

A faint, light blue world map is visible in the background of the slide, centered behind the text.

# Reducing GHG Emissions: Policy Design Considerations

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Robert F. Wescott, Ph.D.

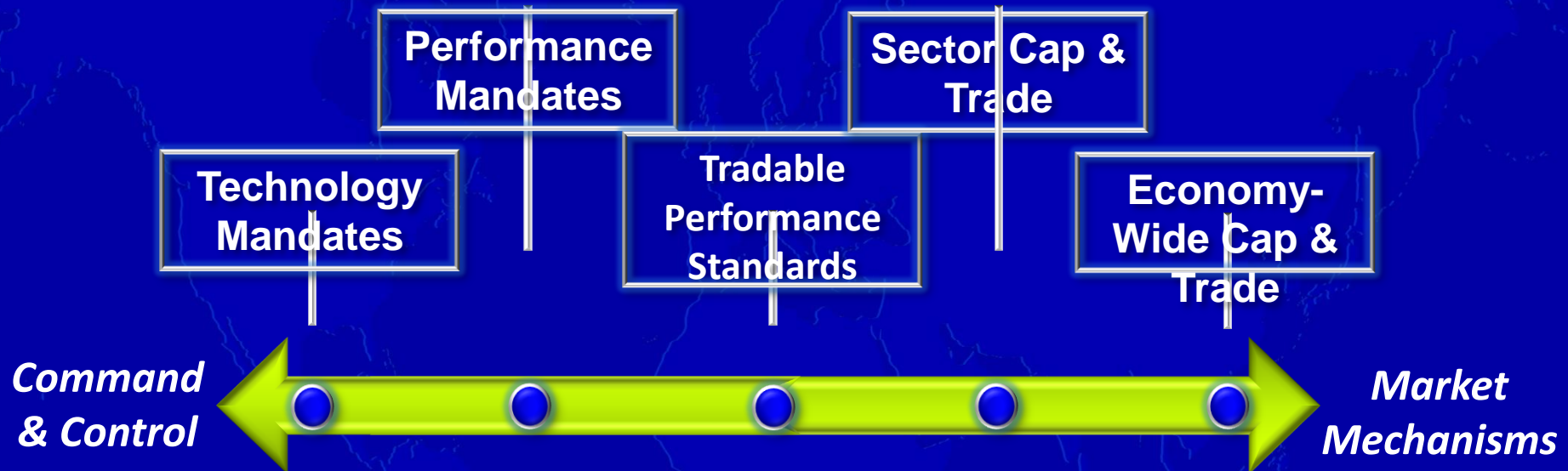
# PRIMARY GOALS

- *Develop an understanding of climate change policy instruments*
- *Offer frameworks for thinking about key policy design features*
- *Provoke a conversation about what policy instruments might be best suited for limiting GHG emissions.*

# Three Broad Approaches to Climate Change

- **Adaptation**
  - Humans have always adapted to changed conditions.
  - Perhaps go for economic growth in short run, build up wealth, to have more resources to handle GHG consequences later.
  - Richer countries probably more able to adapt.
- **Mitigation**
  - Increase world's ability to absorb GHG
  - Eg., rather than investing in expensive abatement technology, plant a new forest.
  - May be more cost effective
- **Stabilization**
  - Try to reduce GHG through policies—mandates, taxes, incentives
  - Reward good behavior and punish bad behavior
  - Focus of current debate around the world

# Policymaker's Toolbox for Stabilization



# TRADITIONAL COMMAND & CONTROL

## Technology Mandates

- *Government specifies “how” you use energy*
- *Example, “you must use lithium-ion batteries in your plug-in hybrid cars.”*

## Performance Mandates

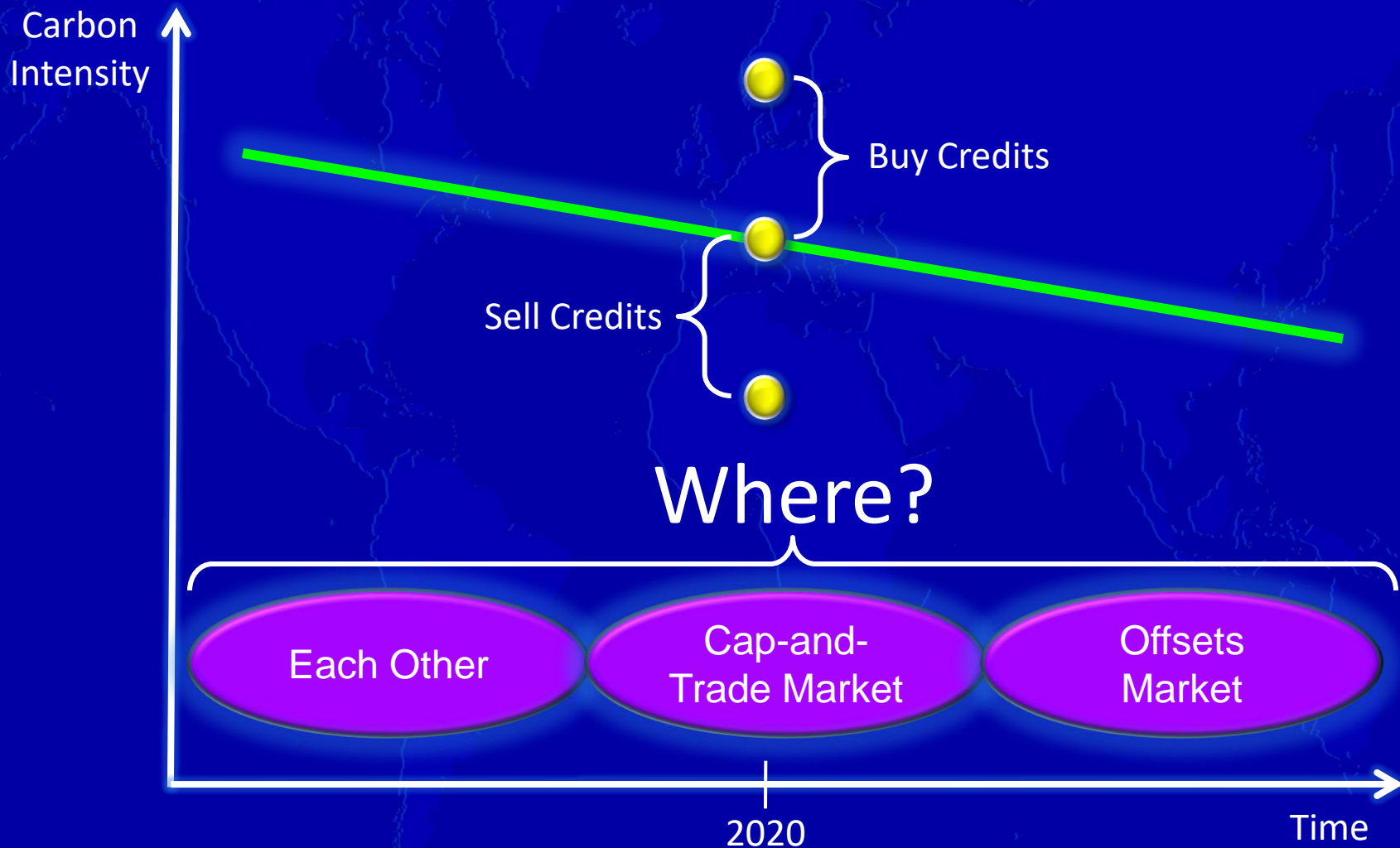
- *Government specifies “at what maximum rate” you may emit per unit of energy used (i.e., intensity standard)*
- *Example, “your cars sold must emit less than 150 grams of CO<sub>2</sub> per mile driven”*

# HYBRID SYSTEM: TRADABLE PERFORMANCE STANDARD

- *Government tells you “maximum rate at which you should emit,” but provides other options (carrots and sticks)*
- *Many variations, but most based on intensity standard*
- *Unlike performance standard, TPS provides alternative compliance mechanisms*
- *Policy Tradeoff: More flexibility than command and control, still no certainty on absolute emissions*



# HOW DOES TPS WORK?



# Cap & Trade: Sector Program

- *Government tells an industry “how much” it can emit as an industry, but leaves the question of where reductions take place to the market*
- *Poor policy for an industry with a small number of players and comparatively high abatement costs*
- *Policy Tradeoff: Provides emissions certainty, but effectively puts a cap on industry growth*

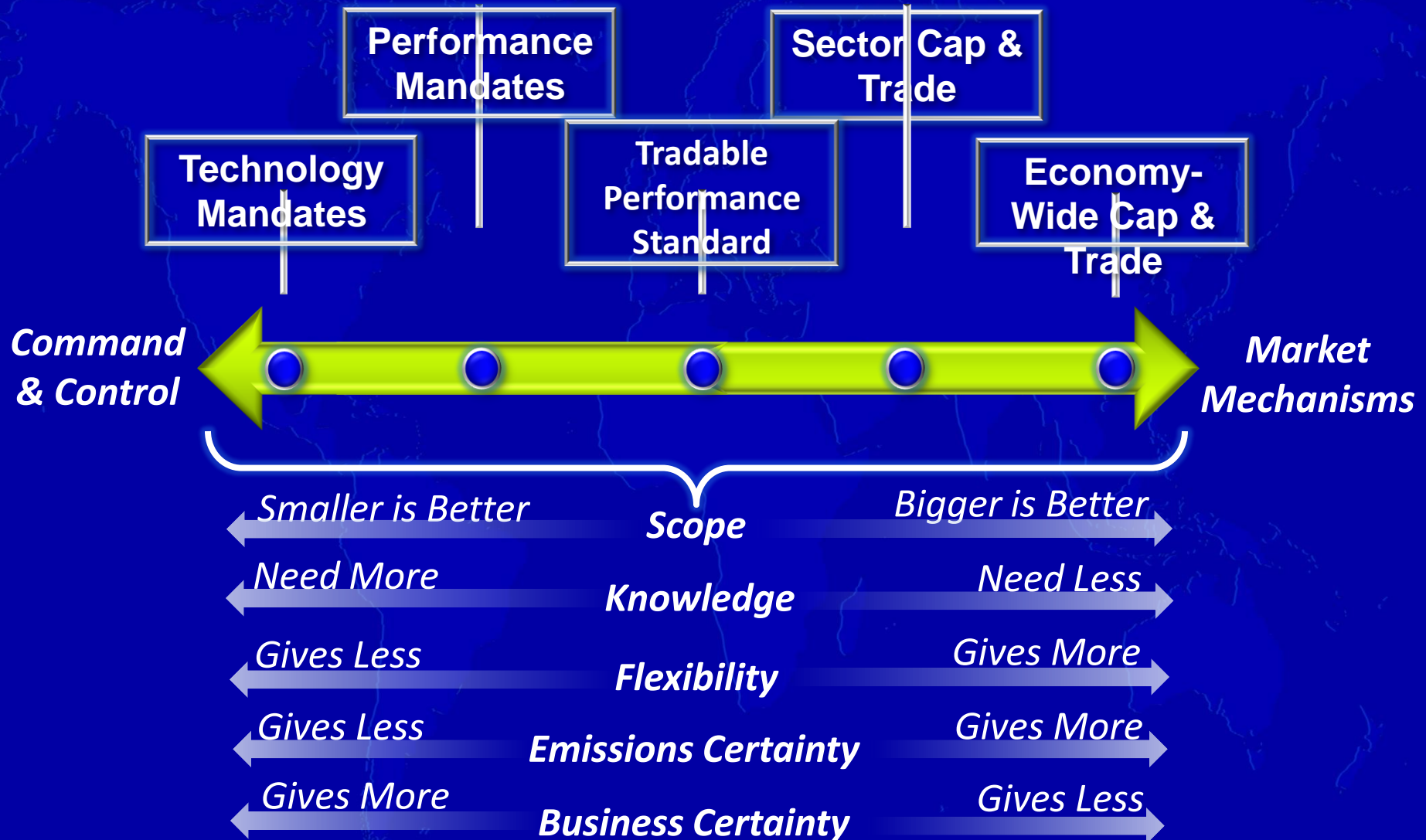
*Inferior to Economy-Wide C&T in All Respects!*



# Cap & Trade: Economy-wide Program

- *Government determines which sectors will be covered and fixes the amount they can emit as a group*
- *If scope of program is broad (e.g., electric power + transportation + oil and gas + industry), effectively represents a new cost but not a cap on industry growth*
- *Policy Tradeoff: Guarantees emissions level, but at what cost?*

# POLICYMAKER'S TOOLBOX



# CAP-AND-TRADE: THE BASIC MECHANICS

- *Government establishes a “cap” that limits total amount of pollution allowed*
- *Creates a scarce resource: the right to emit*
- *Government distributes permits*
- *Permits traded and market price established*
- *Emitters submit permits at end of compliance period*
- *Number of permits declines each year*

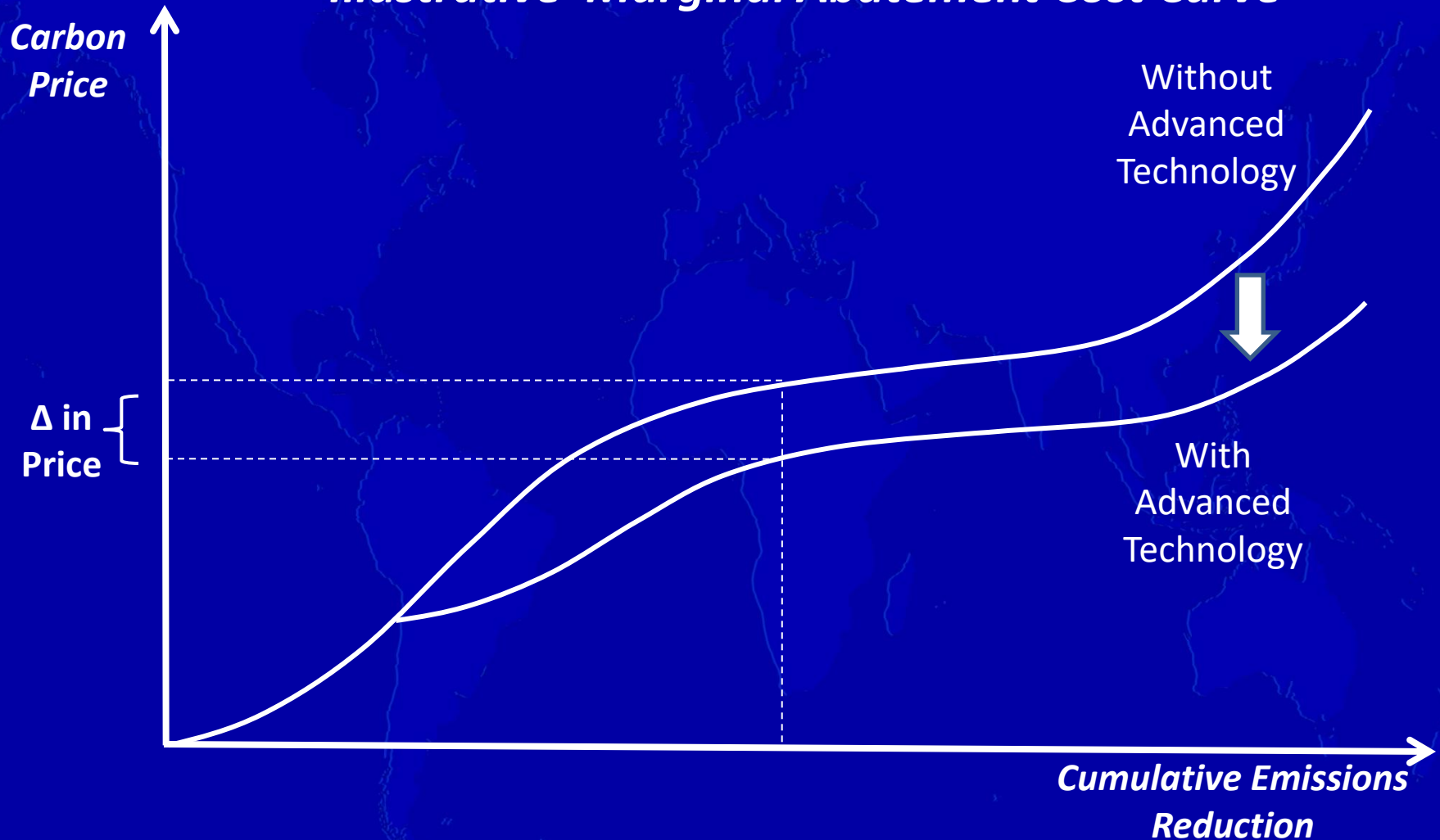
# CAP-AND-TRADE: THE BASICS OF PRICE DETERMINATION

*Illustrative Marginal Abatement Cost Curve*



# CAP-AND-TRADE: HOW TECHNOLOGY CHANGES THE GAME

*Illustrative Marginal Abatement Cost Curve*





# C&T AS MUSICAL CHAIRS

**Today: Everyone Has a Seat!**



**Electric  
Power  
Generator**



**Gasoline  
Refiner**



**Natural Gas  
Distributor**



**Cement  
Manufacturer**

# EVERYONE HAS PRIVATE ABATEMENT COSTS

I can build a wind farm at \$30 per ton CO<sub>2</sub> avoided



**Electric  
Power  
Generator**

I can improve the efficiency of my plant for \$40 per ton CO<sub>2</sub> avoided



**Gasoline  
Refiner**

I can finance more efficient stoves for \$10 per ton CO<sub>2</sub> avoided



**Natural Gas  
Distributor**

I can blend SCMs for \$20 per ton CO<sub>2</sub> avoided



**Cement  
Manufacturer**

# THE WRINKLE: YOU CAN BUY A CHAIR

First Round: Remove Chair & Play the Music  
(Trade)



**Electric  
Power  
Generator**



**Gasoline  
Refiner**



**Natural Gas  
Distributor**

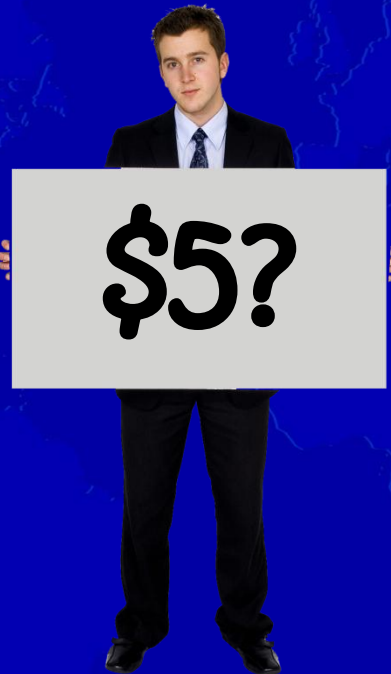


**Cement  
Manufacturer**

# TRADING: LETS MAKE A DEAL!



**Electric  
Power  
Generator**



**Gasoline  
Refiner**



**Natural Gas  
Distributor**



**Cement  
Manufacturer**



# TRADING: LETS MAKE A DEAL!

Sold!

\$10?



**Electric  
Power  
Generator**



**Gasoline  
Refiner**



**Natural Gas  
Distributor**



**Cement  
Manufacturer**



# ALL REMAINING PLAYERS HAVE CHAIRS

**The Market Finds the Least Cost Reduction  
(\$10)**



**Electric  
Power  
Generator**



**Gasoline  
Refiner**



**Cement  
Manufacturer**

# But lots of issues, not an easy game

- Program Scope: Which sectors to include under the cap?
- Target: How much do you want these sectors to reduce?
- Trajectory: How fast do you want to approach the target?
- Allocation Mechanism: Auction or freely allocate permits?
- Compliance Flexibility: Allow banking or borrowing? What terms?
- Cost-Containment Mechanisms: Offsets, safety valves, or other measures to limit price volatility?

# THE DEVIL IS IN THE DETAILS:

## AUCTION VS. FREE ALLOCATION ETS Experience = Aversion to “Windfall Profits”

- Free allocation exception, not rule
  - Possible if industry demonstrates inability to pass through costs
  - In absence of free allocations, such industries are at competitive disadvantage relative to imports
- Must also decide basis for allocation:
  - Historical emissions (grandfathering)
  - Carbon intensity factor (benchmarking)

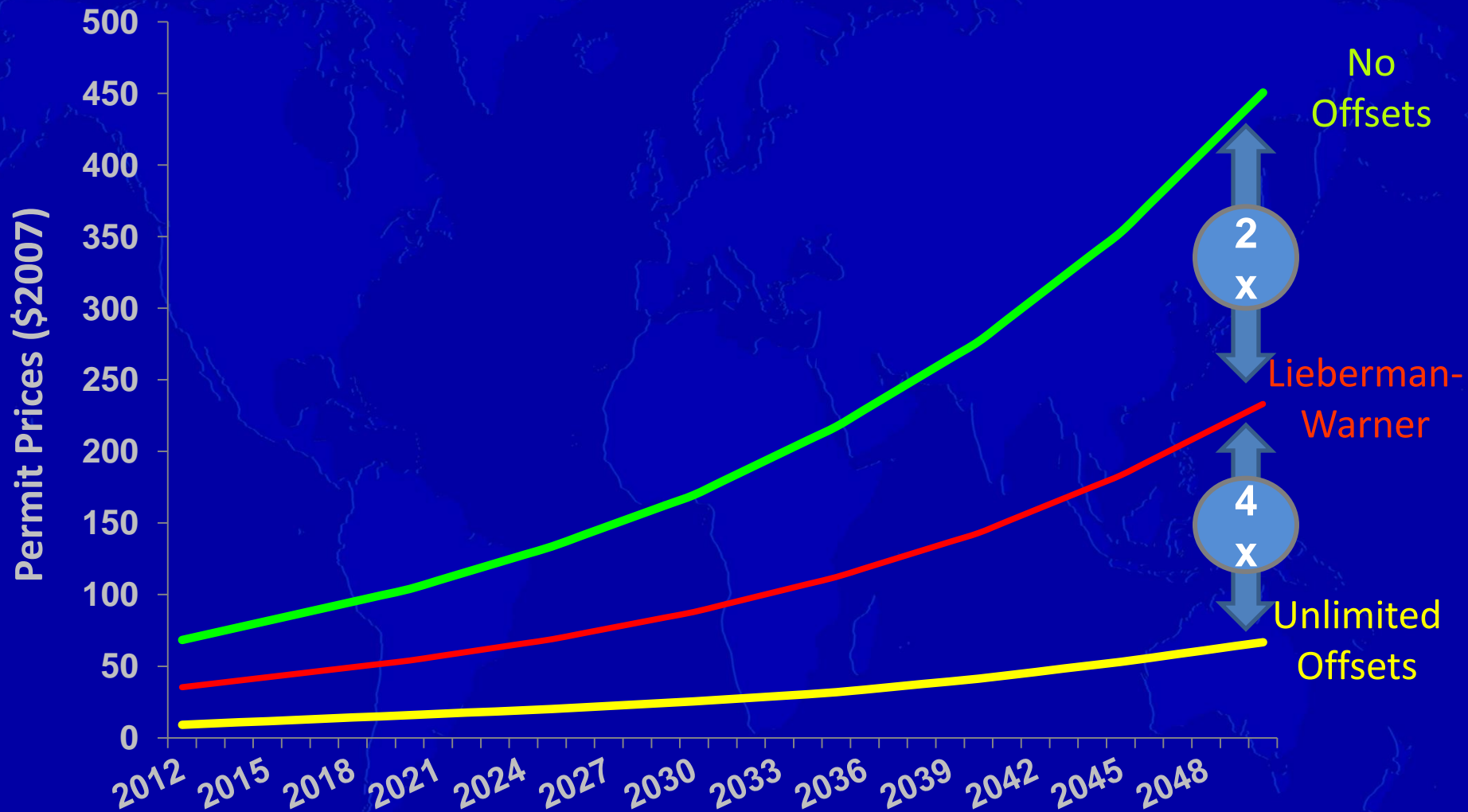
# THE DEVIL IS IN THE DETAILS:

## AVAILABILITY OF OFFSETS

- An offset is a reduction done outside the cap
- Geographic Restrictions
  - State (region) versus National versus International
  - The wider the scope, the lower the costs
- Quantitative Restrictions
  - % that may be used to comply in a given year
  - The higher the %, the lower the costs

Decisions about offsets are critical determinants of permit prices and overall program costs!

# OFFSETS CAN DRAMATICALLY LOWER COSTS





# THE DEVIL IS IN THE DETAILS:

## SAFETY VALVES

- A preset level that permit prices cannot exceed
- Combines C&T and Tax (a “maximum potential tax”)
- Advantage = existence provides some cost certainty (good for business planning)
- Disadvantage = triggering loosens the emissions cap (bad for guaranteeing emissions)
- Variations possible, but all involve same basic tension:

Cost Certainty versus Emissions Certainty

# Other Policy Options

- Research and Development Spending
  - Government can try to promote scientific discoveries, support research, pay bounties for breakthroughs. Rely on national laboratories, fund academic research
- Other Ideas
  - Insure startup concepts (e.g., carbon sequestration)
  - Subsidy for first demonstration plants
  - Fee-bates (tax on inefficient car/appliance, subsidy for efficient car/appliance, etc.)

# POLICY INSTRUMENTS: KEY INSIGHTS & TAKEAWAYS

- Policymaker's toolbox has a diverse range of instruments
- Key tension for the policymaker:  
Cost Certainty versus Emission Certainty
- Flexibility usually generates lowest-cost reductions:  
 $\text{Competitiveness} = f(\text{Cost}) = f(\text{Flexibility})$
- Cap & Trade is elegant on the surface, but many design details dictate the personality and attractiveness of the policy

# Topics for Group Discussion

- In your experience is the global warming problem now accepted as real?
- Does the world have the kind of political leadership to solve the global warming problem?
- Why is it necessary to put GHG issues in the context of a full energy, economics, national security, foreign relations, individual freedom, environment debate? What are the trade-offs?
- How do leaders make citizens realize there are no easy answers, and that tough choices have to be made? (Germany, Florida, etc.)

# Topics for Group Discussion, cont.

- Why is it said that economists like cap and trade, but businesses like a straight emissions tax?
- Any ideas for ways that “behavioral economics” could reduce GHG? (a great thesis topic!!)
- The California challenge—the leakage problem and how to avoid a policy failure “trifecta”?
- The ethanol hype—what to do after a bad policy has been established? (it was easy for GM and politicians!!!!)