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R & D Needs for Industry

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Energy Productivity

- Energy generation is non- [or minimally] polluting
- Energy is used and re-used [by industry; and others]
- Energy is affordable [job retention/creation]
- How does R and D fit in?

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Energy Options

- Solar
- Wind
- Natural Gas
- Nuclear
- Coal



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Solar and Wind

- Maturing Technologies
- Intermittent and Regional
- Transmission a Hurdle
 - Access; NIMBY
 - Cost of transmission infrastructure
- The ceiling for wind and solar may be determined by the availability of new transmission infrastructure

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Natural Gas

- Increasing abundance on shore
- Needs new distribution capacity but it's underground [you can't see it]
- Important part of future US energy equation



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Nuclear

- Time will tell
- Unlikely to be significant impact [more than 20-30 GW] until beyond 2030



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How do you make the math work?

- CCS?
- The “capture” part is possible if not probable
- What about the “S”, storage/sequestration?
 - Underground
 - HUGE liability issues

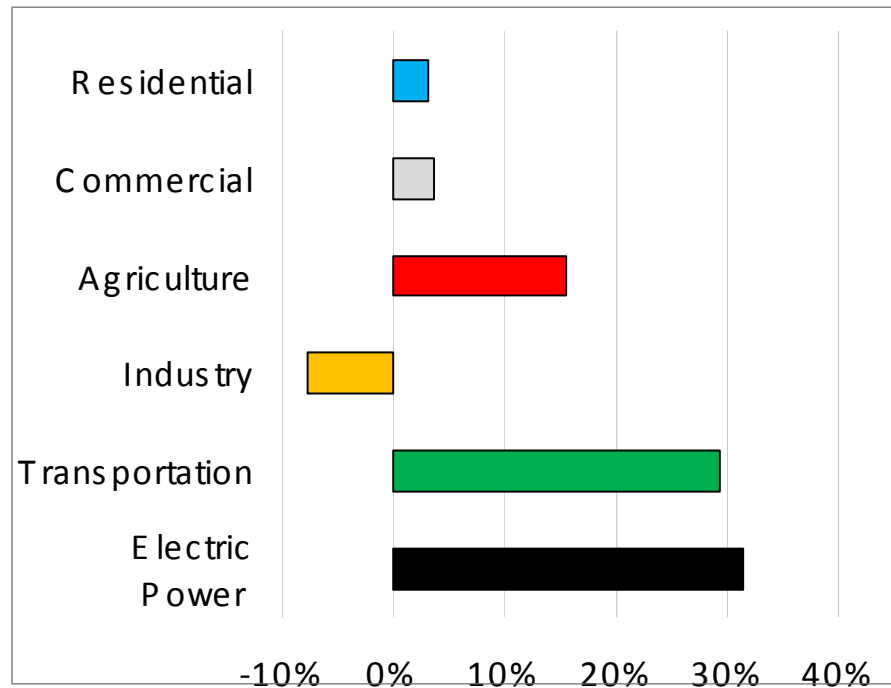
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The Research Component

- Sequestration:
 - in another product/compound
 - Let algae eat it
 - Other ideas?
- A viable sequestration option is the key and should be the challenge we take up

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Industry Leadership on GHG Reductions



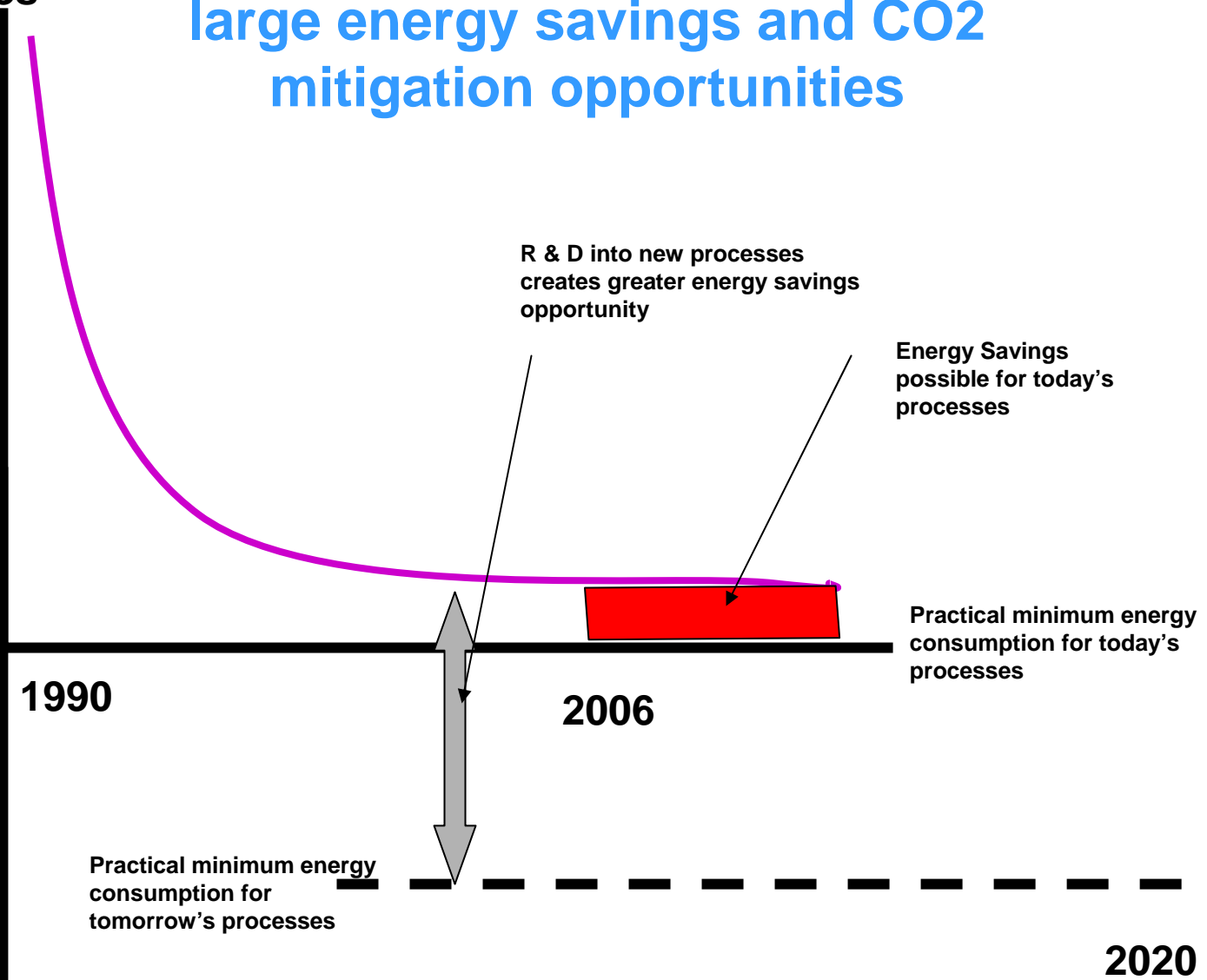
EPA, 1990-2007

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Energy use by EI industries

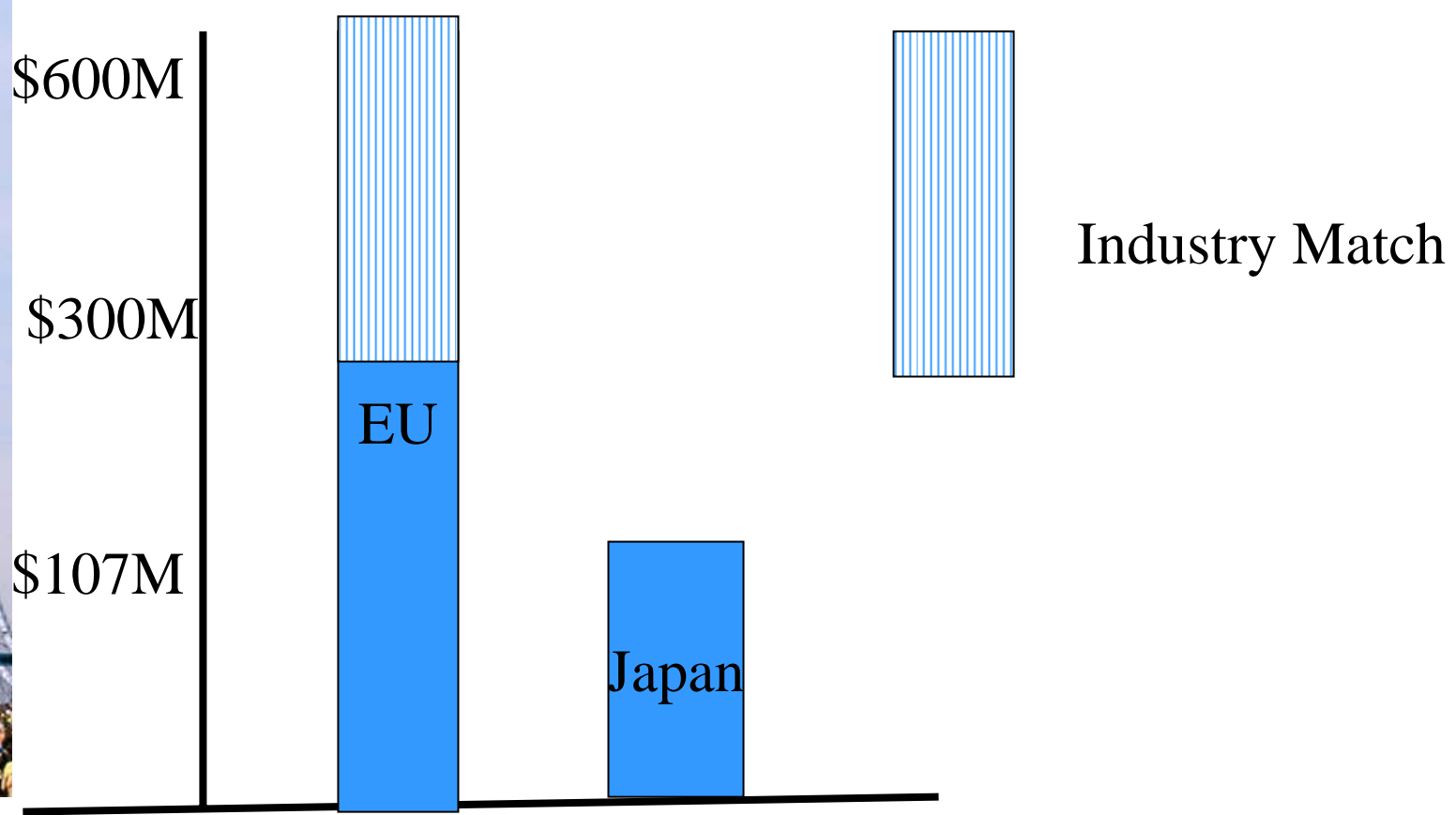
R & D into new processes opens up large energy savings and CO2 mitigation opportunities



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High-Risk R & D Investments by Gov't Agencies

Breakthrough Technologies--Steel Example



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Using less energy is good
but....what's the real objective?

More Energy Use

Lower Energy Use

Higher CO ₂	N	N
Lower CO ₂	Y	Y

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Summary—R & D Needs

- Sequestration Technologies [as co-products] for energy generation and industrial sectors
- Breakthrough [transformational] Industrial processes

