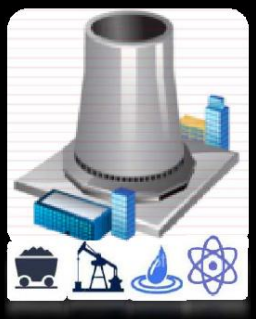
exoes

Sustainable Heat & Power Engines

Last century vs XXI st century

Buildings = 1/3 of CO_2 rejected on our planet

XX th century



« Old » Grid

XXI st century

Smart Grid

Team

Arnaud Desrentes	Rémi Daccord	Thiébaut Kientz	Cédric Bhihe
			
CEO	Hd. of development	Hd of Research	Hd of industrialization
PSA Exosun	**Amoès' founder**	**Amoès**	**20 years in industrial companies**

• Motor engineer • Market	• mCHP • En in buildings	• 2 patents • Mechanical / thermal	• Sourcing • Industrial Road map

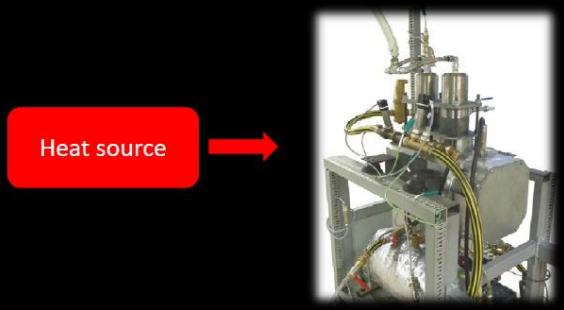
EXOES: since may 2009

Abstract:
- 10 high qualified people
- 2 patents
- > 2 M€ (public and private)
- 2 functional prototypes
- 4 industrial partners
- 1 product sold (installed 2012)
- Commercial partnership
- 4 awards in 2010

Skills at EXOES:
- Knowhow in Rankine engine design
- Energetics in buildings
- Test bench
- Market of mCHP

From Heat to power: mCHP

SHAPE™: Sustainable Heat And Power Engine

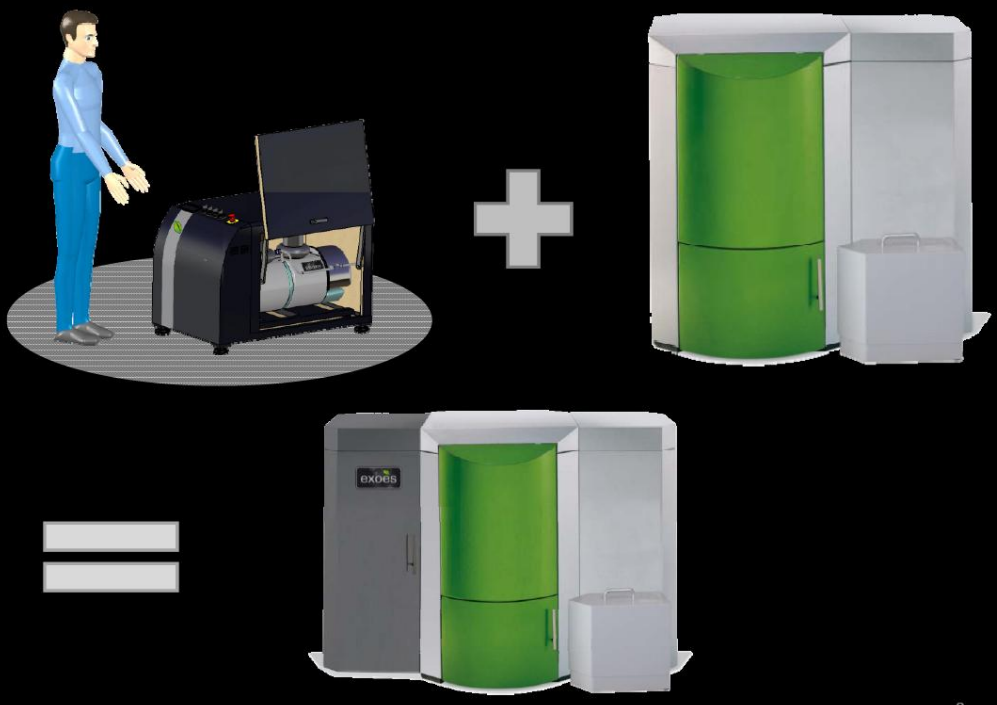


Technology	Rankine piston engine
Electrical power	1 - 50 kW
Thermal power	5 - 250 kW

Energies

Any heat source with T >200°C

Product
Engineering



Technical data

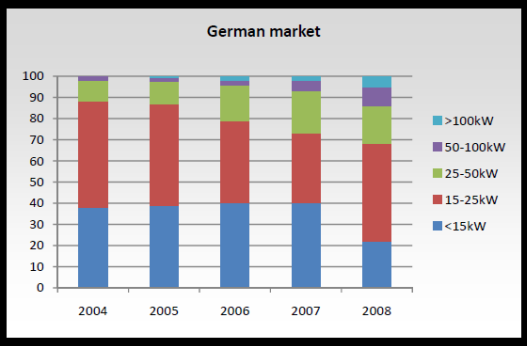
Overall efficiency > 90%

Exoès compared to other RenE

With volumes of about 10 000 units /year

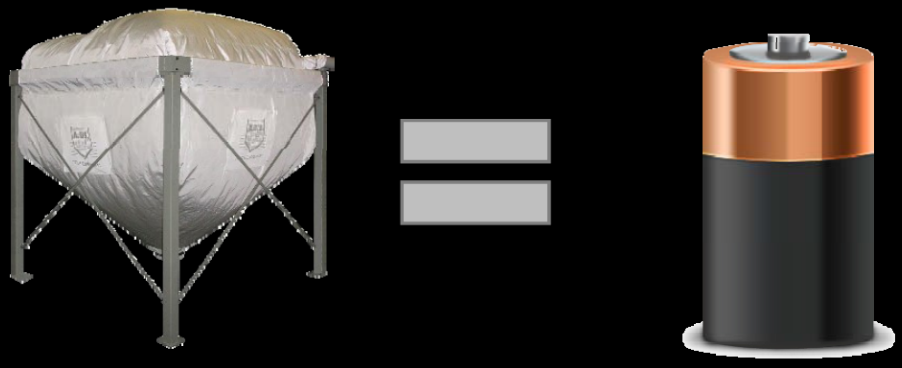
Technology	Exoès	PV on roof
El. Power	3 el. kW	3 el. kW
El. Production	12 000 kWh	3 600 kWh
El. cost	0.20 €/kWh	0.40 €/kWh
Price (installed)	12 k€	18 k€
Nets incomes (20 years)	15 k€	< 10 k€
CO_2 avoided	25 t/y	< 5 t/y

mCHP european market



In 2015 :
Automatic wood pellet boilers: 100 k to 300 k units/year : 1.5 to 5 B€/y.

Compared to other decentralized renewable energies



Research : CSP

Dish + Stirling

Drawbacks :
- El. Cost expensive : 14 €/W.
- T > 800°C
- No storage (efficient enough)
- 2 axis trackers: mechanical pbs.
- Expensive maintenance.

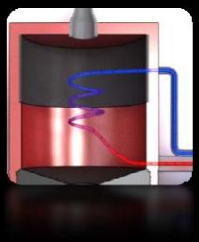
Parabolic troughs

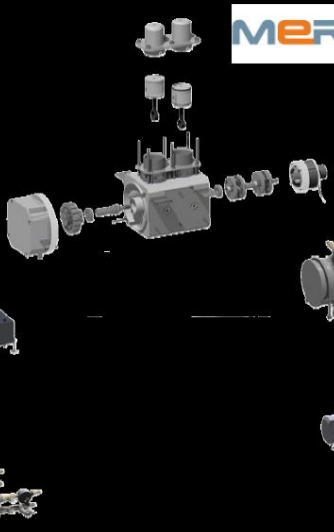
Advantages :
- Cost < 5 €/W.
- Lower T = 300-400°C
- Thermal storage
- 1 axis tracker
- Lower maintenance

Exoès added value

- Thanks to Exoès'innovations : +20% efficiency = + 40% annual energy
- Technology suitable for wood, solar and fossil fuels.
- Renewable power with storage: smart grids opportunities.
- Business model: OEM = rapid growth.

Industrial partners





How to work with Exoès ?

- SHAPE™
- Field tests
- Prototype + tests
- Design
- Financial partners

Thanks for your attention

Contact :
Arnaud DESRENTES
e.mail : arnaud.desrentes@exoes.com