GIANT KING GRASS:

A Dedicated Energy Crop for Electricity Generation, Pellets & Biofuels

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  - VIASPACE stock symbol VSPC.OB
- VIASPACE headquarters in the US with activities in China and other countries

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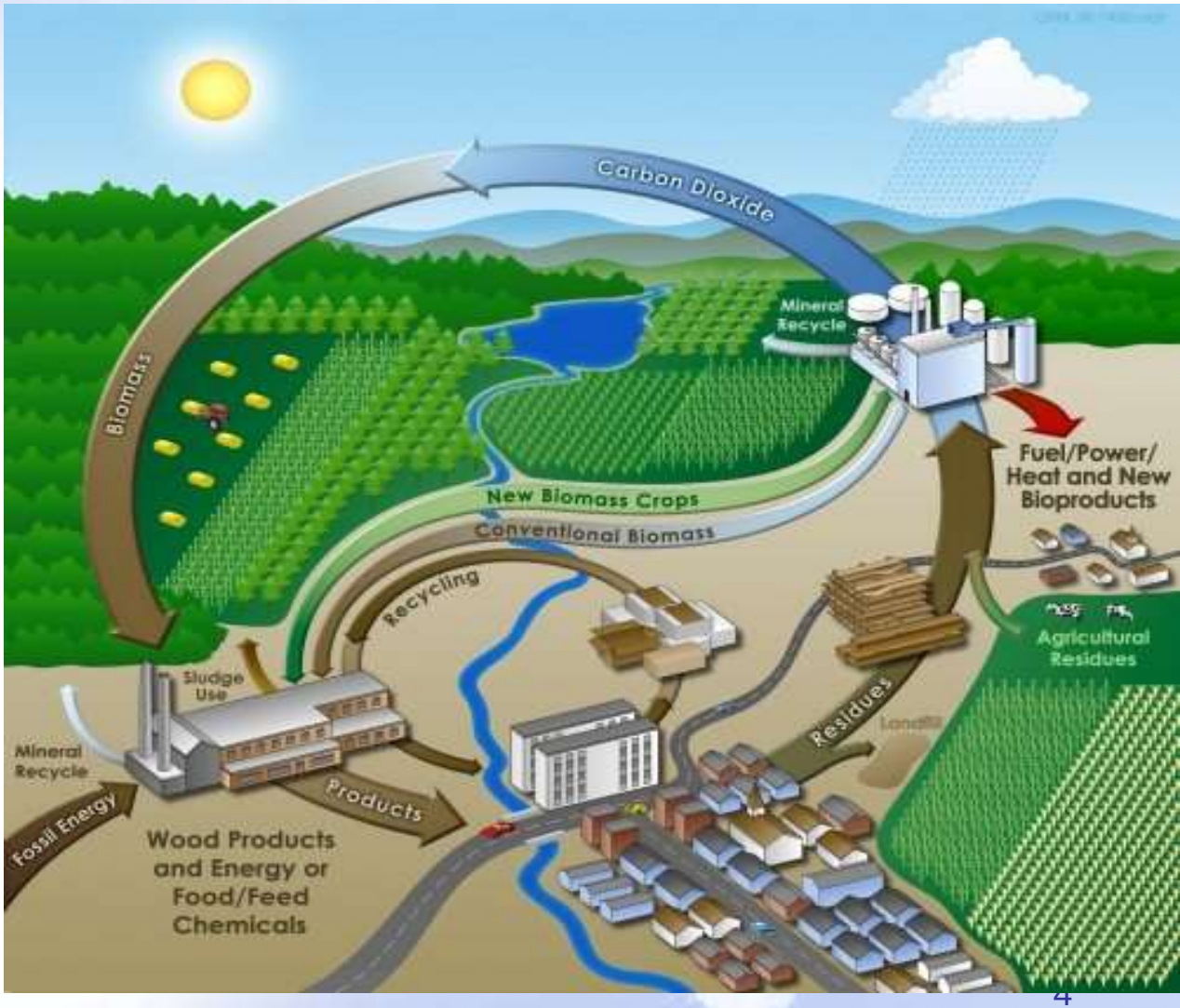
Why Biomass?

- Renewable energy source that can be locally grown and provide jobs and energy security
- Biomass is less expensive than other renewable energy sources and can generate electricity 24 hours per day
- Low carbon– nearly carbon neutral
- Potentially, can produce biofuels, bio-based chemicals, feed/ aquaculture protein and biomaterials through fermentation or syngas

Biomass is Low Carbon Fuel

- Biomass energy is simply light and CO2 captured in plants by photosynthesis
- Burning biomass or biofuels merely recycles the CO2 stored by the plant
- Carbon neutral except
  - Fertilizer, harvesting, & delivery contribute some carbon dioxide



Comparison:
Biomass X Solar X Wind X Coal

	Capital Cost ($M/MW)	Utilization (%)	Fuel Cost ($/kwhe)	Electricity Price $/kwhe	Comment
Solar Photovoltaic	3-5	22	0	0.30-.40	Day only Needs grid
Thermal	3-4	31	0	0.20-.26	back-up
Wind	1.5	34	0	0.10-.15	Windy only Needs grid back-up
Biomass	1.4	83	0.025	0.09	24 hr/day
Coal	1.2	85	0.024	0.08	24 hr.day

- Biomass electricity cost is very competitive to coal.
- Biomass can be used as base power.
- Solar and wind are more expensive and only provide transient power.
- Battery storage will dramatically increase the cost of solar and wind.

Compare Biomass Costs to Fossil Fuel

Coal US	27GJ /mt	$60 /mt	**$2.22 /GJ**
Coal Max.	27GJ /mt	$100 /mt	**$3.70 /GJ**
Oil	6.1GJ /barrel	$90 /barrel	**$14.45 /GJ**
Nat. Gas		$5.00 /Mbtu	**$5.27 /GJ**
Bio-mass	18.4 GJ/mt	$42 /mt China	**$2.28 /GJ**

- Coal is cheapest fuel
  - Most electricity is from coal
  - But most carbon dioxide and other pollutants
- Biomass is next cheapest
  - With near zero net carbon dioxide emissions
  - Generate electricity and produce cellulosic biofuels
- Natural gas is next
  - Cleanest fossil fuel
- Oil is most expensive

Gigajoule=278 kilowatt-hr

mt=metric ton=tonne=2204 lb

Biomass is dry mt and HHV

Agricultural Residues/ Wastes or Dedicated Energy Crops?

- Current biomass fuels and feedstock are agricultural residues such as corn straw, wheat straw and rice straw, or forestry and wood waste
  - Residues from field crops are seasonal and generally not available on long-term contracts
    - Spot market only- - price and availability is unpredictable
    - Not enough to meet demand
- Dedicated energy crops are grown entirely for energy use, co-located with energy plants and not tied to spare or harvest
  - Sustainably grown under long-term contracts which is important for the economic viability of a project

Dedicated Energy Crops:

- Jatropha, oil palm and other oil-seeds/plants
  - Jatropha has to prove its economic success
  - Palm oil has food uses
- Specialty trees have limitation, and focused on pulp/paper/rubber industries
- Algae—lots of R&D, but not near-term
- Perennial grasses
  - Switchgrass, Arundo Donax & Miscanthus for temperate areas
  - Giant King Grass, elephant grass and others for tropical and subtropical regions

Will use Giant King Grass as an actual example

Giant King Grass

- Adaptable, non-food dedicated energy crop
  - Perennial in tropical and subtropical regions
  - Grows on marginal land
  - Short growth cycle -- harvested in the 1st year
  - Annual harvest 2-3 times
- High yield offers better land use efficiency and affordable prices
- Consistent quality feedstock with predictable, and reliable supply - *required for project financing*
- Low cost-- with high yield, it can meet cost targets for energy and biofuels applications
  - Can be used with agricultural residues
- Fuel for electricity generation - 24/7 base electricity
- Feedstock for biofuels, biochemicals and bioplastics

Yield Comparison: GKG X Corn X Miscanthus

Yield Dry Matter	Giant King Grass	Corn Stover	Miscanthus
US ton/acre	44	3.5-4.7	14-18
Metric ton/ha	100	8.6-11.6	30-40

Yield: The yield comparison amongst Giant King Grass, corn Stover and Miscanthus is not an exact apples-to-apples comparison.

- Corn will grow in cold areas, whereas Giant King Grass cannot tolerate freezing temperatures
- Corn is an annual crop and must be planted every year which causes additional expense. The annual planting also has issues for soil erosion, soil organic matter and some of the corn and wheat must be left on the field for nutrient recycling and to mitigate soil erosion, etc.
- Giant King Grass and Miscanthus are both perennial grasses. Giant King Grass requires tropical and subtropical regions and can be harvested several times a year for many years. Miscanthus will grow in cold areas.

Dry Weight Composition
GKG X Corn Stover X Miscanthus

Composition Dry Weight %	Giant King Grass	Corn Stover	Miscanthus
Glucan	43.0	37.4	44
Xylan	22.3	21.1	22
Arabinan	2.9	2.9	2
Lignin	17.4	18.0	17
Ash	4.5	5.2	2.5-4

Giant King Grass has the same composition as corn Stover and miscanthus per dry ton

Notes and references:

Giant King Grass: average of samples cut at 4 m tall

Corn Stover: Aden et al. NREL/TP-510-32438, 2002

Miscanthus: Murnen et al. Biotechnology Progress 23, 4, 846-850, 2007 and other sources

Giant King Grass Nursery, China

Giant King Grass and Factory

110 ha (270 acre) site provides
-seedlings for large energy projects
-demonstration of production
-sample quantities for customers

Giant King Grass planted in late April

10 days after planting

4 months after planting

Giant King Grass in early August

Mechanical Harvesting -- Corn Harvester

Video at http://www.youtube.com/watch?v=MqDQjpdm98I

Chipper and Rotary Dryer

Applications of Giant King Grass

- Direct combustion in electric power/ heat/steam plant
- Pellets for co-firing with coal
- Briquettes for boilers
- Biogas /anerobic digestion
- Cellulosic biofuels--ethanol/ butanol

Present Commercial Applications

- Pyrolysis to bio oil
- Catalytic conversion to bio diesel
- Biochemicals and bio plastics
- High-temperature gasification
- Torrefaction to bio coal
- Protein & Aquaculture
- Pulp for paper and textiles

Future Commercial Applications

Direct Combustion in Biomass Power Plant

- Giant King Grass properties similar to corn & wheat straw
- Burn in a power plant instead of coal or oil
- Giant King Grass has excellent energy content of 18.4 MJ (megajoule) per dry kilogram HHV / equivalent to 4400 kcal/kg, 7900 btu/lb
- 1 kWh electricity requires 0.72 kg of dry Giant King Grass

DP Cleantech has 20 Biomass Power Plants Operating in China—30 in Europe

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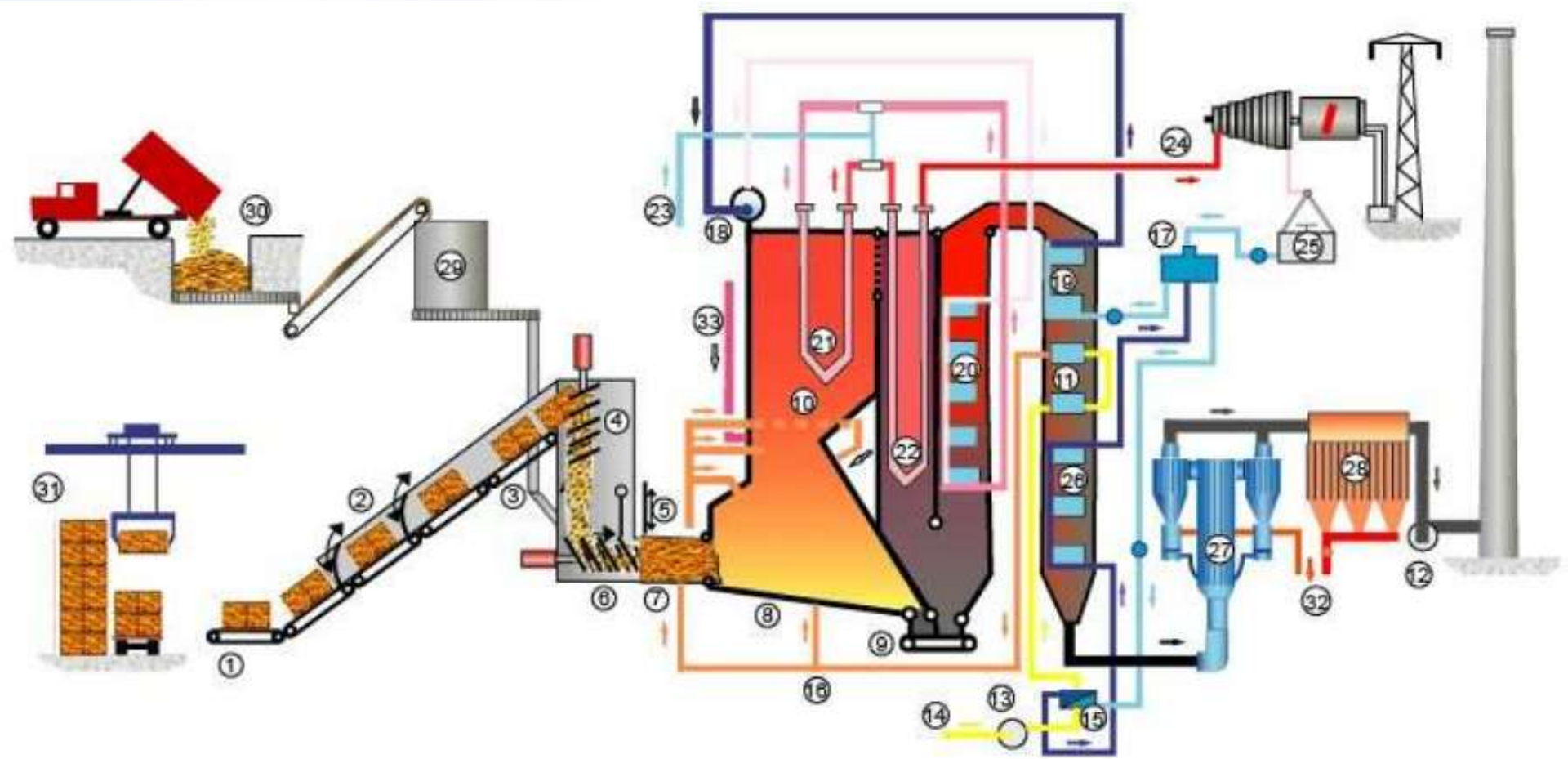
Power Plant Optimized for Agricultural Residues/ Corn Straw

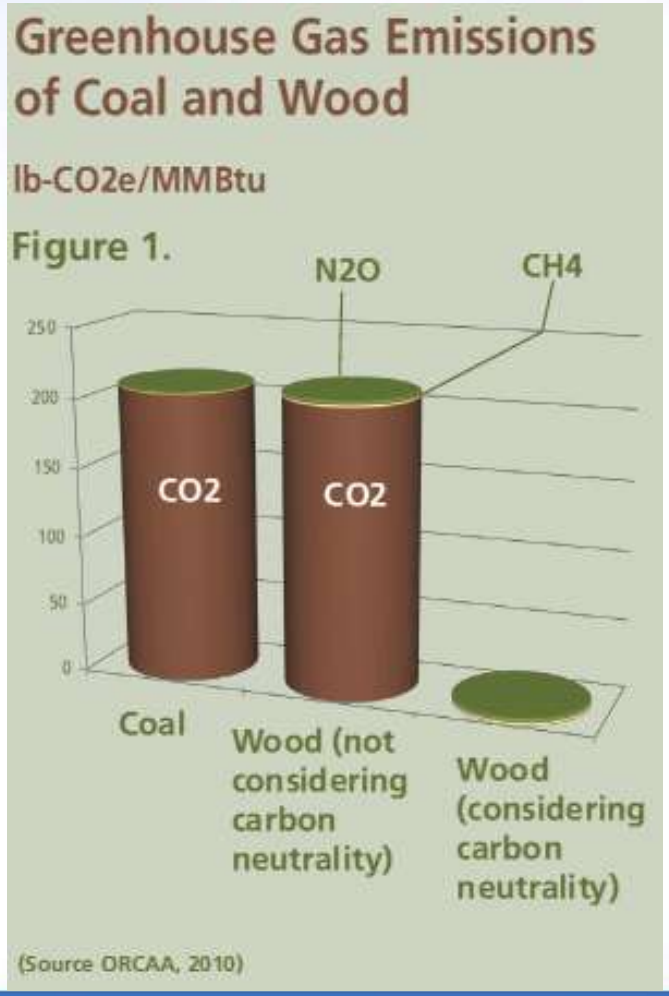


Giant King Grass Energy Analysis

Proximate Analysis	Unit	Sun Dried As Received	Giant King Grass Bone Dry
Total Moisture	%	14	0
Volatile Matter	%	65.68	76.37
Ash	%	3.59	4.17
Fixed Carbon	%	16.74	19.46
Total Sulfur	%	0.11	0.13
HHV	MJ/Kg	15.85	18.43
LHV	MJ/Kg	14.52	-

Pellets to Replace Coal

- Biomass has much lower CO_2 emissions and lower NOX, SO_2, HCL, Hg and As emissions



Forest Biomass and Air Emissions

Uncontrolled Emissions Comparison

Pollutant	WOOD LB pollutant/ LB/MMBtu	COAL LB/MMBtu	NATURAL GAS combined cycle turbine LB/MMBtu
NOX	0.220	0.510	0.0371
CO	0.600	0.025	0.0075
SO2	0.025	0.890 (coal sulfur content varies)	0.0028
VOC	0.017	0.003	0.0043
PM	0.570	0.460	0.0083
CO2	206.94	214.04	116.97
HCl	1.900E-02	6.100E-02	None
Hg	3.500E-06	1.600E-05	None
Mn	1.600E-03	1.200E-03	None

Source: ORCAA Assessment 2/3/2010, Ecology 2/24/2010

Production of Pellets

- Both wood pellets and agricultural pellets are more environmentally friendly than coal
- Wood pellets are technically superior, but there is not enough wood to meet demand
- Agricultural pellets are better alternative
- Dedicated energy crop pellets have significant advantages - sustainable supply

Wood or Agricultural Pellets

- Wood pellets are dominant today
  - 16 M MT/Year
  - Made from sawdust and forestry waste
  - Small residential and commercial boilers can use 100% pellets
  - Replace 20% of coal in existing power plants
    - Minor modification to expensive power plant
  - Dedicated energy forests are being planted
- Agricultural pellets are emerging
  - Most wood waste is already committed for pressed wood products & pellets
  - Pellet market is growing to 46M MT/Year by 2020
    - Not enough supply
  - Do not cut down rain forests
  - Today made from residues e.g. corn or wheat straw
  - Dedicated energy crops favored over agricultural residues
  - Will use Giant King Grass as an example.

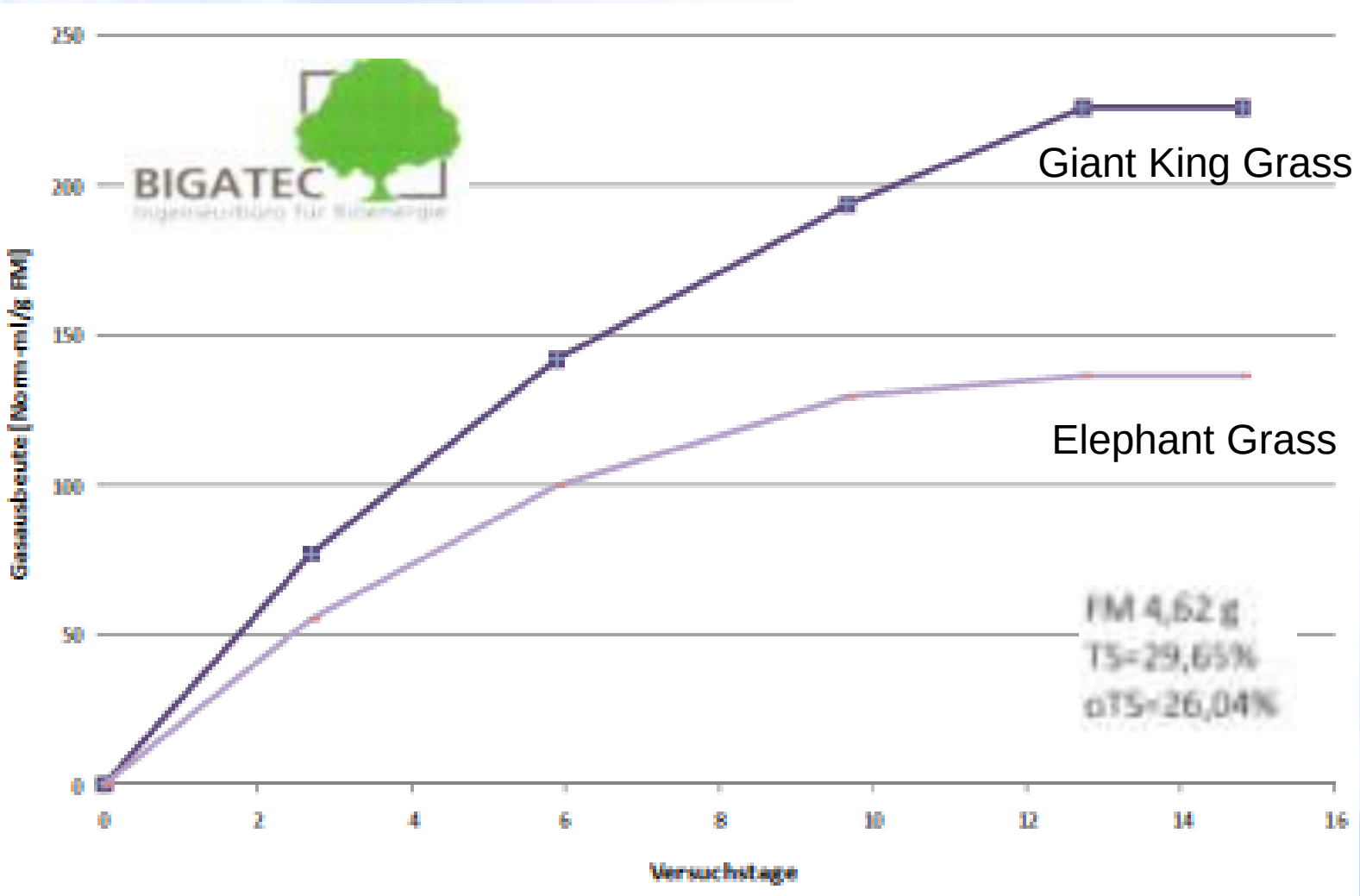
Giant King Grass Pellets as Coal Replacement

- Giant King Grass pellets co-fired up to 20% w/ coal
  - Requires small modification to existing coal power plant
  - Dry & press into pellets
- Preserves existing power plant investment & meets carbon reduction targets
- Large global demand
  - Particularly in Europe
  - Korea, China, Japan emerging

Biomass Briquettes

- Replace oil, natural gas & coal in boilers to provide industrial heat and steam
- Cement, ceramics, brick, chemical, food processing, ethanol, textile, rubber, etc.

High Biogas Yield per Gram of Fresh Grass



Anaerobe Gasproduktion in Anlehnung an DIN 38 414 S8

Bio-Methane Yield/ Hectare of Land

- Biogas production uses fresh Giant King Grass with yield of 375 MT/HA
- Giant King Grass bio-methane yield is 3.4 - 4.0 million BTU per hectare per day
- Measured biogas yields are 160-190 cubic meters of biogas/tonne of fresh grass
- Bio-methane yield is 94 -111 m3/ha/day- *Methane content is 57% of biogas*
- 1 MW of biogas electricity requires 70 HA
- Organic fertilizer is by-product

High Temperature Gasification

- Feedstock for synthesis gas to produce liquid biofuels incl. methanol and gasoline, diesel and jet fuel by the Fisher Tropsch process and also biochemicals

- Producer gas to replace oil, natural gas & coal in boilers and engines that cannot directly burn biomass for process heat & steam

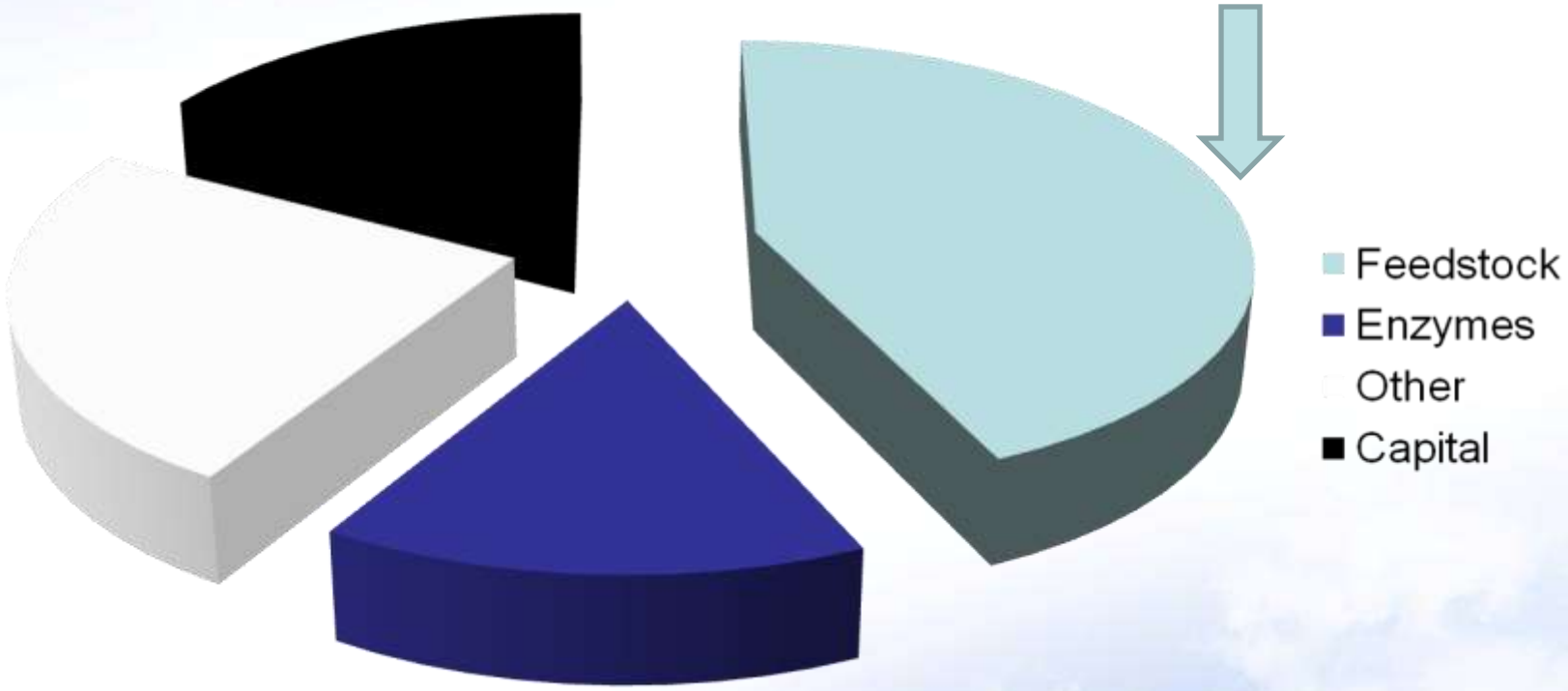

Cellulosic Biofuels
of Giant King Grass

Giant King Grass for Biorefinery

- Independent testing by three companies for biochemical (fermentation) process
- Composition analysis
- Pretreatment & enzymatic hydrolysis
- Results--Giant King Grass is the same as corn Stover or miscanthus per dry ton for ethanol production
- High yield of Giant King Grass in tons per acre promises low cost feedstock

Feedstock is the Largest Cost of Cellulosic Ethanol

Giant King Grass and co-location can reduce feedstock cost by 40-50%



Co-located Biorefinery & Plantation

- Co-location logistics are much simpler
  - Maximum grass transportation distance 3 km
  - Can utilize just in time harvesting in tropical area because not tied to food crop harvesting
  - Do not have to dry and store feedstock
- High yield of Giant King Grass means much lower cost with minimal plantation size
  - 25 M ethanol gallons per year can be produced on 3200 HA

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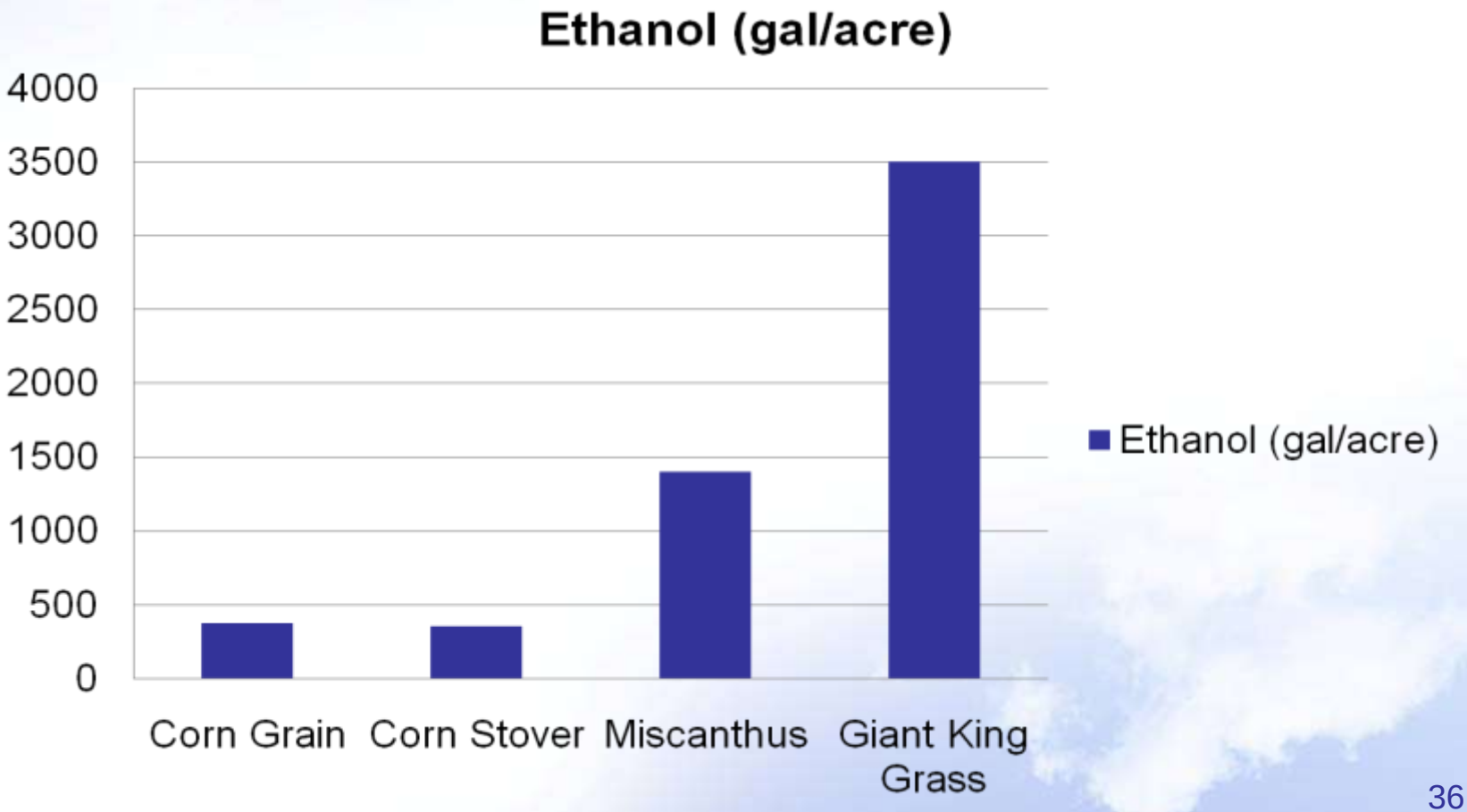
Ethanol Yield - - Land Use Efficiency



SUMMARY

- Successful Biomass Project in Africa should focus on:
  - Near-term opportunities: electricity generation for local consumption
  - Med-term prospect producing energy pellets for export, and
  - Longer-term opportunities to produce bio-fuels

- While the main goal is to provide, electricity or power, the core objective should also consider offering local employment, clean environment and energy security and independence

SUMMARY, *cont.*

Giant King Grass plantation, can definitely meet the targets of successful biomass projects

- Co-located with a power plant, pellet mill, bio-methane or biorefinery
- Scalable, integrated, clean energy module that can be replicated throughout towns, villages and rural areas
- Clean electricity and local employment for farmers and power or processing plant workers
- Electricity generation for local consumption, energy pellets for export, and longer-term opportunities to produce biofuels

Thank You !