



torrgas

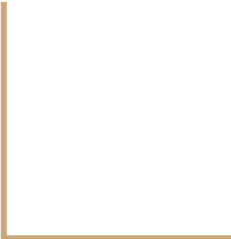
*IEA May 3 2017, Innsbruck Austria*

*20 October 2016*



# Torrefaction and gasification.

The alternative created by Torrgas



technologically & economically viable;  
100% sustainable.

# Traditional gasification dilemmas:



- Heterogeneous feedstock
- Low grindability
- High moisture content
- *Variability is a huge challenge for an 8000 hours/year, continuous and stable operation*

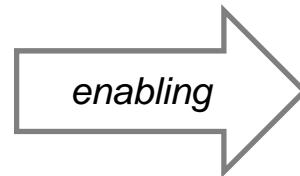
- Agglomeration in fluidized beds
- High CapEx for entrained flow slagging gasifiers

- High CapEx and OpEx for complex tar removal systems
- Low product quality (H<sub>2</sub>:CO ratios)

And the solution...



A proprietary  
torrefaction  
technology



A novel skid mounted  
2-stage gasification  
system

# Biomass is not a fuel... torrefied biomass is.

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

## Torrefaction benefits in logistics:

1. Energy density from 2-3 GJ/m<sup>3</sup> to 15-20 GJ/m<sup>3</sup>
2. Hydrophilic: open air transport & storage possible
3. Commodity: biomass becomes a commodity instead of a local product

## Torrefaction benefits in gasification:

1. Pulverized gasification → short residence time → high output/reactor volume
2. High (cold gas) efficiency due to absence of moisture
3. Continuity in both syngas composition as well as process handling



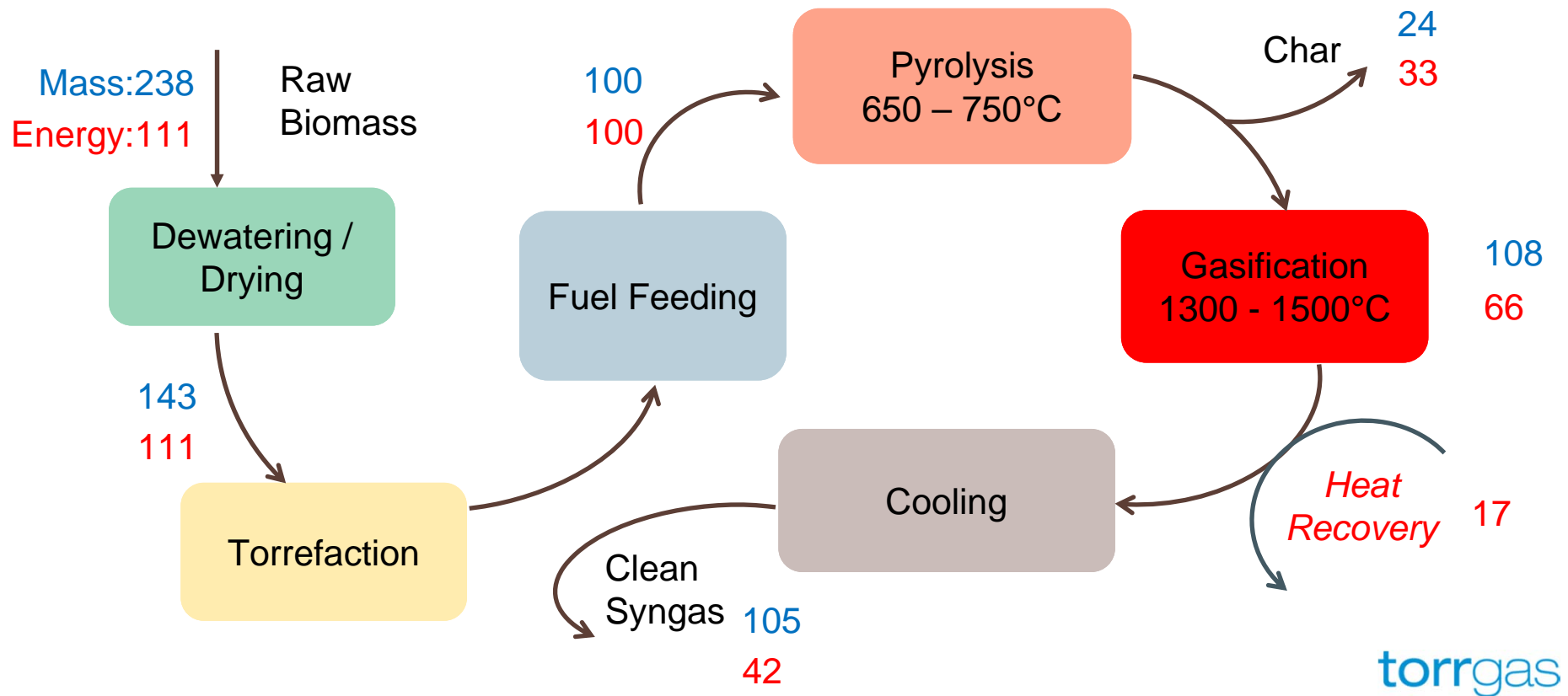
# Features of our Torrefaction technology:

- **Flexibility** to accommodate different feedstock
- **Scalability** in solid conveying and heat transfer mechanisms
- **Heat integration** between the torrefaction reactor and a waste heat source
- **Inherent safety** owing to the volatility of the raw biomass
- **Variability** in operational parameters for adapting to optimum torrefaction process conditions
- **Reactor volume optimization** achieved through the highest possible filling rates



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# An integrated torrefaction / gasification system



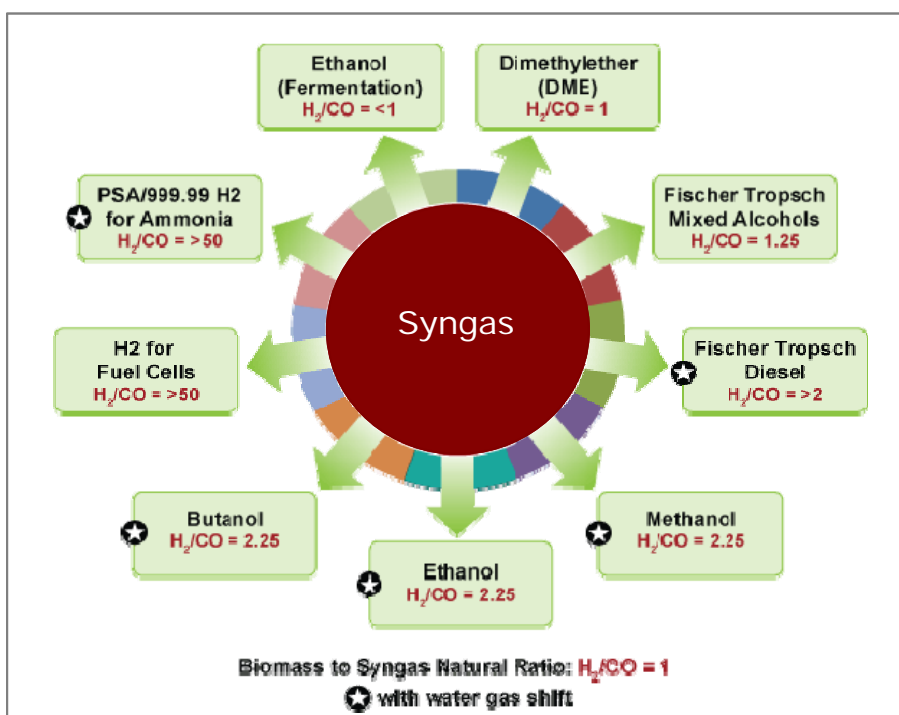
# Characteristics

De-centralized  
Low CapEx  
High efficiency  
Skid mounted/Modular  
Drop-in syngas properties

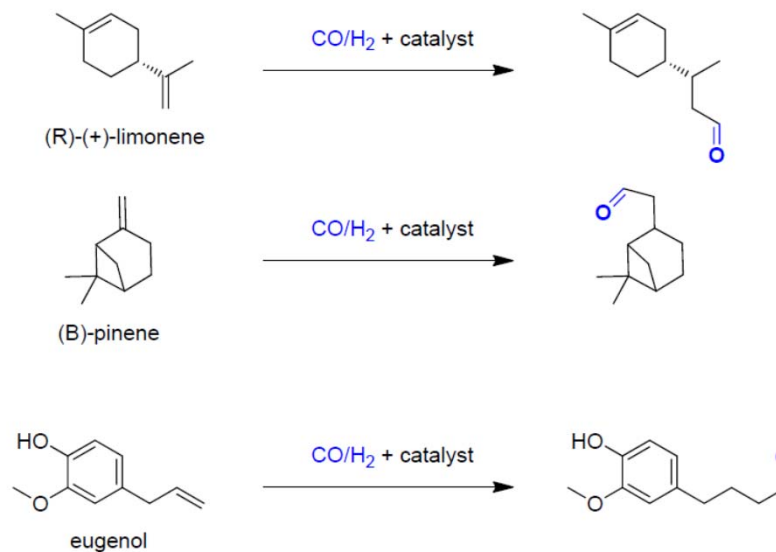


Is this where you could mention that your real value /potential lies in the transformation from syngas to value added products? If yes, why not write that? (no need to be too humble!)

## Torrgas syngas can be used for chemical synthesis.



### Examples of hydroformylation products



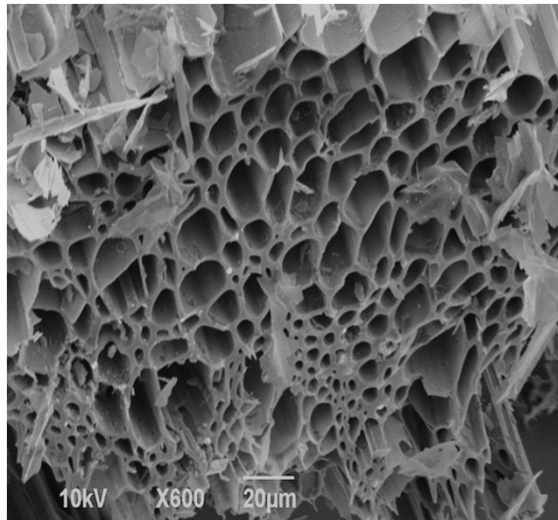
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Torrgas *syngas* can substitute natural gas or propane in existing gas burners.



1. **Drop-in properties:** 12 MJ/kg, nitrogen and tar free syngas meets requirements for direct mixing without major burner modifications.
2. **Skid mounted bio-syngas generator:** up to 15 MW<sub>th</sub> feed capacity can be installed on portable skid due to high volumetric reactor output.
3. **Limited logistic handling:** torrefied biomass handling is far less complicated and space intensive than that of untreated biomass.

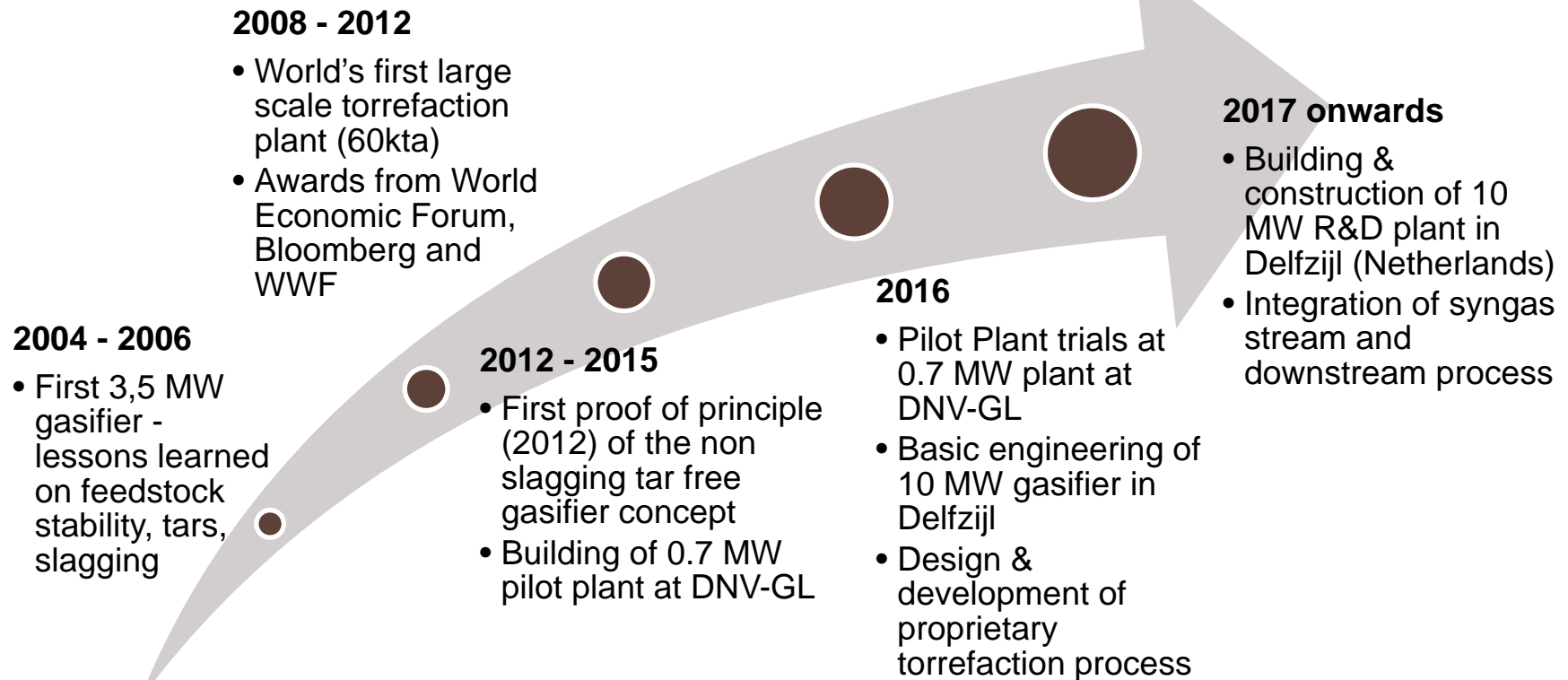
Torrgas technology also produces *char* with which has a wide range of applications.



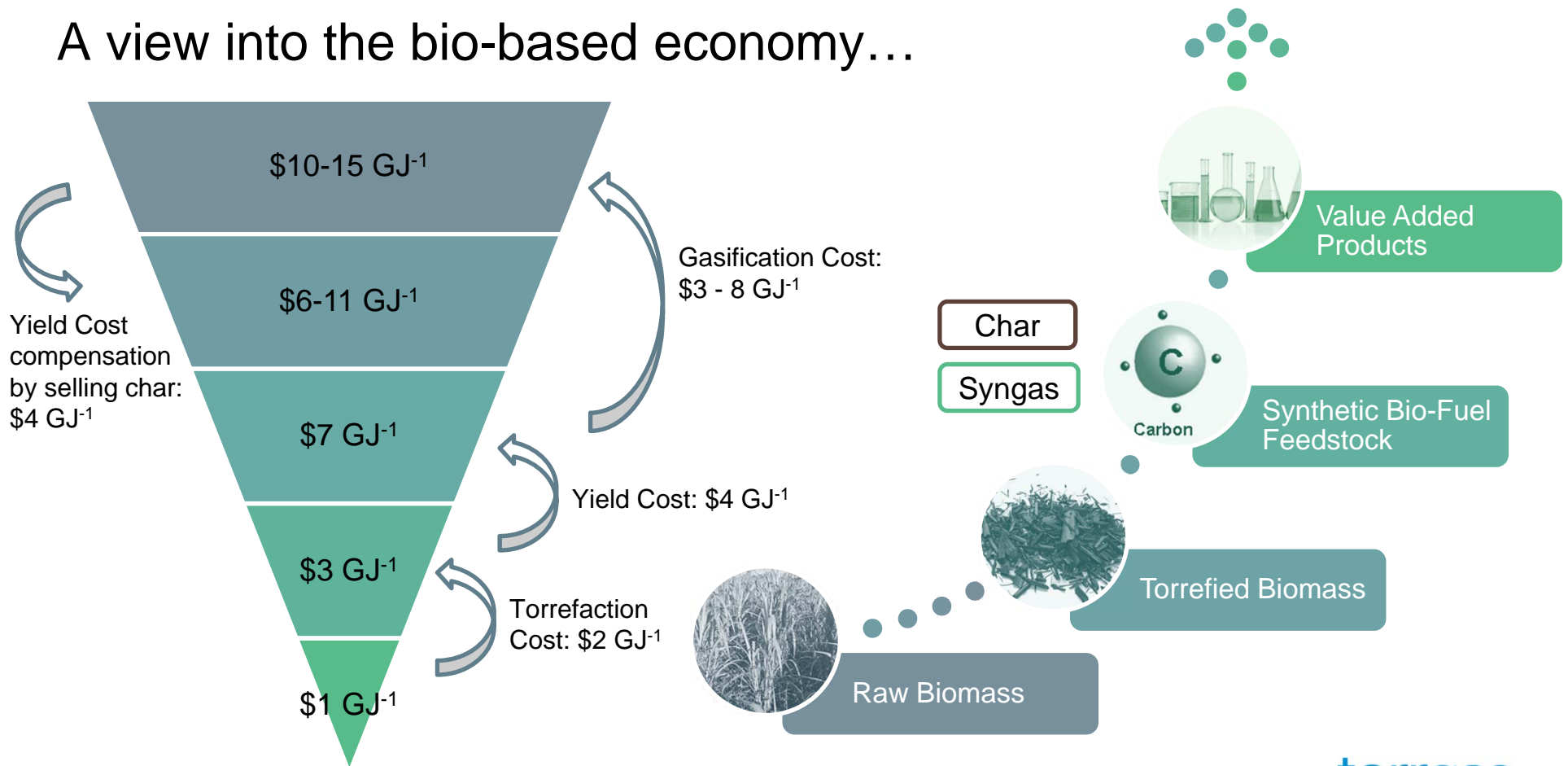
char with 2-20µm pores

1. Activated carbon market: water and flue-gas cleaning.
2. Soil Enhancer (biochar): a high-carbon soil supplement that retains water, microbes and nutrients.
3. Metallurgical char: high purity biochar can produce high purity steel with low carbon footprint.
4. Petcoke replacement for producers (Titanium, Silicon Carbide) requiring low sulfur petcoke.
5. BBQ-briquettes: the high carbon content / low volatile content makes it an ideal recreational fuel.

## Our history and short term rollout plan:



# A view into the bio-based economy...



# Our partners and investors





Thank you  
for your  
attention

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