



Waste Heat to Power

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3rd Annual Waste Heat to Power Workshop, 2007

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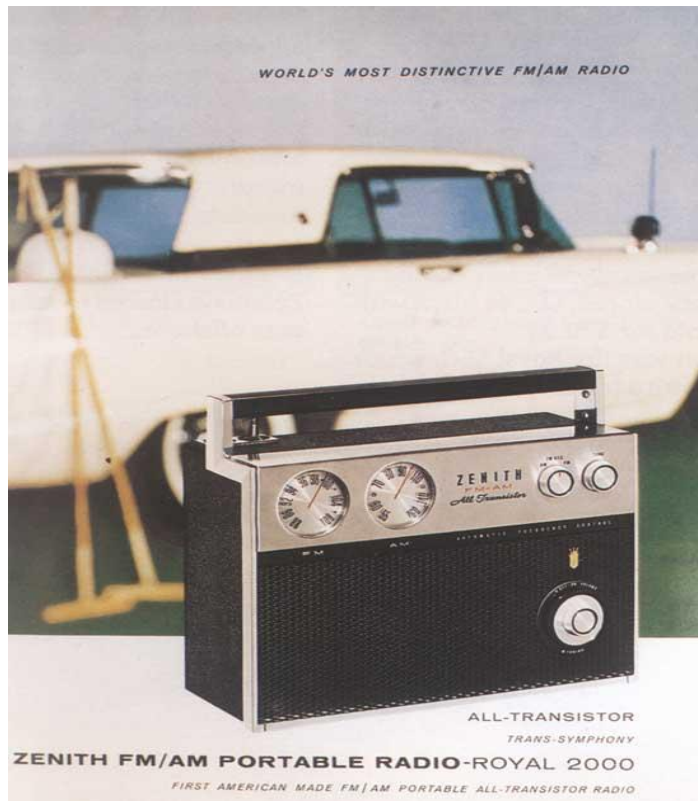


Presentation Summary

- ❑ Unprecedented technology gains since 1958, but:
- ❑ Electric efficiency frozen for five decades
- ❑ Top Ten Reasons for stagnate efficiency
- ❑ Possible removal of some barriers to efficiency
- ❑ ~~Will you help remove barriers?~~

Consider Radios

1959



2007



Consider Air Travel

1959



2007



Consider Computers

1959



2007



Consider Electric Generation

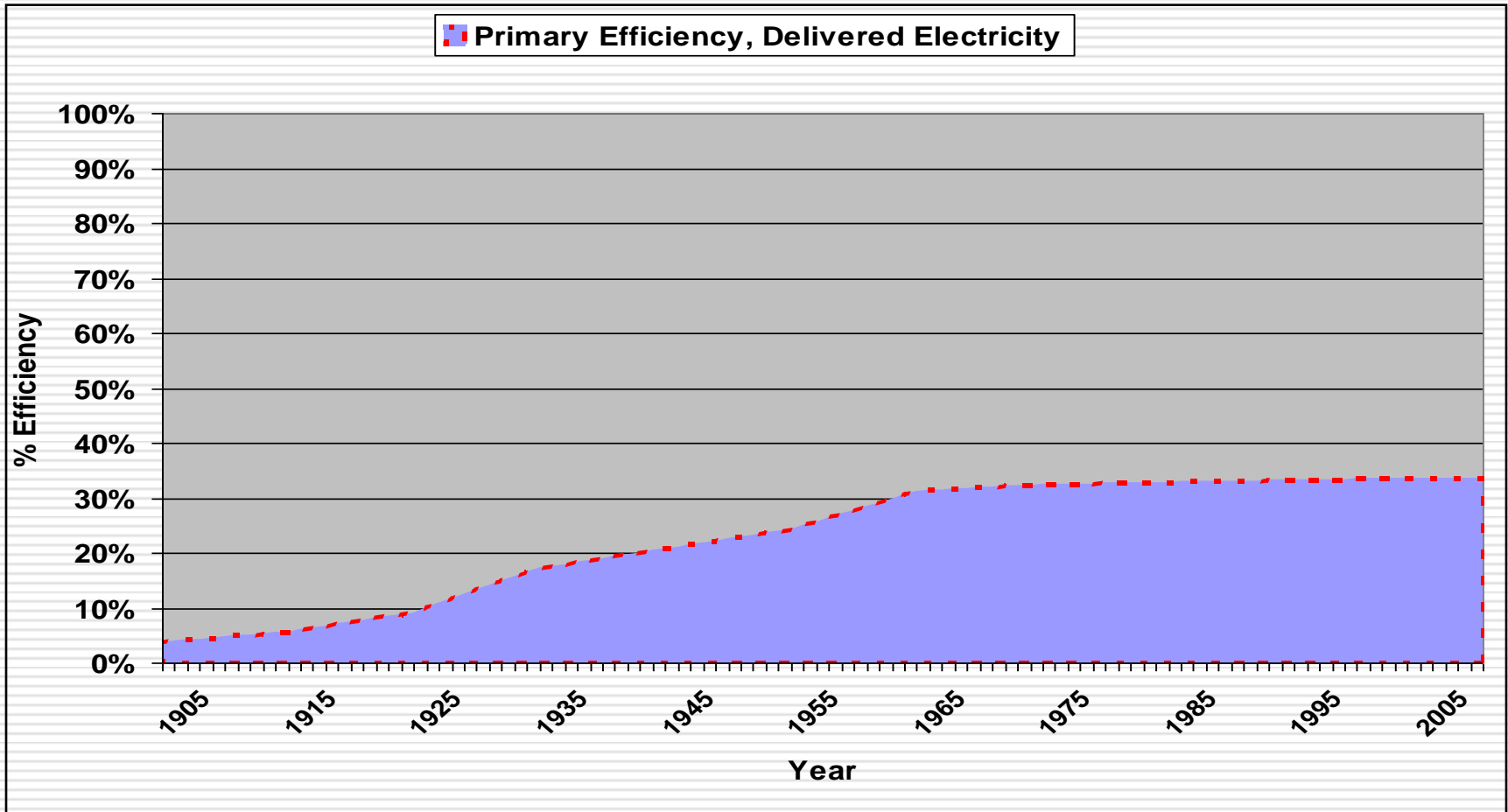
Dominant Central Generation 1959 and 2007



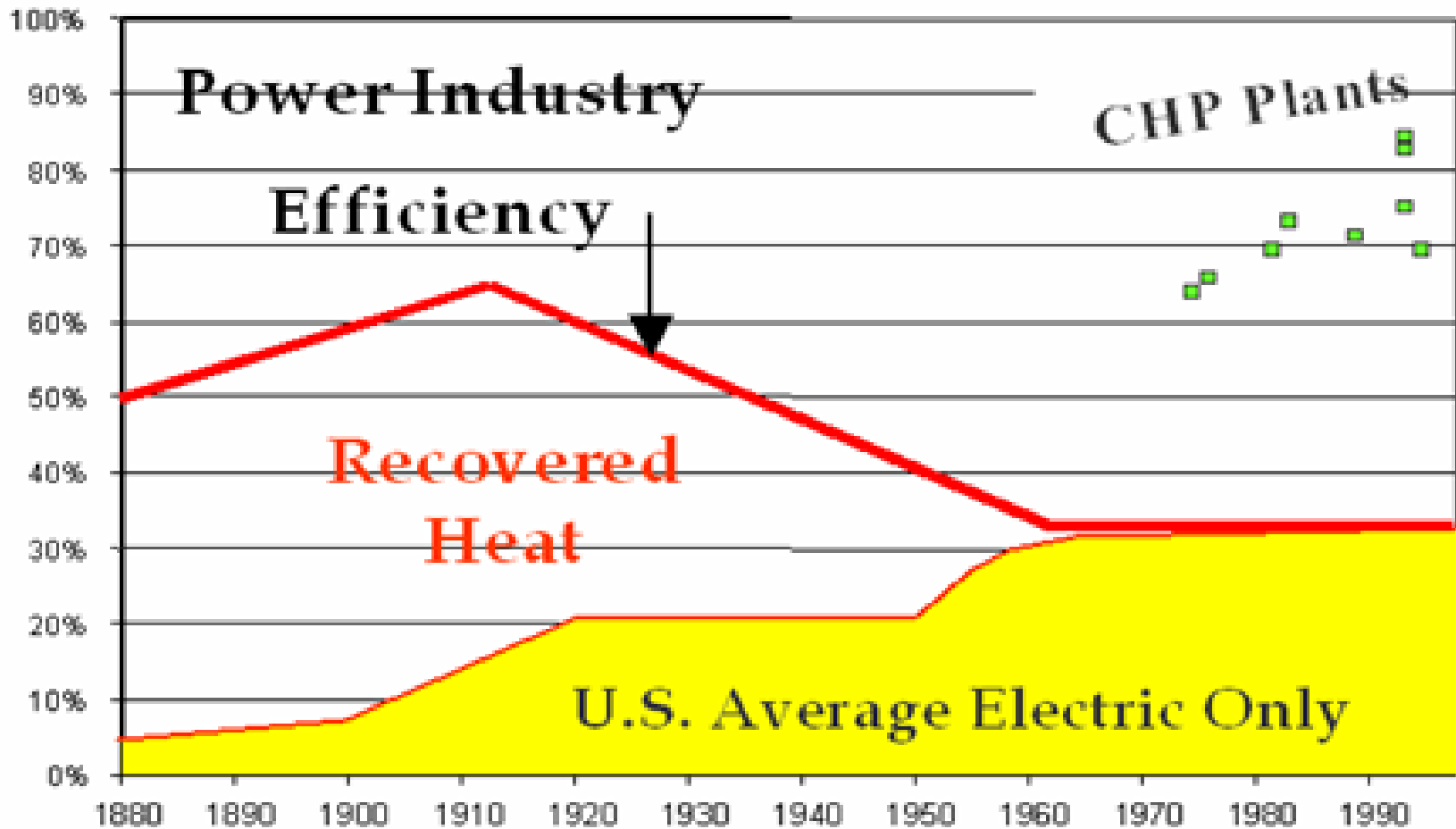
**Eddystone Power Station (PA)- twin coal-fired units (combined 650MW)
built in 1959 and still operating in 2007**



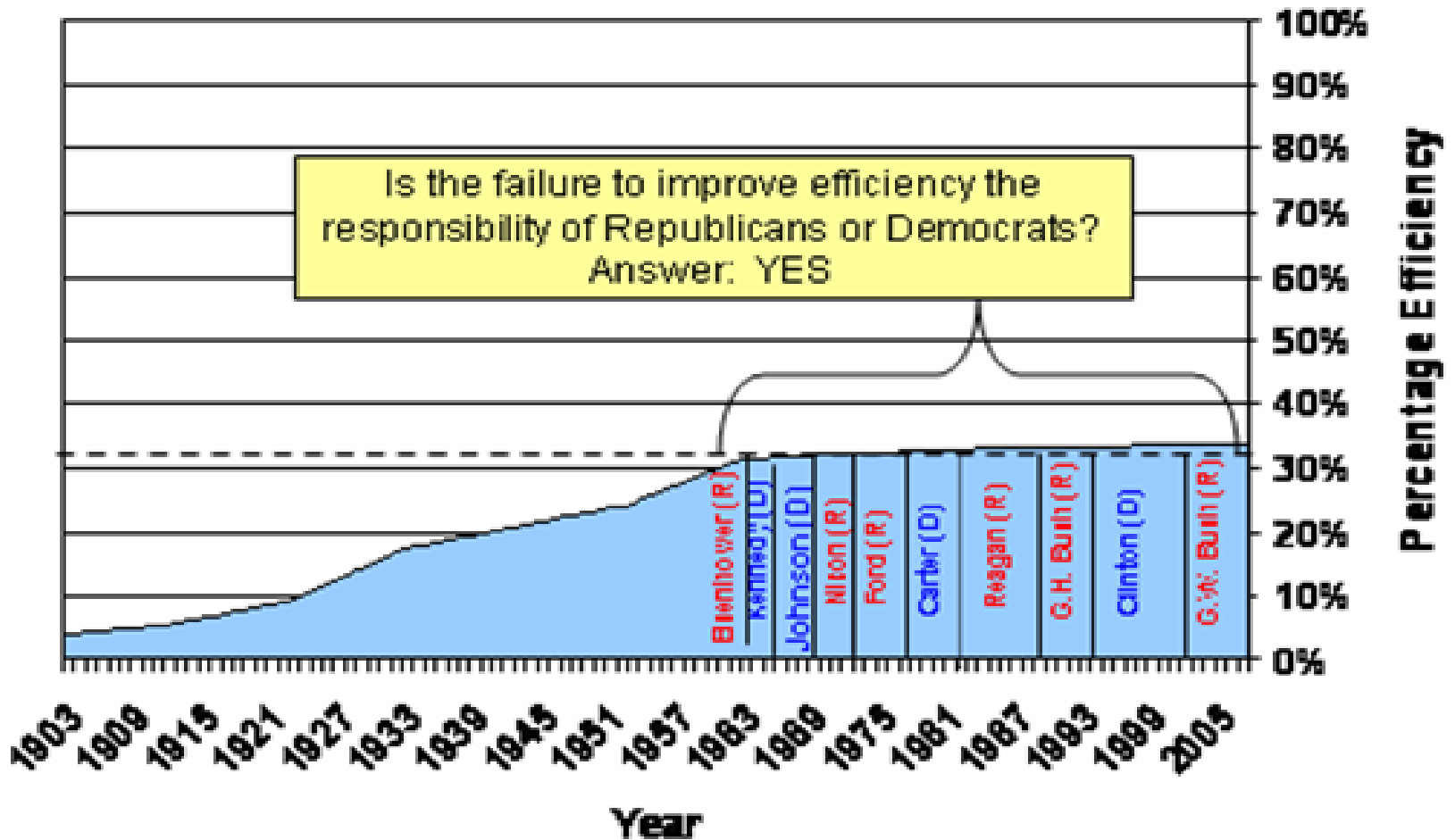
U.S. Electric Efficiency 1900 - 2005



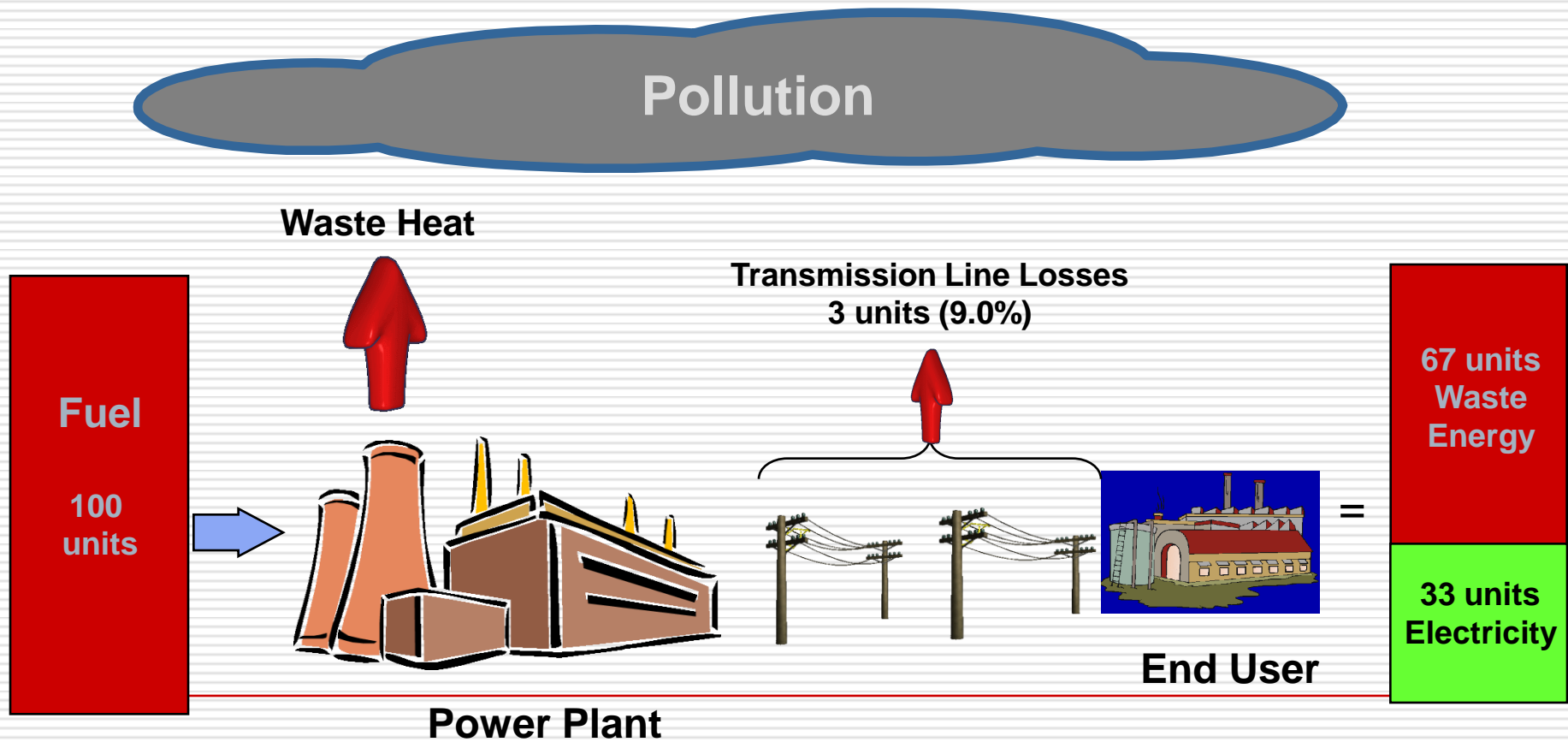
Net Power Industry Efficiency Peaked in 1910



US Electric Efficiency, Last Ten Presidents

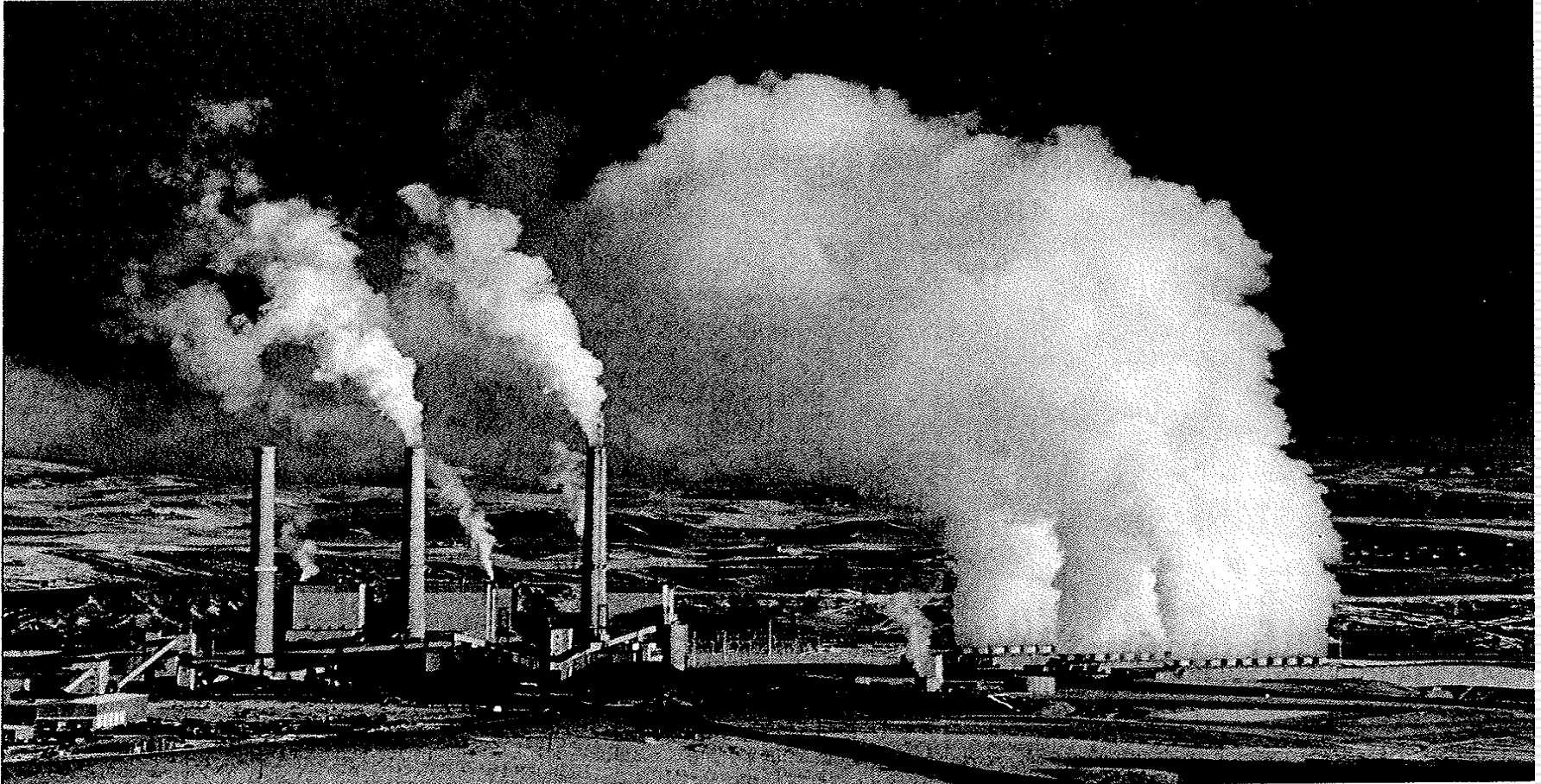


Conventional Electric System Efficiency Since 1959





Remote Generation Waste (66%)





Local Generation Recycles Heat To Industrial Plant (85% efficiency)





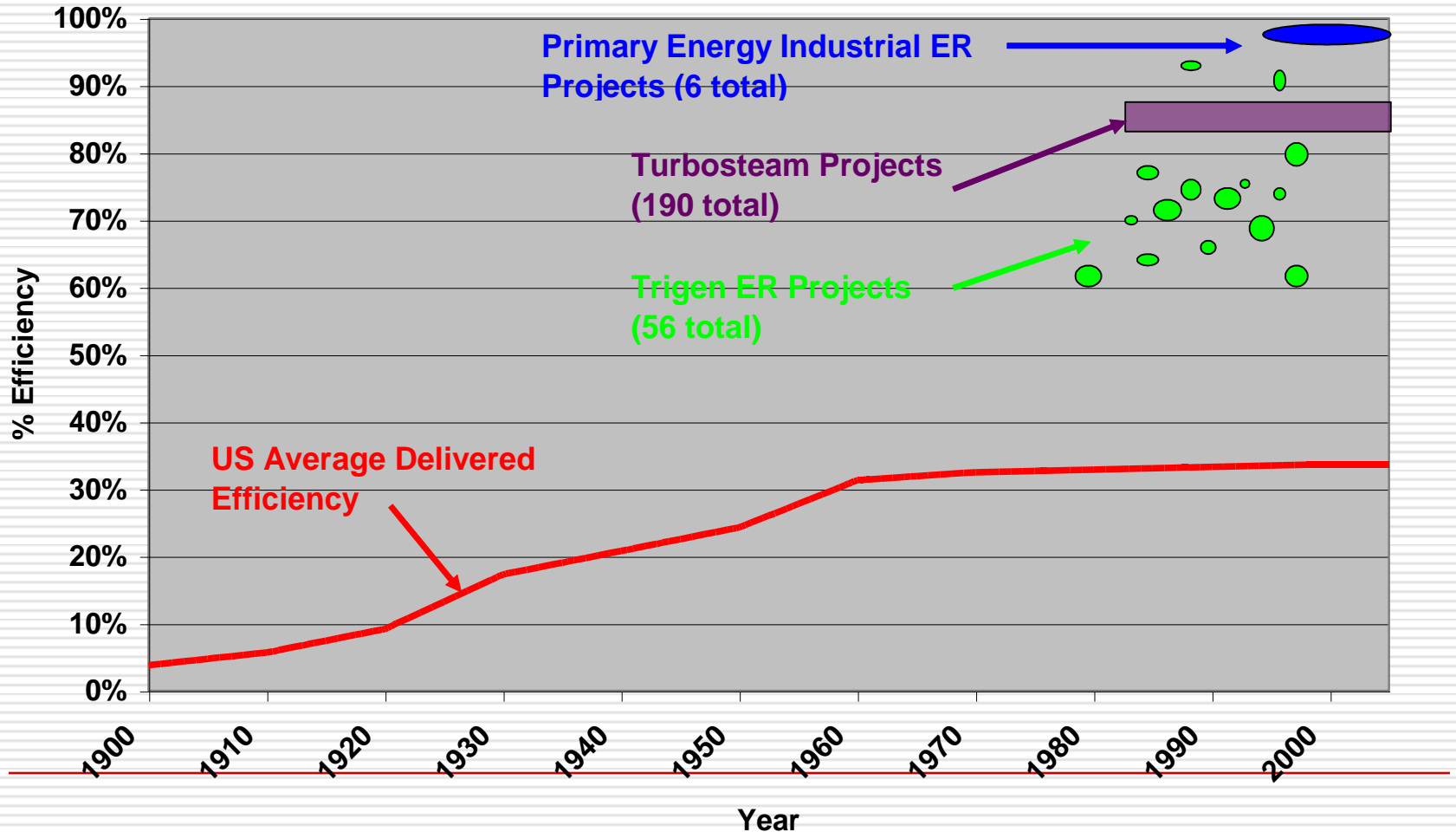
90 MW Recycled from Coke Production





30 Years Experience

250 Plants, \$2.0 Billion

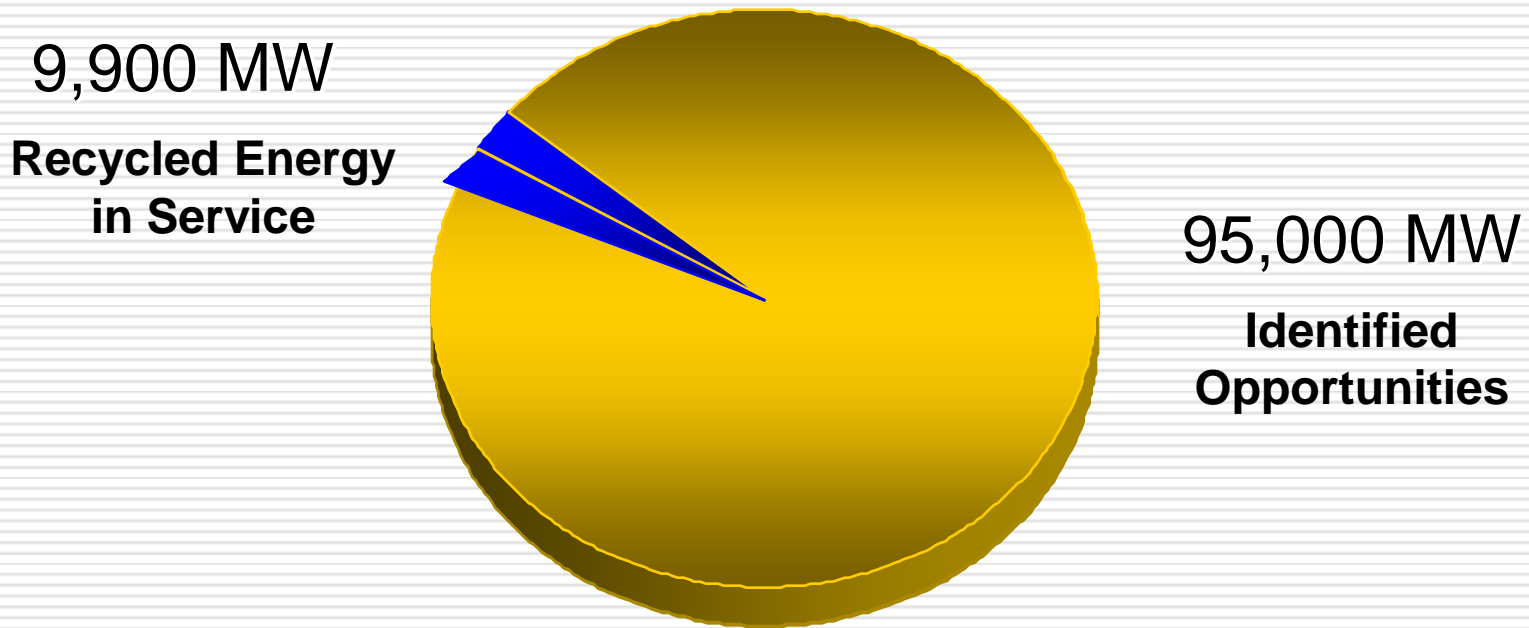




Best New Generation: Recycle Industrial Energy

- ❑ Wasted energy streams in nineteen industries could generate 19% of US electricity

Recycled Energy in the US



Source: USEPA 2004 Study



Estimated Potential to Recycle Waste Energy (Million MWh)

□ 2005 US fossil elec. generation:	2,633
□ Waste Energy Recycling potential	
■ From Industrial waste energy	450
■ From new CHP plants	<u>900</u>
□ Total Energy Recycling potential:	1,350
□ Avoided fossil central gen.:	51%
□ Avoided U.S. CO ₂ :	10% to 20%
□ US savings per year in billions	\$70



What Explains Five Decades of Stagnant Efficiency?

**Why do policy makers
ignore this 'elephant'
in the room?**



Top Ten Reasons for Efficiency Stagnation

- # 10: Distribution utilities seldom pay local generation plants for supplying VARS, capacitance, inductance
 - # 9: Distribution utilities have sole right to provide backup power to local generation plants, rates ignore the grid benefits from local generation.
 - # 8: Utilities recover their costs for rate cases, but local generators bear expense of rate case intervention.
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Top Ten Reasons for Efficiency Stagnation

- # 7: Commissions allow utilities to over specify interconnection designs to raise the cost of interconnection.
 - # 6: Typical rate structures create throughput bias, reward distribution utilities for blocking local generation.
 - # 5: Electric rates don't cover health and environmental costs of coal-fired generation, significantly understating true costs.
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Top Ten Reasons for Efficiency Stagnation

- # 4: EPA rules bestowed near immortality on old, dirty generation plants with grandfather rights to pollute.
 - # 3: Pollution permits ignore output of useful energy, Do not reward efficiency.
 - # 2: Commissions guarantee profits on utility investments while local generators bear all risk of their capital investment.
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Top Ten Reasons for Efficiency Stagnation

- **#1:** Universal bans on private electric wires crossing a public street.
 - (These bans 'gift' 30% to 50% of the value created by local generation to the distribution monopoly.)
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A Convenient Truth:

Recycling Can Profitably Reduce CO₂

- ❑ US can reduce CO₂ emissions by 20%, save \$70 billion/year with proven technology
 - ❑ Governments can induce **Energy Recycling** by sharing societal savings and removing barriers to local generation
 - ❑ House Energy Bill 3221, Subtitles E and G would achieve some of these goals
 - ❑ Will you help to end barriers to efficiency and enable **Energy Recycling**?
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Thank you