

# Wind Atlas for LEBANON

By : Dr Chamel Macaron and Toni Bou Abssi  
Altaka-albadila , DPC/LEBANON , SARL

When we started 3 years ago to install small wind turbines (=SWT), 500 Watts to 2 KW output , we found ourselves facing a serious problem . How can we advise the customers ,that their investment will be worth it ,and that they would have enough wind speed to start spinning the blades and help to generate electricity ?? .In this paper ,we will review the steps we undertook to learn and solve this issue .

Initially ,it was a learning experience which I am going to summarize in few points.

## **First Fact : People tend to overestimate the wind speed**

At the first contact with the potential customer , we ask him about the area where he intends to install the SWT ,and if he thinks that the wind speed is high enough to justify the purchase of SWT .We were amazed by the quick answers ,confirming that according to their judgment , wind speed is STRONG ,and that they are 100 % sure about it . There was no room for hesitation , and no doubt about it . We came to agree with an already well known fact , that people tend to overestimate wind speed .

## **Second Fact : Wind speed is stronger in summer than in winter**

Almost all of our potential customers thought that wind speed was higher during winter , But the truth is that , to the contrary ,wind speed is higher in summer. It is obvious that ,during January and February , some storms do occur along with waves of short strong winds for few hours ,but they are short lived . When the data is spread over the entire period of winter and summer seasons , it is then evident that wind speed is higher during summer . It is the solar energy that creates differential pressure in the atmosphere ,during the summer ,which leads to strong wind .

## **Third Fact : Wind speed is higher during days than nights**

Contrary to the general misconception wind speed is , indeed, higher during days than during nights .

## **Fourth Fact : the guidelines of the SWT manufacturers are not correct**

They state that a wind speed of 2 meters per second is enough to spin the blades ,and generate electricity .While it is true ,that the blades will rotate slowly at that minimal speed ,but it will not generate electricity .Each SWT should have a power curve ,which will show that the real generation of current will start at around 5 to 6 meters per second .and that the peak output of 2 KW/Hour is reached at around 9 meters per second . Let us remember that the wind speed is the most important factor in generation of electricity .Each one time increase in speed ,will correlate with 3 times increase in output .

## **Fifth fact : SWT cannot be installed on roof top**

Almost all interested customers have a strong belief that SWT can be installed on roof top .This is a widespread misconception . If you do install on roof top , a SWT above 500 Watts output , it will damage the structure of the roof top , due to the vibrations which are transmitted through the pole to the cement . No matter what you do , it will- , on the long run - affect the structure of the roof top.

The wind in the cities , hits the high buildings ,and change directions ,and becomes turbulent ,which renders it less efficient . The SWT have to be installed 9 meters far from the house , and there should be no obstacles around it, in order to permit the wind to spin the blades ,freely , from all sides. In addition , the pole should be 3 meters in height above the higher level that surrounds the site .Moreover, SWT are not noisy (sound level is below 60 db).

## **Sixth fact : Wind energy is less efficient than solar energy**

Most customers are fascinated by a wind turbine , located in front of their rural house ,and spinning in a beautiful manner ,and generating electricity for free : there is something magic ,fascinating and pretty to see it. Its high visibility is appealing ! . But , although wind energy is less expensive than solar energy , it is not as efficient .Indeed ,**wind energy is intermittent** .

In the best situations ,wind energy will generate electricity during 120 days of the year ONLY .Remember that wind blows by waves ,and then it calms down .

## **Seventh fact :Wind speed from Meteo of Beirut airport**

So ,we started to look for data about wind speed .And the best place ,one might look for it ,is the meteo of the international airport of Beirut . We went there , and we paid a fee of around 500.000 LL and filled papers ,in order to obtain the wind speed as collected by anemometers placed by the meteo team . After one month ,we got data on 7 sites : Tel amara (Rayak) , Cedars , Al\_Abdeh , Sour, Tripoli-IPC, Zahleh-Houch-el-Oumara, and Beirut airport .

Those data were useless as the anemometers were placed at around 10 meters height ,and the wind speed was reported as a monthly average ,and not in real time , dynamic way as meters per second .

#### **Eight Fact : wind speed collected by satellite data.**

\_It became evident to us , that the best way is to get wind speed data collected by satellite . It would help us locate the sites where we can ,eventually , install a mast 30 to 60 meters height ,with an anemometer and data logger to collect wind speed , direction ,and humidity ,temperature etc. We approached a German company that has 10 years experience in this field ,and requested from them to issue a wind atlas for Lebanon . Six weeks later , they delivered to us ,two hard copies and a CD, with data collected at 60 and at 120 meters height( Syria 15-10 N / 35.0' – 37.5' E / 32.5' – 35.0' N ). A software helped us locate the cities or villages on Google earth , and it depicted the wind speed . Colors were used to display the wind speed category . Blue means a wind speed of 0 to 4 meters per second , green : 5 meters per second . The best areas were the red and purple ones ,and we have some !! There ,you would find the highest wind speed (figure 1 ) . So, it will guide on which site to choose in order to collect real measurements .Unfortunately ,this wind atlas was unverified .Indeed ,you need at least 2 real measurements data ,so that a correlation could be done between the satellite data and the real data . Nevertheless, it was a first step .

#### **Ninth Fact: the help of the geographical division of the Lebanese army**

The map sent by the German company did not have any names of villages or cities .It had only 5 or 6 names of big cities. The scale was 1:200.000 . When we needed to get wind speed data ,it took us lot of time to get the info on the software , with the help of Google earth . So, we went to the geographical division of the Lebanese Army , and requested their help .We wanted to superimpose our wind map on an administrative map and get the names of villages and cities on the wind map . The scales were different , so the German supplier used the CD that we purchased , and sent to us 2 new maps with names of cities and villages . They did not charge us any additional money . So, we finally had a non verified wind atlas for Lebanon .By the way , the Geographical Institute is very efficient ,and you can be proud of their achievements.

#### **Tenth Fact : the wind atlas for Lebanon is available on line**

Any one interested could purchase the map now , at a price much cheaper than we paid for !!.So, all our competitors , and the Lebanese Committee for Energy and the Ministry of Energy can purchase those maps , and use them . Surprisingly , we learned that UNDP and Cedro have submitted a tender for a wind atlas for Lebanon : 18 companies participated. They are 2 years behind our efforts ,and ,unfortunately, in their specifications they did not request a **verified** wind atlas for Lebanon ,with at least 2 real measurements data. We did have a meeting with the responsible staff ,and we notified them ,that such a map is available ,and that we need to move one step ahead in order to get for a verified map .

For those who need more info , they can visit our website : [www.altaka-albadila.com](http://www.altaka-albadila.com) and check the projects page .

It is our hope that , Lebanon can finally start installing some wind farms , to generate green electricity .The wind atlas does show some nice locations that can be selected .