0,4

em 0,2 and 0,6

Classification of wind resource by wind speed range

Class	Wind Speed	
	m/s	mph
Marginal	4 to 5	9 to 11.3
Fair	5 to 6	11.3 to 13.5
Good	6 to 7	13.5 to 15.8
Excellent	7 to 8	15.8 to 18
Outstanding	over 8	Over 18

Global formula: $E=(\rho \cdot A \cdot v^3) \cdot 365 \text{ day} \cdot 24 \text{ hours}$

Legend: Enter your own data, Result (do not change the value), Calculated value (do not change the value)

STARTING FROM YOUR ENERGY LOAD/NEED

E=ENERGY NEED	kWh/year	0,00
POWER WIND (per turbine)	kW	#DIV/0!
POWER TURBINE (per turbine)	kW	#DIV/0!
BLADE LENGTH (3m)	m	#DIV/0!
max radius suggested per turbine	m	#DIV/0!
SWEPT AREA (per turbine)	m ²	#DIV/0!
TURBINE HEIGHT (at least)	m	#DIV/0!
NUMBER OF TURBINE	n°	#DIV/0!
ENERGY ESTIMATED PRODUCTION PER TURBINE	kWh/year	#DIV/0!
AVERAGE COST OF THE SYSTEM	€	0,00

STARTING FROM BLADE LENGTH

BLADE LENGTH (3m)	m	
max radius suggested per turbine	m	
SWEPT AREA	m ²	0,0000
TURBINE HEIGHT (at least)	m	0,0000
POWER WIND	kW	0,00
POWER TURBINE	kW	0,00
ENERGY ESTIMATED PRODUCTION PER TURBINE	kWh/year	0,00
NUMBER OF TURBINES	n°	5,0
TOTAL ENERGY ESTIMATED PRODUCTION PER WIND SYSTEM	kWh/year	0,000
AVERAGE COST OF THE SYSTEM	€	0,00

Is your system off-grid?

INVERTER SIZE (W) AC+DC loads	0,0
DAILY ENERGY LOAD (Wh)	0,00
DAYS OF AUTONOMY (suggested from 2 to 5 days)	3
SYSTEM VOLTAGE (Small daily loads < 1kW = 12V, Intermediate daily loads < 3-4 kW = 24V, Larger loads > 4 kW = 48V)	
MAXIMUM DEPTH OF DISCHARGE (60%)	0,6
BATTERY BANK CAPACITY (Ah)	#DIV/0!
NUMBERS OF BATTERIES	
BATTERY TYPE	Lead-acid
AVERAGE COST OF THE BATTERY	0,00

Diagram: Swept Area T

Navigation: RETURN BACK

Bottom tabs: START, ENERGY NEED-PRODUCTION, EUP POWER CONSUMPTION DATABASE, PV SYSTEM SIZING, WIND SYSTEM SIZING, HYDRO SYSTEM SIZING, BIOGAS DIGESTER SIZING, REFERENC

Status: Normal View, Ready, Sum=0

5. Hydro system sizing

Excel File Edit View Insert Format Tools Data Window Help E.DREemy.xlsx

Home Layout Tables Charts SmartArt Formulas Data Review

Z41

HYDRO ENERGY SYSTEM SIZING

Site

Q = Water flow rate l/s

Stream

g = Gravity m/s² 9,81

η = Efficiency 0,5

STARTING FROM YOUR ENERGY LOAD/NEED

ENERGY NEED kWh/year 0,000

HYDRO POWER kW 0,000

E= GENERATOR POWER kW 0,000

H = HEAD m #DIV/0!

AVERAGE COST OF THE SYSTEM € 0,00

Do you have a head different from the one calculated?

HEAD m

HYDRO POWER kW 0,000

E= GENERATOR POWER kW 0,000

ENERGY ESTIMATED PRODUCTION kWh/year 0,000

AVERAGE COST OF THE SYSTEM € 0,00

Do you have a less or greater budget than that calculated?

BUDGET €

HYDRO POWER kW 0,000

E= GENERATOR POWER kW 0,000

HEAD m #DIV/0!

ENERGY ESTIMATED PRODUCTION kWh/year 0,00

FLOW RATE AVERAGE

[click here](#) to see some examples of river flow

Very small stream l/s 10-50


Small stream l/s 50-250

Stream l/s 250-1000

Small river l/s 1000-2000

River l/s 2000

FLOW MEASUREMENT

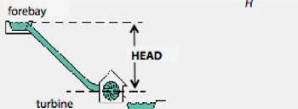


Volume of the container (water) l 0

Filling time s 0

Water flow l/s 0

HEAD



forebay

turbine

HEAD

RETURN BACK

Global formula: $E = H \times Q \times \eta \times 365 \text{ days} \times 24 \text{ hours}$

Legend

Enter your own data

Result (do not change the value)

Calculated value (do not change the value)

START ENERGY NEED-PRODUCTION EUP POWER CONSUMPTION DATABASE PV SYSTEM SIZING WIND SYSTEM SIZING HYDRO SYSTEM SIZING BIOGAS DIGESTER SIZING REFERENC

Normal View Ready Sum=0

6. Biomass digester sizing

The screenshot shows an Excel spreadsheet with the following sections:

Define your feedstock availability

$V_s = \text{TOTAL DAILY FEEDSTOCK (t)}$ 0
 $G_y = \text{TOTAL BIOGAS YIELD (m}^3/\text{day)}$ 0

ANIMAL	N° of animals	daily manure (t/day)	amount of manure (t/day)	VS %	t/Vs	Biogas yield (m ³ /t)	Total biogas yield (m ³ /day)
Cattle (650 kg)		0,055	0	80	0	19	0
Diary cattle		0,055	0	80	0	25	0
Pig		0,0045	0	80	0	28	0
Sheep		0,002	0	75	0	20	0
Horse		0,02	0	80	0	63	0
Chicken		0,0002	0	75	0	140	0
ENERGY CROPS	Area (ha)	Yield (t/ha)	Amount of crops (t/d)	VS%	t/Vs	Biogas yield (m ³ /t)	Total biogas yield (m ³ /day)
Grass silage		0,5	0	90	0	160	0
Triticale							

STARTING FROM FEEDSTOCK AVAILABILITY

$V_d = \text{DIGESTER VOLUME (m}^3)$ 0
 $G = \text{DAILY GAS PRODUCTION (m}^3/\text{day)}$ 0,00
 Rt=Retention time days 30
 Sd=Daily substrate input t 0
 water m³/d 0
AVERAGE COST OF THE SYSTEM € 0,00

RETURN BACK

Biogas potential comparison

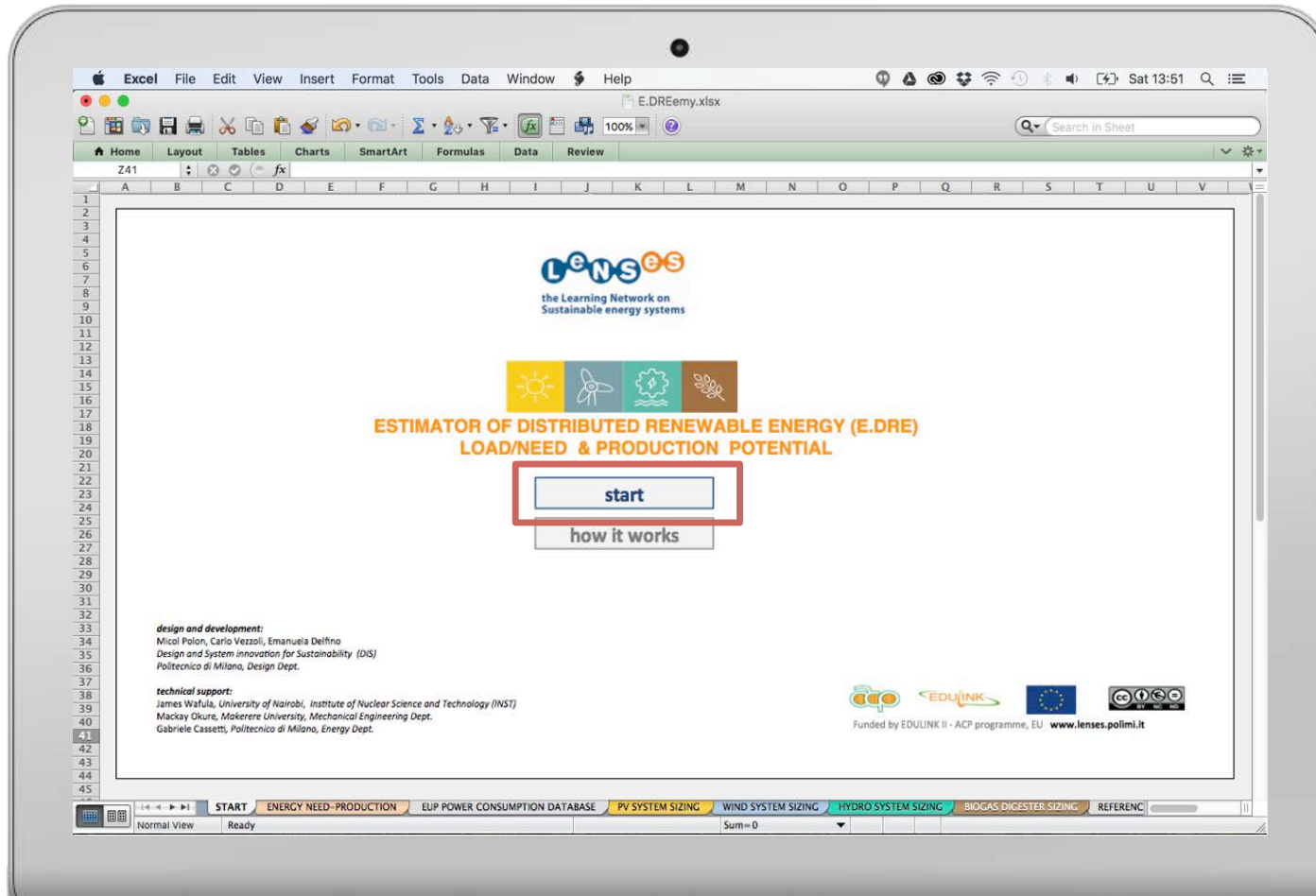
1 m³ of biogas: 0,61 l of diesel fuel, 5,5 Kg of firewood

Legend:
 Enter your own data (grey)
 Result (do not change the value) (orange)
 Calculated value (do not change the value) (white)

Global formula: $G = V_s * G_y$
 $V_d = S_d * R_t$

Navigation tabs: START, ENERGY NEED-PRODUCTION, EUP POWER CONSUMPTION DATABASE, PV SYSTEM SIZING, WIND SYSTEM SIZING, HYDRO SYSTEM SIZING, **BIOGAS DIGESTER SIZING**, REFERENC

Homepage



To calculate/visualize the energy need of the system/user

ENERGY LOAD/NEED						
TOTAL ENERGY NEED (Kwh/year)						0
TOTAL GAS NEED (m³/year)						0
TYPE OF APPLIANCE <small>[DATABASE]</small>	POWER (W)	GAS CONSUMPTION (m ³)	NUMBER OF APPLIANCES (unit)	HOURS OF USAGE PER DAY (h/day)	ELECTRICITY CONSUMPTION PER DAY (kWh/day)	GAS CONSUMPTION PER DAY (m ³ /day)
Select appliance						
Click here to copy and paste the icon	0	0			0	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0

< /=





ENERGY PRODUCTION POTENTIAL			
TOTAL ENERGY PRODUCTION POTENTIAL (Kwh/year)			0,00
TOTAL GAS PRODUCTION POTENTIAL (m³/year)			0,00
TYPE OF DRE RESOURCES	DRE GENERAL CHARACTERISTICS	DRE SYSTEM POWER	TOTAL DRE PRODUCTION POTENTIAL
PHOTOVOLTAIC ENERGY	Describe the general characteristics of the DRE system		kWh 0,00 0,00 0,00
WIND ENERGY	Describe the general characteristics of the DRE system		kWh 0,00 0,00
HYDRO ENERGY	Describe the general characteristics of the DRE system		kWh 0,00 0,00 0,00
BIOGAS ENERGY	Describe the general characteristics of the DRE system		m ³ 0,00
OTHER TYPE OF DRE	Describe the general characteristics of the DRE system		

To add new rows select last row and drag it down from the angle at the bottom right.

Details of the system production potential

ENERGY LOAD/NEED						
TOTAL ENERGY NEED (Kwh/year)						0
TOTAL GAS NEED (m³/year)						0
TYPE OF APPLIANCE <small>[DATABASE]</small>	POWER (W)	GAS CONSUMPTION (m ³)	NUMBER OF APPLIANCES (unit)	HOURS OF USAGE PER DAY (h/day)	ELECTRICITY CONSUMPTION PER DAY (kWh/day)	GAS CONSUMPTION PER DAY (m ³ /day)
Select appliance						
Click here to copy and paste the icon	0	0			0	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0

</=

ENERGY PRODUCTION POTENTIAL			
TOTAL ENERGY PRODUCTION POTENTIAL (Kwh/year)			0,00
TOTAL GAS PRODUCTION POTENTIAL (m³/year)			0,00
TYPE OF DRE RESOURCES	DRE GENERAL CHARACTERISTICS	DRE SYSTEM POWER	TOTAL DRE PRODUCTION POTENTIAL
 PHOTOVOLTAIC ENERGY	Describe the general characteristics of the DRE system		kWh 0,00 0,00 0,00
 WIND ENERGY	Describe the general characteristics of the DRE system		kWh 0,00 0,00
 HYDRO ENERGY	Describe the general characteristics of the DRE system		kWh 0,00 0,00 0,00
 BIOGAS ENERGY	Describe the general characteristics of the DRE system		m ³ 0,00
OTHER TYPE OF DRE	Describe the general characteristics of the DRE system		

To add new rows select last row and drag it down from the angle at the bottom right.

1. Type of appliances

Excel File Edit View Insert Format Tools Data Window Help
Sat 13:51

E.DREEmy.xlsx
Search in Sheet

		APPLIANCE LOAD/NEED		
		(Kwh/year)	0	0
		(m ³ /year)	0	0
TYPE OF APPLIANCE [DATABASE]	HOURS OF USAGE PER DAY (h/day)	ELECTRICITY CONSUMPTION PER DAY (kWh/day)	GAS CONSUMPTION PER DAY (m ³ /day)	
Select appliance				
Click here to copy and paste the icon				
Select appliance				
Click here to copy and paste the icon				
Select appliance				
Click here to copy and paste the icon				
Select appliance				
Click here to copy and paste the icon				
Select appliance				
Click here to copy and paste the icon				

Explore database

Select appliance

ENERGY PRODUCTION POTENTIAL			
TOTAL ENERGY PRODUCTION POTENTIAL (Kwh/year)		0,00	
TOTAL GAS PRODUCTION POTENTIAL (m ³ /year)		0,00	
TYPE OF DRE RESOURCES	DRE GENERAL CHARACTERISTICS	DRE SYSTEM POWER	TOTAL DRE PRODUCTION POTENTIAL
	Describe the general characteristics of the DRE system		kWh 0,00 0,00 0,00
	Describe the general characteristics of the DRE system		kWh 0,00 0,00
	Describe the general characteristics of the DRE system		kWh 0,00 0,00 0,00
	Describe the general characteristics of the DRE system		m ³ 0,00
OTHER TYPE OF DRE	Describe the general characteristics of the DRE system		











To add new rows select last row and drag it down from the angle at the bottom right.

Normal View Ready
Sum=0






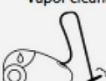
POWER CONSUMPTION DATABASE

RETURN BACK






Kitchen

Oven  2300 W	Refrigerator  188 W	Freezer  273 W	Cooking range  1000 W	Dishwasher  1800 W	Microwave  1500 W	Toaster  1100 W	Coffee machine  360 W	Blender  300 W	Stand mixer  100 W
---	--	---	--	---	--	--	--	---	---

Laundry/Cleaning






Washing m.  425 W	Clothes dryer  3400 W	Iron  1100 W	Sewing machine  100 W	Vacuum cleaner  650 W	Vapor cleaner  800 W
--	--	---	--	--	---

Office




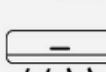


Monitor  150 W	Computer  120 W	Laptop  50 W	Printer  40 W	Phone  3 W
---	--	---	--	---

Copy and paste the icon





Lights

Incandescent bulb (60 Watt)  60 W	CFL bulb (60 W equivalent)  18 W	Led bulb (60 W equivalent)  10 W	Halogen (60 W)  60 W	Neon tube  20 W
--	---	---	---	--

Heating/Cooling

Water heater  479 W	Space heater  1500 W	Air conditioner (central)  5000 W	Air conditioner (room)  1000 W	Ceiling fan  75 W	Table fan  25 W
--	---	--	---	--	--

Water system

Drip irrigation system 	Water Pump 	Water purifier (9L - domestic) 	UV water purifier (60 LPM) ¹ 
---	---	---	--

2. Calculate the energy need

Excel File Edit View Insert Format Tools Data Window Help Sat 13:51

Sheet

ENERGY LOAD/NEED


TOTAL ENERGY NEED (Kwh/year)							905,93
TOTAL GAS NEED (m³/year)							0

ENERGY PRODUCTION POTENTIAL





TOTAL ENERGY PRODUCTION POTENTIAL (Kwh/year)				905,93
TOTAL GAS PRODUCTION POTENTIAL (m³/year)				0,00

</=

Insert the quantity of appliances

TYPE OF APPLIANCE [DATABASE]	POWER (W)	GAS CONSUMPTION (m ³)	NUMBER OF APPLIANCES (unit)	HOURS OF USAGE PER DAY (h/day)	ELECTRICITY CONSUMPTION PER DAY (kWh/day)	GAS CONSUMPTION PER DAY (m ³ /day)
Incan			6	6	2,16	0
			1	5	0,25	0
Phone charger				6		
	4	0	3	6		
Select appliance						
Click here to copy and paste the icon	0	0				
Select appliance						
Click here to copy and paste the icon	0	0				

Insert the number of hours of usage/day

TYPE OF DRE RESOURCES	DRE GENERAL CHARACTERISTICS	DRE SYSTEM POWER	TOTAL DRE PRODUCTION POTENTIAL
	Describe the general characteristics of the DRE system		kWh 905,93 0,00 0,00
	Describe the general characteristics of the DRE system		kWh 905,93 0,00
	Describe the general characteristics of the DRE system		kWh 905,93 0,00 0,00
	Describe the general characteristics of the DRE system		m ³ 0,00
OTHER TYPE OF DRE	Describe the general characteristics of the DRE system		

START ENERGY NEED-PRODUCTION EUP POWER CONSUMPTION DATABASE PV SYSTEM SIZING WIND SYSTEM SIZING HYDRO SYSTEM SIZING BIOGAS DIGESTER SIZING REFERENC

Normal View Ready Sum=0

3. Browse the system sizing sheets

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ENERGY LOAD/NEED

TOTAL ENERGY NEED (Kwh/year) 905,93

TOTAL GAS NEED (m³/year) 0

TYPE OF APPLIANCE [DATABASE]	POWER (W)	GAS CONSUMPTION (m ³)	NUMBER OF APPLIANCES (unit)	HOURS OF USAGE PER DAY (h/day)	ELECTRICITY CONSUMPTION PER DAY (kWh/day)	GAS CONSUMPTION PER DAY (m ³ /day)
Incandescent bulb (60 W)	60	0	6	6	2,16	0
Laptop	50	0	1	5	0,25	0
Phone charger	4	0	3	6	0,072	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0

PHOTOVOLTAIC ENERGY

WIND ENERGY

HYDRO ENERGY

BIOGAS ENERGY

OTHER TYPE OF DRE

DRE GENERAL CHARACTERISTICS

DRE SYSTEM POWER

TOTAL DRE PRODUCTION POTENTIAL

Describe the general characteristics of the DRE system

Describe the general characteristics of the DRE system

Describe the general characteristics of the DRE system

Describe the general characteristics of the DRE system

Describe the general characteristics of the DRE system

Describe the general characteristics of the DRE system

905,93 kWh

0,00

0,00

905,93 kWh

0,00

0,00

905,93 kWh

0,00

0,00

m³

0,00

START ENERGY NEED-PRODUCTION EUP POWER CONSUMPTION DATABASE PV SYSTEM SIZING WIND SYSTEM SIZING HYDRO SYSTEM SIZING BIOGAS DIGESTER SIZING REFERENC

Normal View Ready Sum=0

Select the most appropriate Energy Resource and design the size of the system

Photovoltaic Energy system sizing

PHOTOVOLTAIC ENERGY SYSTEM SIZING basic data

Site		
MONTHLY GLOBAL SOLAR IRRADIATION	Wh/m2/day	
here how to get the minimum solar irradiation value		
H= ANNUAL IRRADIATION	kWh/m2/year	0
$\eta(PV) = PV \text{ modules efficiency}$		
(select heliwl)		
select PV modules type		0
Average of system losses	η_{BOS}	0,76
(Balance of System efficiency)		
	Inclination	°
	Orientation	°

from -

nBOS: Losses details (depend of site, technology, and sizing of the system)

Inverter losses (6% to 15 %)	8%
Temperature losses (5% to 15%)	8%
DC cables losses (1 to 3 %)	2%
AC cables losses (1 to 3 %)	2%
Shadings 0 % to 40% (depends of site)	3%
Losses weak irradiation 3% or 7%	3%
Losses due to dust, snow... (2%)	2%
Other Losses	0%

RETURN BACK

Global formula : $E = S \cdot \eta(PV) \cdot H \cdot \eta(BOS)$

Legend

- Enter your own data
- Result (do not change the value)
- Calculated value (do not change the value)

STARTING FROM YOUR ENERGY LOAD/NEED

E= ENERGY NEED	kWh/year	0
N= NOMINAL POWER	kWp	#DIV/0!
S= SURFACE NEEDED	m ²	#DIV/0!
AVERAGE COST OF THE SYSTEM	€	#DIV/0!





Do you have an available surface different from the one calculated?

S= AVAILABLE SURFACE	m ²	
N= NOMINAL POWER	kWp	0,000
E= ESTIMATED ENERGY PRODUCTION	kWh/year	0,00
AVERAGE COST OF THE SYSTEM	€	0,00

Do you have a less or greater budget than that calculated?

B = BUDGET	€	
N= NOMINAL POWER	kWp	0,000
E= ESTIMATED ENERGY PRODUCTION	kWh/year	0,00
S= SURFACE NEEDED	m ²	#DIV/0!

Is your system off-grid?

 INVERTER SIZE (W) AC+DC loads	0,0
 ENERGY DAILY USAGE (Wh)	0,00
 DAYS OF AUTONOMY (suggested from 2 to 5 days)	3
SYSTEM VOLTAGE Small daily loads < 1kW = 12V daily loads < 3-4 kW = 24V Intermediate Larger loads > 4 kW = 48V	
MAXIMUM DEPTH OF DISCHARGE (60%)	0,6
 BATTERY BANK CAPACITY (Ah)	#DIV/0!
NUMBERS OF BATTERIES	
BATTERY TYPE	Lead-acid
AVERAGE COST OF THE BATTERY (€)	0,00

source: Technical Design Guidelines Off-Grid PV Systems, IRENA

Photovoltaic Energy system sizing

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PHOTOVOLTAIC ENERGY SYSTEM SIZING

Site

MONTHLY GLOBAL SOLAR IRRADIATION
[here](#) how to get the minimum solar irradiation value
 Wh/m2/day

H= ANNUAL IRRADIATION kWh/m2/year 0

$\eta(PV) = PV \text{ modules efficiency}$

(select heliwl) select PV modules type 0

Average of system losses η_{BOS} (Balance of System efficiency) 0,76

Inclination Orientation 0

from -

STARTING FROM YOUR ENERGY LOAD/NEED

E= ENERGY NEED kWh/year 0

N= NOMINAL POWER kWp #DIV/0!

S= SURFACE NEEDED m² #DIV/0!

AVERAGE COST OF THE SYSTEM € #DIV/0!

Do you have an available surface different from the one calculated?

S= AVAILABLE SURFACE m²

N= NOMINAL POWER kWp 0,000

E= ESTIMATED ENERGY PRODUCTION kWh/year 0,00

AVERAGE COST OF THE SYSTEM € 0,00

Do you have a less or greater budget than that calculated?

B= BUDGET €

N= NOMINAL POWER kWp 0,000

E= ESTIMATED ENERGY PRODUCTION kWh/year 0,00

S= SURFACE NEEDED m² #DIV/0!

Monthly global solar irradiation

Modules efficiency (type of modules)

Inclination and Orientation

Is your system off-grid?

INVERTER SIZE (W) AC+DC loads 0,0

ENERGY DAILY USAGE (Wh) 0,00

DAYS OF AUTONOMY (suggested from 2 to 5 days) 3

SYSTEM VOLTAGE
 Small daily loads < 1kW = 12V Intermediate
 daily loads < 3-4 kW = 24V Larger loads > 4 kW = 48V

MAXIMUM DEPTH OF DISCHARGE (60%) 0,6

BATTERY BANK CAPACITY (Ah) #DIV/0!

NUMBERS OF BATTERIES

BATTERY TYPE Lead-acid

AVERAGE COST OF THE BATTERY (€) 0,00

RETURN BACK

Global formula : $E = S * \eta(PV) * H * \eta(BOS)$

Legend

Enter your own data

Result (do not change the value)

Calculated value (do not change the value)

source: Technical Design Guidelines Off-Grid PV Systems, IRENA

START ENERGY NEED-PRODUCTION EUP POWER CONSUMPTION DATABASE PV SYSTEM SIZING WIND SYSTEM SIZING HYDRO SYSTEM SIZING BIOGAS DIGESTER SIZING REFERENC

Normal View Ready Sum=0

Photovoltaic Energy system sizing

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PHOTOVOLTAIC EN

JRC CM SAF Photovoltaic Geographical Information System - Interactive Maps

EUROPA > EC > JRC > IE > RE > SOLAREC > PVGIS > Interactive maps > africa

Contact Important legal notice

New: We are recovering from a hard disk crash. PVGIS may be unstable in the next few days, please let us know if you see strange results.

cursor position: -54.504, 7.734
selected position:

e.g. "Ispra, Italy" or "45.256N, 16.9589E"

Search

Europe Africa-Asia

Latitude: Longitude: Go to lat/lon

Map Satellite

Monthly radiation Daily radiation Stand-alone PV

Monthly global irradiation data

Radiation database: ▾

- Horizontal irradiation
- Irradiation at opt. angle
- Direct normal irradiation
- Irradiation at chosen angle: 90 deg.
- Linke turbidity
- Dif. / global radiation
- Optimal inclination angle

Output options

- Show graphs
- Show horizon
- Web page
- Text file
- PDF

Calculate [help]

S= SURFACE NEEDED m² #DIV/0!

source: Technical Design Guidelines Off-Grid PV Systems, IRENA

START ENERGY NEED-PRODUCTION EUP POWER CONSUMPTION DATABASE PV SYSTEM SIZING WIND SYSTEM SIZING HYDRO SYSTEM SIZING BIOGAS DIGESTER SIZING REFERENC

Normal View Ready Sum=0

Photovoltaic Energy system sizing

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PHOTOVOLTAIC ENERGY SYSTEM SIZING

Site

MONTHLY GLOBAL SOLAR IRRADIATION
[here](#) how to get the minimum solar irradiation value
 Wh/m2/day

H= ANNUAL IRRADIATION kWh/m2/year 0

$\eta(PV) = PV \text{ modules efficiency}$

(select heliwl) select PV modules type 0

Average of system losses η_{BOS} (Balance of System efficiency) 0,76

Inclination °

Orientation °

from -

nBOS: Losses details (depend of site, technology, and sizing of the system)

Inverter losses (6% to 15 %)	8%
Temperature losses (5% to 15%)	8%
DC cables losses (1 to 3 %)	2%
AC cables losses (1 to 3 %)	2%
Shadings 0 % to 40% (depends of site)	3%
Losses weak irradiation 3% or 7%	3%
Losses due to dust, snow... (2%)	2%
Other Losses	0%

RETURN BACK

Global formula : $E = S \cdot \eta(PV) \cdot H \cdot \eta(BOS)$

Legend

Enter your own data

Result (do not change the value)

Calculated value (do not change the value)

STARTING FROM YOUR ENERGY LOAD/NEED

E= ENERGY NEED kWh/year 0

N= NOMINAL POWER kWp #DIV/0!

S= SURFACE NEEDED m² #DIV/0!

AVERAGE COST OF THE SYSTEM € #DIV/0!

Do you have an available surface different from the one calculated?

S= AVAILABLE SURFACE m²

N= NOMINAL POWER kWp 0,000

E= ESTIMATED ENERGY PRODUCTION kWh/year 0,00

AVERAGE COST OF THE SYSTEM € 0,00

Do you have a less or greater budget than that calculated?

B = BUDGET €

N= NOMINAL POWER kWp 0,000

E= ESTIMATED ENERGY PRODUCTION kWh/year 0,00

S= SURFACE NEEDED m² #DIV/0!

Is your system off-grid?

INVERTER SIZE (W) AC+DC loads 0,0

ENERGY DAILY USAGE (Wh) 0,00

DAYS OF AUTONOMY (suggested from 2 to 5 days) 3

SYSTEM VOLTAGE
 Small daily loads < 1kW = 12V
 Intermediate daily loads < 3-4 kW = 24V
 Larger loads > 4 kW = 48V

MAXIMUM DEPTH OF DISCHARGE (60%) 0,6

BATTERY BANK CAPACITY (Ah) #DIV/0!

NUMBERS OF BATTERIES

BATTERY TYPE Lead-acid

AVERAGE COST OF THE BATTERY (€) 0,00

system sizing tables

source: Technical Design Guidelines Off-Grid PV Systems, IRENA

START ENERGY NEED-PRODUCTION EUP POWER CONSUMPTION DATABASE PV SYSTEM SIZING WIND SYSTEM SIZING HYDRO SYSTEM SIZING BIOGAS DIGESTER SIZING REFERENC

Normal View Ready Sum = 0

Photovoltaic Energy system sizing

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PHOTOVOLTAIC ENERGY SYSTEM SIZING

MONTHLY GLOBAL SOLAR IRRADIATION
[here](#) how to get the minimum solar irradiation value

Site Wh/m2/day

H= ANNUAL IRRADIATION kWh/m2/year 0

$\eta(PV) = PV \text{ modules efficiency}$

(select heliwl) select PV modules type 0

Average of system losses η_{BOS} (Balance of System efficiency) 0,76

Inclination °

Orientation °

from -

nBOS: Losses details (depend of site, technology, and sizing of the system)

Inverter losses (6% to 15 %)	8%
Temperature losses (5% to 15%)	8%
DC cables losses (1 to 3 %)	2%
AC cables losses (1 to 3 %)	2%
Shadings 0 % to 40% (depends of site)	3%
Losses weak irradiation 3% or 7%	3%
Losses due to dust, snow... (2%)	2%
Other Losses	0%

RETURN BACK

Global formula : $E = S * \eta(PV) * H * \eta(BOS)$

Legend

Enter your own data

Result (do not change the value)

Calculated value (do not change the value)

STARTING FROM YOUR ENERGY LOAD/NEED

E= ENERGY NEED kWh/year 0

N= NOMINAL POWER kWp #DIV/0!

S= SURFACE NEEDED m² #DIV/0!

AVERAGE COST OF THE SYSTEM € #DIV/0!

Do you have an available surface different from the one calculated?

S= AVAILABLE SURFACE m²

N= NOMINAL POWER kWp 0,000

E= ESTIMATED ENERGY PRODUCTION kWh/year 0,00

AVERAGE COST OF THE SYSTEM € 0,00

Do you have a less or greater budget than that calculated?

B= BUDGET €

N= NOMINAL POWER kWp 0,000

E= ESTIMATED ENERGY PRODUCTION kWh/year 0,00

S= SURFACE NEEDED m² #DIV/0!

Is your system off-grid?

0,0

0,00

DAYS OF AUTONOMY (suggested from 2 to 5 days)

3

0,6

BATTERY BANK CAPACITY (Ah) #DIV/0!

acid

0,00

source: Technical Design Guidelines Off-Grid PV Systems, IRENA

System that meets the energy need

Available surface

Different budget

START ENERGY NEED-PRODUCTION EUP POWER CONSUMPTION DATABASE PV SYSTEM SIZING WIND SYSTEM SIZING HYDRO SYSTEM SIZING BIOGAS DIGESTER SIZING REFERENC

Normal View Ready Sum=0

Photovoltaic Energy system sizing

PHOTOVOLTAIC ENERGY SYSTEM SIZING

		Site	
MONTHLY GLOBAL SOLAR IRRADIATION		Wh/m2/day	
here how to get the minimum solar irradiation value			
H= ANNUAL IRRADIATION	kWh/m2/year	0	
$\eta(PV) = PV \text{ modules efficiency}$		0	
<i>(select heliwl)</i>			
select PV modules type			
Average of system losses	η_{BOS}	0,76	
<i>(Balance of System efficiency)</i>			
		Inclination	°
		Orientation	°
<i>from -</i>			

nBOS: Losses details		(depend of site, technology, and sizing of the system)
Inverter losses (6% to 15%)		8%
Temperature losses (5% to 15%)		8%
DC cables losses (1 to 3%)		2%
AC cables losses (1 to 3%)		2%
Shadings 0% to 40% (depends of site)		3%
Losses weak irradiation 3% or 7%		3%
Losses due to dust, snow... (2%)		2%
Other losses		0%

RETURN BACK

Global formula : $E = S \cdot \eta(PV) \cdot H \cdot \eta(BOS)$

Legend

- Enter your own data
- Result (do not change the value)
- Calculated value (do not change the value)

STARTING FROM YOUR ENERGY LOAD/NEED

E= ENERGY NEED	kWh/year	0
N= NOMINAL POWER	kWp	#DIV/0!
S= SURFACE NEEDED	m ²	#DIV/0!
AVERAGE COST OF THE SYSTEM	€	#DIV/0!

Do you have an available surface different from the one calculated?

S= AVAILABLE SURFACE	m ²	
N= NOMINAL POWER	kWp	0,000
E= ESTIMATED ENERGY PRODUCTION	kWh/year	0,00
AVERAGE COST OF THE SYSTEM	€	0,00

Do you have a less or greater budget than that calculated?

B= BUDGET	€	
N= NOMINAL POWER	kWp	0,000
E= ESTIMATED ENERGY PRODUCTION	kWh/year	0,00
S= SURFACE NEEDED	m ²	#DIV/0!

off-grid system

Is your system off-grid?

	INVERTER SIZE (W) AC+DC loads	0,0
	ENERGY DAILY USAGE (Wh)	0,00
	DAYS OF AUTONOMY (suggested from 2 to 5 days)	3
	SYSTEM VOLTAGE Small daily loads < 1kW = 12V daily loads < 3-4 kW = 24V Intermediate Larger loads > 4 kW = 48V	
	MAXIMUM DEPTH OF DISCHARGE (60%)	0,6
	BATTERY BANK CAPACITY (Ah)	#DIV/0!
	NUMBERS OF BATTERIES	
	BATTERY TYPE	Lead-acid
	AVERAGE COST OF THE BATTERY (€)	0,00

source: Technical Design Guidelines Off-Grid PV Systems, IRENA

Wind system sizing

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WIND SYSTEM SIZING

basic data

Site

ρ =AIR DENSITY kg/m³ 1,20

v =MINIMUM WIND SPEED m/s

[here how to get the wind speed value](#)

POWER COEFFICIENT

en 0,2 and 0,6) 0,4

Classification of wind resource by wind speed range

Class	Wind Speed	
	m/s	mph
Marginal	4 to 5	9 to 11.3
Fair	5 to 6	11.3 to 13.5
Good	6 to 7	13.5 to 15.8
Excellent	7 to 8	15.8 to 18
Outstanding	over 8	Over 18

RETURN BACK

Global formula: $E=(\frac{1}{2} \rho A v^3) * 365 \text{ day} * 24 \text{ hours}$


Legend

- Enter your own data
- Result (do not change the value)
- Calculated value (do not change the value)

STARTING FROM YOUR ENERGY LOAD/NEED

E=ENERGY NEED	kWh/year	0,00
POWER WIND (per turbine)	kW	#DIV/0!
POWER TURBINE (per turbine)	kW	#DIV/0!
BLADE LENGTH (3m max radius suggested per turbine)	m	#DIV/0!
SWEPT AREA (per turbine)	m ²	#DIV/0!
TURBINE HEIGHT (at least)	m	#DIV/0!
NUMBER OF TURBINE	n°	#DIV/0!
ENERGY ESTIMATED PRODUCTION PER TURBINE	kWh/year	#DIV/0!
AVERAGE COST OF THE SYSTEM	€	0,00

SWEPT AREA







T

STARTING FROM BLADE LENGTH

BLADE LENGTH (3m max radius suggested per turbine)	m	
SWEPT AREA	m ²	0,0000
TURBINE HEIGHT (at least)	m	0,0000
POWER WIND	kW	0,00
POWER TURBINE	kW	0,00
ENERGY ESTIMATED PRODUCTION PER TURBINE	kWh/year	0,00
NUMBER OF TURBINES	n°	5,0
TOTAL ENERGY ESTIMATED PRODUCTION PER WIND SYSTEM	kWh/year	0,000
AVERAGE COST OF THE SYSTEM	€	0,00

Is your system off-grid?

 INVERTER SIZE (W) AC+DC loads	0,0
 DAILY ENERGY LOAD (Wh)	0,00
 DAYS OF AUTONOMY (suggested from 2 to 5 days)	3
SYSTEM VOLTAGE Small daily loads < 1kW = 12V Intermediate daily loads < 3-4 kW = 24V Larger loads > 4 kW = 48V	
MAXIMUM DEPTH OF DISCHARGE (60%)	0,6
 BATTERY BANK CAPACITY (Ah)	#DIV/0!
NUMBERS OF BATTERIES	
BATTERY TYPE	Lead-acid
AVERAGE COST OF THE BATTERY	0,00

START ENERGY NEED-PRODUCTION EUP POWER CONSUMPTION DATABASE PV SYSTEM SIZING WIND SYSTEM SIZING HYDRO SYSTEM SIZING BIOGAS DIGESTER SIZING REFERENC

Normal View Ready Sum=0

Wind system sizing

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WIND SYSTEM SIZING

Site

ρ = AIR DENSITY kg/m³ 1,20

v = MINIMUM WIND SPEED m/s

[here how to get the wind seed value](#)

POWER COEFFICIENT

en 0,2 and 0,6) 0,4

Classification of wind resource by wind speed range

Class	Wind Speed Range	Power Class
Fair	5 to 6	11.3 to 13.5
Good	6 to 7	13.5 to 15.8
Excellent	7 to 8	15.8 to 18
Outstanding	over 8	Over 18

RETURN BACK

Global formula: $E = (\frac{1}{2} \rho A v^3) * 365 \text{ day} * 24 \text{ hours}$

Legend

- Enter your own data
- Result (do not change the value)
- Calculated value (do not change the value)


STARTING FROM YOUR ENERGY LOAD/NEED

E=ENERGY NEED	kWh/year	0,00
POWER WIND (per turbine)	kW	#DIV/0!
POWER TURBINE (per turbine)	kW	#DIV/0!
BLADE LENGTH (3m max radius suggested per turbine)	m	#DIV/0!
SWEPT AREA (per turbine)	m ²	#DIV/0!
TURBINE HEIGHT (at least)	m	#DIV/0!
NUMBER OF TURBINE	n°	#DIV/0!
ENERGY ESTIMATED PRODUCTION PER TURBINE	kWh/year	#DIV/0!
AVERAGE COST OF THE SYSTEM	€	0,00

STARTING FROM BLADE LENGHT

BLADE LENGTH (3m max radius suggested per turbine)	m	
SWEPT AREA	m ²	0,0000
TURBINE HEIGHT (at least)	m	0,0000
POWER WIND	kW	0,00
POWER TURBINE	kW	0,00
ENERGY ESTIMATED PRODUCTION PER TURBINE	kWh/year	0,00
NUMBER OF TURBINES	n°	5,0
TOTAL ENERGY ESTIMATED PRODUCTION PER WIND SYSTEM	kWh/year	0,000
AVERAGE COST OF THE SYSTEM	€	0,00

SWEPT AREA



T

Is your system off-grid?

INVERTER SIZE (W) AC+DC loads	0,0
DAILY ENERGY LOAD (Wh)	0,00
DAYS OF AUTONOMY (suggested from 2 to 5 days)	3
SYSTEM VOLTAGE	Small daily loads < 1kW = 12V Intermediate daily loads < 3-4 kW = 24V Larger loads > 4 kW = 48V
MAXIMUM DEPTH OF DISCHARGE (60%)	0,6
BATTERY BANK CAPACITY (Ah)	#DIV/0!
NUMBERS OF BATTERIES	
BATTERY TYPE	Lead-acid
AVERAGE COST OF THE BATTERY	0,00

START ENERGY NEED-PRODUCTION EUP POWER CONSUMPTION DATABASE PV SYSTEM SIZING WIND SYSTEM SIZING HYDRO SYSTEM SIZING BIOGAS DIGESTER SIZING REFERENC

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Wind system sizing

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Solar and Wind Energy Resource Assessment

A United Nations Environment Programme facilitated effort.

swera

Getting Started Data Sets Analysis Tools About SWERA

South Africa

Analyze Layer Data in OpenCarto

View Country Profile in OpenEI | OPEN | SWERA | WRO

South Africa

Solar Wind Climate Homer

STARTING FROM BLADE LENGTH			
BLADE LENGTH	(3m	m	
max radius suggested per turbine)			
	SWEPT AREA	m ²	0,0000
	TURBINE HEIGHT (at least)	m	0,0000
	POWER WIND	kW	0,00
	POWER TURBINE	kW	0,00
	ENERGY ESTIMATED PRODUCTION PER TURBINE	kWh/year	0,00
	NUMBER OF TURBINES	n°	5,0
	TOTAL ENERGY ESTIMATED PRODUCTION PER WIND SYSTEM	kWh/year	0,000
	AVERAGE COST OF THE SYSTEM	€	0,00

SYSTEM VOLTAGE	
Small daily loads < 1kW = 12V	Intermediate
daily loads < 3-4 kW = 24V	Larger loads > 4 kW = 48V
MAXIMUM DEPTH OF DISCHARGE (60%)	0,6
BATTERY BANK CAPACITY (Ah)	#DIV/0!
NUMBERS OF BATTERIES	
BATTERY TYPE	Lead-acid
AVERAGE COST OF THE BATTERY	0,00

START ENERGY NEED-PRODUCTION EUP POWER CONSUMPTION DATABASE PV SYSTEM SIZING WIND SYSTEM SIZING HYDRO SYSTEM SIZING BIOGAS DIGESTER SIZING REFERENC

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Wind system sizing

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WIND SYSTEM SIZING

Site

$\rho = \text{AIR DENSITY}$ kg/m³ 1,20

$v = \text{MINIMUM WIND SPEED}$ m/s

[here how to get the wind seed value](#)

POWER COEFFICIENT

en 0,2 and 0,5 0,4

system sizing tables

STARTING FROM YOUR ENERGY LOAD/NEED

E=ENERGY NEED	kWh/year	0,00
POWER WIND (per turbine)	kW	#DIV/0!
POWER TURBINE (per turbine)	kW	#DIV/0!
BLADE LENGTH (3m max radius suggested per turbine)	m	#DIV/0!
SWEPT AREA (per turbine)	m ²	#DIV/0!
TURBINE HEIGHT (at least)	m	#DIV/0!
NUMBER OF TURBINE	n°	#DIV/0!
ENERGY ESTIMATED PRODUCTION PER TURBINE	kWh/year	#DIV/0!
AVERAGE COST OF THE SYSTEM	€	0,00

STARTING FROM BLADE LENGHT

BLADE LENGTH (3m max radius suggested per turbine)	m	
SWEPT AREA	m ²	0,0000
TURBINE HEIGHT (at least)	m	0,0000
POWER WIND	kW	0,00
POWER TURBINE	kW	0,00
ENERGY ESTIMATED PRODUCTION PER TURBINE	kWh/year	0,00
NUMBER OF TURBINES	n°	5,0
TOTAL ENERGY ESTIMATED PRODUCTION PER WIND SYSTEM	kWh/year	0,000
AVERAGE COST OF THE SYSTEM	€	0,00

Classification of wind resource by wind speed range

Class	Wind Speed	
	m/s	mph
Marginal	4 to 5	9 to 11.3
Fair	5 to 6	11.3 to 13.5
Good	6 to 7	13.5 to 15.8
Excellent	7 to 8	15.8 to 18
Outstanding	over 8	Over 18

RETURN BACK

Global formula: $E = (\frac{1}{2} \rho A v^3) * 365 \text{ day} * 24 \text{ hours}$

Legend

- Enter your own data
- Result (do not change the value)
- Calculated value (do not change the value)

SWEPT AREA

T

Is your system off-grid?

INVERTER SIZE (W) AC+DC loads 0,0

DAILY ENERGY LOAD (Wh) 0,00

DAYS OF AUTONOMY (suggested from 2 to 5 days) 3

SYSTEM VOLTAGE
Small daily loads < 1kW = 12V Intermediate
daily loads < 3-4 kW = 24V Larger loads > 4 kW = 48V

MAXIMUM DEPTH OF DISCHARGE (60%) 0,6

BATTERY BANK CAPACITY (Ah) #DIV/0!

NUMBERS OF BATTERIES

BATTERY TYPE Lead-acid

AVERAGE COST OF THE BATTERY 0,00

START ENERGY NEED-PRODUCTION EUP POWER CONSUMPTION DATABASE PV SYSTEM SIZING WIND SYSTEM SIZING HYDRO SYSTEM SIZING BIOGAS DIGESTER SIZING REFERENC

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Wind system sizing

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WIND SYSTEM SIZING

Site

$\rho = \text{AIR DENSITY}$ kg/m³ 1,20

$v = \text{MINIMUM WIND SPEED}$ m/s

[here](#) how to get the wind seed value

POWER COEFFICIENT

en 0,2 and 0,6) 0,4

Classification of wind resource by wind speed range

Class	Wind Speed	
	m/s	mph
Marginal	4 to 5	9 to 11.3
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Good	6 to 7	13.5 to 15.8
Excellent	7 to 8	15.8 to 18
Outstanding	over 8	Over 18

RETURN BACK

Global formula: $E = (\frac{1}{2} \rho A v^3) * 365 \text{ day} * 24 \text{ hours}$

Legend

- Enter your own data
- Result (do not change the value)
- Calculated value (do not change the value)

STARTING FROM YOUR ENERGY LOAD/NEED

E=ENERGY NEED	kWh/year	0,00
POWER WIND (per turbine)	kW	#DIV/0!
POWER TURBINE (per turbine)	kW	#DIV/0!
BLADE LENGTH (3m max radius suggested per turbine)	m	#DIV/0!
SWEPT AREA (per turbine)	m ²	#DIV/0!
TURBINE HEIGHT (at least)	m	#DIV/0!
NUMBER OF TURBINE	n°	#DIV/0!
ENERGY ESTIMATED PRODUCTION PER TURBINE	kWh/year	#DIV/0!
AVERAGE COST OF THE SYSTEM	€	0,00

System that meets the energy need

STARTING FROM BLADE LENGHT

BLADE LENGTH (3m max radius suggested per turbine)	m	
SWEPT AREA	m ²	0,0000
TURBINE HEIGHT (at least)	m	0,0000
POWER WIND	kW	0,00
POWER TURBINE	kW	0,00
ENERGY ESTIMATED PRODUCTION PER TURBINE	kWh/year	0,00
NUMBER OF TURBINES	n°	5,0
TOTAL ENERGY ESTIMATED PRODUCTION PER WIND SYSTEM	kWh/year	0,000
AVERAGE COST OF THE SYSTEM	€	0.00

Turbine dimension (blade length)

Is your system off-grid?

INVERTER SIZE (W) AC+DC loads 0,0

DAILY ENERGY LOAD (Wh) 0,00

48V

MAXIMUM DEPTH OF DISCHARGE (60%) 0,6

BATTERY BANK CAPACITY (Ah) #DIV/0!

NUMBERS OF BATTERIES

BATTERY TYPE Lead-acid

AVERAGE COST OF THE BATTERY 0,00

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START ENERGY NEED-PRODUCTION EUP POWER CONSUMPTION DATABASE PV SYSTEM SIZING WIND SYSTEM SIZING HYDRO SYSTEM SIZING BIOGAS DIGESTER SIZING REFERENC

Wind system sizing

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WIND SYSTEM SIZING

Site			
$\rho = \text{AIR DENSITY}$	kg/m ³	1,20	
$v = \text{MINIMUM WIND SPEED}$	m/s		
here how to get the wind speed value			
POWER COEFFICIENT			
en 0,2 and 0,6)		0,4	

STARTING FROM YOUR ENERGY LOAD/NEED			
E=ENERGY NEED	kWh/year	0,00	
POWER WIND (per turbine)	kW	#DIV/0!	
POWER TURBINE (per turbine)	kW	#DIV/0!	
BLADE LENGTH (3m max radius suggested per turbine)	m	#DIV/0!	
SWEPT AREA (per turbine)	m ²	#DIV/0!	
TURBINE HEIGHT (at least)	m	#DIV/0!	
NUMBER OF TURBINE	n°	#DIV/0!	
ENERGY ESTIMATED PRODUCTION PER TURBINE	kWh/year	#DIV/0!	
AVERAGE COST OF THE SYSTEM	€	0,00	

STARTING FROM BLADE LENGHT			
BLADE LENGTH (3m max radius suggested per turbine)	m		
SWEPT AREA	m ²	0,0000	
TURBINE HEIGHT (at least)	m	0,0000	
POWER WIND	kW	0,00	
POWER TURBINE	kW	0,00	
ENERGY ESTIMATED PRODUCTION PER TURBINE	kWh/year	0,00	
NUMBER OF TURBINES	n°	5,0	
TOTAL ENERGY ESTIMATED PRODUCTION PER WIND SYSTEM	kWh/year	0,000	
AVERAGE COST OF THE SYSTEM	€	0,00	

Classification of wind resource by wind speed range		
Class	Wind Speed	
	m/s	mph
Marginal	4 to 5	9 to 11.3
Fair	5 to 6	11.3 to 13.5
Good	6 to 7	13.5 to 15.8
Excellent	7 to 8	15.8 to 18
Outstanding	over 8	Over 18

Global formula: $E = (\frac{1}{2} \rho A v^3) * 365 \text{ day} * 24 \text{ hours}$

Legend

- Enter your own data
- Result (do not change the value)
- Calculated value (do not change the value)

SWEPT AREA

T

off-grid system

Is your system off-grid?		
	INVERTER SIZE (W) AC+DC loads	0,0
	DAILY ENERGY LOAD (Wh)	0,00
	DAYS OF AUTONOMY (suggested from 2 to 5 days)	3
	SYSTEM VOLTAGE Small daily loads < 1kW = 12V Intermediate daily loads < 3-4 kW = 24V Larger loads > 4 kW = 48V	
	MAXIMUM DEPTH OF DISCHARGE (60%)	0,6
	BATTERY BANK CAPACITY (Ah)	#DIV/0!
	NUMBERS OF BATTERIES	
	BATTERY TYPE	Lead-acid
	AVERAGE COST OF THE BATTERY	0,00

Hydro system sizing

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HYDRO ENERGY SYSTEM SIZING

basic data

Site		
Q = Water flow rate	l/s	
Stream		
g = Gravity	m/s ²	9,81
η = Efficiency		0,5

STARTING FROM YOUR ENERGY LOAD/NEED

ENERGY NEED	kWh/year	0,000
HYDRO POWER	kW	0,000
E= GENERATOR POWER	kW	0,000
H = HEAD	m	#DIV/0!
AVERAGE COST OF THE SYSTEM	€	0,00

Do you have a head different from the one calculated?

HEAD	m	
HYDRO POWER	kW	0,000
E= GENERATOR POWER	kW	0,000
ENERGY ESTIMATED PRODUCTION	kWh/year	0,000
AVERAGE COST OF THE SYSTEM	€	0,00

Do you have a less or greater budget than that calculated?


BUDGET	€	
HYDRO POWER	kW	0,000
E= GENERATOR POWER	kW	0,000
HEAD	m	#DIV/0!
ENERGY ESTIMATED PRODUCTION	kWh/year	0,00

FLOW RATE AVERAGE

[click here](#) to see some examples of river flow

Very small stream	l/s	10-50
Small stream	l/s	50-250
Stream	l/s	250-1000
Small river	l/s	1000-2000
River	l/s	2000

FLOW MEASUREMENT



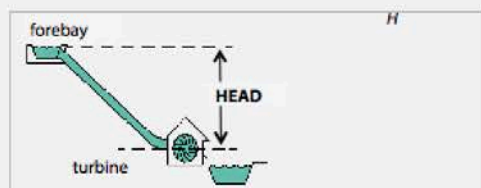
Volume of the container (water)	l	0
Filling time	s	0
Water flow	l/s	0

RETURN BACK

Global formula: $E = H \times Q \times g \times \eta \times 365 \text{ days} \times 24 \text{ hours}$

Legend

- Enter your own data
- Result (do not change the value)
- Calculated value (do not change the value)



forebay
turbine
HEAD

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Hydro system sizing

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A B C D E F G H I J K L M N O P Q R S T U V

HYDRO ENERGY SYSTEM SIZING






Site

FLOW RATE AVERAGE

[click here to see some examples of river flow](#)

RETURN BACK

O = Water flow rate

Water flow rate	Very small stream	Small stream	Stream	Small river	River
10 to 50 l/s	50 to 250 l/s	250 to 1000 l/s	1000 to 2000 l/s	2000 l/s and greater	
					

source: <http://www.micro-hydro-power.com/micro-hydro-power-Estimating-Head-and-Flow.htm>

RETURN BACK

START ENERGY NEED-PRODUCTION EUP POWER CONSUMPTION DATABASE PV SYSTEM SIZING WIND SYSTEM SIZING HYDRO SYSTEM SIZING BIOGAS ...

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A B C D E F G H I J K L M N O P Q R S T U V

HYDRO ENERGY SYSTEM SIZING

Site		
Q = Water flow rate	l/s	
Stream		
g = Gravity	m/s ²	9,81
η = Efficiency		0,5

STARTING FROM YOUR ENERGY LOAD/NEED

ENERGY NEED	kWh/year	0,000
HYDRO POWER	kW	0,000
E= GENERATOR POWER	kW	0,000
H = HEAD	m	#DIV/0!
AVERAGE COST OF THE SYSTEM	€	0,00

Do you have a head different from the one calculated?

HEAD	m	
HYDRO POWER	kW	0,000
E= GENERATOR POWER	kW	0,000
ENERGY ESTIMATED PRODUCTION	kWh/year	0,000
AVERAGE COST OF THE SYSTEM	€	0,00

Do you have a less or greater budget than that calculated?

BUDGET	€	
HYDRO POWER	kW	0,000
E= GENERATOR POWER	kW	0,000
HEAD	m	#DIV/0!
ENERGY ESTIMATED PRODUCTION	kWh/year	0,00


system sizing tables

FLOW RATE AVERAGE

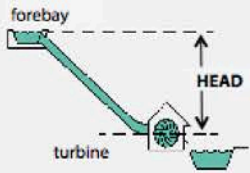
[click here](#) to see some examples of river flow

Very small stream	l/s	10-50
Small stream	l/s	50-250
Stream	l/s	250-1000
Small river	l/s	1000-2000
River	l/s	2000

FLOW MEASUREMENT



Volume of the container (water)	l	0
Filling time	s	0
Water flow	l/s	0



[RETURN BACK](#)

Global formula: $E = H \times Q \times g \times \eta \times 365 \text{ days} \times 24 \text{ hours}$

Legend

Enter your own data

Result (do not change the value)

Calculated value (do not change the value)

START ENERGY NEED-PRODUCTION EUP POWER CONSUMPTION DATABASE PV SYSTEM SIZING WIND SYSTEM SIZING HYDRO SYSTEM SIZING BIOGAS DIGESTER SIZING REFERENC

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Hydro system sizing

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A B C D E F G H I J K L M N O P Q R S T U V

HYDRO ENERGY SYSTEM SIZING

Site

Q = Water flow rate l/s

Stream

g = Gravity m/s² 9,81

η = Efficiency 0,5

STARTING FROM YOUR ENERGY LOAD/NEED

ENERGY NEED	kWh/year	0,000
HYDRO POWER	kW	0,000
E= GENERATOR POWER	kW	0,000
H = HEAD	m	#DIV/0!
AVERAGE COST OF THE SYSTEM	€	0,00

Do you have a head different from the one calculated?

HEAD	m	
HYDRO POWER	kW	0,000
E= GENERATOR POWER	kW	0,000
ENERGY ESTIMATED PRODUCTION	kWh/year	0,000
AVERAGE COST OF THE SYSTEM	€	0,00

Do you have a less or greater budget than that calculated?

BUDGET	€	
HYDRO POWER	kW	0,000
E= GENERATOR POWER	kW	0,000
HEAD	m	#DIV/0!
ENERGY ESTIMATED PRODUCTION	kWh/year	0,00

FLOW RATE AVERAGE

[click here](#) to see some examples of river flow

Very small stream	l/s	10-50
Small stream	l/s	50-250
Stream	l/s	250-1000
Small river	l/s	1000-2000
River	l/s	

System that meets the energy need

Different head

Different budget

RETURN BACK

Global formula: $E = H \times Q \times g \times \eta \times 365 \text{ days} \times 24 \text{ hours}$

Legend

Enter your own data
Result (do not change the value)
Calculated value (do not change the value)

START ENERGY NEED-PRODUCTION EUP POWER CONSUMPTION DATABASE PV SYSTEM SIZING WIND SYSTEM SIZING HYDRO SYSTEM SIZING BIOGAS DIGESTER SIZING REFERENC

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Biomass digester sizing

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define the amount feedstock

Define your feedstock availability

Vs=TOTAL DAILY FEEDSTOCK (t) 0

Gy=TOTAL BIOGAS YIELD (m³/day) 0

ANIMAL	N° of animals	daily manure (t/day)	amount of manure (t/day)	VS %	t/VS	Biogas yield (m ³ /t)	Total biogas yield (m ³ /day)	
Cattle (650 kg)		0,055	0	80	0	19	0	
Diary cattle		0,055	0	80	0	25	0	
Pig		0,0045	0	80	0	28	0	
Sheep		0,002	0	75	0	20	0	
Horse		0,02	0	80	0	63	0	
Chicken		0,0002	0	75	0	140	0	
ENERGY CROPS		Area (ha)	Yield (t/ha)	Amount of crops (t/d)	VS%	t/VS	Biogas yield (m ³ /t)	Total biogas yield (m ³ /day)
Grass silage			0,5	0	90	0	160	0
Triticale								

STARTING FROM FEEDSTOCK AVAILABILITY

Vd=DIGESTER VOLUME m³ 0

G=DAILY GAS PRODUCTION m³/day 0,00

Rt=Retention time days 30

Sd=Daily substrate input t 0

water m³/d 0

AVERAGE COST OF THE SYSTEM € 0,00

RETURN BACK

Biogas potential comparison

1 m³ of biogas 0,61 l of diesel fuel
5,5 Kg of firewood

Legend

Enter your own data

Result (do not change the value)

Calculated value (do not change the value)

Global formula: $G = Vs * Gy$
 $Vd = Sd * Rt$

Normal View Ready

Sum=0

START ENERGY NEED-PRODUCTION EUP POWER CONSUMPTION DATABASE PV SYSTEM SIZING WIND SYSTEM SIZING HYDRO SYSTEM SIZING BIOGAS DIGESTER SIZING REFERENC

Biomass digester sizing

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BIOGAS DIGESTER SIZING

Define your feedstock availability

Vs=TOTAL DAILY FEEDSTOCK (t) 0

Gy=TOTAL BIOGAS YIELD (m³/day) 0

ANIMAL	N° of animals	daily manure (t/day)	amount of manure (t/day)	VS %	t/VS	Biogas yield (m ³ /t)	Total biogas yield (m ³ /day)	
Cattle (650 kg)		0,055						
Dairy cattle								
Pig		0,0045						
Sheep		0,002	0	75	0	20	0	
Horse		0,02	0	80	0	63	0	
Chicken		0,0002	0	75	0	140	0	
ENERGY CROPS		Area (ha)	Yield (t/ha)	Amount of crops (t/d)	VS%	t/VS	Biogas yield (m ³ /t)	Total biogas yield (m ³ /day)
Grass silage			0,5	0	90	0	160	0
Triticale								

STARTING FROM FEEDSTOCK AVAILABILITY

Vd=DIGESTER VOLUME m³ 0

G=DAILY GAS PRODUCTION m³/day 0,00

Rt=Retention time days 30

Sd=Daily substrate input t 0

water m³/d 0

AVERAGE COST OF THE SYSTEM € 0,00

RETURN BACK

Biogas potential comparison

1 m³ of biogas	0,61 l of diesel fuel
	5,5 Kg of firewood

Legend

Enter your own data

Result (do not change the value)

Calculated value (do not change the value)

Global formula: $G = Vs * Gy$

Vd = Sd * Rt

N° of Animals
Ha of Energy crops
Quantity of residues

Biomass digester sizing

System sizing table

BIOGAS DIGESTER SIZING

Define your feedstock availability								
Vs=TOTAL DAILY FEEDSTOCK (t)		0						
Gy=TOTAL BIOGAS YIELD (m ³ /day)		0						
ANIMAL	N° of animals	daily manure (t/day)	amount of manure (t/day)	VS %	t/VS	Biogas yield (m ³ /t)	Total biogas yield (m ³ /day)	
Cattle (650 kg)		0,055	0	80	0	19	0	
Diary cattle		0,055	0	80	0	25	0	
Pig		0,0045	0	80	0	28	0	
Sheep		0,002	0	75	0	20	0	
Horse		0,02	0	80	0	63	0	
Chicken		0,0002	0	75	0	140	0	
ENERGY CROPS		Area (ha)	Yield (t/ha)	Amount of crops (t/d)	VS%	t/VS	Biogas yield (m ³ /t)	Total biogas yield (m ³ /day)
Grass silage			0,5	0	90	0	160	0
Triticale			0,3	0	90	0	337	0

STARTING FROM FEEDSTOCK AVAILABILITY		
Vd=DIGESTER VOLUME	m ³	0
G=DAILY GAS PRODUCTION	m ³ /day	0,00
Rt=Retention time	days	30
Sd=Daily substrate input	t	0
water	m ³ /d	0
AVERAGE COST OF THE SYSTEM	€	0,00

RETURN BACK

Biogas potential comparison	
1 m ³ of biogas	0,61 l of diesel fuel 5,5 Kg of firewood

Legend

Enter your own data
Result (do not change the value)
Calculated value (do not change the value)

Global formula: $G = Vs * Gy$
 $Vd = Sd * Rt$

4. Verify if the system proposed satisfy the energy need

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ENERGY LOAD/NEED						
TOTAL ENERGY NEED (Kwh/year)					905,93	
TOTAL GAS NEED (m³/year)					0	
TYPE OF APPLIANCE [DATABASE]	POWER (W)	GAS CONSUMPTION (m ³)	NUMBER OF APPLIANCES (unit)	HOURS OF USAGE PER DAY (h/day)	ELECTRICITY CONSUMPTION PER DAY (kWh/day)	GAS CONSUMPTION PER DAY (m ³ /day)
Incandescent bulb (60 W)	60	0	6	6	2,16	0
Laptop	50	0	1	5	0,25	0
Phone charger	4	0	3	6	0,072	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0

ENERGY PRODUCTION POTENTIAL			
TOTAL ENERGY PRODUCTION POTENTIAL (Kwh/year)			905,93
TOTAL GAS PRODUCTION POTENTIAL (m³/year)			0,00
TYPE OF DRE RESOURCES	DRE GENERAL CHARACTERISTICS	DRE SYSTEM POWER	TOTAL DRE PRODUCTION POTENTIAL
PHOTOVOLTAIC ENERGY	Describe the general characteristics of the DRE system		kWh 905,93 0,00 0,00
WIND ENERGY	Describe the general characteristics of the DRE system		kWh 905,93 0,00
HYDRO ENERGY	Describe the general characteristics of the DRE system		kWh 905,93 0,00 0,00
BIOGAS ENERGY	Describe the general characteristics of the DRE system		m ³ 0,00
OTHER TYPE OF DRE	Describe the general characteristics of the DRE system		

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4. Verify if the system proposed satisfy the energy need

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satisfying

ENERGY LOAD/NEED						
TOTAL ENERGY NEED (Kwh/year)					905,93	
TOTAL GAS NEED (m³/year)					0	
TYPE OF APPLIANCE [DATABASE]	POWER (W)	GAS CONSUMPTION (m ³)	NUMBER OF APPLIANCES (unit)	HOURS OF USAGE PER DAY (h/day)	ELECTRICITY CONSUMPTION PER DAY (kWh/day)	GAS CONSUMPTION PER DAY (m ³ /day)
Incandescent bulb (60 W)	60	0	6	6	2,16	0
Laptop	50	0	1	5	0,25	0
Phone charger	4	0	3	6	0,072	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0
Select appliance						
Click here to copy and paste the icon	0	0			0	0

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ENERGY PRODUCTION POTENTIAL			
TOTAL ENERGY PRODUCTION POTENTIAL (Kwh/year)			905,93
TOTAL GAS PRODUCTION POTENTIAL (m³/year)			0,00
TYPE OF DRE RESOURCES	DRE GENERAL CHARACTERISTICS	DRE SYSTEM POWER	TOTAL DRE PRODUCTION POTENTIAL
PHOTOVOLTAIC ENERGY	Describe the general characteristics of the DRE system		kWh 905,93 0,00 0,00
WIND ENERGY	Describe the general characteristics of the DRE system		kWh 905,93 0,00
HYDRO ENERGY	Describe the general characteristics of the DRE system		kWh 905,93 0,00 0,00
BIOGAS ENERGY	Describe the general characteristics of the DRE system		m ³ 0,00
OTHER TYPE OF DRE	Describe the general characteristics of the DRE system		

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4. Verify if the system proposed satisfy the energy need

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unsatisfying

ENERGY LOAD/NEED							ENERGY PRODUCTION POTENTIAL			
TOTAL ENERGY NEED (Kwh/year)					905,93		TOTAL ENERGY PRODUCTION POTENTIAL (Kwh/year)		834,15	
TOTAL GAS NEED (m³/year)					0		TOTAL GAS PRODUCTION POTENTIAL (m³/year)		0,00	
TYPE OF APPLIANCE [DATABASE]	POWER (W)	GAS CONSUMPTION (m ³)	NUMBER OF APPLIANCES (unit)	HOURS OF USAGE PER DAY (h/day)	ELECTRICITY CONSUMPTION PER DAY (kWh/day)	GAS CONSUMPTION PER DAY (m ³ /day)	TYPE OF DRE RESOURCES	DRE GENERAL CHARACTERISTICS	DRE SYSTEM POWER	TOTAL DRE PRODUCTION POTENTIAL
Incandescent bulb (60 W)	60	0	6	6	2,16	0	PHOTOVOLTAIC ENERGY	Describe the general characteristics of the DRE system		kWh 905,93 834,15 0,00
Laptop	50	0	1	5	0,25	0	WIND ENERGY	Describe the general characteristics of the DRE system		kWh 905,93 0,00
Phone charger	4	0	3	6	0,072	0	HYDRO ENERGY	Describe the general characteristics of the DRE system		kWh 905,93 0,00 0,00
Select appliance	0	0			0	0	BIOGAS ENERGY	Describe the general characteristics of the DRE system		m ³ 0,00
Select appliance	0	0			0	0	OTHER TYPE OF DRE	Describe the general characteristics of the DRE system		

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START ENERGY NEED-PRODUCTION EUP POWER CONSUMPTION DATABASE PV SYSTEM SIZING WIND SYSTEM SIZING HYDRO SYSTEM SIZING BIOGAS DIGESTER SIZING REFERENC

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Conclusions

- Combine existing tools and information to design and dimension DRE system into one single tool accessible for designers
- Allow designers to have a basic knowledge on energy, and to integrate energy requirement into their design works
- Implemented with excel to make calculations
- It can be easily updated and integrated to be open to the fast evolution of the renewable energy technology