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U.S. Carbon Policy:
Will Cap-and-Trade Work Differently, If Allowances Are Allocated vs. Auctioned?

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Focus of this Talk

- Under a cap-and-trade program, reductions in compliance costs, profits from allowance trading and prospective profits from deploying new technologies will provide incentives to reduce greenhouse gas (GHG) emissions.
- This talk will discuss issues surrounding ***administrative allowance allocations*** and ***allowance auctions,*** which are the main mechanisms for distributing GHG emission allowances.
- Key unanswered questions are:
  - Will the Cap-and-Trade Market Work Differently, If Allowances Are Allocated vs. Auctioned?,
  - How Should Allowances Be Allocated?, and
  - How Should Auction Revenues Be Distributed?

Topics

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Will Cap and Trade Work Differently, If Allowances Are Allocated vs. Auctioned?

- Because of market interactions and different incentives to potential participants, GHG emissions allowance, electricity, technology and energy markets could behave differently under Administrative Allocation vs. Auction schemes.
- Because the annual market value of GHG allowances in the U.S. alone has been estimated to be on the order of $100 to $370 billion, it is important to understand market interactions and differing incentives.
- Two related questions:
  - How should the initial market value of GHG allowances be distributed?
  - What will be the equity and efficiency impacts of the chosen distribution method(s)?

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Will Cap and Trade Work Differently, If Allowances Are Allocated vs. Auctioned?

- Current studies estimate compliance costs, energy prices, effects on electric rates and economy-wide impacts under a variety of assumptions about future caps, technologies and allowance prices.
- These studies assume well-functioning, reliable markets, independent of allowance allocation methods and the initial distribution of allowances.
- They also assume broad participation, liquid markets and seamless trading.

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Cap-and-Trade Basics

- GHG allowances measured in tonnes of CO_2 equivalent emissions (CO_2e) will be issued for each year of the program. One allowance of a current or prior year vintage must be surrendered after the end of the compliance period for each tonne of emissions.
- The number of allowances issued will decline over time to match the annual emissions "cap."
- Tradable allowances will enable diverse emission sources in different locations to reduce emissions at locations where it is cost-effective.

Cap-and-Trade Basics cont'd

- **Market rules** will define the points of regulation / compliance entities, allowance distribution methods, compliance periods, banking, borrowing, use of offsets, trading restrictions and other rules governing the allowance market.
- **Potential profits** from reducing compliance costs under cap-and-trade will encourage venture capitalists, technologists, innovators, investors and entrepreneurs, who believe they can reduce emissions at lower costs than the costs of complying by purchasing allowances.

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Tenets for Distributing GHG Allowances

- Provide GHG emitters with an allowance supply matched over time to the declining cap on emissions.
- Create integrity, liquidity and fungibility of allowances, in order to:
  - Send a market price signal that reflects the marginal costs of emission reductions,
  - Bring about widespread market participation,
  - Promote cost-effective trading across state and international boundaries,
  - Provide incentives to invest in research, development and commercialization of low-emitting technologies, and
  - Encourage allowance trading and, thereby, reduce the costs of compliance with the emissions cap.

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Tenets for Distributing GHG Allowances cont'd

- Ease the transition of affected firms and individuals to a future where the costs of GHG emissions are internalized in operating and investment decisions.
- Moderate disruption to existing operations, contracts and practices.
- Minimize administrative and transaction costs for compliance and trading.
- Help alleviate concerns about the distributional equity of compliance costs.
  - Equity issues can be addressed by the allocation of auction revenues/fees or revenue rights, rather than allowances themselves.

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Tenets for Distributing GHG Allowances cont'd

- Provide a mechanism to enforce reductions, penalize non-compliance and realize profits from successful emission reduction projects.
  - Profits are an essential motivation, and
  - Profitability is necessary to sustain reductions over decades.
- Promote simplicity, certainty, compatibility and stability in affected markets, including emissions, technologies, energy and financial markets.
  - The European Union Emissions Trading Scheme (EU ETS) is well-established and consistent with the Kyoto Protocol.
  - The success of the Clean Development Mechanism (CDM) or its successor depends on the integrity and robustness of a post-2012 global market for allowances.

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Administrative Allocation of Allowances

- **Administrative Allocations** under source-based cap-and-trade would distribute allowances for free or for a fee:
  - To emission sources in perpetuity or for a period of years in advance, as in U.S. SO_2, NOx and EU ETS Phase 1 markets,
  - To electric power providers/Local Distribution Companies, who could sell allowances to offset increases in electric rates,
    - LDC power costs will exhibit seasonality, while revenues from allowance sales may peak at the end of mandated compliance periods of 3 years or longer.
    - If electric rates to consumers are lowered by receipt of allowance revenues, this could result in over-consumption, since true GHG costs have not been fully internalized.
  - To other entities or for reserves for new entrants.

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Administrative Allocation Methods

- **Administrative Allocations** might be based on:
  - Historical emission tonnages during selected base years,
  - Calculated annual emission tonnages, and
  - Designated set asides for new entrants.
- The choice of any allocation formula and modifications to it will be influenced by politics.

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Alternative Methods for Calculating Allowance Tonnages

- Specified Input Rate x Input in a base year – e.g., Specified CO_2 per ton of coal multiplied by annual tons consumed.
- Specified Output Rate x Product Output in an historical year – Specified CO_2 per MWh x annual MWh output.
  - Output Rates could be differentiated by fuel type (coal or natural gas) and combustion technology.
  - In some proposals, non-fossil electric generation sources would be allocated allowances.
- Tonnages may be allocated in perpetuity, declining proportionally with the cap or might be updated each year based on output in the prior year.
- Updating allocations yearly based on prior year operations would change today's marginal costs of allowances and create different incentives for the continued use/retirement of existing assets. Updating would be less efficient, introduce uncertainty and, administratively, would be more cumbersome than allocations fixed at the outset.

More About Administrative Allocations

- Traders and other market participants would buy & sell allowances in secondary markets.
- There is concern about potential "windfall profits," if "over-allocation" occurs.
  - For regulated utilities the costs of and revenues from trading will flow through to ratepayers.
  - Accurate GHG inventories can improve the allocation process.
  - "Over-allocation" is unlikely to be a primary cause of "windfall" profits.
    - Over-allocation leads to lower allowance prices.
    - Other factors, including market interactions, will affect the ability to make profits in energy and emissions allowance markets.

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Allowance Auctions

- **Periodic Allowance Auctions** would sell GHG allowances to parties submitting successful bids.
  - A variety of auction formats could be utilized.
  - Bidders must be creditworthy and pay up-front.
  - Buying a long-term stream of allowances could be very expensive.
  - Prices under existing contracts could prevent some generators with power delivery obligations from recovering the full market price paid for allowances.
  - Auction revenues would be allocated by government for various purposes.

More About Auctions

- Traders and emission sources would also participate in the secondary market.
- However, there is concern about capital availability to buy allowances and at the same time to raise capital to pay for RD & D and emission reductions.
- There is also concern that regulated utility buyers and generators will buy only what they need initially to ensure reliable operations, not to trade.
  - If allowances were administratively allocated, surplus allowances would be available for immediate trading.

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Hybrid Allocation Approaches

- Hybrid approaches would phase-in auctions after initially making administrative allocations. Both would be subject to a declining cap.
- In most proposals, the transition from administrative allocations to full auctioning of allowances would occur by 2020 or by 2030.

Revenue & Fee Distributions

- Ultimately, consumers will bear the costs and reap the benefits of GHG reductions.
- Revenue distributions can be handled separately from initial allowance distributions, in order to mitigate equity or efficiency impacts.
- Distributions could increase overall economic efficiency, but might also be regressive (i.e., provide a greater proportion of revenues to higher income groups). Examples are:
  - Reducing income or payroll taxes, and
  - Free "grandfathered" allocations to emitters based on historical emissions.
- Regional impacts will differ.

Revenue & Fee Distributions cont'd

- Could be progressive, but with accompanying increases in allowance prices and decreases in allowance market efficiency. Examples are:
  - Applying revenues to compensate utilities, which, in turn, would reduce consumer electric rates,
  - Rebating costs for home heating or transportation fuels to residential consumers, and
  - Giving a per-capita dividend, lump-sum rebate or EITC.
- Could be progressive and enhance market efficiency, if successfully applied to improve energy end-use efficiencies.
  - Higher end-use efficiencies would reduce energy demand, lower emissions and reduce allowance prices. and
  - Existing programs are already designed for this purpose.
- Could be applied to research, development and deployment of new technologies and energy infrastructure.

Experience with GHG Auctions

- Worldwide experience with emission allowance auctions is limited.
- The U.S. SO_2 market auctioned only 2.86% of allowances each year and returned the revenues to owners of the auctioned allowances.
- The Regional Greenhouse Gas Initiative (RGGI)* has held two successful auctions to date.
- U.K. held Europe's first GHG auction in November, selling 4 million tonnes of CO_2e EUAs for €16.15/mtonne.
- Austria and the U.K. will hold auctions in March 2009.
- EU ETS Phases 2 & 3 will increase auctioning.

* RGGI has 10 member states: New York, Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, Rhode Island and Vermont.

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RGGI Auctions to Date

- RGGI conducted two successful GHG allowance auctions using a sealed-bid, uniform-price format with a reserve allowance price of $1.86.
  - The first auction on Sept. 25, 2008, sold 12.5 million vintage 2009 allowances from six RGGI states: Connecticut, Maine, Maryland, Massachusetts, Rhode Island, and Vermont, at a market clearing price of $3.07 per allowance.
  - On December 17, 2008, the 10 RGGI states earned $106.5 million via the sale of 31.5 million vintage 2009 allowances @ $3.38 market clearing price. Sixty-nine participants submitted bids for 3.5 times the quantity of offered allowances.
  - A third auction, including 2009 and 2012 vintages, is scheduled for March 18, 2009.
- RGGI auctions will not provide examples of auction behavior where allowances are scarce.
  - RGGI allocations exceed expected emissions.
  - Opportunities for market manipulation when the market is short on allowances are less well understood. RGGI results will not illuminate such a situation.

Auctions vs. Administrative Allocation: Points to Consider

- Governments and advocacy groups are salivating over potential auction revenues.
- Studies of GHG auctions to date have focused more on the equity effects of revenue distribution to consumers, rather than on the effects of auctions on market participants, market operations, efficiency, volatility and other potential impacts.*
- Earning profits from selling allowances received at zero-cost under administrative allocations might encourage sources to make earlier reductions to free up allowances for sale.

*Burtraw, Sweeney, and Walls. "The Incidence of US Climate Policy." Resources for the Future discussion paper 08-28, September 08

Points to Consider – Compensation

- Free administrative allocations are partly intended to compensate existing sources for the costs of making emission reductions.
- Free allocation of 100% of the total allowances to existing sources would over-compensate the majority of electric utilities owning GHG emission sources.
- Estimates suggest that free allocation of 25-75% of GHG allowances would be sufficient to compensate existing sources for their compliance costs. However, determining the amount needed to mitigate harm would be a contentious process.

Burtraw, Dallas, and Karen Palmer, Resources for the Future. "Compensation Rules for Climate Policy in the Electricity Sector." Journal of Policy Analysis and Management. 2008.

Points to Consider – Windfall Profits

- Some affected sources are thought to be capable of generating "windfall profits" by selling surplus allowances, if allowances are awarded for free via grandfathered administrative allocations.
  - Such "windfall profits" could be considered as compensation for those who made emission reductions after the base year.
  - Such "profits" may need to be reinvested to make future reductions.
- Well-designed "scarce" allocations could avoid surpluses. However, allocations that are too scarce would raise the price, yielding greater profit margins for some holders of allowances.
- In any case, regulated entities are not likely to be permitted to make either windfall or excess profits.
- The contributions of "over-allocation" to "windfall profits" in Phase 1 of the EU ETS were over-estimated. Other factors, including less competitive power markets, were more significant.

Points to Consider – Capital Availability

- The GHG sector must attract investment based on expected profits.
- Capital needed for future investment in low-emitting technologies must come from somewhere, i.e., prior profits in the energy sector or from outside sources.
  - Substantial capital will be needed to bid for allowances required to cover generator emissions and, in addition, to pay for permanent reductions and to develop new technologies needed to comply with a declining cap.
  - Uncertainty and "boom and bust" cycles inhibit investment.
  - Collateral requirements for allowance purchases may affect a firm's cost of capital or covenants in contracts.
- Current studies of GHG auction bidding and allowance market performance assume that sufficient capital will be available via well-functioning capital markets.

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Points to Consider – Market Liquidity

- Market liquidity will be lower in the early years, until a sufficient bank of allowances is accumulated.
  - A compliance period of adequate length will help avoid shortfalls. (3 years might not be long enough)
  - Little quantitative analysis has been done regarding different compliance periods.
- Because of the up-front costs, bidders in auctions will most likely buy only the amounts they need.
- When compared to free initial allocations of a multi-year stream, auctions might reduce the availability of allowances for resale in the secondary market.
- A multi-year supply would enable sources to make spot market sales, execute puts, calls, leases, swaps, & forward transactions for near-term, as well as for future year allowances.

Points to Consider – Auction Participation

- Widespread participation will help ensure efficiency and transparency and will reduce opportunities for market manipulation.
- Agents, including financial firms and market intermediaries, can enhance efficiency and help avoid problems that could result from the very large asymmetry of information and capabilities among all affected firms that must comply.
- Interactions among markets, e.g., fuels and electricity, and competitiveness issues should be taken into account in revealing bid information.
- The effects of minimum reserve prices and/or price triggers affecting quantities to be auctioned or reserved should be carefully considered.

Questions That Should Be Answered

- How and when might organizational and financial constraints influence market behavior under different allocation methods?
- How will different allocation methods
  - Affect particular types of market and auction participants,
  - Affect bidding and prices across multiple auctions, and
  - Affect allowance market efficiency and secondary market prices and volatility, particularly, when
    - Allowances are scarce relative to the cap or
    - Future vintages are not yet available?
- Will opportunities to exhibit market power or manipulate the market be different under auctions vs. administrative allocations?

Questions That Should Be Answered cont'd

- Will the purchase and sale of allowances affect the capital structure and costs of capital for utilities?
- Will sectors other than electric utilities provide the credit-worthiness and develop the expertise to bid and to trade?
- Do "cost-minimization" and "profit-maximization" incentives differ under auctions vs. administrative allocations?
- What are the pros and cons of a 5-year, 10- year or 15-year transition from administrative allocations to full auctioning of all allowances?
- How might opportunities and incentives to conduct RD & D for new technologies differ under auctions vs. administrative allocations?

Appendix — A Simple, Equitable Method for Allowance Allocation, Illustrated for Power Plants in the Western Electric Coordinating Council (WECC)

A Comparison of the Potential Costs of Allowances Purchased at Auction or Allocated for Free Using Best-in-Class, Fuel-Differentiated Emission Rates

Allowance Allocation Methods

- VHC compared three GHG allocation methods in the WECC that would yield a range of first-year auction percentages:
  - Grandfathered allocation to individual generators based on historical annual tons in year 2004,
  - A single output-based emission rate allocation applied to all plants
    - One fixed uniform output rate (lbs CO_2/MWh) multiplied by 2004 annual generation.
  - Fuel-differentiated, output-based emission rate allocations determined before the beginning of the cap-and-trade program.
    - First-year historical emission rates derived from the lowest emission rate power plants burning coal or natural gas in the WECC, i.e., best-in-class emission rates, along with base-year MWh output for each source, which would not be updated for allocation purposes.
    - The first-year emission rates could decline pro-rata to enable the percentage of auctioned allowances to increase over time.
    - Additional categories like those for federal New Source Performance Standards (NSPS) could be chosen to create additional category emission rates based on fuel and technology combinations. (This was not done here).

A Simple, Best-in-Class Allocation Method

- A best-in-class, fuel-differentiated, output-based CO_2 emission rate in lbs. CO_2 per MWh was calculated from historical data for two categories of fossil-fired electric generators in the WECC: coal and natural gas-fired power plants.
  - Power plants were ranked from lowest to highest CO_2 emission rates in 2004.
  - Best-in-class average rates were calculated based on cumulative generation and cumulative emissions from plants up to a cutoff percentage, ***P***, of the category's total generation.

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Only One Parameter Is Required

- The *single* parameter, ***P***, defines the output-based emissions rates for the first-year allocation of GHG allowances:
  - The cutoff percentage for cumulative output from the lowest emission rate sources in each category defines the best-in-class average emissions rate, e.g., ***P = 10%***. This cutoff percentage is applied across all categories.
  - A base-year for validated data must also be designated to determine each source's CO_2 emissions and MWh output. ***2004*** was used.
  - For each category the **[cumulative emissions/cumulative generation]@ *P = 10%*** becomes the best-in-class CO_2 emissions rate for allocating allowances to individual sources in the category.
  - First-year allocations equal the best-in-class category emissions rate (lbs. CO_2 per MWh) multiplied by the base year's generation (MWh). Calculated allocation rates for coal-fired and natural-gas-fired sources are shown in the next slide for different values of ***P,*** along with the percentage of unallocated allowances that would be available for auctioning.
  - Free allocations in subsequent years would decline pro-rata, subject to increasing the percentage of auctioned allowances and satisfying the declining sector cap. All free allocations can be specified prior to the first year of the cap-and-trade program.

First-year CO_2 Emission Rates for Free Allocations

P, Cutoff Percent of Cumulative Generation Included to Calculate Best-in-Class Average Rates	**WECC Coal-fired Generators: Annual Average (lbs CO_2/MWh)**	**WECC Natural Gas-fired: Generators (lbs CO_2/MWh)**	**Percent of First-year Sector Allowances Available for Auction or Reserves***
5	1,452	590	40
10	1,948	678	22
20	2,022	760	18
50	2,121	847	13
100	2,247	1,205	0

*Unallocated allowances would be available for auction or could be used for special purpose reserves.

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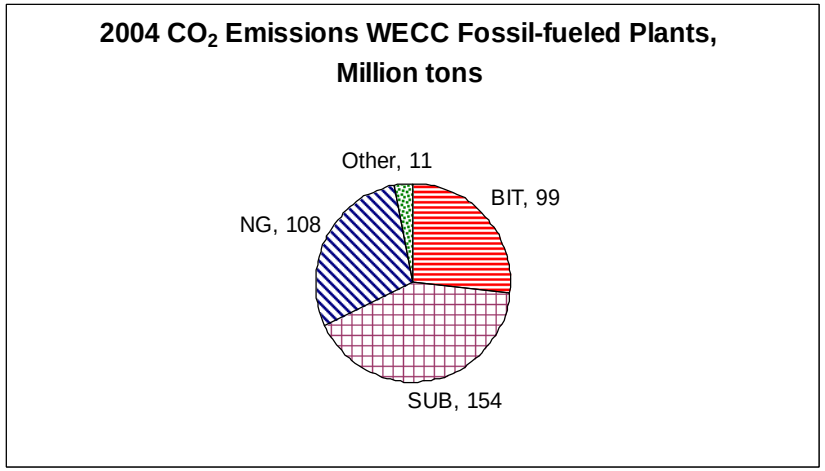
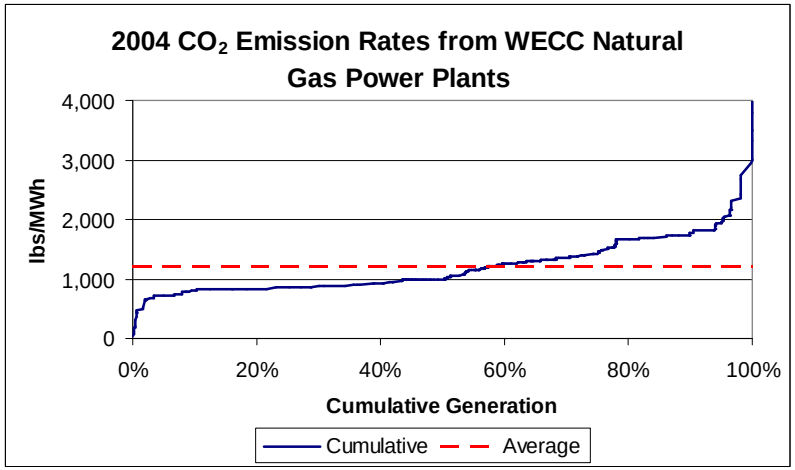
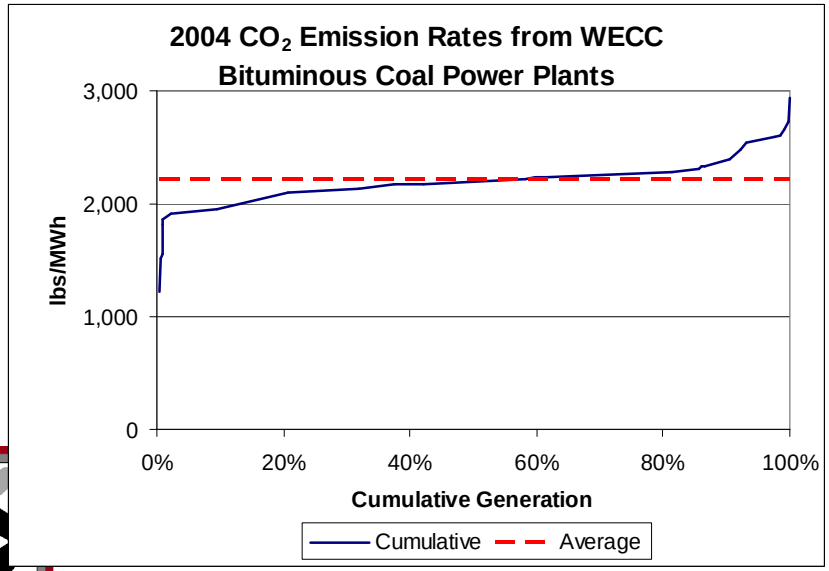
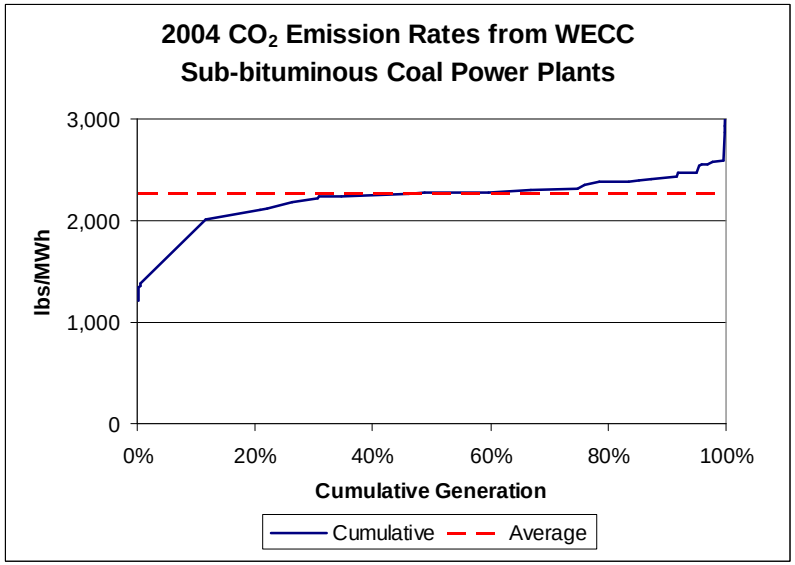
CO_2 Emissions from WECC Power Plants









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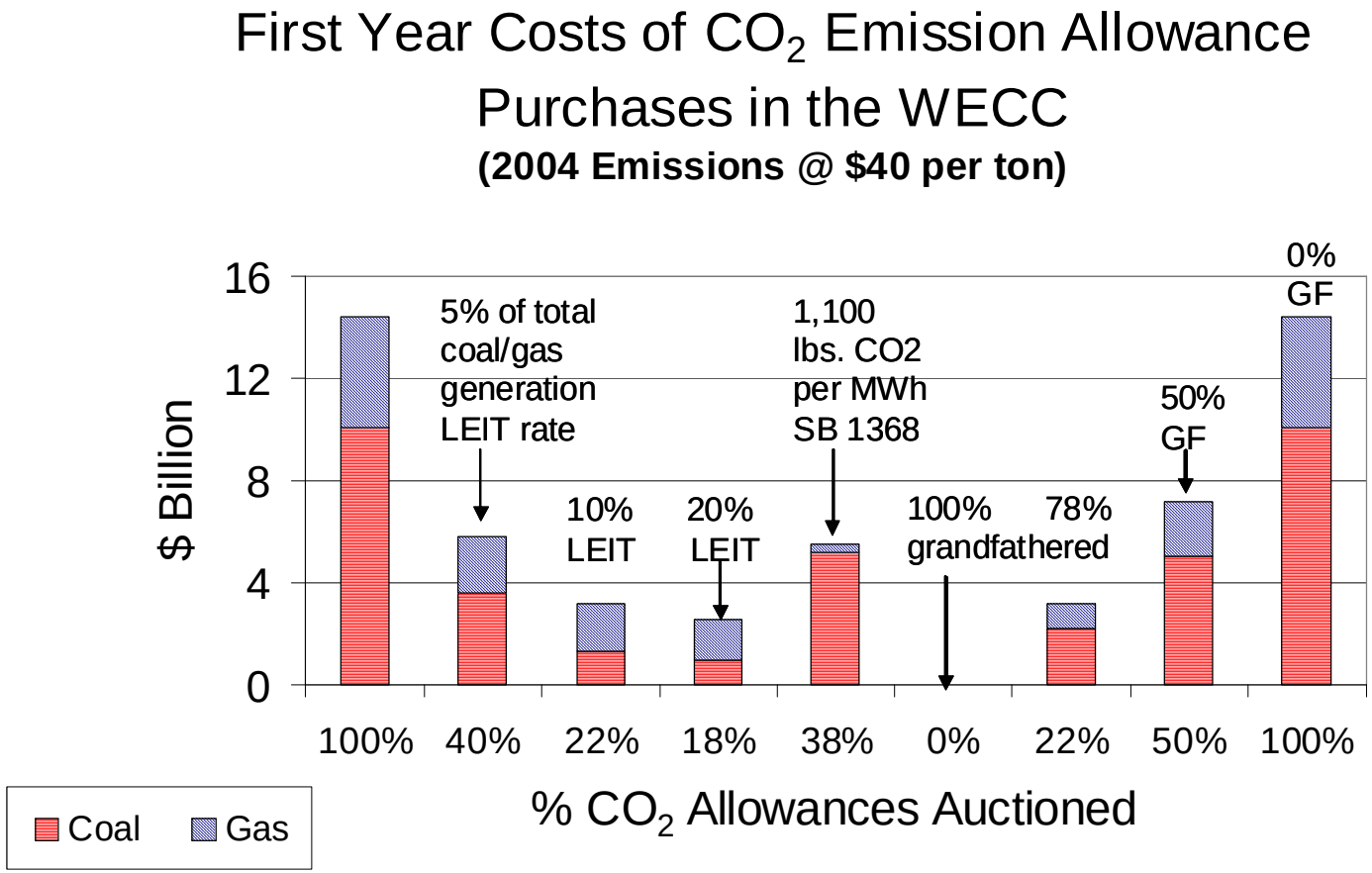
No Surprise: Auctions Would Raise Up-Front Costs to Fossil-fired Generators



Fuel-differentiated, output-based allocations determined in advance for natural gas and coal-fired plants would reduce uncertainty and be more equitable on a $/kW and $/MWh basis.

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About Van Horn Consulting

- Founded in 1987, Van Horn Consulting (VHC) helps clients examine energy and environmental markets, competitive, regulatory and implementation issues, proposed projects, and business strategies.
- Rigorous analyses of a broad spectrum of market, contractual and business decisions combined with management consulting constitute the core of our practice.
- We have conducted major studies for EPRI, EPA, numerous utilities & market participants. We provide expert reviews, analyses and testimonies regarding electricity, fuels, technology and emissions markets, regulations and contracts.

VHC Expertise

- Electricity markets and technologies
  - Evaluations of power procurement alternatives & contracts,
  - Independent Evaluator (IE) for SDG&E (2007-present):
    - Evaluate renewable and conventional supply RFOs, including bids received, SDG&E's economic methods & short-list analyses,
    - Monitor negotiations with short-listed bidders and review contract terms and conditions, and
    - Prepare IE reports regarding RFO fairness, short-listed projects and specific contracts filed for approval at the CPUC.
  - Design and implementation of market rules, price and rate forecasts, resource planning, regulatory compliance, damage calculations, expert testimony,
  - Power plant development, project assessment & valuation, rate design, electric supply strategy and
  - Technology cost and performance, market penetration and R & D.

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VHC Expertise cont'd

- Fuels, primarily natural gas and coal
  - Procurement and hedging,
  - Reasonable reviews and expert testimony,
  - Contracts, operations & fuel switching,
  - Market behavior, prices, economics and regulation, and
  - Pipeline assessment, FERC and PUC ratemaking.
- Emissions controls, cap and trade markets and environmental regulations
  - New Source Performance Standards (NSPS), New Source Review, CEQA, and GHG market design and regulation,
  - Cap and trade markets for emission allowances – helped develop the U.S. SO_2 market and set the price for the first SO_2 allowance market trade in 1992, and
  - Forecasted allowance prices and technology cost and performance for EPRI, TVA, Southern Company and others.

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VHC Senior Consultants

- **Michael Katz, M.S., P.E.,** Senior Consultant, has over 25 years experience in electric and natural gas markets, risk management, strategic planning and operations of physical assets. With VHC, Mike is SDG&E's Independent Evaluator for renewable, conventional and demand-side contracts. As PG&E's Vice President, California Gas Transmission (CGT) from 2000 to 2004, he led a department with $400 million in revenue and 500 people. Earlier, he led PG&E's Power Generation Department and was Director of Generation Portfolio Management and Power Generation Business Planning, after holding positions in Electric Resources Planning.
- **Edward Remedios, Ph.D.,** Senior Consultant, formerly worked for Chevron Research Company and for Pacific Gas & Electric Company (PG&E). While at PG&E, Ed coordinated PG&E's long-range planning and was the head of the Economics and Forecasting Department with responsibilities for economic and sales forecasts and project evaluations, including financial and technical assessments.
- **Andrew Van Horn, Ph.D.,** Managing Director, has 30 years experience evaluating *electricity, natural gas, coal and emissions markets* and implementing new technologies, contracts and regulations. He developed EPRI's first Integrated Resource Planning model, provided the price for the first SO_2 allowance trade in 1992, analyzed both the 1977 and 1990 Clean Air Act Amendments and projected impacts of greenhouse gas (GHG) policies from 2000 to 2050. He has advised clients on SO_2 and GHG market design, technology cost and performance, R&D, electricity and gas procurement and contracts, price forecasting, plant valuation and strategic planning. He has testified about power, natural gas, steam and emissions contracts, economic damages, resource planning, tariffs and the economic and environmental impacts of regulations before the FERC, state agencies and courts.

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