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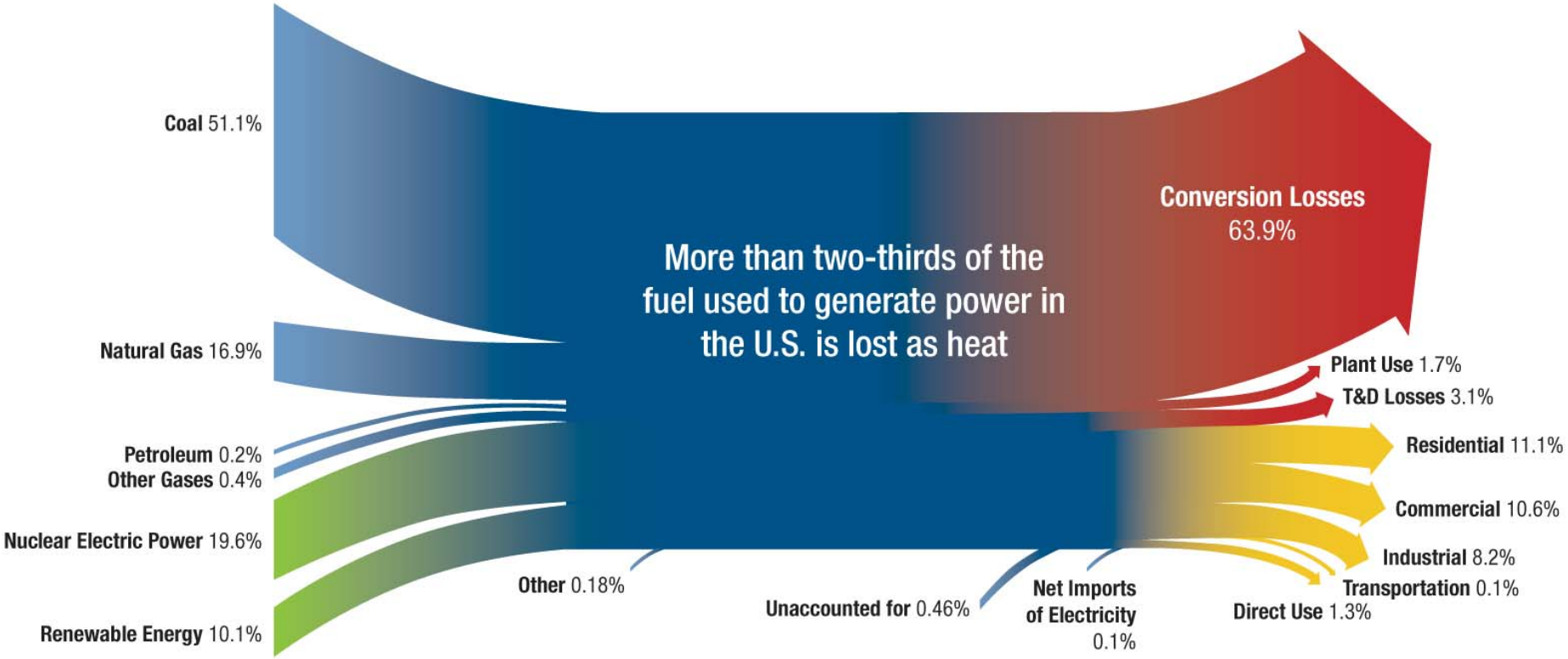
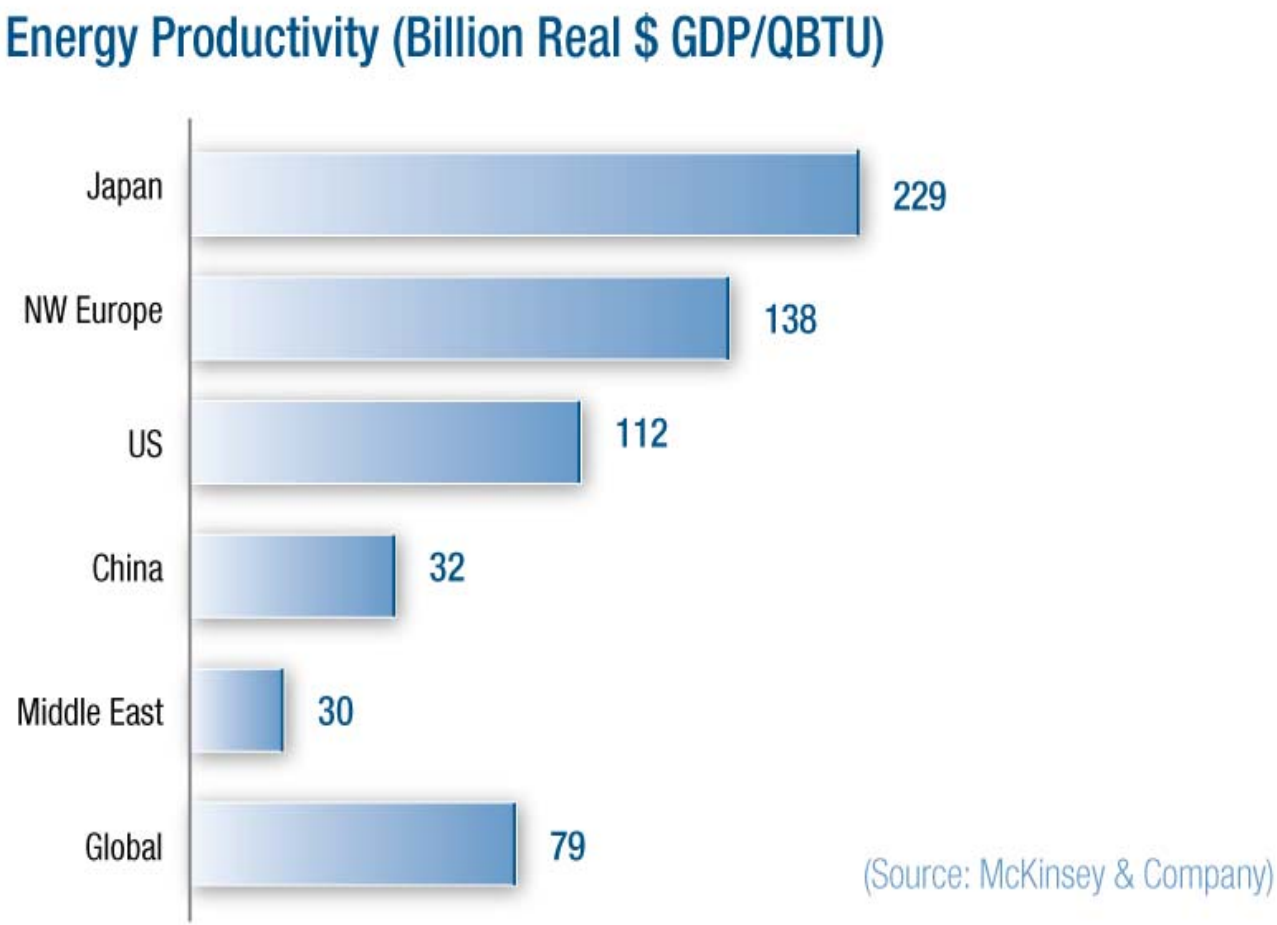
Energy Flows in the US Economy

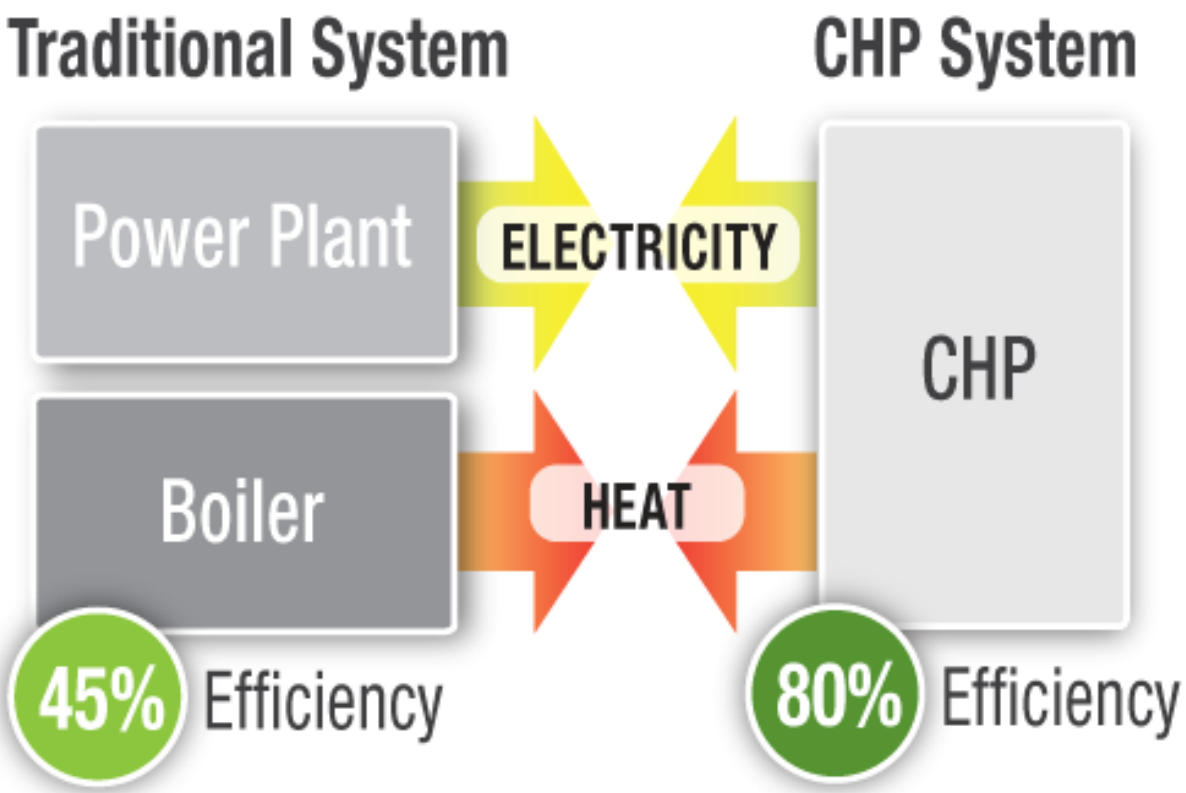


The US is not as Efficient as it Could be



CHP Compared to Traditional Heat and Power

CHP Process Flow Diagram



CHP In the Market Today

- 85,000 MW installed at 3,400 sites (2007)
- Represents almost 9% of total U.S. generating capacity
- Saves an estimated 1.9 quads of fuel use per year
- Eliminates over 245 million metric tons of CO_2 emissions annually

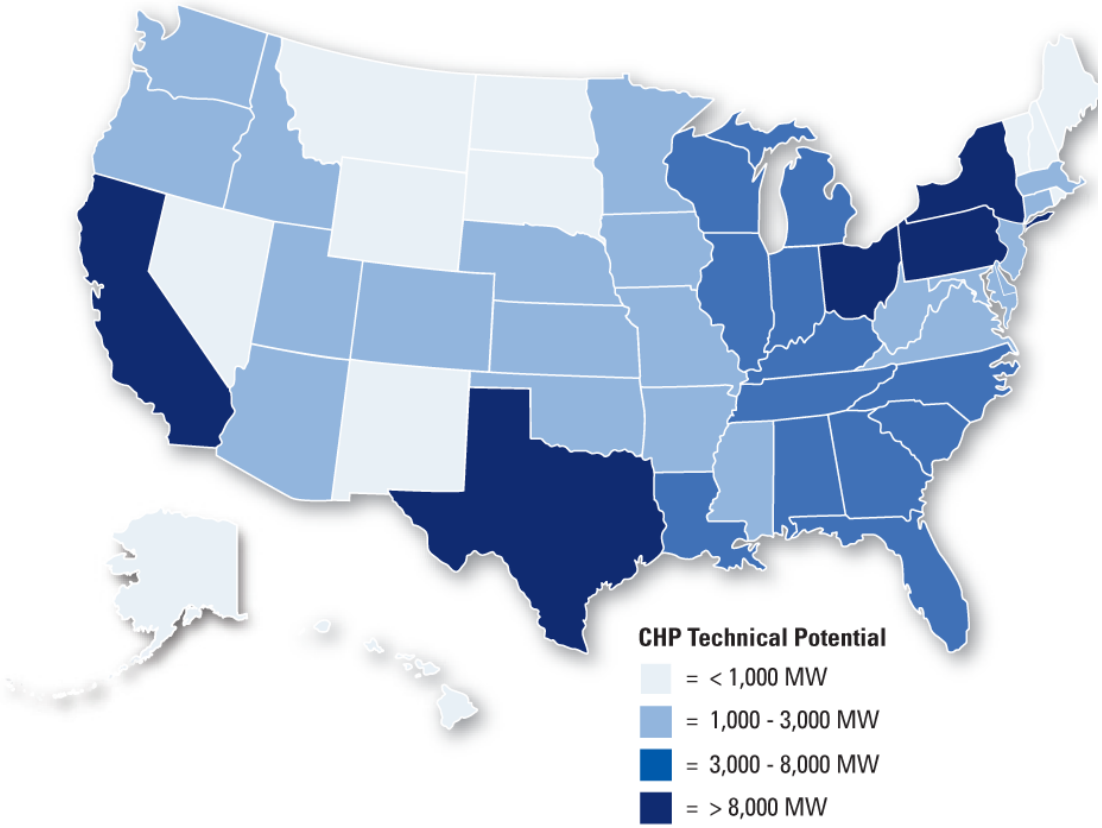
Based on comparing the annual fuel use and CO_2 emissions of existing CHP with separate heat and power comprised of on-site thermal energy supplied by the same fuel type and average fossil based electricity generation for 2006 (AEO 2008) with 7% T&D losses.

2006 Existing CHP - 9% of U.S. Capacity	**85** GW
Reduced Annual Energy Consumption With CHP	**1.9** Quads
Total Annual CO_2 Reduction	**248** MMT
Carbon Saved	**68** MMT
Number of Car Equivalents Taken Off Road	**45** million

Source: Based on *Annual Energy Outlook 2008* (AEO 2008), U.S. Energy Information Administration and eGRID, EPA.

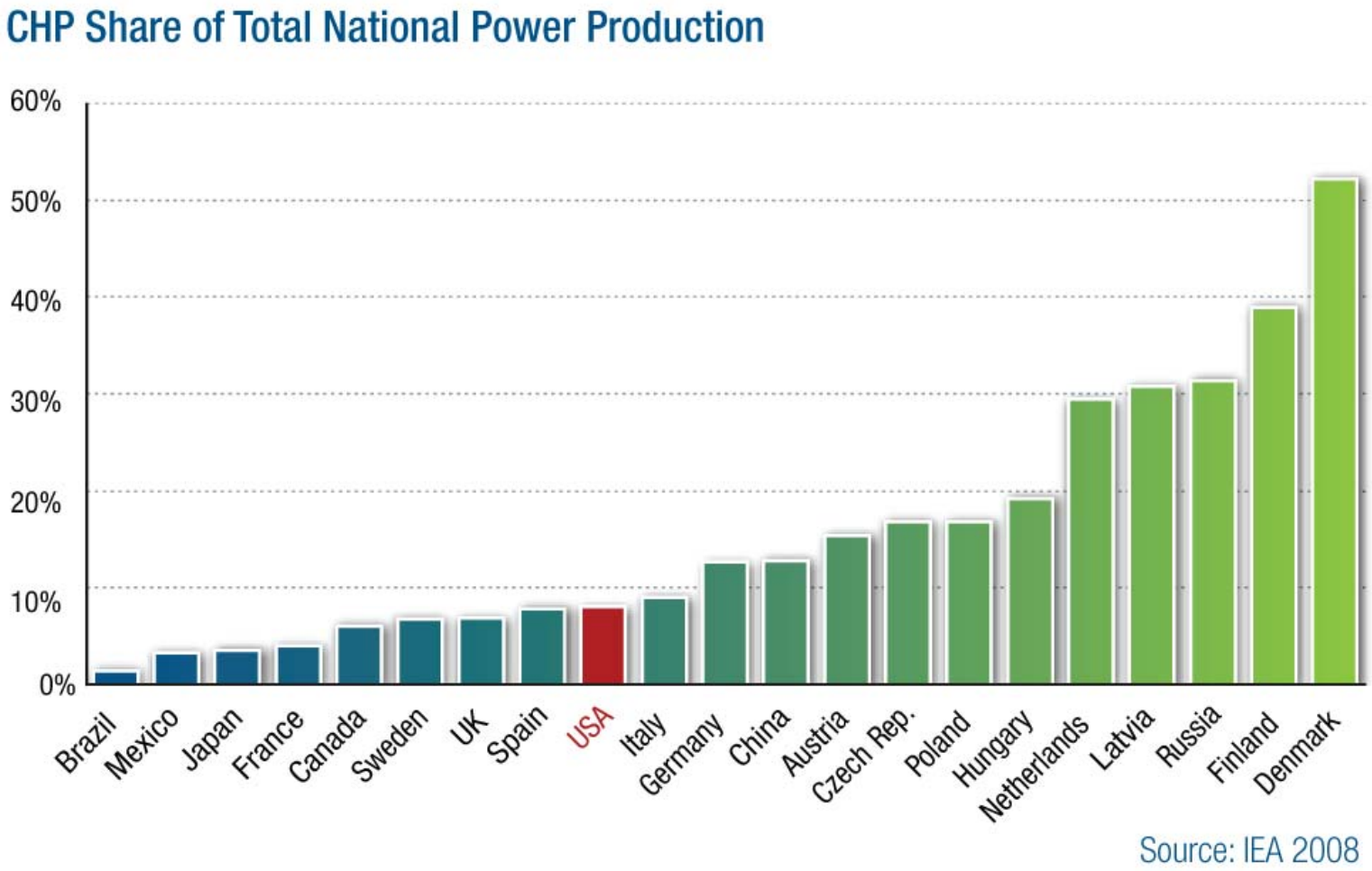
CHP Technical Potential

Remaining Technical CHP Potential

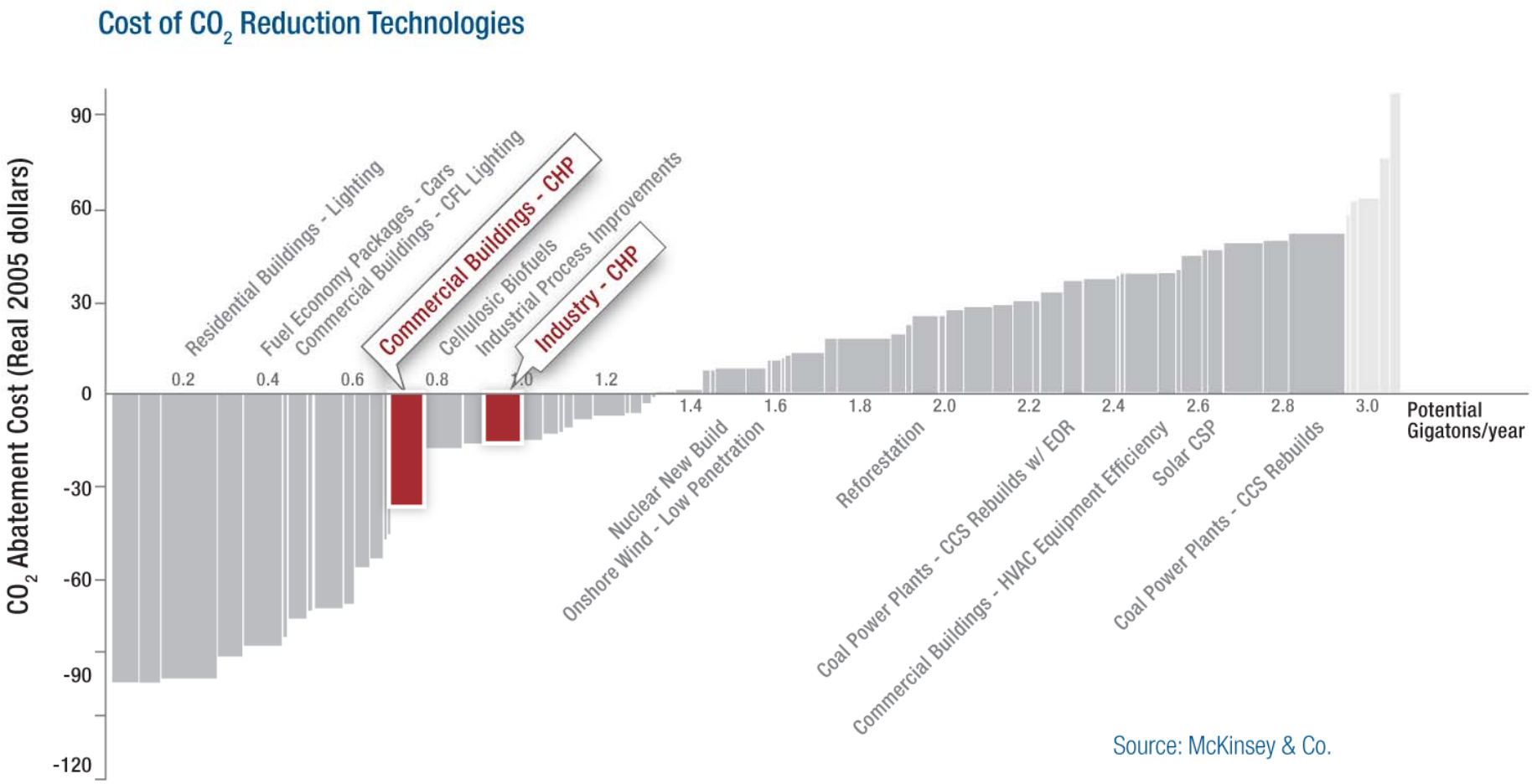


Rank	State	Total Capacity 2006 (MW)
1	TX	17,240
2	CA	9,220
3	LA	6,959
4	NY	5,789
5	FL	3,545
6	NJ	3,493
7	AL	3,362
8	PA	3,242
9	MI	3,104
10	OR	2,523

CHP in US Compared to other Countries



CHP Is a Cost-effective CO_2 reduction option



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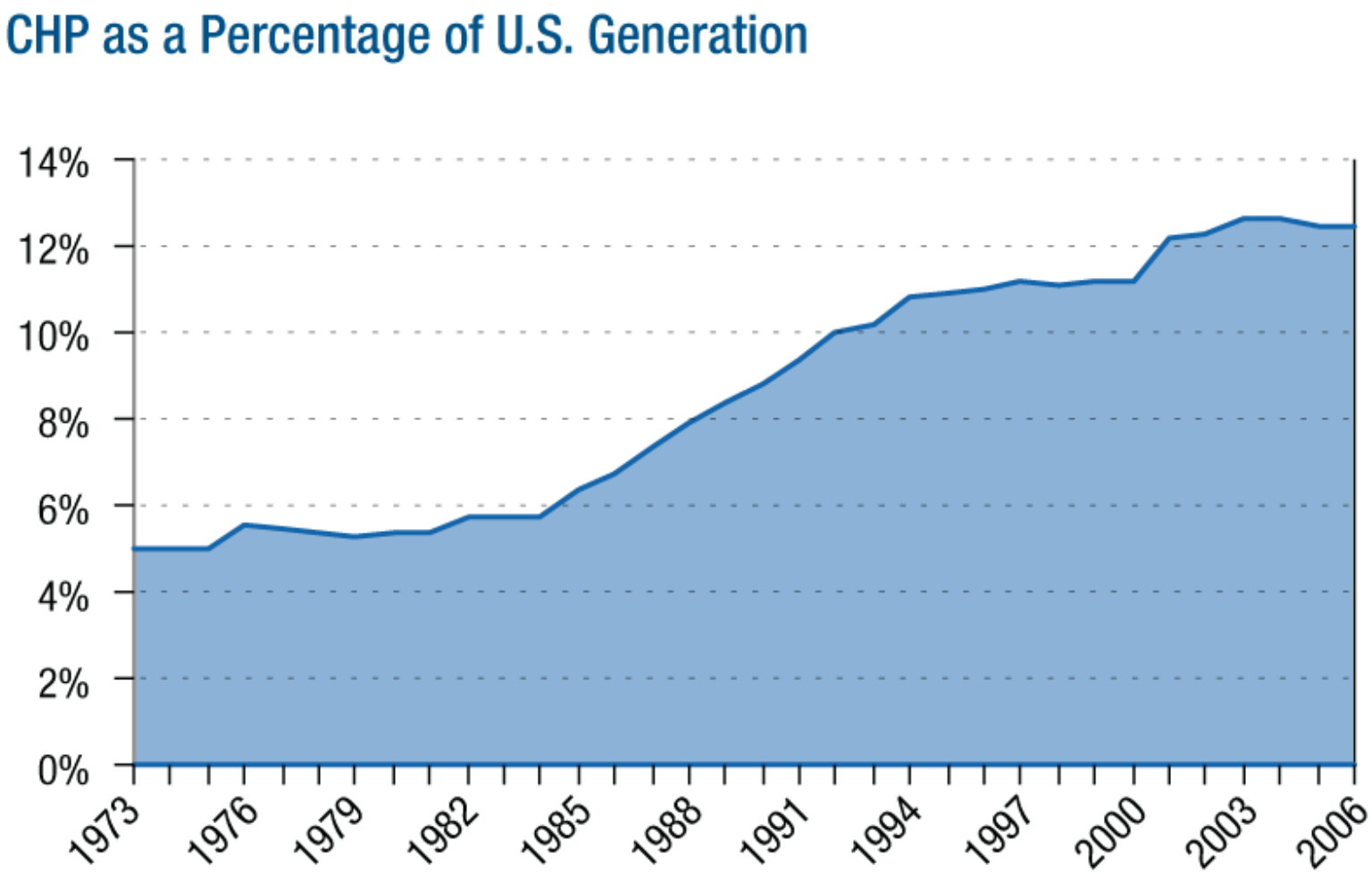
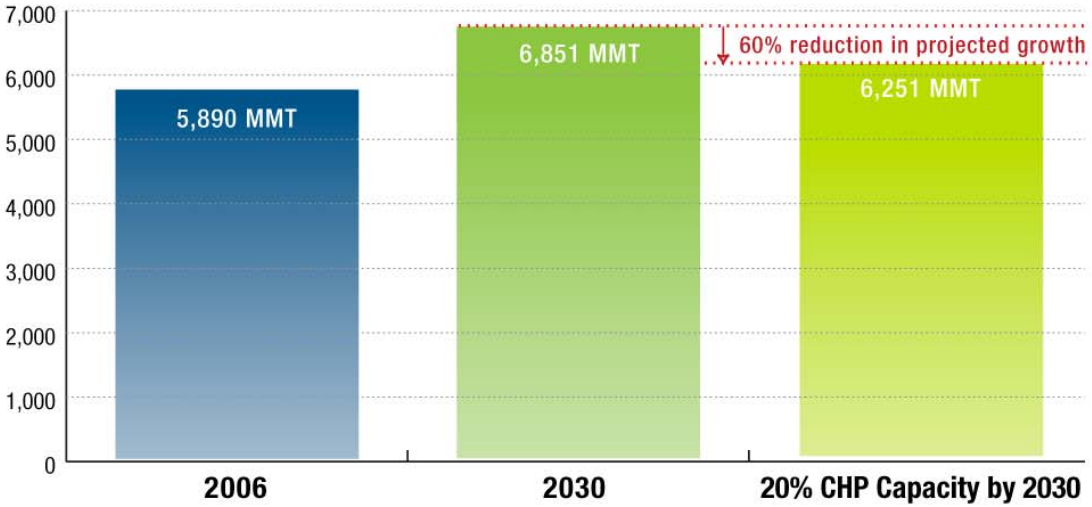


Increasing CHP Capacity to 20% -- What would it mean?

2030 CHP – Proposition: 20% of U.S. Capacity	**240,900** MW
Reduced Annual Energy Consumption with CHP	**5.3** Quads
Total Annual CO_2 Reduction	**848** MMT
Total Annual Carbon Reduction	**231** MMT
Number of Car Equivalents Taken Off Road	**154** million

US Carbon Dioxide Emissions 2006 and 2030 (MMT)



Source: DOE EIA AEO 2008 and internal analysis

What Limits CHP Adoption in the US?

- Regulated Fees and Tariffs
- Interconnection Issues
- Environmental Permitting
- Tax Treatment
- Technical Barriers

Regulated Fees and Tariffs

- Utility rate structures link revenues to the number of kWh sold
- CHP societal benefits are not monetized properly under current structures
- Stand-by and Back-up service charges may be prohibitive

Interconnection Issues

- Application processes and fees can vary by service territory and state
- Manufacturers unable to economically produce modular packages for interconnection
- IEEE 1547 Standard for Interconnecting Distributed Resources – states are not required to adopt the standard

Environmental Permitting

- Regulations based on heat input (lbs/MMBtu) or exhaust concentration (ppm) in 31 states
- CHP may potentially increase onsite emissions, while lowering total regional emissions
- New Source Review (NSR) requires SOA emissions control equipment whenever a new major source or major modification is made

Tax Treatment and Technical Barriers

- CHP systems do not fall into a specific depreciation category -- schedules range from 5 to 39 years

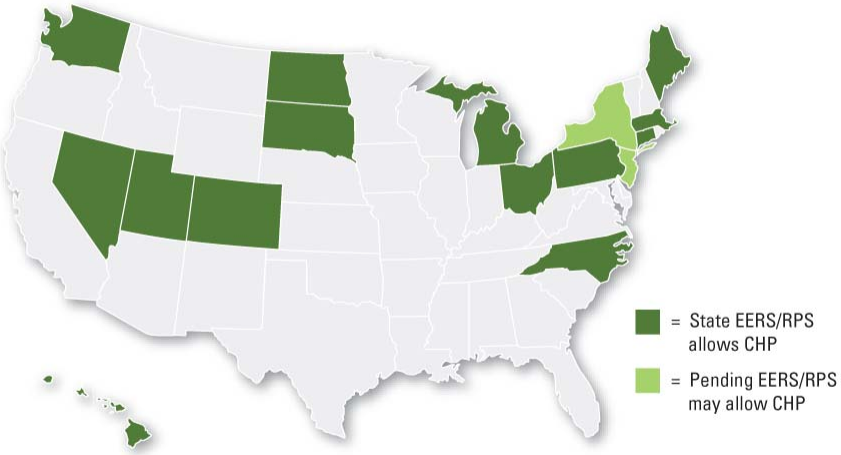
- System and component capital costs, emissions control, fuel costs and risk limit adoption. RAMD can adversely effect life-cycle costs

What Role can Policy Play?

- Recognize CHP as an important energy efficiency option
- Support technology research, demonstration and deployment
- Consider incentives to overcome market barriers and promote societal benefits
- Promote new business models through regulatory and policy change

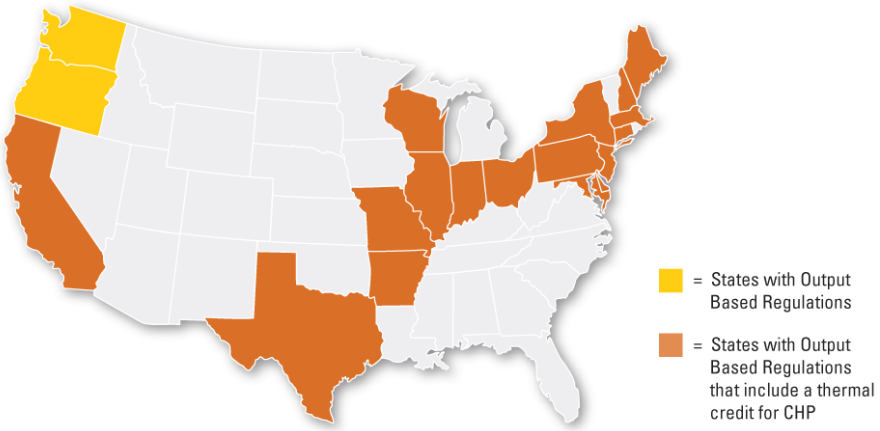
Progress on the Policy Front - Evironmental

States with Portfolio Standards That Include CHP (as of April 2008)



North Dakota and Nevada include waste heat CHP only. Source: EPA

Output-Based Emissions Standards



Source: ACEEE

Progress on the Policy Front

- Energy Improvement and Extension Act of 2008 – allows a 10% Investment Tax Credit

- Cap and Trade – No federal program yet, but some regional agreements like RGGI will favor increased efficiency via CHP

Conclusions

- CHP should be one of the first technologies deployed for near-term carbon reduction
- Energy-efficiency benefits of CHP offer significant, realistic solutions to US energy issues.
- A balanced set of policies, incentives, and business models can stimulate the adoption of CHP.