

# *TASK FORCE ON CLIMATE POLICY*

Presentation by  
Commissioner Kevin D. Gunn  
Missouri Public Service Commission



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# *Introduction*

- 2009 Eisenhower Fellowship
- Month in Australia studying energy and economic development
- <http://gunninaustralia.blogspot.com/>

# AUSTRALIA

- Land mass is 85% of U.S.
- Only 21 million people
- Majority of population lives on the coasts
- Largest coal producer and exporter
- Wind, Solar, Geothermal, No Nukes!
- Cheap electricity 7-8¢ per Kwh (similar to Missouri)
- Coal is ↑ in carbon emissions  
↓ in  $SO_x$   $NO_x$



## Several factors converged to firmly place climate change in the Australian consciousness:

- Severe drought in the south (Victoria, NSW)
- Flooding in the north (Queensland)
- Black Saturday bush fires (Victoria)
- “An Inconvenient Truth”
- Howard Government skepticism

# *2007 Australian Policy Changes*

- Rudd Government elected
- Commissioned Garnaut Review  
Comprehensive scientific and economic impact study -- [www.garnautreview.org.au](http://www.garnautreview.org.au)
- Australia's "Stern Report"

# *Australia's steps --*

## FEDERAL

- Carbon Pollution Reduction Scheme (CPRS)  
<http://www.climatechange.gov.au/emissionstrading/index.html>
- Renewable Energy Target (RET)  
<http://www.climatechange.gov.au/renewabletarget/>
- Government and private funding of CCS projects
- Rebate Program (\$10K for solar panels, \$1K for solar hot water)

## STATES

- Feed-in Tariffs
- Energy Efficiency Programs
- “Public Use” Funds
- Rebate Programs (appliances)

# Carbon Pollution Reduction Scheme

## Basics

- Gov. sets cap on total amounts of carbon allowed by sector
- Cap will change based on global agreements
- Permit for every ton of carbon emitted issued by Gov. up to cap
- End of each year, permits surrendered for every ton of carbon emitted
- Trading market for permits created
- Transitional assistance to trade-exposed industries

### STATUS

- Implementation delayed until 2011
- Stalled in Australian Senate

# Renewable Energy Target (RET)

## Basics

- 20% Renewables by 2020
- RET plus tradeable Renewable Energy Certificates (RECs)
- Annual targets start at 12,500 Gwh in 2010 rising to 45,000 Gwh by 2020
- Maintain 45,000 Gwh until 2030
- Can bank RECs for life of the scheme without restrictions
- Shortfall charge of \$65 per megawatt hour
- Assistance to electricity intensive, trade-exposed industries

# Carbon-Capture and Sequestration

# *Geologic CCS*

- Injection sites in Western Australia  
(Commonwealth Scientific and Industrial Research Organization)
- Depleted natural gas fields off coast  
(Privately-held)
- Power plant mechanical/chemical capture  
(Progress Group)



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***MOST EXCITING***

**Biologic CCS**

# *Biologic CCS*

- Use of algae to capture carbon
- Algae is grown through a bio-reactor and then harvested
- Algae used to make algae oils, algae meal, pharmaceuticals
- Private companies – MDB Biodiesel
- Public Universities – University of Queensland

# MBD's CO<sub>2</sub> to energy Process Overview



## CO<sub>2</sub> Emitter

Greenhouse gases from emitter collected at the bases of the flue gas chimney and piped to algae farm.  
(CO<sub>2</sub> NO<sub>x</sub> SO<sub>x</sub>)

- e.g.
- Power Plant , Refinery
  - Cement Kiln,
  - LNG,
  - Coal Seam Gas

## Sunlight

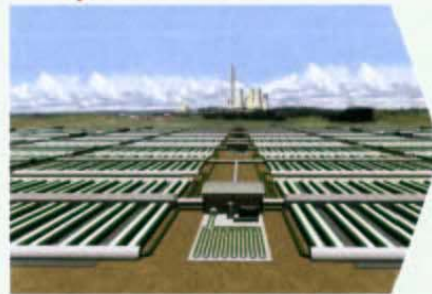


## Waste Nutrient

N, P, K, S



- Sewerage
- Waste from feedlot
- Waste water
- **Supplemented with**
- Commercial fertilizer



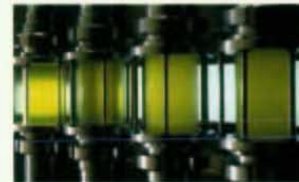
## Algae Synthesiser Farm

Land (low value buffer): 300 to 1000 Ha  
Each Million tonnes of CO<sub>2</sub> e sequestered produces the following outputs:

- 300,000 tonnes of algae:
- 125,000 tpa algae oil
  - 225,000 tpa nutritious livestock feed

O<sub>2</sub>

H<sub>2</sub>O



## Algae Oil 35% Oil Options Include

- Biodiesel Production
- Plastic Production
- Jet fuel, other fuels



## Algae Meal 65% Meal Options Include

- Feed for livestock industry
- Feed for fertilizer
- Biomass for bio-plastic production
- Biomass for electricity production

**100% of Algae used as value added product**



**Ben Hankamer**  
**Director of Solar Biofuels Consortium**  
**The Institute for Molecular Bioscience**  
**The University of Queensland**

# *Other greenhouse gas research*

## **Pongamia Tree**



- Center of Excellence Integrated Legume Research
- Naturally sequesters nitrogen
- Legumes produced are pressed into oil

■ **QUESTIONS?**