

Panel on Disruptive Technology in the Transport and Building Sectors: Zero Net Energy and Emissions

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From Hidden Fuels to World's First Fuel?

- October 2013, IEA Executive Director Marian van der Hoeven, issued inaugural Energy Efficiency Market Report highlighting the role of efficiency as a major fuel.
- She states: “Energy efficiency has been called a “hidden fuel,” yet it is hiding in plain sight. Indeed, the degree of global investment in energy efficiency and the resulting energy savings are so massive that they beg the following question: **Is energy efficiency not just a hidden fuel but rather the world's first fuel?**”
- IEA identified energy efficiency as the major contributor to potential cuts to carbon emissions, reductions in local pollution, and cost-effective energy security.

The Economic Imperative of Energy Efficiency: The Costs and Benefits of a Surprisingly Large Resource*

John A. “Skip” Laitner

***In Conversation with NERI, the Center for Sustainability at
the University of Otago, and Many Others***

The Energy Conference 2014
Going Much, Much Further with Energy

**Wellington, New Zealand
March 20, 2014**

<http://www.youtube.com/watch?v=Ug2p5ldKccc>

Societies and Economies in Transition

- In geologic terms we are formally in the Holocene period of the Cenozoic era, but for good reasons many now are suggesting we are deep into the Anthropocene. Not good news!
- We are now living off the very diminishing returns of the Second Industrial Revolution, and we absolutely must kick it up into what my colleague Jeremy Rifkin calls the *Third Industrial Revolution*.
- And instead of economic activity based on supply-side perspective we need to act immediately on the economic imperative of energy efficiency.
- *A very real need to talk about the implications, and the huge opportunity to turn this around to advantage!*

How Has Humanity Impacted the World?

- Human activity has transformed between one-third and one-half of the land surface of the planet.
- Fertilizer plants produce more nitrogen than is fixed naturally by all terrestrial ecosystems.
- Fisheries remove more than a third of the primary production of the oceans' coastal waters.
- Humans use more than half of the world's readily available fresh water runoff.
- Since the industrial revolution, humans have dumped CO₂ emissions, the weight-equivalent of one trillion cars into our global atmosphere. That level of waste cannot be good for climate!

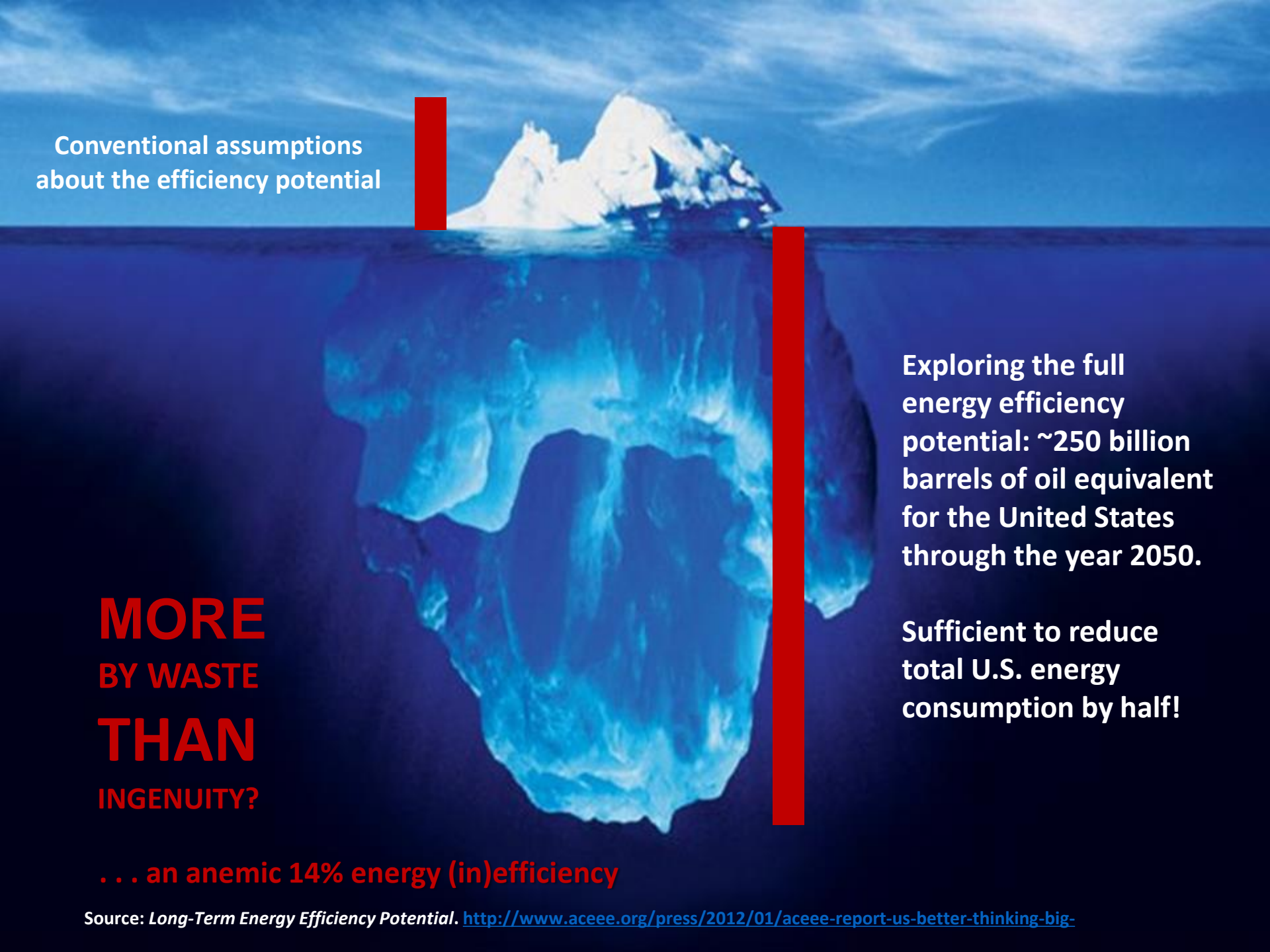
Question: Other than population, what may be the single largest contributor to environmental degradation?

Answer: The large-scale and inefficient use of energy.

Fact: The United States wastes ~86 percent of all the energy consumed within the economic process.

Result: That magnitude of waste imposes a large array of costs that severely constrains the economic process!

Conclusion: Perhaps the most immediate opportunity to ensure a more robust and sustainable economy is to quadruple or better our current 14 percent level of energy (in)efficiency.

An iceberg floating in the ocean. The tip of the iceberg is visible above the water line, while the much larger, submerged part is below. Two vertical red bars are placed on either side of the iceberg, one on the left and one on the right, extending from the water line down to the bottom of the frame. The sky is blue with some clouds, and the water is a deep blue.

Conventional assumptions
about the efficiency potential

Exploring the full
energy efficiency
potential: ~250 billion
barrels of oil equivalent
for the United States
through the year 2050.

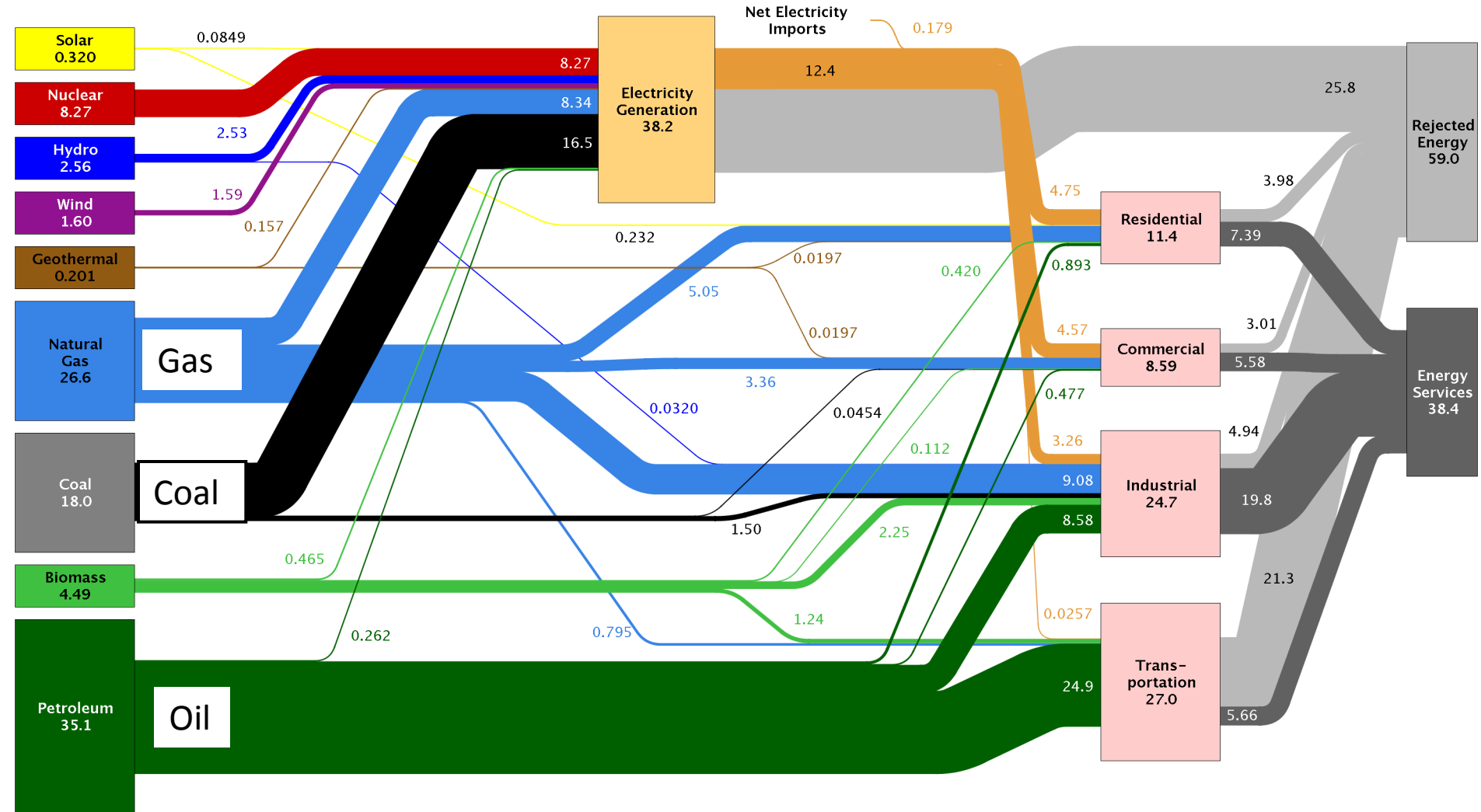
Sufficient to reduce
total U.S. energy
consumption by half!

**MORE
BY WASTE
THAN
INGENUITY?**

... an anemic 14% energy (in)efficiency

Source: *Long-Term Energy Efficiency Potential*. <http://www.aceee.org/press/2012/01/aceee-report-us-better-thinking-big->

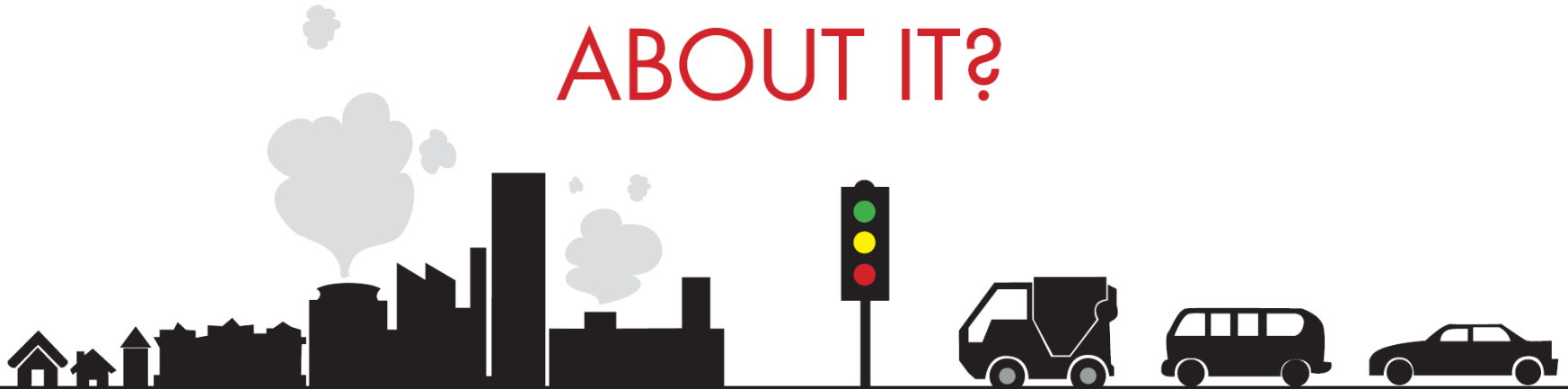
Estimated U.S. Energy Use in 2013: ~97.4 Quads



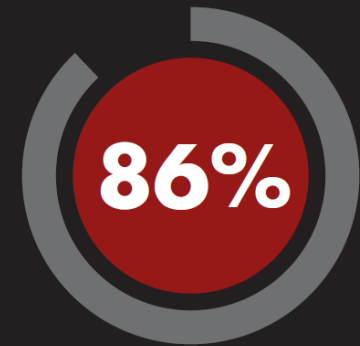
Source: LLNL 2014. Data is based on DOE/EIA-0035(2014-03), March, 2014. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant "heat rate." The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential and commercial sectors 80% for the industrial sector, and 21% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527

... **WHERE'S THE WASTE?** ...

**AND WHAT CAN WE DO
ABOUT IT?**



The American economy
currently wastes **86%** of the
energy we consume



Reference: Powering Up America--The Revolution Began Yesterday, by Emily Hall Tremaine Foundation, p. 75

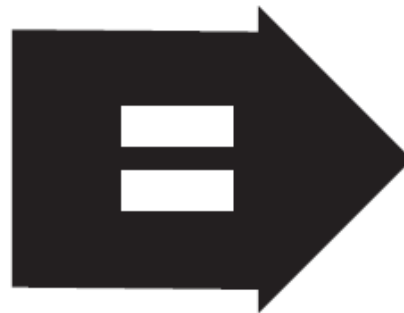


68%

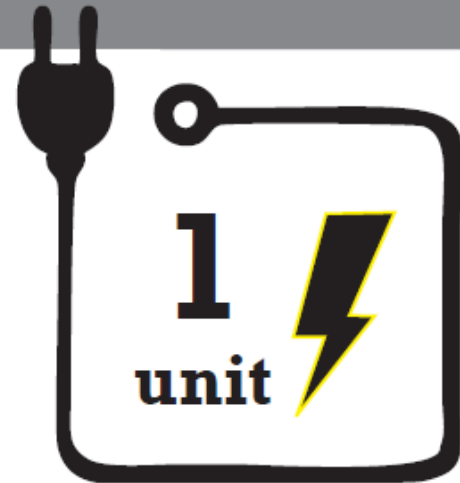
68% of energy
generated for
electricity is lost
in transmission



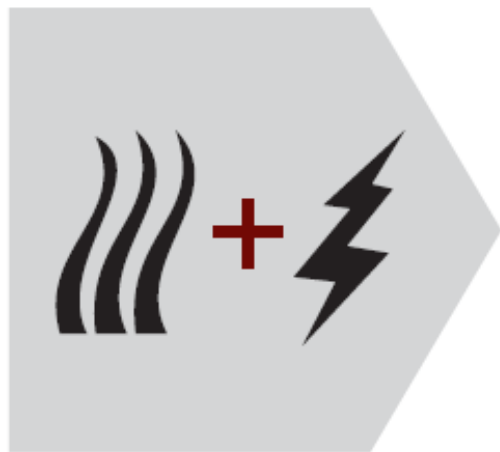
3 units
of coal used to
generate power



**DELIVERS
ONLY**



to heat and light and cool
the places where we work,
live, study, and play.



TRADITIONAL SYSTEM
32% ENERGY EFFICIENCY.

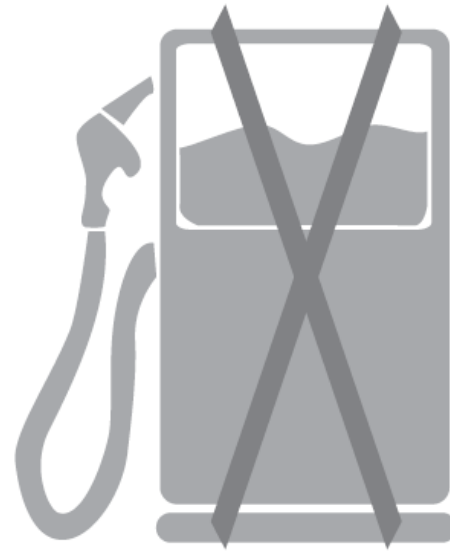
COMBINED HEAT & POWER
80% ENERGY EFFICIENCY.

Combined Heat and Power systems, built on-site to use the heat created by producing power, can improve energy efficiency from this average of 32 percent to up to 80 percent.



90%

of fuel energy is wasted
with inefficient use of fuel
in cars and trucks



**54.5
MPG**

New federal standards will
increase the average fuel
economy of new cars and
light trucks to above 50
miles per gallon by 2025.

INCANDESCENT LIGHTBULBS



93%

93 PERCENT OF ENERGY CONSUMED BY INCANDESCENT LIGHTBULBS IS LOST.

LED LIGHTBULBS



7%

80%

SWITCHING TO LIGHT-EMITTING DIODE (LED) LIGHTING SYSTEMS CAN CUT THAT WASTE BY INCREASING EFFICIENCY ON AVERAGE FROM 7 PERCENT TO UP TO 80 PERCENT.

A Big Thought on the Tough Choices

“Individuals have a natural tendency to choose from an *impoverished option bag*. Cognitive research in problem solving shows that individuals usually generate only about 30 percent of the total number of potential options on simple problems, and that, on average, individuals miss about 70 percent to 80 percent of the potential high-quality alternatives (emphasis in the original).”

Dr. Jeffrey S. Luke

*Catalytic Leadership: Strategies
for an Interconnected World, 1998*

Are Others Acting on These Ideas?

- Consider Nord-Pas de Calais, a former coal mining and still heavy industry region of 4 million people in northeastern France. . .
- Working with Jeremy Rifkin, and our partners in the Paris office of Accenture, we developed a master plan for the Third Industrial Revolution that can reduce total energy use by half by 2050.
- All remaining energy needs are to be provided by renewable energy resources – also by 2050.
- The plan anticipates average annual upgrade investments on the order of €6 billion per year over the next 36 years.
- Our modeling estimates suggest that employment will grow annually, reach as many as 165,000 jobs by 2050.
- The master plan was formally delivered to and unanimously accepted by both the Nord-Pas de Calais Chamber of Commerce and the Regional Council at the World Forum for a Responsible Economy, October 25th in Lille.

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Leaders in Energy Research, Communications,
Policies & Analysis LinkedIn Group (LERCPA)



For information on how to join this select networking group which attracts professionals who delight in thinking about, discussing, and collaborating on energy, environmental, and sustainability topics, please visit:

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