

CALIFORNIA'S ADVANCED ENERGY ECONOMY

Advanced Energy Business Leaders' Perspectives
and Recommendations on California's Energy Policies

ACKNOWLEDGMENTS

This report summarizes interviews with CEOs and other senior executives from advanced energy companies active in the state of California. The survey was conducted and the report completed with the Advanced Energy Economy Institute (AEEI) by Paul Hibbard, Andrea Okie, and Sue Tierney of Analysis Group, Inc., with funding from AEEI.

The authors wish to thank all of the individuals and companies who contributed their time to discuss California energy policy, energy technology and resource development, and the challenges associated with developing and sustaining advanced energy businesses in a complicated fiscal, economic, policy, and institutional landscape. The executives interviewed for this study provided thoughtful and candid comments and invaluable insights about the ways their companies are affected by California regulations, programs, and incentives, as well as the overall business climate in the state.

All conversations between the study team and executives were confidential. This report reflects the content of those conversations without attributing comments to particular companies. The observations and conclusions in this report reflect the analysis and judgment of the authors based on all of the interviews, and does not necessarily reflect the views of any single individual or company interviewed.

ADVANCED ENERGY ECONOMY INSTITUTE

Advanced Energy Economy Institute (AEEI) is a nonprofit educational organization promoting greater public understanding of advanced energy and its economic potential for the U.S. and fostering business growth and innovation within the advanced energy industry. The mission of AEEI is to raise awareness of the public benefits of advanced energy, drive the policy debate on key topics, and provide a forum where leaders can address energy challenges and opportunities facing the U.S.

www.institute.aee.net

ANALYSIS GROUP

Analysis Group, Inc. provides economic, financial, and business strategy consulting to law firms, corporations, and government agencies. Through work in thousands of client engagements across multiple industries, including an extensive track record in the areas of energy and finance, Analysis Group consultants have built a reputation for excellence by providing fact-based, objective, and thoughtful interpretation of complex economic and business issues. Our firm specializes in work that is analytically complex and data-intensive.

Analysis Group's energy and environment practice area is distinguished by expertise in economics, finance, market analysis, regulatory issues, and public policy, as well as significant experience in environmental economics and energy infrastructure development. The firm's energy consultants have worked for a wide variety of clients including energy suppliers and consumers, utilities, regulatory commissions and agencies, tribal governments, and power system operators. Analysis Group's consultants have developed studies in the contexts of reports and whitepapers; affidavits and expert witness testimony before courts, regulatory agencies, and arbitration panels; modeling exercises; and market, policy and management strategic consulting.

www.analysisgroup.com

TABLE OF CONTENTS

FOREWORD	i
-----------------------	----------

Advanced Energy Companies' Perspectives on California's Energy Policies: SUMMARY AND RECOMMENDATIONS	ii
--	-----------

Summary of Observations from California's Advanced Executives	ii
---	-----------

Summary of Recommendations from California's Advanced Energy Executives	iii
--	------------

California's Advanced Energy PERSPECTIVES OF SENIOR EXECUTIVES	1
--	----------

Recommendations from California's Advanced Energy Executives	8
--	----------

APPENDIX 1

PURPOSE AND CONTEXT OF THE STUDY OF CALIFORNIA'S ADVANCED ENERGY POLICIES	8
--	----------

California Energy Policy Context	8
--	----------

Survey Purpose and Approach	9
-----------------------------------	----------

APPENDIX 2

SPECIFIC OBSERVATIONS FROM SENIOR EXECUTIVES OF ADVANCED ENERGY COMPANIES IN CALIFORNIA	10
--	-----------

ADVANCED ENERGY IS THE ECONOMIC OPPORTUNITY OF OUR LIFETIME. Secure, clean, affordable energy – that’s what the world needs as global energy demand grows a projected 39 percent by 2030. California is, and should be, out in front on making it happen. In doing so, California should disproportionately enjoy the benefits – in technological innovation, entrepreneurship, and economic growth.

California has long been a leader in energy and environmental policies that can only be realized by advanced energy technologies, products, and services. Renewable energy, energy efficiency, advanced vehicles – California has set a course toward a smarter energy future by making a commitment to all of these. But will it get there? This report puts that question to business leaders who stand ready to meet the challenge.

The genius of America is setting public goals and leaving it to the private sector to achieve them. Except for war, we don’t marshal armies to solve problems. We set expectations and let the market do its work – creating demand, encouraging private initiative, and providing rewards for the best solutions.

In energy and environment, California has set ambitious goals that only the private sector can achieve. It matters what entrepreneurs and business leaders see as the opportunities and challenges in meeting those goals as business propositions. Is there policy certainty sufficient to build a business? Do the programs and incentives align with business imperatives? Are there obstacles that stand in the way of success?

That is what we asked our expert consultants at Analysis Group to find out. They interviewed advanced energy business executives in California privately to get their candid perceptions of the business opportunities California’s nation-leading policies have created. Is the stage set for realizing those opportunities? What could be done to accelerate success?

We hope the answers they provide will help make California the global advanced energy leader it deserves to be.

A handwritten signature in black ink that reads "Graham Richard". The signature is written in a cursive, flowing style.

Graham Richard
CEO, Advanced Energy Economy
San Francisco

SUMMARY AND RECOMMENDATIONS

Based on a series of interviews with CEOs and other senior executives of advanced energy companies with operations in the State of California, this report presents key findings about perceptions of the state's energy policies and conditions for realizing their potential, along with specific recommendations for actions to accelerate the growth of an advanced energy economy in California.

Summary

Observations From California's Advanced Energy Executives

California's energy policies have put the state on the cutting edge of advanced energy development, investment, and deployment. California is a national leader both in technology and policy innovation that spans a wide range of sectors: advanced vehicle fuel standards; alternative vehicles and the infrastructure to support them; developing markets for renewable energy resources; deep deployment of energy efficiency, through advanced building codes, appliance efficiency standards and utility policies and programs; support for investment in smart grid, transmission, and on-site generation technologies; and funding for advanced energy research and development (R&D). Together, these policies create powerful demand for advanced energy technology development, products, and services – making California a testing ground for development of a vibrant advanced energy economy nationwide.

California offers a diverse set of financial tools for advanced energy research, demonstration, deployment, and for unleashing private investment in private companies. These tools include energy technology development grants, ratepayer funding for energy efficiency, tax incentives for investment, and other financing mechanisms for advanced energy investment.

California has launched the biggest policy experiment affecting energy markets to date: a **multi-sector cap on greenhouse gas (GHG) emissions** in the state, known as AB 32. Combined with California's energy policies, this program will lead to billions of dollars of investment in advanced energy technologies, systems, and equipment to better meet energy needs.

California's advanced energy economy benefits from clear strategic assets, including Silicon Valley, a highly trained labor force, a culture of innovation, and many investment firms.

There is growing anxiety over reactions to the cumulative price tag and distributional impacts of California's policies. Advanced energy CEOs see it as essential that these policies and the programs that flow from them be managed in a way that avoids unnecessary waste and inefficiency and mitigates potential cost impacts that could result in a backlash against California's energy leadership.

A clearer and more accountable assignment of responsibility would make administration of the state's complex web of energy policies and programs more effective. Without focused attention to streamlining administration, the success of these programs in stimulating advanced energy adoption and business growth could be at risk.

While California provides an enviable environment for technology research and development, product design and testing, and retailing of advanced technologies, **our companies find it much more challenging to establish manufacturing operations in the state and to develop advanced energy installation projects.** The state's environmental quality act (CEQA) presents particular challenges, both in compliance, which is onerous compared to the environmental review process in other states, and in project development, where the law allows for opponents to engage in obstructive tactics even against projects that offer environmental benefits.

Low natural gas prices are a double-edged sword, providing relief in the form of lower energy prices for business and residential customers but creating economic hurdles that make it difficult to introduce some newer advanced energy technologies into the marketplace.

Summary

Recommendations From California's Advanced Energy Executives

California should articulate an integrated vision and action plan in support of an advanced energy economy to help guide, coordinate, and prioritize agencies' actions, and to provide greater accountability for successful implementation of the state's policies.

California should strive to establish the stability and predictability businesses and investors need to pursue innovation.

Programs that change year to year and incentives that expire after a short period of time (or get renewed on a short-term basis) are not conducive to investment and business development. California should maintain a commitment to energy policy solutions with longer-term, stable trajectories.

California should foster innovation and competition by avoiding programs that pick technology winners. Competition spurs innovation and drives down cost in meeting policy goals. California should structure programs to encourage the private sector to bring innovative technologies to the market that meet desired energy and/or environmental performance standards rather than implicitly or explicitly prescribe specific technologies.

The Governor should appoint and empower an advanced energy business ombudsman, to assist advanced energy companies in navigating the policies, programs, and requirements intended to promote advanced energy growth and adoption.

California should use funding from the AB 32 revenues to fill gaps in private sector funding of advanced energy technologies and companies, especially for smaller early-stage companies and for developers of pre-commercial technologies that need assistance in demonstration and scale-up.

California should reform CEQA to streamline the environmental review process and prevent abuse. Advanced energy projects could be completed faster and at lower cost (to applicants, to the state, and in many cases to the environment) if compliance with CEQA were more straightforward and if the law were less easily used for NIMBY purposes.

PERSPECTIVES OF SENIOR EXECUTIVES

Introduction

California's Advanced Energy Landscape

California will soon be in the crosshairs of supporters and detractors of advanced energy policies and programs. The state's energy policies are on the cutting edge: They have been instrumental in pushing development of energy options. They have contributed to higher vehicle fuel standards and alternative vehicles and the infrastructure to support them; developing markets for renewable and advanced energy resources, and the deployment of energy efficiency; and supporting investment in smart grid, transmission, and on-site generation technologies.

At the same time, there is growing anxiety over the cumulative price tag and distributional impacts of such policies and programs, especially as the state faces the continuing burdens of a slow economy, deep public budget cuts, and ongoing fiscal challenges. Additionally, the memory of the failed restructuring of the state's electric industry – and how that experience affected consumers and the electric industry more generally – is never far behind.

“For a long time, and in particular in the last 4 years, California stands out as a leader in policies and programs in advanced energy...California is where there's action going on.”

— CEO of large, diversified advanced energy company

Against this backdrop, California has also launched the biggest policy experiment affecting energy choices to date: a multi-sector cap on greenhouse gas (GHG) emissions in the state. This policy – known as AB 32, after its authorizing legislation – will impose significant compliance requirements on countless firms and organizations but will also generate large sums of revenues for state and utility use. On top of this, California will soon begin to implement Proposition 39, a recently passed ballot initiative that will generate additional large sums of money for energy-related investments.



STATE CAPITOL BUILDING, SACRAMENTO

Together, AB 32 and Proposition 39 represent billions of dollars directed to various constituencies, including to energy consumers in the form of bill-impact relief and to businesses, government entities, and other enterprises in the form of investment.

As these transformational policy initiatives and funding vehicles take hold over the next few years, the energy landscape in California will undergo major changes. Yet there is not yet a single entity responsible for – or a single vision that fully integrates – these initiatives in the context of the state's economic, energy, and environmental policy goals. Only the most dedicated observers can decipher the myriad and often-inconsistent rules created by these laws. The complexity and opacity of the 'system' add significantly to the challenges facing private and public actors in the state as they seek to conform to new requirements – and capitalize on new opportunities.

Managing these changes in the most efficient and effective way possible, while also minimizing adverse impacts on the state's consumers and businesses, might constitute the state's biggest energy policy challenge in the coming years. If done right, these changes could introduce significant gains for the state's economy and standard of living, while solidifying California's reputation as a true national leader; if executed poorly, the costs may undermine the very outcomes California's policies aspire to achieve.

The Outlook From Advanced Energy Business Leaders

This report presents the results of a series of interviews conducted with business leaders involved in California's energy market and focused on these critically important policy challenges. We sought the perspective of a particular set of business leaders – namely, CEOs and other senior executives from companies with operations in the state and with businesses in a position to grow, to California's economic benefit, as a result of effective implementation of the state's energy policies.

We focused on 'advanced energy' companies – companies that encompass a broad range of products, services, and investments that constitute the best available or emerging technologies for meeting energy needs today and tomorrow. Such companies are involved in a diverse set of business segments. They include companies involved in technology or product development; in component and product manufacturing; in energy project and infrastructure development; in equipment sales and installation; in engineering, finance, and advisory services; and others. In many ways, the markets for these companies' investments, products and services are driven by and respond to the state's advanced energy and environmental policies. The success of private enterprise will determine to a large degree the success or failure of these policies for California's economy and its residents.

On behalf of the Advanced Energy Economy Institute, the Analysis Group team interviewed 30 CEOs and senior executives from advanced energy companies located in and/or doing significant business in California. Starting with a list of hundreds of such companies, we selected a set designed to reflect the breadth of businesses involved in advanced energy activities. Thus, the companies were involved in different advanced energy business sectors: electricity generation, transportation, buildings, transport and non-transport fuel production, electricity delivery and management, fuel delivery, and industry.

As described further in Appendix 1, we used lengthy open-ended interviews with the participants to gather their perspectives on how California policies directly and indirectly affected their core business interests and long-term strategy. We asked them to reflect not only on those state policies that shape the markets for their products, but also others that affect the conduct of their business development and operations within the state. We inquired about the design of existing and new state policies and programs. We asked them for their thoughts on what policies seem to be working within their business segment, and on any suggestions for changes that could improve conditions going forward. We asked them to comment on the cumulative effects of the many and diverse policies that affect energy choices, advanced energy businesses' activities, and the investment/innovation climate in the state.

The goal of our interviews was to collect information on the perspectives of advanced energy business leaders regarding California's forthcoming transition and to provide their insights into how California should manage the transition as efficiently and effectively as possible. This report describes the results of our interviews and extracts key observations and recommendations that flow from them.



SOLAR PANELS, INDIAN WELLS

Key Insights From Advanced Energy Business Leaders

Almost universally, the executives we interviewed place California at the forefront of policies that stimulate energy innovation and investment and encourage advanced energy business development in the United States. At the same time, they express strong concerns about how complex and hard it is to conduct business in California. They see the state's leaders as far better at adopting policies than they are at executing them for results. They note the value and importance of Silicon Valley's location in California, with its innovation culture, its highly trained labor force, and investment firms, as critical for many advanced energy companies being situated in the state. They also point to the high cost of living and working in California, which narrows the set of activities that make sense for advanced energy companies to perform within the state.

As a result, these executives simultaneously admire California's leadership and what the state is doing to advance modern energy technology, products and services, and express concern about the environment for operating a business in the state, and even to respond to the pro-advanced energy priorities and incentives embodied in state policy.

Across the board, advanced energy executives caution that in order for California to accomplish the outcomes that underpin the state's energy and economic development policies, the state government may need to focus much more effectively on facilitating a more favorable environment for companies doing business in California. The executives suggest that moving forward effectively will require a concerted effort across different parts of the state government to manage programs in a way that avoids waste and inefficiency and that mitigates potential cost impacts that could result in backlash against California's energy leadership. Also, a clearer and more accountable assignment of responsibility would make the administration of the state's complex web of energy policies and programs more effective. Without greater attention to and genuine priority on the "how" of state energy and environmental policies, California risks either not accomplishing the goals its energy policies set out or accomplishing the desired results at a greater cost to the economy than is warranted or acceptable.

More Specifics

The advanced energy executives in various business segments provided rich commentary on the policies and conditions that they think are working in California, the ones they think need improvement, and specific ideas for what is needed to make good on California's advanced energy promises.

In the sections that follow, we summarize some of the specific observations about which policies are and are not effective, along with recommendations for actions that California should take to increase the effectiveness of its advanced energy policies. In Appendix 2, we provide more detailed comments on the different business segments of advanced energy companies, including energy efficiency; renewable power; energy storage; transportation sector including alternative fuels, vehicles and infrastructure issues; GHG emissions reduction; carbon capture and sequestration; and manufacturing, among others.

"California seems to know what it wants to be when it grows up – it wants to be a clean energy state. This compares to the fractured discussion that has taken place in Washington and in other states. California has consensus on this; as an advanced energy business leader I don't worry that the rug is going to be pulled out from under me... California is attractive as a place to invest and to try new things.

— CEO of large advanced energy company with diverse electric assets, investment and products

What Works Well

California is a leader on policies that affect the various business segments of the advanced energy sector. Notable elements of this robust set of policies in California include: economy-wide greenhouse-gas control policy (AB 32), which is in the process of being implemented; vehicle fuel-economy standards; content standards for transportation fuels; funding and regulatory requirements for alternative fuel and low-emission vehicles; energy-efficient building codes; appliance efficiency standards; policies affecting electric utility rates, practices and offerings (such as the renewable portfolio standard and other procurement targets; energy efficiency programs, revenue decoupling, and net metering for customers with on-site renewable systems); and funding for advanced energy research and development (R&D). Some of these policies are primarily environmental in nature, but lead toward adoption of advanced energy solutions. Others directly target the efficiency and management of energy use in buildings, industrial processes, and vehicles. Others affect the character of electric generating resources and transportation fuels. Still others affect the market related to the use of advanced energy (including job training, education and the permitting of facilities). Together, these policies create a powerfully strong demand for advanced energy technology development, products, and services, creating market opportunities and stimulating business growth.

California enjoys many benefits from deep experience in adopting new energy policies that span a wide array of sectors, along with a prospering culture of innovation.

California has a bias toward trying new things – introducing change through executive initiatives, legislation, referendum, and evolving regulations. In many ways, this is consistent with California’s deep “innovation culture” that includes not only Silicon Valley, but also many other communities within the state. Over the years, California and its many strong universities have attracted a hub of investors and talent that fosters further investment and innovation. In the policy arena, administrative and enforcement responsibilities for state programs that affect the energy sector cut across numerous state offices, agencies, and commissions, and responsibilities for program design and execution happen across many levels of government – from the key agencies of the state government’s executive branch, to regional and county government entities, right down to town/local offices.



HYDROPOWER PLANT, SHASTA DAM

California offers a diverse set of financial tools for advanced energy. These include energy technology development grants, ratepayer funding for energy efficiency, tax incentives for investment, and other financing mechanisms for advanced energy investment. These sources of public funding are important for providing support for research, for developing new technologies, for demonstrating them, and for deploying them into markets. The state’s financial tools are important for helping to unleash private capital, too – in the form of early-stage investment for smaller start-up companies trying to develop technologies and products, or to assist in demonstrating and scaling up certain advanced energy technologies.

California’s energy and environmental policies will also shape advanced energy investment and product choices. Implementation of AB 32 and Proposition 39 has the potential to be a game changer, provided the revenues collected from these policies are directed and administered appropriately and efficiently, and consistent with a vision for the state’s policy goals.

“One of the things that California does well is that it has a history of and momentum of hubs for innovation and R&D. It’s attracted lots of smart people. There’s not only a Silicon Valley hub but also some in other communities in California...”

— CEO of start-up company involved in alternative fuels

Where Improvements Would Be Useful

The flip side of the positive aspects of California's innovative advanced energy policy-development culture is the fact that there are frequent changes in policies and programs. As in all economic sectors, uncertainty and changes in policy make it harder for investors. Greater stability and predictability in policy conditions – including policies, programs, and incentives with longer-term, known, and stable trajectories – will create a stronger magnet for investment in California.

The difficulty of doing business in California creates challenges in meeting the state's goals for advanced energy. While California policy creates significant demand 'pull' for advanced energy goods and services, business conditions in California render it less attractive to open up new offices, operations and facilities, and very difficult to engage in most aspects of advanced energy manufacturing, which is done predominantly out of state. Among the challenges to advanced energy business development in California are: the manner in which the state's environmental quality act (CEQA) is administered; the high tax burden; the high cost of living, which affects the availability of and costs of certain blue-collar labor; and other factors.

"The more you have consistent policies, the better for investment. A big message for California should be don't get off the energy agenda and 'don't flip flop.'"

— *CEO of large, diversified advanced energy company*

There is a real risk of consumer and business backlash stemming from the cumulative effects of the costs of these various policies affecting energy choices in California. The convergence of various policy elements and economic conditions affects this risk. Things occurring in parallel include: AB 32 compliance cost impacts, along with AB 32 administration challenges and complexities; stringent state requirements leading to substantial increases in renewable energy as part of electricity supply, at the same time of heightened uncertainty about the future of federal subsidies for renewable energy technologies and the pressure on renewables from low natural gas prices; the continuing sluggishness of California's and the national economy; state

budget challenges; and other energy policies and standards. Together, these translate into an even-greater need to take actions to assure that the investment California businesses and consumers are making in energy progress is managed in such a way as to avoid waste and inefficiency.

In this context, low natural gas prices are actually double-edged – providing relief in the form of lower energy prices than experienced by electricity and natural gas consumers in the recent past, but creating economic hurdles that make it more difficult to introduce some of the newer advanced energy technologies into the marketplace. This situation contributes to the challenges California's agencies and private enterprises face in satisfying the state's advanced energy goals.

California's advanced energy executives remain concerned that the state's ability to deliver on its promises will be undermined by actions of the state itself.

There is a substantial concern that, under business-as-usual, state agencies and other government entities will implement these various programs in ways that prove ineffective and inefficient. While state officials are uniformly committed to success in moving California toward a better energy future, there are so many agencies and programs in play that unintended consequences result. Agencies act in uncoordinated and un-prioritized ways, and advanced energy businesses face agency actions in one domain that seem inconsistent with the goals of policies in others. Advanced energy businesses often receive mixed messages: these executives view California's policies as implying on the one hand that the state welcomes innovation and competition by private sector actors, but also experience interactions with agency personnel that send the message that every private sector action leaves the world worse off. They see state agencies saying they want the market to work, but find them picking winners among technologies instead of letting the market do so. They see the state relying on utilities to facilitate advanced energy outcomes, without ensuring that utilities are actually supporting innovation and competitive investment by third parties. In these ways, the executives we interviewed fear that California will fail to deliver on the outcomes its policies aspire to achieve. Without focused and sustained attention to addressing these administrative issues, the risks to program outcomes and the costs to the state's economy will be higher than they need be.

Recommendations

California's Advanced Energy Executives

California should articulate an integrated vision and action plan for its own actions in support of an advanced energy economy. A common theme among advanced energy executives is that the state needs both a long-term vision consistent with its suite of energy policies and a well-defined road map for executing on that vision. Having these benchmarks would help relevant agencies guide and prioritize actions across agencies (e.g., the California Energy Commission, the California Public Utilities Commission, the California Air Resources Board), across reviews of business-development and project steps (e.g., program grants, CEQA reviews), across jurisdictions (e.g., county and local agencies), and across terms of public officials and across changes in economic conditions. Additionally, the Governor could hold agencies more accountable for executing against the plan through establishment and use of an integrated/coordinated policy review and energy policy/resource planning function. This could facilitate the proper design and administration of individual programs and policies across all agencies with energy policy responsibilities. It would also help to provide greater accountability at the highest levels of government – for appropriate use of the massive funding emerging from AB 32 and Proposition 39, and for integrating/facilitating administration of programs and policies that involve or cut across multiple agencies.

“California tends to pick their favorite technology instead of setting a goal and letting the market determine winners. The latter is the harder way to write legislation but it’s the right way to do it. The state needs to be less specific about the ways to make specific goals happen; the far superior approach is for California to ask ‘where do we want to be in 20 years,’ and then figure out the policies needed to get there.”

— *CEO of advanced energy start-up company producing alternative fuels*



SAN ONOFRE NUCLEAR GENERATING STATION

California should resist the temptation to frequently change its energy policies and programs.

Establishing a degree of stability in its energy policy landscape would better attract private capital to invest in advanced energy activities in the state. It would also allow the state to focus on improved execution rather than implementation of new policies and programs.

The Governor should appoint and empower an advanced energy business ombudsman. Given the importance of successful execution on California’s advanced energy policies, and of the state’s reliance on private businesses for investment, technology innovation, and other actions, California’s chief executive should appoint someone at the highest level of the executive branch with a mandate to facilitate problem-solving processes within the executive branch. The focus could be on the advanced energy business community broadly defined and to help it navigate the complexity of the state’s policy landscape. The ombudsman should be vested with sufficient responsibility and authority to convene relevant agency personnel, to work through issues that stem from procedural snags in agency administration of energy programs, to set appropriate deadlines for resolving issues, and to communicate clearly across agencies and the affected businesses in the advanced energy community.

Recommendations

California should resist picking technology winners for advanced energy policies and programs where the private sector may bring innovative technologies to the market in response to energy performance standards. Among California's many policies that affect energy technology development, investment, product and service delivery, California should establish less-prescriptive approaches that in effect select technology winners. For example, as the state establishes a price on carbon and other GHG emissions, it should use that yardstick with other programs (e.g., renewable portfolio standards, alternative fuel vehicle standards) and allow the market to find the most efficient and effective responses.

California should use funding from the AB 32 revenues and Proposition 39 funding to fill in gaps in private sector funding of advanced energy technologies and companies.

Given the current withdrawal of private capital from early-stage investing in advanced energy companies and technologies, California should use some of the AB 32 and Proposition 39 funding to address this gap in financing. Capital shortage is especially an issue for smaller early-stage companies, and for developers of not-yet-commercially proven technologies that need assistance in their scale-up demonstrations. California could use AB 32/Proposition 39 funding to support an early-stage investment fund for advanced energy companies. This could be set up so that it provides matching funds or the state serves as an anchor investor for a fund so that smaller investors could participate.

California should reform CEQA to make environmentally beneficial projects easier to develop and less vulnerable to obstruction by opponents. A more streamlined process of environmental review would accelerate advanced energy development and reduce costs. For operations and facilities being developed to produce goods and services that deliver environmental improvements, California should consider how to take such factors into account in administering CEQA requirements. In addition, it is vital to make CEQA less subject to abuse by opponents, who are now able to use the state's landmark environmental law to obstruct even environmentally beneficial projects.

"The environmental review process is fairly onerous in California: CEQA makes any project in California more expensive and more marginal than it would otherwise be in another state. You could get 10-20% more investment and development of renewables in California if the environmental process were more streamlined. Even projects with significant environmental benefits are slowed down by CEQA. If we learn there's opposition to a project using CEQA, we drop it down the priority list. It's just too expensive."

— CEO of large, diversified advanced energy company



SACRAMENTO, CITY OF TREES

PURPOSE AND CONTEXT OF THE STUDY OF CALIFORNIA'S ADVANCED ENERGY POLICIES

California Energy Policy Context

For decades, California has been at the forefront of energy policy development in the U.S. – including a wide range of laws, regulations and programs to address the environmental, fuel security/diversity, and economic impacts of energy production and consumption. Such policies have included the following, among many others:

- Policies affecting the environmental footprint of development projects and business activities (e.g., AB 32's carbon cap/trade program, with allowance revenues dedicated to energy projects and cost impacts; the California Environmental Quality Act (CEQA)).
- Policies affecting the efficiency and management of energy use in buildings and industrial processes (e.g., energy-efficient building codes; appliance efficiency standards; Proposition 39's tax reform proceeds for use in energy efficiency and advanced energy; combined heat and power support; ratepayer-funded utility energy-efficiency programs; other utility policies relevant for energy efficiency, including revenue decoupling).
- Policies supporting renewable energy generation and use (e.g., self-generation incentives for alternative energy resources such as property-assessed clean energy (PACE) financing; performance contracting and third-party financing for solar installations; renewable portfolio standards (RPS); feed-in tariffs; utility long-term contracts for renewable energy supply; other utility policy affecting on-site generation by renewable energy, including net metering, virtual net metering, municipal bill aggregation; planning and cost allocation for high-voltage transmission to distant renewable resources; wholesale market rules to facilitate integration of variable resources; loan guarantees and grants for advanced energy projects).
- Policies to introduce vehicle efficiency and alternative fuels into the transportation sector (e.g., vehicle fuel economy standards; fuel content requirement; support for low-carbon fuels and alternative vehicle fueling infrastructure).
- Other policies affecting the market for advanced energy (including job training and skills development; education curriculum; siting/permitting coordination and reforms).
- Other policies and conditions affecting the cost and character of doing business in California (including property and income taxes; labor requirements; CEQA reviews).

Many policies are targeted to support the development or commercialization of specific technologies, or to achieve goal-driven outcomes, such as low-emission or renewable power generation, or alternative fuel vehicles and fueling infrastructure. Other policies shape the state's energy picture because they may affect the cost and timing of development or commercialization of certain advanced energy activity, such as the permitting or siting of projects; by facilitating innovation clusters; or by imposing certain taxes or fees affecting development.

Against this backdrop, California ground-breaking, economy-wide cap on GHG emissions (AB 32) is possibly the largest policy impacting energy choices to date: one that will impose significant compliance requirements on countless firms and organizations in the state, but also generate large sums of revenues that can be used in ways that could help or hinder energy policy efforts. In addition, the state is beginning implementation of Proposition 39 – a ballot initiative that adjusts the taxation of multi-state businesses, with the expectation that it will generate additional large sums of money for energy-related programs for many years.

As these policies take hold over the next few years, the energy landscape in California will undergo major change. Yet it is hard to find a single entity responsible for or a single vision that fully integrates these initiatives in the context of the state's economic, energy, and environmental policy goals. Further, many policy design questions remain. How will policy costs be allocated? How will AB 32 and Proposition 39 funds be used over time? How will the potential impacts on consumers and businesses in the state be identified and mitigated? Are there ways to coordinate or integrate administration of programs in a way that eliminates duplication, redundancy, or waste? Administering these changes in a way that meets California's policy goals in the most efficient and effective way possible, with due consideration to minimize impacts on the state's consumers and businesses, is a key challenge going forward.

Survey Purpose and Approach

The purpose of our survey was to elicit thoughts on these challenges from a particular viewpoint – namely, the perspective of business leaders of advanced energy companies with significant operations in the state (or hopes for such in the future), and whose businesses are likely to be directly affected by the state’s energy policies.

These companies are developing technologies, products and services aimed at making the global energy system more secure, clean, and affordable. Their broad range of products and services constitute the emerging and, in some cases, best available commercial technologies for meeting energy needs today and in the future. The companies vary in size and stage of development. Their businesses also vary, from technology development, to component and product manufacturing, to project and infrastructure development, to equipment installation, to engineering, finance, and advisory services.

In many ways these companies – and how the markets for their products respond to and are driven by energy policy in the coming years – will determine the success or failure of these policies for California’s economy, residents, and policy goals. We interviewed 30 CEOs and other senior executives from such companies, across the following energy sectors/ business lines:²

- Buildings (e.g., combined heat and power; energy efficiency; appliance efficiency); Renewable and Low-Carbon Electricity Generation (e.g., solar, including large central station, distributed, and third-party contracting; wind; geothermal; natural gas; hydro; co-located carbon capture; fuel cells);
- Electricity Delivery and Management (e.g., batteries/storage; smart grid; energy management/demand response);
- Transportation (e.g., alternative-fuel vehicles; alternative fuel production (including biofuels production); alternative fuel delivery and distribution infrastructure); and
- Capital investment in advanced energy.

We selected a broad range of businesses to include in the survey in order to capture a variety of perspectives. Within each interview, we focused on the issues of importance within that company’s specific business segment. We sought to speak with the CEOs of these companies (rather than with personnel specifically responsible for legislative, regulatory

or policy issues for the company) in order to probe how California policies directly affected the core business interests and long-term strategy in consideration of investor and shareholder interests. We relied on open-ended questions so as to learn from the CEOs about those policies of most interest and importance to their companies.

We asked individual executives about their point of view on those state policies that shape the markets for their products, but also others that affect the conduct of their business development and operations within the state. We asked them for their thoughts on what policies seem to be working well within their business segment, and any suggestions for changes that could improve conditions going forward. We asked them to comment on the cumulative effects of the many and diverse policies that affect energy choices, advanced energy businesses’ activities, and the investment/ innovation climate in the state.

Specifically, we focused on a number of key business areas with interviewees:

- How should the state focus new streams of public resources to enable in-state industry growth while offsetting existing program costs?
- What are the best opportunities for investment of new revenues and areas the state should focus on in planning for California’s energy future?
- How effective have been past/existing energy-related state budgetary and regulatory programs intended to expand advanced energy opportunities? Are there strategies for use of programs and funding to increase the availability of low-cost capital, leverage existing public funding sources, and attract private capital?

What are the key regulatory barriers to new and continued services, installation and manufacturing by advanced energy companies in the state, and what are the opportunities to address these?

We conducted the confidential interviews during December 2012 and January 2013. All interviewees were given in advance (and at the beginning of the interview) a consistent overview of the purpose of the interview process, the areas of interest, and how (and for what purpose) the results would be used. Each interview lasted approximately one hour.

² In several instances, where CEOs were not available, we interviewed other senior executives close to the business operations of the firms in question.

SPECIFIC OBSERVATIONS FROM SENIOR EXECUTIVES OF ADVANCED ENERGY COMPANIES IN CALIFORNIA

This appendix provides in more detail some of the specific feedback we received through our confidential interviews with 30 senior advanced energy executives. The comments appear below more or less in the words spoken by the executives themselves (although not attributed to a particular person or company).

Where there were comments on a particular point by several executives, we have not repeated each statement. We have organized the comments into functional categories, and within each present advanced energy executives' viewpoints on (1) what policies seem to be working well, (2) areas where improvements could help advanced energy outcomes, and (3) recommendations for changes going forward. The functional categories comments are organized into include the following:

- The overall suite of policies for advanced energy investment, innovation and deployment
- Greenhouse gas policies
- Energy efficiency/smart grid
- Renewable power generation
- Energy storage
- Transportation fuels and policies
- Advanced energy manufacturing
- Other

Observations about the Overall Suite of Policies for Advanced Energy Investment, Innovation and Deployment

The advanced energy executives' comments spanned a wide range of topics, but most of them touched on California's overall suite of policies affecting advanced energy companies. Virtually all of the executives put California at the forefront of energy policy that drives innovation, investment, and advanced energy business development. The state's policies are indicative of California's willingness to serve as a bellwether state for advanced energy policy, paving the way for other state and federal policies to follow suit. At the same time, the executives reported that California's suite of advanced energy policies form a complex web that can be difficult to understand and navigate, especially for small businesses.

In some instances, these policies even create inconsistencies. These inconsistencies, combined with the state's high cost of living, create challenges for many advanced energy businesses. Many executives expressed a desire that, moving forward, California policy makers identify a crisp, long-term vision for the state's advanced energy policy to create a more integrated and cohesive platform for implementing the many individual energy policies. Also, a common theme was to encourage California to set targets and standards (rather than prescribing certain technology winners), and let the market innovate with diverse solutions.

Among the more descriptive comments provided by executives were the following:

Policies that are Working Well

- California is a leader on renewable energy policy (e.g. low-carbon fuel standard, renewable portfolio standard (RPS), etc.). California's policies tend to be ahead of the rest of the country. California has done a very good job indicating its willingness to be a bellwether state and to be a national leader on policy (e.g., for electric vehicles (EVs), hydrogen, the state's CO₂ cap-and-trade market).
- There is an ethos in California that values sustainability. A number of times Californians have voted for these changes in referendum. One cannot overlook this element – there is a difference in California in that Californians actually do want more alternative energy choices.
- California seems to know what it wants to be when it grows up – it wants to be a clean energy state. This compares to the fractured discussion that has taken place in other states. California has consensus on this; as an advanced energy business leader, I don't have to worry that the rug is going to be pulled out from under me if the

state elects a different governor with seemingly different values. California is therefore attractive to us as a place to invest and a place for us to try new things.

- One of the things that California has as an advantage is its history of and momentum of hubs for innovation/R&D. It's attracted lots of smart people. This includes the highly innovative culture in Silicon Valley, but also others (e.g., in San Diego centered on biology-based technologies).
- California's utility regulators are among a handful of PUCs in the country that are active in policy development, as opposed to being more judicial than legislative.

Areas Where Improvements Could Help Advanced Energy Outcomes

- Though California is a leader on clean/renewable energy, it is running the risk that its policies will lead to contribute to higher rates in the next 3-5 years. There are lots of things happening at once. If California needs to upgrade the transmission grid for whatever reason, and that raises rates, people are likely going to point the finger at renewable energy as driving it, and renewable generation companies get blamed.
- California knows it wants to be a clean energy state. What you worry about in California is the implementation – everything is difficult out there.
- California policies are a huge web of different policies. They're too complicated for many businesses to respond to. At times the state is trying to push customers into a particular direction instead of leveling the playing field and letting the market play out. At the end of the day the state's policies are noisy, confusing, and bureaucratic.
- California has constantly changing energy policies. Developers think it's automatic that California will change its policies often, and that mindset creates a challenging environment for development. Consistency is very important – companies need to be able to count on an incentive for the life of the capital equipment. The state can't have a lot of one-off incentives and still attract investment.
- It's challenging for investors to put money into companies where the policy settings are both important and either temporary or fragile (and might go away). Companies and investors need stability in a state. Predictability and clear guide path are essential ingredients to get investors interested. It's not attractive to invest in California (or anywhere, for that matter) if policies are only in place for a year.
- The more a state has consistent policies, the better for investment. A big message for California should be "don't get off the energy agenda" and "don't flip flop." In addition, it's better to have broad policies in place such as the RPS and GHG emissions cap and let the market work to come up with solutions rather than focusing on incentives for specific programs. If a standard or incentive gets too specific, companies lose investment across a broad range of technologies.
- California has solar, wind, EV, etc. programs and policies that are very prescriptive and there are very specific mandates on utilities, government buildings, etc. The biggest problem is that everything is too technology-specific. The state needs to take a more general approach on clean energy.
- California needs to figure out where there's overlap in objectives among existing programs. Where there is, California should pool the resources of those programs so that there's more funding and more technologies are able to compete. In addition, quite-similar programs are administered by separately by the CEC, CARB, etc., so there's overlap in content.
- Relative taxation level in California versus other states is a drawback for the state in terms of performing certain business functions there. It's not such an issue for a very small start-up but as a company gets bigger, it does become a significant issue.
- California tends to pick its favorite technology instead of setting a goal and letting the market determine winners. The latter is the harder way to write legislation but it's the right way to do it. The far superior approach is for California to ask "where do we want to be in 20 years?" and then figure out the policies needed to get there. Leadership is needed to let the market play out with options, and generate results that meet energy policy goals.
- California deserves a lot of credit for having devoted a lot of thought to energy issues, but it also needs to follow through with rules and practices that work to accomplish what they want. There's a huge benefit for development that's associated with policy continuity and policy clarity, but California does not maintain policies over time. The state has aggressive – the most aggressive – carbon goals, but there's no way that it can get there if policy variability and follow-through create barriers to implementation at every single level. Politically, there needs to be a force from the top down, to make this effort more coordinated. California has a governor right now who's willing to do a lot of tough things, and this coordinated effort should be one of them.
- Because the costs of California's programs are piling up, the state should carefully review the impacts on different types of consumers (such as low-income customers).

For example, careful review of all rate-distribution issues could mitigate concern over the impact of expanding distributed generation.

- In California, the governor gets the advanced energy agenda at a high level. But it is inherently challenging to keep department heads to be responsive and take the actions needed to make things work from an execution point of view. Without the governor's leadership to hold those agency heads accountable, much of what the state wants to do will be bogged down in bureaucratic delay.
- If California wants to lead in advanced energy, it should start with the money it already has. For example, there's a bucket of money created by AB 118 from state vehicle charges that's intended to support advanced transportation in the state. This money bypasses the state budget and goes directly to the CEC. The CEC should move the \$250 million into the economy more quickly. Another example: a company was awarded a grant for an alternative fuel production program in California, but to obtain funding from the program, the company first had to undergo an unfunded CEQA impact review and CEC approval process. That kind of delay makes it simply not possible for smaller companies to participate: the level of effort is too high, given the available grant. It might even be a deterrent for larger companies.
- Permitting for large renewable projects takes too long and is hung up by investor-owned utilities (IOUs). For example: All 3 IOUs incurred penalties in 2010 for missing their RPS targets, so it was clear that more renewable capacity was needed quickly. We subsequently applied to move forward with a large-scale renewable project, but the CPUC transferred the vetting of the project over to an IOU with stipulated purchase

quantities, and an overly bureaucratic and lengthy process ensued that dramatically interfered with project development and value.

- Access to capital and engineering were the two trump cards for being in Silicon Valley. The energy policies of the state are in parallel with these trump cards: California's universities crank out people that we need for our work, in part because the state's policies and programs naturally allow this to happen. It's an indirect impact. Consequently, California shouldn't forget the link between the educational institutes and the state's assets – California's universities are getting hammered on budgets – and state needs to be mindful of the damage this could cause. The universities are a big reason why start-ups would be attracted to the region and the state.
- Access to capital is the reason why we are located here. Silicon Valley is the best place in the world to start a business. It might not be the best place to scale a business. We are in Silicon Valley first, and that just so happens to be in California. There is no comparison to Silicon Valley elsewhere in the country; we are really trying to do cutting edge stuff here. The venture capital support and the ecosystem attributes in Silicon Valley are amazing. I don't think you have this concentration of innovative business anywhere else. Despite these positive attributes, it's hard to recruit for certain types of jobs because it's expensive to live here.
- Despite being a leader in energy policy, California is not the most business friendly state: taxes are the number one issue – corporate income tax, personal income tax, relatively few tax incentives, property taxes – all are an issue. Recruiting people to live in California is tough, and it's hard to get the right labor for certain types of jobs because of the cost of living.

Recommendations from Advanced Energy Executives

- California's fundamental strategy needs to be to appropriately price the policy focus (e.g., in the case of carbon, through either a gas tax or carbon tax). That's the only technology-neutral policy device that would signal to consumers without picking a technological winner, thus providing a level playing field.
- The state needs long-term, consistent legislation and policy, not legislation/policy that changes all the time.
- California should take steps to align the implementation of various energy policies across the various relevant agencies.
- California should look at what other states are doing to support advanced energy companies in the context of business development support – e.g., efforts to streamline development activities, reduce permitting or other obstacles, provide tax relief or grants, etc.

- There's a hodgepodge of regulation in California that's makes it difficult for people who own a broad portfolio of assets to keep up with: California has a state-mandated energy use disclosure for their IOUs for example, but individual munis can adopt different ones.
- Companies do make decisions about where to locate based on cost of energy when energy costs are their number one or two cost. When you have an energy-intensive business, that cost will impact where you locate. Examples are data centers – we have a client looking to site their facility in another state because there were subsidies being provided there.
- California is our research location, due to the proximity of university talent for research labor. But when we needed to move to large testing facilities, we located them out of state. Siting issues and the availability of direct business incentives elsewhere led us to build the facility out of state. Other places had lots of policies to get our permits granted rapidly there and they gave us property incentives; these are important for a relatively small company. Also, the state doesn't have the ability seemingly to coordinate their different agencies' approach – they need to have more coordination to make this work.
- There are things being done in other states to create a welcome climate for business investment. It would be useful for California to look at what other states are doing for economic development.

AB 32 Observations

The advanced energy executives interviewed shared a number of observations about AB 32, which set it apart from what other states and the federal government are doing. Many executives noted that implementation is ongoing, and it remains uncertain how various advanced energy technologies will help achieve California's AB 32 goals. Executives offered the hope that, moving forward, California will use the proceeds from AB 32 to further advanced energy and reduce GHG emissions in the state as originally envisioned in the legislation, rather than use the proceeds for general fund purposes.

Among the more descriptive comments on AB 32 issues were the following:

Policies that are Working Well

- For a long time, and in particular in the last four years, California has stood out as a leader in policies and programs in advanced energy. California is where there's the greatest level of state action happening on climate issues.
- AB 32 was set up originally to invest proceeds in technologies to continually reduce GHG. We need to ensure that money is used for that purpose, to help drive innovation.

Areas Where Improvements Could Help Advanced Energy Outcomes

- In implementing AB 32, there may be somewhat inconsistent attitudes with regard to advanced energy technologies. Some questionable ones are being allowed, while there's hesitancy to allow others, such as carbon storage, as a way to address carbon. CARB is not sufficiently staffed to investigate qualification of some advanced technologies for credits (e.g., natural gas combined cycle with enhanced oil recovery), and this can lead to inefficiencies and inconsistencies in implementation.

Recommendations from Advanced Energy Executives

- AB 32 funds need to go to reduce carbon emissions as originally envisioned in the legislation, and should not be used as general funds. The funds should be used to provide cheap loans to businesses and homeowners. Right now the state has no renewable loan programs – none – and no money to do so. Now they'll have \$1 billion in capital available each year to introduce this type of program.
- California should resist the temptation to use AB 32 and Proposition 39 funds for general fund purposes. Inexpensive debt is key for the advanced energy industry – AB 32 funds should be used to provide inexpensive debt in order to grow advanced energy in the state.
- CARB needs to write clearer definitions of what qualifies as a low-carbon generation technology with respect to carbon capture/storage: the qualification documents need to be written.

Energy Efficiency and Smart Grid Policies

The advanced energy executives interviewed shared a number of thoughts on California's policies surrounding energy efficiency and smart grid deployment. Many view California's combination of advanced building codes, appliance efficiency standards, energy efficiency resource standards, and ratepayer-funded efficiency programs as putting the state into a leadership position in getting high value for the energy its economy uses. In addition, some of the CEOs observed that California leads others in its support for smart grid deployment to date.

Among the more descriptive comments provided by executives were the following:

Policies that are Working Well

- California's building code – namely its net zero energy buildings – has driven lots of innovation.
- The energy efficiency resource standard (EERS) and the decoupling mechanism are among the most effective set of policies in the country for those focused on energy efficiency. There are utilities in California that are generally interested in being good partners in meeting these objectives, including the loading order.
- California legislature passed a bill that required IOUs to submit smart grid roadmaps – a visioning document for 10-20 years down the road. That was a very good policy for the industry and for utilities to be held to that requirement.
- Another piece of legislation was a requirement that the CPUC develop defined metrics against which to measure the progress towards these smart grid goals. Having stakeholder agreed-upon metrics has been very important.
- Utility rebate programs for energy efficiency have been the biggest boon for some advanced energy companies.
- Performance incentives for utility energy efficiency programs have worked, at least when they were first introduced. This created big changes in the attitudes of IOU executives about efficiency when incentives were added. (Lately however, the incentives are lower, spottier, and can't be counted on.)
- Having energy efficiency stated as number one in the loading order has been key. Having efficiency be number one in loading order is key because it puts procurement money into efficiency programs. It also allowed the efficiency industry to say, "this is a real business," and "we're going to really use this to provide energy efficiency in the state." For the industry, that really catapulted the businesses from the margin into the mainstream.

Areas Where Improvements Could Help Advanced Energy Outcomes

- For some efficiency technologies that are new or emerging, there's too much bureaucracy to be included as part of an IOU's efficiency programs.
- The CPUC has not done a good enough job in holding IOUs responsible for delivering smart grid benefits (though they've done a nice job with the visioning). Right now utilities just use smart meters to read the meter better, and the CPUC hasn't held the IOUs accountable for delivering broader smart grid benefits. Utilities around the country are using smart meters to read meters better, but some of them have tied them to their outage management systems, which will lower restoration times. Remote disconnects and reconnects are also being done with smart meters as people move in/out – that can be done with the flip of a switch. Those are important functionalities that are more than just meter reading; they are missing in California.
- Cross-industry valuation can be a problem under CPUC policies. For example, a device that provides both gas and electric savings may lose out, because it's only approved for gas efficiency programs. Therefore, the IOUs are not counting the saved electric benefits and they're missing out on these benefits. There's supposed to be joint implementation of gas and electric efficiency programs with the state coordinating the programs/savings, but it's not happening. California is missing out on lots of potential energy savings because this technology would have a much better cost-effectiveness if both the gas and electric savings were counted.
- The CPUC just decided at the end of 2012 what the utility incentives would be for the 2010-2012 energy efficiency program years. The state is making retroactive policy decisions on efficiency incentives. This is not helpful because utilities can't plan without knowing what incentive the Commission is going to implement next time. Ex-ante performance incentives are good for utilities and efficiency companies because utilities are averse to going with more services, as they don't know how they will be compensated through a performance incentive. Utilities will not go beyond 100% of their program goal if there is an uncertain incentive.
- Additionally, adopting retroactive performance incentives creates a poor policy environment. Iowa has a 5-year energy efficiency planning horizon, and there's a single pot of money to use during that time period for performance incentives; that's a simpler and superior approach

- California's policy lacks clarity and simplicity; the policies are always changing, and that's a negative for the state.
- The level of performance incentive awarded to the IOUs in California should be based entirely on objective (rather than some subjective) criteria, and tied to efficiency outcomes. Those involved in energy efficiency arena for decades find it a challenge that California doesn't integrate efficiency with other approaches (demand response, water efficiency, smart grid, etc.). These can be mutually reinforcing, and make combinations of them be the cheapest thing to do.
- California's Energy Efficiency Strategic Plan (Big Bold Initiatives) doesn't seem to be making enough of a difference. The idea is good but you need to have Big Bold Objectives that different agencies agree upon to be effective.
- There's some mistrust between the PUC and the utilities with regard to efficiency program administration, and there's too much energy spent in turf battles, overcoming perceptions about motives, etc. For example, there's tremendous energy wasted on the question of whether California should bid out efficiency program administration. We either need to introduce/reinforce more functional relationships, or be realistic about outcomes.
- The measurement and verification (M&V) protocol for efficiency programs is not functioning effectively. There's a disconnect between the CPUC and the utilities, and they sometimes work at odds with each other.
- Short program cycles for efficiency programs are hurting outcomes because of uncertainty about program sustainability. It takes a long time to build trust in certain markets. If there are artificial deadlines or arbitrary program elements, it exacerbates industry/market distrust and this is really disruptive.
- California should consider providing regulatory authority to munis and coops for efficiency program design, based on similar experience in other states.

Recommendations from Advanced Energy Executives

- There may be a handful of companies that will do energy efficiency irrespective of cost, but the vast majority of companies (as consumers) will only do it if the economics are there. A state needs to have policies that provide an economic case to undertake energy efficiency.
- California is missing a policy to require that *all* customers be given information about their energy use through their power bill. This is a big missed opportunity. Currently the CPUC requires the three IOUs to provide "green button" data to just 5 percent of its customers.
- Utilities (rather than third parties) must be the provider of green button data because (1) they have brand recognition by customers, and customers trust them, (2) utilities have their customer's data and that's a powerful asset, and (3) they have the channels and obligation to communicate with their customers.
- There should be more consideration in California about how to maximize the uptake of energy efficiency measures. One of the things that's limiting efficiency capture rates right now is that utilities feel obligated to provide the same level of rebate to all of their customers. One could perhaps means-test the rebates. Or, the utility could vary the rebate level in locations where the efficiency resource is most valuable to the utilities. Are there places in the grid that are so congested that California should offer a \$150 rebate instead of the \$50 that's offered elsewhere?

Renewable Power Generation Policies

The advanced energy CEOs we interviewed commented broadly on the array of policies California has adopted to support renewable energy development and use. They see the state as a leader in a number of dimensions that have supported renewables, including net metering, utility-scale projects, transmission investment, grants and tax incentives for renewable investment. They have recommendations for ways that the state could improve on deployment of renewables, including through long-term contracts (PPAs), more standardized policies for permitting across municipalities, reforming certain aspects of implementing California Environmental Quality Act (CEQA) requirements, among other things.

The following comments are illustrative of the comments from the CEOs:

Policies that are Working Well

- California's RPS is the biggest help on renewables development from a policy perspective because of the sheer numbers involved in the size of California's market. The RPS has attracted a huge amount of renewable development in the state. Expanding the RPS to 33% and including the IOUs has led directly to the development of certain new renewable generation projects.
- The RPS is critically important as a market driver but also to demonstrate to others that the U.S. can implement renewable energy.
- California is where there is 'opportunity' because of the apparent intentions of its RPS and carbon policies. It's too big to ignore, and we have to do business there.
- Making municipal utilities subject to the state's RPS has been helpful in terms of facilitating new project development.
- California's IOUs will still enter into long term PPAs, which is a plus for new renewable capacity development (in other states, utilities are less likely to enter into long term PPAs).
- California's Self-Generation Incentive Program ("SGIP") and California Solar Initiative ("CSI") policies have been important in developing utility-scale solar. The CSI program was a real success for rooftop solar; it was a very cost-effective way to bring down costs and increase deployment.
- The state's property tax exemption for solar energy improvement (SB 1451) is an important policy for solar development but is currently set to expire in 2014.
- Net metering is the single most important policy in the state for encouraging solar development. But now

there's uncertainty as to what will happen to the policy after January 1, 2015, unless the CPUC adopts rules determining what happens when the 5 percent cap on net metering is hit. The 18-month lead-in period for solar means that the regulatory uncertainty will chill projects after June 30, 2013.

- The California Solar Rights Act encourages solar development by limiting the ability of a locality to block installation of solar for unreasonable aesthetic reasons.
- Tiered electricity rates (increasing rate blocks) in the rate structure should be maintained to encourage efficiency and renewable development. Utilities are currently pushing to move toward higher fixed monthly charges for ratepayers but this will discourage efficiency and rooftop solar: if you had a fixed charge of \$50/month and very little variable cost, there's no incentive to turn the lights off or install distributed generation.

Areas Where Improvements Could Help Advanced Energy Outcomes

- While the CSI program overall has been hugely successful, the New Homes Solar Program (NHSP) component of the CSI program aimed at new homes has been underfunded. There's been huge demand by homebuilders for this program and San Diego Gas and Electric's (SDG&E) territory is about to run out of money to fund this program even though the program's megawatt (MW) goal has yet to be hit.
- Unless you get into long-term PPAs with a utility, there's very little merchant plant development right now; developers are not responding to market signals alone and are very reluctant to develop merchant renewable projects right now.
- Regulatory uncertainty is hindering further development of renewables.
- Geothermal development is closer to the oil and gas industries in terms of the amount of capital required for development, as compared to the solar or wind industries. There's huge geothermal potential in California but also huge costs and risks. This makes developing geothermal in the state a challenge, even though development would provide well-paid local jobs with lots of local economic development benefits, and provide relative benefits as a baseload source (rather than intermittent).
- California has unbalanced taxation for renewable development that's very weighted towards solar: there's a property tax benefit if you install solar (SB 1451) but nothing for geothermal. A 50 MW geothermal plant

incurs a \$2-3 million per year in property taxes, which is a huge number in terms of the bottom line.

- At present, CEQA is a big issue: any stakeholder can hold up the development process. This needs to get resolved. CEQA is often used by opponents to block a project. We're asked to get involved in lots of projects. If we learn there's opposition to a project using CEQA, we drop it down the priority list because it's too expensive to deal with.
- The environmental review process is fairly onerous in California: CEQA makes any project in California more expensive and more marginal than it would otherwise be in another state. You could get 10-20% more investment and development of renewables in California if the environmental process were more streamlined. Even projects with significant environmental benefits are slowed down by CEQA.
- It feels like the additional hoops we have to jump through for CEQA are more difficult than in other places in the U.S. And when I compare that to what's required in China, they can get something up and running in half to one-quarter the amount of time than it takes here. That's our competition, so to the extent that we can streamline some of that work in California it would be helpful. We need to change the amount of paperwork that needs to be done to expand business.
- It would be really good if California put the burden on someone other than the IOUs to procure for green power. Regarding the RPS, in the first few years the IOUs were surprisingly flexible. But once they saw prices coming down and old contracts were too high, they reverted back to form and were difficult, saying any revisions to contract would require a new tender.
- For a large-scale solar project, the regulatory process of working with utilities is challenging and inefficient.
- In California, there's a fundamental disconnect between what they say they want (in terms of the policies they adopted) and what they will allow to happen in practice. It's not that the state had to adopt aggressive renewables/low-carbon goals and policies, but it did. Therefore it needs to match the aspirations with the practical issues.

For example:

- IOUs sign contracts, possibly expecting that they will never have to perform, because there are too many hoops to go through.
- CPUC is making it difficult to deliver on goals, as they keep inserting their own terms into contracts.
- The transmission arm of the utility can introduce delays that would inevitably mean that the utility affiliate will be able to get out of the contract, because delay will kill the project.

- The California Independent System Operator's (CAISO) centralized transmission planning has created, in effect, green zones and red zones for renewable development: if you interconnect to ratepayer-funded needed transmission (the "green zones") you're golden from an economic/cost perspective. Siting is much more complicated for renewables than just those variables that roll into the CAISO transmission planning process (e.g., land availability, endangered species, etc.). By ignoring these siting issues in its transmission planning, CAISO is placing an inappropriate thumb on the scale.
- Different generation technologies have different attributes in terms of reliability, resiliency, black start, and peak coincidence benefits – and those characteristics need to be factored in more by CAISO and the CPUC. Right now fuel cells deployed as distributed generation don't get compensated for any of these very real benefits that they're providing.
- Munis in California are not required to interconnect fuel cells used as distributed generation to the grid. That is a big problem.
- The biggest challenges for rooftop solar are:
 - 1) Lack of long-term certainty/signals in policy
 - 2) The extent to which jurisdictions vary in terms of siting/permitting requirements for residential applications. Customer acquisition and permitting costs are as high as the solar panels themselves. This variation makes it very hard to give a firm quote to a homeowner – it creates a bad customer experience and you can lose lots of customers when you have to change the quote after you find out that the building code in a certain town requires a change.
- California's IOUs have started to get aggressive with interconnection and rate design and are attacking net metering. Net metering hadn't been referred to as a subsidy and transfer of wealth until the recent past. The inherent issue here is that utilities are concerned about losing their exclusive relationship with customers that adopt solar.
- The interconnection time for rooftop solar is very slow. IOUs are mandated to interconnect within a certain amount of time, but they never do it on time. The general amount of obstruction that developers face is very high.
- The fast-track interconnection requirement for small systems (several MW and under) is 30 days, and utilities generally interconnect within 30 to 60 days.
- California's loading order for utilities should be a good policy but the utilities don't send the impression that they are acting on it; often, utilities will suggest they support a policy but be ineffective in acting on it.
- CAISO's resource adequacy market seems like a half-hearted attempt to create a capacity market. Capacity markets serve to avoid brown-outs but they're insufficient to incentivize new generation. Bilateral contracts are the wave of the future for developing new capacity.

Recommendations from Advanced Energy Executives

- The State should introduce policies that provide incentives for the development of flexible resources and can balance intermittent resources.
- California needs to address the need for flexible resources and black start capability. Introducing a “reliability energy credit” is one way of addressing this issue and compensating the different attributes of renewable generation technologies, in terms of reliability, resiliency, black start, and peak coincidence benefits.
- There should be an effort to make renewable projects bundle with non-intermittent power in order to sell into the market. We’ve always thought that a market would develop for reliable green power where we’d enter into a contract with someone for renewable energy that’s backed by gas (say, 60% of a PPA’s power would be renewable, and the provider could blend when needed with gas). That’s a way to deal with the intermittency problem of renewables. We thought this would naturally develop on commercial terms, but it never did because everything has to go through the IOUs in California.
- Another way to address intermittent power is to have CAISO identify the areas where there are grid constraints, and then provide an adder for resources located in these zones. This would add to transparency and enable a cost effective fix to the problem.
- If you’re on the net metering tariff, you’re exempt from interconnection standby charges, though installations are limited to 1MW in size. California needs to expand the current net metering tariff to include installations larger than 1 MW, which would include more fuel cells to serve as distributed generation.
- California should introduce policies and programs that provide incentives for geothermal development given the huge upfront exploratory costs. Right now, an individual company has to take on substantial risk in order to understand the resource potential. The state should incent oil and gas companies to explore geothermal resources given their balance sheets.
- California should consider issuing categorical exclusions as part of CEQA. As long as the project doesn’t exceed certain criteria, then a project could get through the CEQA process without having to do a full-blown review.
- CPUC should consider offering local economic development benefits and reliability benefits when permitting renewables.
- The state needs to introduce a cap on the level of permitting fees that an individual municipality can charge for distributed generation installations, including for residential solar.
- Regarding variation in siting and permitting requirements for residential solar applications, California should enable online permitting, publish best practices for installation and codes to facilitate standardization, and introduce a cap on permit fees.
- California should expand the ability of consumers to buy competitive power. There’s a lottery, but many more customers are interested in participating than there are available slots.
- People and businesses are no longer interested in depending on the grid for 100 percent of their power post-Sandy. California should encourage key service providers like ATMs and gas stations to undertake grid independence by installing rooftop solar instead of diesel generators. When people think of unreliable power, they’re alluding to the fact that solar can’t provide power at night. However, in the middle of Hurricane Sandy, we found people would have been delighted with just 4 hours of electricity during the day to charge cell phones, etc. Rather than waiting for a disaster before acting California should act now. Solar as a source of energy in a crisis is a great idea, yet current rules don’t encourage this. Texas has recently said that all water authorities must have backup generation so that when the grid goes down water is still available. This could be a good idea in California.

Energy Storage Technology Policies

In light of the state's high goals for relying on renewable resources, some of the CEOs pointed out the importance of doing more to develop and deploy electric and other energy storage technologies.

Policies that are Working Well

- AB 2514, regarding utility-scale energy storage, is a great attempt to have utilities ask difficult but important questions. If California is serious about all of the high-level goals that the state has (e.g., getting to RPS by 2020), then the state needs to ask hard questions such as, "are there better ways to get spinning reserves?". Looking at how the dollars were used this year, much of the funding went to solar-related storage.

Recommendations from Advanced Energy Executives

- California needs a policy on storage. Right now no one knows whether to treat storage as a transmission asset or as a generation asset, so the payment for value from a storage project never seems to be enough in terms of compensation. Two possible solutions are: (1) California introduces an RPS-type policy where it requires a certain amount of storage to be procured (preferred option); or (2) in a less-attractive option, the utility would have ownership of the storage asset, but the construction and development of the asset would be undertaken by a third party.
- California should consider introducing a feed-in tariff for storage.
- There are examples of proactive policies that could help storage, and could help create a voice/constituency for this particular technology approach. For example, one of the creative things that Los Angeles Department of Water and Power (LADWP) has done recently was to issue two RFPs, one of them was for traditional low-carbon resources (e.g., renewables) that are intermittent, and the other for unconventional dispatchable low-carbon resources. For the former, there was a ceiling on the price that parties could bid (~\$60/MWh). For the latter, LADWP said that it had to be both low carbon and dispatchable and if it were, they would accept bids up to some higher ceiling (~\$100/MWh).

Fuels, Vehicles, Infrastructure

Transportation Sector Energy Policies

California has long held a unique role in advanced vehicle policies, and has broadened that to include advanced fuels and diversified vehicle programs. The CEOs we interviewed pointed to this role, and noted the steps that California is taking to build up the fueling infrastructure for advanced vehicles, as well as supporting R&D and deployment of advanced energy fuels. There were a variety of comments on the relative importance of incentives for vehicles versus fuels versus infrastructure, in terms of where California should focus its attention, as illustrated in their comments below.

Policies that are Working Well

- Existing policies that are helping the development of electric vehicles include: high-occupancy vehicle (HOV) lane access for EVs, clean energy standards which encourage high mileage/low emission vehicles, SB 375 (related to sustainable urban development), and the provision of rebates for the purchase of EVs.
- California's incentives have helped create demand for EVs (e.g., HOV access for EVs), which in turn have helped create markets.
- Vehicle incentives are what really work in advancing clean transportation; it is the right policy lever instead of focusing on

incentives for creating fueling stations. Without incentives for vehicles, there will be fueling stations but no customers. Therefore, the best policies are programs like Proposition 1B (Goods Movement Emission Reduction Program). The model is to create the customers, and then the stations will become viable.

- Fleet rules requiring public agencies to purchase low-emission vehicles that are preferably fueled by an alternate fuel from petroleum have really jump-started southern California and have been helpful.
- AB 32 is a helpful policy that created an early action item in the form of the low-carbon fuel standard, which sets a goal of reducing carbon content by 10% by 2020. It also provides an incentive for companies in the low-carbon fuels and EV markets to be able to expand our markets and sell the credit that we generate to third-parties in the market that are not yet in compliance in the standard. This has helped provide additional capital to expand the market and provides further incentive to invest in the state.
- AB 118, the California Alternative and Renewable Fuel, Vehicle Technology, Clean Air and Carbon Reduction Act of 2007, which established the Air Quality Improvement Program to fund clean vehicle and equipment projects, research on biofuels production and the air quality impacts of alternative fuels, and workforce training] has provided essential capital for companies with emerging technologies. This funding has been critical.

Areas Where Improvements Could Help Advanced Energy Outcomes

- Rebates for EVs need to be in place for a longer-term to stimulate real business development. It doesn't provide enough incentive if the state only introduces a rebate for one or two years, since the business development cycle is much longer than this.
- Access to capital/funding for early stage R&D is the biggest challenge for the development of EV charging stations.
- There are state mandates and regulations that require the state fleet to use alternative fuels when they're available and convenient. In our experience, these policies exist but they are not acted upon. California is really good at enacting policies, but struggles with implementation. California says that it wants to use its purchasing power and fleet as a trigger for market development but needs to follow through as a real customer.
- To facilitate the development of EVs, developers need access to sufficient capital to put necessary infrastructure in place. Car drivers are uncomfortable with purchasing EVs due to the lack of charging infrastructure.
- Investors feel California needs more policy support for batteries and storage. The lack of good policy in this area is hurting investment.

Recommendations from Advanced Energy Executives

- EVs may grow in California but there is no standard for a connection between the vehicle and the charging station. Having a standard connection would facilitate the growth of EVs. For example, Chevy and Nissan use different charging station connection devices. It doesn't affect the manufacturing of the vehicles, but it does affect the infrastructure for EVs and in turn, customers' willingness to buy EVs.
- AB 32 revenues should be used to support infrastructure for EV charging. The lack of existing infrastructure is impacting the deployment of EV's. This is the true cause of consumer range anxiety.
- Local government permitting issues are a big hindrance to getting charging stations installed.

Every town has to be educated as to what the chargers are all about, because the chargers are regulated at the local/municipal level. These level-three chargers are serious pieces of equipment with high voltage, and there should be a statewide, standardized approach. Even if the state just offers standardized forms or standardized codes for this type of installation, it would be hugely helpful.

- California needs to introduce a policy/set of rules promoting peer-to-peer transportation and instant ridesharing. Such a policy would reduce the need for private cars and encourage multiple passengers per trip, which would in turn provide the state with significant emissions and congestion benefits.

- There is so much room in the field of transportation that CARB shouldn't pit technologies against each other. All of these technologies complement one another. The right policy design is to set the right bar (e.g., starting in the next 3 years cars have to meet this emission requirement) and don't exclude any vehicle types. It's better to allow technologies to complement each other rather than picking winners that might not necessarily be ready for prime time (such as hydrogen vehicles).
- AB 118 funding has been biased toward certain fuel types that are not viable today such as hydrogen. There's been a large amount of funding that's been shoveled toward hydrogen, to the detriment of more market-ready alternatives. The government process should be fuel-neutral. If anything, the state should show a bias toward supporting technologies that have a chance to move to market soon.
- Existing transportation rules are outdated and do not reflect today's technologies, such as smartphone applications that can improve transportation efficiency.

Manufacturing-Related Policies Affecting Advanced Energy Companies

A common topic on which most of the advanced energy executives commented was the difficulty of being able to invest in manufacturing activities in the state. While they tended to view California as a fertile place to innovate and start up their companies and to sell their products or services, they identified many hurdles affecting their ability to also do manufacturing of products in California. Clearly, they saw the double-edged quality of California's attention to advanced energy and some possible implications for certain cost of doing business in the state. Among the comments on this topic, representative ones are shown below:

Policies that are Working Well

- Sales use tax exemptions for manufacturing equipment (SB 71) can be important to an EV manufacturer's decision to locate manufacturing in California. This policy allowed them to avoid paying sales tax for equipment used in manufacturing.

Areas Where Improvements Could Help Advanced Energy Outcomes

- Too many of California's policies are focused on the demand side. The state also should focus more on the supply side of the equation in order to promote in-state development and manufacturing which would move forward the state's broader economic development goals. A 20% tax credit for in-state manufacturing is a great idea. In addition, a sales tax exemption on manufacturing equipment is nice because the state has a high (9%) sales tax, though the impact is not that large in terms of actual dollars.

Recommendations from Advanced Energy Executives

- To encourage manufacturing in the state, from a tax perspective, consistent energy policies for the long term need to be introduced, not policies that change all the time.
- To provide incentives to locate manufacturing in California, the state could introduce an economic tax free zone or zones.
- California should consider grants to build factories in state. Oregon, Kentucky, and Florida were all active in soliciting their manufacturing business to be located there through such approaches. AB 32 funds could be used to provide specific tax incentives or grants to locate manufacturing in state.
- California should introduce tax credits to induce manufacturing – credits for hiring people, credits for property taxes, credits for marketing costs, etc.
- Encouraging in-state manufacturing comes down to tax policy. For example, Connecticut's RPS offers incentives for Connecticut-manufactured technologies when bidding into REC market (e.g. if you bid in \$50 it was be treated as a \$45 bid).

- From a global perspective, California is destined to have clean tech show up and sold here, but it won't be built here due to the high income taxes, property taxes, commuting costs, permitting challenges, and red tape. The state is destined to be a user and importer of clean energy but not a manufacturer. Other states offer better incentives to manufacture in state.
 - Capital formation is a challenge. Other states have incentives (corporate tax structure, etc.) to encourage companies to locate their manufacturing there.
 - California has an extremely high cost of living, which makes locating manufacturing in the state hard. It is difficult to manufacture in California. Some companies have long-standing manufacturing activities in the state. It's too big to ignore the California market. But for some companies, which have so many options in so many states and continents, the market is not enough if the cost of doing business takes a viable investment into the unviable pot.
-

Other Policies Affecting Doing Business in California

Finally, some of the advanced energy CEOs commented on the changing nature of access to capital that is affecting the sector generally.

Areas Where Improvements Could Help Advanced Energy Outcomes

- Formerly it was easy to get venture capital money for clean tech, and one didn't need project financing for projects. Now it's the opposite – there is no venture capital money to be had, and companies have to raise development funds via project finance.

Recommendations from California's Advanced Energy Executives

- California should use AB 32 proceeds to create an early-stage investment fund for advanced energy companies (some New England states do this, as does Michigan). This can be set up to provide matching funds or the state could serve as an anchor investor so that smaller investors can participate.
- AB 32 funds could go to government loans for advanced energy. Funds could also be used to spur early stage innovation (start-up costs). But in doing so, the state must be tolerant of failure, as it is inevitable for some early-stage companies and technologies to fail.



Washington, DC • San Francisco • Boston | www.aee.net | www.institute.aee.net

California's Advanced Energy Economy • Business Perspectives Report © 2013