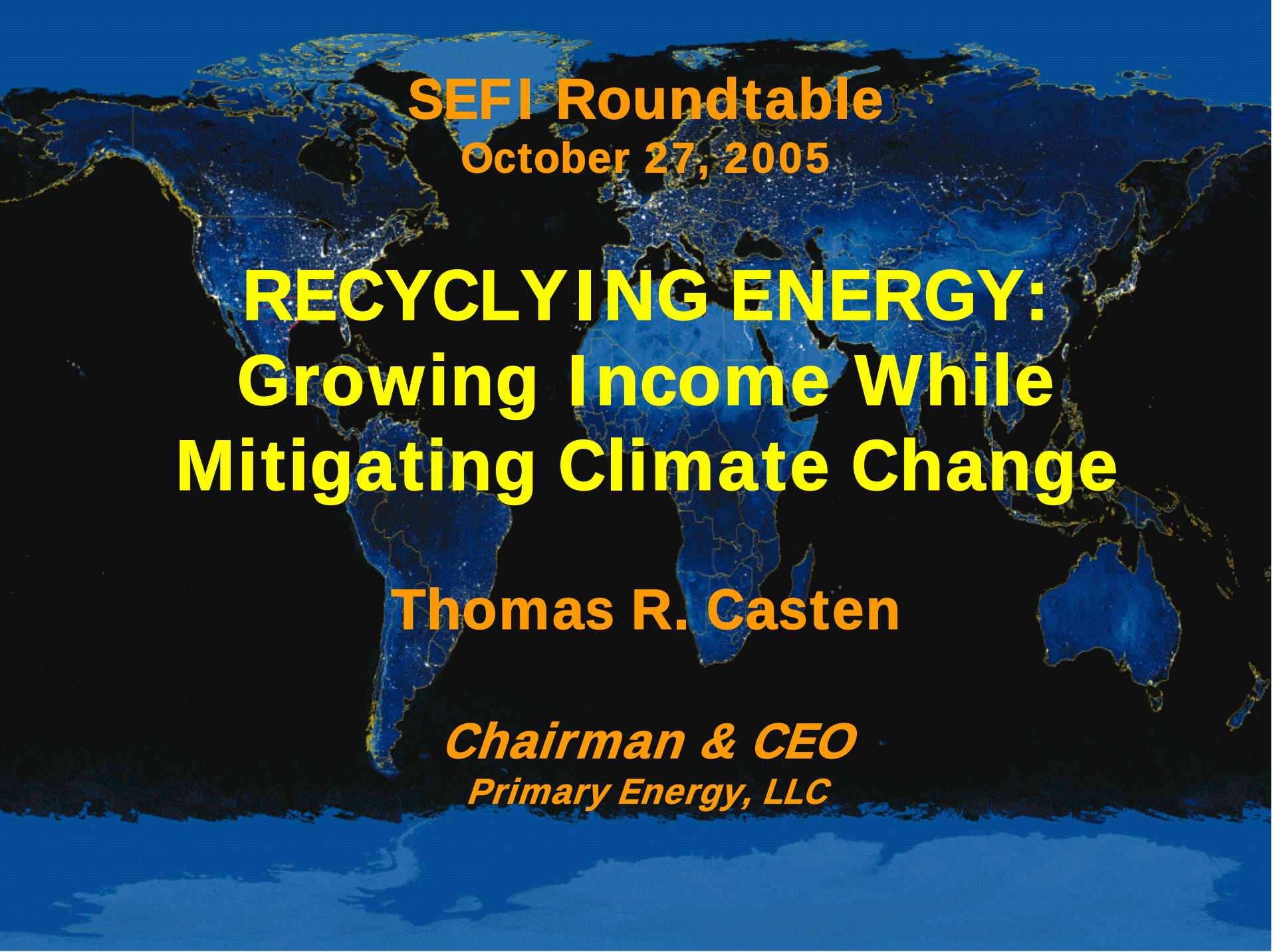

SEFI Roundtable
October 27, 2005

RECYCLYING ENERGY: Growing Income While Mitigating Climate Change

Thomas R. Casten

Chairman & CEO
Primary Energy, LLC

Personal History

- Focused on CO_2 reduction by efficient heat and power generation since 1975
- Formed Cummins Cogeneration Co, ’77, led to Trigen Energy Corp in ’86, NYSE in ’94, hostile takeover in 2000, started over with new team
- Organizations have developed/owned over 250 local power projects, 14 district energy projects, nearly all technologies and fuels
- Personal Mission: **Change the way the world makes power.**

Primary Energy

- Formed in 2001, after sale of Trigen Energy Corporation
- Mission: Create value by recycling energy
- 14 projects, 5 states, 200 employees
  - Revenues $250 million/year
  - EBIDTA $84 million/year
  - 785 MW electric, 3.7 million pounds steam
  - IPO of five projects, August 2005 as PERC

Primary Energy Recycling Corporation

- Initial offering portfolio of 5 facilities, Aug ‘05
  - Generating capacity 183 MW electricity, 1,850 Mlbs/hour of steam
- 5 recycling energy projects
  - Four use waste gas or waste heat exclusively
  - Fifth plant converts customer supplied natural gas to heat and power
- Projects generated US$50 million of EBITDA in 2004
- Raised $500 million to repay debt,
- Initial investors have received 120% returns to date

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  - **Generating capacity 183 MW electricity, 1,850 Mlbs/hour of steam**
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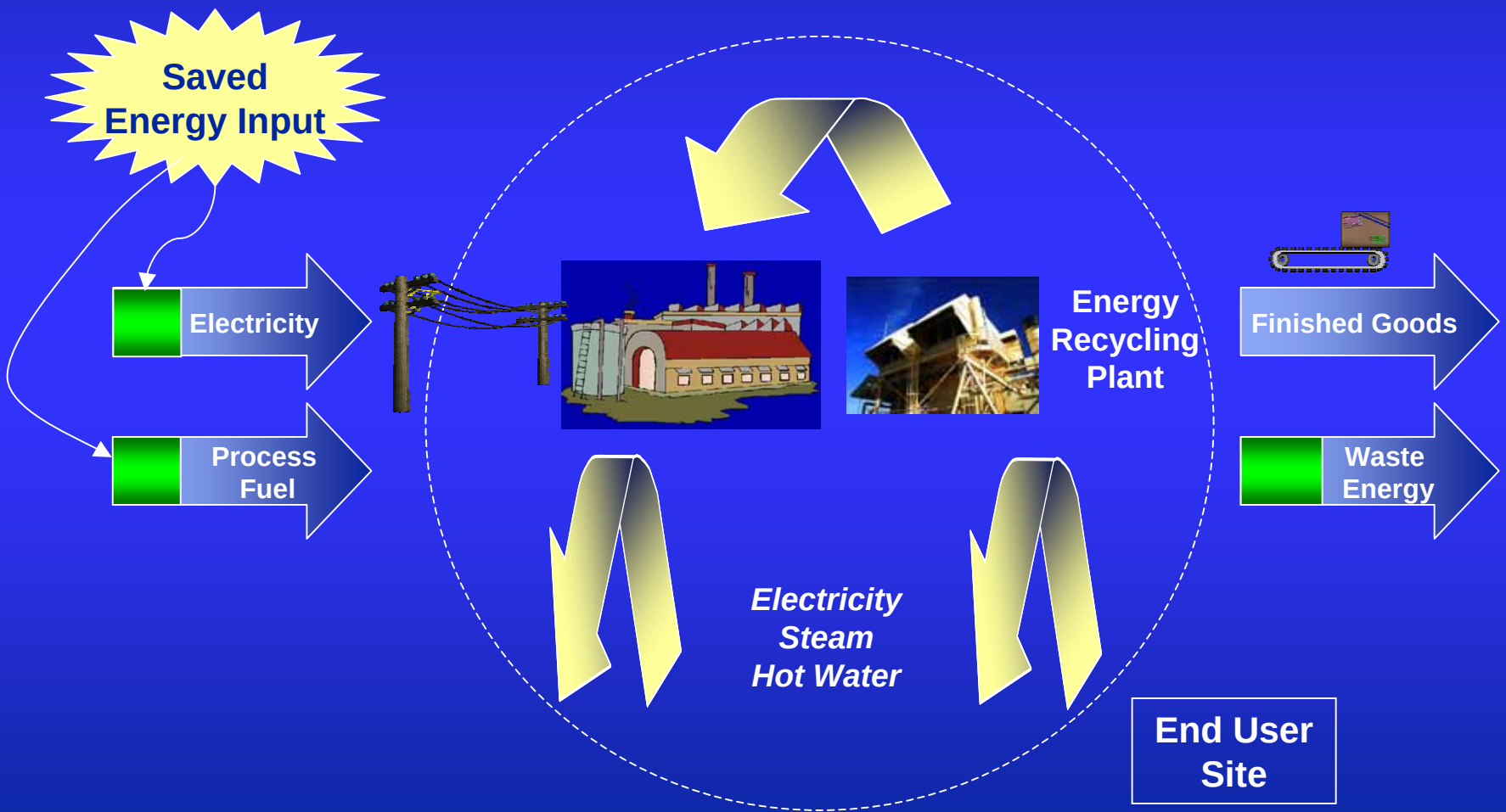
Strategic Logic

- **Burning fossil fuel has increased economic standard of living & damaged environment**
- **2/3's of fossil fuel is used for heat and power, responsible for 2/3's of CO_2 emissions**
- **Apparent dilemma: balance desires for economic growth and for a healthy biosphere**
- **But power system is sub optimal, locked in obsolete central generation paradigm, cannot recycle energy**

Defining Recycled Energy

- ***Recycled energy is useful energy derived from:***
  - ***Exhaust heat from any industrial process or power generation***
  - ***Industrial tail gas that would otherwise be flared, incinerated or vented,***
  - ***Pressure drop in any gas***

Industrial Energy Options



Primary Energy's Approach
90 MW Recycled from Coke Production

Recycled Industrial Energy Potential

- **Recycled industrial energy could power 92 gigawatts of capacity (US EPA study)**
  - **Could supply 19% of US power, nearly double today's non-fossil power from nuclear and renewable energy.**
  - **Only 9.9 gigawatts recycled energy operating**
  - **Comparable numbers likely in other nations**
- **Recycled energy is as clean as renewable energy – no incremental fuel or emissions**
  - **Governance encourages renewable energy, but not recycled energy**

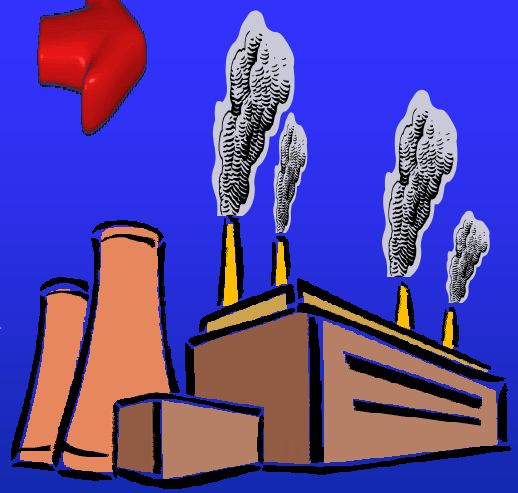
Conventional Central Approach 1960 Data (& 2003 Data)

Pollution

Waste Heat

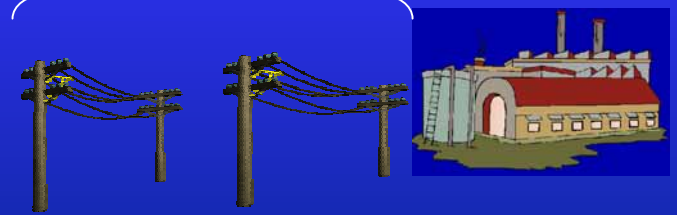
Fuel

100 units



Power Plant

Transmission Line Losses
3 units (7.5%)



End User

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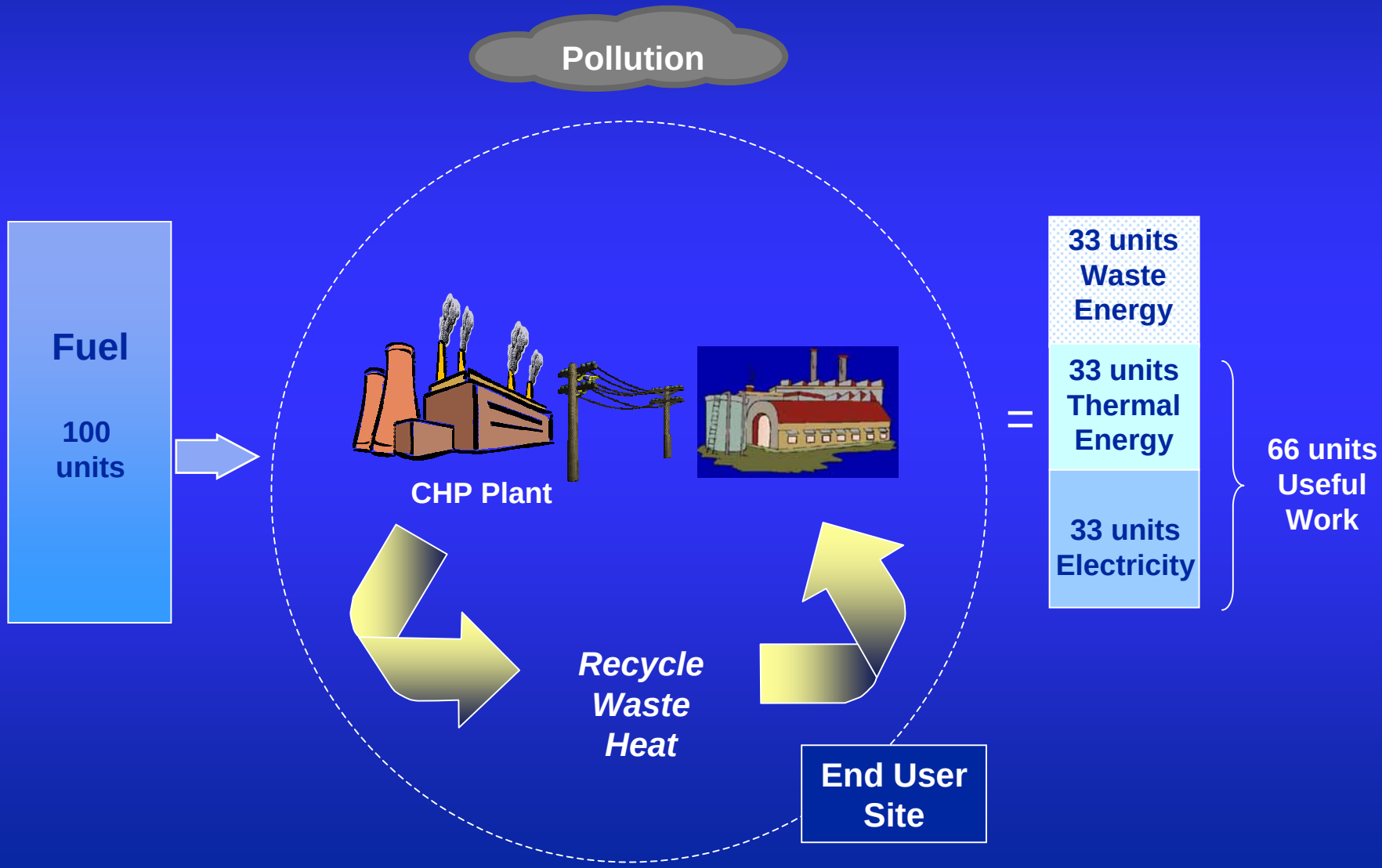
67 units Waste Energy

33 units Electricity

Decentralized Generation Option
Combined Heat and Power



Economies of Scale?
Central versus Decentralized Generation

	Generation	Transmission & Distribution	Total / kW of Generation	KW required/ kW Load	Total costs/ kW New Load
Central Generation	$890	$1380	$2,270	1.44	$3,269
Local Generation	$1,200	$138	$1,338	1.07	$1,432
Savings (Excess) of Central vs. Local Generation	$310	$1,242	$1,068	0.37	$1,837
Central generation capital as a % of local capital	74%	1000%	170%	135%	228%

Local Generation that Recycles Waste Energy:

- **Saves fossil fuel**
- **Reduces capital expenditures**
- **Reduces pollution**
- **Is less vulnerable to extreme weather & terrorism**
- **Substitutes human resources for fossil fuel,**
- **Will be resisted by power companies because of need for ten times more skilled people than wasteful central generation**

Why Do Most Countries Keep Building Central Generation?

Governance ignores lessons of economics

Market Enabling Conditions Are Not Met in Any Country

- **Entry & exit into/from business blocked**
- **Price signals not accurate**
- **Subsidies distort decisions**
- **Externality costs not in power prices**
- **Few restrictions of predatory practices by incumbent firms against insurgent firms**

Good News: Local Generation is a Win/Win

- **Meet load growth with recycled energy to lower costs, reduce fossil fuel use, and cut emissions**
- **To achieve, expose power industry to competitive forces, from all approaches**
  - **End central generation paradigm**
  - **Modernize obsolete rules that block local generation**
  - **Either encourage all clean energy, including recycled and renewable energy with mandates and production credits, or**
  - **Change governance to reflect economic lessons, and**
  - **Allow private wires**

Worldwide Benefits of Meeting 2030 Load Growth with Decentralized Energy

- **Capital cost $5.8 trillion versus $10.8 trillion with all central generation, save $5 trillion**
- **Consume 122 billion fewer barrels of oil equivalent; equal to ½ of Saudi reserves**
- **Spend $2.8 trillion less on fossil fuel**
- **Reduced illness from air pollution**
- **Much easier to supply electric services to entire population**
- **Global warming might slow down**

Conclusion:

Global economic and environmental health depends upon the speed at which governments cause optimization in the world's largest industry: electric power generation


Thank you