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Technical and economical study of a Stand-alone Wind Energy System for Remote Rural Area Electrification in Algeria

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Abstract. The present work is the investigation of a specific SWES. This system is designed to provide enough power for domestic use that satisfies a single household's demand and allows a certain level of autonomy. The whole work is based on simulation. Models are elaborated to simulate the power source (wind turbine), a storage battery, the electrical load and the relevant meteorological conditions. in addition to other items that are needed to represent the SWES satisfactorily. MATLAB/SIMULINK software is used for the whole system simulation. Focus is put onto the power source and battery. The load situated in various climatic zones of Algeria is represented as a power demand that needs be satisfied. Finally, the economic analysis has resulted in the calculation of the installed total cost, kWh cost, and the actualized total cost for the wind energy source. The simulation results indicate that the coverage provided by the wind/battery system depends on the wind turbine nominal power. It depends also from the local wind speed distribution As far as the economic results are concerned, it appears that the cost of the energy produced by the wind/battery system is very high (1.3-4\$/kWh) compared to those corresponding to conventional installations (0.4\$/kWh). This, however, is not to be considered as a negative determinant factor since the local authorities plan to manufacture renewable energy equipment locally and, by doing so, cancel the effects of subsidizing the local fossil fuels on the imported machines costs, which will in turn be favorably reflected on renewable energy costs.

Keywords:

Wind energy system, autonomy, electricity production, load, MATLAB/SIMULINK.

1. Introduction

The energy reserves of coal, oil and natural gas in the world are gradually being depleted. On the other hand, the energy demand is increasing, and thus worsening the depletion of conventional energy sources. The assumption is that the supplies of fossil fuels will not be sufficient to satisfy the demand in the future. In addition, the use of fossil fuels cause²s problems related to environmental pollution and increases emissions of the greenhouse gases. By using the renewable energy sources, especially wind energy, these problems can be effectively managed. The application of wind energy to generate electrical power has certain advantages: it is free and available, does not pollute the environment (no emissions, while there is a growing

pressure on the world's nations to reduce greenhouse gas emissions), belongs to the renewable energy sources kind and contributes to sustainable development. So, it is not surprising to see that public authorities have taken an interest in renewable energy sources. Wind power in particular has attracted attention, and is poised to become the world's most rapidly growing source of electricity [1]. Several papers have been published on the subject of wind diesel hybrid system dynamic simulation. In [2] the interaction between one diesel generator and a constant/variable speed wind turbine generator is studied. In [3] a no-storage hybrid wind-diesel system is simulated against several perturbations, among which is the connection of a wind turbine generator to the dieselisolated grid. In [4] a wind diesel hybrid system (WDHS) comprised a wind turbine generator (WTG), a diesel engine (DE), a synchronous machine (SM), the consumer load, a battery-based energy storage system (BESS), a discrete dump load (DL) and a distributed control system (DCS).

This work focuses on wind-powered electrical generators (wind turbines) as economical solutions for isolated regions in Algeria. These systems are designed to provide enough power for domestic use, satisfying a single household demands and granting a certain level of autonomy.

In the following paragraphs, a theoretical model of the system is presented and the energy requirements of a typical household evaluated. The coverage provided by seven commercially available wind turbines is then analyzed. Finally the authors present an economic study for different sites from a rural Algerian area.

2. Theoretical aspect of modelling

2.1 Wind Speed Variation with Height.

To calculate the output of the wind turbine in each of the 8760h of a year, the hourly values of measured wind speed on the Adrar site at the hub height of the machine is calculated by using

$$v_2 = v \frac{\ln \left(\frac{z_2}{z_0}\right)}{\ln \left(\frac{z_1}{z_0}\right)} \tag{1}$$

Where z_2 is the hub height of the wind turbine (m), z_1 is the anemometer height (m), z_0 is the surface roughness length

(m) presented in Table 1 below [5] and v_2 is the wind speed at the anemometer height during the hour h (m/s).

Table 1 Typical surface roughness lengths

Terrain Description	Surface lengths (m)
Very smooth, ice or mud	0.00001
Calm open sea	0.0002
Blown surface	0.0005
Snow surface	0.003
Lawn grass	0.008
Rough pasture	0.01
Fallow field	0.03
Crops	0.05
Few Trees	0.10
Many trees, few buildings	0.25
Forest and woodlands	0.5
Suburbs	1.5
City center, tall Buildings	3.0

2.2 Modelling of the wind system

To calculate the performance of a wind turbine operating at a given site, the first step is to express its energy production in terms of wind speed. Among the many mathematical models used in wind power studies, the cumulative statistical distribution of Weibull [6-9] is most appropriate for describing wind speed variations:

$$F(v) = 1 - \exp\left[-\left(\frac{v}{c}\right)^k\right]$$
(2)

where v is an individual wind speed measurement (averaged over ten minutes). This distribution is characterized by two parameters: a scale factor c (m/s) and the dimensionless shape factor k. In this paper, the distribution is assumed to be valid for a single month. The shape factor k and monthly average wind speed \overline{v} can generally be obtained from national meteorological offices [6]. The scale factor can be calculated using the following formula:

$$c = \frac{\overline{v}}{\Gamma\left(1 + \frac{1}{k}\right)} \tag{3}$$

Thus, the average power produced by a wind turbine is

given by

$$P = \int_{Vin}^{Vout} P(v) f(v) dv , \qquad (4)$$

Where

 $V_{\rm in}$ is the wind speed at which electricity production begins (m/s);

 V_{out} is the wind speed at which electricity production ends (m/s).

The probability density f(v) is the derivative of Equation (2):

$$f(v) = \left(\frac{k}{c}\right) \left(\frac{v}{c}\right)^{k-1} \exp\left[-\left(\frac{v}{c}\right)^k\right]$$
(5)

Thus, if the characteristics of the wind turbine are known in addition to the monthly average wind speed \overline{v} and its

corresponding (probability density F(v), we can rapidly deduce the total power produced.

However, the extrapolated scale (c) and shape (k) parameters at any height of the rotor are determined using the Justus and Mikhail method [10]:

$$c_1 = c \left(\frac{z_2}{z_1}\right)^{ak} \tag{6}$$

With

$$ak = \frac{1}{\ln\left(\frac{\sqrt{z_1 z_2}}{z_0}\right)} - 0.0881.\ln\left(\frac{c}{6}\right)$$
(7)

For the shape factor k:

$$k_{1} = \frac{k}{1 - 0.088 \ln\left(\frac{z_{2}}{z_{1}}\right)}$$
(8)

So, a SIMULINK program has been written for this purpose (see Fig. 1). The inputs of this latter are the monthly values of v, k, and c for each of the considered sites. These data are calculated, at the hub height of the wind turbine and are processed in the block designated Subsystem 1, which displays the corresponding probability density f(v). This function is passed on to Subsystem 2, which then calculates the power produced by the generator. By averaging the monthly mean wind speed calculated at the hub heights (see Fig. 2) and taking into account the mechanical and electrical yields provided by the gearbox and generator, respectively, the power curves for Bouzaréah site are generated.

2.3 Modeling of battery system

The model used to represent the battery-voltage evolution during charge, overcharge and discharge processes is Copetti's [11] model. In this model, the battery efficiency is presented as a function of the upper regulation thresholds of the charge controllers and the size of the generator and storage systems. During the charging process, Copetti's voltage–current SOC relation for lead– acid battery can be calculated as follows:

$$V_{bat-c} = \left[2.0 - 0.61(1 - SOC)\right] +$$

$$I\left[\left(\frac{1 - 0.025\Delta T}{C10}\right)\left(\frac{6}{1 + (I_{-})^{1.3}} + \frac{0.27}{(1 - SOC)^{1.2}} + 0.036\right)\right]$$
(9)

Where:

Vbat-c : the charge voltage;

I : the charge current;

SOC : the state of battery charge;

C10 : the nominal capacity;

DT = T-25, T is the temperature in °C.

During the discharge process, Copetti's voltage–current SOC relation for lead–acid battery can be calculated as follows:

$$V_{bat-d} = [2.085 - 0.12(1 - SOC)] + I\left[\left(\frac{1 - 0.025\Delta T}{C10}\right)\left(\frac{4}{1 + (I)^{1.3}} + \frac{0.27}{(SOC)^{1.5} + 0.02}\right)\right]$$

Where: Vbat-d is the battery discharge voltage.



Fig. 1 Simulink model of the wind system





Fig. 2 Monthly wind speed, the scale factor and the shape factor at the hub height



Fig. 3 Characteristics of the Whisper 175 wind turbine



Fig. 4 Monthly wind speed and mean power generated by the Whisper 175

3. Installation site

As the potential for wind power depends strongly on climate and topology, sites representing several Algerian climatic zones [12] have been chosen (see Fig.5) :

- BOUZAREAH is in zone A, which comprises the coast and the north side of coastal mountain ranges;
- BATNA is in zone C comprising the high plateaus between the Tell Atlas and Saharan Atlas ranges;
- EL OUED, GHARDAIA, ADRAR, and TAMANRASSET are in zone D, the Sahara desert (beyond the Saharan Atlas).



Fig. 5 Algerian climatic zones

The corresponding monthly average wind speeds at each of the sites are presented in Fig.6.

4. Characteristics of the household

For this study, a household that is not connected to the classical energy distribution network is considered. Nonetheless, it is equipped with a number of devices for the comfort of its inhabitants. Additionally, the house is assumed occupied over whole the year and that its devices require the sector's standard voltage (220V AC, 50 Hz). The characteristics of the house are [13 14]:



Fig. 6 Monthly average wind speeds

Type: individual.

Number of rooms: 3, plus hallway, kitchen, and bathroom. Household devices: refrigerator, color television set, HiFi stereo system, blender, washing machine, fan.

4.1 Energy consumption

To calculate energy needs of the house, the following hypotheses are adopted.

4.1.1 Lighting

The times of sunrise, h_R , and that of sunset, h_S , are calculated using the following equations:

$$h_R = -\frac{1}{15} (\cos^{-1}(-\tan\varphi\tan\delta)) + 12$$
(11)

$$h_{S} = \frac{1}{15} (\cos^{-1}(-\tan\varphi\tan\delta)) + 12$$
 (12)

These values are then corrected to local time [11, 14, 15]. The family is assumed to get up at 7 AM (Fg) and retire at 11 PM (Fr). Fig. 7 shows the plots of the local times of sunrise and sunset for adrar site. Note that these parameters vary with the seasons. In this manner, the household lighting requirements can easily be determined.

4.1.2 The refrigerator

The number of hours a refrigerator runs depends on the ambient temperature, which varies with location and from one season to the other. In the studied case, the refrigerator is assumed to be active for 8 hours each day during winter (November-April) and 12 hours each day during summer (May-October).

4.1.3 The Fan

It is assumed that the fan is only used during the summer months (May-October), for an average uses of 4 hours each day.

4.2 Energy budget

Table 2 summarizes the estimates of daily energy requirements in Watt-hours averaged over the whole year for one household for all sites.



Fig. 7 Diagram for energy consumption related to lighting

Table 2. Estimated daily energy requirements

		Power	Duratio	Daily
		(W)	n	consumption
			(hours)	(Watt hours)
Lighti	Masterbedroom	11	4	44
ng	Children's	22	5	110
	bedroom			
	Living room	22	6	132
	Hall way	22	2	44
	Bathroom	22	2	44
	Toilet	11	1	11
	Kitchen	11	7	77
	Subtotal (A)			462
	Refrigerator	120	8/12	960/1440
	-	(Winter/su		
		mmer)		
	Television	75	7	525
	Fan	100	4	400
	Other	100	2	200
	Subtotal (B)			2085/2565
Total Co	nsumption= Subtota	1 (A)+ Subtota	1 (B)	2547/3027

5. Economic assessment

Algeria is a country characterized by different types of climates which include: A coastal climate, A semi arid climate and an arid climate.

These characteristics have a considerable effect on the lifetime of the system. On the other hand, this country is at a developing stage where fluctuations of interest rates are very significant.

So, to take account of these parameters in the economical study the following assumptions have been selected:

- Three lifetimes are considered: 10, 15 and 20 years;

- Three Interest Rates are considered: 5%, 10% and 15%.

5.1 Investment

All the aspects related to a plant construction are considered: design, materials and transportation.

5.2 Total installed cost

The installation cost correspond to the total of all the investments.

5.3 Annual amortization

It is the process of decreasing or accounting for an amount over a period.

Batteries have a lifetime directly dependent on their conditions of use; the related amortization is calculated separately from the rest of the system.

Calculations are performed for three different assumptions of interest rates and lifetime of the installation as, stated in the above sections.

This optionally allows locating a specific case by interpolation between these values.

So, the amortization is expressed as follows:

$$a = \frac{i.Ic}{1 - (1 + i)^{-n}} \tag{13}$$

Ic: the investment cost;

i: the interest rate;

n: the lifetime.

5.4 The total annual cost

The annual total cost is calculated based on the same set of assumptions, as above, by:

TAC = annual amortization (batteries included) + cost of maintenance,

5.5 The actualized total cost

The actualized total cost is the total installed cost to which is added N times the cost of storage (that must be repeated N times during the lifetime of the plant). It is expressed by:

Where Fa is the discount factor defined by:

$$Fa = \frac{1 - (1 + a)^{-n}}{a}$$
(15)

5.6 The cost of kWh

This cost, takes into account the amortization of the converter. Thus, the kWh cost of wind energy is given by:

$$COE = \frac{TAC - benificts}{\text{annual consumption}}$$
(16)

6. RESULTS

6.1 The wind system sizing

In the present work, seven types of wind turbines [13] manufactured by five different companies are considered. They are identified in the Table 3.

To calculate the power provided by associated electric generators, the wind speed distribution at each site (i.e. \overline{v} , k, and c as described in Section 2) is taken into account.

Figures 8 show plots of the total energy provided by each generator over the course of the year, for the various considered sites. The household consumption (load) is also shown.

Table 3.	The	various	wind	turbines	considered	in 1	this j	paper	

Manufacturer	Model	Rated Power	Country of
		[kW]	origin
Bergey	BWC 1000	1	USA
	BWC	7.5	
Bornay	EXCEL	6	Spain
Fortis	INCLIN	4	Netherlands
Southwest Wind	6000	3	USA
power	MONTANA	5	France
Vergnet	Whisper 175	10	
	GEV 5/5		
	GEV 7/10		

These figures represent the monthly energy production of each wind turbine and the household load on the system. It is noted that the load is relatively stable; there are just a few weak fluctuations due to seasonal variations in the number of hours certain appliances are used. A slight rise occurs during hotter months, when the fan is running. The coverage provided by the wind turbines depends on their nominal power and the local wind speed distribution. For sites where the winds are weak such as Tamanrasset, many machines are needed to meet the demand regardless of their nominal power. For sites where the average wind speed value is between 3 to 4 m/s, such as Ghardaïa and Batna, many wind turbines characterized by a power rated lower than 6 kW may be needed. So, for Adrar, Bouzaréah, and El Oued, where the average wind speed is above 4.5 m/s, only a few wind turbines characterized by a power rated between 1 kW to 3 kW are needed. For the wind turbines rated above 7 kW, such as Vergnet GEV 7/10 and INCLIN 6000 models, one unit can provide more than enough energy for a single household.



Fig. 8 Household load, and the energy provided by each generator

To achieve an autonomy of three days (assuming an accumulator yield of 85%, nominal voltage of 48 V, maximum discharge of 50% and nominal power of 105 A-h), the number of storage batteries required for each month is given in the table 4. These results are valid for all the considered sites.

Table 4. Number of storage batteries required for three days of autonomy

Month	Jan	Feb	Mar	Apr	M ay	june	July	Aug	Sep	Oct	Nov	Dec
Number Of Batteries	4	4	4	4	5	5	5	5	4	4	4	4

.3 Result of economic study

6.3.1. Total installed cost

From the presented results, it will be noted that, the wind system represents a higher investment for all the considered sites. Particularly for Tamanrasset location in which case this solution seems to be the most expensive because of the fact that this site represents a very moderate wind energy potential over the whole year.

In this study, instead of taking five decision variables in the optimization process, as taken by Yang et al. [16], we consider four decision variables:

The number of wind turbines, the height of wind turbine, the number of batteries and the cost.

Fig. 9 represents the total installed cost [17, 18] for the considered system.

6.3.2 Cost of kWh and the actualized total cost

The costs of kWh and actualized total cost derived from the wind system are presented in Table 5. The costs evaluated here are very high compared to those corresponding to conventional installation (0.4\$/kWh). This is due, in the author's opinion, to the following reasons:



Fig. 9 Installed total cost for each site

- The price of the conventional fuels is state-subsidized, in this country;
- Nowadays, wind energy conversion system equipments and technology are either not available in this country or excessively expensive. This leads to a very high initial investment cost including transport;
- The inflation problem in this country is such that the equipment costs have gone very high

7. CONCLUSION

The objective of the present work is to estimate the appropriate dimensions of a stand-alone application of wind system using a set of batteries as storage system to ensure the energy autonomy of a typical remote consumer, to compare the performance and find the optimal sizing for seven wind turbines for all the considered sites. The case study is realized by using the meteorological data for six different sites in three of Algeria climatic zones. MATLAB /SIMULINK software version 7 was used for this purpose. The coverage provided by the wind turbines depends on their nominal power and the local wind speed distribution. For sites where the winds are weak such as Tamanrasset, many machines are needed to meet the demand regardless of their nominal power. For sites where the average wind speed is between 3 and 4 m/s, such as Ghardaïa and Batna, many wind turbines rated less than 6kW may be needed.But for Adrar, Bouzaréah, and El Oued, where the average wind speed is above 4.5 m/s, only a few wind turbines rated between 1 kW to 3 kW are needed.

Concerning the economic results, it can be noticed that, actually, the wind system is not a more competitive solution than the conventional system for all the chosen sites. This, however, should be taken with care since the

conventional fuels are subsidized by the state, in this country, and therefore the comparison of the related costs

	Table 5 Result of economic study							
			Wind system kWh	cost (\$/kWh)				
Site	Adrar	Ghardaia	Bouzareah	Batna	El oued	Taman rasset		
	10 15 20	10 15 20	10 15 20	10 15 20	10 15 20	10 15 20		
5%	2.26 1.77 1.54	2.55 2.06 1.75	1.72 1.35 1.17	2.53 2.00 1.74	2.04 1.60 1.39	3.75 3.32 3.04		
10%	2.73 2.28 2.07	3.10 2.58 2.35	2.10 1.75 1.59	3.07 2.57 2.33	2.47 2.06 1.87	4.05 3.54 3.22		
15%	3.27 2.90 2.69	3.70 3.23 3.04	2.50 2.18 2.06	3.67 3.21 3.03	2.95 2.58 2.43	4.31 3.96 3.46		
			Wind actualized	total cost (\$)				
Site	Adrar	Ghardaia	Bouzareah	Batna	El oued	Tamanrasset		
	10 15 20	10 15 20	10 15 20	10 15 20	10 15 20	10 15 20		
5%	10 - 15 1 1- 0							
- / -	42.7 45.1 47.3	67.1 71.4 74.8	36.6 39.0 41.5	59.5 63.4 66.4	51.9 55.3 57.9	81.9 85.0 87.9		
10%	42.7 45.1 47.3 40.7 42.3 43.2	67.171.474.864.566.968.4	36.6 39.0 41.5 35.2 36.5 37.3	59.5 63.4 66.4 57.2 59.3 60.6	51.955.357.949.951.852.9	81.985.087.979.381.382.4		
10% 15%	42.7 45.1 47.3 40.7 42.3 43.2 40.1 40.8 41.2	67.1 71.4 74.8 64.5 66.9 68.4 63.6 65.3 65.6	36.6 39.0 41.5 35.2 36.5 37.3 34.6 35.3 35.7	59.5 63.4 66.4 57.2 59.3 60.6 56.1 57.3 57.9	51.955.357.949.951.852.949.150.250.8	81.9 85.0 87.9 79.3 81.3 82.4 79.0 80.2 80.6		

cannot be objective. This brings about the debate whether to include the cost of externalities

in the price of energy or not. The aim of this discussion is the following:

It is increasingly accepted that the applied tariff is far from representing the real cost of fossil energy the Algerian population is charged for. So, in addition to the officially recognized cost of production, it is necessary to include the environmental costs (damage to the environment and required control costs to meet the standards), impacts on human health, depreciated cost of non-renewable resources, macroeconomic effects and finally the allowed subsidies for the industrial sector.

On the other hand, the kWh-wind energy cost can be significantly reduced through the improvement of the efficiency of the machines used for converting the wind energy into electrical energy by optimizing them for lower wind speed ranges.

Finally, accounting for all cost components enables the right appreciation of the real costs of the conventional energy. However, it would not be sensible comparing the costs of the wind to those of the conventional energy. This is because of the fact that all the renewable energy equipments are not manufactured locally, are imported and therefore the related costs are subject to various factors such as shipping, trade rates, customs rates, additional installation rates, etc. This can be verified referring to the industrialized countries in which the practiced conventional energy rates are half those wind energy actually in use locally. Based on this, and taking into account the fact that

The renewable energy equipment prices have started decreasing, on one hand, and that the authorities have become aware of the necessity to move toward the renewable energy production, on the other, plans have been set up for producing parts of these equipments locally. This is, in the author's opinion, certainly going to make the renewable energies, including photovoltaic, costs effective and competitive in the near future.

REFERENCES

[1] T. H. M El-Fouly, E. F El-Saadany, M. M. A Salama, Grey predictor for wind energy conversion systems output power

prediction, IEEE Trans. On Power Syst., 21(2006), pp. 1450-1452.

2] R. Sebastian, Smooth transition from wind only to wind diesel

mode in an autonomous wind diesel system with a battery-based energy storage system. Renew Energy, 33(2008) 454–466

[3] E. Muljadi, H.E. McKenna Power quality issues in a hybrid power system. IEEE Trans Ind Appl, 38 (2002) 803–809

[4] S. A. Papathanassiou, M.P. Papadopoulos. Dynamic characteristics of autonomous wind-diesel systems. Renew Energy, 23(2001) 293–311.

[5] T.Burton, D.Sharpe, N.Jenkins, E. Bossanyi, Wind Energy Handbook. West Sussex: John Wiley & Sons, Ltd, 2001.

[6] R.Hammouche, Atlas vent de l'Algérie, Office national de la météorologie, Edition OPU, Alger, 1990.

[7] D.Saheb-Koussa , M.Haddadi , M.Belhamel. Etude de faisabilité et optimisation d'un système hybride (éolien – photovoltaïque – diesel) à fourniture d'énergie électrique totalement autonome .RSFA . 2 (2010) 84-95.

[8] D.Saheb-Koussa, M.Haddadi et M.Belhamel. Contribution à l'étude théorique du comportement d'un système hybride (eolien – photovoltaïque - diesel) de production d'électricité sans interruption, Afrique SCIENCE, 5 (2009) 23-38.

[9] N.Kesbadji-Merzouk. and M.Merzouk, useful power density of wind machine in Algeria, Proceedings of IMEC 2004, International mechanical engineering conference. Kuwait.

[10] Justus, C. G; Hargraves, W. R; Mikail, A; Graber, D. Methods for estimating wind speed frequency distributions. J. Appl. Meteorol., Boston, 17(1978) 350 – 353.

[11] J. Copetti, E. Lorenzo, F. Chenlo. A general battery model for PV systems simulation. Progr Photovolt, 1(1993) 283–292.

[12] Office National de la Météorologie, Atlas climatologique national, Recueil de données, 1975-1984

[13] D.Saheb-Koussa, M.Haddadi et M.Belhamel, Economic and technical study of a hybrid system (wind–photovoltaic–diesel) for rural electrification in Algeria, Appl. Energy, 86 (2009) 1024-1030.

[14] D.Saheb-Koussa ,M.Belhamel et M.Haddadi, An Hybrid System (Wind, Solar) for the Electric Supply of a Load as a Domestic Use, World Renewable Energy Congress VII WREC2002, Cologne, Germany.

[15] M.Iqbal., An introduction to solar radiation. Department of mechanical engineering, The University of British Columbia, Vancouver, Canada, Academic press,1983.

[16] Yang HX, Zhou W, Lou C. Optimal Design and Techno-Economic Analysis of a

Hybrid Solar–Wind Power Generation System. Appl Energy 2009; 86:163–9.

[17] The catalog of the sun tools. Publishing (N 26, 1–25, 2001).

[18] The universal converter of currencies on 1145 Nicholson Rd, continuation 20 New market, Ontario L3Y 9C3, Canada.