



**EUROPEAN ENERGY  
VENTURE FAIR 2007**



**MTT**

**Micro Turbine Technology BV**

**European Energy Venture Fair**

**September 17-18th 2007**

**Zürich, Switzerland**

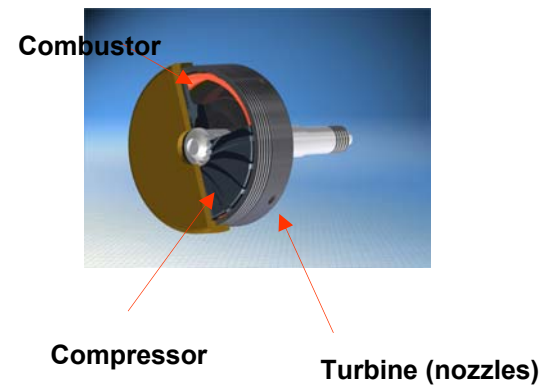
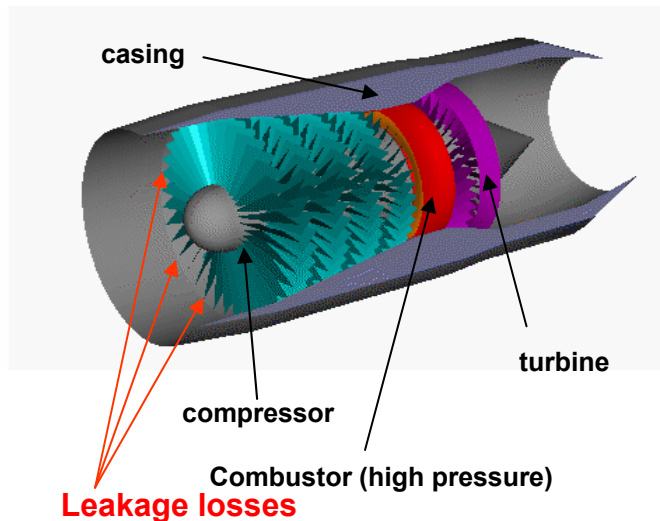


- **Development and marketing of a new type of micro gas turbine (novel cycle)**
- **Simple: the MTT turbine has only 4 small parts !**
- **Focus on both micro CHP and APU's for medium and heavy trucks**
- **Cheap & simple solution for 2 mass markets:  $\pm$  30% cost price of nearest competitors**
- **Development with partners (SKF, DAF, E.on, Essent, CCM, Remeha, Bekaert, TNO, TU Delft, TU/e)**

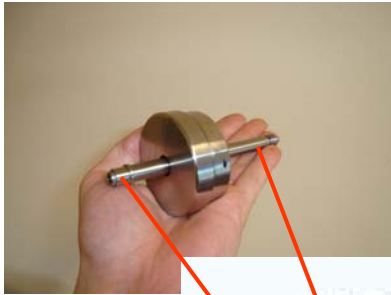
# MTT – Technology and Product



- Simple and rigid reaction turbine
- No leakage losses □ specially suited for lower power ranges
- Higher performance and efficiency (up to  $\pm 30$  kWatt shaft power)
- 4 patents, market launch 2010



# MTT – Market micro CHP



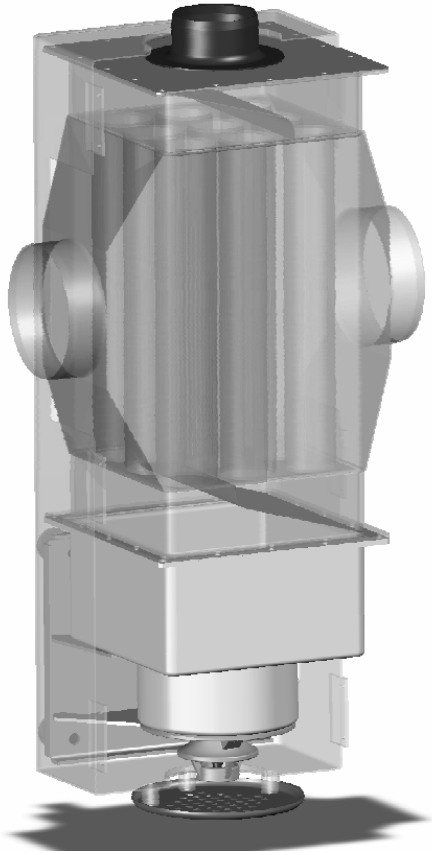
- **MTT turbine replaces the burner in a condensing boiler (domestic)**
- **Exhaust gasses are used for heating**
- **Consumer produces its own electricity**
- **Leads to  $\pm 20\%$  lower energy bill for consumer**
- **Results in substantial reduction in CO2 emissions (*1 ton per household per year*)**
- **Consumer pay back time:  $\pm 2$  years**
- **European market potential: 50 million units / 3-4 million units / year**

# MTT – Market micro CHP

Technology	Market price*	Maint. Costs	Pay back time	Time to market	Players
Stirling - engine	€ 2.000 - € 3.000*	Medium / low	6 - 7 yrs	2008 - 2009	ENATEC, WhisperTech, MicroGen (BG), Kockums, SCR, Bosch (BBT), Disenco, Gasterra
Fuel cell	€ 6.000* / € 20.000 (?)	low (expected)	?	2009 (??) - 2012 (?)	Vaillant-Hepworth, Hexis, Toshiba, Ballard, Sanyo
Rankine cycle (Steam/Organic)	€ 2.000 - € 3.000*	Medium	6 - 7 yrs	2008 - 2009	Enginion (†), Cogen Microsystems, Energetix MicroPower, OTAG, Baxi
Gasengine	€ 2.000 - € 4.000*	high	6 – 7 yrs	2008	Honda (Ecowill), Senertec
Micro turbine	€ 500 - € 600* (MTT)	low	2 – 3 yrs	2010	MTT, Compower

\* Surplus price to a condensing boiler / heater  
(Price of condensing boilers range from € 850 to €2.000)

# MTT – Market APU for trucks



- **MTT turbine as Combined APU & Parking heater**
- **Automotive application (long distance trucks), solving the "idling" problem in international transport**
- **Delivers both heat and power**
- **Dimensions slightly larger than a traditional parking heater**
- **Fleet owner pay back time:  $\pm$  12 months, fuel saving  $\pm$  2.250 liters per truck per year**
- **European civil market potential: 270.000 units / year**

# MTT – Market APU for trucks

<i>Technology</i>	<i>Market price</i>	<i>Maintenance</i>	<i>Lifetime</i>	<i>Time to market</i>	<i>Players</i>
Piston engines	€ 6.500 to € 5.000 (range)	12 months	6 - 8 yrs	commercial	Mopacc, eCycle, Mechtron CCS, MorElectric CAT, Pony Pack, Cummins
Fuel cells	€ 6.000 to high (?)	low (expected)	?	2010 (??) - 2012 (?)	Delphi, Webasto, BMW, Powercell, Cummins
Extra batteries	€ 3.550	replacement	3 – 4 yrs	commercial	OEM
Stirling engines	€ 4.500	12 months	8 - 10 yrs	2008 (?)	Whispergen, Sunpower (?)
Micro turbine	€ 1.950 → € 1.500	12 months	8 - 10 yrs	2011	MTT bv

- **Number of employees: 7 FTE (MTT), total team 23 (incl. partners)**
- **CEO: Willy Ahout MKM**  
Officer Netherlands Navy, Akzo Nobel, Electrolux, Johnson Wax  
Business Administration and Knowledge Management  
10 years experience in high tech start-ups, 3 exits
- **CTO: Ir. Wilfried Visser**  
Stork, NLR, Delta consult  
> 20 years experience in gas turbine R&D and engineering
- **COO: Ir. Luc Hamilton**  
ECN, independent consultant / project management  
> 15 years experience in energy related projects

- **Develop products and markets with relevant partners from industry**
  - Ⓟ To combine knowledge ("Open Innovation")
  - Ⓟ To accelerate growth and obtain market leadership

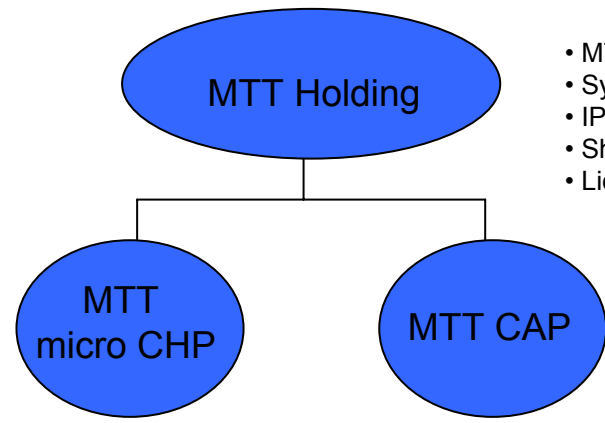
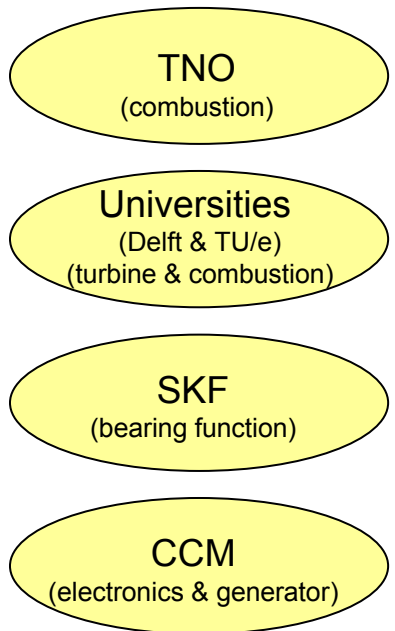
**Micro CHP:** E.on, Essent, Remeha, Bekaert etc.

**CAP / automotive:** DAF Trucks, SKF, Bosal(?), Espar(?)

- **Either in joint venture, joint company or through joint projects**
- **Mixed model of license fees, shareholder ship and contracted research**

# MTT – Business Model / Financial

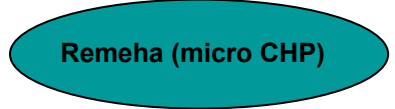
## Partners core development:



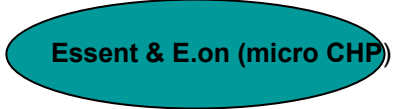
- MTT: Core technical & business development
- System integration
- IP owner (gas turbine IP)
- Shareholder MTT micro CHP & MTT CAP
- License fees from MTT micro CHP & MTT CAP

- application development
- exclusive license for certain P/M combinations
- business development
- business owner P/M combination

## Partners application development:



- Integration in domestic boilers
- @ own cost + first client
- Limited exclusivity in time
- iaw BP micro CHP



- Execution of field trials
- @ own cost / E.on pays
- No rights (Essent)
- Option 1<sup>st</sup> 7.500 units (E.on)



- Integration / testing in trucks
- @ own costs
- early stage partner
- No rights



- Subsidy partners CAP
- "Subsidized" suppliers
- No rights
- GfE: potential production partner

# MTT – Funding Requirements

- **Cash events till mid 2007:**
  - $\Sigma$  Euro 3.8 million (subsidies, business, funding events, bank loans)
  - Additional:
    - **Contracted contribution partners: Euro 3 million**
    - **Dutch credit facility: Euro 1 million (no interest, risk sharing)**
- **MTT profitable in first half of 2007 (Euro 200 K)**
- **Funding: current round Euro 2 million**
- **Usage: development, application engineering, business development, sales & marketing, organization building**

# MTT – Contact details

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