Waste Heat to Power
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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

Primary Efficiency, Delivered Electricity
Net Power Industry Efficiency Peaked in 1910
US Electric Efficiency, Last Ten Presidents

Is the failure to improve efficiency the responsibility of Republicans or Democrats? Answer: YES
Conventional Electric System Efficiency Since 1959

Pollution

Waste Heat

Transmission Line Losses
3 units (9.0%)

Power Plant

Fuel
100 units

67 units Waste Energy

33 units Electricity

End User
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

Primary Energy Industrial ER Projects (6 total)
Turbosteam Projects (190 total)
Triggen ER Projects (56 total)
US Average Delivered Efficiency

Year
% Efficiency
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Best New Generation: Recycle Industrial Energy

- Wasted energy streams in nineteen industries could generate 19% of US electricity
  - Recycled Energy in the US
    - 9,900 MW Recycled Energy in Service
    - 95,000 MW Identified Opportunities

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: 900
- **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.
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.
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.
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.)
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*?
Thank you