

# WIND FARM OF SANTO ANTÃO

## The First IPP in Cabo Verde



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November 2013

# Brief Summary

- I - First IPP in Cabo Verde running since April 2011;
- II - Functioning of the Wind Farm;
- III - Technical Impact at the Diesel Power Plant;
- IV - Financial and Environmental Impact

# Project Concept

- Addressed to Islands with small electrical systems;
- Island of Santo Antão with around 49.000 inhabitants, 11.000 electricity consumers, average load of about 1.000 kW + 700 Kw;
- Project on two steps with 2 x 250 kW each;
- Total investment of about 1.000.000 Euros of which:
  - 50% from Government of The Netherlands (Grant);
  - 25,5% from Dutch partner Green Energy Services;
  - 24,5% from Capverdean partner Electric, Lda;
- License as Independent Producer issued by Ministry of Energy;
- Power Purchase Agreement with the Public Utility ELECTRA.

# Production and Availability of The Wind Farm

Table 1 – Production and Availability on Year 2012

	Production (kW.h)	Running Hours	Average Production / Running Hours (kWh)	Capacity Factor (Full Load Hours)	Wind Turbine and Grid Availability
WT1	687.798	6.887	100	31,4% (2.751 Horas)	79%
WT2	676.807	6.463	105	30,9% (2.707 Horas)	74%

# Monthly Production

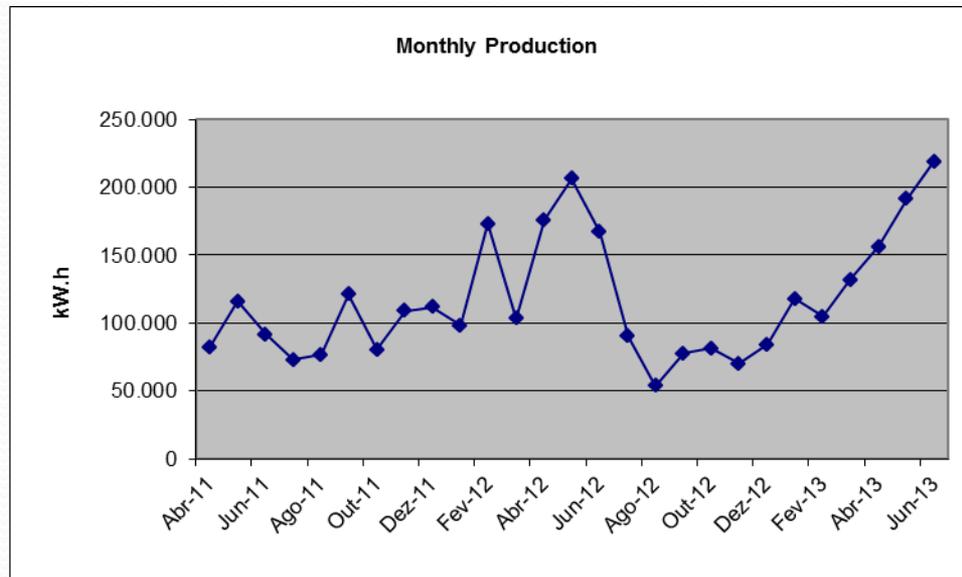
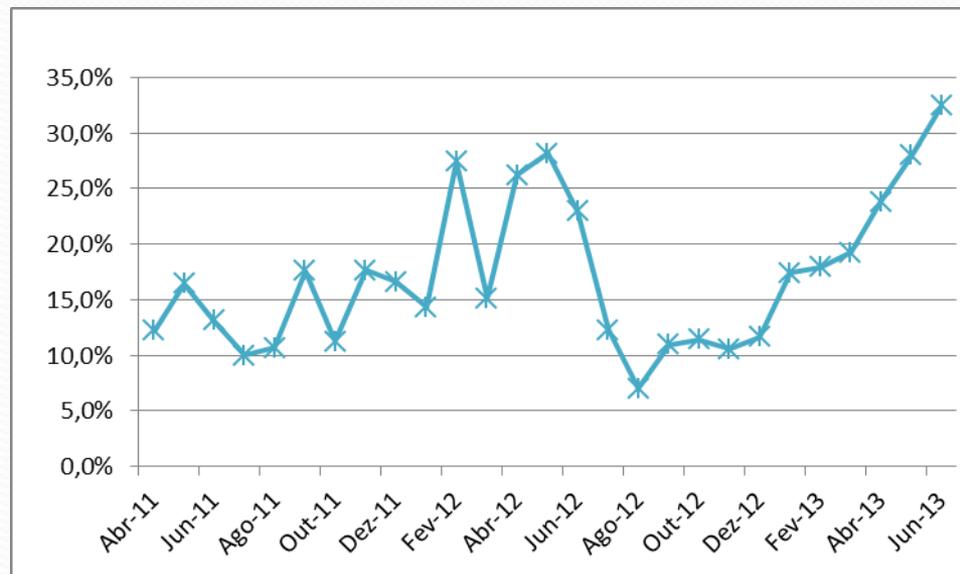


Figure 1

**Monthly Average Production of 117.200 kW.h**

# Wind Power Contribution for the Electrical System



- Wind Power Contribution of 13,8% on Year 2011
- Wind Power Contribution of 16,4% on Year 2012

# Anomalies in The Functioning of the Wind Turbine Units

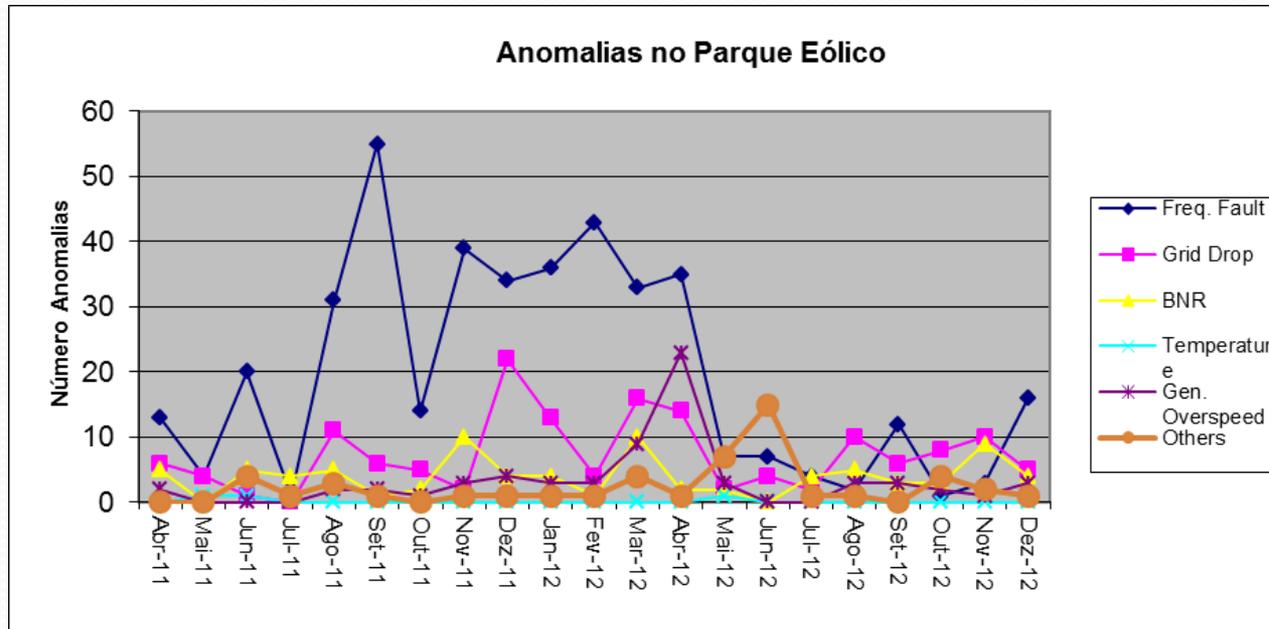


Figura 3

- Total Number of Anomalies in the period April 2011/Dec 2013 was 772;
- Average number of Anomalies per Wind Turbine 0,6 / day;
- 72% of Anomalies are Frequency Fault and Grid Drop (Electric Grid and Power Plant Problems)

# Technical Impact of the Wind Farm at the Diesel Power Plant

## 1. Fuel Consumption per kW.h Produced

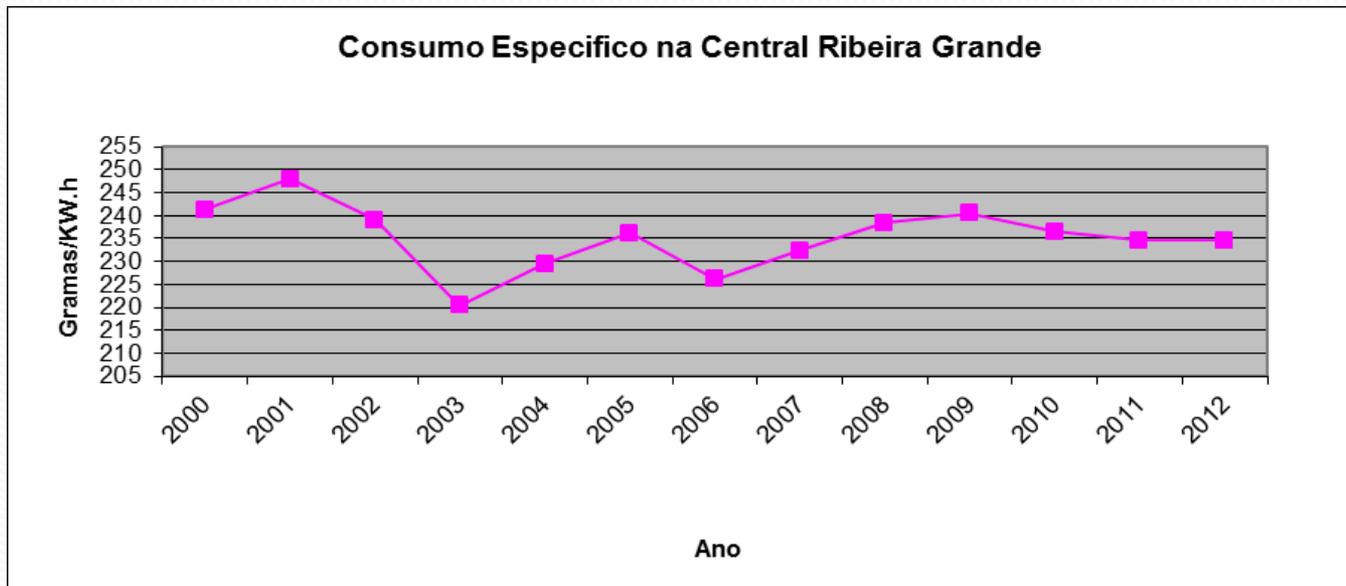


Figure 4

Mean Value of 235,2 gr/kW.h

# Technical Impact of the Wind Farm at the Diesel Power Plant

## 2. Fuel Saving versus Wind Power Production: An almost Linear Correlation

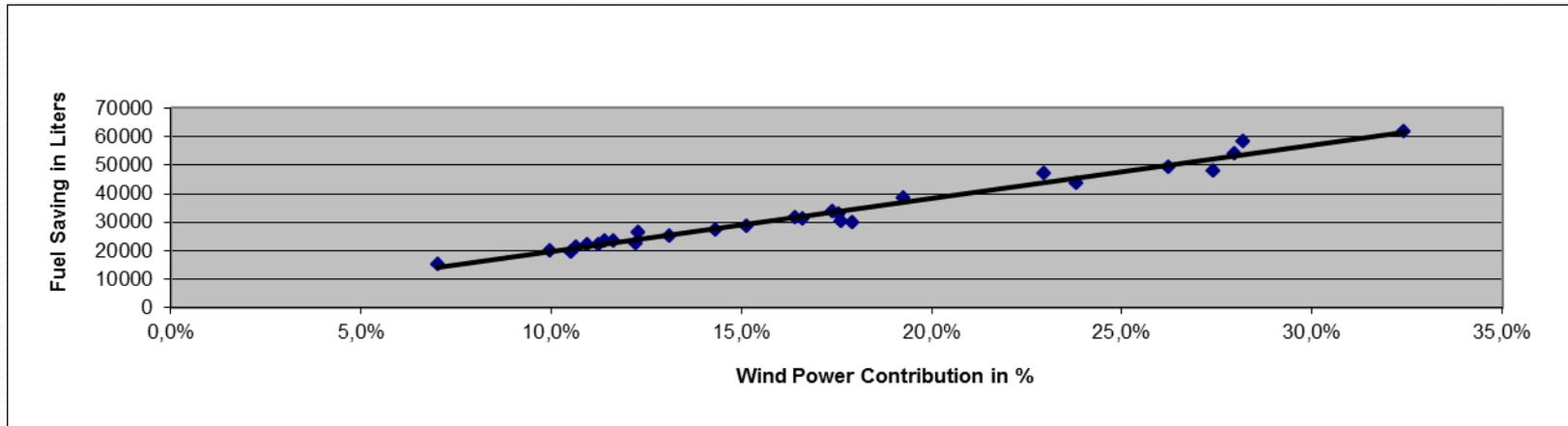


Figure 5

# Technical Impact of the Wind Farm at the Diesel Power Plant

## 3. Black Outs

Table 2: Number of Black Outs per Year

Ano 2008	Ano 2009	Ano 2010	Abril/Dez 2011	Ano 2012
9	14	14	13	12

# Technical Impact of the Wind Farm at the Diesel Power Plant

## 4. Average Power Factor of the Wind Farm

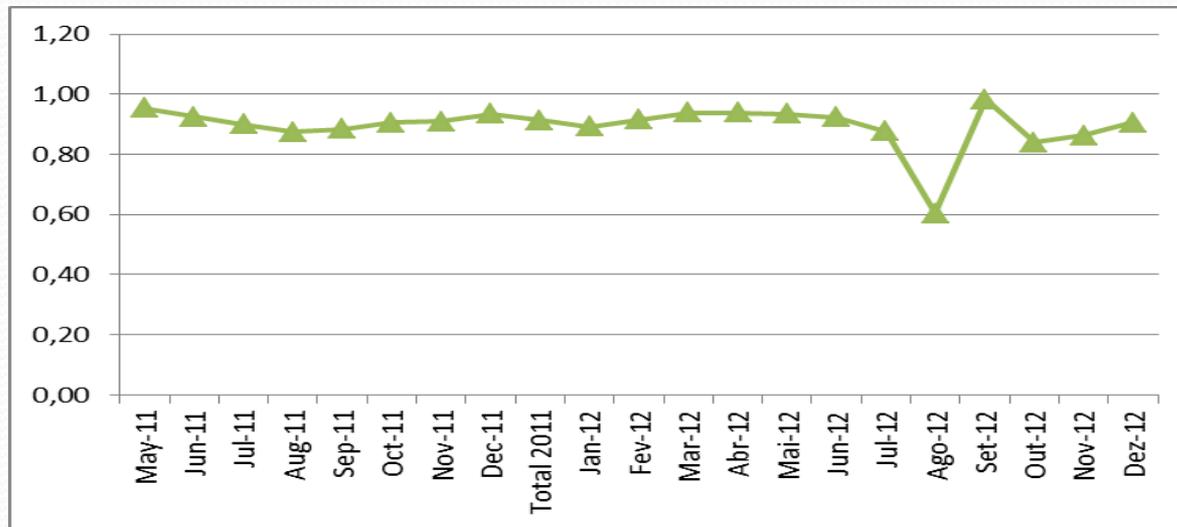


Figure 6

Average Power Factor is 0,91 and the minimum allowed is 0,85

# Technical Impact of the Wind Farm at the Diesel Power Plant

## 5. Losses in the Electrical System

Table 3 – Losses in the Electrical System

Ano	2008	2009	2010	2011
Perdas	29,1%	23,7%	23,1%	22,9%

# Financial and Environmental Impact of the Wind Farm.

- i. Electric Wind has had net profit on years 2011 and 2012;
- ii. Electra, SA (public utility) has had and avoided cost of fuel higher than price paid for kW.h wind power;
- iii. Cap Verde has had positive impact on its Balance of Payments derived from fuel savings on the Diesel Power Plant;
- iv. Environment has benefited from significant amount of gas emission saving;

# Financial and Environmental Impact of the Wind Farm.

Table 4 – Financial and Environmental Impact on period April 2011/ June 2013

Production (kW.h)	Fuel Saving (liter)	Savings on the Balance of Payments (Euro)	Saving on Gaz Emission (Ton)
3.164.297	887.800	899.537	2.237

This is a significant positive impact (technical, financial and environmental) of a small Wind Farm connected to an Electric System feeding around 11.000 consumers. In the near future, after interconnection of the electrical grids in the Island of Santo Antão, the installed capacity at the Wind Farm will be reinforced and the positive impact is likely to double.



THANKS FOR YOUR ATTENTION

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