

# Bioenergy in the USA – Success with Decentralized Bioenergy



*Santa Fe, New Mexico USA*



**LOCAL ENERGY**

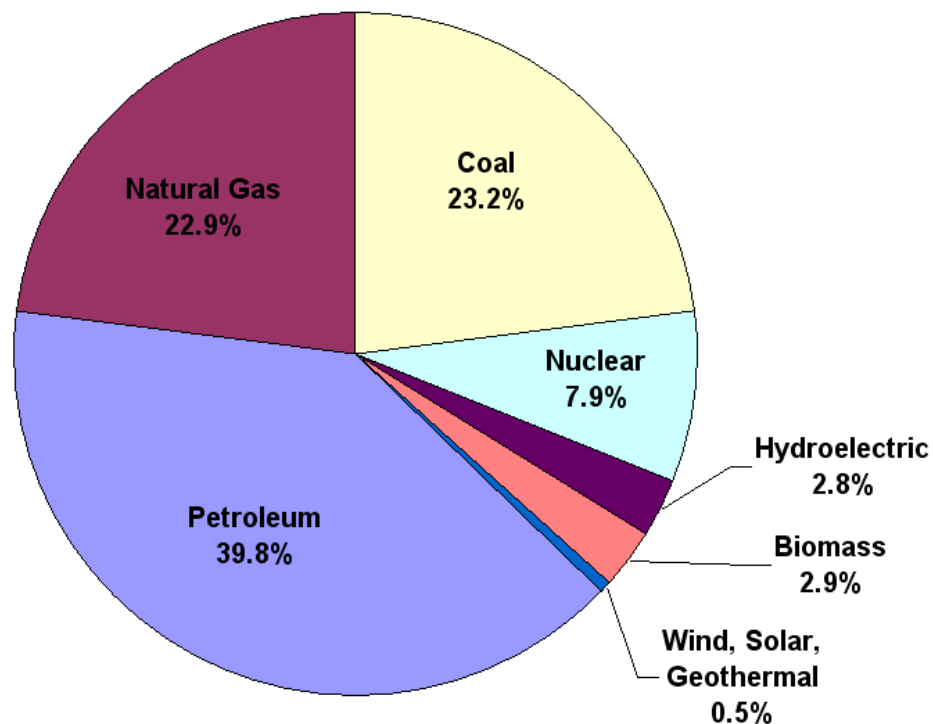
...communities becoming energy self-reliant



## U.S. Energy Consumption 2003

Nearly two-thirds of U.S. energy is from oil and gas

Source	Million MWh
Petroleum	11,449
Natural Gas	6,590
Coal	6,672
Nuclear	2,284
Hydroelectric	814
Biomass	839
Wind, Solar, Geothermal	142
<b>Total Consumption:</b>	<b>28,790</b>

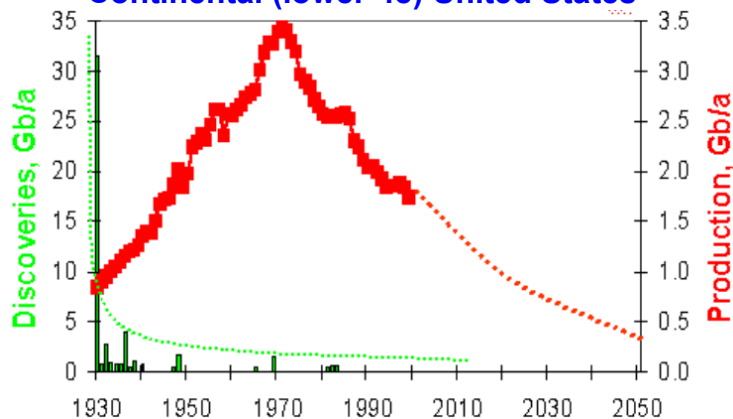




# U.S. Oil and Gas Decline

## PETROLEUM

Oil Discovery and Production in the Continental (lower-48) United States

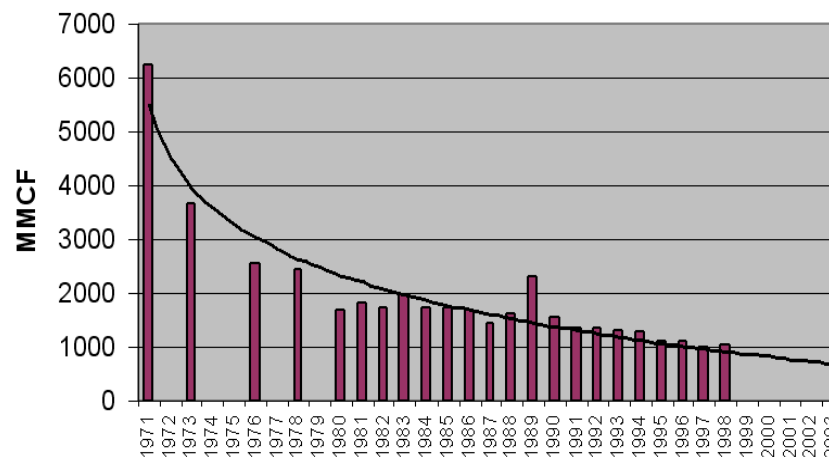


Source: Colin Campbell, Association for the Study of Peak Oil  
Note: Excludes heavy, deepwater, polar, and natural gas liquids.

- ◆ 20.0 million barrels consumed per day
- ◆ 12.5 million barrels of it imported (62 percent)
- ◆ 400,000 stripper wells produce 1 million bpd
- ◆ difficulty increasing imports

## NATURAL GAS

Average Projected Ultimate Recovery from a Texas Gas Well, by Year Drilled



Data Source: Gary S. Swindell and Associates

- ◆ 630 billion cubic meters consumed per year
- ◆ approx. 107 bcm of it imported (17 percent)
- ◆ 245,000 stripper wells produce ~ 40 bcm per
- ◆ difficulty increasing imports



## A Deeper Look at Decline's Nature

### Levels of Understanding of Decline's Implications

**1<sup>st</sup> Order: Resource quantity is finite.**

*Conclusion: We will run out some day.*

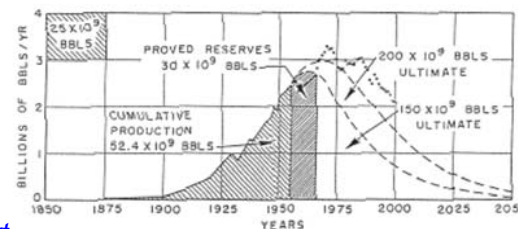


**2<sup>nd</sup> Order: Production has a maximum.**

*Conclusion: Peak will occur, or has occurred.*

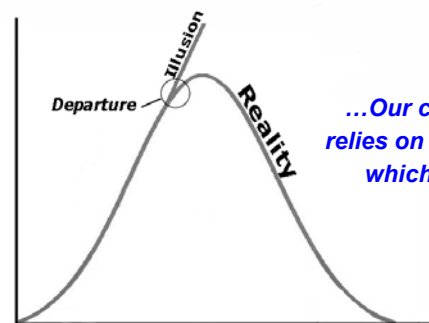


M. King Hubbert



**3<sup>rd</sup> Order: Declining resource quality is destabilizing.**

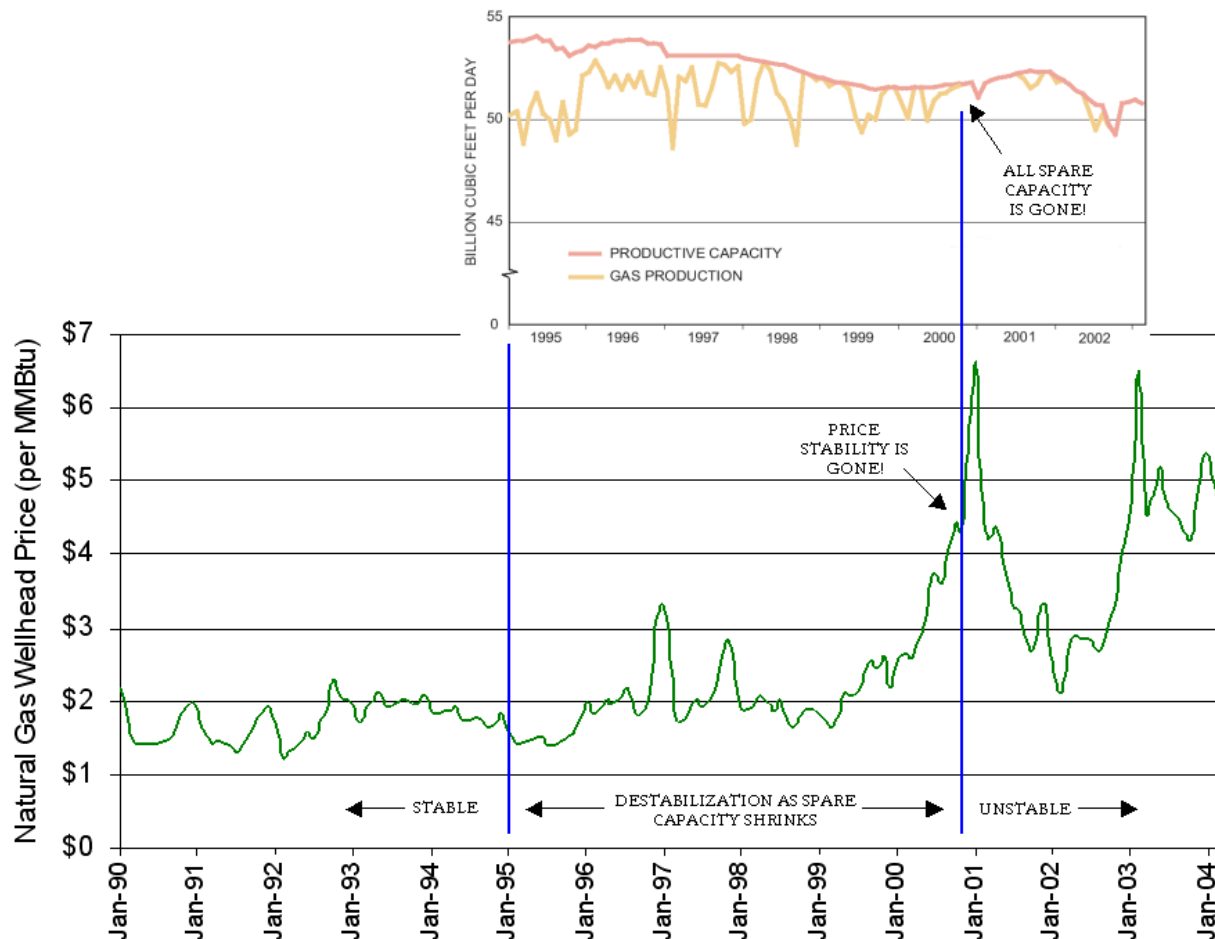
*Conclusion: A new economic model is required.*



*...Our current economy relies on perpetual growth, which is an illusion.*



## The first phase of destabilization is underway...



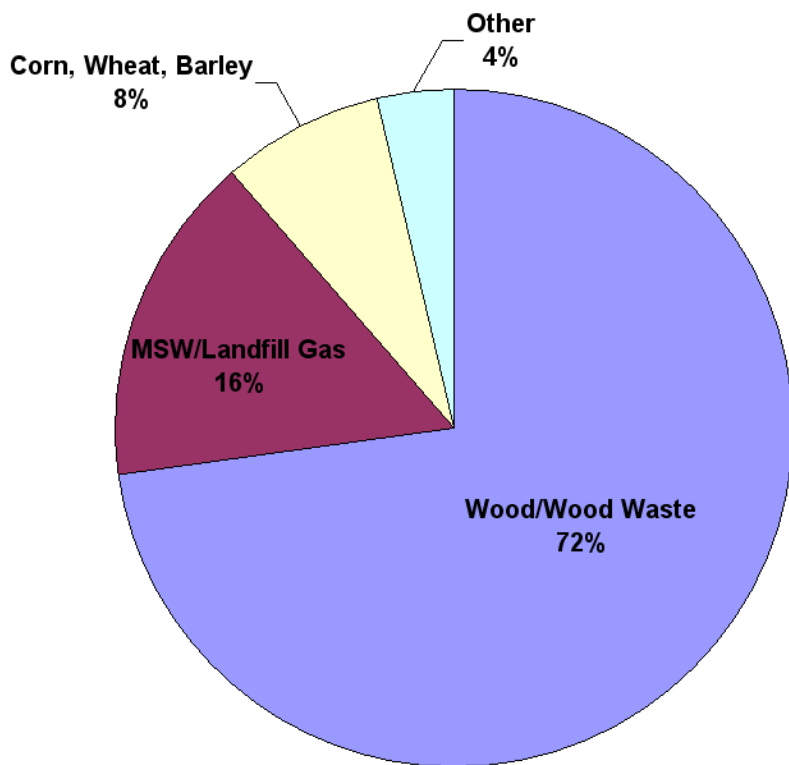
Sources:  
Energy and Environmental Analysis, Inc.  
National Petroleum Council  
U.S. Energy Information Administration.



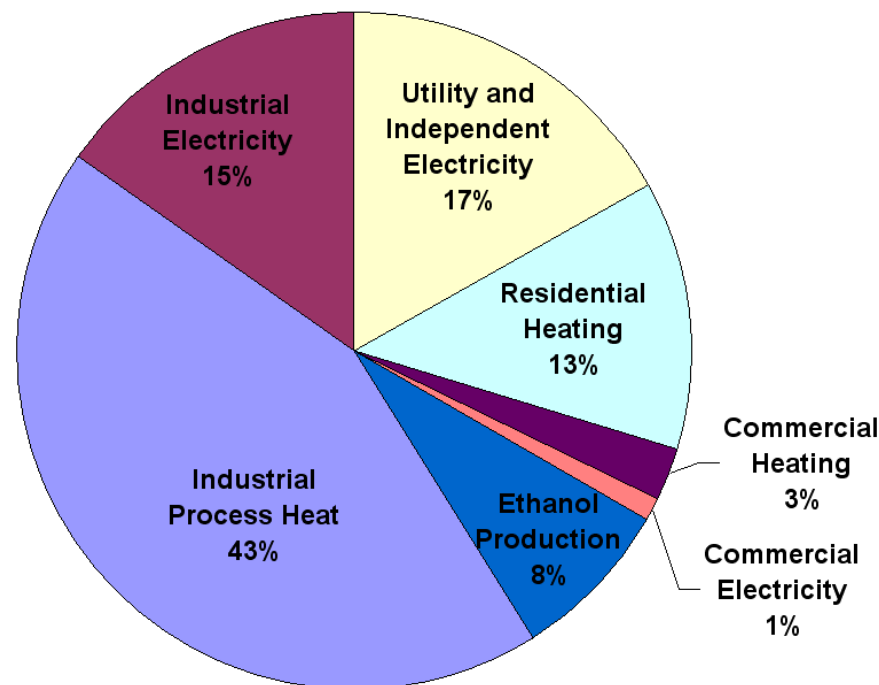
## The U.S. Bioenergy Industry

**Bioenergy provided 839 million MWh in 2003**

*(3 percent of of U.S. energy consumption)*



**(consumption by source)**



**(consumption by end use)**

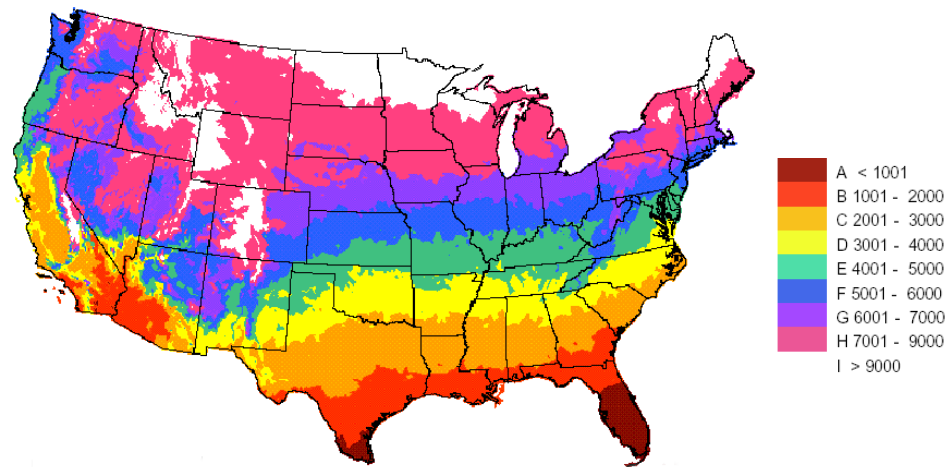


## U.S. Bioenergy Potential

**226 Million Hectares of Forest**



**Cold Climate**



**At US\$40 per dry ton (delivered), forests residues could produce 559 million MWh.  
Total cropland (136 million hectares) could produce 6,800 million MWh.  
Together, this amounts to about 25 percent of U.S. energy consumption.**



## National Biomass Initiative Created in 2000

*Potential Increases Based on Goals Set by the Biomass Technical Advisory Committee*

End Use Sector	2001 Consumption (million MWh)	Vision for 2030 (million MWh)	Net Increase (million MWh)	Annual Effective Rate of Increase
Industrial	791	1,405	614	2.0%
Electric Utilities	6	42	36	7.2%
Transport Fuels	43	2,344	2,301	14.8%
<b>Totals:</b>	<b>840</b>	<b>3,790</b>	<b>2,951</b>	

*Grant Award Funding Through the National Biomass Initiative*

Biomass Research and Development Initiative	Number of Awards	Total Funding US\$	Recipients	Projects
Round 1 (FY 2002)	6	\$96 million	Corporations	conversion of energy crops (corn) into liquid fuels (ethanol)
Round 2 (FY 2003)	19	\$23 million	Corporations, Universities, Nonprofits	liquid fuels (ethanol, biodiesel), hydrogen, biogas, chemicals, economic and environmental assessments of biomass potential
Round 3 (FY 2004)	22	\$25 million	Corporations, Universities, Nonprofits	corn-stover biomass, black-liquor gasification, ethanol production, liquid fuels for fuel cells, hydrogen from farm-animal waste, education, rural development, sustainable forestry, incentives



**“Appropriate” energy projects optimally address the hardships created by the oil and gas supply problem.**

### **Recommended Project Criteria:**

**1. Production Efficiency:** The fuel produced per unit of process energy must be maximized. *(Calculation of EROI by a neutral third-party using standardized protocols)*

**2. Utilization Efficiency:** The useful work produced per unit of fuel consumed must be maximized. *(Calculation by a neutral third-party using standardized protocols)*

**3. Economic Efficiency:** The value to members of the host community must be maximized. *(Calculation based primarily on local economic multiplier impacts, considering the local character of capital costs, fuel costs, and operating costs over the life of the project)*



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## First Case-Study Projects

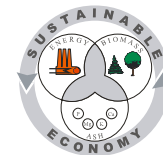
### Biomass-Fired District Energy for Santa Fe

*Budget: US\$1.75 million, Focus: Community Self-Reliance*



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..communities becoming energy self-reliant



BIOENERGIESYSTEME GmbH



## Santa Fe Studies In Progress

### Downtown Santa Fe



- ◆ 32.7 MW total capacity, heat only
- ◆ 13.1 MW biomass capacity
- ◆ natural gas back-up
- ◆ ~ 550 clients (commercial, residential)
- ◆ 30,000 meter delivery network
- ◆ investment cost ~ US\$23.7 million
- ◆ energy production costs US\$0.061 per kWh

### Santa Fe Community College



- ◆ 5.1 MW total capacity, heat only
- ◆ 1.1 MW biomass capacity
- ◆ 1.4 MW storage tank capacity
- ◆ natural gas back-up
- ◆ existing pipe network
- ◆ investment cost ~ US\$1.2 million
- ◆ energy production costs US\$0.029 per kWh

*Notes: Several additional micro-grid case-studies are also underway.*

*The current commercial heat price in Santa Fe is US\$0.037 per kWh.*



### 1. Fuel Production Efficiency

Woodchip biomass fuel can have energy profit ratios in the range of 20:1 to 50:1

### 2. Utilization Efficiency

The percentage of fuel energy delivered as useful heat is:\*

75 percent (downtown system)

85 percent (community college)

\*after subtraction of losses at the heating plant and pipe network, as well as energy used to run the circulation pumps



## For every dollar spent on heating bills...

**Current Case: (investor-owned utility):**

*80-cents leaves town in the first round, 20-cents remains local*

**Under our proposal: (community corporation)**

*20-cents leaves town in the first round, 80-cents remains local*

## The money that stays local multiplies in the local economy.

*Preliminary Results of Local Economic Benefits of the Main District Heating Project*

Gas Price-Rise Scenario (annual percent increase)	Subsidy Required (million US\$)	Multiplier Benefit to County (million US\$)	Net Benefit to County (million US\$)
1.09% (1987-2004)	14	1,015	1,001
4.16% (1995-2004)	4	2,468	2,464
13.84% (2002-2004)	2	72,448	72,446

*Note: Subsidy shown is needed to reduce the biomass heat cost to the natural-gas heat cost.*



## **Why consider expanding into the U.S. Market?**

- ◆ **Vast, under-developed biofuel resources**
- ◆ **Technology and methods not yet at European levels**
- ◆ **Government is supporting research and projects**
- ◆ **Oil and gas prices are increasing rapidly**
- ◆ **Increasing imports is not a viable option**

**Local Energy and BIOS are working to facilitate European technology transfer to the U.S. for use in community-based energy projects.**



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**Thank You!**

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We help communities develop local self-reliance in energy.

Please visit us at [www.localenergy.org](http://www.localenergy.org)

or

Contact us at (+1) 505-982-9800 or [info@localenergy.org](mailto:info@localenergy.org)



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