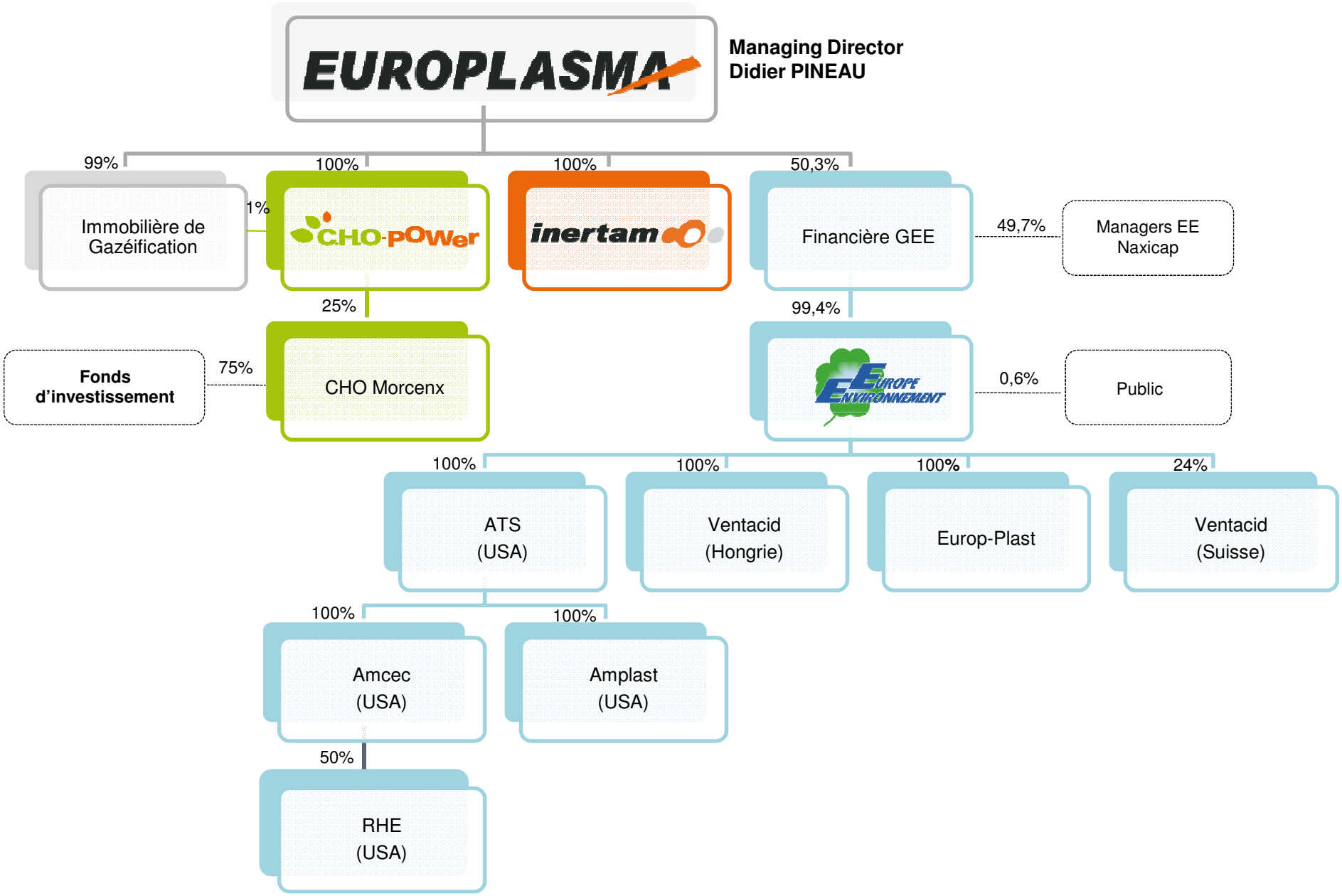
Electricity from waste & biomass

By advanced plasma gasification technology

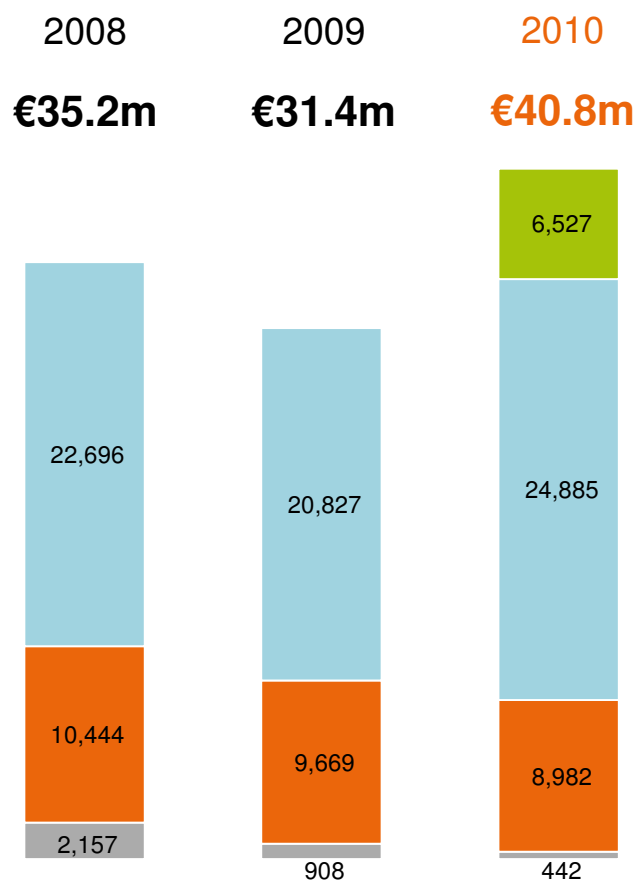
Clean Green Event Paris – November 2011

Group structure



Group revenues

TURNOVER BY ACTIVITY IN THOUSAND €



- Production of renewable energy
- Treatment of air and gas
- Elimination of hazadous waste
- Research and engineering, torches and processes

4 activities to serve the environment

THE GROUP IS INVOLVED IN THE ENVIRONMENTAL AND ENERGY MARKETS WITH ITS 4 BUSINESS UNITS:

Study & Engineering torches and processes

EUROPLASMA

Design, production and sales of plasma heating systems and related applications

Air and gas cleaning solutions

EUROPE ENVIRONNEMENT

Air treatment, odour and VOCs abatement using bio-chemical process

Hazardous waste destruction

inertam

Vitrification of asbestos and other hazardous waste

Renewable energy production

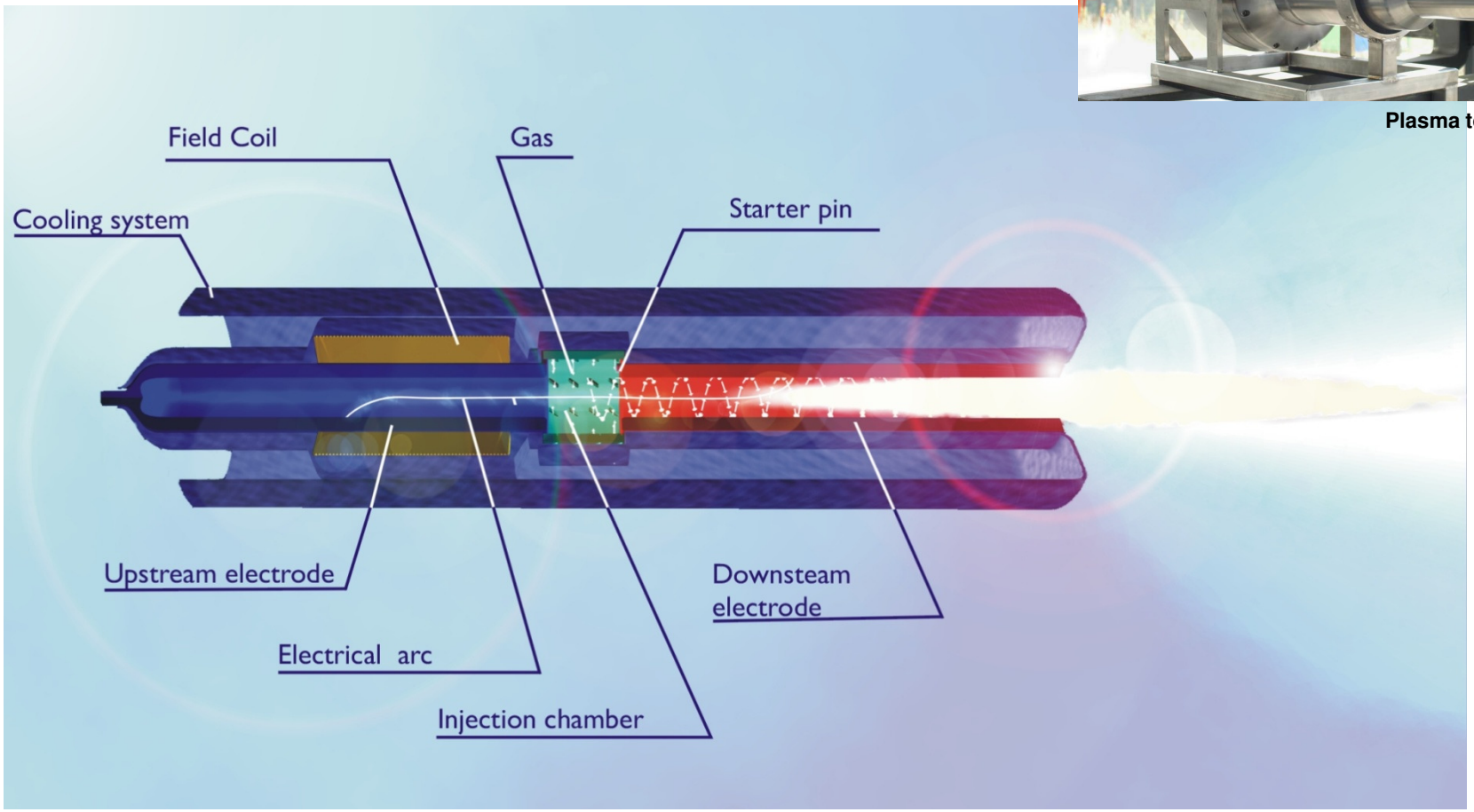
CHO-POWER

Production of electricity from the gasification of waste and biomass

The core process for the vitrification and gasification

The non-transferred plasma torch

Plasma torch (300KW)



Engineering of torches and processes

EUROPLASMA

Industrial applications

Europlasma designs and develops plasma systems (torches and related furnaces). The high temperatures of these systems can be used in:

- the high-temperature gasification of biomass and non-hazardous waste,
- the treatment of hazardous waste and low-level radioactive waste,
- or the steel industry.

References

- Design and manufacture of an ash vitirification unit (7t/day) for the Urban Community of Bordeaux in the municipal solid waste (MSW) incinerator in Cenon.
- Equipment of 4 ash vitrification units in many MSW incinerators in Japan.
- Design and manufacture of an asbestos waste vitrification unit with a capacity of 8,000 tonnes per year for its subsidiary Inertam.
- Development and sale of a plasma torch system part of an incinerator for sludge produced from a wastewater treatment plant in Yongin, South Korea.

Services

- Supply of plasma torch systems
- Study and engineering of the furnaces equiped with plasma torches
- Sales of know-how licenses
- Construction and commissioning of the equipments
- Technical assistance and formation of the operators
- After sales service

Some figures

- 20 years of expertise
- Ownership of more than 10 patents
- Plasma torch power range from 25KW to 4MW
- 4 licensees: Kobe Steel and Hitachi Zosen (Japan), Kolon (South Korea), CHO Morcenx (France)

Hazardous waste destruction by vitrification

inertam

Markets & positioning

- Destruction of hazardous waste (asbestos, chemicals, ashes...)
- Certified site (Basle treaty)
- Clients : industrial operators, real estate sector…
- Core offering : transport and destruction of waste
- Competitive market : Leadership and unique definitive solution

Growth strategy

- Leverage our position of unique definitive solution provider
- 15% growth in incoming hazardous waste
- Duplicate best practice deployed in France with European key accounts
- Develop new services: asbestos waste dismantling, operation & maintenance of the CHO Morcenx power plant (from 2012)

Business model

- Integrated operator from removal to valorisation delivering a discharge certificate (responsibility discharge)
- Long term contracts: average contract life is 3 years
- European marketsfocus

Some data

- Permitting of 10,000 tonnes/year of hazardous waste
- Around 6,000 tonnes of asbestos waste processed each year
- Continuous operation 7/7 et 24/24
- 43 employees

Air and gas cleaning solutions

Key figures

- 166 employees
- 3 major sites (US, France, Hungaria)
- A 12,000 sq. m. modern manufacturing plant
- 1,000 customers worldwide
- 2 gas treatment lines (80MW each) worth over €10 million designed , manufactured and commissioned in connection with 3Sun building Europe's largest photovoltaic cell and panel plant in Catania, Italy

Strategy

- Develop strategic partnerships with eco industrial firms worldwide
- Export revenues to reach 50% of turnover by 2011
- Consolidate existing sales footprint to reach leading position in each historic market
- Invest in VOC removal and odour control solutions
- Reach a leadership position in the sector of solar cell and panel production
- Take advantage of external growth opportunities

Business model

- End to end ownership of the technology and production process : research, engineering, manufacturing and after sales
- Development of technological synergies in air cleaning and clean energy

Growth leverage sector

Sep. 2010 : Europe Environnement wins a contract worth over €10 million in connection with 3Sun building Europe's largest photovoltaic cell and panel plant in Catania, Italy.

The commissioning of the two gas treatment lines (80MW each) in early July and early September allowed to close successfully this first achievement in the photovoltaic sector.

Energy production from waste and biomass

Market & positioning

- Production of electricity from waste and biomass using a proprietary plasma torch based process
- Twice power is produced from same feedstock with low environmental footprint
- Short term customers: self funded BOO projects, independent developers, backed by security of power off take contracts.
- Medium term customers: communities, IPP, large industries
- Typical offering: from €5m (proprietary equipments) to €50m (turnkey plant)

Business model

- Preliminary studies and FEED studies, consultancy
- Project development and financing (BOO projects)
- Delivery of turnkey plants with performance guarantees through EPC contracts
- Operation and maintenance services

Growth strategy

- Co-investment fund to set up the first plant in Morcenx and demonstrate process at scale
- Set up ecosystem relying on partnerships with local developers and project funders to accelerate roll out
- Focus on mature areas for waste & biomass management, with renewable power incentive systems (ROC, feed in tariff, tax credits): Europe and North America
- Constantly improve process
- Expand to new segments: industry and communities

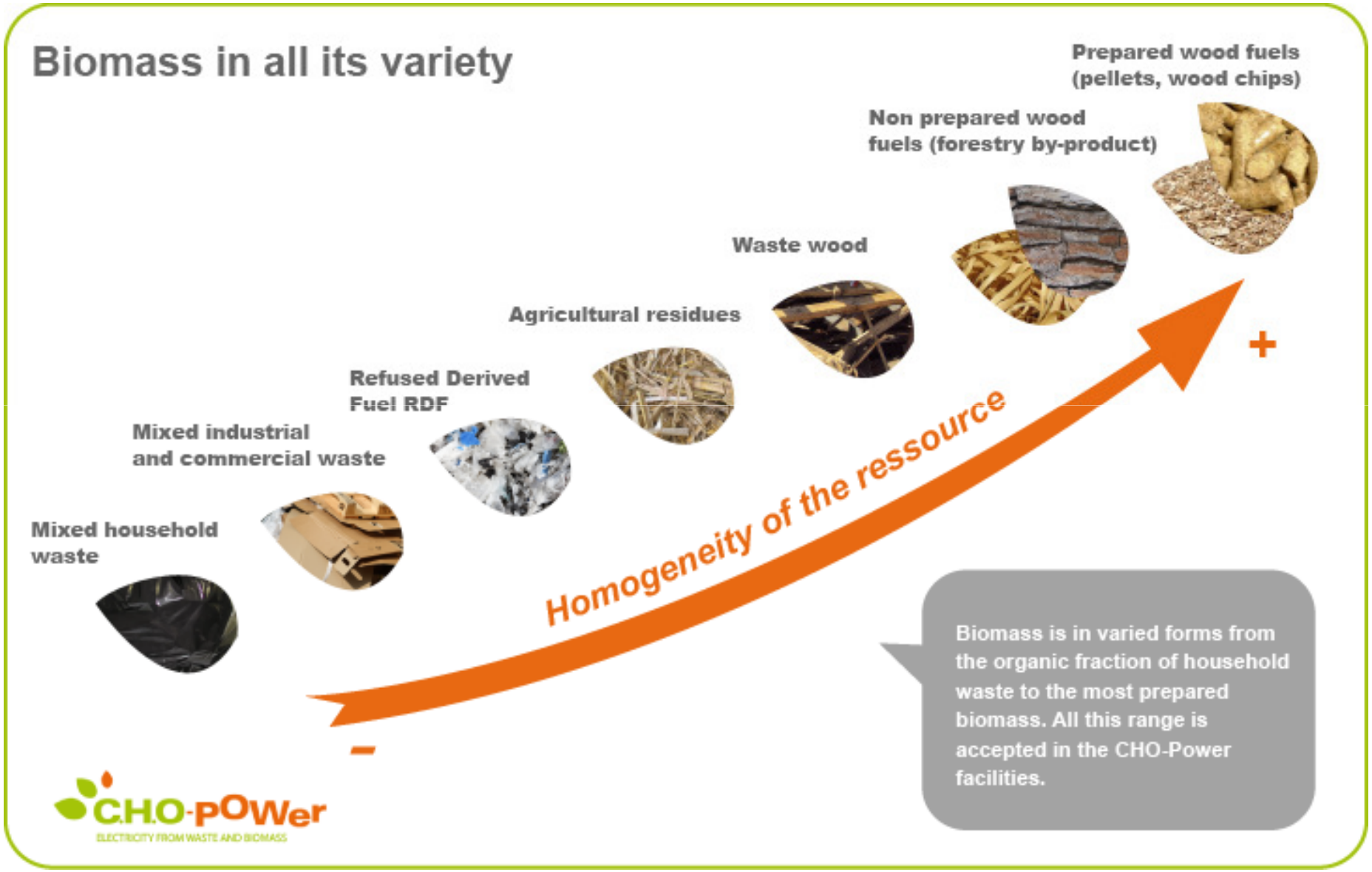
Commercial pipe

- First plant under construction in Morcenx (France), operation planned S1 2012
- Large number of solicitations and incoming requests. CHO Power is actively working on 7 projects in Western Europe and North America.

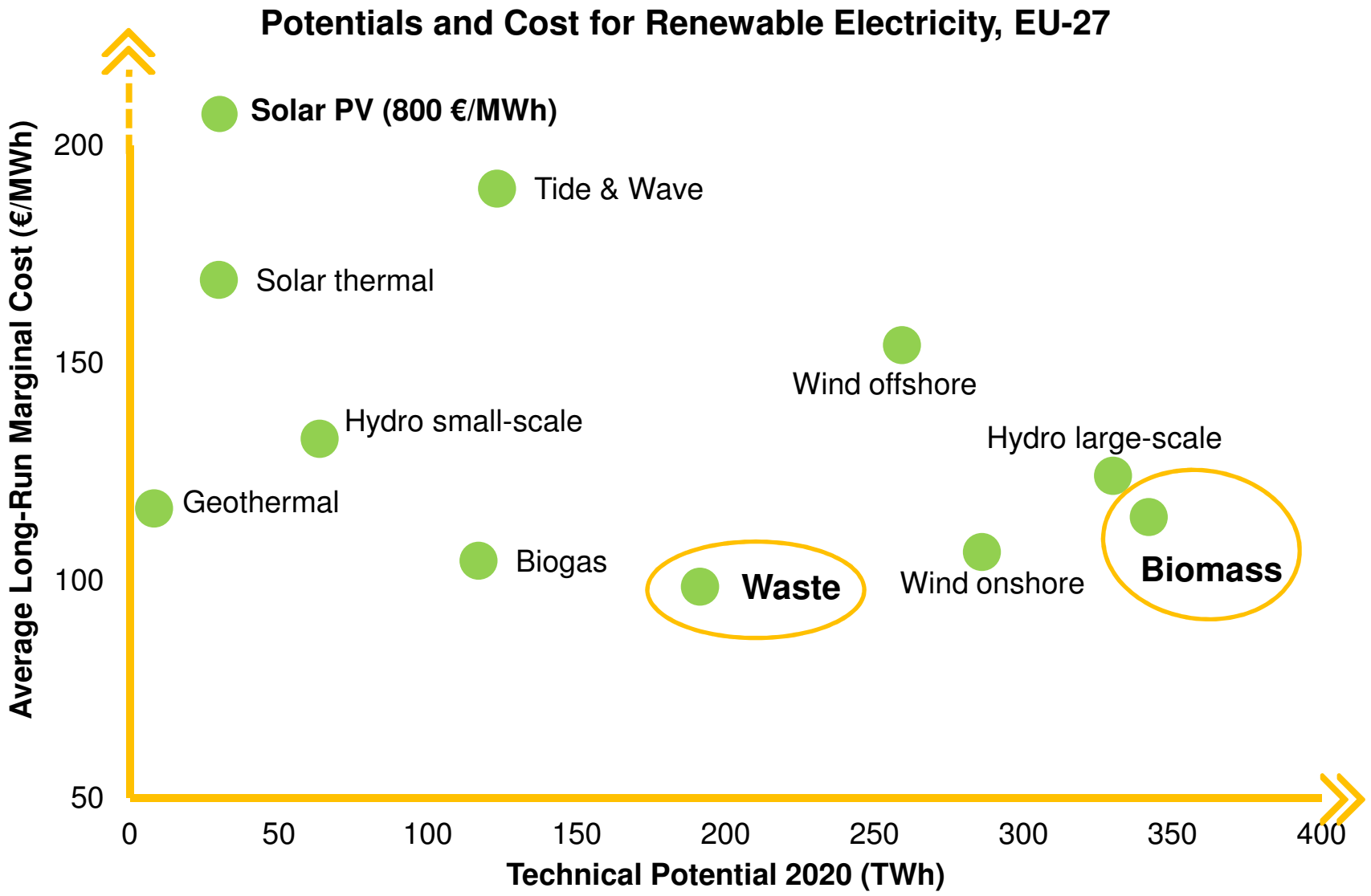
Focus on the renewable energy production market

C.H.O-POWer

A mix made of waste and biomass



Potential and cost for renewable electricity in Europe



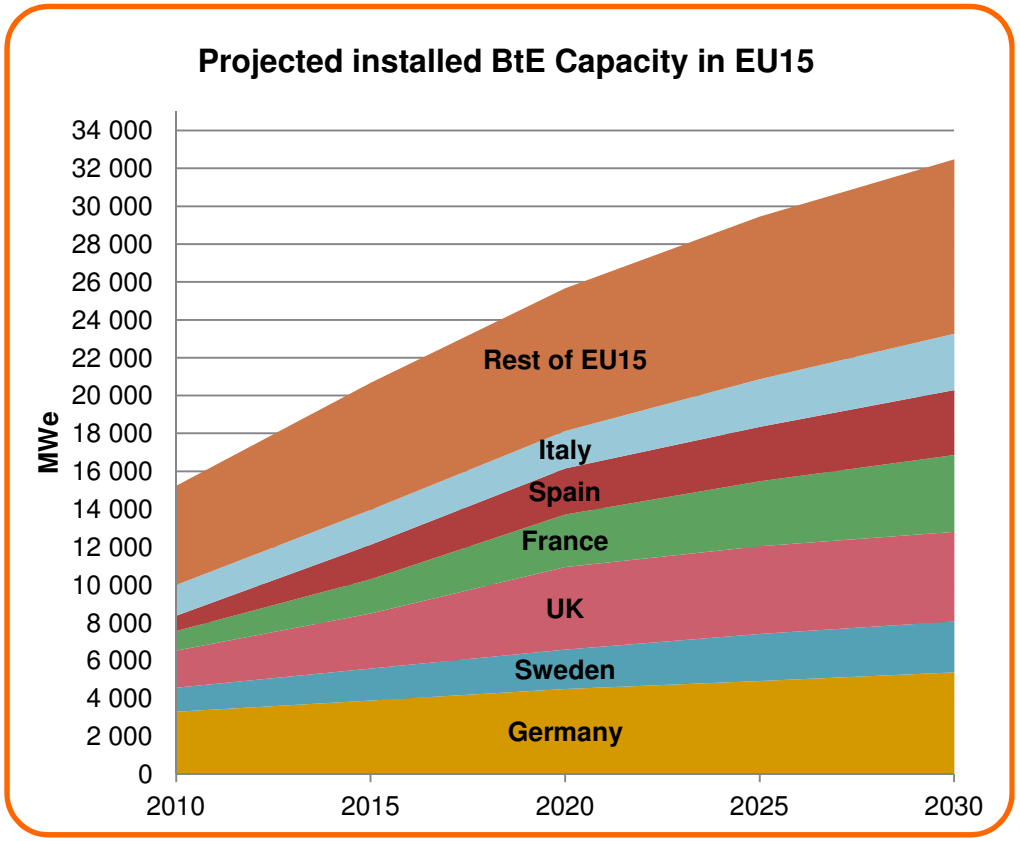
Long-Run Marginal Cost is a tool to help in the decision to invest in a new installation. It is calculated over a 15 years period and takes into account the investment required, cost of operations, cost of fuel. The Technical Potential represents the yearly power generation potential by fuel type in 2020.

Sources: ECOFYS 2011 - Financing RE in the European Energy Market/EUROSTAT 2010 - EU Energy Trends to 2030 / IEE 2006 - Potentials and Cost for RE in Europe

Biomass to Electricity: a fast growing market

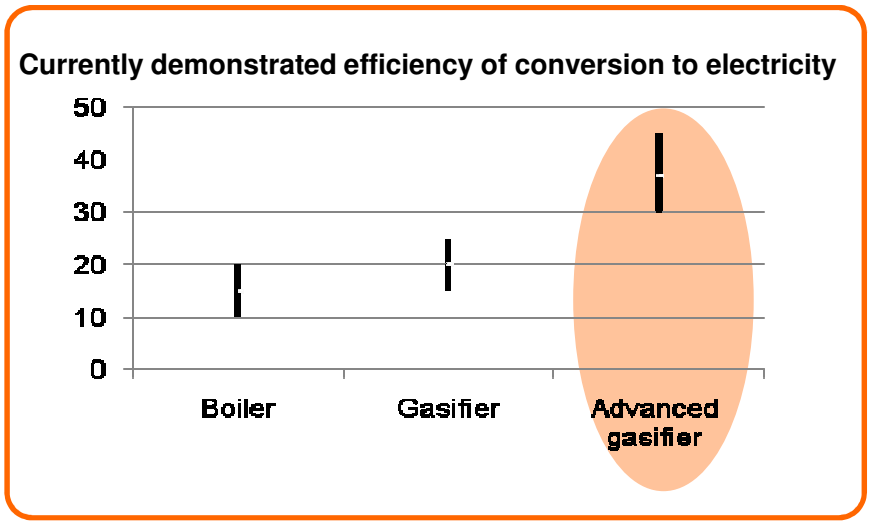
Biomass is one of the largest or the largest contributor to RE, but it has been growing much slower than wind and solar during the period 1995-2009 because of

- A perception that other Res are cleaner and a resulting more favorable regulatory framework for other Res.
- A supply/value chain that is not fully in place and/or insufficiently organized.
- A lack of technological progress leading to insufficient decrease in the CAPEX and OPEX costs.
- A lack of use at a larger scale of improved technologies such as gasification.



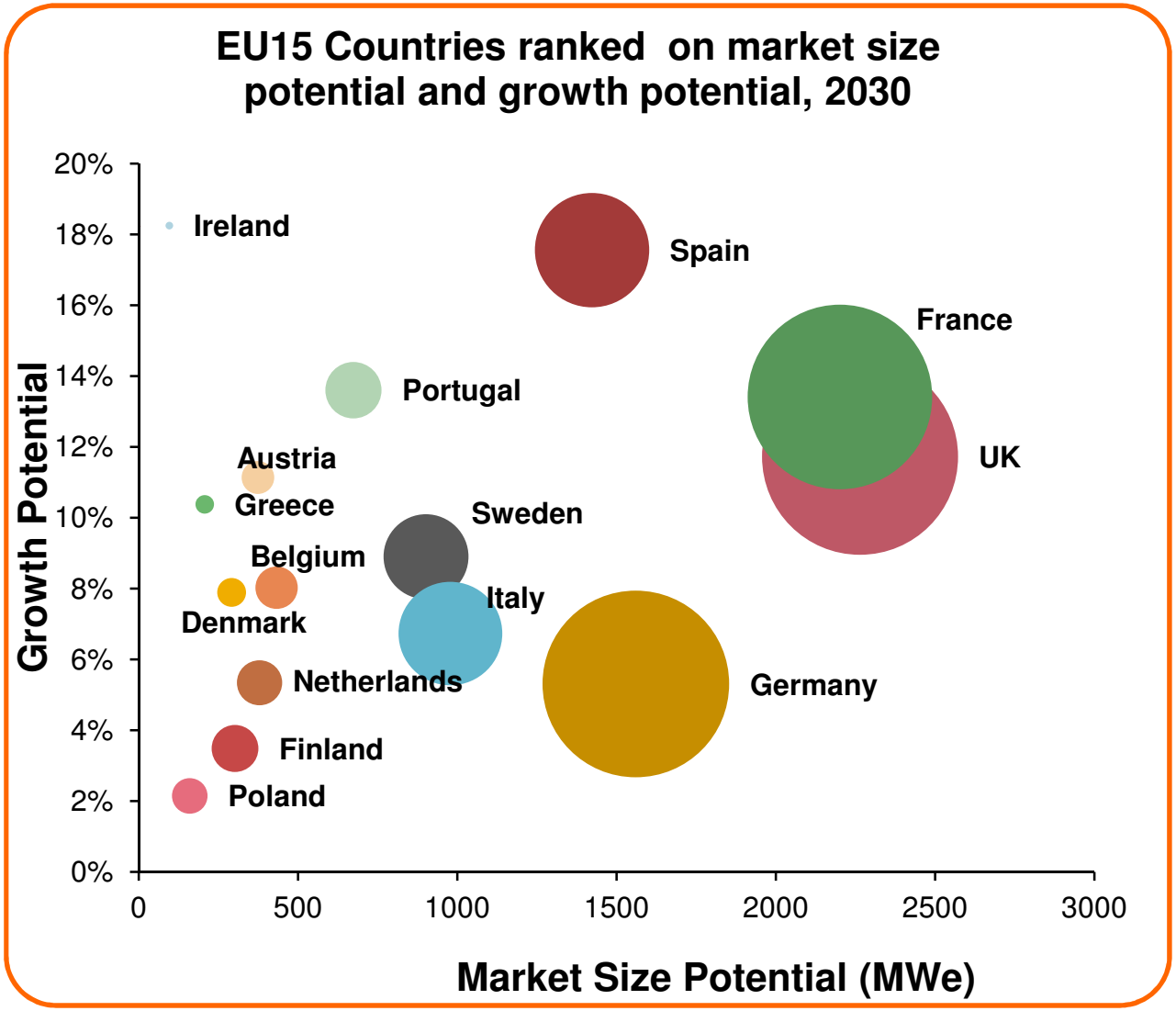
- **The projected BTE market shows a growth potential of 19 000 MWe capacity to be installed in EU15 over the period 2010 – 2030.**
- **Gasification should capture 6 400 MWe of this potential thanks to higher performances**

See below



Sources: Eurostat 2010 – EU Energy Trends to 2030 / DGEC Juillet 2011 – Scénarios prospectifs Energie Climat Air à l'horizon 2030 / Company data

EU-15 markets attractiveness: market size



CHO-Power undertook a number of detailed market research studies to shape its strategy for key targets for the development of biomass and waste to electricity projects.

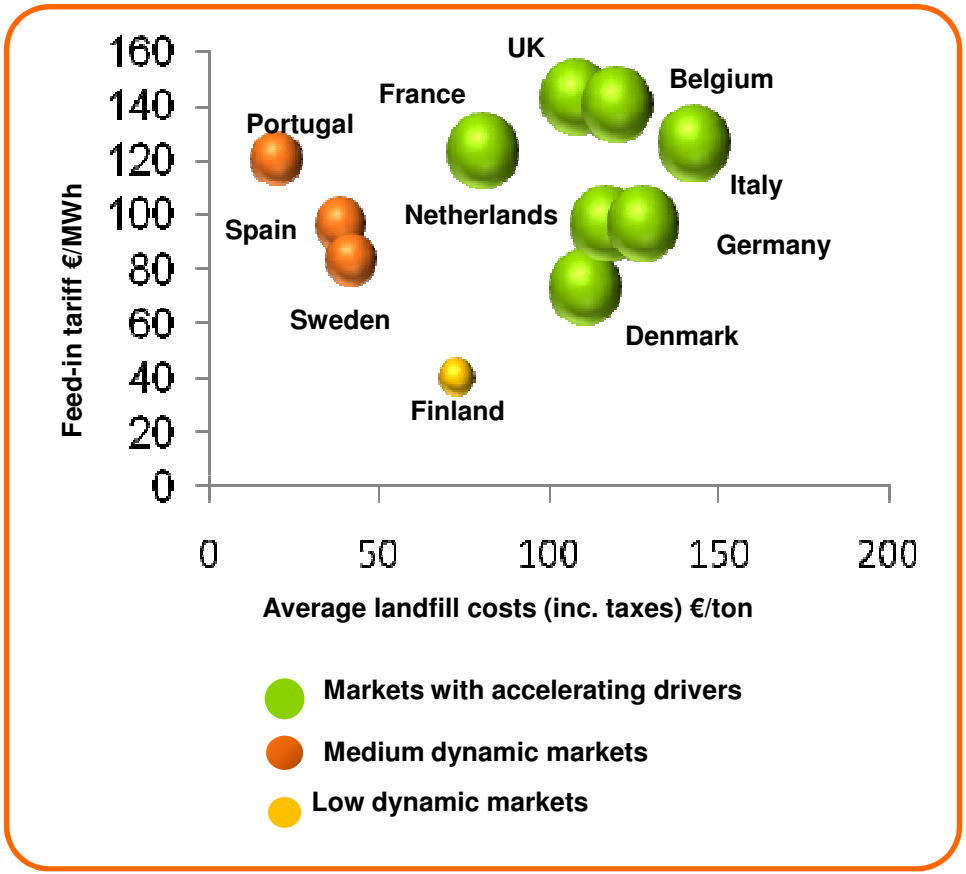
The first step is sizing the serviceable market for CHO Power products: starting from the total BTE market demand and filtering the serviceable segments.
Results are given in the chart.

Key findings are:
➔Germany, Spain, UK and France appear as the leading markets in EU15.
➔ Most of the potential in Germany arises from pure biomass whereas it comes mostly from waste in the UK.
➔ The post Fukushima effects have not yet been taken into account for these countries. It is expected that switching off part of the nuclear power stations will increase the BTE market potential.

Market Size Potential: Additional CHO Power serviceable capacity 2010-2030 in MWe
Growth Potential: CAGR 2010-2030 of serviceable market size
Bubble size: Installed BtoE capacity in 2030

Sources: Eurostat 2010 – EU Energy Trends to 2030 / DGEC Juillet 2011 – Scénarios prospectifs Energie Climat Air à l'horizon 2030 / Company data / CEWEP / European Commission Energy

EU-15 markets attractiveness: accelerating drivers



The BtE potential is closely linked to:
- energy off-take price and the value derived by green certificates or renewable energy tariffs for biomass.
- Landfill costs and landfill diversion policy.

The chart shows for most EU-15 countries the average landfill costs and the feed-in tariff (or the equivalent value for a quota based country) for such a feedstock.

High landfill costs (including taxes) encourage landfill diversion and makes any other technology more attractive.

High feed in tariff create accelerating factors for the development of BTE plants.
Combination of both make the best conditions for the fast deployment of BTE plants.

Sources Eurostat 2010 – EU Energy Trends to 2030 / DGEC Juillet 2011 – Scénarios prospectifs Energie Climat Air à l'horizon 2030 / Company data / CEWEP / European Commission Energy

Focus on key markets

Based on the market studies findings (size, growth, drivers),
CHO Power focuses in a first step on the following key markets:

Market	Growth and size	BtE tariff and landfill fee	Estimated serviceable market capacity 2010-2030
France	Large market, high growth potential	Landfill tax to double by 2015. Feed in tariff doubled in 2009. Many opportunities on I&C waste.	2 201 Mwe
UK	Fast growth in the coming 10 years	Highest tax in EU for landfill. ROC system favouring advanced gasification.	2 264 Mwe
Germany	Largest EU market, high growth	Mature ecosystem for biomass and waste. Saturation of RDF plants.	1 560 Mwe
US & Canada	Market as large as EU-15 that can not be ignored. RES incentive at each state level completed by federal tax credits. Strategy based on seizing opportunities with large and organised developers.		

The conservative potential for power plants of CHO-Power technology type, of a typical 10MWe size in France, UK and Germany to be built by 2030 is **320 units.**

Company key strengths

Advanced patented technology

- Proven plasma technology operational record of 1.5 million hrs
- Plasma plant operated since 1995
- Biomass demonstration facility with validation from SLR consulting
- At scale funded project under construction

+

Formal management structure in place providing a base for projected growth

- Extensive knowledge of design, development, operations and finance
- Track record of achieving sustainable growth
- Knowledge in project financing closing
- Steering process for opportunity review

+

Attractive pipeline

- Advanced pipeline of profitable projects
- Rigorous selection criteria for new developments
- Project development methodology to save development lead time and costs

Business model

DEVELOPMENT & FINANCING

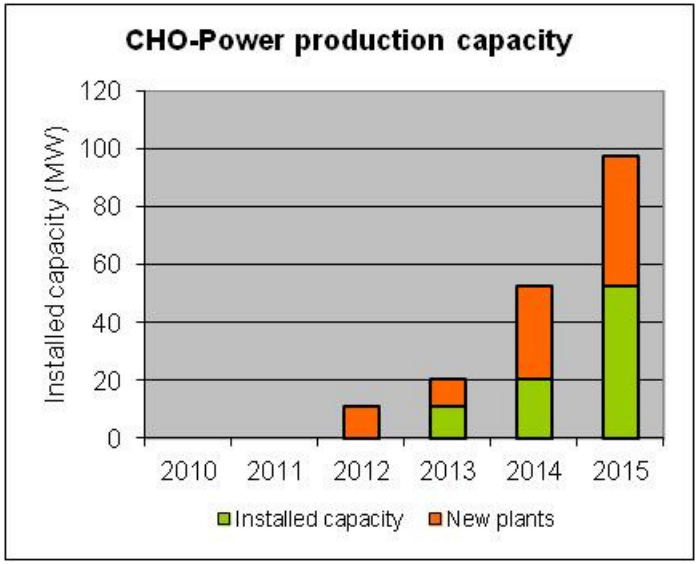
CHO-Power is developing a portfolio of BOOs plants in Europe and North America, in partnerships with local development entrepreneurs and funding partners.
In the case of a non BOO project, CHO-Power can delivery necessary FEED services and feasibility studies on demand.

CONSTRUCTION

CHO-Power can deliver the plant directly as the main contractor, or can grant a license to an EPC partner while providing proprietary equipments.

OPERATIONS & MAINTENANCE

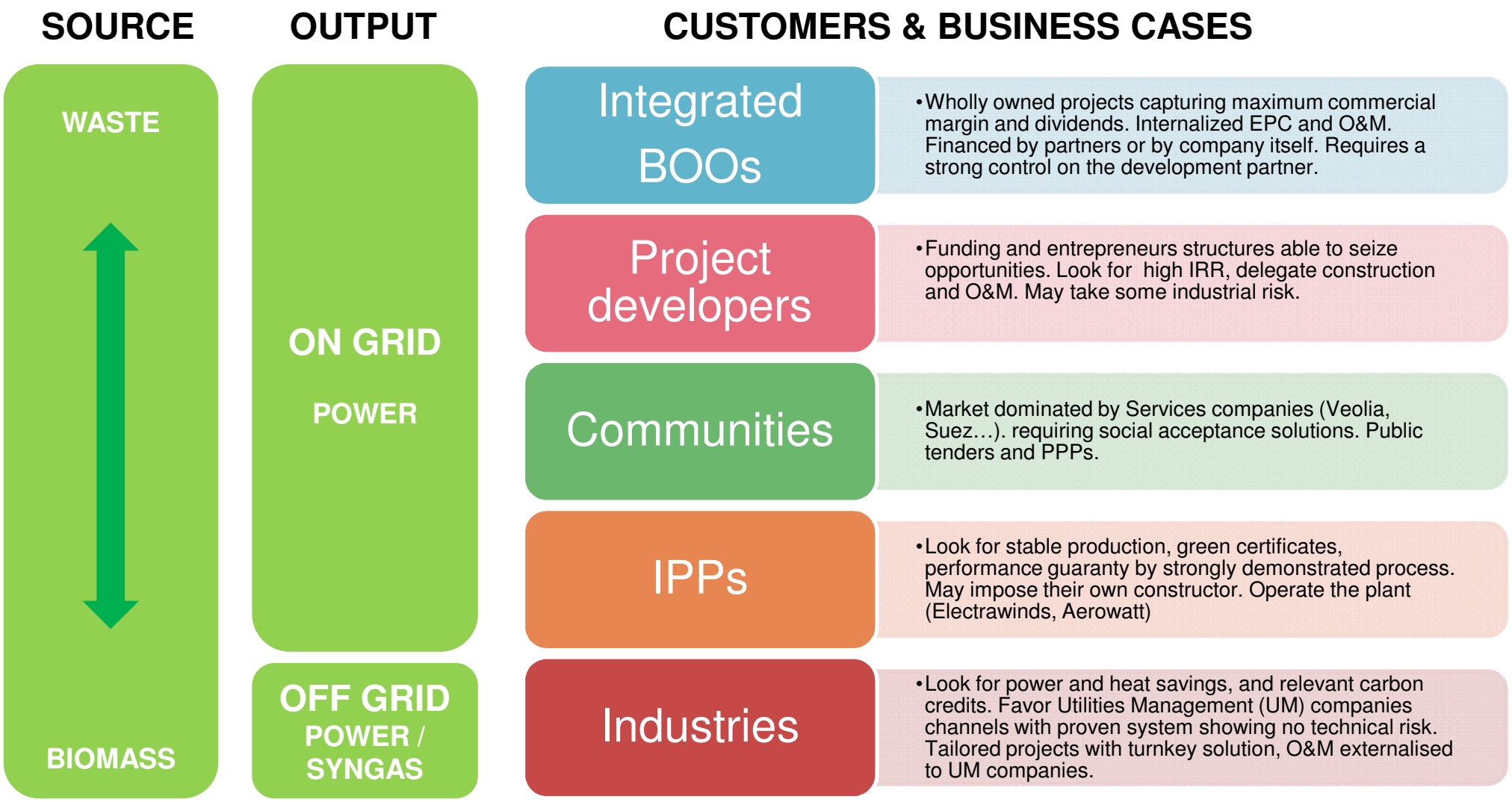
CHO-Power can provide the plant operation and maintenance services. In any case, the O&M operator will be trained in the training center in Morcenx.



➔ OUR TARGETED CUSTOMERS AND PARTNERS

- Renewable Energy Investment funds
- Developers, entrepreneurs
- Independant Power Producers (IPP)
- Facility Management Companies
- Waste Management Companies
- Large Industries having interest in captive energy production

Customers segmentation



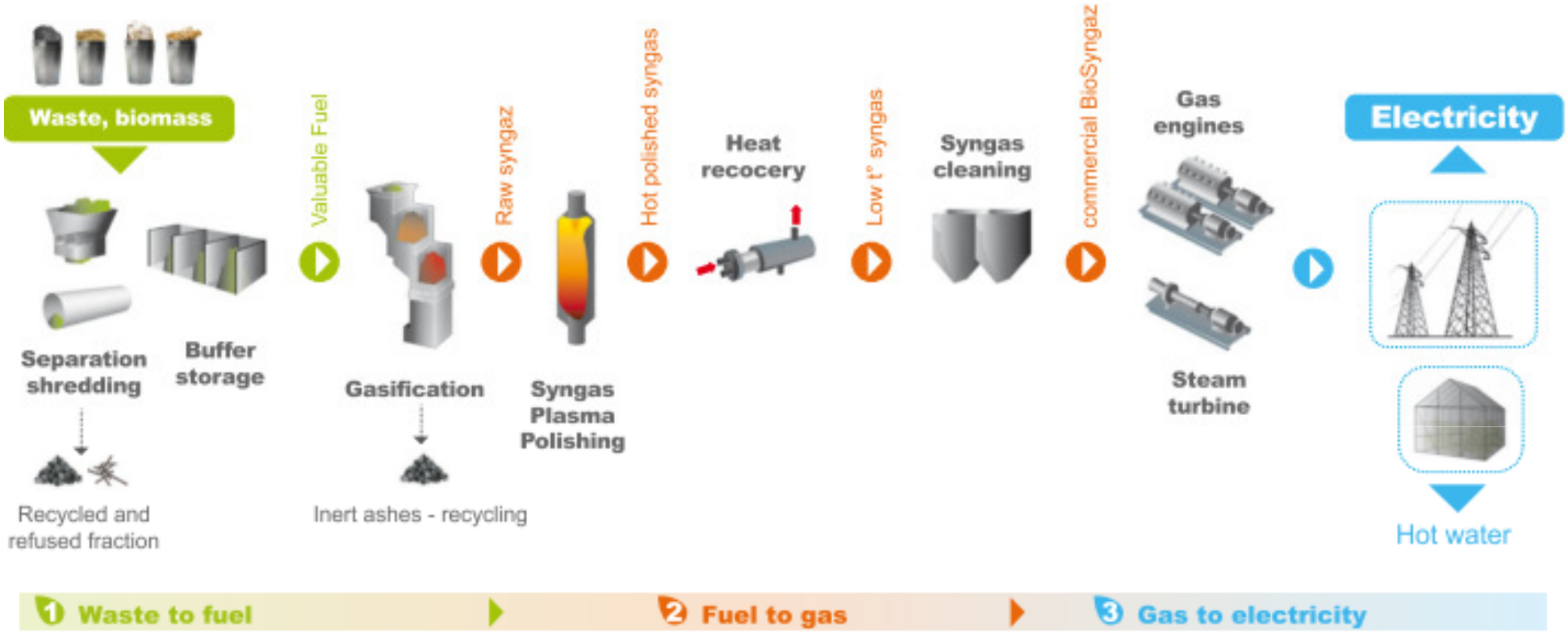
The competition

CLEAR COMPETITIVE ADVANTAGES

CHO Power is the only company to have developed its own proprietary technology, to have gained operating experience and to have developed demonstration facility and commercial pipeline.

	CHO-POWER	Advanced Plasma Power	ALTER NRG	PlascoEnergy Group
Proprietary torch technology	Yes	Yes	Yes	No
Qualified plasma torch 2MW+	Yes	No	Yes	No
Demonstrated facility audited	Yes	Yes	Yes	Yes
First plant funded	Yes	No	Yes	No
Operation experience	Yes	No	No	No
Second generation gasification	Yes	Yes	No	Yes

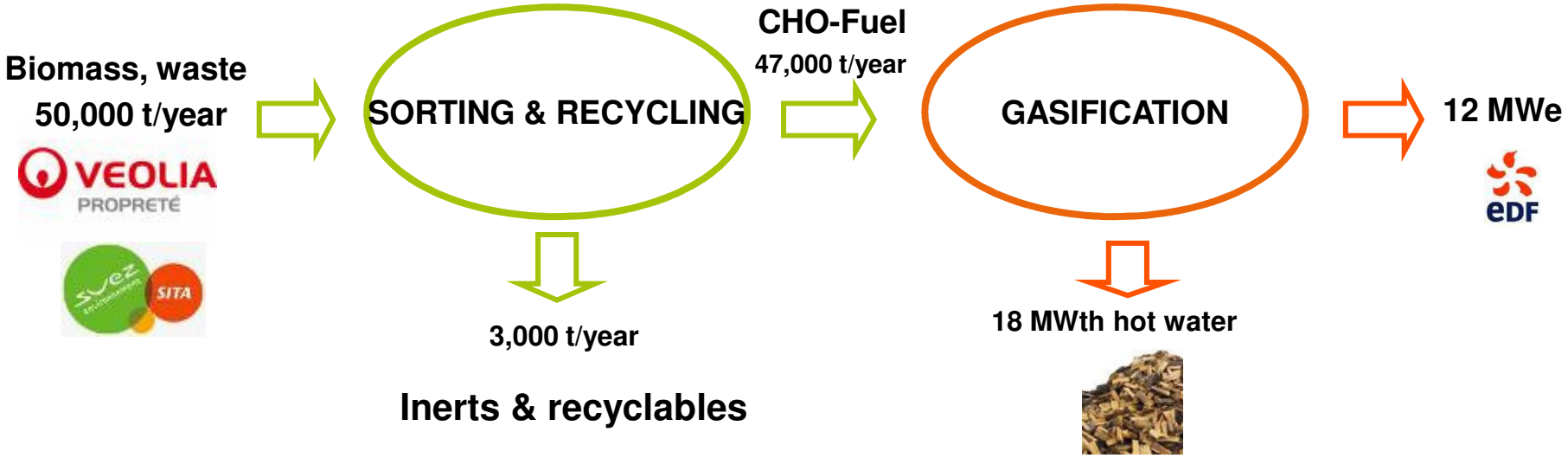
The CHO-Power process



1. Fuel preparation : the waste is crushed. Heavy inert substances and metals are taken out. Everything is mixed in a buffer zone in order to obtain a homogeneous fuel guaranteeing the optimal operation of the rest of the process.
2. Fuel to gas : the fuel is put into a gasification reactor to be transformed into syngas. It is then taken to high temperature to be refined in a plasma reactor. The syngas is then cooled down, its heat recovered, then filtered.
3. Electricity and heat production : the gas is injected into gas engines that activate a generator to produce electricity. The heat recovered when the gas is cooling down and when it leaves the engines in the form of steam can also be turbined or delivered to a heat customer. The engine cooling circuit generates 90°C water which can feed a heating network.

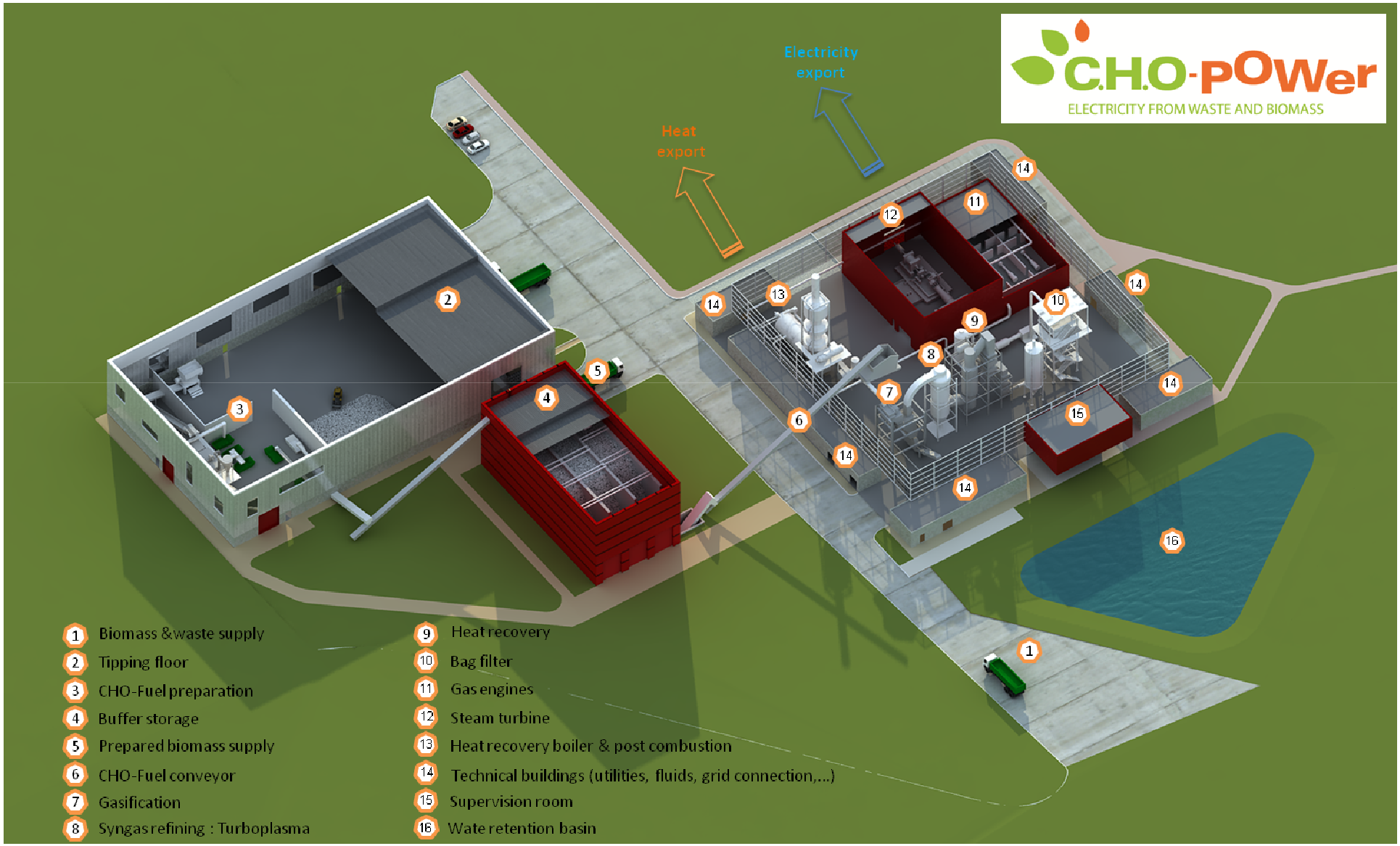
CHO-Power in Morcenx (France): a First in Europe

Show casing the technical know-how of CHO-Power



- Start of construction 1st December 2010 – 18 months of construction
- **12 MW electricity production** – supply 50,000 people with electricity
- From 50,000 tonnes/year of waste and biomass
- A global **investment of more than €40m**
- Heat recovering for a large wood dryer
- **Start operation : S1 2012**

General view of the plant



Ongoing construction

Business model and value creation

The CHO Power business strategy is to develop at least 250MW energy from waste & biomass projects capacity by 2018 and become the preferred technology choice of BtE and EfW developers, operators and industrial players world-wide.

Management has targeted key European and US markets which offer attractive returns whereby every plant contract will deliver project fundable at IRRs above 15%, subject to financing arrangements. CHO Power will provide the entire engineering package as technology provider, EPC and O&M contractor and generate EPC margins and EPC and O&M royalties for every technology equipment sold or contract developed.

In 2011 CHO Power was concentrated on the delivery of the Morcenx project due to start operation beginning 2012. In parallel CHO Power has build a pipeline of projects that in short term can generate substantial revenue.

Investment case

CHO POWER PROVIDES A UNIQUE OPPORTUNITY TO INVEST INTO THE GROWING AND PROFITABLE WASTE/BIOMASS TO ENERGY MARKET

- Uniquely positioned plasma gasification provider to benefit from growth prospects in BtE and EfW sectors.
- Company supported by patent protected technology and expertise.
- First commercial plant under construction and in operation first semester 2012.
- Business led by management team with core competence in technology, development and finance.

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