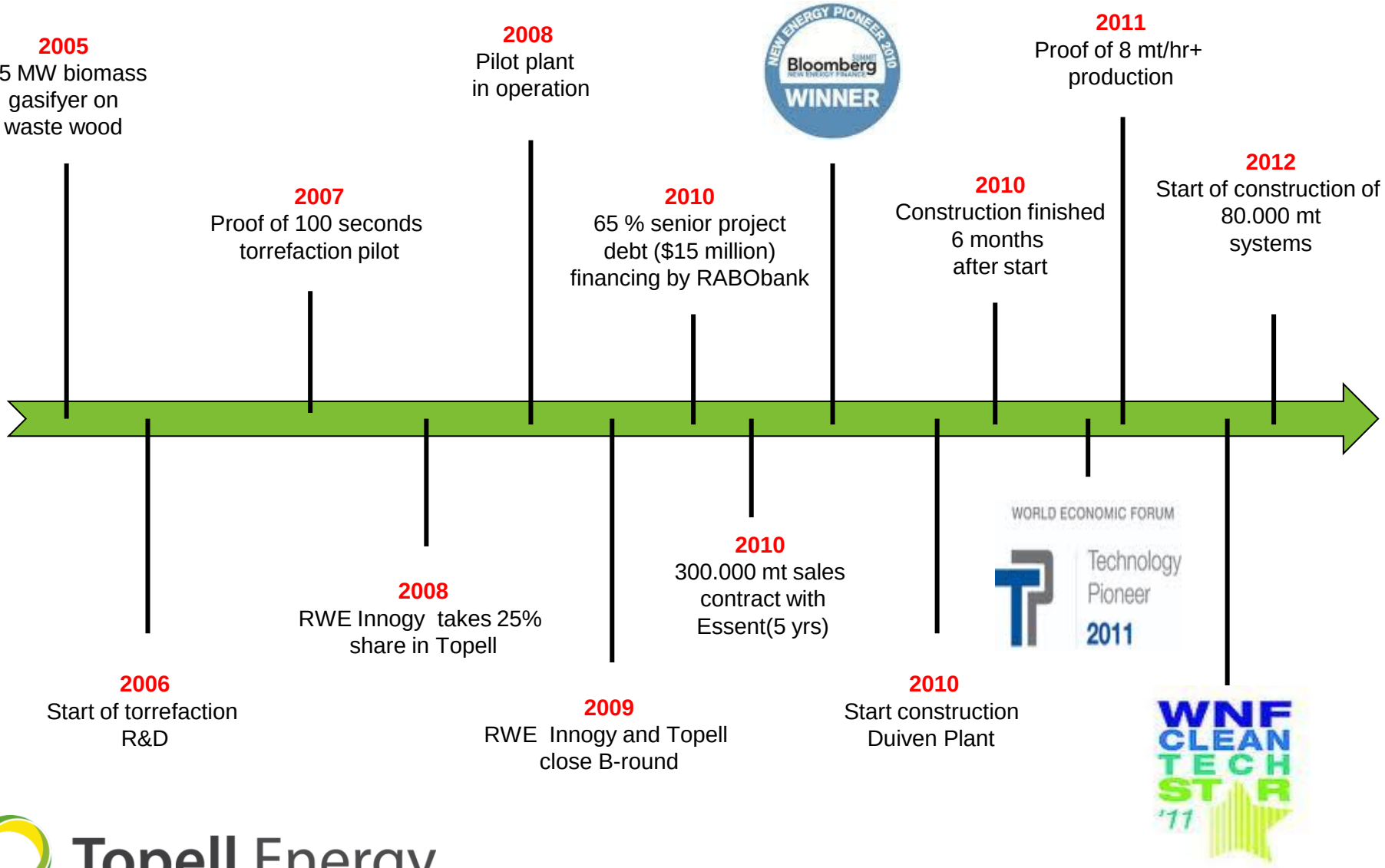
TOPELL ON TORREFACTION

LEADERS IN TORREFACTION TECHNOLOGY

TOPELL ENERGY HISTORY

GLOBAL TOP 3 UTILITY AS INVESTOR, WORLD'S LARGEST PLANT, VARIOUS REWARDS



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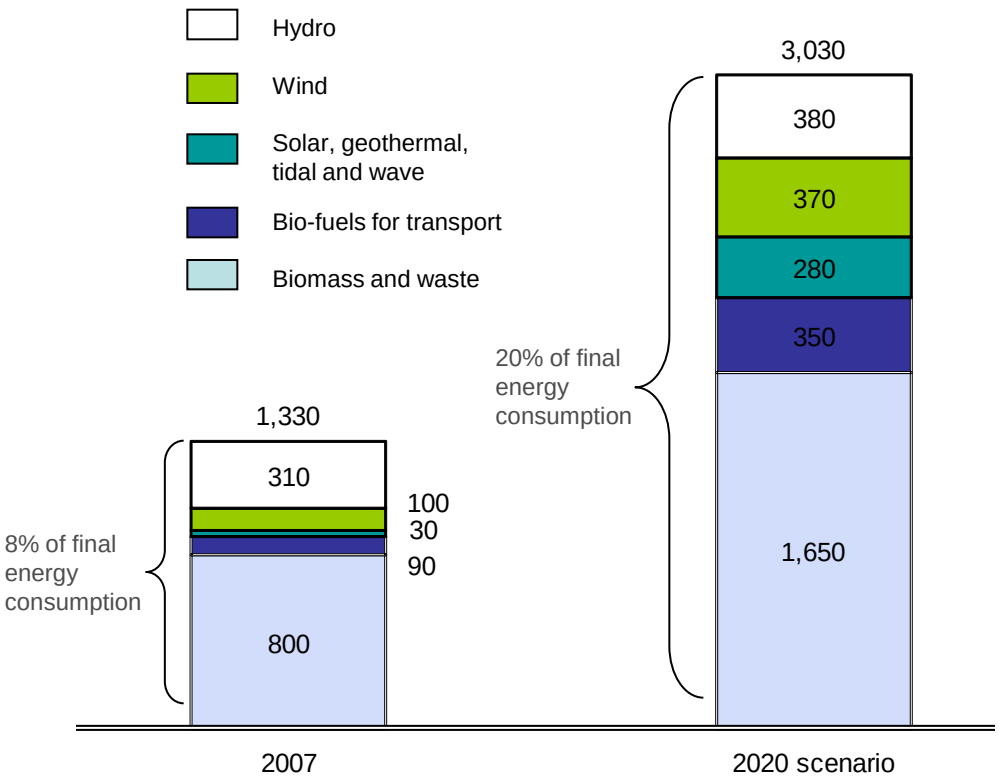
BIOMASS IS A KEY RENEWABLE FUEL NOW AND IN THE FUTURE, AS CONFIRMED BY UTILITY SECTOR EXECUTIVES

EU-27 mandated final renewable energy consumption
(*TWh*)



"Torrefied biomass provides a great opportunity not only for RWE but also for the Netherlands as a whole."
Leonhard Birnbaum, COO RWE

"Electricity generation from biomass has the potential to grow significantly and make a vital contribution to meeting the UK's challenging renewables and climate change targets at least cost to UK consumers."
Dorothy Thompson, Chief Executive of Drax

"The entire Vattenfall Group is fully engaged in changing our power plants and production methods such that we can meet the expectations that world has on us to provide clean, environmentally friendly energy,"
Hans von Uthmann, VP Vattenfall

Source: 'Biomass for heat and power: opportunity and economics'. Report by Vattenfall, SÖDRA, SVEASKOG, and the European Climate Foundation, with the assistance of McKinsey. Published June 10th 2010

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TORREFACTION PRODUCES COAL-LIKE PRODUCT

INVOLVES THERMO-CHEMICAL TREATMENT OF BIOMASS

	Biomass (pellet, chip)		Torrefied biomass	Coal
				
Tough	Yes	⇔	No	No
Fibrous	Yes	⇔	No	No
Hydrophilic	Yes	⇔	No	No
Biodegradable	Yes	⇔	No	No
Heterogeneous	Yes	⇔	No	No
Poor energy density	Yes	⇔	No	No
Sustainable fuel	Yes	⇔	Yes	No

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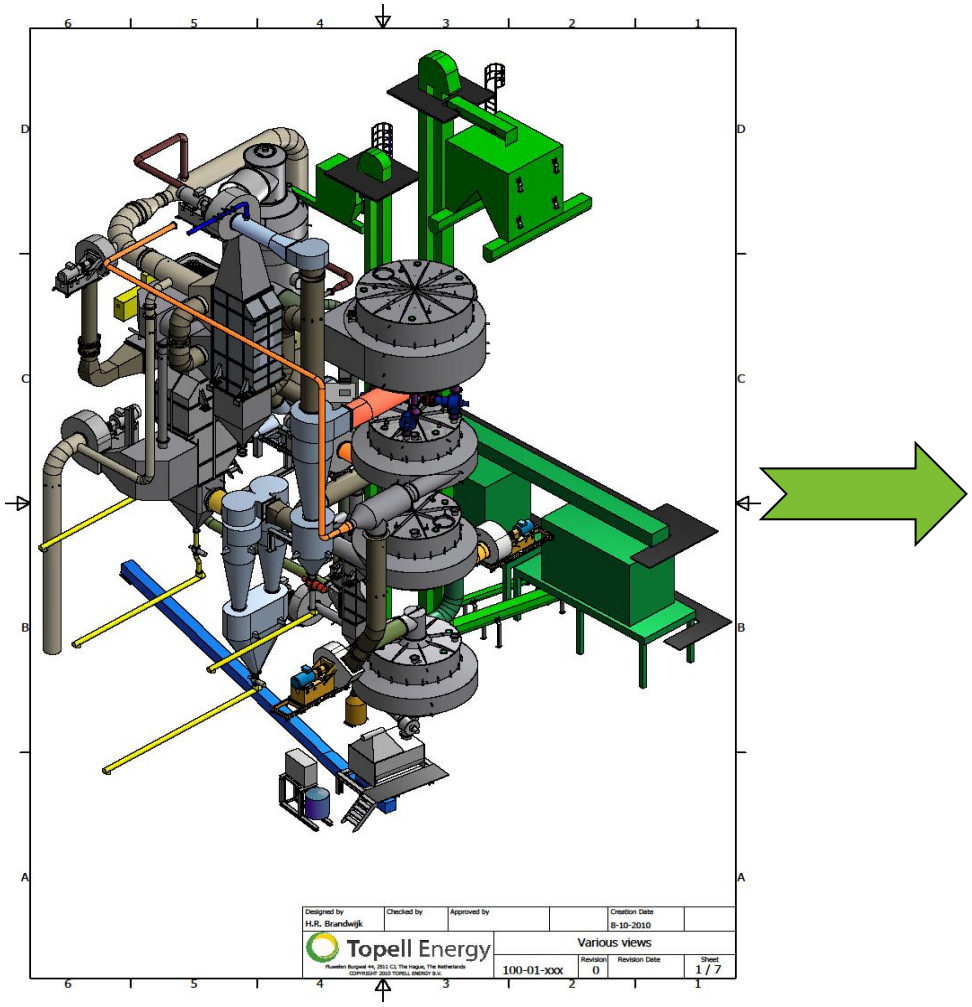
TOPELL TECHNOLOGY CHARACTERISTICS

IT TAKES 100 MILLION YEARS TO MAKE COAL NOW TAKES 100 SECONDS



- **Process time of 100 seconds.**
- **No moving parts(low maintenance)**
- **Proven reactor technology**
- **Heat transfer 40++ times faster than plug flow reactors**
- **Ability to precisely control product specifications**
- **Low energy consumption**
- **Scalable to 25 mt/hr+**

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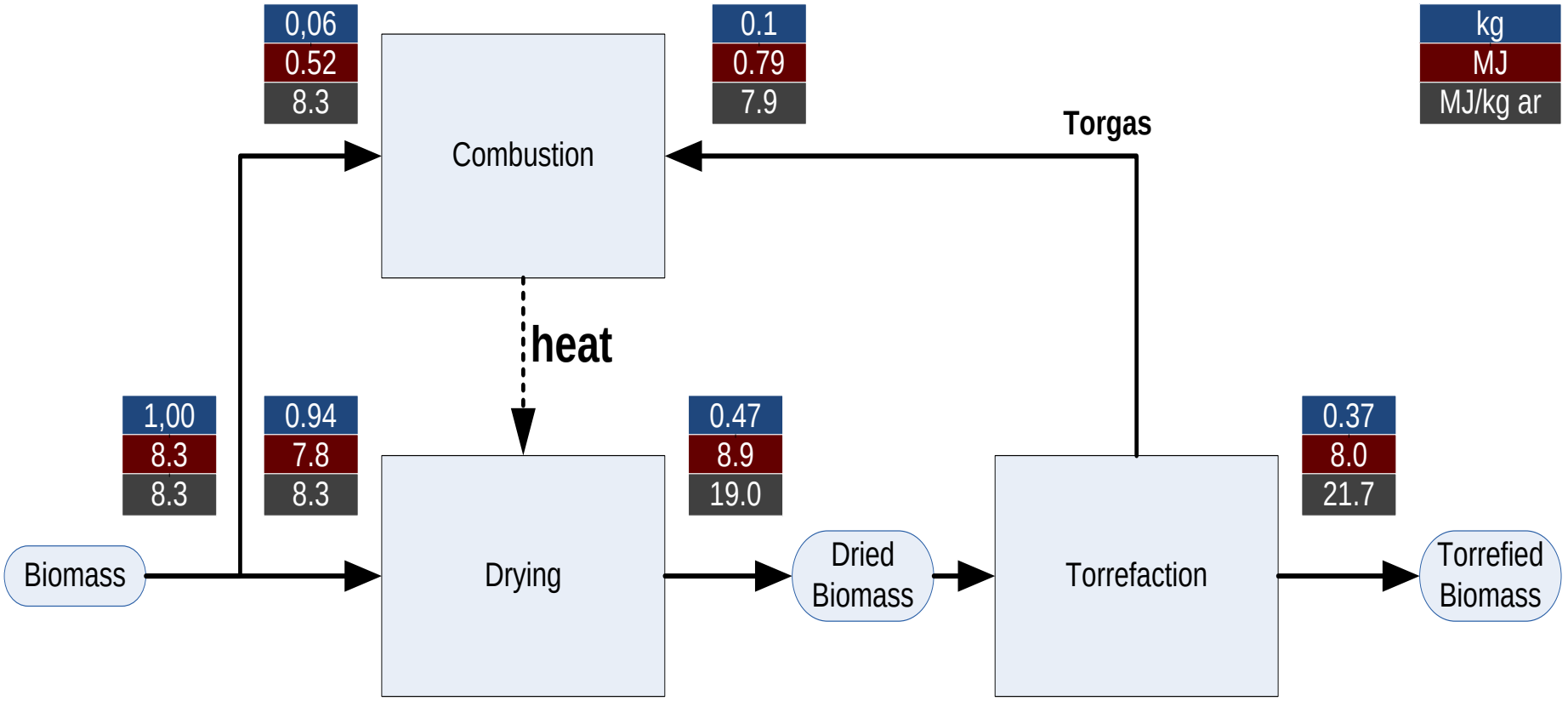
THERMAL EFFICIENCY TOPELL PROCESS IS 95%+

UTILIZATION OF COMBUSTION OF TORREFACTION GASES DRIVES HIGH EFFICIENCY



1. Feed is 50% moisture biomass.
2. Biomass co-combustion is zero at 35% or less moisture(autothermal point of operation)
3. Over 100% thermal effieciency possible due to exponential increase in LHV when reducing moisture from 50% to 0%

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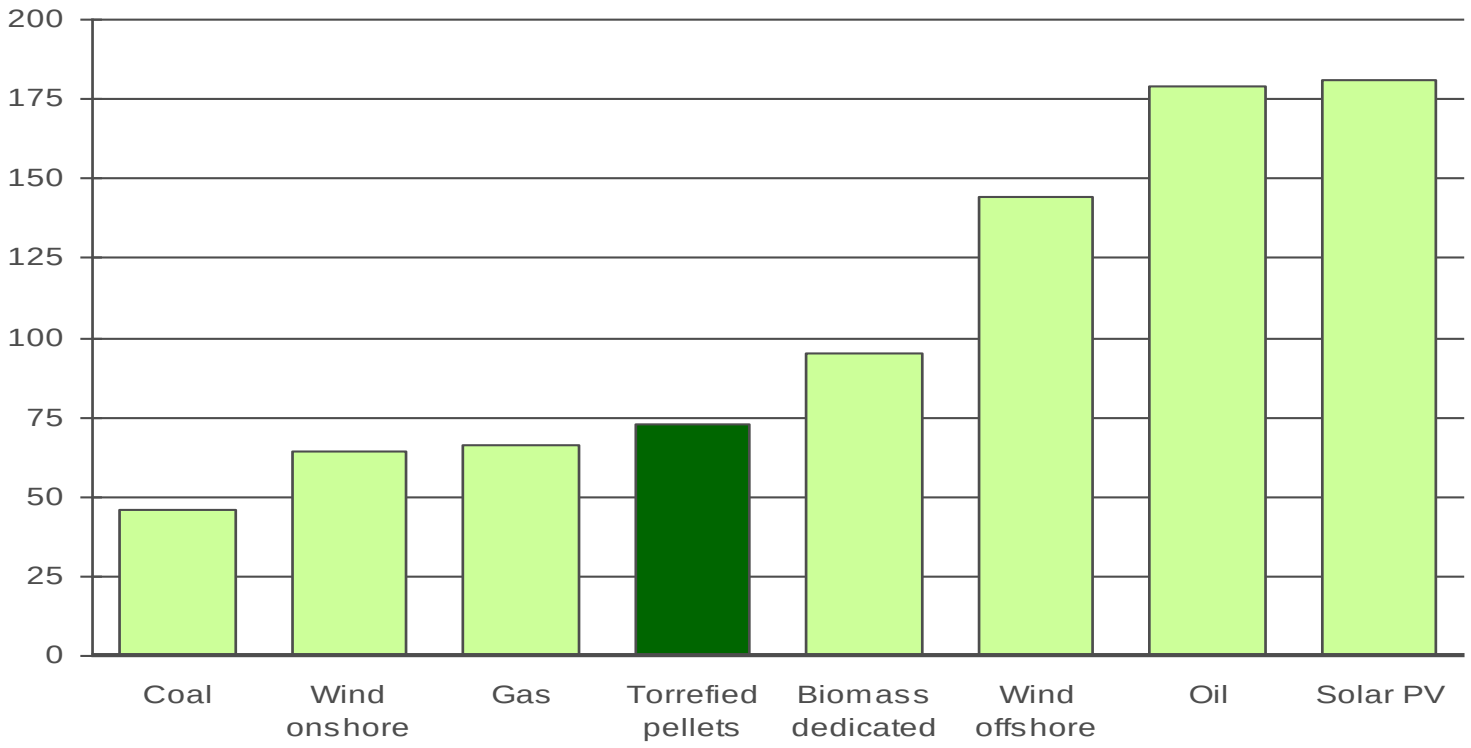
BIOMASS, AND MORE SPECIFICALLY TORREFIED BIOMASS, IS A COST COMPETITIVE RENEWABLE ENERGY FUEL

ENERGY PRODUCTION COSTS ANNO 2010 (€/MWH)



1.	Torrefied biomass:	base load + renewable
2.	Wind & solar:	renewable
3.	Gas, oil, coal:	base load

Source: Roadmap2050.eu

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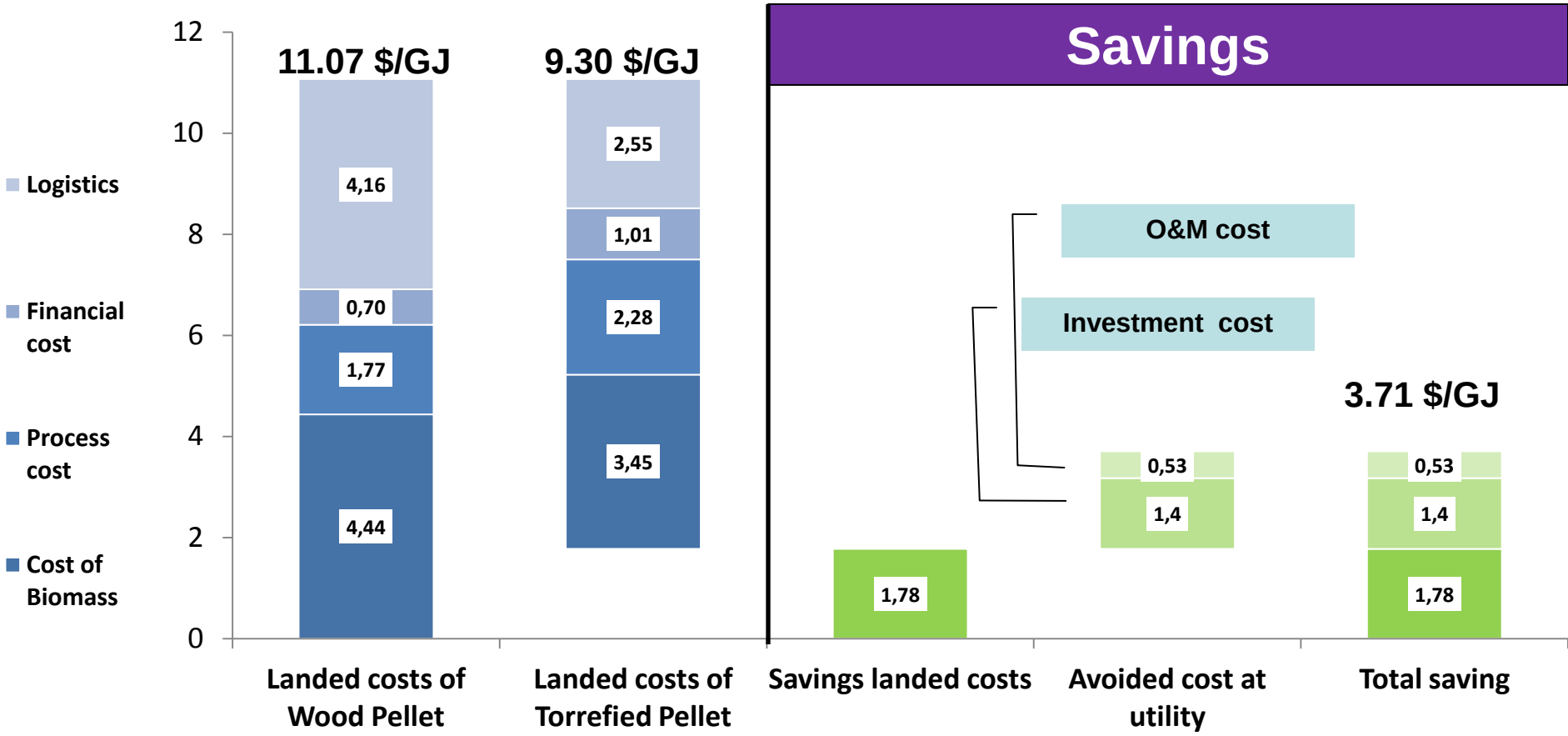
TORREFACTION RESULTS IN SIGNIFICANTLY LOWER COSTS IN THE ENTIRE VALUE CHAIN

COST COMPARISON BASED ON THE SAME PHYSICAL VALUE CHAIN USD/GJ



*Feedstock cost includes: delivered chipped cost of whole logs for wood pellet; whole logs and logging residues for torrefied pellet assuming 50% moisture content

**Process cost includes: electricity, labour, SG&A, binding agent, royalty and other operating costs

***Financial cost includes: depreciation, interest on debt

****Logistics includes: the cost of transportation and handling from plant to power plant

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TORREFACTION BASED ON TOPELL TECHNOLOGY PROVIDES A SOLID VALUE PRPOSITION TO ITS CUSTOMERS

POSSIBILITY OF LONGTERM TAKE-OFF AGREEMENTS SECURE STABLE CASH FLOWS

Torrefaction plants' IRRs depends on 2 main cost drivers

Biomass (40% moisture, chipped) *($/ton)*

Deapsea freight costs *($/ton)*

	16	22	28	34	40	45
28	40%	36%	32%	27%	24%	21%
36	38%	34%	29%	24%	21%	18%
44	36%	32%	27%	21%	18%	14%
51	34%	29%	24%	18%	14%	9%
58	32%	27%	21%	14%	9%	2%

likely

either unlikely or not viable

Assumptions

- A greenfield project costs $28 mln for 100,000 ton plant
- 40% equity financed, 60% is bank debt financed
- Sales prices $11.50/GJ CIF Rotterdam.
- Staff 25
- All costs included
- Average local corporate taxation: 25%

IRR for the plant owner > 20-25%, which is a relevant return for large number of customers

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TOPELL ENERGY HISTORY

FROM A PLAN TO REALITY TAKES 6-8 YEARS AND SIGNIFICANT CAPITAL

Stage I.

€0.5-1M*

Idea

- Concept-business plan
- Planning
- License

Stage II.

€2-3 M*

Pilot Plant

- Organization
- Engineering commercial plant
-IP portfolio
-R&D

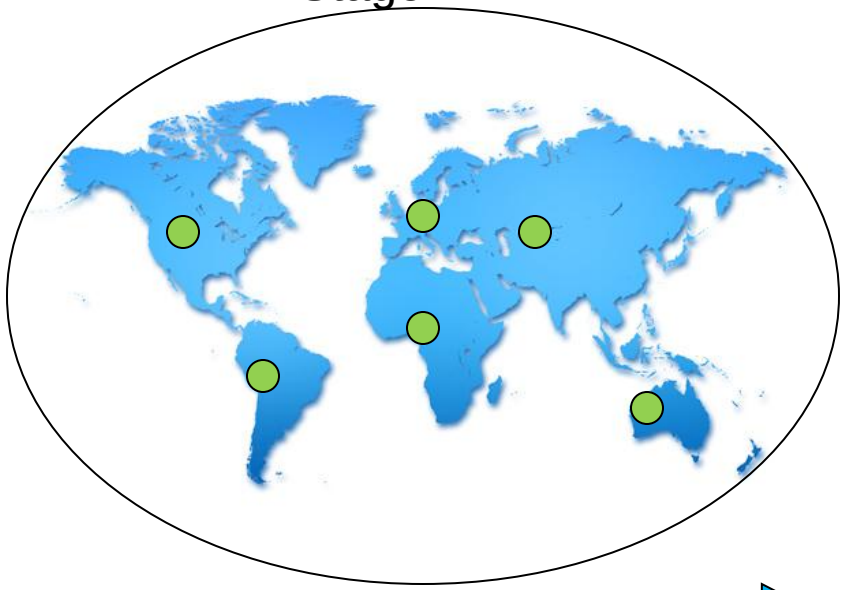
Stage III.

€20-25M*

Commercial Plant

- Bank financing
- Commissioning
- Sales contract
- Process know how

Stage IV.



€35-50M*

International Roll Out

-Organization
-R&D
-Engineering
-Process know how

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* Cummulative capital expenditure

TOPELL TORREFACTION PLANT

PELLETS PRODUCED AND PRODUCTION BOOSTED