

# TOPELL ON TORREFACTION

GLOBAL LEADERS IN TORREFACTION TECHNOLOGY

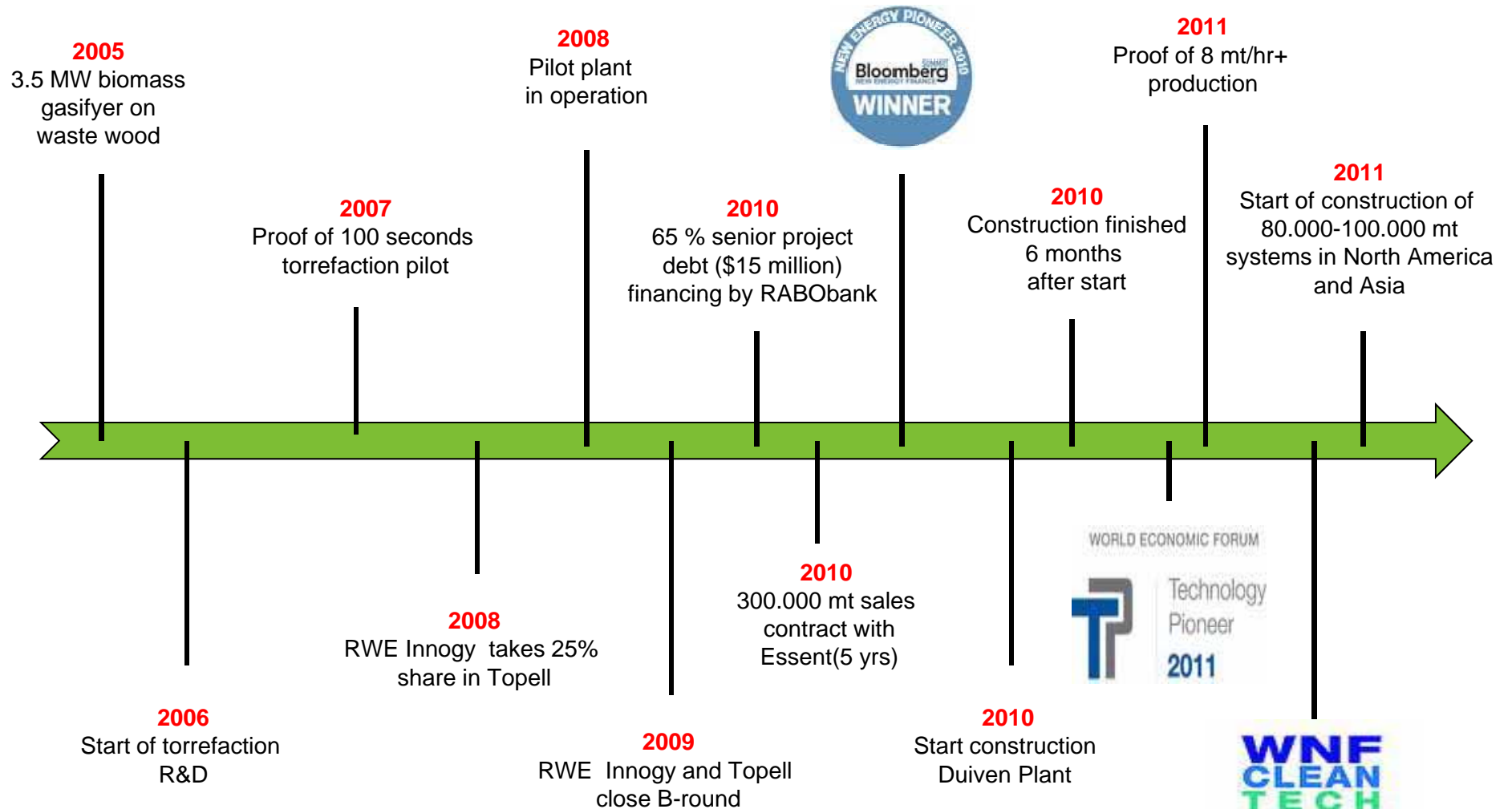


Topell Energy



# TOPELL ENERGY HISTORY

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



# THE BIG CHALLENGE

SOLVE THE MISMATCH IN PHYSICAL PROPERTIES THAT LOWERS VALUE OF BIOMASS



Y	Tough	N
Y	Fibrous	N
Y	Hydrophillic	N
Y	Biodegradable	N
Y	Heterogeneous	N
Y	Poor energy density	N



**BIOMASS IS A FEEDSTOCK**



**TORREFIED BIOMASS IS A FUEL**

# THE SOLUTION

## MATCH IN PROPERTIES



N	Tough (Taai)	N
N	Fibrous (vezelig)	N
	Hydrophillic (wateropnemend)	N
N	Biodegradable	N
	Heterogeneous	N
N	Poor energy density	N



# TOPELL TECHNOLOGY CHARACTERISTICS

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

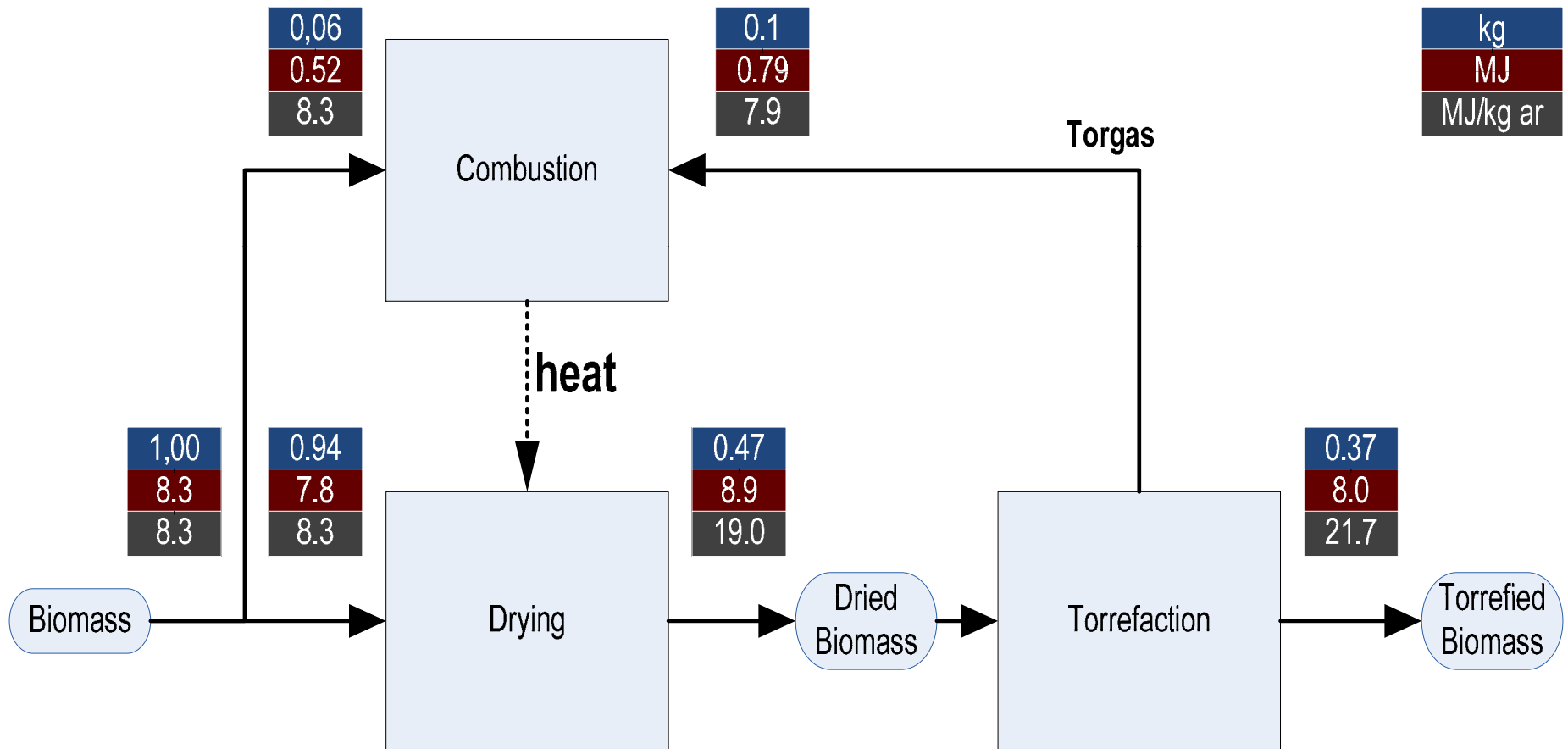
**Topell System**



- **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+**

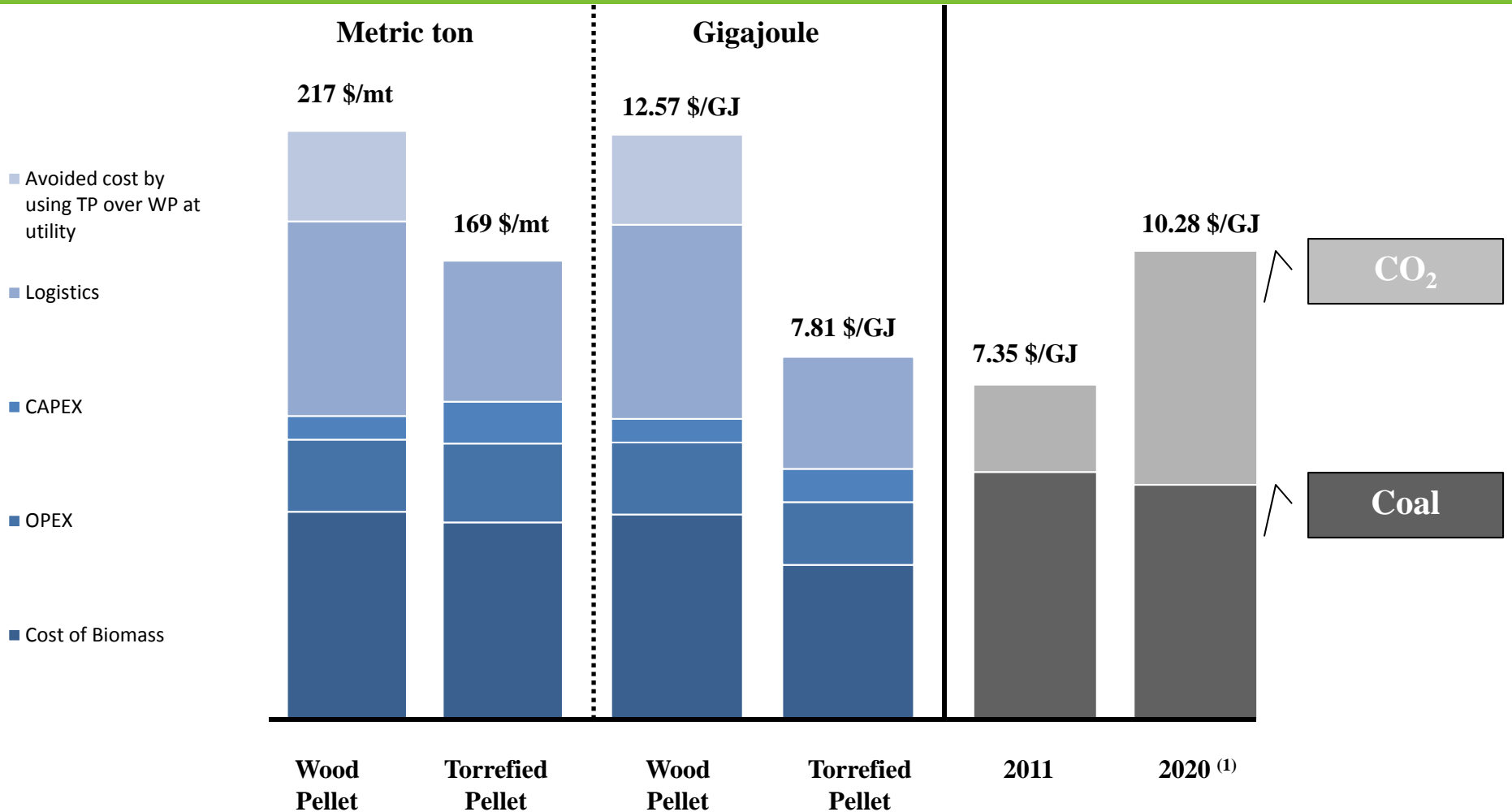
# THERMAL EFFICIENCY TOPELL PROCESS IS 95%+

UTILIZATION OF COMBUSTION OF TORREFACTION GASES DRIVES HIGH EFFICIENCY



# TORREFACTION RESULTS IN SIGNIFICANTLY LOWER COSTS THROUGH THE ENTIRE VALUE CHAIN

COST SAVING OF 35%+ AND POTENTIAL TO BEAT COAL +CO<sub>2</sub> IN NEAR FUTURE



UK co-firing subsidy of 0,5 ROC is equivalent to 4,5 \$/GJ

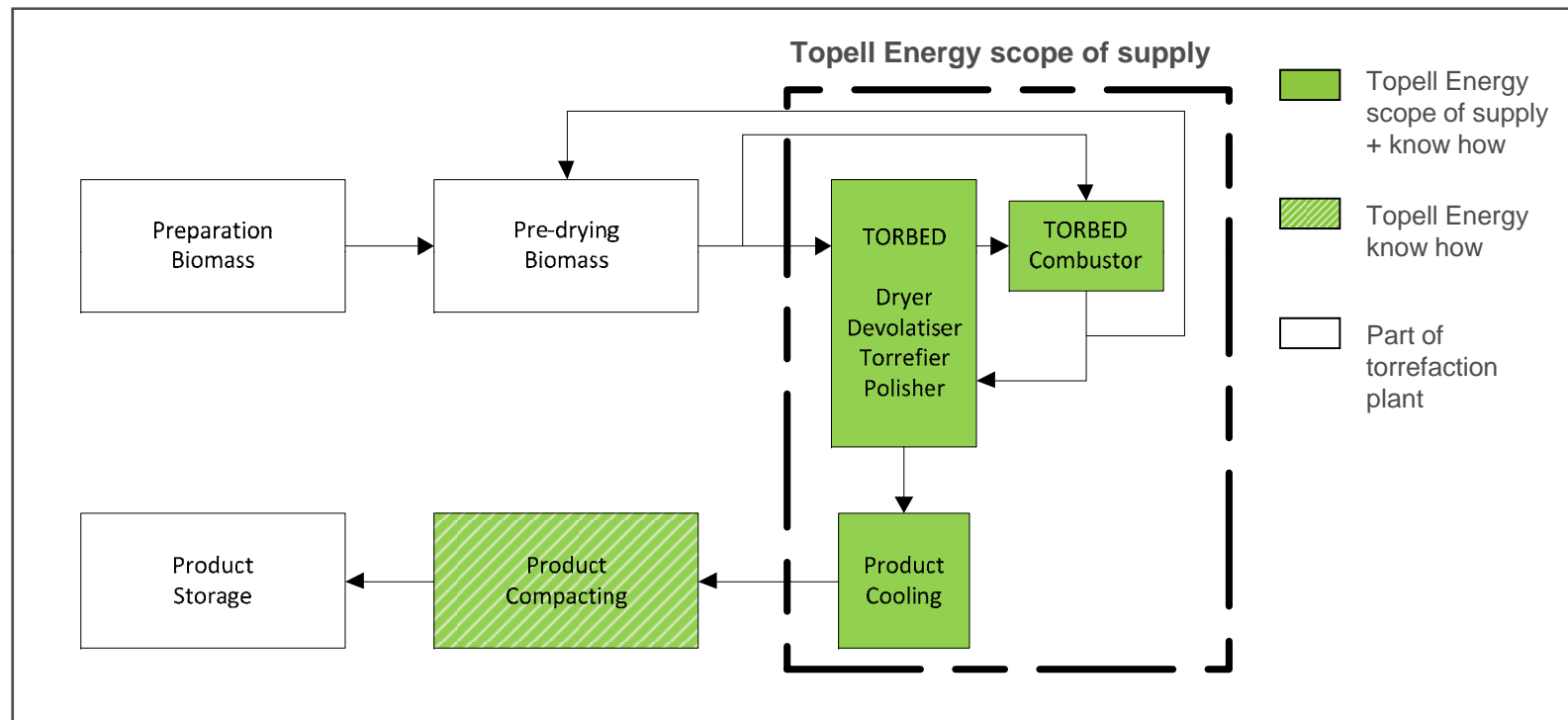


(1) Source: Bloomberg New Energy Finance

# TOPELL ENERGY SCOPE OF SUPPLY IS ON TORREFACTION SYSTEM

PLANT IS COMBINATION OF THREE TURN KEY PACKAGES

## Torrefaction plant



Torrefaction system is either part of greenfield (new) plant, or integrated in existing wood pellet plant

# TOPELL TORREFACTION PLANT

PELLETS PRODUCED AND PRODUCTION BOOSTED TO OVER 8 MT/HR

