

Future of Residential Wood Heating: Technology and Policy Challenges

Woody Biomass Utilization Group Partners Meeting

October 16, 2012

John Ackerly,

President

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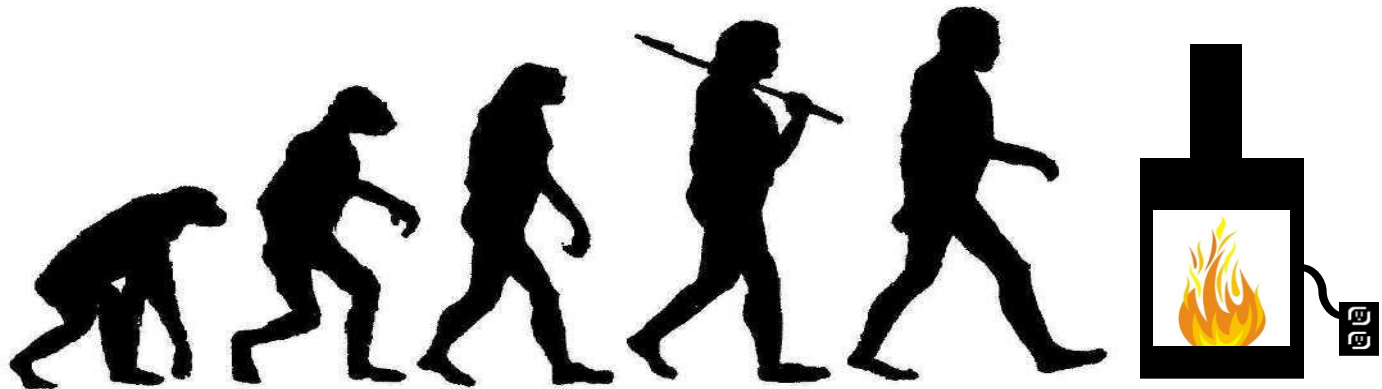


ALLIANCE

FOR GREEN HEAT

clean, renewable & local

- * The Alliance for Green Heat is a 501c3 non-profit based in Maryland.
- * We have a staff of 3 & were founded in 2009
- * Our budget is \$120,000 a year, raised from foundations, donations and US government grants.
- * We believe in progress.

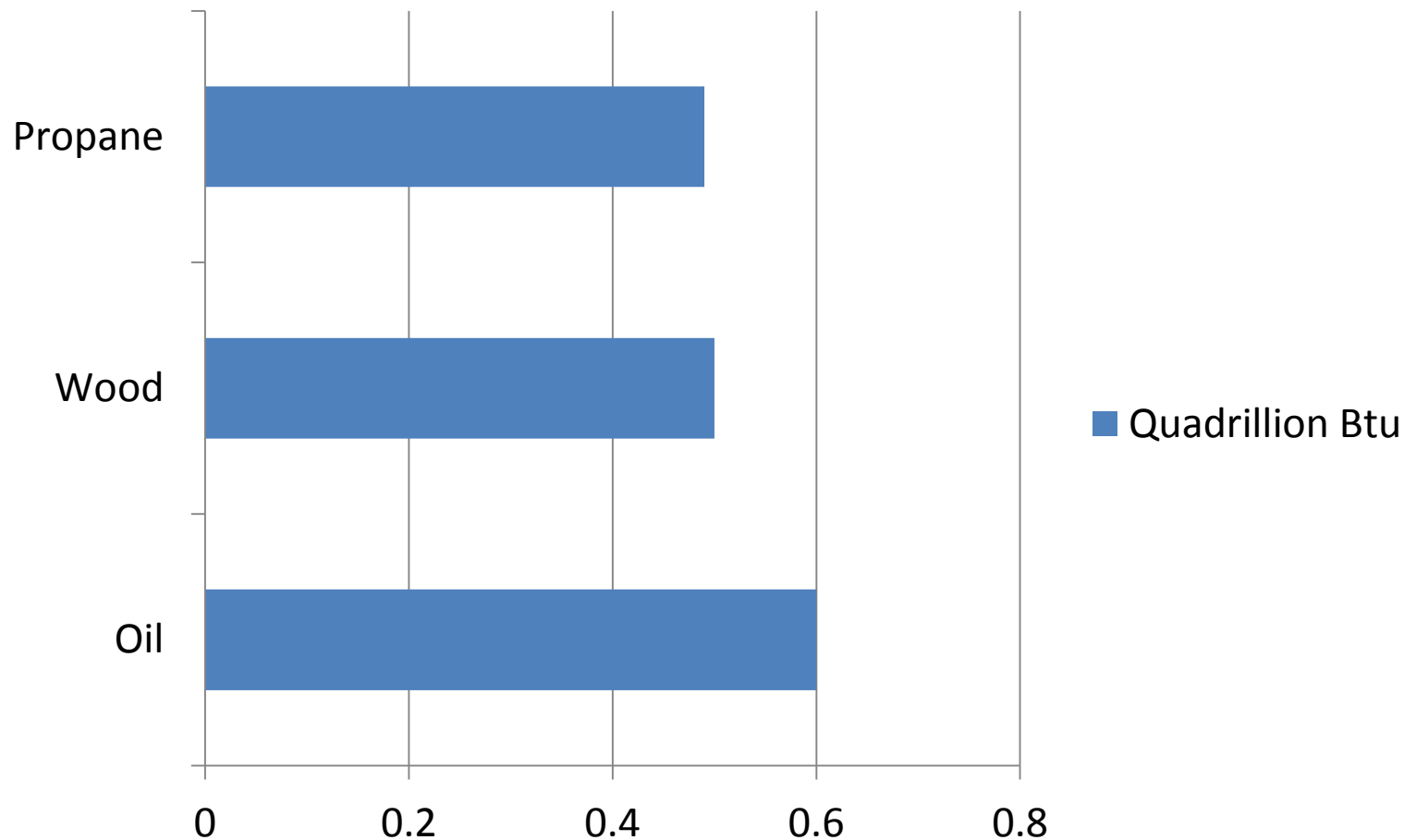


Wood

- Largest residential renewable energy source - 80%
- Fastest growing fuel source
- 2.4 million US homes use wood as primary heat source



Residential energy from heating fuels in the U.S., 2010

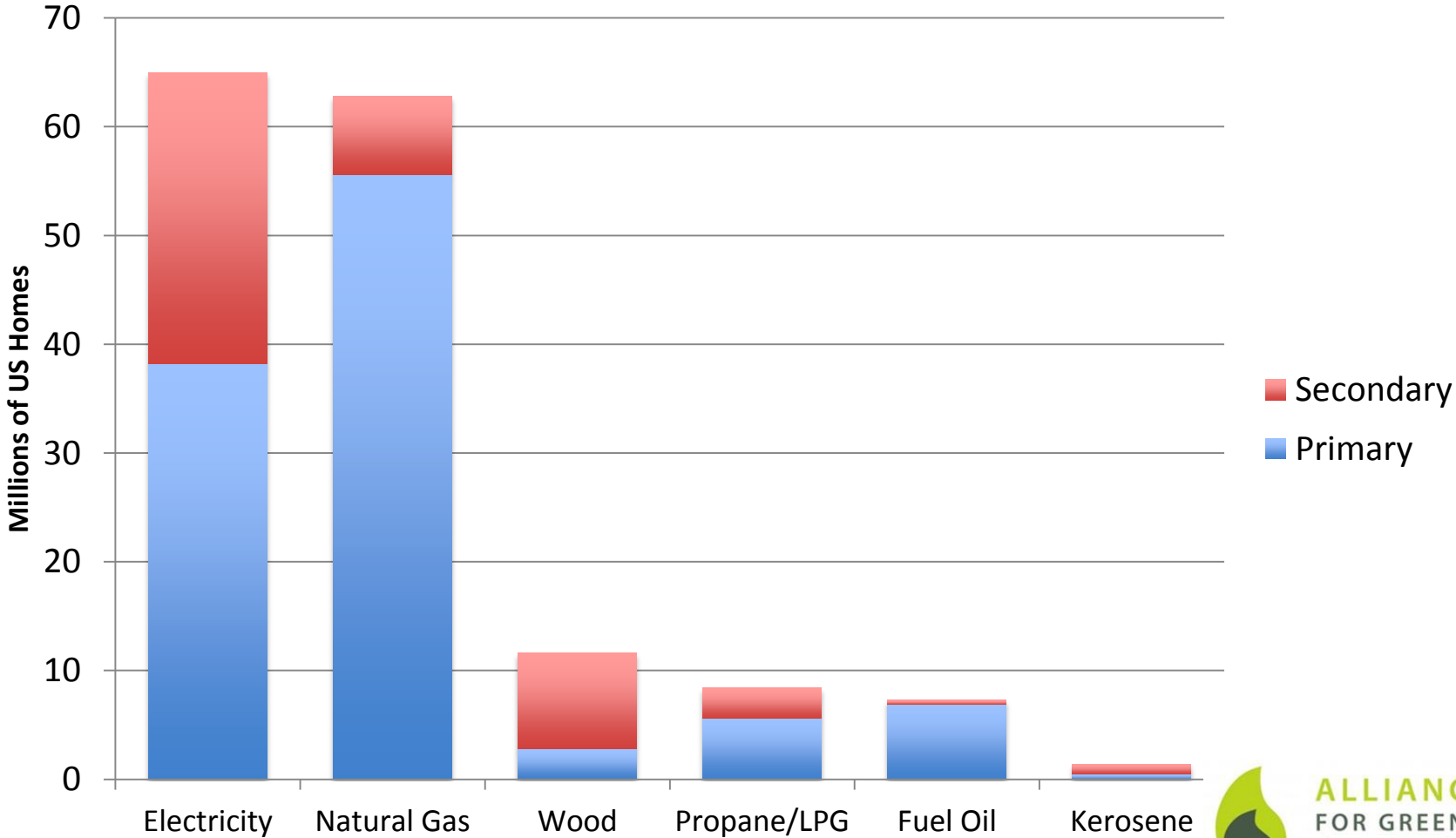


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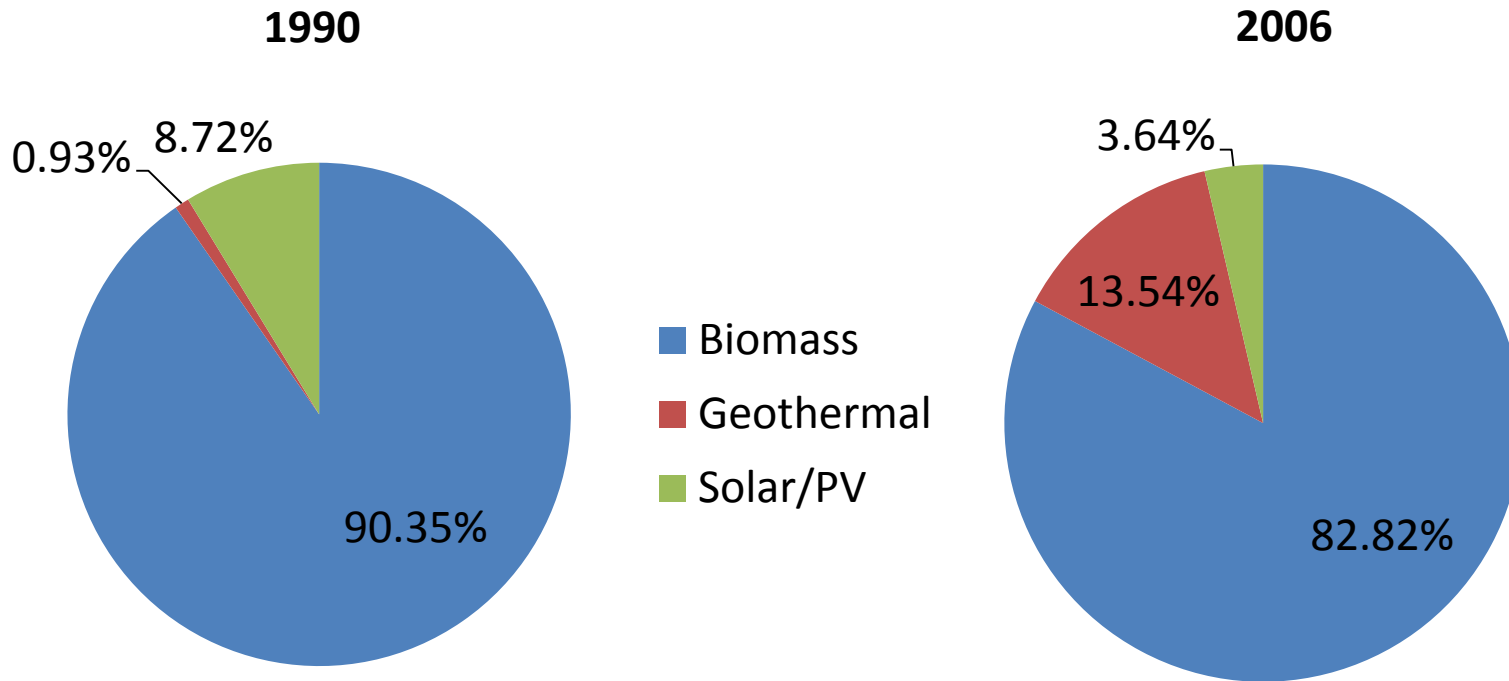
www.eia.gov/forecasts/steo/pdf/steo_full.pdf

Wood is 3rd most common heat in U.S.

US Residential Heating Fuel Use



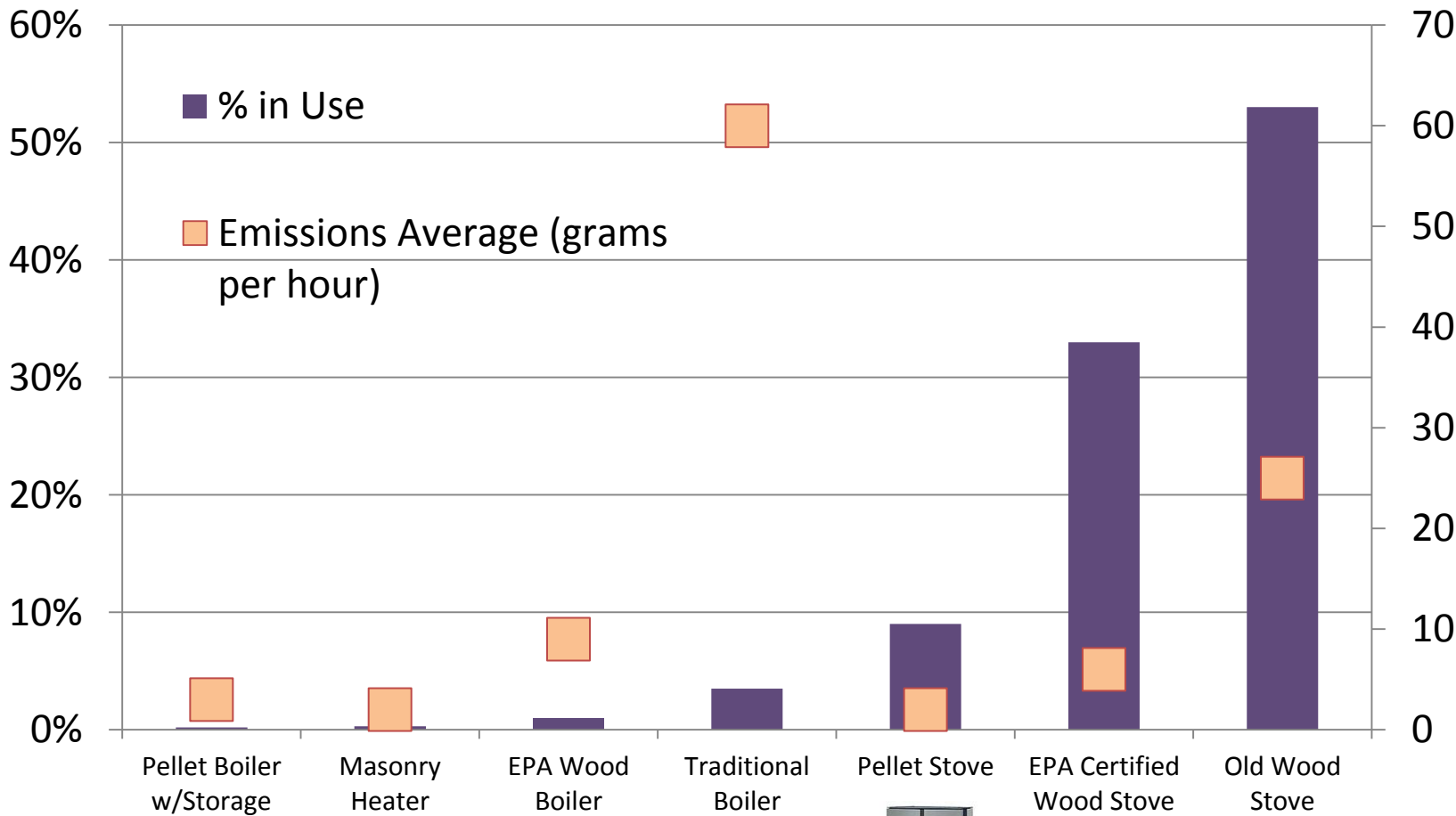
Residential Renewable Energy Sources



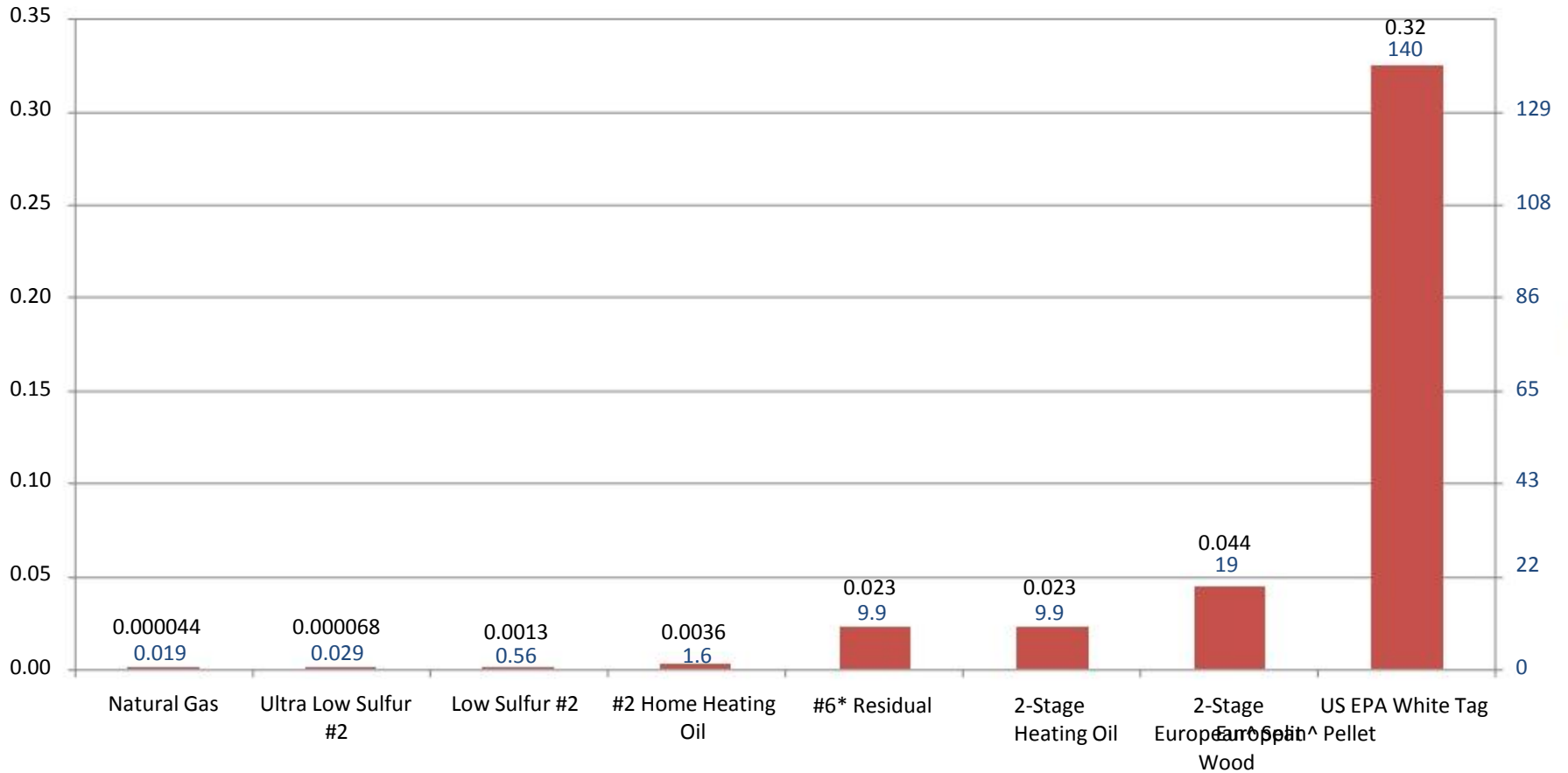
Energy Information Administration

•Wood dominates all types of residential renewable energy and will continue to do so potentially for decades.

Most Wood Heating Equipment is Outdated and Too Polluting



Fine Particulate Emissions (Output) for Residential Boilers by Fuel Type



Fuel

ULS #2 home heating oil, 11 ppm sulfur, 85% efficiency
 LS #2 home heating oil, 322 ppm sulfur, 85% efficiency
 #2 home heating oil, 1520 ppm sulfur, 85% efficiency

* Commercial Boiler, 70% efficiency (estimated)
 ^Average of Top 25% Performers

Single Stage



Efficiency

<40% (<<40% at idle)	>80% (at 50-100% load)
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Water Volume

300 gallons	45 gallons
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Wood Charge

250 pounds (2.1 mmBtu)	75 pounds (0.64 mmBtu)
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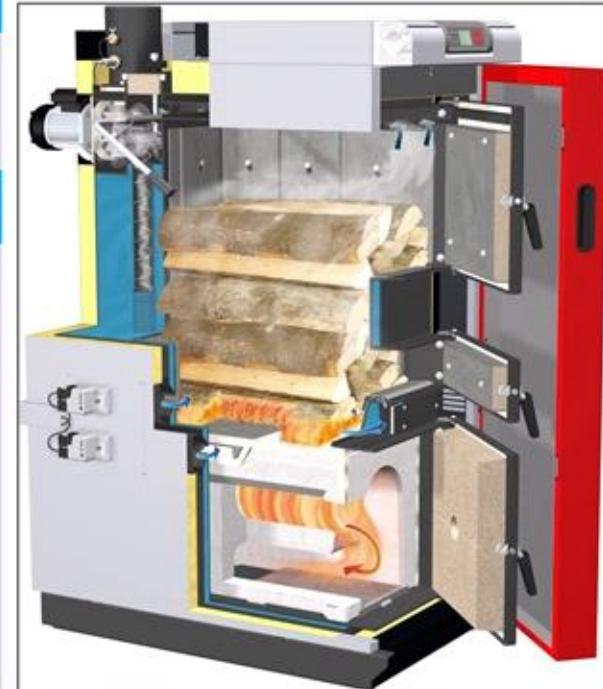
Controls

Damper: Open/Closed Fan: Hi/Low Fans might be optional	Lambda Sensor; Temp Sensor(s); Variable speed blowers; Advanced Algorithms
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PM2.5 Emissions

0.32+ lb/mmBtu Largely organic	0.03 lb/mmBtu Largely inorganic
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Two-Stage Gasification



Technology Comparison

EPA Certified



Next Gen



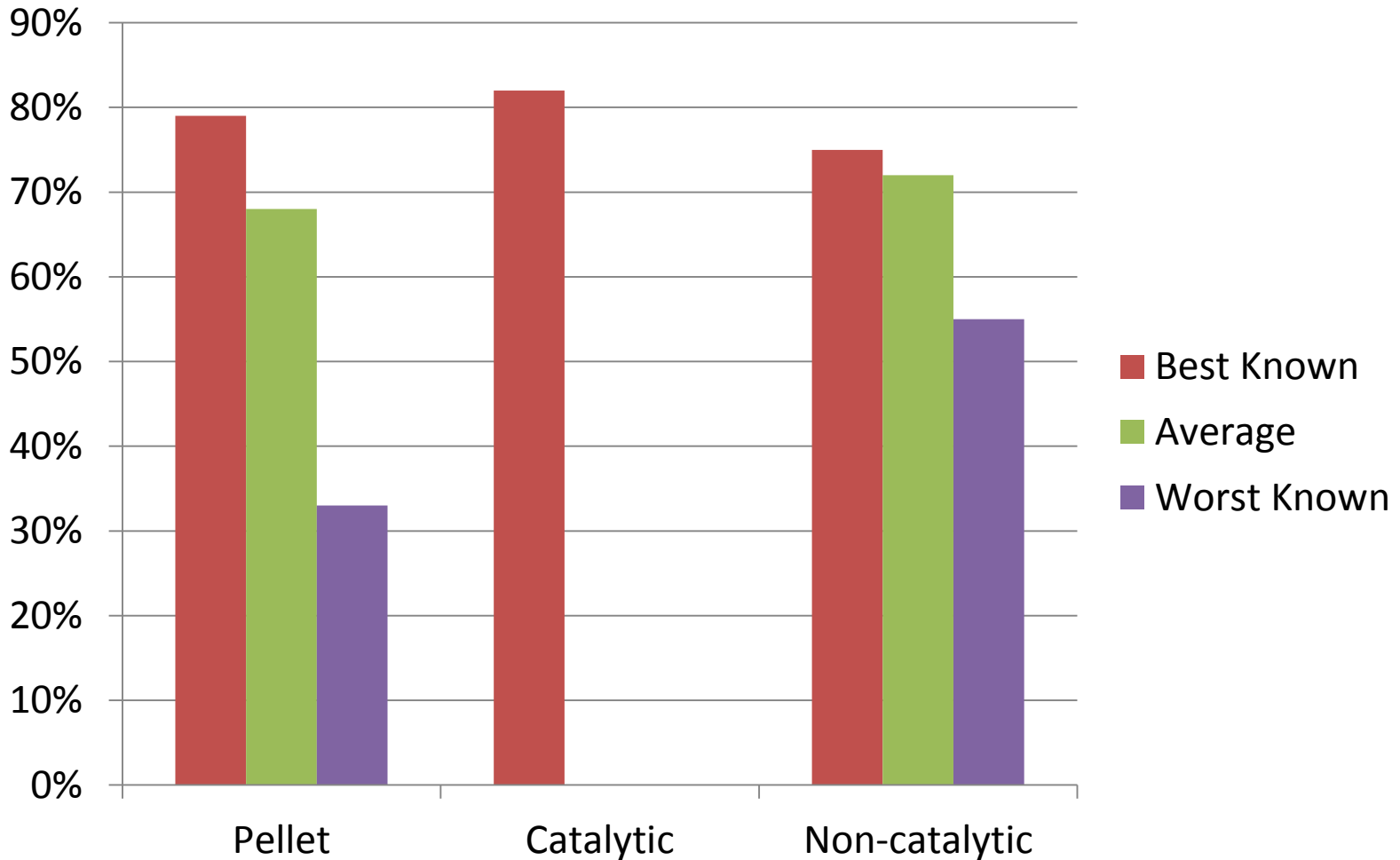
Efficiency	
65%	85%
Controls	
Natural draft; Operator Dependent; Unable to handle wet wood; Industry favors non-cats	Lambda Sensor; Temp Sensor(s); Real time Digital data; "Smart" features; Automated controls
PM _{2.5} Emissions	
2-4 gr/hr in lab Far higher in real world	.5-1.5 gr/hr in lab. Marginally higher in real world

BNL Lab Studies



Efficiency of appliances

Tested with B415.1 using High Heating Value (HHV)



Residential Market is Backbone of Pellet Industry

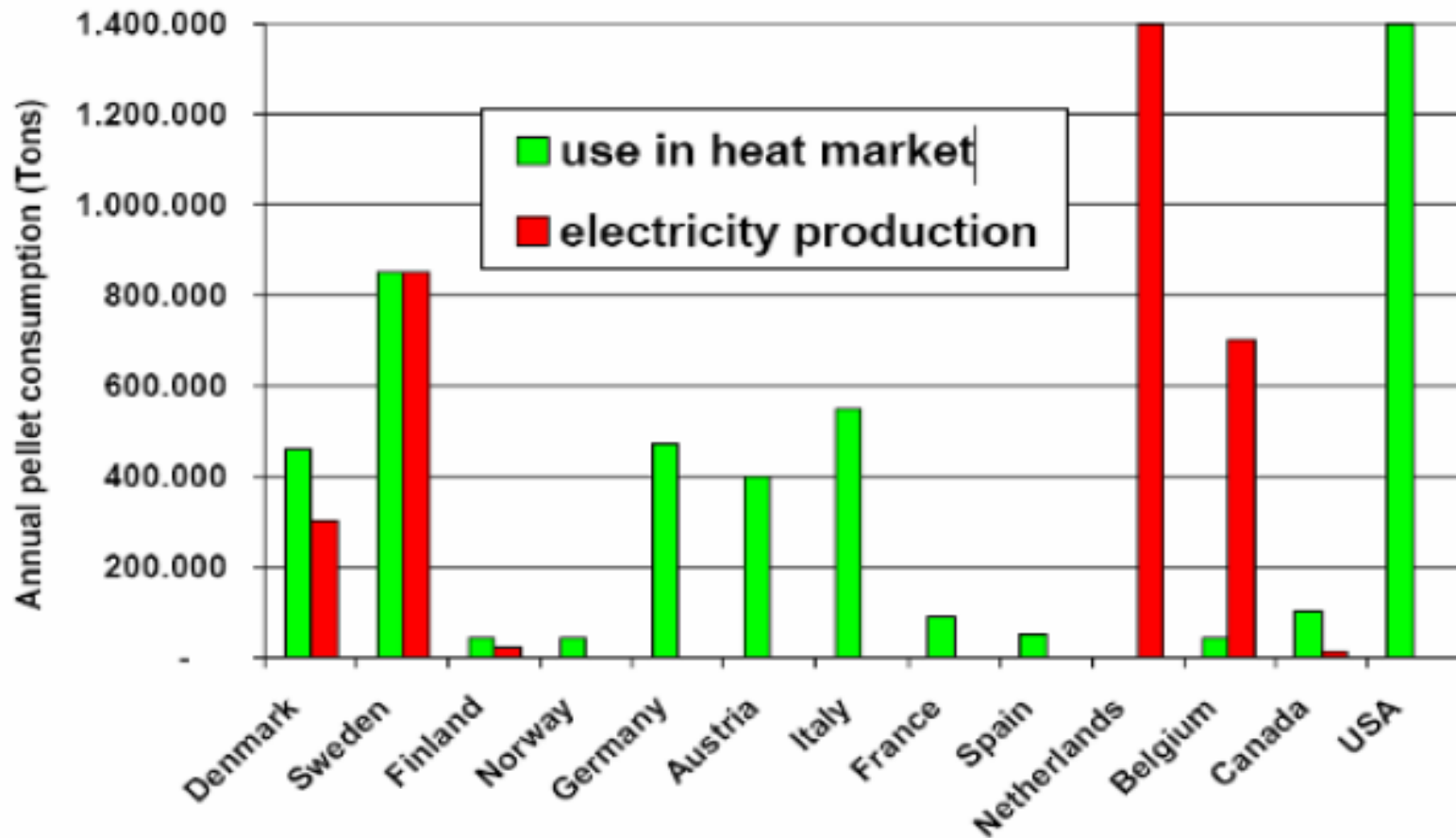


Figure nr 36. Pellets demand by sector in some European countries, Canada and USA in 2006.
(Source: proPellets Austria)

Policy Challenges and Recommendation

Solution is not in subsidized change-out programs. They are:

- * Expensive & time consuming
- * Only worthwhile in small targeted, non-attainment areas.
- * Often result in installations of mediocre, inefficient equipment

Solution lies in the technology, the consumer and the free market. Like with a refrigerator, a car or a cell phone, there needs to be “next generation” equipment that has:

- * more attractive features
- * saves money
- * saves time
- * is “smart,” has some “Appleness” and
- * is at least half as cool as solar panels



1. The Way Forward: EPA

We need stricter emissions and efficiency regulations.

The NSPS offers the industry badly needed regulation; it can provide new lease on life and a PR boost to the industry just as the 1988 NSPS did.

- ✓ Covers all common heaters. Boilers, pellet & masonry stoves and cheap wood stoves no longer exempt. Only fireplaces remain exempt.
- ✓ For stoves, emissions remain about the same. For boilers, they are stricter.
- ✓ Could add a 70% efficiency minimum for stoves.



2. The Way Forward: EIA

We need the information, documentation and analysis that other renewables and heating fuels have.



“Wood pellets represent a significant opportunity for consumers to save money.”

Adam Sieminski, EIA Administrator,
Press conference, Oct. 10, 2012

“Wood consumption in homes has risen over the past 10 years, reversing a trend seen in the last two decades of the 20th century. In 2009, U.S. households consumed about 0.5 quadrillion Btu (quads) of wood. Household fuel oil consumption, by comparison, was only slightly higher at 0.6 quads.”

EIA 2012 Winter Fuel Outlook



3. The Way Forward: Congress

We need to be incentivizing increasingly clean and efficient appliances, just like any other appliance

- ✓ If Congress extends the 25C tax credit of \$300, they should stipulate that stoves must be 70% efficient using B415 at HHV.
- ✓ Ultimately, high efficiency wood heaters should be part of 25D, the Renewable Energy title, not 25C, the energy efficiency title.



4. The Way Forward: States

- ✓ States should include cleanest and most efficient stoves and boilers in renewable energy incentive programs.
- ✓ By focusing on solar & geothermal, states provide rebates and tax credits to wealthy residents while leaving out ordinary residents
- ✓ Innovative MD program is only open to homes heated with oil, propane & electricity.
 - ✓ Helps families with highest cost heating fuel and keeps more wood stoves out of densely habited areas.
 - ✓ \$400 rebate for wood stove; \$600 for pellet stove



Maryland Energy
ADMINISTRATION
Powering Maryland's Future

5. The Way Forward: Including Wood Stoves in Energy Audits, BPI standards

The Home Energy Auditing Standard (BPI-1100-T-2012):

- ✓ 7.8: Energy auditors shall inspect solid fuel burning appliances for safe operation and efficiency.
- ✓ 7.23: Energy auditors shall recommend replacement of solid fuel burning appliances with UL-listed and EPA-certified appliances if the existing appliance is not UL-listed or has signs of structural failure.



Building Performance Institute, Inc.
BPI Standards



6. The Way Forward: Energy Star

- **Energy Star**: Industry, led by HPBA, should campaign for Energy Star Label Program
 - Based on efficiency and possibly emissions.
 - Would cover top 20% of stoves
 - Would make state rebates and tax incentives much more likely.
 - A huge benefit to consumers
 - A implicit stamp of approval
 - Increased credibility for stoves



7. The Way Forward: DOE

Research & Development

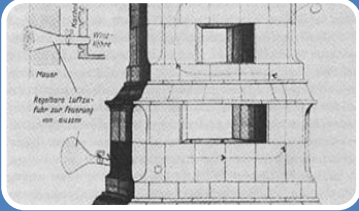


R & D is sorely missing in the residential thermal biomass sector. Industry is too small and too strapped. R & D has not been recognized as a government priority. We need

- State Prioritizing
- Federal Funding – DOE, EPA, USDA
- University engagement

Stove Technology Competitions

driven by wood scarcity, oil prices & climate change



1783 – During a period of extreme cold in Europe, Frederick the Great holds a contest for the most efficient masonry stove (w/ outside air)



1796 – Firewood shortages prompts the American Philosophical Society to offer a \$60 prize for the "best construction or improvement of stoves."



1970 – Three friends hold a competition among themselves to build the best wood stove.



2012 – The Alliance for Green Heat launches an competition to design a “next generation” wood stove.



Wood Stove Design Challenge:

- ✓ Modeled on the DOE's Solar Decathlon
- ✓ \$25,000 prize for cleanest, most efficient & innovative wood stove.
- ✓ Held on the DC National Mall in November 2013.
- ✓ To engage and challenge perceptions of policymakers and public about their image of wood heat.
- ✓ Build expectations and demand for really clean, efficient heaters.



Goals:

- ✓ To challenge perceptions of policymakers and public about their image of wood heat
- ✓ Challenge wood heater industry's image about who we are and where we can go.
- ✓ Build expectations and demand for really clean, efficient heaters.
- ✓ Recognize and publicize cleanest heaters.
- ✓ Showcase low-cost catalyst systems, low-cost sensor technology and automation. Operator only loads stove and does not adjust air.

Judges



Raymond
Albrecht

*Consulting
Engineer*



Ellen
Burkhard

NYSERDA



Thomas
Butcher

*DOE
Brookhaven
National
Laboratory*



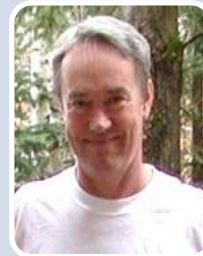
Bill
Clarke

*Osprey
Foundation*



James
Meigs

*Popular
Mechanics*



Norbert
Senf

*Masonry
Heater
Association*



Kirk R.
Smith

*University
of
California,
Berkeley*



Rod
Tinnemore

*Wash.
State Dept.
of Ecology*

Partners and Sponsors of Wood Stove Design Challenge

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