The Climate Change Challenge and How We Can Benefit

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CCES is an experienced firm dedicated to help companies turn climate change, energy, sustainability, and environmental compliance to your advantage, meeting goals and realizing tangible financial gains. We have experience in all technical and policy environmental areas.

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THE

LONDON, EDINBURGH, AND DUBLIN

PHILOSOPHICAL MAGAZINE

AND

JOURNAL OF SCIENCE.

[FIFTH SERIES.]

APRIL 1896.

XXXI. *On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground.* By Prof. SVANTE ARRHENIUS *.

1. *Introduction*: *Observations of* Langley *on Atmospherical Absorption.*

A GREAT deal has been written on the influence of the absorption of the atmosphere upon the climate. Tyndall † in particular has pointed out the enormous importance of this question. To him it was chiefly the diurnal and annual variations of the temperature that were lessened by this circumstance. Another side of the question, that has long attracted the attention of physicists, is this:—Is the mean temperature of the ground in any way influenced by the presence of heat-absorbing gases in the atmosphere? Fourier‡ maintained that the atmosphere acts like the glass of a hot-house, because it lets through the light rays of the sun but retains the dark rays from the ground. This idea was elaborated by Pouillet§; and Langley was by some of his researches led to the view, that "the temperature of the earth under direct sunshine, even though our atmosphere were present as now, would probably fall to −200° C., if that atmosphere did not possess the quality of selective

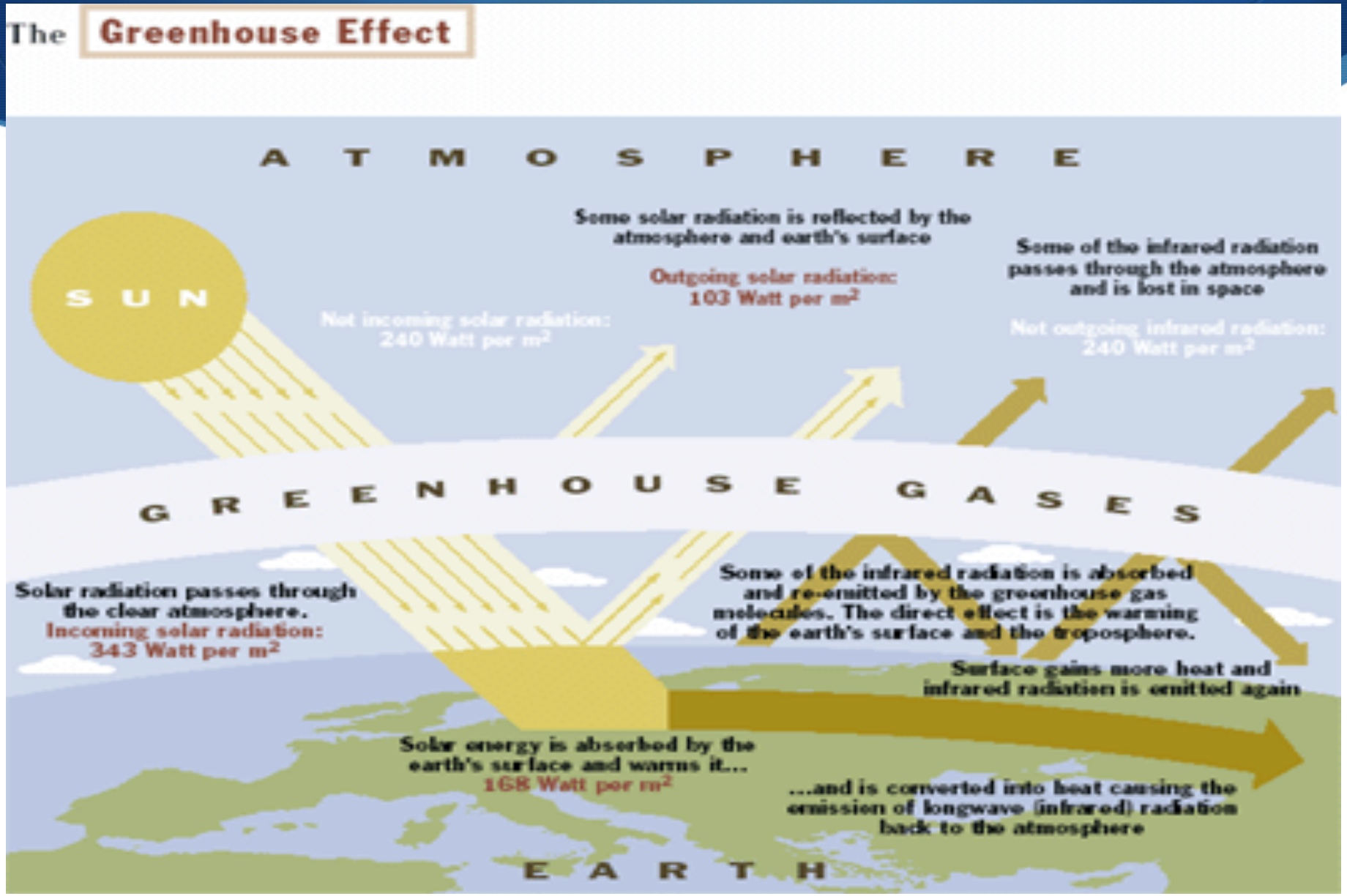
* Extract from a paper presented to the Royal Swedish Academy of Sciences, 11th December, 1895. Communicated by the Author.

† 'Heat a Mode of Motion,' 2nd ed. p. 405 (Lond., 1865).

‡ *Mém. de l'Ac. R. d. Sci. de l'Inst. de France*, t. vii. 1827.

§ *Comptes rendus*, t. vii. p. 41 (1838).

From the Pew Center on Global Climate Change



So, The Challenge In Front Of Us

- Scientists believe CC impacts can be reversed if major GHG emission reductions can be achieved
  - 70-80% reduction in GHGs from 1990 baseline by 2050
- Attempt to return CO_2 concentration back toward 280 ppm baseline. We just reached the 400 ppm.
- However, if we don't achieve this, we may reach a "tipping point" where no amount of GHG reduction will forestall the impacts of climate change.

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That Should Be Easy, Right?

- OK, not so bad, right? Hey, we got 37 years!
- Not so fast! The demographic time bomb!
  - Now, we have 7 billion people on Earth, of which about 1 billion live "like us" (have electricity, a car, home heat/AC, TVs, laptops, iPads, etc.). High energy users!
  - But by 2050, we may have 9 billion people, of which 3 bill. will live "like us". **2 billion more high energy users!**
- How can we have 2 billion more such people and reduce GHG emissions by 70-80%?

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Greenhouse Gas Reduction Philosophy

- Global problem requires a global reduction in GHGs.
- Focus on activities that are highest in fuel use: power, transportation, cement, glass, steel, paper
- Progress wherever GHG emiss. reductions occur
  - Same GHGs whether from Union Sq. or Times Sq. or Oshkosh or Honolulu or Timbuktu or …..
- Market-based. Reduction goals may be achieved by actual reductions or purchase of "credits" from another entity.
  - GHG credits as "currency" for firms.

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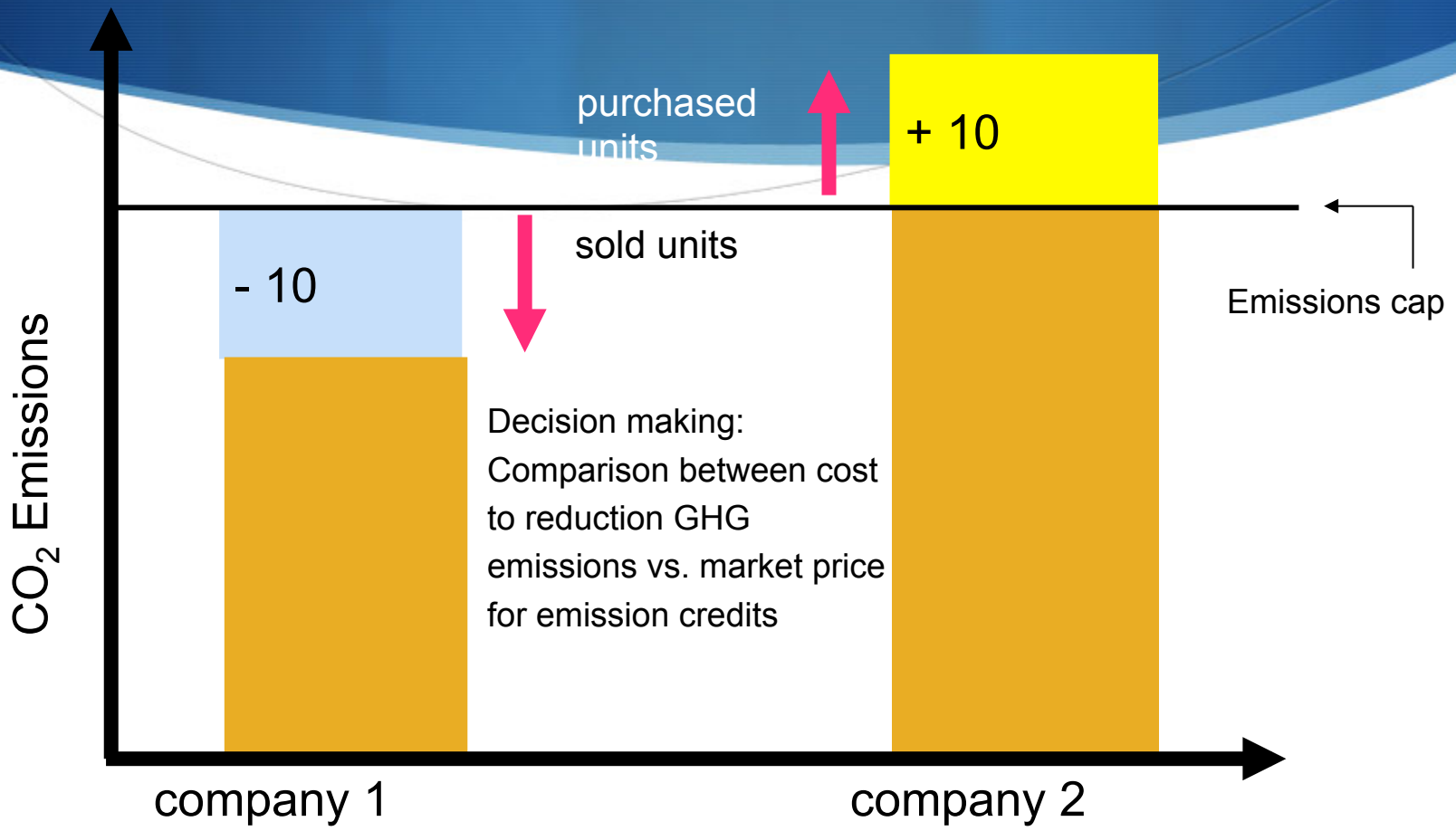
Cap and Trade Concept



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Where Things Stand in the U.S.

- No national GHG emissions reduction law. However, there is a federal rule for large facilities to report GHG emissions. And other air rules are being "tailored" to address GHG emissions.
- Several state and regional rules are recording successes in reducing GHG emissions ("RGGI").
- Other economic and social drivers make a GHG reduction program beneficial.

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9 Purely Business Reasons to Have a Robust "Green" Energy Program

1. *Making the Monetary Case*

- **$$$$:** Actions that reduce your electricity and fuel usage will directly reduce GHG emissions and …
  - Given rising cost of energy this will also save a lot of $$.
- **Value:** If you save $100K/yr in energy costs, that's $100K in your pocket. What is equivalent in sales? @10% profit, $1 million/yr sales↑. Which is easier?
- **Example:** DuPont spent $200 million in energy upgrades in the 1990's. Cost savings now: > $300 million/year.

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2. ***Create New Products / Re-brand***

- Sustainability offers new product options.
- Or re-brand existing products to address the changing consumer interest in "green".
- **Example**: GE Ecomagination
  - What is Ecomagination? It is simply the re-branding of old products to appear more "green" and to sell to the "green" market.
  - These products doubled in sales within 3 years after being re-branded.

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3. Impress Customers and Suppliers

- A growing number of customers want to know the environmental/energy impacts of products sold
  - "Carbon footprint" – amount of GHGs emitted in the "life cycle" of a product is a common metric
  - May put your products in a more competitive sales position.
  - **Example:** Walmart is in the process of asking their suppliers for their GHG emissions during part of product life cycle and put info. up on shelves. And when Walmart speaks, ….

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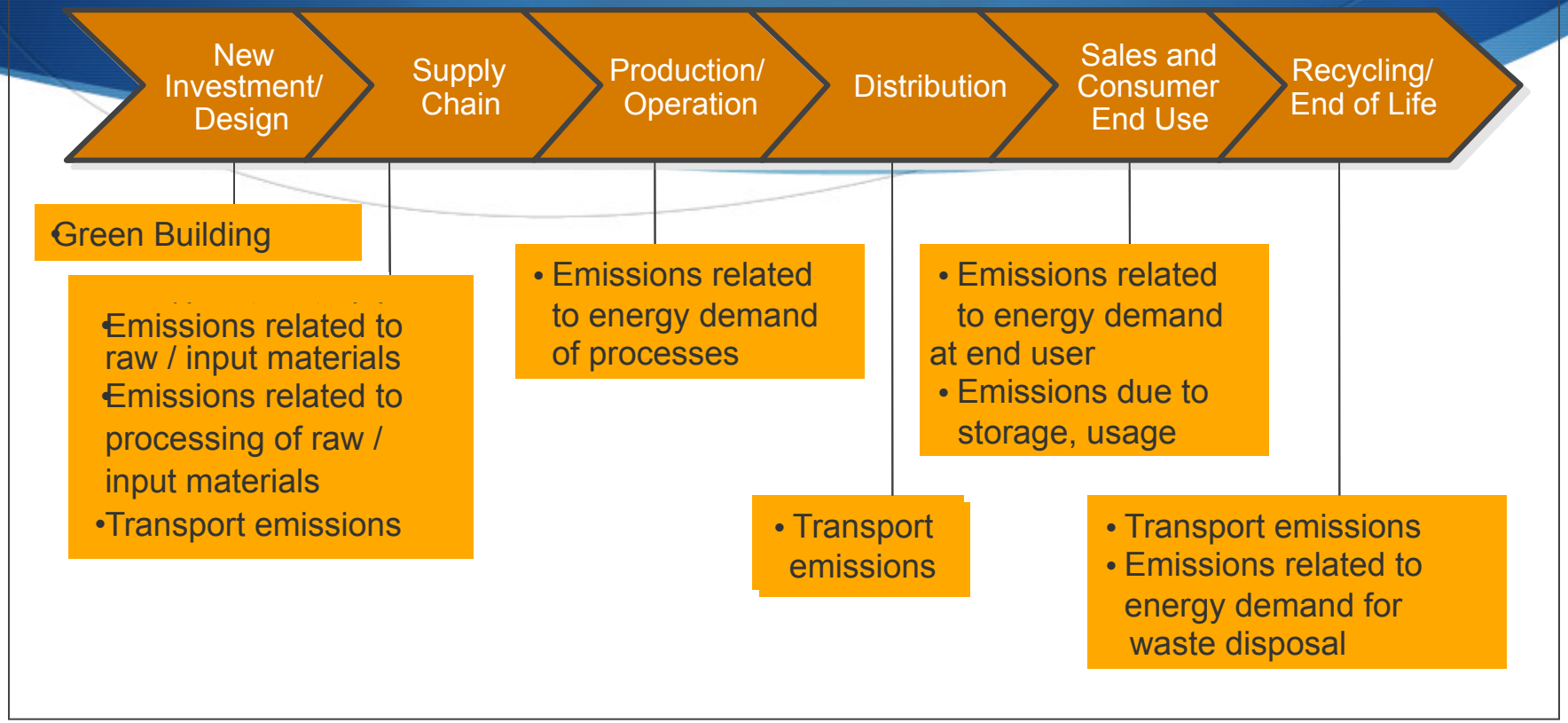
GHG Emissions Along Product Life Cycle



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4. Raise Employee Morale

- Significant cost of replacing a worker who leaves.
  - Finding a replacement, training, lost productivity
- "Green" pgm. gives workers new devotion to firm.
- In addition, research shows that "green buildings" result in greater productivity and lower turnover.
- **Example:** Ray Anderson, Founder, Interface, "I have never seen anything equal to sustainability as far as attracting, motivating, and bringing people together."

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5. Fast Track Important Projects

- Simply put, a climate change or sustainability program gives a company the moral high ground for developing new projects which some citizen groups may object to.
- **Example:** During proposed buyout of TXU power plants, a climate change program was a major factor in agreeing to a proposed expansion. Several environmental groups signed on to allow new coal-fired plants, ultimately saving TXU much $$$ and time in avoided litigation.

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6. Improve Efficiency, Flexibility

- Using less fuel or electricity to sell or to make a product improves efficiency in terms of cost and in terms of quality and timing of operation.
- In addition, fuel flexibility reduces your risk should there be future fuel shortages.
- **Example:** East River Housing, Lower East Side. Underwent boiler renovation, clean fuel switch:
  - Saved them >$5 million in 1st year in avoided fuel costs
  - Con Ed incentives
  - Led to increased value of co-op units

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7. Climate Change Risks

- How may potl effects of climate change (sea level rise, heat, more severe storms) impact business?
  - Major change in philosophy. Used to be concerns with how a company affects the environment. Now we're concerned with how the environment affects business.
  - Both business risks and opportunities.
- **Example:** European company used computer model to predict future temperatures, concluding that current farmers would no longer be able to produce raw product in 20 years.

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Physical Climate Change Effects?

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8. Improve Company's Image

- A company's image is of growing importance as more of the public uses perception to buy or reject products in the market. Plus it affects stock price.
- Environment and climate change are two strong factors affecting image. Be on the right side!
- **Example:** Toyota's hybrid Prius helped to counter bad publicity around their poorer performing cars.
- **Example:** BP. Need I say more?

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9 Purely Business Reasons to Have a Robust "Green" Energy Program

9. Company's Stock Value

- Recent major study of S&P 500 companies shows that for each metric ton of GHGs emitted, the value based on stock price drops by over $200.
- Interesting because value of a metric ton of GHGs in the European market is rarely >$40 / metric ton.
- Markets are speaking about risk and higher value of companies that reduce GHG emissions (use less fuel).

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Climate Change Opportunities for Firms

- Actions to reduce GHG emissions will lead to direct cost savings
- Show progress to stakeholders and the public; raise your social quotient
- Understand the physical and regulatory business risks that Climate Change represent
- Can Climate Change be an opportunity? (Hint, ask Toyota or GE)

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Corporate Strategy for Addressing GHGs

• Where are our GHG emissions coming from and how large are they?	→ Emissions Inventory
• What is driving our GHG emissions and what are our internal abatement costs? • What might our future emissions be?	→ Analysis/ Projections
• What is the implication of this for us: potential opportunities to earn $? added costs/operating impacts?	→ Due diligence
• How to manage risks/earn new C credits?	→ Strategies

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Develop a Climate Change/Sustainability Infrastructure

- Develop a Group focused on these issues
- Need leadership from the top – from the CEO
  - Why? There will be some “vetoers” within management who can only be stopped by those in the C Suite.
- Should have participation from:
  - EH&S
  - Communications
  - Finance/Procurement
  - Legal
  - Product Development
  - Engineering
  - Operations & Maintenance

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Initial Self-evaluation

- Perform initial evaluation of where you are vs. desired future position of your “Green” program.
  - Diagnostics exist.
  - Which of 9 purely business reasons are most important?
  - Enables you to plan your program and address early the potential barriers to success
- What is your ultimate goal vis-à-vis sustainability?
  - To be the leader in your industry?
  - Do little and learn from mistakes of others and pounce?

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Next Steps: Energy/Chemical Engineers
Establish Your Carbon Footprint, Then Develop Specific Goals

- You can't manage what you don't measure!
- Perform a baseline GHG emissions inventory
  - Critical: data quality!! Must be sure data collected to determine GHG emissions is complete, thorough, consistent, and accurate!
- Benchmark different divisions, facilities, operations
  - Benchmark your facilities vs. your competitors
- Establish where you spend the most money on energy, then look for ways to reduce energy usage

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Next Steps: Energy/Chemical Engineers
Establish Your Carbon Footprint, Then Specific Goals

- Calculate and rank ROI, paybacks. Look for "low hanging fruit".
- Manage growth. While reducing GHGs in some places, it may grow significantly in others.
- Don't just go for the singles; go for the home runs (big energy reductions) to give your firm a signature project to talk about.
- Establish GHG emission reduction goals and track them.

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Great Investment of Capital
Energy Audit is $$$$$

- Investing money in an energy audit and smartly upgrading building: near guarantee of a good ROI.
- Upgrades will reduce fuel and electricity usage:
  - more efficient lighting
  - upgrade building “envelope” (windows, insulation)
  - upgrading your boiler and engine equipment
    - in NY, Con Edison programs encourage more efficient equipment
- And you will also be reducing your GHG emissions

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Renewable Energy

- Renewable energy – energy not derived from fossil fuels, but from sources found in nature:
  - Solar
  - Wind
  - Geothermal
  - Biofuels
- Advantages:
  - No/little GHG or other emissions
  - If designed and placed properly, reliable source of power
  - Government and other grants available
- Compare costs to fossil fuels

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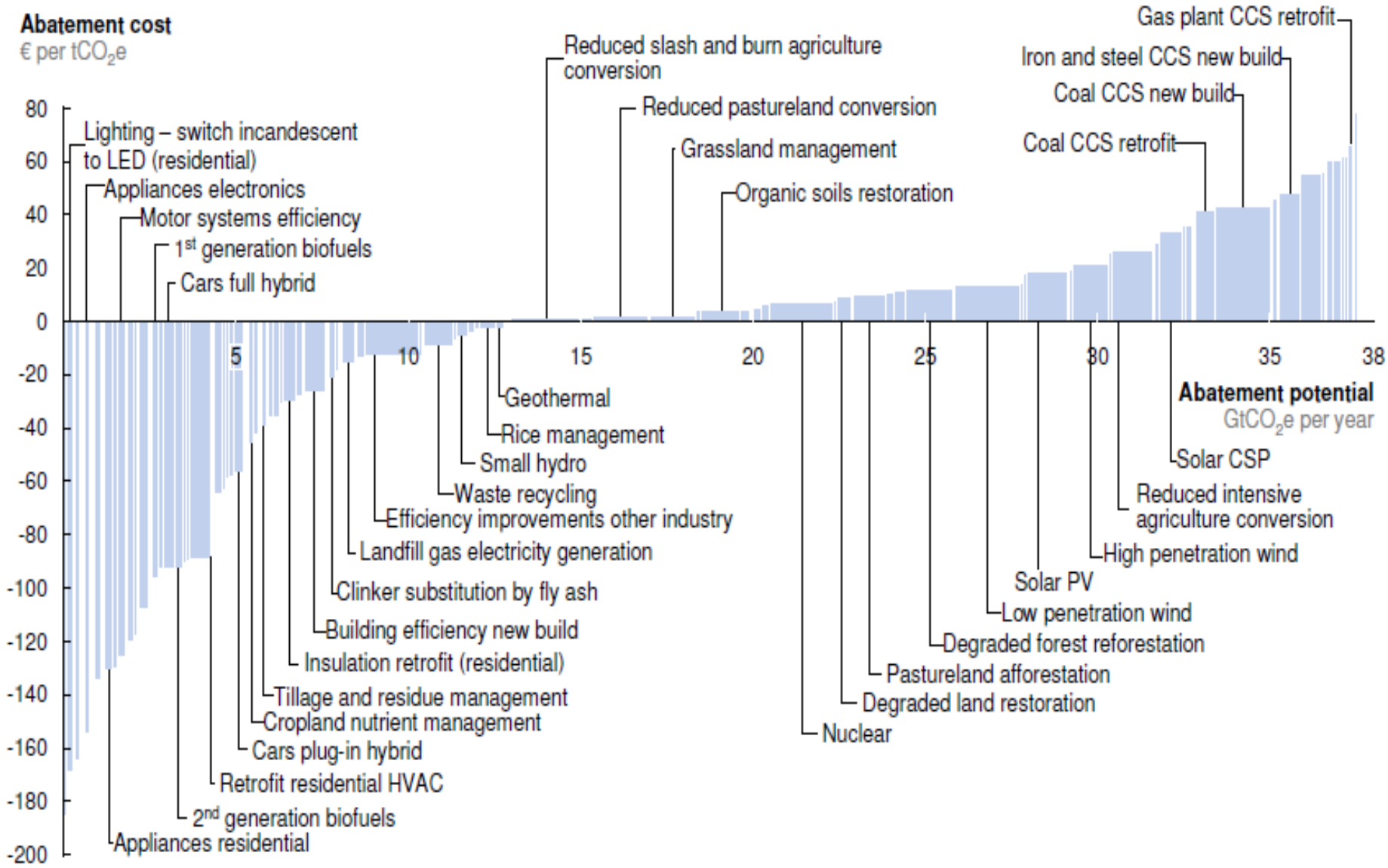

Note: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €80 per tCO_2e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play.

Source: Global GHG Abatement Cost Curve v2.1

The Green Building Revolution

- A lot of resource usage and GHG emissions are passive – in our homes, schools, offices daily
- Features can be built into these buildings to minimize our environmental impact, increase sustainability. **"Better performing buildings"**
- US Green Building Council: LEED Program
- Improved sustainability, reduced energy usage. Studies show improved worker productivity, fewer sick days

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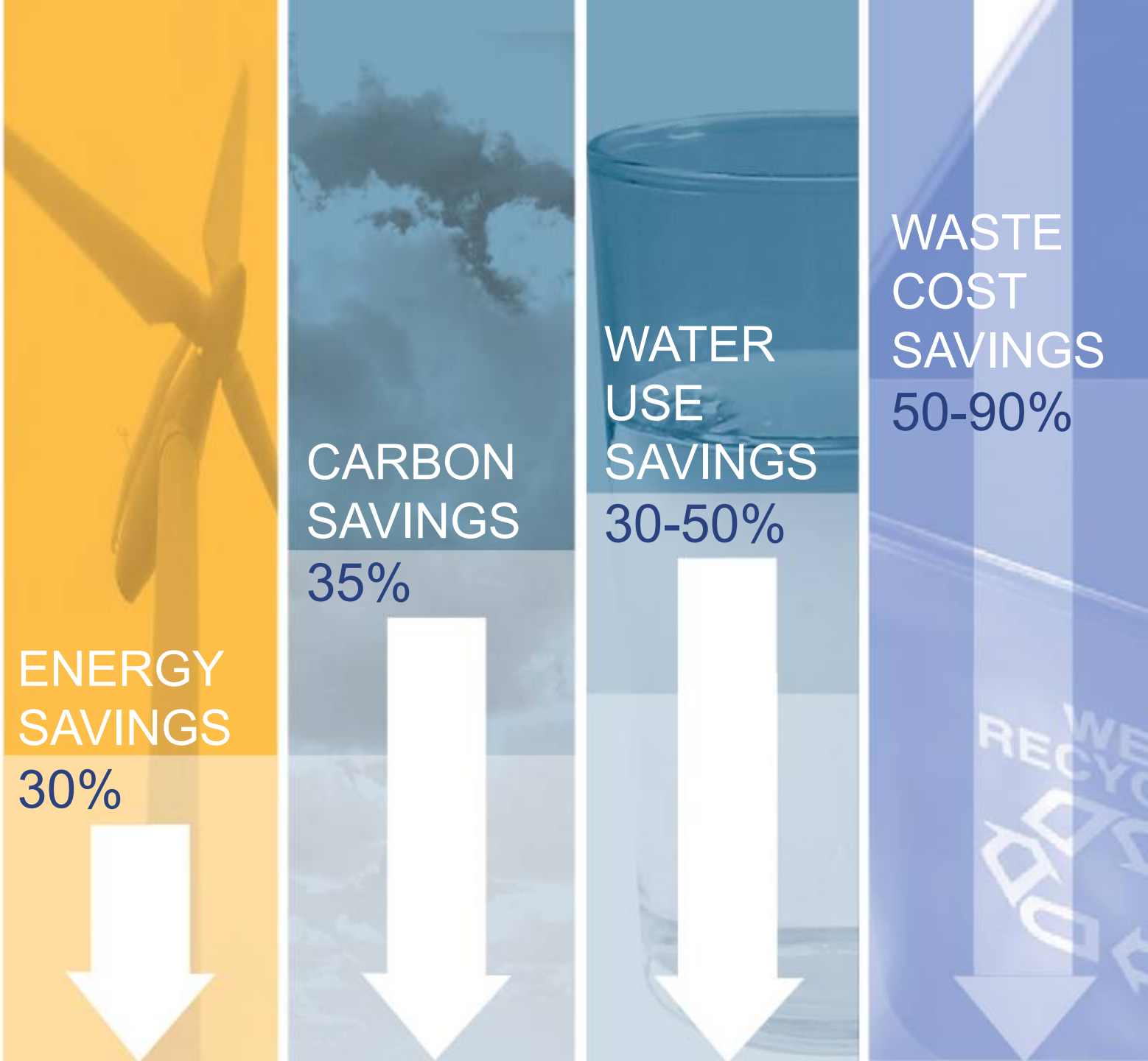
Average Savings of Green Buildings



Source: Capital E

What's In It For the Chemical Engineer

- We are needed to make this program work
  - Perform GHG baseline emission inventories
  - Perform energy evaluation/audit, find "low hanging fruit"
  - Strategize, determine economic, product benefits of GHG reduction steps
  - Develop new products to meet growing "green" demand
  - Efficiency of processes is a key; that's what we do!
  - Monitor, maintain systems to run reliably.
- Brings the value back into the manufacturing, transportation, and use of the materials engineers make.

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Why Should a Firm Invest in Carbon Management?

- Reduce exposure to future rules and carbon trading
- Direct economic benefits of GHG reductions
  - Can be a moneymaker
- Carbon management should be part of overall planning
- Integrate GHG metrics into business and environmental reporting

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Why Should a Firm Invest in Carbon Management?

- Respond to stakeholders
- Social benefits of doing the “right” thing before being required to do so
- Better position to examine physical, regulatory, business risk issues related to climate change
- Carbon management as VALUE, not LIABILITY, as pollution is normally considered.

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A True Team Effort for Sustainability

- Expertise of many different specialists needed:
  - Chemical/mechanical/combustion engineers to establish the inventory, perform the energy audit, evaluate, design, implement improvements
  - Product engineers to develop greener products
  - Business specialists to determine cost effectiveness, get the capital, manage its use, mine its success
  - Legal to understand growing quilt of rules & contracts
  - Communications to ensure that stakeholders see the impacts of a Climate Change program.

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“

With regard to excellence, it is not enough to know (excellence), but we must try to have (it) and use it.”

- Who said this?

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“

With regard to excellence, it is not enough to know (excellence), but we must try to have (it) and use it.”

- Aristotle 384-322 BC

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Thank you. Questions?

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