

# AREVA BIOENERGY Torrefaction

January 17, 2014



# AREVA supplies solutions for power generation with less carbon

## ▶ Number 1 worldwide in nuclear power

- ◆ Products and services to ensure nuclear reactor safety and performance throughout the lifecycle
- ◆ An integrated model covering every stage of the fuel cycle, reactor design and construction, and operating services

## ▶ A major player in renewable energies

- ◆ Advanced technology solutions: offshore wind, bioenergy, concentrated solar power and energy storage

**Nuclear and renewables:  
contributing synergistically to a  
reliable, economical and low-carbon  
energy mix**

# Renewable energies: a low-carbon power portfolio with a strong track-record



## Bioenergy Power Generation

More than 100 projects worldwide totalizing over 2.5 GW

35 years of experience

Upstream biomass treatment market through its torrefaction solution



## Offshore Wind Power Generation

Supplying and installing 120 turbines with a 600 MW output (Global Tech 1 & Borkum West 2)

Increasing production capacity



## Concentrated Solar Thermal

2x125 MW solar thermal project selected by Reliance, a major developer in India

300 MWe in operation, construction and advanced development



## Energy Storage

Decentralised systems for storing and generating power with or without renewable energy sources

Myrte storage system (500 KWc)



**AREVA**  
forward-looking energy

# AREVA Bioenergy

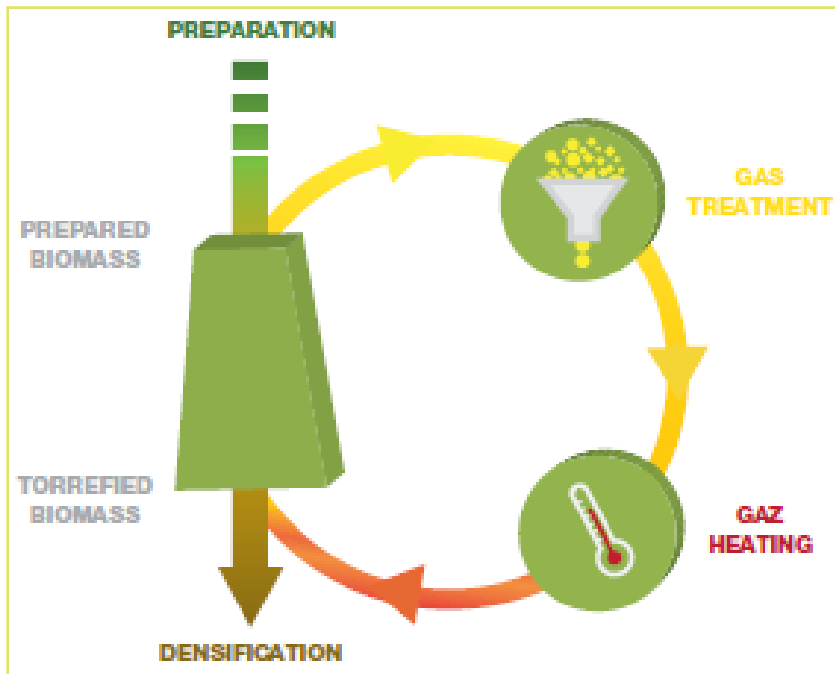
## *Our Assets*



- ▶ **Leader in Bioenergy, with 2.5 GW installed base**
- ▶ **35 years of experience**
- ▶ **Strong engineering expertise**
- ▶ **Skilled and dedicated people**
- ▶ **Safety first: zero accident in Europe for more than 3,000 days**
- ▶ **CHP EPC supplier, from 5 to 100 MWe (a 50 MWe biomass power plant in commissioning in the Netherlands)**
- ▶ **Innovative in product development:**
  - ▶ **AdCub: a standardized 5 MWe CHP offer**
  - ▶ **Torrefaction: Acquisition and improvement of Thermya technology to address the “front-end” biomass characteristics enhancement**

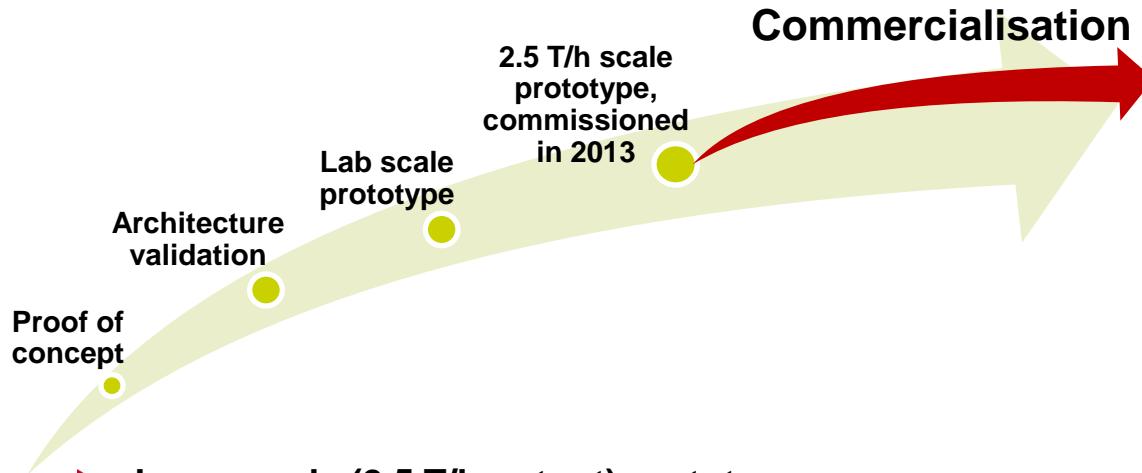
# AREVA Torrefaction key characteristics

- ▶ A direct heating, moving bed technology.
- ▶ A continuous thermal treatment in a torrefaction column, where two flows move vertically in opposite directions.



- Improved energy & mass balance
- Large particle size range accepted at column inlet
- Large moisture content range accepted at column inlet
- Flexibility and accurate control of torrefaction temperature
- Various heat sources usable
- Very compact technology
- Simple, robust, very few moving parts for easy maintenance

# AREVA torrefaction milestones and applications

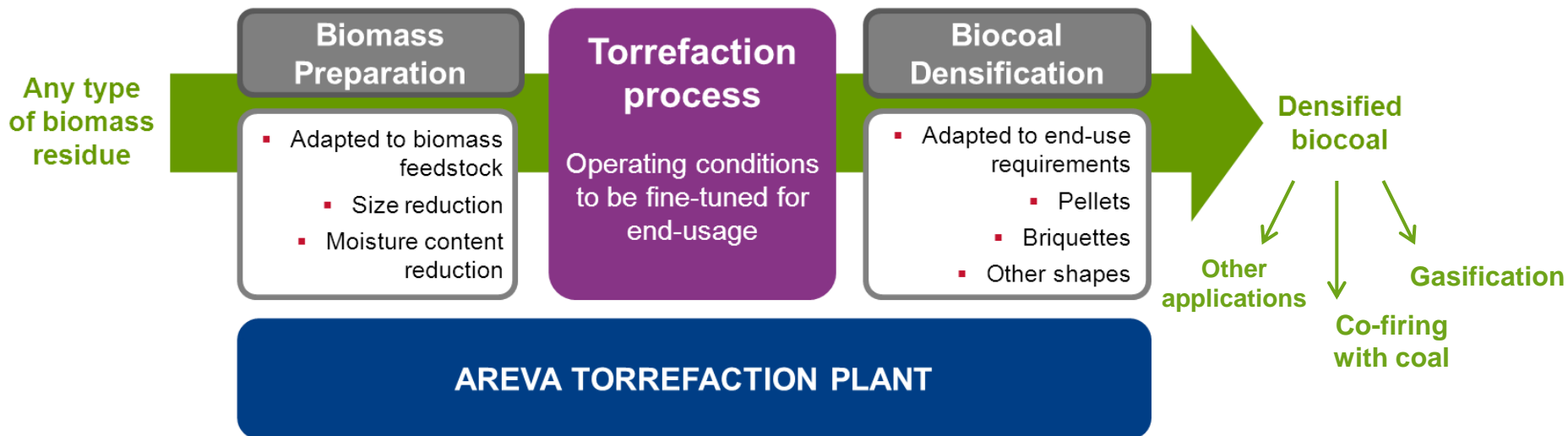


- ▶ **Large scale (2.5 T/h output) prototype commissioning in 2013**
  - ◆ Validation of industrial scale performance
  - ◆ Running and 24/7 production of thousands of tons for end-users tests in 2014
- ▶ **Bagasse and wood**
  - ◆ Validation of running with bagasse through tests performed in Brazil
- ▶ **Validation of a range of densification options**
  - ◆ depending on markets, pellets, briquettes and nuggets represent optimized shape

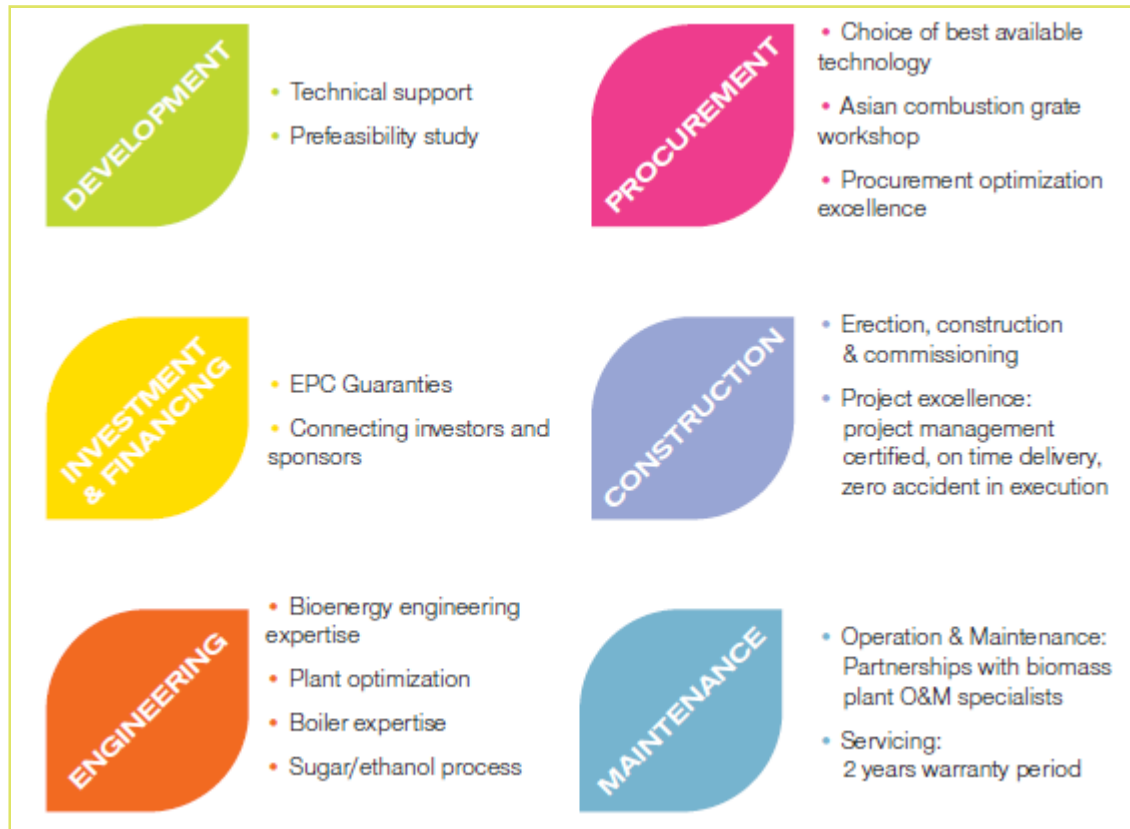


# AREVA provides complete solutions meeting end-use requirements

- ▶ Thanks to its expertise and experience in biomass project engineering, AREVA is well positioned to provide complete turnkey biomass torrefaction plants around its technological offer, in order to:
  - ◆ Deal with a wide variety of woody and bagasse feedstock,
  - ◆ Produce biocoal according to specific requirements.
  - ◆ Fit to project's specificities.



# AREVA provides support to its clients over the entire bioenergy value chain



The key partner to execute a wide range of projects



# Operational Excellence

## Strong focus on project execution and quality

**1**

### Project management excellence

**PMI Certification for project managers**

To ensure success, iPlan is building capability in stages

**2**

### Environment

**Manufacture certification**  
**ISO 14001**

**Carbon compensation**

**3**

### On time delivery

**Optimized planning**  
**site delivery / installation**

**4**

### Strong quality process

**ISO 9001 for Engineering services**



***Thank you for your attention !***

**Hervé CHAUVIN**

***herve.chauvin@areva.com***

**New Products Director**

**AREVA Bioenergy**

1 Place Jean Millier

92084 PARIS La Defense Cedex

FRANCE

**[www.areva.com](http://www.areva.com)**