

# Greenhouse Gas Reduction Options - Program 103

## Program Overview

### Program Description

The ongoing evolution and implementation of carbon management policies at state, regional, and national levels are forcing electric companies to evaluate potential impacts of mandatory carbon constraints on operations and financial performance. Companies need to understand the costs and risks associated with low-carbon generation, delivery, and end-use technologies and to effectively communicate insights to policymakers and regulators.

This program provides public- and private-sector decision makers with vital insights regarding the costs, availability, performance, and potential risks of greenhouse gas (GHG) emission reduction and mitigation options. The program provides investment strategies for expanding these options over time and insights on how to integrate GHG policy risk management into corporate business strategies as companies respond to growing demand for electric power. This information helps members develop coherent corporate strategies in response to climate change and helps decision makers create and implement cost-effective, environmentally sound public policies.

### Research Value

Policymakers and utility personnel need to understand the implications of climate policy implementation choices (e.g., program scope, use of market mechanisms, and offsets) and potential compliance costs. Through its GHG reduction options program, EPRI helps the industry and the public understand the costs and risks associated with a low-carbon future; make strategic generation, delivery, and end-use technology choices; and communicate these insights to policymakers and state regulators. With this research utilities and the public may see

- more-efficient (and thereby less expensive) policy designs due to better effectiveness of the user community in informing the policy development process,
- lower compliance costs and less risky business strategies due to better understanding of potential impacts of climate policy on power markets and incentives to add or retire generation,
- higher probability that cost-effective GHG offsets will be available to reduce compliance costs, and
- assistance for adoption of advanced generation technologies due to better understanding of tradeoffs between risks and benefits.

### Approach

The program provides improved analytical approaches to support strategic decisions and consideration of generation investments and emission reduction options. It produces software tools and methodologies that help companies develop least-cost approaches to achieving voluntary and mandatory GHG emissions reduction targets. The program informs the public policy process by communicating research results with the broadest possible audience through issue briefs; newsletters; congressional testimony; briefings for stakeholders, policymakers, researchers, and the press/media; and peer-reviewed literature submitted to prestigious journals. This program delivers

- a greater understanding of how climate policy will fundamentally change electric sector economics and oil power markets,
- opportunities to inform evolving climate policies by helping companies understand subtle nuances of climate policy design and its impact on utility asset owners and customers, and
- development of robust compliance strategies. Increased understanding of detailed policy design alternatives, impacts on power markets, the role of advanced low-emission technologies, and opportunities for GHG offsets can have tremendous value in forging robust corporate business and compliance strategies in a turbulent environment.

## Accomplishments

Climate policy designs for achieving an environmental goal can vary in cost by trillions of dollars, and climate policy can significantly affect returns on existing capital and on new corporate investments. Sound analyses and clear communication are critical to creating effective, efficient policies and effective corporate strategies. Program accomplishments include the following:

- Launched the Global Climate Policy Design Forum Series to inform company and Congressional discussions on key domestic policy choices, including an Offset Policy Dialogue
- Helped companies develop and communicate publicly their climate strategies
- Developed and applied frameworks for helping companies evaluate specific generation and emissions reduction investments
- Evaluated incentives for early deployment of advanced coal technologies and communicated insights to key stakeholders
- Examined and communicated the implications of a CO<sub>2</sub> price in a regional electricity market

## Current Year Activities

Program R&D for 2010 will focus on the following:

- Analyses examining detailed implementation of climate policy choices, such as the interplay between market and regulatory approaches and the challenges of making emission offset markets viable
- Frameworks to incorporate power market impacts into corporate business and compliance strategies
- Analyses that examine the benefits to electric utilities of new technology in a carbon-constrained business environment
- Expanded capability to analyze electric sector effects of climate policy at state and regional levels
- Frequent domestic and international climate policy workshops and policy forums

## Estimated 2010 Program Funding

\$3.7M

## Program Manager

Victor Niemeyer, 650-855-2744, niemeyer@epri.com

## Summary of Projects

Project Number	Project Title	Description
P103.001	Investigate Use of Market Mechanisms and Offsets in Climate Policy Design	This project provides detailed analyses of emission trading and GHG offset program designs to help electric utilities understand the company-level implications and communicate them to policy makers and stakeholders.
P103.002	Methods to Assess GHG Policy Impacts on Business Strategy and GHG Compliance	This project will help electric utility decision makers understand the implications of climate policy for their companies and incorporate policy uncertainty into their business strategies, investment decisions, and compliance choices.
P103.003	Company-Level Analyses of New Technologies in a Carbon-Constrained Environment	This project will help companies quantify the opportunities and risks of applying new generation technologies given the uncertainties in climate policy, fuel markets, and technological success.
P103.004	Electric Market and Economic Implications of Climate Policy at the State and Regional Levels	This project will provide insights into the implications for the electric and energy sectors, and for regional economics, of climate policy at state, regional, and national levels.
P103.005	Communications	This project helps members communicate program results on climate policy complexities to diverse stakeholders through workshops, issue summary documents, and other communication channels.

### P103.001 Investigate Use of Market Mechanisms and Offsets in Climate Policy Design (057734)

#### Key Research Question

Economically efficient climate policy approaches such as global emissions trading can cost trillions of dollars less than more-prescriptive regulatory policies to achieve the same emissions levels. Proposed restrictions on trade, limitations on the use of GHG offsets, and development of incompatible national and regional trading programs could dramatically reduce these potential savings. In the near term, electric companies seeking to reduce direct CO<sub>2</sub> emissions from fossil fuel-based electricity generation have few cost-effective and large-scale options available. The opportunity to offset direct emissions by implementing off-system GHG reduction projects can have tremendous value in reducing the compliance cost of meeting GHG emissions targets, particularly in the near term before new large-scale GHG abatement technologies can be deployed. Key issues to be resolved include basic institutions, mechanisms and enforcement, point of regulation, methods for trading among gases, rationales for permit allocation, linking of divergent trading systems, and tradeoffs among economic efficiency, distributional equity, environmental effectiveness, and administrative feasibility. It is also important to understand how climate policy design choices impact the cost and availability of GHG offsets.

#### Approach

This project provides detailed analyses of U.S. and international trading programs to promote development of environmentally effective and economically efficient market mechanisms to abate GHG emissions. GHG offsets can also play a key role in helping electric companies achieve GHG reductions at lowest cost. This work aims to help companies and others understand the implications of alternative approaches to implementing market-based climate policy. Studies and workshops will address issues such as the comparative merits of cap-and-trade vs. taxes, allowance allocation, interactions between overlapping policies (e.g., Renewable Portfolio Standards requirements), cost-containment approaches, linking of trading systems, and frameworks for international cooperation. Given the tremendous potential value of offsets in containing costs, the project will pay particular attention to the efficacy of different offset project types; potential eligibility

criteria; and quantitative limits on their use, measurement, and verification, and will explore promising new types and categories of GHG offsets.

### Impact

- Examines emerging experience with climate policy across the United States and other countries to inform new policy implementation; identifies important lessons from early trading system experiences
- Provides clear communication regarding implications of different rules and restrictions on trading
- Develops and applies models to quantify implications of different policy implementation choices
- Evaluates and analyzes different approaches to creating GHG emissions offsets and provides insights about the expected cost and potential availability of offsets
- Conducts basic research into innovative offset ideas and helps to refine methodologies for evaluating offset projects and estimating availability
- Contributes to development of protocols designed to quantify, measure, monitor, and verify GHG emissions offsets, and examines implications of different rules for crediting offset projects.

### How to Apply Results

Company environmental staff can use the information to inform their company's climate strategy, help identify and evaluate possible near-term GHG emission reduction investments, and guide development of corporate policy positions. The Electric Power Research Institute (EPRI) will facilitate broader use and awareness of the results by briefing key stakeholders, including policymakers, researchers and the public; developing materials for the trade press/media; keeping EPRI's public website current; presenting at meetings/seminars; and continuing service on various advisory panels.

### 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>Analysis of Key Greenhouse Gas Emissions Trading Issues:</b> With inputs from program members, EPRI will identify and conduct analyses to address specific GHG trading issues and the use of project-based mechanisms to offset GHG emissions. The research also will highlight practical approaches that electric companies can use to begin effective participation in emerging emissions trading markets and markets for project-based offset credits.	12/31/10	Technical Update

### Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<b>Analysis of Key Greenhouse Gas Emissions Trading Issues:</b> Future deliverables will be determined annually based on evolving climate policies. Research will continue on the general range of subjects in emissions trading and GHG offsets. Analytical tools will be developed and enhanced to allow quantitative analyses of emerging policy proposals.	12/31/11	Technical Update

## P103.002 Methods to Assess GHG Policy Impacts on Business Strategy and GHG Compliance (047425)

### Key Research Question

Any policy seeking to reduce CO<sub>2</sub> emissions below historical levels will have a dramatic impact on electric power prices, cash flows to generating assets, and incentives for new generation investment. With few options to achieve substantial short-term emission reductions, and expensive, technologically or institutionally

uncertain long-term options, the costs could be problematic. A binding emissions cap with a substantial share of auctioned allowances could expose the electric sector to over \$100 billion per year in CO<sub>2</sub> costs in a market that is likely to be highly volatile. Electric utility decision makers will need new methods and analytical frameworks to navigate this sea change in their compliance and business environment.

### Approach

The goal of this project is to develop frameworks to help electric utility decision makers understand the implications of climate policy for their companies, incorporate climate policy uncertainty into their business strategies and investment decisions, and develop compliance strategies in a volatile policy environment. The project will develop market simulation tools, apply them to representative policy and energy market scenarios, and map the results back to the individual company level. The tools will explicitly recognize the highly integrated nature of power, fuel, and environmental markets that makes this problem so challenging. It will also assess the implications of interactions of GHG policies with mandates promoting renewables and increased conservation and end-use efficiency. The analyses will assess impacts from the perspectives of both asset owners and electricity consumers. The results will be packaged to facilitate communication within the company and to external stakeholders.

### Impact

- Helps companies assess climate policy risks and opportunities and develop strategies to manage both
- Assesses company implications of climate policy with overlapping policies promoting renewable energy and conservation
- Provides methods for evaluating capital investments in existing generation given policy and other uncertainties
- Provides methods for comparing emission reduction investments—from on-system options to emissions offsets—on a consistent basis
- Helps companies communicate the implications of climate policy to stakeholders

### How to Apply Results

Company environmental and planning staff can learn from reports, presentations, and workshops about how to consider climate policy uncertainty for planning and operational activities. Key insights may be communicated to a broader stakeholder audience in order to widen understanding of the drivers and dynamics of electric company decision making.

### 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<p><b>Development of Methods to Understand the Effects of Climate Policy Uncertainty on Investment Decisions:</b> Project results will be delivered primarily through a technical report providing methodological insights and results concerning the impact of stringent climate policy on power markets, the consistent assessment of emission reduction options, and the challenge of complying in a market environment. Insights will be shared with program members and other stakeholders through presentations and workshops.</p>	12/31/10	Technical Update

## Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<p><b>Development of Methods to Understand the Effects of Climate Policy Uncertainty on Investment Decisions:</b> Future deliverables will be determined in consultation with members. Topics will depend, in part, on whether climate legislation has been passed in the United States. There is likely to be an ongoing need to understand new generation choices, given continuing uncertainty about climate policy, fuel prices, capital costs, and public acceptance of technology.</p>	12/31/11	Technical Update

## P103.003 Company-Level Analyses of New Technologies in a Carbon-Constrained Environment (067508)

### Key Research Question

In a carbon-constrained policy environment, companies will face tremendous pressure to reduce CO<sub>2</sub> emissions. While there are some opportunities to reduce emissions at low cost, few of those opportunities result in the high-volume reductions needed to meet a national cap that ratchets down year by year. This need will drive electric utilities to aggressively evaluate deployment of new generation technologies, often before there is solid information on the cost to construct and operate the technologies and on their performance in an operating environment. Further, the benefits of the technologies will depend on CO<sub>2</sub> price, fuel prices, and the success of competing technologies, all of which will be highly uncertain given the long lead times for bringing new generation technologies to market. Utilities need analytical frameworks and insights to address the complex set of decisions leading to the adoption of new technologies, both to inform those decisions and to help communicate to stakeholders and policymakers the challenges and tradeoffs between the risks and opportunities.

### Approach

This project will develop analytical frameworks to evaluate investments in new technology under uncertainty. The analytical frameworks will combine conceptual analysis of key value pathways, and risks, implemented in spreadsheet models. The frameworks will help companies quantify the potential value of applying new generation technologies. These analyses will facilitate communication to stakeholders and policymakers about the potential benefits and risks. The analysis approach will integrate the operation of new technologies with the existing fleet to show the overall benefit to the adopting utility and its customers. The frameworks will be applied across a range of scenarios to capture the technological uncertainties, as well as critical uncertainties affecting market success, such as CO<sub>2</sub> and fuel prices. While the primary focus of the frameworks will be new generating technologies, the project will also represent potential opportunities from adopting demand-side technologies.

### Impact

- Help utility decision makers better understand the opportunities and risks in adopting new generating technologies
- Help communicate the balance of opportunities and risks to stakeholders seeking to deploy new technologies before full information on their costs and performance is available
- Provide insights on development of strategies for deploying new technologies, i.e., mapping out the decisions and sequence of commitments for deployment as technological and market information is clarified over time

## How to Apply Results

Company environmental and planning staff can learn from reports, presentations, and workshops about how to consider climate policy uncertainty in their activities. Some key insights may be communicated to a broader stakeholder audience in order to widen understanding of the drivers and dynamics of electric company decision making.

## 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<p><b>Framework for Evaluating Benefits and Risks of Adopting New Generation Technologies in a Carbon-Constrained Business</b>  <b>Environment:</b> Project results will be delivered primarily through a technical report, focusing on in-depth assessments of investments in new technologies. Methodological insights and results concerning the potential benefits and risks of deploying new technologies will be shared with program members through presentations and workshops.</p>	12/31/10	Technical Update

## Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<p><b>Framework for Evaluating Benefits and Risks of Adopting New Generation Technologies in a Carbon-Constrained Business</b>  <b>Environment:</b> Future deliverables will be determined in consultation with members. Topics will depend, in part, on whether climate legislation has been passed in the United States. There is likely to be an ongoing need to understand new generation choices, given climate policy uncertainty.</p>	12/31/11	Technical Update

## P103.004 Electric Market and Economic Implications of Climate Policy at the State and Regional Levels (067509)

### Key Research Question

From California to the Northeast, there are numerous proposals to implement climate policy at regional and state levels. Some of these policies are already in force, and others are under active consideration and may become law. Unless federal climate policy clearly preempts these activities, many are likely to continue in parallel with climate policy at the federal level. One issue is what impact these regional policies will have on emissions, given the many opportunities for leakage of economic activity across state lines or even abroad. Another issue is whether the economic consequences are minor, or whether policies that limit emissions within the region have serious economic consequences. Electric utilities and their customers are key stakeholders in these debates, and thus they have a strong need to understand the efficacy and consequences of policy proposals and to effectively communicate that understanding in the policymaking process. As federal policies evolve, policymakers and companies will be interested in their regional impacts.

### Approach

This project will develop and maintain a suite of modeling frameworks that provide insights into policy discussions at state, regional, and national levels. A diverse set of models is needed to effectively address the wide range of emerging policy ideas and questions. The project will apply these models in generic analyses to promote general understanding of the issues and advance methodological foundations where needed.

## Impact

- Help clarify and communicate regional-level climate policy impacts on national and global emissions given the opportunities for relocation of economic activity and trade
- Help assess the effects of regional and state climate policy on regional electricity markets and economic activity
- Increase capability to support electric utilities that are participating in policymaking processes

## How to Apply Results

The project models and internal capabilities may be applied in supplemental projects in support of program members seeking to apply these capabilities in their regions or states. In addition, company environmental and planning staff can learn from reports, presentations, and workshops about how to consider the implications of climate policy at the regional level and effectively communicate those implications in the policymaking process.

## 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>Assessment and Enhancement of Capabilities to Evaluate Regional Climate Policy:</b> Presentations, workshops, and informal reports assessing the state of the art for modeling the effects on utilities of regional policies to limit greenhouse gases.	12/31/10	Technical Resource

## Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<b>Assessment and Enhancement of Capabilities to Evaluate Regional Climate Policy:</b> Future deliverables will be determined in consultation with members. Topics will depend, in part, on whether climate legislation has been passed in the United States. There is likely to be an ongoing need to understand the implications of policy at a regional level as rules are legislated or regulated, or as companies create compliance strategies.	12/31/11	Technical Resource

## P103.005 Communications (067510)

### Key Research Question

EPRI climate research produces numerous insights for policymaking at a variety of levels. It is essential that these insights be effectively communicated to various stakeholder groups if the results are to help inform relevant policy discussions. Much of this material is rooted in economic theory or based on implementations of climate policy in distant international venues, making it difficult to access and interpret.

### Approach

This project effectively transfers research insights through easily understandable content and targeted communication channels such as workshops, two-page Climate Briefs, and public presentations to help members communicate climate policy complexities to diverse stakeholders. The enhanced communications supported by this project will be directed primarily at member staff and management. However, the materials will be packaged to support communications to broad audiences with varying backgrounds, so that members can use the materials in their own communication efforts with stakeholders, policymakers, and the public.

## Impact

- Improved understanding of issues critical to the design and implementation of cost-effective climate policy
- Better understanding of how climate policy affects electric power markets and the implications for investment and operating decisions
- Better understanding of the potential opportunities and challenges for electric companies in meeting compliance goals
- Increased effectiveness in communicating the important details of climate policy design and critical tradeoffs to investors, electric company customers, policymakers, and other stakeholders

## How to Apply Results

Company environmental staff can use the information to inform company climate strategy, help identify and evaluate possible near-term GHG emission reduction investments, and guide development of corporate policy positions. EPRI will facilitate broader use and awareness of the results by briefing key stakeholders, including policymakers and policy researchers; developing materials for the trade press/media; keeping the program public website current; presenting at meetings/seminars; and continuing service on various advisory panels.

## 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>Communication Activities and Materials:</b> Deliverables will include papers, research summaries, webcasts, the program website, briefings, and presentations, supplementing the EPRI reports and/or peer-reviewed literature created by each of the other projects in the program.	12/31/10	Technical Resource

## Future Year Products

Product Title & Description	Planned Completion Date	Product Type
<b>Communication Activities and Materials:</b> Future deliverables will be determined in consultation with members. Topics, modes of communication, and key audiences will depend, in part, on whether climate legislation has been passed in the United States.	12/31/11	Technical Resource