



**EUROPEAN ENERGY
VENTURE FAIR 2007**



Turby

European Energy Venture Fair
September 17-18th 2007
Zürich, Switzerland

Development and marketing of Vertical Axis Wind Turbines

Currently

- ☂ Mk I 2,5 kW nr 1 in the Netherlands with 22 units running
- ☂ Mk II 10,0 kW 10 kW unit currently in development, available: 2009

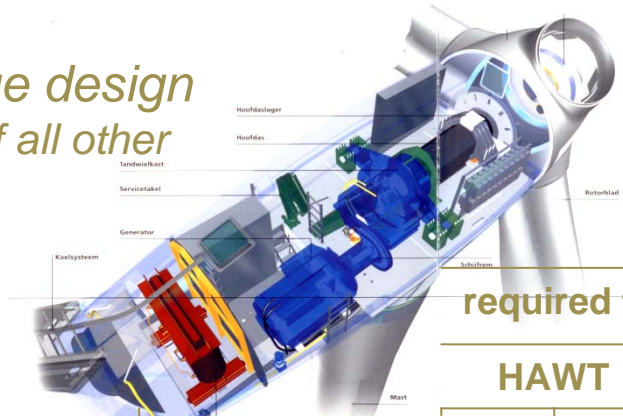
Applications

- ☂ Renewable Energy in roof top applications
(company) image, emphasized by laser projection → → → → →
- ☂ Cost saving for industrial stand-alone applications:
 - offshore *one maintenance trip to a rig costing € 15.000*
 - telecommunication *90 % of operational costs is related to power supply*
- ☂ Rural power supply



Competitive advantage

The first high efficient lift type VAWT of an unique design
 Turby's measured efficiency > 35% exceeds by far that of all other
 small wind turbines: < 25% (Paul Gipe)
 and comes close to the efficiency of large HAWT's



required functions

Function	HAWT		VAW
	MW	kW	Tall
nacelle	Yes	Yes	No
drive train	Yes	Yes	No
yawing system	Yes	Yes	No
pitch control	Yes	No	No
mech. brake	Yes	Yes	No
generator	Yes	Yes	Yes
blades	Yes	Yes	Yes
mast	Yes	Yes	Yes
inverter	Yes	Yes	Yes ?
Efficiency %	> 45	< 25	> 35

• VAWT: Ultimate simplicity

- ☂ Low specific costs per kW rated power
 - ☂ Mk I : € 5.000 / kW
 - ☂ Mk II : € 1.250 / kW
- ☂ Maintenance free
 - Primary components do not fail; controls do!

• Patents

- NL patents granted
- European patent filed and published – no opposition
- PCT application in preparation for Mk II

• Status of development

- 22 field tests running since mid 2005
- Mk I ready to market: Q4 - 2007
- Mk II ready to market: Q4 - 2009



Market size small VAWT's:

- **Rooftops:**

NL study: 60 MW till 2020; 5 MW p.a

Using the GNP as a yardstick worldwide 500 MW p.a. **200,000**

- **Industrial costs saving**

- Offshore:

- Dutch continental plain: 550 rigs
- Europe total n x 1000
- Worldwide ???



50,000

- Telecom:

- One provider in Nigeria owns over 1000 masts
- Worldwide ???

50,000

- **Rural power supply:** Nearly infinite.....

Size of the market **500.000**

Turby's current break even lies by 50 units p.a.



- ☁ *There is a large market for small wind turbines;*
- ☁ *Turby has the best product;*
- ☁ *and is world wide known;*

- Broadcasted on Television:
 - “Beyond Tomorrow”
 - Australia on ABC
 - North America twice on Discovery Channel
 - in the Netherlands: in 5 different programmes
- on Radio:
 - France, USA, Canada and NL
- Printed press:
 - A multitude of magazines
 - All Dutch and many international papers
- Responses from over 150 countries worldwide
 - Tour Generali & Phare tower La Defense Paris
 - China Merchant Bank Sjanghai
 - Yarra River Melbourne Australia
 - City Storage Portland Oregon USA
 - Skyscraper 236 m Madrid Spain



Staff

- Dirk Sidler (65) CEO, aerodynamics, mechanics, finance, sales, outsourcing M
- Martijn Sidler (35) COO, electrical, electronics, control, testing, outsourcing E
- vacancy site surveys, installation and after sales service



A small and vulnerable basis; recruitment of additional staff is top priority

Part of the funding is reserved for that purpose.

Co-designers

- Delft University of technology aerodynamics, generator, control algorithm
- Ghent University composite constructions, system dynamics



Co-makers

- Duits Engineering mechanical parts, dynamic balancing
- IPA blades
- Nedap invertors
- Valmont support systems (masts, foundation frames)



• Organizational

- Small office:
 - Management, organization of world wide sales,
 - QA, outsourcing, technical/engineering support office
 - Development
 - Local sales and after sales service

• Sales

- In the Netherlands and neighbouring countries through Turby BV:
 - » supply, installation and after sales
- In Europe through distributors:
 - Spain : Elmaservi
 - Ireland : Warmfloor Heating
 - Belgium : Ineltra Systems
 - » turbines and inverters supplied by Turby BV
 - » masts, installation etc. locally
- Overseas through Joint Ventures or Licensees (USA; Australia):
 - » blades and inverters supplied by Turby BV
 - » mechanical parts, assembly, masts and installation locally

• Manufacturing

- Outsourcing of all parts and subassemblies.
- Final assembly and testing by Turby and/or Licensees

Q4-2007: From development to exploitation - €0,5 mio

- expand office and recruit essential staff
- manufacturing capacity from 50 to 500 units p.a
- building up of a stock
- compliance with International Standards / certification

Effects:

- cost price reduction of 30 % (Q2-2008)
- inverter compliant to > 80 % world requirements
- certification of the Mk I turbine
- PCT application for Mk II filed
- proof of concept of Mk II

Q1-2008: Grow to 1000 units pa - €1 mio

- establish and co-finance JV's in USA and Australia
- development of Mk II: field testing, certification,
- extension range of applications
 - stand - alone system with PV, batteries, genset
 - emergency power supply

Q1-2009: Further growth in nr's and markets - €1 mio

- ☁ No specific exit strategy

- ☁ Since the Turby concept offers a serious alternative to large HAWT's

 - ☁ $\approx 40\%$ cheaper per kW installed;

 - ☁ maintenance free;

 - ☁ a kWh price of $< \text{€ } 0,05$,

we expect to attract the interest of large wind turbine manufacturers.

Turby

ir. H.F.A. Sidler (Dick)
Managing director

Heuvelenweg 18, 7241 HZ Lochem
The Netherlands
Tel + 31 (0)573 256 358
Fax + 31 (0)573 254 420
E-mail ds@turby.nl
www.turby.nl