Cost Competitive Biomass Gasification for Power, Heat and Biochar Production

Presented at

Biomass 2012: CONFRONTING CHALLENGES, CREATING OPPORTUNITIES – SUSTAINING COMMITMENT TO BIOENERGY

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Biomass Gasification

- Our biomass gasification converts biomass to a gas that can be more efficiently converted to heat and power than direct combustion
- It also produces a valuable bio char
- The science is well known
- CHP plants exist but challenge is delivering commercially viable solution:
  - Industrial scale availability
  - Reliably produce high quality syngas
  - Competitive CAPEX and OPEX
- Our technology which has been under development for the last decade is both commercially available and economically viable

Biomass Gasification Pros and Cons

	Existing small gasification technologies	Advanced small gasification technologies	Large coal power plant
CAPEX per 1 MW	>5M+ USD	3 - 4M USD	**<3M USD**
Electrical efficiency	25%	**25 - 35%**	**40%**
Total plant efficiency	<70%	**>80%**	40%
Staff per MW	4 – 8	1 – 2	**1**
Uptime	<60%	**>90%**	**>90%**
Commercial availability	Low	Low	**High**
Fuel price increase risk	**Low**	**Low**	High
CO2 emissions	**Low**	**Low**	High
Fuel transport costs	**Low**	**Low**	High
Additional rural job creation	**High**	**High**	Low

ENERTECGREEN Technology – Combined Power, Heat and Biochar

How small biomass gasification plants can generate income

Raw biomass in
(Wood waste)

Power
to grid
or end use
30% energy

Heat
Steam/
Hot water
25% energy

Biochar
Soil conditioner
Carbon source
BBQ Briquetes
25% energy

Total process losses
20% energy

ENERTECGREEN – the facts

Technology development

- 8 years of technology evolution
- Unique hybrid gasifier of our own design
- Commercial stage
- Deployable today

Existing plants

- 1st commercial pilot in July 2009 – 500kWe
  - Ccontinuously operating 18,000+ hours
- 2nd commercial full scale plant Jan 2012 – 1MWe
  - 4,000 engine operating hours in first 6 months

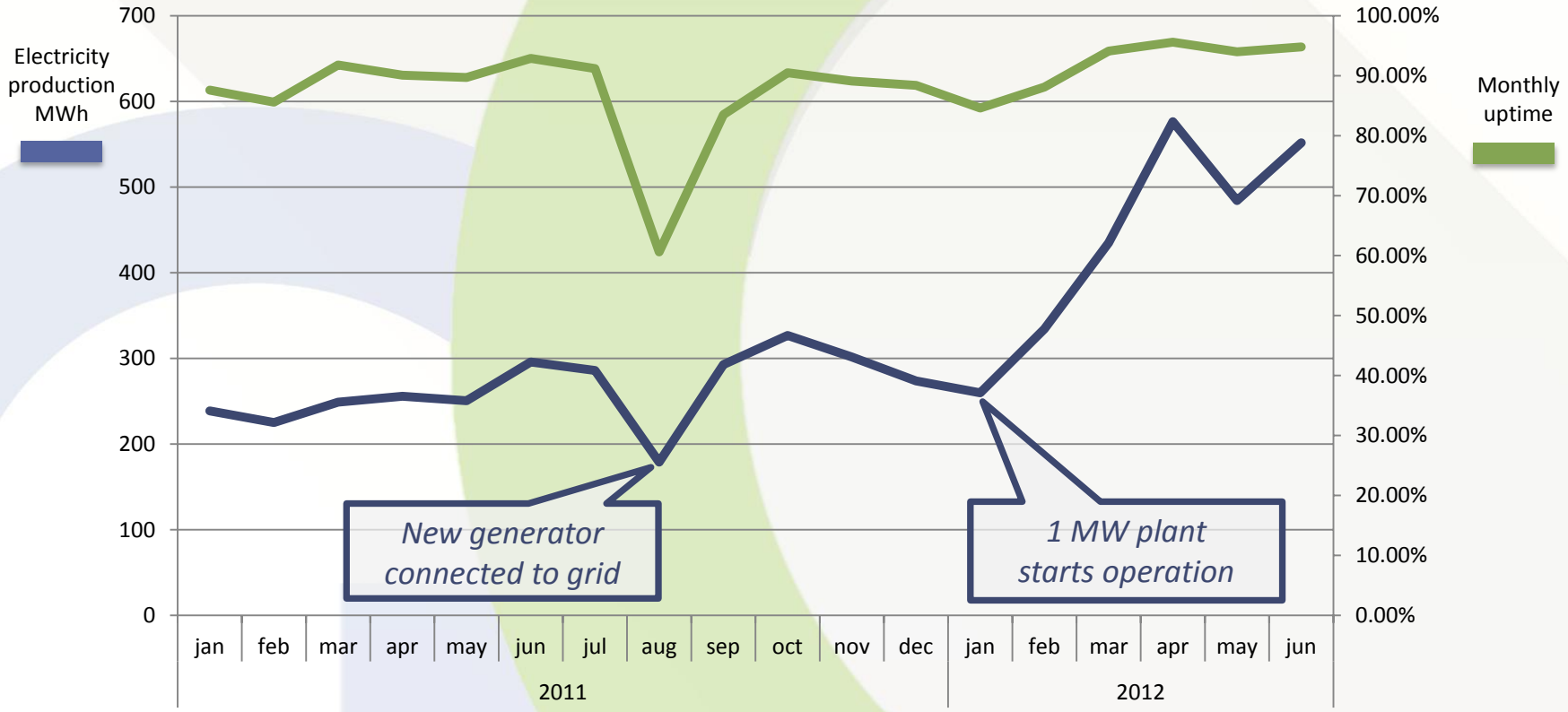
What makes us different?

- 90%+ uptime
- No gas scrubbing or tar disposal of any sort
- Compact modular design
- CAPEX of 3.0 Million USD per 1 MWe in near future

ENERTECGREEN technology - highlights

Electrical efficiency	• Up to 32%, depending on gas engine characteristics
Plant size	• 1.0 – 1.5 MWe • Modular design for easy scale-up
Fuel consumption	• 0.7-1.0 tons per electrical MWh depending on feedstock and engine
Cost	• CAPEX - 3.5 Million USD/MWe • OPEX – $20/MWh plus feedstock and labor
Uptime	• 90%+ • 8000+ hours per year

ENERTECGREEN technology - Actual monthly up-time and electricity production

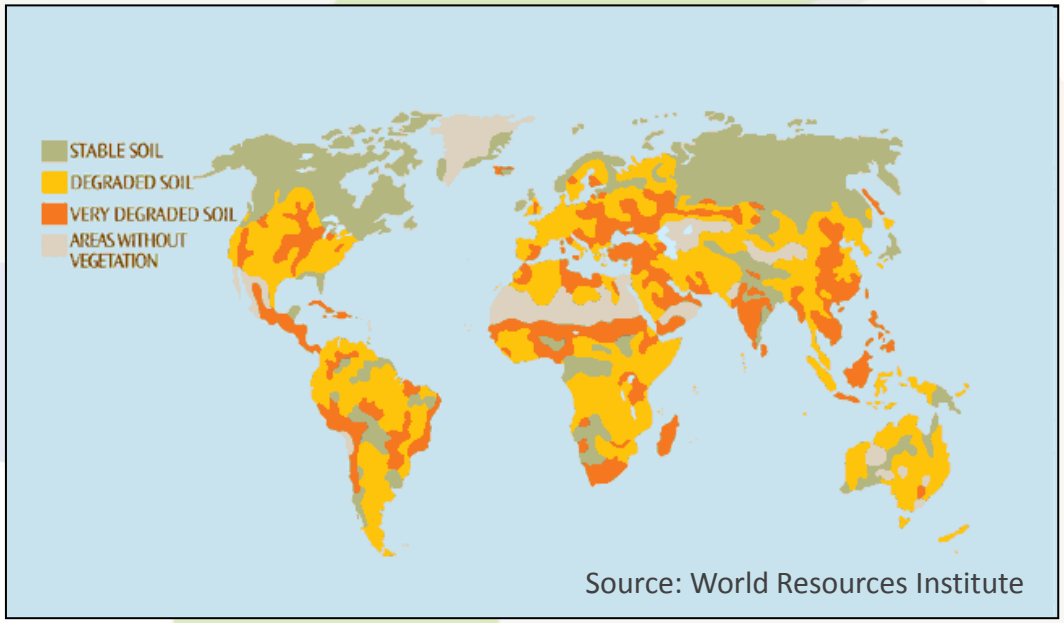


Why biochar is valuable?

- Biochar is high carbon containing material, coming as bioproduct from biomass gasification
- Low sulfur and low ash material for energy and chemical industries use, as well in agriculture and forestry for soil upgrading
- Can be sold as BBQ briquettes—a high value product
- Biochar is more valuable than low temperature heat generated form CHP
- Our technology focuses on high yield and high quality biochar production
- Economics is much favorable comparing to separated biochar (charcoal) only production

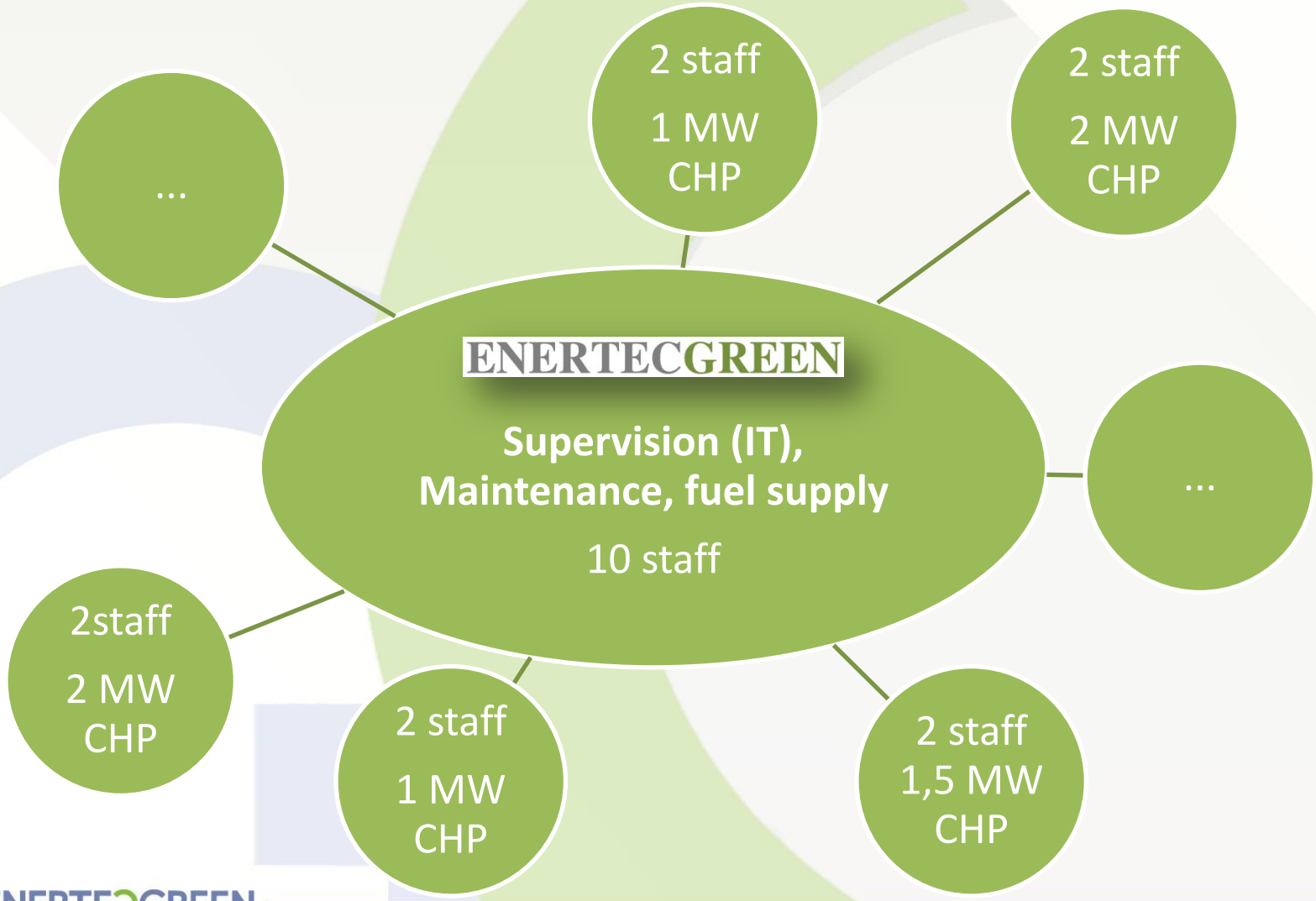
Biochar as a soil amendment

Global problem: soil degradation

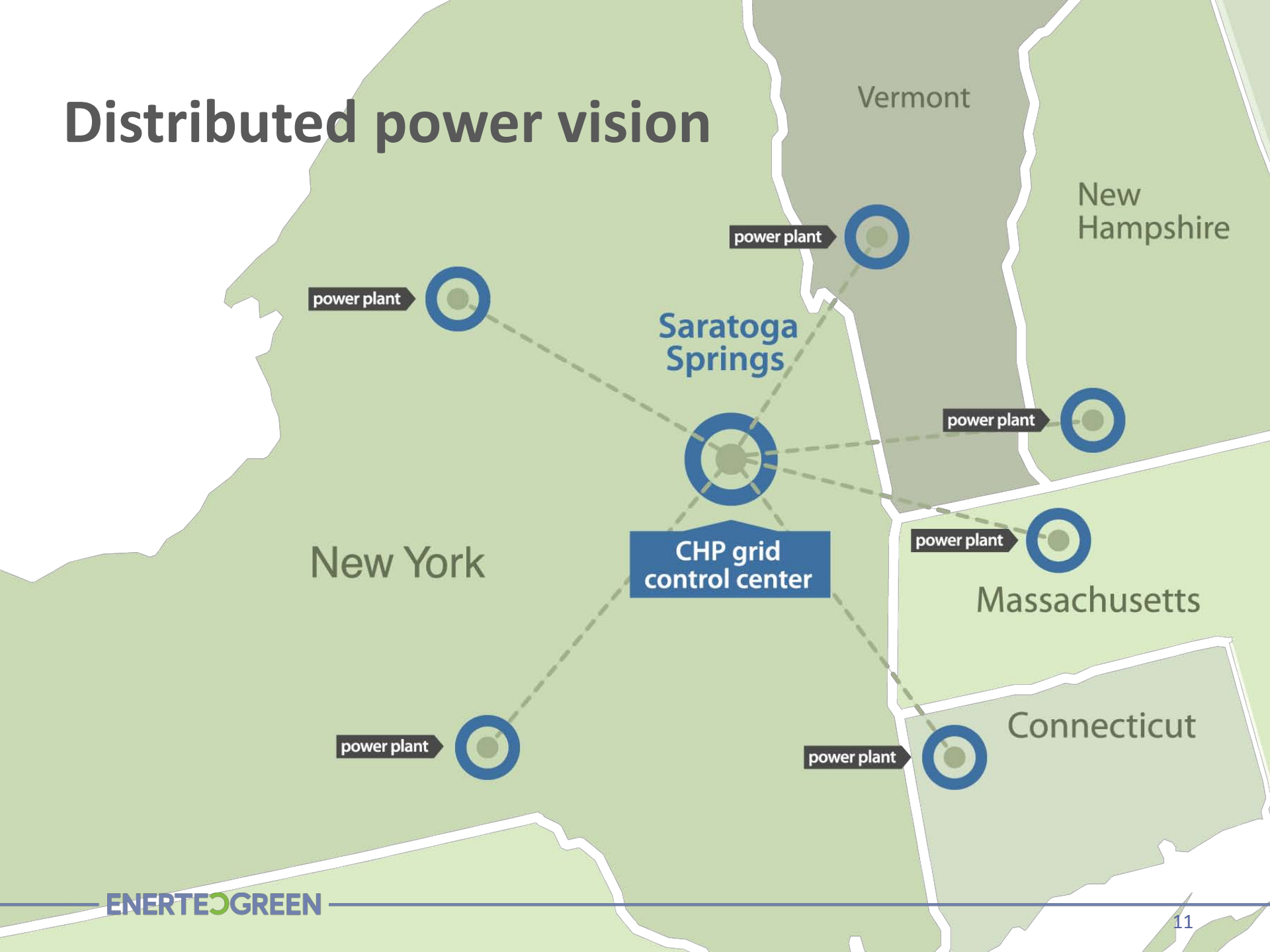


- No continent is free of soil degradation
- 1.2 billion ha moderately to severely degraded (especially Asia and Africa)
- Central partof USA very degraded soils due to mechanized monoculture
- Biochar is excellent conditioner for damaged soils, considerably increasing yields
- Great potential for carbon capture and storage

ENERTECGREEN – distributed power vision



Distributed power vision



ENERTECGREEN Advantage

- Small distributed facilities limit the need to transport fuel great distances both reducing costs and improving the environmental performance of gasifying biomass.
- Biochar is highly valuable product when adequately produced and used
- Combined electricity, heat and biochar production becomes an attractive alternative to CHP in places with limited low temperature heat energy demand.
- Low CAPEX and OPEX
- Already operating, commercialized and bankable

ENERTECGREEN Future

- EnertecGreen is seeking to leverage its current technology advantage into a market-leader position among small- and medium-scale biomass gasification power plant suppliers. With investment, the company wants to quickly scale-up manufacturing operations to commercialize the technology – with the goal of expanding into the rapidly growing renewable energy markets worldwide within the next 5 years
- From a technology perspective we are looking to expand the number of feedstocks, increase efficiency, and decrease capital and operating costs

Thank you for attention!

Kindly welcome to visit us!

www.enertecgreen.com

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