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The California Air Resource Board's AB 32 Rules and the Electric Power Market

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Topics

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Topics cont'd

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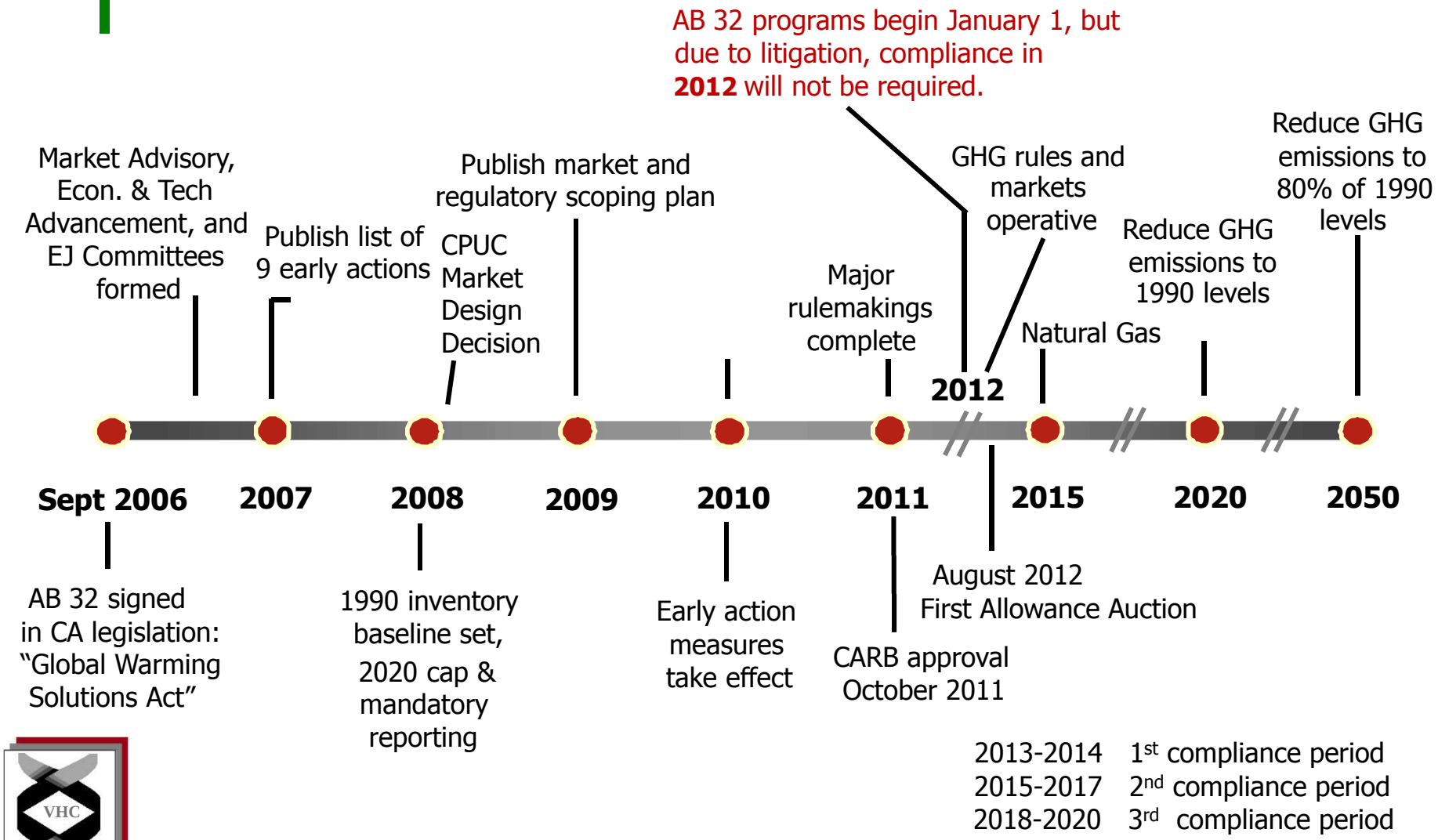
California's AB 32: Timeline & Basic Elements

AB 32 Regulated Greenhouse Gases

- AB 32 regulated greenhouse gases (GHGs) are: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), sulfur hexafluoride (SF6), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and other fluorinated greenhouse gases, including sulfur hexafluoride (SF6) and nitrogen trifluoride (NF3).
- These gases have different Global Warming Potentials (GWP), which means "the ratio of the time-integrated radiative forcing from the instantaneous release of one kilogram of a trace substance relative to that of one kilogram of a reference gas, i.e., CO2."
- Approximate 100-year GWPs:*
  - CO2=1.0, CH4=25, N2O=298, HFC-23=14,800, SF6=22,800

*2007 IPCC Fourth Assessment Report (AR4), p. 212.

California's AB 32 Timeline



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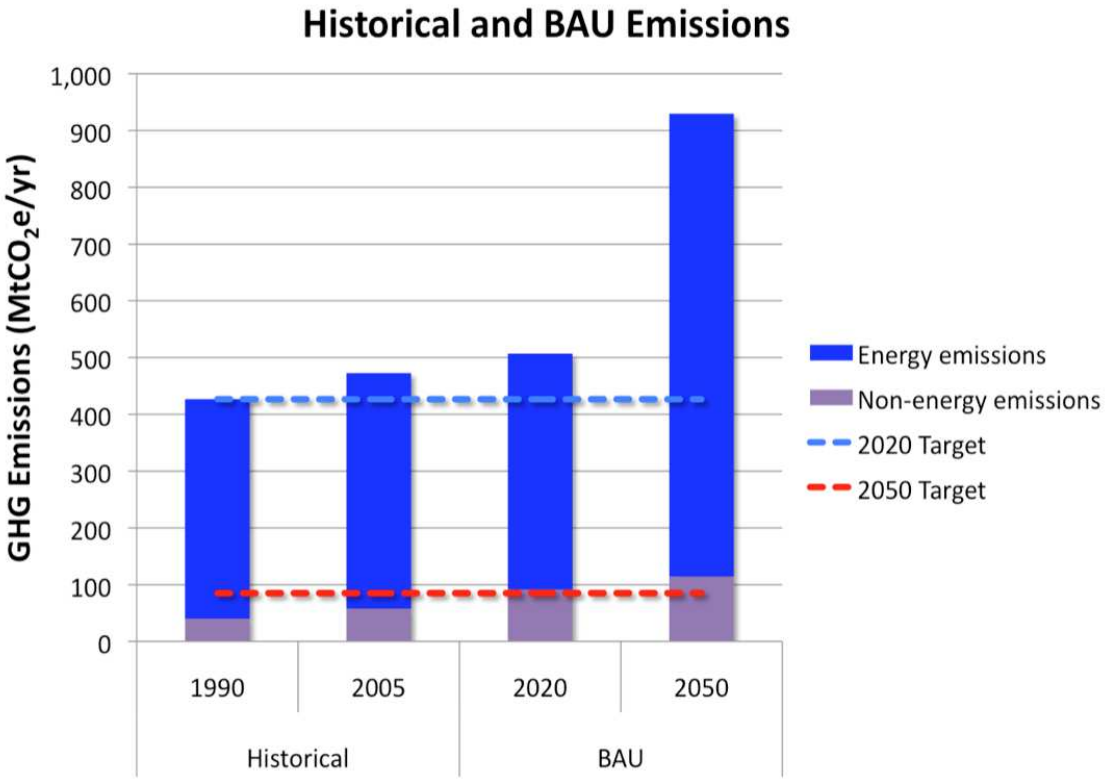
California's GHG Emissions

- Current and projected GHG emissions and AB 32 target levels for 2020 and 2050.



California's Energy Future – The View to 2050, LBNL Report, May 2011

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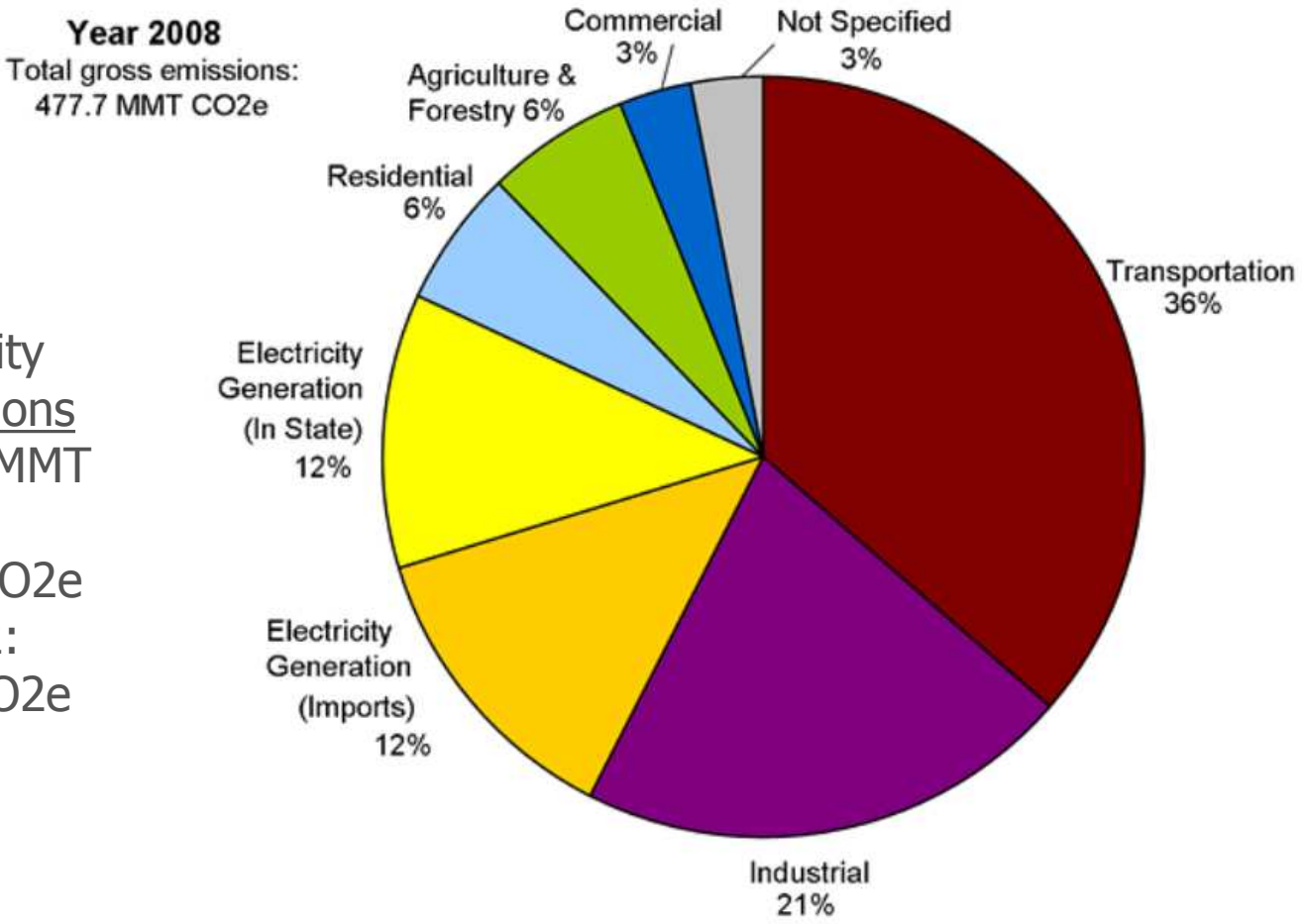
California's GHG Emissions By Sector

- California's GHG emissions in 2008:



Electric Utility
GHG Emissions
2008: 116 MMT
2020 BAU:
110 MMTCO2e
2020 AB 32:
83 MMTCO2e

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AB 32 GHG Reductions

- Under the October 2011 adopted Scoping Plan, BAU emissions would be 507 MMTCO2e in 2020. Hence, 80 MMT additional GHG reductions will be needed.
  - Baseline projections made in 2008 (BAU=596) were reduced in 2011 by 51 MMT due to economic recession and by 38 MMT from assuming Pavley light-duty vehicle emission standards, 20% RPS, and low-friction oil in BAU.
- Projected reductions from complementary measures under the adopted AB 32 plan, other than Cap-and-Trade (C&T) and the Advanced Clean Cars program, would avoid about 58 MMTCO2e in 2020.
- Leaving ~22 MMTCO2e to come from Cap-and-Trade (18 MMT) and advanced clean cars (3.8 MMT).*

*CARB, Status of Scoping Plan Recommended Measures, 2011, and CARB Final_supplement_to_ AB32 Scoping Plan Functional Equivalent Document, August 2011, p. 12

AB 32 GHG Reductions cont'd

- Adopted "complementary measures" in capped sectors total 45.2 MMTCO2e of reductions:

	MMTCO2e
The Renewable Electricity Standard (RES), 20% to 33% by 2020, legislated by SBX1-2:	11.4
The Low Carbon Fuel Standard (LCFS):	15.0
Energy Efficiency and Conservation:	11.9
Cogeneration (formerly 4.8 to 6.7 MMT)	0.0
Solar Water Heating (AB 1470)	0.1
Regional Transportation Targets (SB375)	3.0
Higher Tire Pressure	0.6
Shore-to-ship power in port for ocean vessels	0.2
Million Solar Roofs	1.1
High Speed Rail (1.0 MMT) + Vehicle Aerodynamics	1.9

*CARB, Status of Scoping Plan Recommended Measures, 2011, and CARB Final_supplement_to_ AB32 Scoping Plan Functional Equivalent Document, August 2011, p. 12

AB 32 GHG Reductions cont'd

- Adopted "complementary measures" in uncapped sectors total 13.0 MMTCO2e reductions:

	MMTCO2e
High Global Warming Potential Gases (was 20.2)	6.5
Sustainable Forests	5.0
Industrial Measures (were 1.1 in 2008 forecast)	0.0
Recycling and Waste (Landfill Methane Controls)	1.5

- Complementary measures to-be-adopted
  - Advanced Clean Cars 3.8
- Total annual GHG reductions forecasted from "complementary measures" in year 2020: 62
- Leaving the additional reductions under the cap-and-trade (C&T) program to provide: 18

*CARB, Status of Scoping Plan Recommended Measures, 2011, and CARB Final_supplement_to_ AB32 Scoping Plan Functional Equivalent Document, August 2011, p. 12

AB 32 Covered Sectors

- Large industrial sources, such as electric power plants, including specified* out-of-state plants selling into CA, oil refineries, cement plants… emitting 25,000 metric tons (MT or tonne) per year must submit a GHG allowance for each MT of CO2e released as of January 1, 2013.**
- Suppliers and users of natural gas, RBOB***, distillate fuel oils, LPG & transportation fuel distributors will be added to Cap & Trade in 2015.
- About 350 businesses, representing 600 facilities are affected. Ultimately, about 85% of GHG emissions in the state will be covered under the overall cap.

* Unspecified electric generation sources must assume default emission rates.
** Sources below thresholds may opt-in.
*** RBOB means (reformulated blendstock for oxygenate blending)

Cap-and-Trade

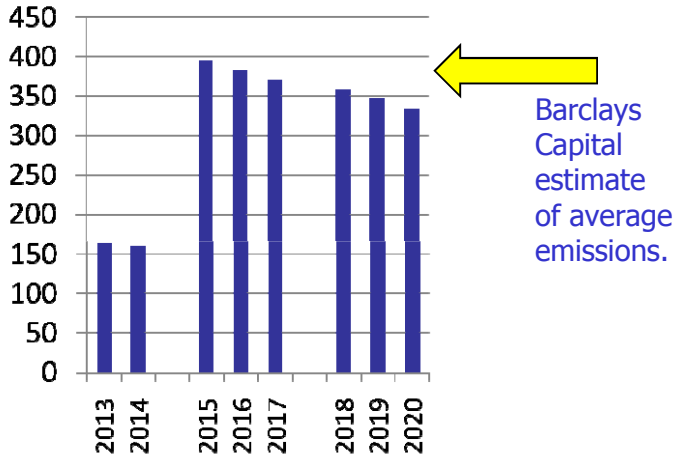
- California's Cap-and-Trade (C&T) program is a market-based approach that caps overall GHG emissions from electricity, industrial, commercial, and residential sectors and transportation fuels.
- Cap-and-Trade will provide the price signal needed
  - to create a market for GHG reductions and
  - to provide incentives to develop and implement improved technologies.

Jaco Environmental removing insulation foam
Under contract to EOS Climate
Photo Credit Christopher Joyce/NPR

Photo Credit: GreenVolts, Inc.
GreenVolts, Inc. in CEC 2011 IEPR
Concentrating Photovoltaic System

Allowance Allocation

- The overall GHG emissions cap for covered sources was intended to start at the level of emissions in 2012.
- The cap will decline at 2% per year between 2013 and 2014; then decline at 3% per year after 2015, when other sectors are brought into the C&T program.
- Free allocations will begin at 90 percent of industry sector average facility emission levels expected for 2012.
  - 2013 allocation: 162.8 MMTCO2e,
  - 2015 allocation: 394.5 MMTCO2e,
  - 2018 allocation: 358.3 MMTCO2e,
  - 2020 allocation: 334.2 MMTCO2e.



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Allowance Allocation cont'd

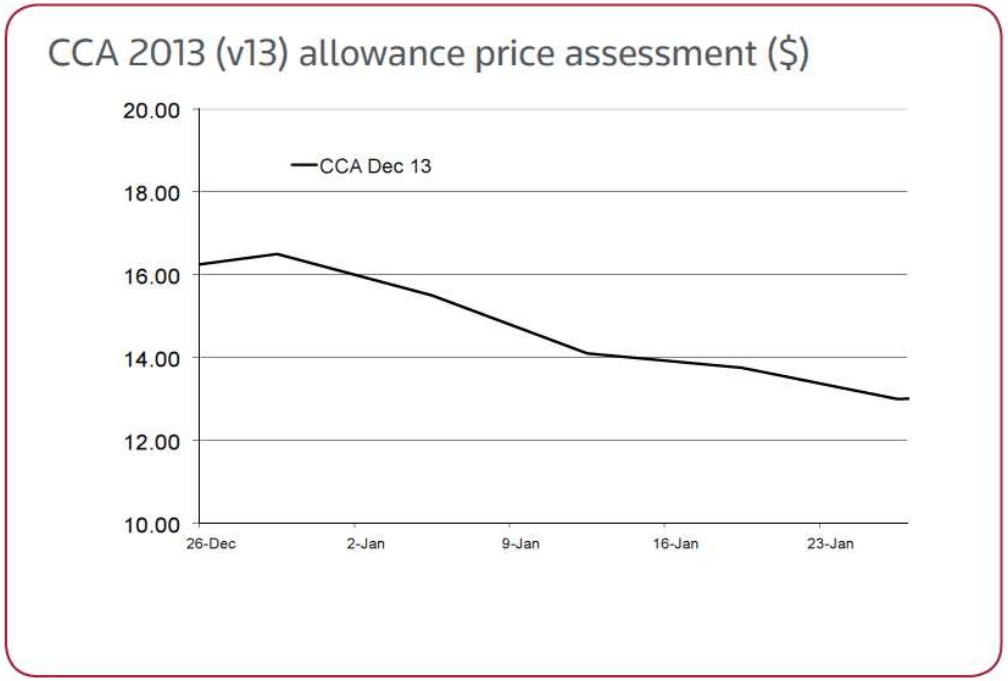
- Four to seven percent of the allowances will be held in the Allowance Price Containment Reserve, and less than 0.5% will be held in a Voluntary Renewable Electricity Reserve Account.
- Utilities will be given free allowances with the value of auctioned allowances used to benefit ratepayers, but IOUs will have to purchase allowances via the auction or on the secondary market.
- Output-based allocations to industrial GHG sources will help reduce leakage.
- Cumulative allowances to be issued:
  - 2013-2020 ~ 2.5 billion.
  - Total allowable offsets in the three compliance periods = 201 million (8%)

Carbon Offset Projects

- There are currently only 4 adopted offset protocols under CA's C&T programs:
  - U.S. forest projects,
  - Ozone depleting substances (ODS),
  - Urban forests, and
  - Livestock manure (digesters).
- Buyer liability is a great concern, due to potential invalidation for up to 8 (or 3) years after issuance.
  - Two certifications by different auditors will reduce the 8-year invalidation period to 3 years.
- Maximum offset demand for the first compliance period (2013-2014) is 26 million tonnes.
- The supply of offsets is likely to be short of demand.
- Offset limits apply each period (i.e., Max of 8%).

GHG Allowance Prices

- Floor prices start at $10/tonne and escalate annually.
- Futures prices for v2013 California Carbon Allowances have come down to about $13.00 in January:



California Carbon Allowance (CCA) price graph from Point Carbon newsletter: Carbon Market North America, Vol. 7, Issue 4. January 27, 2012. www.pointcarbon.com/news

Benefits of AB 32

- AB 32 efforts will have the largest payback, if California's economy-wide Cap-and-Trade approach can become a working model for regional, national and global efforts to reduce GHG.
- The resulting technological incentives and innovation will position California companies, jurisdictions that become trading partners, AB 32 market participants and California citizens, by
  - Creating new jobs, processes and technologies,
  - Increasing commerce in and outside of California,
  - Contributing to a more efficient economy, and by
  - Achieving a cleaner environment.

Cap-and-Trade Rules Affecting the California Electricity Market

Allowance Allocations to Electricity Distributors (Utilities and Electric Providers)

- Each year 97.7 million metric tons (90% of 2008) multiplied by a yearly cap adjustment factor will be allocated to "Electrical Distribution Utilities.
- Each EDU's annual % of the total is pre-determined.
- Allocations will occur on July 15, 2012 for vintage 2013 allowances and on November 1 of each calendar year from 2013-2019 for the next year.
- Allocation declines 15% between 2015 and 2020, but the effective electric sector cap will decline even more rapidly to achieve 33% Renewables.

Budget Year	Cap Adjustment Factor
2013	0.981
2014	0.963
2015	0.944
2016	0.925
2017	0.907
2018	0.888
2019	0.869
2020	0.851

97.7 includes 8.7 for CHP selling to the grid

First-Deliverers

- Electric Energy First Deliverers are the operators of an electricity generating facility located in California or electricity importers.
- Compliance obligations apply to process emissions, stationary combustion emissions and vented emissions at each facility.
  - Every MT of CO2e subject to Mandatory Reporting Regulations or for which emissions are assigned, when such emissions are from a source in California or in a jurisdiction where a GHG emissions trading system has not been approved for linkage by the Board.
  - Beginning in 2015, combustion emissions resulting from burning RBOB, distillate fuel oils, or natural gas liquids are not included, when calculating an operator's compliance obligation.

Electricity Importers

- "Electricity Importers" are marketers and retail providers that deliver imported electricity.
- For electricity delivered between balancing authority areas, the electricity importer is identified on the NERC E-tag as the purchasing-selling entity (PSE) on the last segment of the tag's physical path, with the point of receipt located outside the state of California and the point of delivery located inside the state of California.
- For facilities physically located outside the state of California with the first point of interconnection to a California balancing authority's transmission and distribution system, the importer is the facility operator or scheduling coordinator. Federal and state agencies are subject to the regulatory authority of ARB.

Compliance Obligations of Importers

- For first deliverers that are electricity importers, GHG emissions subject to compliance are calculated using the following equation:

$$CO2e_{covered} = CO2e_{unspecified} + (CO2e_{specified} - CO2e_{specified,not\ covered}) - CO2e_{RPS\ Adjustment} - CO2e_{QE\ Adjustment} - CO2e_{Linked\ Program}$$

- Where $CO2e_{covered}$ = Annual metric tons of CO2e with a compliance obligation and $CO2e_{xxxxx}$ are the annual metric tons of CO2e from
  - 'Unspecified' imported electricity calculated pursuant to MRR 95111(b)(1),
  - Imported electricity from 'specified' sources that meet the requirements of Mandatory Reporting Regulation (MRR) section 95111(b)(1),
  - 'Specified, not covered' sources without a compliance obligation pursuant to section 95852.2. that meet the requirements in MRR section 95111(b)(1),
  - Sources subject to an 'RPS adjustment' calculated pursuant to MRR that meets the requirements of section 95852(b)(4).
  - Sources subject to a 'QE_adjustment' from "qualified exports" pursuant to MRR section 95111(b)(1) that meet the requirements of section 95852(b)(5), and
  - 'Linked program' sources, where the electricity has a first point of receipt located in a jurisdiction where a GHG emissions trading system has been approved for linkage by the Board pursuant to subarticle 12.

Specified and Unspecified Sources

- For electricity delivered from specified generators, GHG emissions will be tracked under the Mandatory Reporting Regulation.
  - Direct delivery, facility ownership, or contract path.
  - Before 2015, compliance threshold is 25,000 MTCO2e per year. After 2015, threshold is zero for imported power, but remains 25,000 MT for in-state sources.
- For electricity delivered from unspecified generators, e.g., system power purchases, default GHG emission rates will apply. Compliance threshold is zero.
- Renewable deliveries with zero emissions must come from a specified source.

Qualified Exports

- Only electricity exported within the same hour and by the same importer as the imported electricity is considered as a Qualified Export.
- NERC e-tags may be used to document these transactions.
- Emissions from Qualified Exports may be subtracted from compliance obligations, subject to a limitation on the QE adjustment based on the lowest emission factor during the hour of import/export.
- However, it is not necessary for the imported and exported electricity (as defined in the MRR) to enter or leave California at the same intertie.

Resource Shuffling & Grid Operations

- Resource shuffling means "any plan, scheme, or artifice to receive credit based on emissions reductions that have not occurred, involving the delivery of electricity to the California grid."
- CARB is trying to prevent dirty power scheduled for California from being redirected and replaced in CA by cleaner power without reducing overall regional GHG emissions.
- There will be a rulemaking in 2012.

Existing Contracts Without GHG Clauses

- Existing fossil-fired generators under long-term wholesale power contracts negotiated before the approval of AB 32 on September 27, 2006, asked CARB to require the purchasing utility to provide allowances for GHG emitted, since the previously negotiated costs did not contemplate or include AB 32 compliance costs.
- CARB declined, but will monitor progress on bilateral negotiations between counterparties with existing contracts that do not have a mechanism for recovery of carbon costs associated with cap-and-trade for industries receiving free allowances.

Combined Heat & Power

- CARB's 2010 Scoping Plan assumed that new and existing CHP facilities would reduce GHG emissions by ~6.7 MMTCO2e in year 2020.
  - Current annual GHG emissions from Combined Heat and Power (CHP) facilities are about 8.7 MMTCO2e.
  - Under a CPUC-approved Settlement, Investor-Owned Utilities (IOUs), Energy service providers (ESPs), and community choice aggregators (CCAs) are required to achieve 4.8 MMTCO2e reductions from Combined Heat and Power (CHP) by 2020.
  - The IOU reduction target is 4.3 MMTCO2e by 2020.
  - Another 1.9 MMTCO2e is assumed to be achieved by CHP contracts with Publicly-Owned Utilities (POUs).
- CARB's 2011 Scoping Plan assumes 0.0 MMT.

GHG Allowance Auctions

- Ten percent of 2015-2020 total allowances will be set aside for advance auctions. In 2012, each auction will offer 5% of 2015 vintage allowances.
- The sale of future vintages will help compliance planning, increase liquidity and reduce volatility.
- After 2012, IOUs must consign all their allowances for auction.
- One-sixth of IOU 2013 vintage allowances will be auctioned in each of the two auctions held in 2012.
- POUs won't have to auction their allowances, but must use them to benefit their ratepayers.
- Allowance auction reserve prices for 2013 vintage CCAs will start at $10/MT and escalate upward at 5%/year + CPI inflation after 2013.

GHG Allowance Auctions cont'd

- Single round, sealed bids for multiples of 1,000 allowances will set the settlement price paid by all successful bidders with the same price to be received by holders of consigned allowances.
  - A random number will be assigned to break ties.
- A purchase limit applies to auctions conducted from January 1, 2012 through December 31, 2014.
- The purchase limit for future vintage allowances for a single covered entity or associated entities is 25% of the allowances offered in each auction. A 15% limit applies for current year vintages.
- Non-covered entities have a four percent limit on purchases of current vintages.

Allowance Auction Revenues

- The CPUC estimated that Commission-regulated electric utilities could raise about $650 million in 2012 alone for allowances sold in auctions.
  - IOUs will need to bid for allowances to cover their own emissions, pay for them and then the utilities will be paid for the allocated allowances IOUs sold in the auctions, with these revenues to be allocated by the CPUC.
  - If IOUs need more allowances than allocated, which is likely, electric rates will be raised to cover the costs.
- Annual auction volumes are expected by some analysts to increase from over 100 million tonnes in 2013 to over 250 million tonnes in 2015.
  - Not all allowances (2.5 billion from 2013-2020) will be offered at auction, since allowance banking and compliance needs will keep allowances from the market.

Auction Revenues

- The CPUC is in the process of determining how to distribute the revenues received from IOU allowance auctions (Rulemaking (R.) 11-03-012).
- Revenue distribution options include:
  - An equal dollar amount sent to each customer within a given rate schedule,
    - CARB favored rebates based on the fixed portion of ratepayers' bills. However, this could result in inequitable impacts among similarly situated customers
  - A volumetric amount distributed via a rebate or bill credit,
    - which would be less expensive, more equitable and is favored by the IOUs, or
  - Funding R&D, energy efficiency, loan funds for renewable energy projects and other pet programs proposed by advocacy groups.

Banking & Allowance Holding Limits

- Separate holding limits will apply to allowances that can be used for current compliance and allowances for future compliance, as calculated by formulas:
  - The holding limit for current year compliance:

  Holding Limit = 0.1*Base + 0.025*(Annual Allowance Budget – Base) (In which: "Base" equals 25 million metric tons of CO2e and "Annual Allowance Budget" is the number of allowances issued for the current budget year.) ~6 MMT in 2012
  - The holding limit for future compliance periods is:

  Holding Limit = 0.1*Base + 0.025*(Compliance Period Budget – Base) (In which: "Base" equals 75 million metric tons of CO2e and "Compliance Period Budget" is the number of allowances issued for the future compliance period from which the allowances were sold at the advance auction.) ~15.5 in 2015

  Allowances held in compliance accounts will not be included within each entity's holding limit.

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Banking & Allowance Holding Limits

- No single entity can purchase more than 10 percent of the current vintage of allowances; 25% of the smaller amount of future allowances offered in each auction.
- Chevron said it needed to buy more just to comply: "ARB has essentially designed its market to guarantee that large entities will be short in every auction and required to go into the secondary market to buy their allowances at a premium from speculators and financial intermediaries." (Chevron's Richmond oil refinery emits 4.5 MT GHG annually, complying under cap-and-trade in 2013. In 2015 its transportation fuel products will also be subject to the cap.)
- If 2013 and 2014 are low hydro years, the bank build-up could be insufficient to keep future prices down.

Market Monitoring and Oversight

- CARB adopted strong deterrent and enforcement provisions with punishment for rule violations & fraud.
- CARB will contract with an independent market monitor and create a Market Surveillance Committee.
- The program will be coordinated with state and federal monitoring and enforcement agencies, including Commodities Futures Trading Commission regulations under the Dodd-Frank bill.

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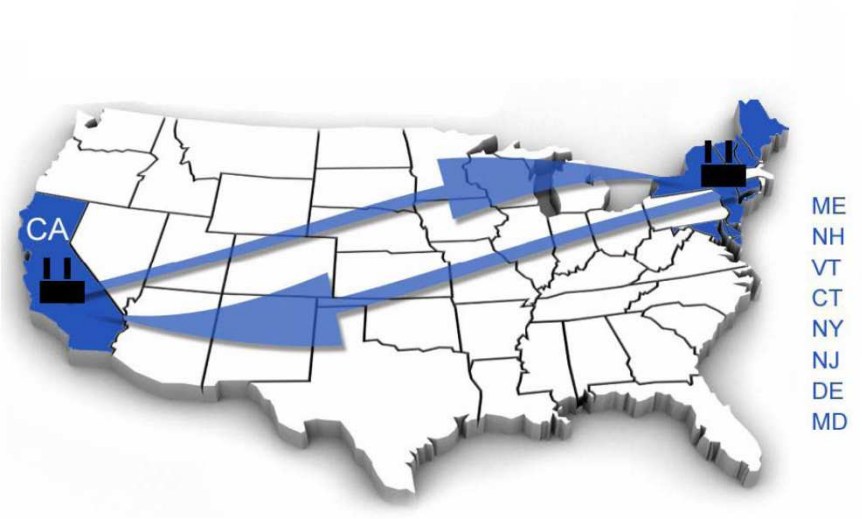
Linkage to Other Markets

- Six U.S. states have withdrawn from the Western Climate Initiative (WCI), after failing to enact legislation supporting GHG emissions trading.
  - NM, AZ, WA, OR, MT, and UT withdrew.
- California, British Columbia (BC), Manitoba (MB), Ontario (ON) and Quebec (QC) remain part of the WCI.
- Quebec plans to reduce its GHG emissions 20% below 1990 levels by 2020 and is implementing its carbon market on a time-scale similar to California's.
- Quebec and CA carbon markets hope to link up in time for California's August 2012 auction.

The Need for Compliance Strategies

- Affected companies should adopt a strategic approach to compliance planning and the implementation of AB 32.
- Compliance planning should incorporate a strategic analysis of your firm's options in the context of scenarios that consider:
  - Alternative future economic and regulatory conditions,
  - Interactions among energy & environmental markets,
  - Uncertainties in the key drivers affecting allowance prices and availability,
  - Traditional and non-traditional risks facing your business,
  - Your competitors' capabilities.



Appendix:

Why A Carbon Tax is Not Preferable to Cap-and-Trade

Why A Carbon Tax Is Not Preferable

Market Function	Cap-and-Trade	Carbon Tax
Reduce emissions to specified target levels	✓	✓−−
Set a fixed price for allowances	✓−	✓
Reflect marginal costs of environmental damage or of compliance costs over time	✓	✓−−
Compare transactions across markets and across different standards	✓	−
Facilitate transactions across national borders	✓	✓−−
Enhance national security	✓	✓
Preserve our global environment	✓	✓−−
Ready for Implementation in CA	✓	✓−−

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Why A Carbon Tax Is Not Preferable cont'd

Market Function	Cap-and-Trade	Carbon Tax
Reduce the costs of compliance	✓	–
Encourage and reward innovation*	✓	✓–
Promote Research and Development	✓	✓
Fund commercialization of new technologies	✓	✓–
Upgrade energy efficiency	✓	✓
Enable more effective use of resources	✓	✓
Refurbish and revitalize energy infrastructure	✓	✓

* Chen and Tseng (2011) "Inducing Clean Technology in the Electricity Sector: Tradable Permits or Carbon Tax Policies?" Energy Journal 32:6-20.

Van Horn and Remedios (March 2008) "A Comparison of Three Cap-and-Trade Market Designs and Incentives for New Technologies to Reduce Greenhouse Gases." The Electricity Journal, Vol 21/2, pp 51-62.

About Van Horn Consulting

www.vhcenergy.com

Van Horn Consulting

- Founded in 1987, Van Horn Consulting (VHC) helps its clients examine energy and environmental markets and contracts, evaluate competitive and regulatory issues, review projects, devise business strategies, prepare expert testimony and value assets.
- We have developed and analyzed strategies and conducted major studies for EPRI, EPA, electric and gas utilities & market participants.
- VHC provides independent reviews, evaluations, litigation consulting and expert testimony regarding electricity, fuels, technology and emissions markets, regulations and contracts.
- VHC advises utilities in soliciting and contracting for renewables, combined heat and power, conventional and demand-side resources and serves as an Independent Evaluator for electric utilities in California.

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. Mike leads Independent Evaluator assignments for renewable, conventional and combined heat & power contracts for San Diego Gas & Electric and Southern California Edison. At Pacific Gas & Electric Company (PG&E), 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. He also provides analysis and advice regarding procurement, operations, planning, technologies and strategy.
- **Edward Remedios, Ph.D., MBA,** Senior Consultant, formerly worked for Chevron Research and for Pacific Gas & Electric Company (PG&E). While at PG&E, Ed coordinated 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, economic and technical assessments. Ed provides evaluations of projects and analyses of markets, tariffs and regulations.
- **Andrew Van Horn, Ph.D.,** Managing Director, has 35 years experience evaluating ***electricity, natural gas, coal and emissions markets, regulations, technologies and contracts***. He advises market participants and also serves as an Independent Evaluator for utilities procuring power and natural gas. He developed EPRI's first Integrated Resource Planning model, provided a price for the first SO_2 allowance trade in 1992, analyzed the 1977 and 1990 Clean Air Act Amendments and projected impacts of greenhouse gas (GHG) policies from 2000 to 2050. He advises clients on electricity and natural gas procurement processes, SO_2 and GHG markets, technology cost and performance, R&D, price forecasting, plant valuation and strategic planning. He has testified before the FERC, state agencies and courts about power, natural gas, steam and emissions contracts, economic damages, resource planning, reasonableness reviews, tariffs and the impacts of regulations.

Selected Clients

Alberta Department of Utilities
American Electric Power
Amgen
Arizona Public Service Company
Cinergy
Cogeneration Association of California
Colorado Independent Energy Association
Consolidated Edison of New York
Consolidated Natural Gas Transmission
CIGNA Insurance
City of Huntington Beach
Drummond Coal
Duke Energy
Electric Clearinghouse (Dynegy)
Electric Power Research Institute (EPRI)
Harvard Management Corporation
National Acid Precipitation Assessment Program
Northern California Power Agency
Orinda Union School District
PacifiCorp Power Marketing
PPL Corp
Pacific Gas and Electric Company
Pacific Gas Transmission
Pinnacle West
Port of Long Beach
San Diego Gas & Electric Company
Sithe Energies
Southern Company
Southern California Edison Company
SeaWest Wind Corp
Tennessee Valley Authority
The Emissions Exchange
Utility Air Regulatory Group
Universal Studios
U.S. Environmental Protection Agency
U.S. General Accounting Office

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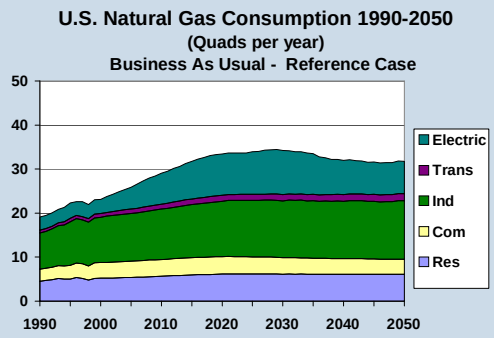

Why Worry About Climate Change? Of Course, We'll Live Through It.

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