



Giant King Grass

Renewable Low-Carbon Energy Crop
for Cellulosic Biofuels
and Direct Combustion in Power Plants

Biofuels Markets Mexico & Central America
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VIASPACE Grows Giant King Grass

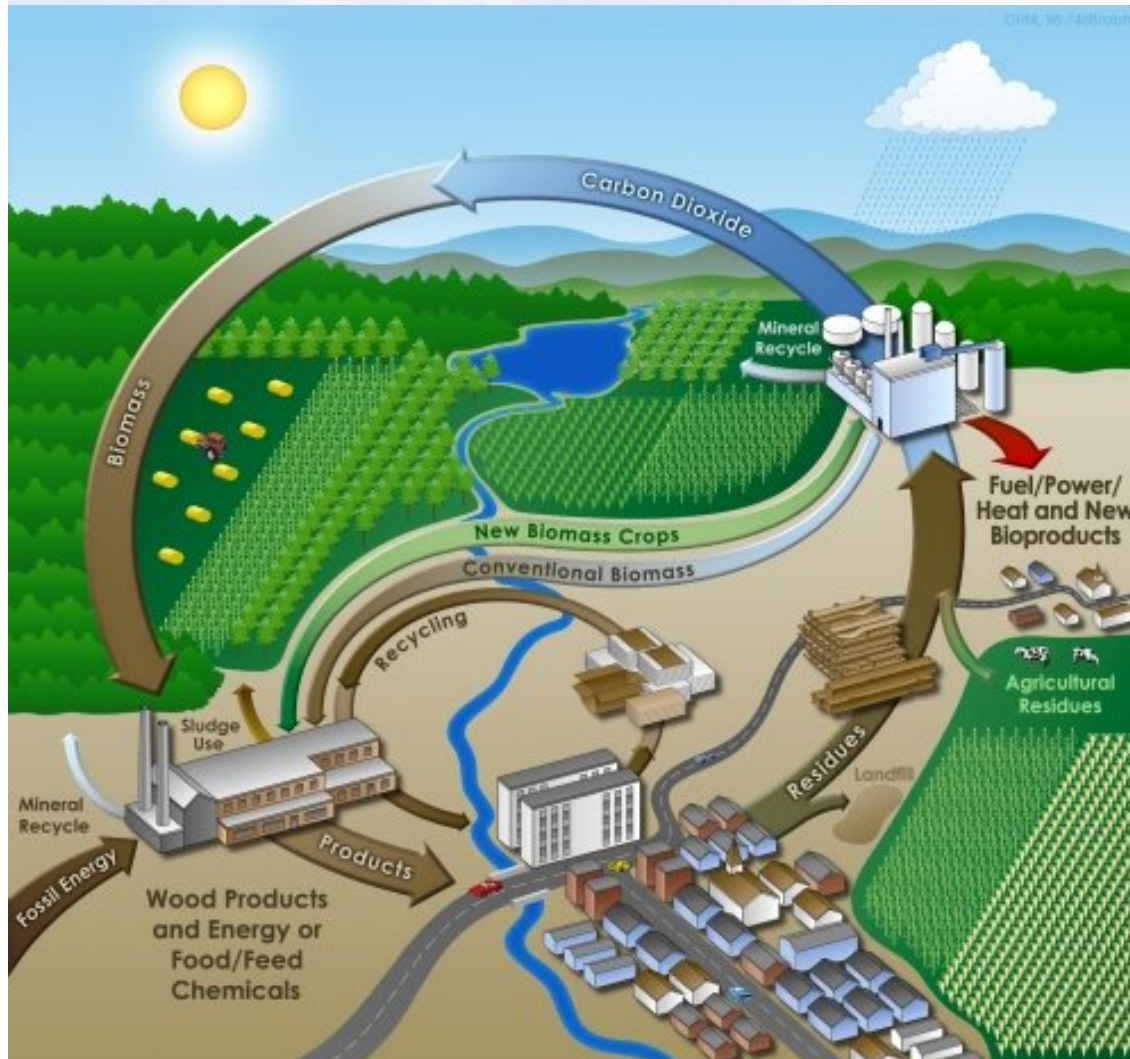


- VIASPACE is a biomass provider
 - Not a biofuel producer or power plant operator



GIANT KING GRASS 3.5 m (12 ft) tall five months after first planting

Biomass is Low Carbon Fuel



- Carbon dioxide is emitted when burned in a power plant
- However the next crop of biomass absorbs the carbon dioxide during photosynthesis
 - Fertilizer, harvesting, & delivery contribute some carbon dioxide

Biomass Fuels- Feedstock Is Key



- Need very high-yield crops
 - For efficient use of land and low cost
- Crops suitable for large-scale farming
 - Large quantities needed at low cost
- Competition with food will not be allowed
- Agriculture and forestry waste will be important sources, but not enough available
- Dedicated energy crops required
- Raw biomass is bulky and difficult to ship over long distances
 - Processing plants need to be near the farms
 - Ship the processed product
- Biomass projects will generate carbon credits

Thoughts from a Biomass Provider



- Risky to plant a large farm only for a biofuels market that may or may not develop in 3-5 years
- Need immediate customer or forward funded contract from to cover costs to establish the crop
- National governments may support biomass farms to create jobs, energy security & independence, and new export markets
- Seek joint venture with power plant or biofuels producer for a financeable project with assured source of biomass supply at known price
- Multiple independent markets are desired
 - Diversified revenue sources
 - Economies of scale in production

Multiple Energy Markets for Giant King Grass



- Direct combustion in 100% biomass power plants (12-30 MW)
 - 30 MW power plant requires 600 tons of grass per day
- Dry and press into pellets to be co-fired with coal in existing coal power plants
 - Up to 20% co-firing

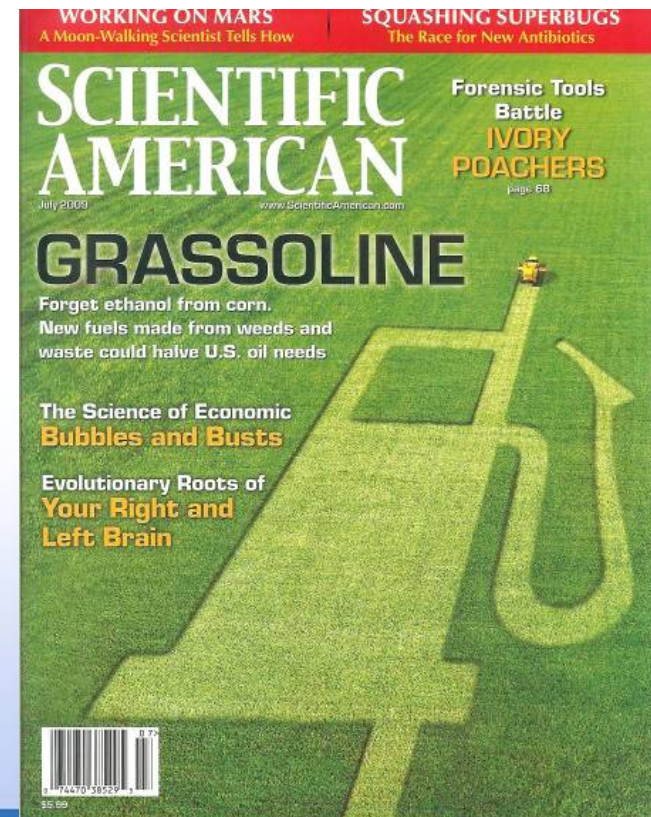


Multiple Energy Markets for Giant King Grass

- Feedstock for making methane through anaerobic digestion
 - Carbon credits
 - Small-scale (1MW) local electricity generation



- Feedstock for liquid cellulosic biofuels
 - Ethanol, methanol, green gasoline, diesel



Additional Markets for Giant King Grass



- Animal feed for cows, cattle, pigs, goats, poultry and fish



- Pressed “wood” products, paper
- Biomass derived chemicals and bio plastics

Why Giant King Grass?



- Giant King Grass has been independently analyzed by potential customers
 - Energy content is excellent
 - Suitable to be burned in biomass power plants
- Giant King Grass has the highest yield of any energy crop we are aware of
 - Extremely fast-growing, produces in the first year





Giant King Grass planted late April 2009

Giant King Grass in early August 2009



10 days after planting



Giant King Grass



- Rapid growth to 4+ meters in height
- Perennial grass with very high annual productivity
 - Up to 375 metric ton/hectare (wet)
 - 125-180 tons per hectare at 25% moisture suitable for power plant
 - 100–135 tons per hectare dry
 - Much higher than other energy crops
- Best in tropical and subtropical areas
 - 4 or more harvests per year possible
- Excellent energy content of 18.4 MJ per dry kilogram (4402 kcal/kg)



Giant King Grass

- Natural hybrid of 2 grasses
 - Not genetically modified
 - Not an invasive species
- Productive even in first year of planting
- Needs 100 days sunshine and >800mm rain or irrigation
- Can be grown in acidic or mildly saline soil
- No pesticide required in China



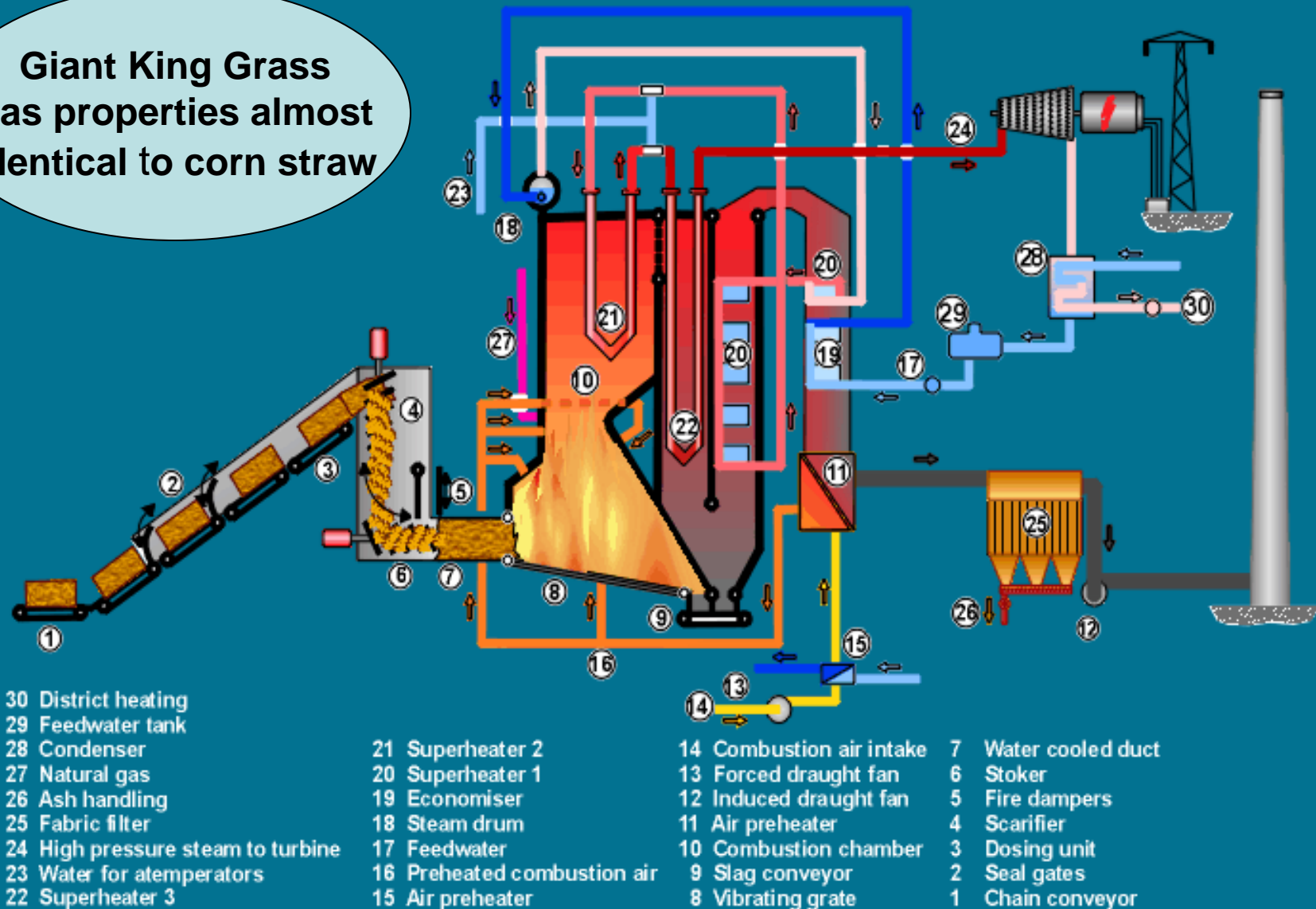
Seedlings planted less than three months ago



DPCleanTech has 19 dedicated biomass power plants operating in China

Straw fired boiler

Giant King Grass has properties almost identical to corn straw



For guidance only



Biomass Power Plant Co-located with Grass



- Sell Giant King Grass to co-located 30 MW biomass power plant
 - 600 tons/per day grass
 - 80% utilization factor
 - 175,200 tons per year
 - 1400 hectares needed
 - \$36 US per ton in China
- Grass revenue at \$36 per ton is \$6.3M USD/year
- Gross margin is good



MOU with Biomass Power Plant Partner



- DP Cleantech has built and operates 19 power plants in China --all running on 100% biomass
 - Most experienced biomass power plant company in China (and one of the most experienced in the world)
 - Power plant is based on licensed Danish technology, and designed and optimized for biomass
 - 30 MW and 12 MW power plants
 - Currently fueled by agricultural waste such as corn straw, wheat straw or woodchips
 - Giant King Grass is suitable for fuel
- Cost effective solution for turnkey biomass power plant
 - Available 18 months after all approvals
- DPCleanTech will build a power plant anywhere in the world– contact VIASPACE for further information

Grass Pellets-Coal Replacement Opportunity



- Sell Giant King Grass pellets to be co-fired with coal
 - Dry & press into pellets
 - Requires investment in pellet making plant
 - Requires shipping to port
- \$100 US/metric ton FOB port suitable for bulk shipment
- 1400 ha yields \$14.5 M USD per year revenue
- Gross margin is good



Pellet Customers Are Ready



- One of the world's largest producers of electricity has coal-fired power plants in Europe that are co-firing biomass
- Pellets wanted at \$100/mt delivered to a port suitable for bulk shipment
 - 40,000 tons in 2010,
 - 1,000,000 tons or more in 2013
- Many other global customers for biomass pellets

Scalable and Sustainable Global Energy Business



- Biomass power plants & Giant King Grass plantations in tropical and subtropical areas
 - Central and South America, Southeast Asia, China, India, and Africa
 - Local electrical power generation, development and jobs without contributing to global warming
 - Energy independence, less imported fuel
- Grass plantations & pellets for co-firing with coal, and the replacement of coal in existing power plants around the world
 - Local jobs and hard currency from exports

VIASPACE



- Headquarters in Irvine, California USA
- A public company listed on the US OTC Bulletin Board with stock symbol VSPC
- Growing Giant King Grass in southern China
 - Current crops are focused on providing seedlings for a future large project
- Seeking to expand Giant King Grass cultivation under a joint venture or other arrangement in other areas of the world

Example: Americas



- Joint venture growing Giant King Grass
- Electric power plant with captive fuel source
- Pellet mill and global exports
- Biofuel feedstock
- Bio methane
- Others

Additional Information and Details

Low Carbon Emissions



- Global treaties and national policies in place to reduce carbon dioxide emissions to slow global warming
- Government support and subsidies for alternative energy in most of the world
 - Including China, Japan, Korea, Europe, US
- Coal is worst emitter of carbon dioxide
 - 41% of world electricity is generated by coal
 - China is building two new coal power plants every month

Solar, Wind & Biomass Electricity



- Solar electricity has zero carbon emissions
 - But solar only produces electricity in the daytime and when the sun is shining
 - There is no way to store the electricity for the nighttime or for cloudy days
 - Must have backup natural gas power plants to bring online when solar is not available (Load management)
- Wind electricity has zero carbon emissions
 - But only produces electricity when it is windy
- Biomass power plants have zero net carbon emissions over a growing cycle
 - Biomass power plants operate 24 hours per day

Co-firing Coal and Biomass



- An existing coal-fired electrical power plant can be modified to burn biomass instead of coal for up to 20% of its fuel
 - Grass or wood pellets
- Carbon dioxide smokestack emissions are the same as 100% coal, but the next crop of grass as it grows absorbs the carbon dioxide emitted from the burned grass
- Co-firing is simplest and fastest way to partially clean up coal power plants and introduce renewable biomass fuels on a large scale
 - Converting existing coal power plants is much less expensive compared to building new power plants

Renewable Methane (Natural Gas)



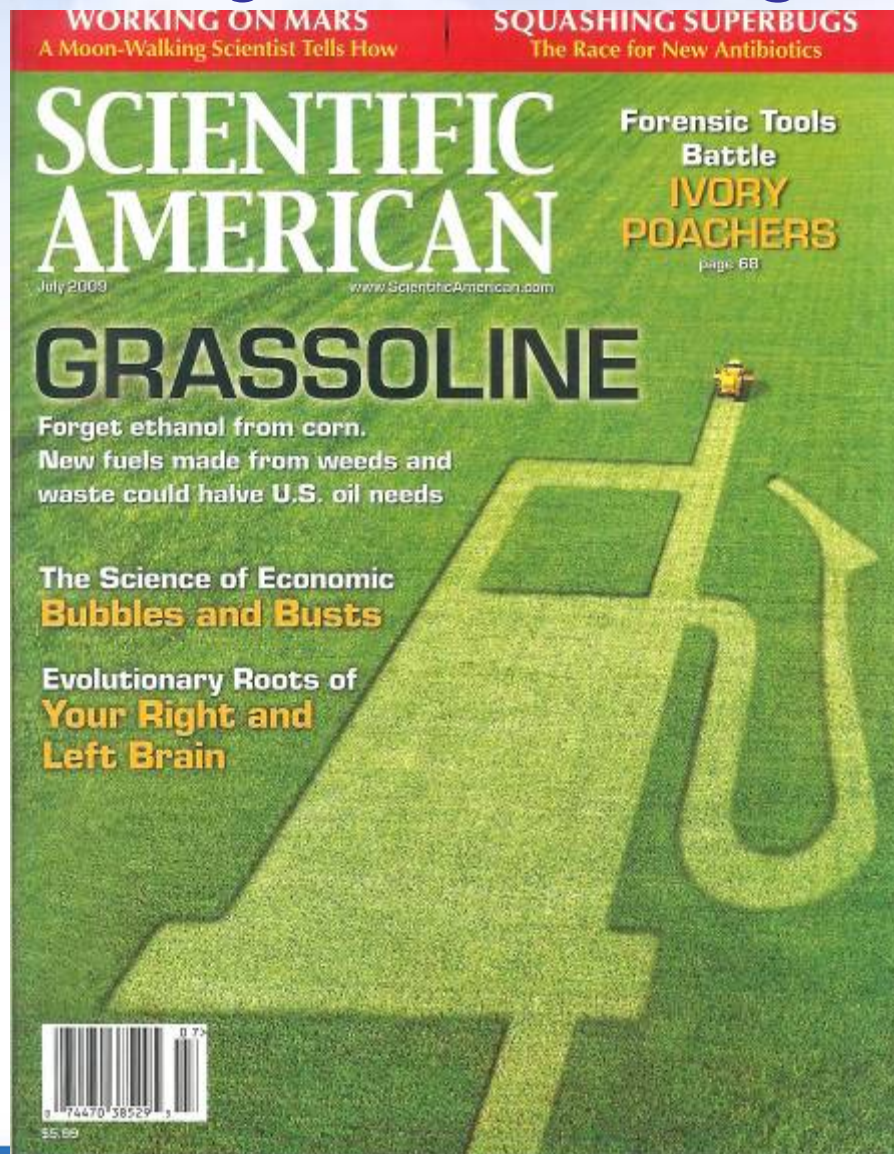
- Biomethanation (anerobic digestion) is source of renewable energy because it produces methane gas that can be burned to generate electricity and heat
- Microorganisms break down biodegradable material in the absence of oxygen
 - Widely used today to treat wastewater sludge and organic waste
- Identified by United Nations Development Program as a decentralized energy source
- Generates significant carbon credits because methane is 21x worse than carbon dioxide
- Giant King Grass is a candidate feedstock

Grassoline



- Grassoline—a new term for renewable, low carbon liquid biofuels made from grass
- Examples
 - Cellulosic ethanol, methanol and green gasoline, even diesel if gasification is used
- Does not use food crops such as corn for its production
 - Does not cause high food prices and resulting world hunger
- Note: In 2008 one third of the US corn crop was used to make ethanol

Scientific American July 2009--Highlights



- Cellulosic biofuels offer the most environmentally attractive and technologically feasible near-term alternative to oil
- Grassoline will come from agricultural waste and dedicated energy crops such as fast-growing grasses
- The US can grow enough of these feedstocks to replace about one half the country's total consumption of oil without affecting food supplies

Scientific American July 2009--Highlights



- Most energy crops can grow on marginal lands that would not otherwise be used as farmland
- Cellulosic biomass can be converted into any type of fuel – ethanol, ordinary gasoline, diesel and even jet fuel
- The move toward Grassoline can fundamentally change the world

Backup Slides

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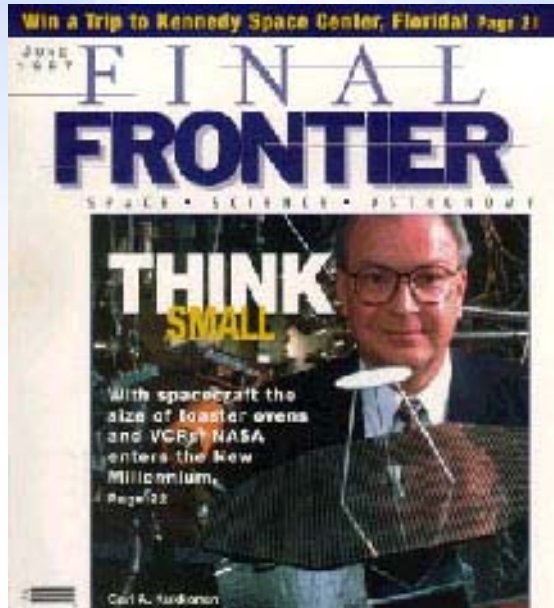


Company Background

- Founded in 1998 as a spin out from the NASA/Caltech Jet Propulsion Laboratory (JPL)
- Became a public company in 2005.
Traded on the U.S. OTC Bulletin Board with stock symbol VSPC

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CEO Background



Kukkonen with Al Gore

Dr. Carl Kukkonen

- 2005 – present **VIASPACE Inc. CEO**
-Publicly traded on the OTC BB symbol VSPC

- 1998-2005 **ViaSpace Technologies (incubator)**
- Founded and led 7 startup companies

- 1984-1998 **NASA/Caltech Jet Propulsion Laboratory**
Director, Center for Space Microelectronics
& Manager of Supercomputing
- Led staff of 250 with annual budget of \$70M
- On review boards of 14 leading universities

- 1977-1984 **Ford Motor Company,**
Principal Research Scientist and Engineer
- Ford's expert on hydrogen as an
 alternative motor fuel
- Developed new direct injection diesel engine

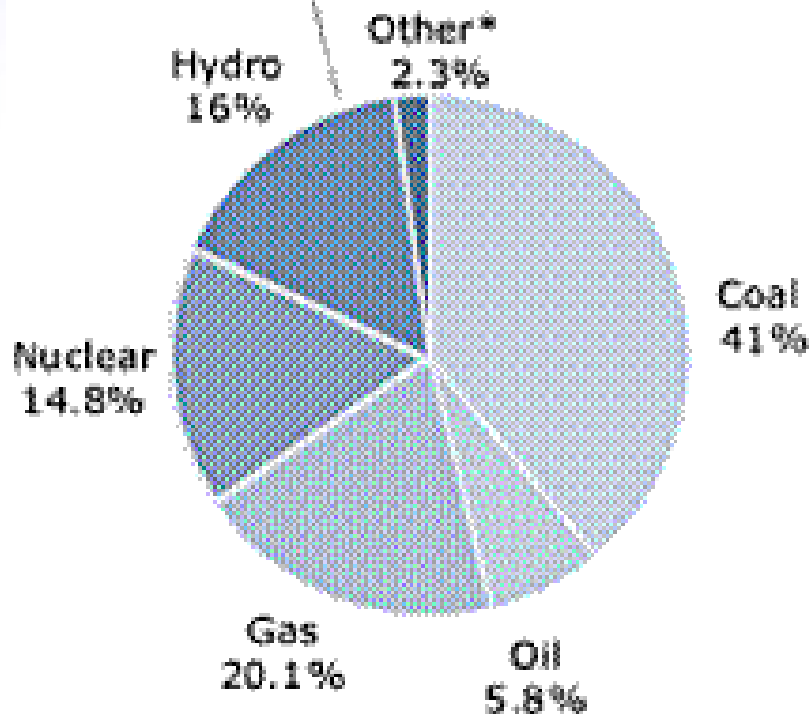
- 1975-1977 **Purdue University**
Postdoctoral Research Fellow

- 1975 **Cornell University**
PhD, Physics

Is There Enough Land for Energy Crops?



Total World Electricity Generation by Fuel (2006)



* Other includes solar, wind, combustible renewables, geothermal & waste

- Question--Is there enough land to grow biomass to provide 41% of global electricity and replace coal which is most polluting fossil fuel
- World electricity use is 0.72×10^{20} joules
- Total world land 13 billion hectares
- Total cropland 1.5 billion ha
 - 11.5% of total world land
 - Do not want to grow on existing cropland, but the next best land

Is There Enough Land for Energy Crops?



- Energy crop yield depends on crop type, climate, rainfall, soil and fertilizer
- Biomass energy content of 15.6 MJ/kg
- Biomass power plant efficiency 31%
- Simple calculation shows importance of high yield for the future of biomass energy
- Yield in metric tons/hectare-year
 - Metric ton=2200 lbs
 - Hectare=10,000 m²= 2.47 acres

There is Enough Land for High Yield Crops



- The percentage increase in world cropland needed to replace coal for electricity generation worldwide is given by

$$\% \text{ Increase in World Cropland} = 4.4/\text{Yield} \times 100\%$$

- Giant King Grass yield (at 25% moisture) is 125-180 metric tons/hectare-year
 - Switchgrass is about 25, corn straw is 10
- Giant King Grass would only require a 2.4-3.5% increase in cropland to entirely replace coal
 - This amount of land should be available
 - Additional land could be used for liquid biofuels
- High yield is key

Compare Fossil Fuel Costs to Biomass



Coal US	27GJ /mt	\$50 /mt	\$1.85 /GJ
Coal Max.	27GJ /mt	\$100 /mt	\$3.70 /GJ
Oil	6.1GJ /barrel	\$70 /barrel	\$11.48 /GJ
Nat. Gas		\$5.00 /Mbtu	\$5.27 /GJ
Bio-mass	15.6GJ /mt	\$36 /mt	\$2.31 /GJ

- Coal is cheapest
 - Most electricity is from coal
 - But most carbon dioxide and other pollutants
- Natural gas is next
 - Cleanest fossil fuel
 - Much electricity from natural gas
- Oil is most expensive
 - Little electricity from oil
- Biomass needs subsidy to compete with coal
- Biomass has least net carbon dioxide emissions

Biomass vs Corn to Ethanol—Land Use



- **Is it a more efficient use of land to grow corn or biomass for ethanol?**
- Biomass with yields above 25 tonnes/hectare/year exceed the land productivity of corn to produce ethanol
 - Switchgrass can be as high as 25 tonnes/hectare/year
 - Giant King Grass exceeds 125
- High yield is the key

Feed-stock	Yield	Ethanol GJ/hectare
Corn US	472 bu /hectare	100
Corn- straw	10 Mt/ha	39
Switch- grass	25 mt/ha	98
Giant King Grass	125 mt/ha	488