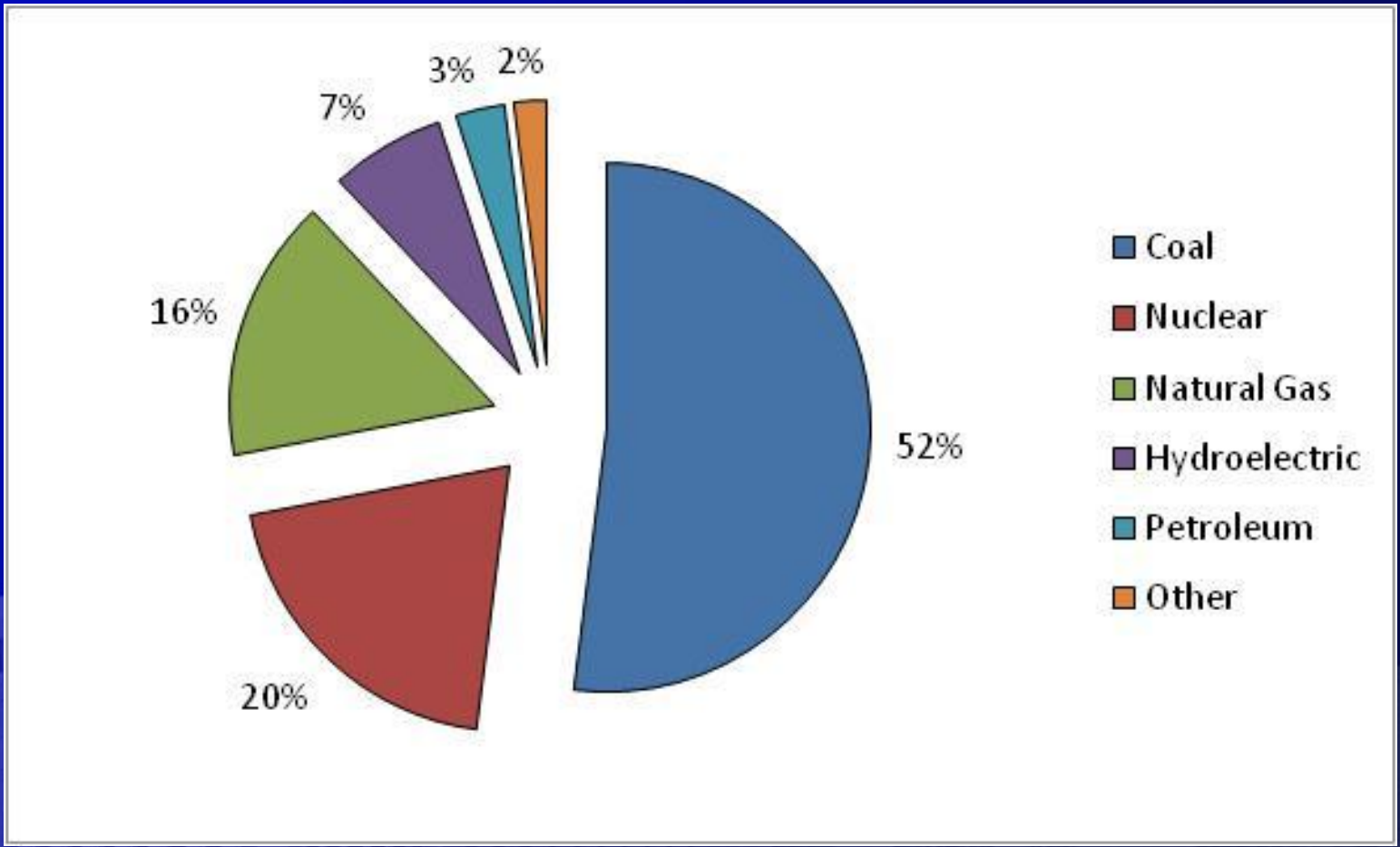
Solid Waste Gasification

Lake County Solid Waste Task Force

September 13, 2010

Power – where does US get it from now?



Current reserve status for power fuels

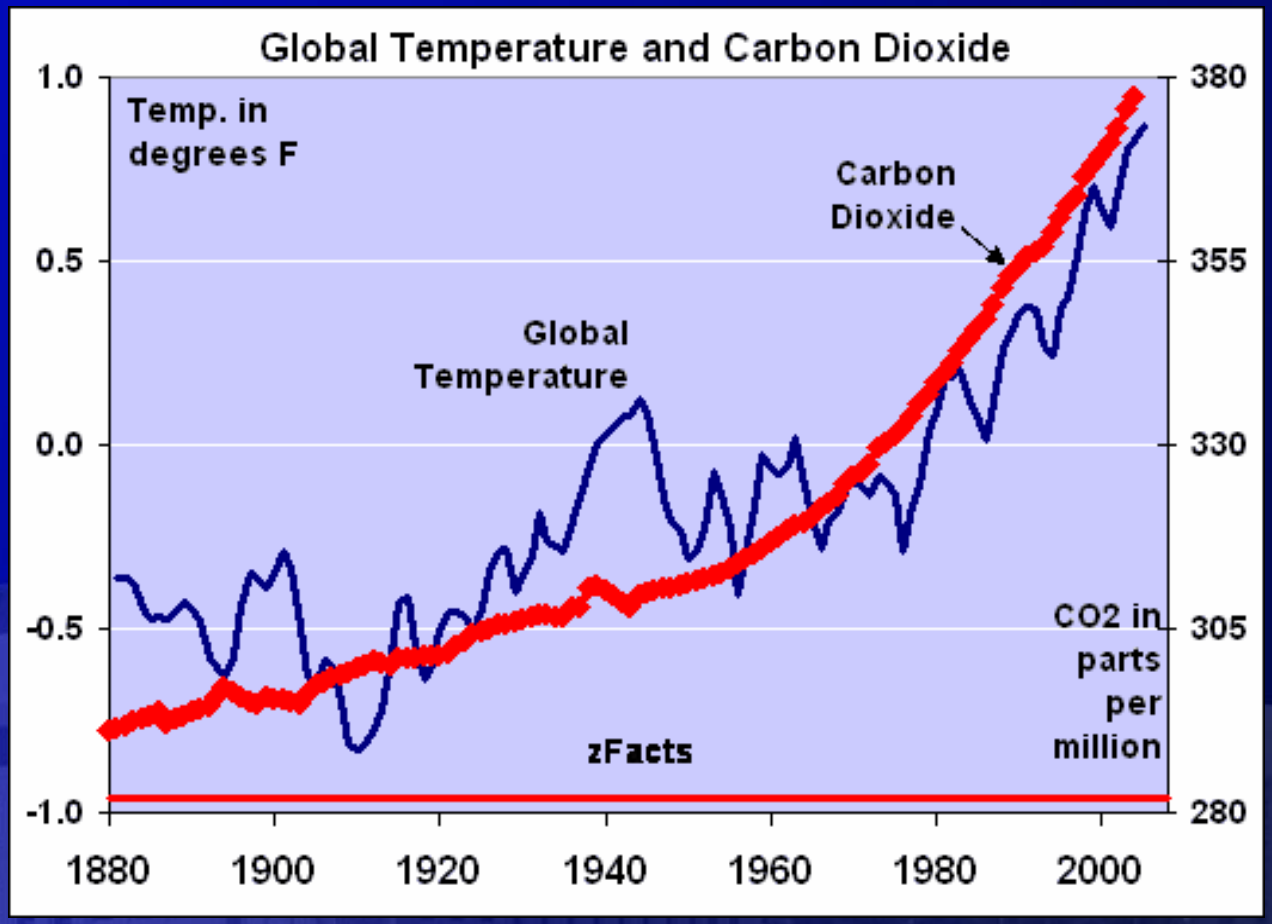
- US has 250 years of coal reserves
- US, Canada and Mexico have 20 to 30 years of natural gas reserves
- Nuclear represents a strong potential, but spent fuel storage is an issue until the late 2020s and public acceptance is questionable

Local power demand

- Power demand is expected to grow by 2% to 3% per year
- By 2030, our demand will have increased by 50 to 70%
- Based on available reserves, coal appears to be the best option for expansion

But…..

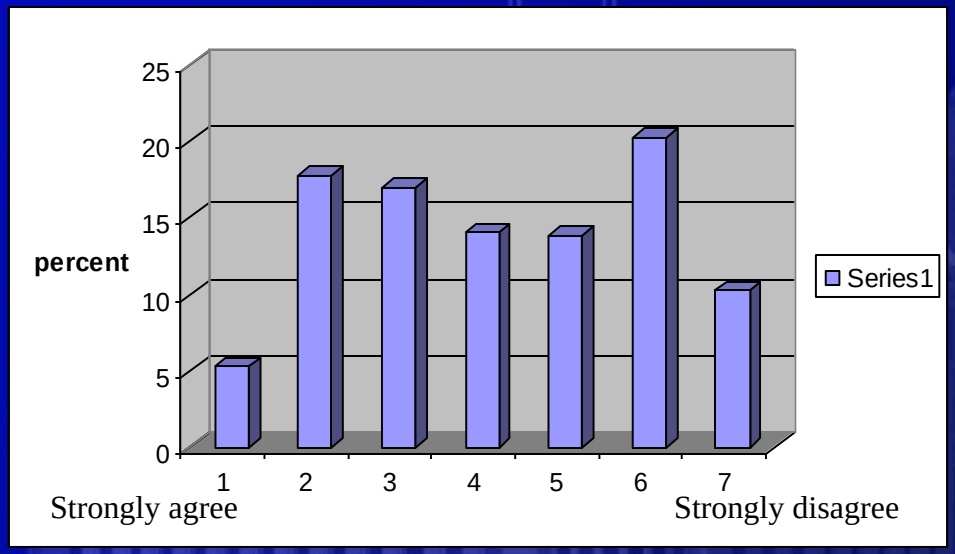
Global climate change



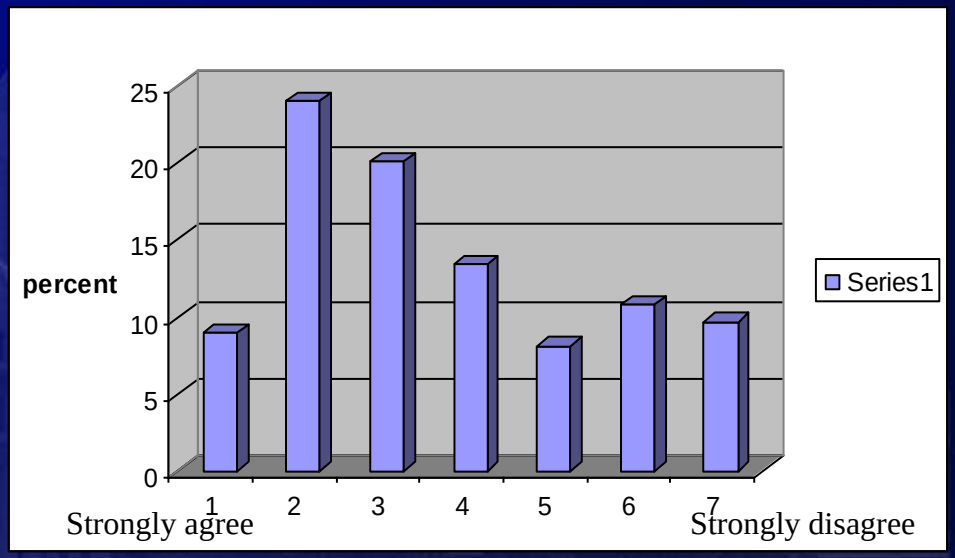
Global climate change

- 530 climate scientists polled in 1996 and again in 2003
- Question – is climate change mostly a result of anthropogenic (man-made) causes?

1996 results



2003 results



Greenhouse gas reductions

- July 13, 2007, Governor Crist issues executive orders to reduce greenhouse gases
- Order calls for electric utilities to reduce their greenhouse gas emissions:
  - By 2017, reduce to year 2000 levels
  - By 2025, reduce to year 1990 levels
  - By 2050, reduce to 80% of 1990 levels
- FL Legislators likely to pass 20% clean energy standard for 2020 (5% of requirement may be nuclear)

Nationally……..

Public Power Weekly

A news summary for members of the American Public Power Association

No. 14 April 7, 2008

18 states ask court to order EPA to act on CO_2

Eighteen states, the District of Columbia, the cities of New York and Baltimore, and about a dozen environmental groups last week asked a federal appeals court to order the Environmental Protection Agency to issue a ruling within 60 days on whether greenhouse gases—including carbon dioxide—pose a danger to the public health or welfare.

In a related development, Senate Majority Leader Harry Reid, D-Nev., said the Senate will take up debate the first week of June on the Lieberman-Warner global warming bill. That bill, written by Sens. Joseph Lieberman, I-Conn., and John Warner, R-Va., would require EPA to curb carbon dioxide and other greenhouse gases using a cap-and-trade system that would cover power plants, motor vehicles and manufacturing sources. The measure, approved by the Environment and Public Works Committee in December, would reduce U.S. greenhouse gas emissions by an estimated 70%, compared to 2005 levels, by 2050, according to the bill's sponsors.

"Once again the EPA has forced our hand, which has resulted in our taking this extraordinary measure to fight the dangers of climate change," said Massachusetts Attorney General Martha Coakley.

The states and other groups filed their complaint with the U.S. Court of Appeals for the District of Columbia Circuit. They sued EPA on April 2, exactly one year after the U.S. Supreme Court ruled in *Massachusetts v. EPA* that the agency has authority to regulate carbon dioxide and other greenhouse gases as pollutants.

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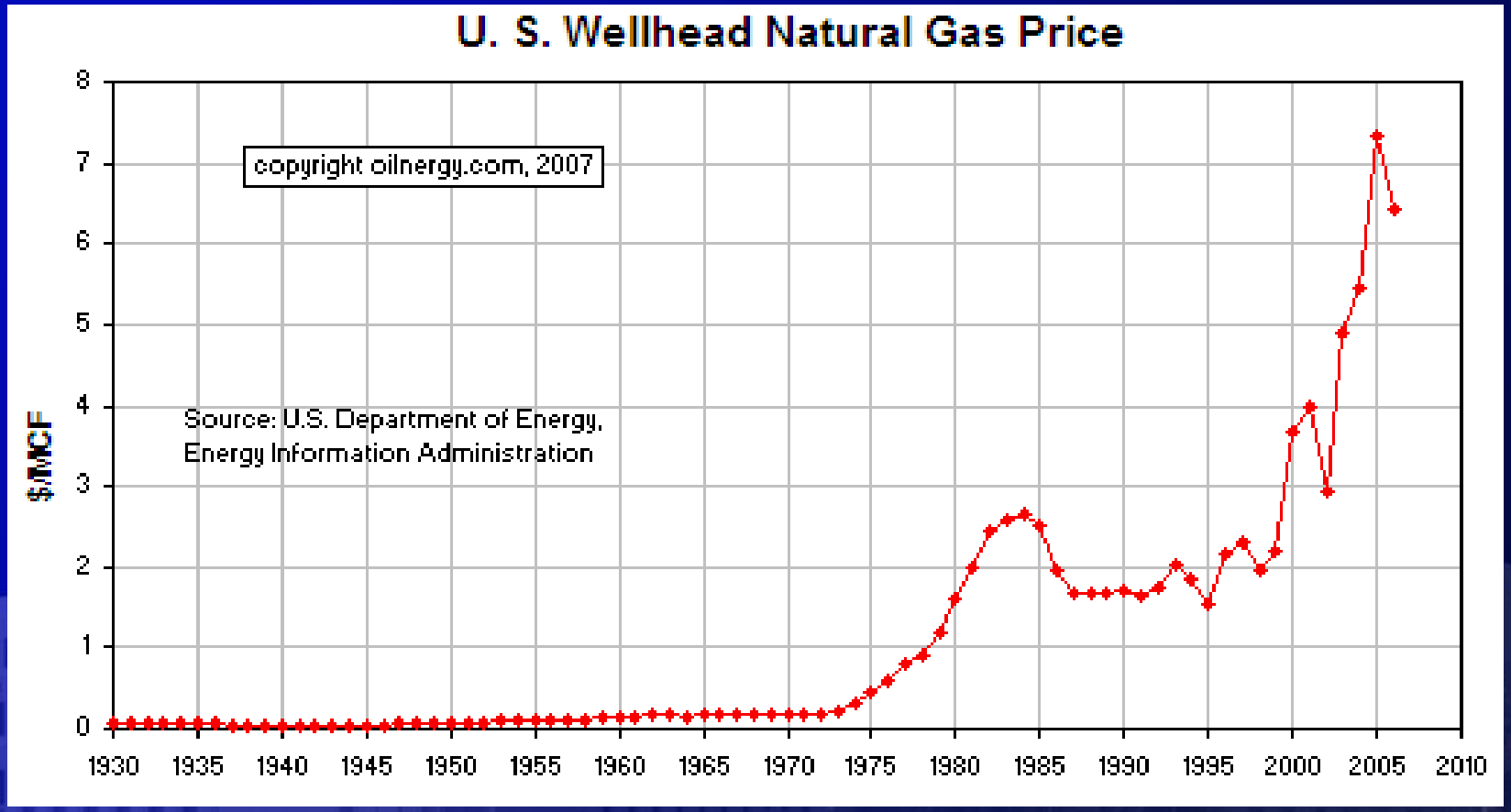
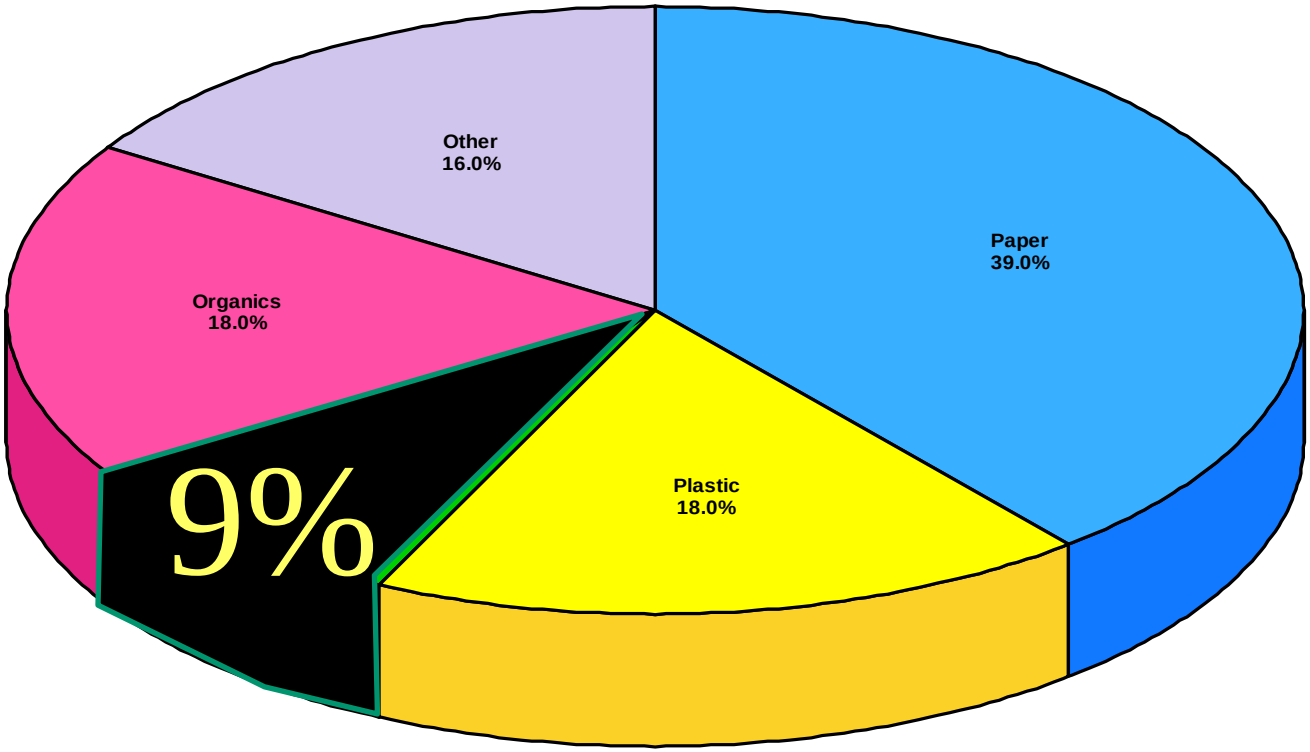

U. S. Wellhead Natural Gas Price
copyright oilnergy.com, 2007
Source: U.S. Department of Energy,
Energy Information Administration
$/MCF
0
1
2
3
4
5
6
7
8
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010

What’s in our future?

- The cost of energy is going to climb
- Conservation will be a key part of being able to meet future energy demand
- Renewable energy sources will play an important role in our future power supply



Source:

1. University of Florida, *Municipal Solid Waste Composition Study for Orange County Utilities Solid Waste Division and the Rechargeable Battery Recycling Corporation*, undated.

Orlando Garbage Numbers

In 2009, the City produced:

- 84,040 tons of commercial waste
- 52,500 tons of residential waste
- 12,800 tons of yard waste
- 4860 tons of mixed recyclables

An average of 400 tons per day of City MSW is landfilled

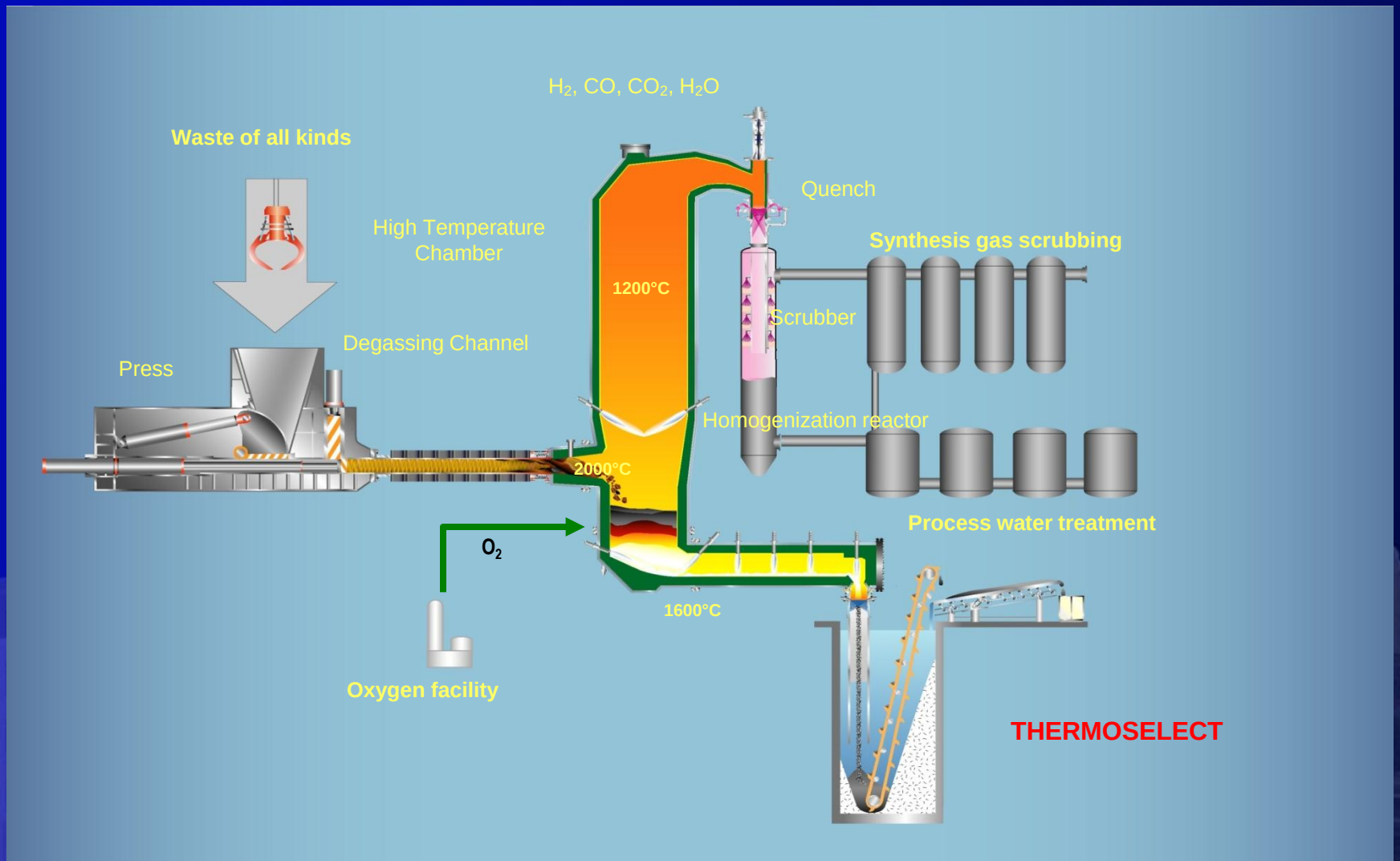
The Orange County landfill receives an average of 3,100 tons per day, 95% of which is suitable for conversion

CO_2 Savings

- Garbage decomposition in landfills produces methane
- Although Orange County does capture some methane currently for power generation, the best systems only get about 50%
- Methane has 21 times the warming potential of CO_2
- Gasifying MSW reduces the production of methane and reduces the need to burn coal or other non-renewable fuels

What is Gasification?

- It is not incineration – 800 to 1000 C; high air flow = high NOx, ash leftovers
- Gasification is high temperature 1200 to 6000 C, low oxygen atmosphere, vitrified slag leftovers
- Organic material broken down to simple gases known as synthesis gas
- Synthesis gas is similar to a low quality natural gas
- Can be used in gas turbine, gas engine or boiler to drive generator and produce power
- Leftover slag material may have market value


H_2, CO, CO_2, H_2O
Waste of all kinds
High Temperature Chamber
Quench
Synthesis gas scrubbing
1200°C
Scrubber
Degassing Channel
Press
Homogenization reactor
2000°C
Process water treatment
O_2
1600°C
Oxygen facility
THERMOSELECT

If this is so great, how come everyone is not doing it?

- Landfilling, in most cases, is relatively inexpensive
- The technology is still emerging in the United States
- Need a power partner in close proximity to purchase gas or electricity to be successful
- Site permitting and air permitting can be problematic

Who else is looking at this?

- The following communities have active programs looking at alternative energy MSW projects:
  - Los Angeles County, California
  - City of Los Angeles, California
  - Broward County, Florida
  - City of San Jose, California
  - Santa Barbara, California
  - Salinas Valley, California

Procurement concept

- City will issue RFP seeking companies willing to construct a project on land provided by the City at the Water Conserv II wastewater treatment plant
- Proposer will design, permit, build, own and operate facilities – no capital outlay by City
- City will enter into long term contract to provide a base load of garbage in exchange for stable tipping fees
- City will purchase the power for use at the treatment plant; what isn’t used can be net metered to the local power provider
- Proposer will be encouraged to develop other markets as part of a revenue sharing program

What's in it for us?

- Financial considerations:
  - Solid Waste budget has 3 main expenses – tipping fee, fuel cost and personnel
  - Gasification project will allow us to negotiate stable or even reduced tipping fee long term
  - Allows us to eliminate separate pick up for recycling, saving fuel and vehicles
  - May give us access to revenue stream – spot markets
  - Helps OUC to access renewable fuels at a reduced cost.

What's in it for us?

- Environmental considerations
  - Significantly reduces amount of material being landfilled
  - Reduces GHG emissions – methane at landfill and CO2 from our power provider
  - State has a new recycling goal of 75%; under current definition, gasification counts as recycling
  - Reduces our demand on non-renewable resources – petroleum and coal

Questions?