Vision Statement:

An energy independent United States with energy-production-driven prosperity for the State of Tennessee, especially for East Tennessee.
Tasks:

• Encourage Investment
  – Disseminate promising technology information
  – Seek out promising energy companies
    • Existing
      – Inside Tennessee
      – Outside Tennessee
    • Entrepreneurial Start ups
      – Seek out willing venture capitalists
      – Coordinate “business incubators” and other assistance
  – Encourage rapid investment for the most promising energy technologies and enhancements
Tasks:

• Coordinate
  – Government grants
  – Tax incentives
  – State executive agencies
    • Eliminate or reduce interference
    • Streamline permit & application processes
  – State higher education institutions
    • Support studies
    • Institutional assistance and partnering
Traditional Energy Sources

- Petroleum
- Natural gas
- Coal
- Nuclear
Traditional National Energy Sources

- Coal: 44.6%
- Natural Gas: 23.3%
- Nuclear: 20.2%
- Oil: 1.0%
- Renewable and Other: 4.1%
- Hydroelectric: 6.8%

Source: U.S. Energy Information Administration
Traditional Tennessee Energy Sources

Energy Data

Tennessee Electricity Generation Mix

Source: Energy Information Administration
Alternative Energy Sources

• Small Nuclear
• Clean Coal
• Biomass
• Solar
• Wind
• Geothermal
Nuclear

• Large megawatt plants (104 active sites in USA)
  – Very long licensing lead times
  – Extremely capital intensive upfront
  – Long construction lead times

• Vulnerable to grid disruptions

• Current national grid contribution of 20%

• Forecast (required) national grid contribution of 39%

• Waste disposal remains politically contentious
Nuclear – Tennessee

• Large megawatt plants
  – Third Watts Bar unit – ahead of schedule
• Current national grid contribution of 20%
• Current Tennessee grid contribution of 30%
• Oak Ridge National Laboratory
  – Large local employer
  – Premier research facility for nuclear power
  • Trans-Uranic Waste
  • Consortium for Advanced Simulation of Light Water Reactors
Small Nuclear

- Small megawatt plants (intended for municipalities)
  - Proven technology (conceptually similar to nuclear submarine power plants)
  - Capital intensive upfront (lower than traditional large plants)
  - Licensing and construction lead times (long but potentially shorter than traditional large plants)

- Waste disposal remains politically contentious

- Not large-scale grid limited
  - Reduces potential impacts from “rolling blackout,” natural disaster outages and terrorist attack
Clean Coal

• Bergius Process
  – Coal liquefaction (process used by Wehrmacht in WWII)
  – Currently undeveloped and expensive

• Fischer-Tropsch Process
  – Hydrogenation to syngas to gasoline... now in use by Sasol in South Africa (process used by Wehrmacht in WWII)
  – Currently developed and economically expensive but viable

• Karrick Process
  – Carbonization to primarily solid fuel and limited oil amounts
  – Environmentally friendly (production and use)
  – Pilot plant under construction
Clean Coal

• Karrick Process
  – Originally developed in 1920’s
    – Initially used for coal-to-liquid fuel conversion
      – Effective but expensive in this use
    – Modified by Dr. Wolfe in late 1990’s
      – Removes nearly all intrinsic coal pollutants
      – Environmentally closed-loop production process
      – BTU output of carbon end-product nearly equal to input coal
      – Oil by-product
        – Approximately 1 barrel per ton of processed coal
Clean Coal

• Karrick Process Output
  – Carbon end-product nearly pure
    – Combustion source
      – Primary combustion by-products
        – CO₂
        – Water
      – Reduced fly ash
      – Biologically neutral fly ash
  – Steel industry coke source
    – Combined with paper industry by-product (black liquor)
    – Additional heat treatment
  – Stack scrubber substitute for activated charcoal
Biomass

• Corn and Sugar to Ethanol Process
  – Proven technology in current use
  – Competes with food crop production

• Switchgrass to Ethanol Process
  – Large scale pilot production plant in use (Vonore)
  – Uses “weed” that grows well on, otherwise, unproductive crop land
  – Current logistics increase expense

• Algae Direct to Diesel Process
  – Environmentally attractive
  – Not fresh water dependent
  – Current production expenses high
Solar – legislation enabled 2009

• Maximum forecast contribution of 3%-5%
• Manufacturing
• Site availability
  – Annual days of sunshine
• Gas turbine backup expense
  – Acquisition, operation and maintenance
  – Fuel costs variability
• Silicon panel cost/inefficiency/durability
Summary

• Environmental pressures
  • Manageable
  • Publicity required

• Worldwide demand increase
  • Emerging economies – China & India
  • European total dependence on imports

• Essential need
  • National security and economic survival
  • Current planning not properly addressing
    • Near term – Clean coal & increased domestic oil
    • Far term – Combination of nuclear & alternatives