CALIFORNIA FEED-IN TARIFF DESIGN AND POLICY OPTIONS

DRAFT CONSULTANT REPORT

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Abstract

This report explores the use of feed-in tariffs for renewable electricity generation projects in California. California has a Renewables Portfolio Standard (RPS) that requires the state's investor-owned utilities, energy service providers, and community choice aggregators to serve 20 percent of retail sales with renewable resources by 2010; publicly owned utilities are required to develop RPS programs as well. As indicated in the *2007 Integrated Energy Policy Report*, California is not currently on track to meet the 20 percent by 2010 requirement. California has also set a renewable energy objective of 33 percent by 2020 and is expected to need new policy tools to meet this aggressive target. In addition, it is clear that renewable energy must play a significant role in meeting the state's aggressive carbon-reduction goals.

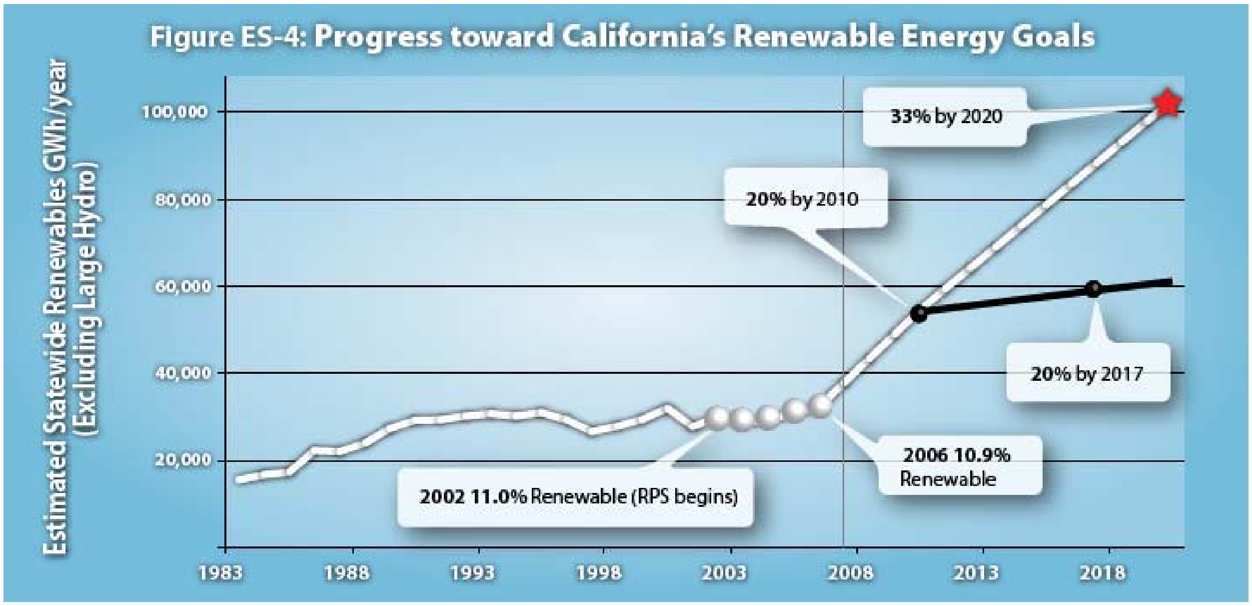
This report explores the potential approaches to expanding the use of feed-in tariffs as a mechanism to aid in making California's renewable generation objectives a reality. There are a great variety of potential feed-in tariff policy design options and policy paths. In examining options for design issues, such as appropriate tariff structure, eligibility, and pricing, this report considers policy goals and objectives, stakeholder comments on materials presented in the Energy Commission's June 30, 2008, feed-in tariff design issues and options workshop, as well as lessons learned from feed-in tariff experience in Spain and Germany. Six representative policy paths are identified for further consideration. The pros and cons of the six policy paths are explored and analyzed in detail. Finally, the report explores the potential interaction of these policy paths, examines the interaction of feed-in tariff policies with other related policies, and discusses issues related to potential next steps.

Keywords: Feed-in tariff, tariff design, energy policy, Renewables Portfolio Standard (RPS), renewable resources, renewable energy policy, interconnection, grid access, cost allocation, fixed-price payments, greenhouse gas

Executive Summary

California has a Renewables Portfolio Standard (RPS) that requires the state's investor-owned utilities, energy service providers, and community choice aggregators to serve 20 percent of retail sales with renewable resources by 2010; publicly owned utilities are required to develop RPS programs as well.[1] As indicated in the *2007 Integrated Energy Policy Report* (IEPR), California is not currently on track to meet the 20 percent by 2010 requirement. California has also set a renewable energy target of 33 percent by 2020 and is expected to need new policy tools to meet this aggressive target.

Figure 1: California's Renewable Energy Goals[2]



Source: *California Energy Commission, 2007 IEPR*

This report explores the potential approaches to expanding the use of feed-in tariffs as a mechanism to aid in making California's renewable generation objectives a reality. There are a great variety of potential feed-in tariff policy design options and policy paths. In examining options for design issues, such as appropriate tariff structure, eligibility and pricing, this report considers policy goals and objectives, stakeholder comments on materials presented in the Energy Commission's June 30, 2008, feed-in tariff design issues and options workshop, as well as lessons learned from feed-in tariff experience in Spain and Germany. Six representative policy paths are identified for further consideration. The pros and cons of the six policy paths are explored and analyzed in detail. Finally, the report explores the potential interaction of

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[1] See Public Utilities Code Section 387, Subdivision (a).

[2] California Energy Commission, *2007 Integrated Energy Policy Report.*

these policy paths, examines the interaction of feed-in tariff policies with other related policies and discusses issues related to potential for next steps.

The six policy paths that are examined in the report are summarized in Table 1. These policy paths span a range of policy directions, as well as timing and scope. In addition to the six options identified, there is an implicit seventh choice—maintaining the status quo—which will be considered as a reference point in this and future analyses.

Policy Path 1 is designed to be similar to the feed-in tariff system currently in place in Germany, but is conditional, in that it will be triggered only if California's 20 percent renewable energy goal is not met by 2010. Therefore, under this option, tariffs would become available in the 2012-2013 timeframe as insurance that the 33 percent renewables target would be met by 2020. There are no restrictions on generator size, and all contracts are fixed-price and long-term. The tariffs would be differentiated by technology and project size. It is cost-based, and the preliminary price settings would be set competitively, not administratively. The use of emerging resources would be capped, so as to limit ratepayer impacts. In addition, the use of long-term contract and technology-differentiation would provide a degree of price stability to investors, while promoting a diversity of renewable resources.

Policy Path 2 is a pilot program within one utility for generators over 20 megawatts (MWs), which would go into effect immediately without any sort of trigger mechanism. Long-term fixed-price contracts would be available for projects coming on-line within a three-year window, after which the policy would be reevaluated. There would be no limit to the quantity of generation eligible to use this tariff, as the limited duration would serve to constrain its overall use. Tariff payments under this option would be value-based, with payments differentiated only by production profile (time of production, contribution to peak, and so forth) and/or environmental adders, rather than being based on the costs of different technologies. The value-based payments could alleviate some ratepayer concerns relative to the cost-based alternatives. However, this path may not promote the resource diversity that Policy Path 1 presents.

Policy Path 3 would be triggered by the establishment of a Competitive Renewable Energy Zone (CREZ) designated for feed-in tariff procurement in the 2010/2011 timeframe, allowing generation within the CREZ to proceed aggressively with development once transmission expansion is committed, without being constrained by the timing and risk of a RPS competitive solicitation. It is cost-based, but tariff prices would be set administratively rather than through use of competitive benchmarks. This option would be limited geographically by the CREZ footprint, and the quantity eligible to take the feed-in tariff price would be capped at the CREZ transmission limit. This option would target generators over 1.5 MW. Based on the renewable resource potential and available/planned transmission in the CREZ, this option would help alleviate worries of undersubscription of new transmission lines and support a diverse mix of renewable resources.

Table 1: Policy Paths for Further Discussion

	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Feed-in Tariff Policy Attribute	Full-Market, unlimited size, differentiated cost-based with competitive benchmark, triggered by failure to meet 2010 RPS target	> 20 MW, undifferentiated value-based 3-yr pilot in 1 utility	Differentiated Cost-based CREZ-Only, > 1.5 MW	Solar > net metering pilot in 1 utility, cost-based with competitive benchmark	Sustainable biomass > 1.5 MW only, cost-based	Full market < 20 MW cost-based differentiated by technology & size
Resource Type	All	All	All	Solar	Biomass (sustainable)	All
Vintage	New, separate price for repowering	New + repowering	New	New	New	New, separate price for repowering
Size	No limit	> 20	>1.5	> Net metering threshold	>1.5	<20
Timing	Trigger (RPS < 20 percent under contract by 2010, implement Feed-in Tariff in 2012/13)	Now (available for 3-year duration)	Automatically in 2010/11 (so projects are developed in parallel with transmission)	Now	Now	Now
Scope	Full Market	Pilot (limited time, one utility)	CREZ-Only	Pilot (e.g. within one utility)	Full Market	Full Market
Setting the Price	Cost-based with initial differentiated auction without MPR to set competitive benchmark for subsequent tariff	Value Based (time & peak differentiated with CO_2 & other adders)	Cost-based	Cost-Based w/ Competitive benchmark	Cost-based, calculated to consider sustainable yield of local biomass sources	Cost-based
Contract Duration	Long-term	Long-term	Long-term	Long-term	ST/MT	Long-term
Tariff Differenti-ation	Differentiation by technology & size	Not applicable	Wind by size, geothermal, biomass by size, solar by technology	By size, type	By fuel and size	Differentiation by technology & size
Limits	Capped at RPS targets; caps on more expensive technologies	Uncapped	Capped at CREZ Transmission limit	Capacity limit will be established for the sponsoring utility.	Uncapped	Uncapped

Source: KEMA

Policy Path 4 is a solar-only pilot feed-in tariff. It includes elements of Policy Paths 1 and 3 in that it is cost-based, with rates using a competitive benchmark, and that it is also a pilot. Rather than being limited to a specific window of time, however, the pilot-scale for the tariff would be accomplished by limiting long-term contract availability to a single utility territory. Eligibility would be limited to solar installations larger than the net metering limit of 1 MW. It is also envisioned that there would also be a capacity cap on this option. Although this option could provide incentives for larger systems, since solar energy is above market, it may not provide enough renewable energy and diversity for the state to meet its goals. This option could be established independently or in concert with another policy path.

Policy Path 5 is limited to a single technology—in this case, sustainable biomass. Tariffs would be cost-based and differentiated by size and differentiated by biomass fuel feedstock. Unlike the solar-only option, the biomass path would be available in every market, rather than on a pilot scale in a single utility, and would not be capped. Finally, unlike all of the other policy paths that would incorporate long-term contracts or price guarantees, the contract term would be either short- or medium- term in acknowledgement of the fuel price risk that longer term contracts would place on biomass developers and investors. As discussed below, this option could be established independently or in concert with another policy path.

Policy Path 6 would be established promptly and without condition and be available statewide to generators up to 20 MW in size, helping to address a perceived gap in the current RPS solicitation process. It would offer cost-based, long-term prices differentiated by size and technology. Unlike Policy Path 1, however, prices would not be based on a competitive benchmark, and the tariff quantity would be uncapped. It is not limited to one technology, and therefore might be helpful in enabling the state to meet its diversity goals.

The report discusses the advantages and disadvantages of each policy path, as well as the effectiveness in meeting the articulated objectives. The policy paths identified in this report, while distinct, need not be thought of as independent alternatives. Some could be adopted in concert with others, and those that do not apply to the whole of the California market, or are on a pilot scale or duration, can be thought of as potentially working together along a *policy trajectory*. A policy trajectory might incorporate modest initial steps before the launch of a comprehensive feed-in tariff policy regime.

Ultimately, this report is to stimulate stakeholder and policymaker input on which feed-in tariffs options could best help California meet its renewable energy objectives. The IEPR Committee and the Renewables Committee will seek comments on this topic from stakeholders and at Workshop 2, to be held on October 1, 2008. Discussion at the workshop will further inform development of the final report and assist California's energy policy makers in exploring the use of feed-in tariffs in the development of the next *IEPR*.

CHAPTER 1: Introduction

Feed-In Tariffs as Renewable Energy Policy

At its simplest, a feed-in tariff is an offering of a fixed-price contract over a specified term with specified operating conditions to eligible renewable energy generators. Feed-in tariffs can be either an all-inclusive rate or a fixed premium payment on top of the prevailing spot market price for power. The price paid represents estimates of either the cost or value of renewable generation. The tariff is generally offered by the interconnecting utility and sets a standing price for each category of eligible renewable generator; the price is available to all eligible generators. Tariffs are often differentiated based on technology type, resource quality, or project size and may decline on a set schedule over time.

A Draft Consultant's Report developed for the Energy Commission in prior stages of its exploration of feed-in tariffs, entitled *Exploring Feed-in Tariffs for California: Feed-in Tariff Design and Implementation Issues and Options* (referred to herein as the *Draft Issues & Options Report*),[3] identified a comprehensive list of feed-in tariff design issues and options associated with each issue. These are summarized in Appendix A. This report builds upon the *Draft Issues & Options Report* and examines six policy paths related to feed-in tariffs for electricity generation projects of all sizes in California.

Benefits and Limitations

As with other policies, feed-in tariffs provide benefits and limitations, a number of which depend upon the design of the tariff. From the generator's perspective, the benefits of a feed-in tariff include the availability of a guaranteed price, buyer, and long-term revenue stream without the cost of solicitation. Market access is enhanced by feed-in tariffs, as project timing is not constrained by periodic scheduled solicitations. In addition, completion dates may not be constrained by contractual requirements, quantities are often uncapped, and interconnection is typically guaranteed. Together, these characteristics can help to reduce or alleviate generator revenue uncertainty, project risk, and associated financing concerns. Feed-in tariffs reduce transaction costs for both buyer and seller and are more transparent to administer than the current system. Because responding to standing tariffs is likely to be less costly and less complex than competitive solicitations, feed-in tariffs may increase the ability of smaller projects or developers to help the state meet its Renewables Portfolio Standard (RPS) and greenhouse gas emission reduction goals. Policy makers can target feed-in tariffs to encourage specific types of projects and technologies if so desired.

However, there are limitations to how a feed-in tariff might function in California. Total feed-in tariff costs cannot be predicted accurately because, despite the predetermined payments, the quantity of generation responding to a feed-in tariff is not typically predetermined (though it

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[3] KEMA. *Exploring Feed-in Tariffs for California*. California Energy Commission. Publication number: CEC-300-2008-003-D.

can be, and sometimes is, capped). One key issue is how the tariff fits in a deregulated market structure, including questions of who pays, how payments are distributed, what portion of rates would be used to recover tariff costs, and how to integrate electric production purchased through feed-in tariffs into utility power supplies. Another question specific to California is whether feed-in tariffs would work in concert with California's existing RPS law or would require changes in that law.

Getting the price right can be challenging. If the price is set too high, the tariff introduces the risk of overpaying and over stimulating the market. This risk may be exacerbated when the tariff is open to large projects in regions with ample resource potential. On the other hand, if the tariff is set too low to provide adequate returns to eligible projects, it may have little effect on stimulating development of new renewable energy generation. A range of approaches for setting the price are discussed in the six options considered in this report.

Design Issues

Proper design is critical to the success of a feed-in tariff. If the tariff rates are fixed and cannot be adjusted, for example, they may not be flexible enough to respond to changing market conditions. Moreover, some feed-in tariffs intentionally or unintentionally favor less efficient plants. As renewable energy resource potential is not uniformly distributed across California, unequal costs are likely to be incurred by interconnecting utilities, raising the issue of cost allocation. Finally, tariff quantity limitations or declining tariff price blocks may encourage speculative queuing, in which projects with no real commercial prospects detract from the success of a feed-in tariff by reserving funds that are ultimately not disbursed or are later released at a lower incentive level. Policy makers should strive to minimize such negative, unintended outcomes with careful feed-in tariff design.

A Draft Consultants Report developed for the Energy Commission in prior stages of its exploration of feed-in tariffs, entitled *Exploring Feed-in Tariffs for California: Feed-in Tariff Design and Implementation Issues and Options* (referred to herein as the *Issues & Options Report*),[4] identified a comprehensive list of feed-in tariff design issues and options for tariff design associated with each issue. These are summarized in Appendix A.

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[4] KEMA. *Exploring Feed-in Tariffs for California*. California Energy Commission. Publication number: CEC-300-2008-003-D.

Energy Commission's Exploration of Feed-In Tariffs

In 2007, the California Energy Commission's *Integrated Energy Policy Report* (IEPR) recommended that the Energy Commission, in collaboration with the California Public Utilities Commission (CPUC), draft a white paper that explores the use of feed-in tariffs for electricity generation projects over 20 megawatts (MW) in California.

California has an RPS that requires the state's investor-owned utilities, energy service providers, and community choice aggregators to serve 20 percent of retail sales with renewable resources by 2010; publicly owned utilities are required to develop RPS programs as well.[5] As indicated in the 2007 IEPR, California is not currently on track to meet the 20-percent-by-2010 requirement. California has also set a renewable energy objective of 33 percent by 2020 and is expected to need new policy tools to meet this target. In addition, it is clear that renewable energy must play a significant role in meeting the state's aggressive carbon-reduction goals.

A number of market barriers exist to meeting the current RPS, including:

- Permitting and siting challenges.
- Transmission availability, timing, and cost allocation.
- Development risks, including securing site control and obtaining financing.
- Complexity of the RPS solicitation processes, including suitability of RPS solicitation processes for smaller projects.
- Lack of transparency.
- Contract failure, which may be caused by a wide variety of reasons, including over-aggressive bidding in solicitation processes.[6]
- Cost changes during the project development process, which may cause some projects to become infeasible; such cost changes are often caused by external factors, ranging from whether federal tax credits will be extended to rising costs of equipment.
- Potential limitations on the availability of funds for any contract costs that are above the market price referent (MPR).

[5] See Public Utilities Code Section 387, Subdivision (a)

[6] Wiser, R., O'Connell, R., Bolinger, M., Grace, R., and Pletka, R. (2006). *Building a "margin of safety" into renewable energy procurements: A review of experience with contract failure* (CEC-300-2006-004). Sacramento, California: California Energy Commission.

Feed-in tariffs have driven rapid expansion in renewable energy development in some markets and may provide California with a tool to increase the pace of renewables development, reduce the rate of renewable energy contract failure, address the discrepancies between the MPR and the cost of renewable project development, and promote renewable projects in areas that require new transmission.

Feed-in tariffs could potentially address a number of the barriers identified above and help California meet its 33-percent-by-2020 renewable energy target. Feed-in tariffs can:

- Reduce project developer costs, risks, and complexity without increasing ratepayer cost (relative to the cost of viable projects, as opposed to speculative bids, which result in contract failure).
- Reduce utility and regulator administrative burdens.
- Reduce transaction costs. Current complexity hampers the ability for small businesses and small projects to participate.
- Increase the willingness of developers to take on risk in addressing siting, permitting, or other barriers because the reward has a higher degree of certainty than under the current regime.
- Add the possibility of lower overall costs. Currently, low-cost, viable projects are allowed to bid up to the MPR, which may act as a price floor, contrary to legislative intent.
- Shift competitive pressure from generators to manufacturers and suppliers of renewable energy generation equipment.
- Reduce the rate of contract failure.

Many cost factors can change between a solicitation response and a project's permitting, siting, interconnection, and equipment procurement.[7] Once projects have progressed to the point where costs become certain, previously signed contracts may become infeasible. Under the current approach, such contracts would fail (or their proponents would seek to renegotiate with the purchasing utility, a practice that would tend to encourage more speculative bidding). With feed-in tariffs, it is possible that a greater number of projects could move forward because the

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[7] In response to solicitations, projects often bid before having cost certainty. Fixing a project's costs requires substantial progress through permitting, interconnection, commitment to equipment orders, construction contracts, and financing. Obtaining cost certainty requires commitment of substantial funds, something many developers are unable to do without the certainty of a contract. In addition, a competitive solicitation without substantial bid security requirements encourages bidders to price aggressively, with little to lose if the price becomes infeasible.

potential for reduced costs under a feed-in tariff regime could leave a project with a greater ability to absorb cost increases related to potential project delays.

In May of 2008, the Energy Commission commissioned this study to explore the potential use of feed-in tariffs for California, particularly focusing on RPS-eligible generators larger than 20 MW.

In June of 2008, the Energy Commission released the *Draft Issues & Options Report* described earlier.[8] The purpose of the *Draft Issues & Options Report* was to explore the implications of the possible use of feed-in tariffs as a policy tool in the California context, inform policy makers and stakeholders on design issues and options available for feed-in tariffs, and identify the advantages, disadvantages, and tradeoffs of alternative design approaches. Ultimately, the report was intended to support informed discussion and stakeholder input and feedback on appropriate feed-in tariff objectives, measures of success, and design features of feed-in tariffs for renewable energy in California.

The Energy Commission held a staff workshop (Workshop 1) to discuss this paper on June 30, 2008. At that workshop, presentations explained the context for the Energy Commission's motivation for exploring feed-in tariffs, the status of RPS procurement experience, the experience with feed-in tariffs internationally and in North America, and feed-in tariff design and implementation issues. Public comment and discussion of these topics at the June 30 workshop informed the development of this *Draft California Feed-In Tariff Design and Policy Options Report.*

In addition, an on-line survey was posted to seek detailed stakeholder feedback on questions posed in the Workshop 1 presentation on feed-in tariff design and implementation issues.

This draft will be presented and discussed at a Staff Workshop scheduled for October 1, 2008 (Workshop 2). Comments received on this draft following Workshop 2 will be taken into consideration in developing a final *California Feed-In Tariff Design and Policy Options Report*, to be presented and discussed at a Joint Renewables and IEPR Committee workshop scheduled for November 20 (Workshop 3).

The discussion at the November 20 workshop will inform further consideration of feed-in tariffs as part of the IEPR 2009 process.

Purpose of This Report

The *2007 IEPR* recommended that a paper be developed to investigate the advantages and drawbacks of adopting feed-in tariffs in California. The purpose of this paper is to build upon the *Draft Issues & Options Report* by exploring possible future feed-in tariff policy paths for California for generators of all sizes, by:

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[8] KEMA. *Exploring Feed-in Tariffs for California*. California Energy Commission. Publication number: CEC-300-2008-003-D. June 2008.

- Analyzing each of the building blocks of feed-in tariff design identified in the *Draft Issues & Options Report*, based on a variety of factors—the pros and cons identified in *Draft Issues & Options Report*, practical constraints, Energy Commission consultant and staff analysis, alignment with Energy Commission goals, and stakeholder comments.
- Sorting these design issues into those that comprise critical characteristics for assessing alternative feed-in tariff policy paths and; policy choices that are independent of the ultimate policy path taken, and implementation details.
- Narrowing the options for each design issue to either a single viable design option for further consideration, or a narrowed set of options for further consideration.
- Developing and articulating a range of representative feed-in tariff policy paths for the Energy Commission, legislators, and stakeholders to consider further.
- Based on the evaluation criteria described in Chapter 4, identifying the ability of each representative policy path to meet articulated policy goals.

Leading up to the *Draft Issues & Options Report*, the focus of the Energy Commission's attention was to explore the use of feed-in tariffs for electricity generation projects over 20 MW. Stakeholder comments during and after Workshop 1 indicated broad support for considering a wider range of generator size and emphasizing, at least in the near-term, smaller generators. Based on this feedback, this report does consider a range of future feed-in tariff policy options that also includes smaller generators.

Ultimately, the current draft report's purpose is to stimulate stakeholder and policymaker input and feedback on potential future policy options for using feed-in. The results of this draft report will be presented for public comment at a workshop to be held on October 1, 2008. Discussion at the workshop will further inform development of the final report and assist California's energy policy makers in exploring the use of feed-in tariffs in the development of the next IEPR.

Organization of This Report

The remainder of this report is organized as follows:

- Chapter 2 summarizes feed-in tariff experience outside of California and lessons learned from that experience pertinent to California's consideration of feed-in tariffs as a potential policy tool.
- Chapter 3 outlines the policy goals and objectives for feed-in tariffs in California and their use as evaluation criteria for potential policy design.
- Chapter 4 summarizes stakeholder comments on the *Draft Issues & Options Report* and the materials provided in Workshop 1.

- In Chapter 5, design issues are sorted into those critical for defining alternative policy paths, those independent of the policy path chosen, and those to be addressed at a later date if feed-in tariffs are adopted on a broader scale. Within each of the design issues, the options identified in the *Draft Issues & Options Report* are then narrowed to those that will comprise the six policy paths considered in Chapter 6.
- Chapter 6 lays out a representative range of six potential policy paths for expanded implementation of feed-in tariffs in California, discusses each path's advantages and disadvantages and effectiveness at meeting the articulated objectives, and makes recommendations for how these policy paths might be considered.
- In Chapter 7, the interaction of feed-in tariff policies with other related policies is discussed.
- Finally, Chapter 8 offers conclusions and recommended next steps.

CHAPTER 2: Feed-In Tariff Experience in Europe and Lessons Learned

Learning From European Experience

The *2007 Integrated Energy Policy Report (*IEPR) recommended that a feed-in tariff, if developed, should incorporate "features of the most successful European feed-in tariffs." The definition of success and the identification of best practices to achieve that success are highly dependent upon the objectives that the policy is meant to achieve. Internationally, the principle laboratory for feed-in tariff development has been Europe,[9] where 18 European Union (EU) countries and non-EU countries such as Switzerland, the Republic of Macedonia, and Albania,[10] have adopted feed-in tariff policies.[11] Of the national policies in the EU, a European Commission analysis concluded that feed-in tariffs were the most successful policy type.[12] From the European Commission perspective, success is measured by a policy's effectiveness in increasing renewable electricity generation, and by the level of payment received by generators in comparison to the level they require for profitability. Using these success criteria, the EU concluded that feed-in tariffs achieve greater growth in renewable energy generation than do other policy types, and that they do so at a lower cost. The primary driver for this success was the investor security created by feed-in tariffs, which resulted in low financial risk, low financing costs, and rapid market growth. These findings were echoed by the Stern Review on the Economics of Global Climate Change,[13] and again more recently by the International Energy

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[9] Feed-in tariffs have also been developed in a broad range of non-European countries as well (for example, Algeria, Brazil, Israel, South Korea, etc.), and feed-in tariffs are the most prevalent national policy globally – see Martinot, E. (2008). *Renewables 2007 Global Status Report* (Paris: REN21 Secretariat and Washington, DC: Worldwatch Institute). There has also been an increase in interest in feed-in tariffs in the US, with 6 states considering feed-in tariffs, 8 states discussing feed-in tariff regulation, and a federal feed-in tariff bill introduced in Congress, during 2006-2007 – see Rickerson, W., Bennhold, F., & Bradbury, J. (2008). *Feed-in tariffs and renewable energy in the USA: A policy update*. Raleigh, NC, Washington, DC, and Hamburg, Germany: North Carolina Solar Center, Heinrich Böll Foundation North America, and the World Future Council.

[10] Gipe, P. (2008). Swiss adopt aggressive feed law for renewable energy. *RenewableEnergyWorld.com* Retrieved August 8, 2008, from http://www.renewableenergyworld.com/rea/news/story?id=53026; *See also* Energy Community Secretariat. (2008). *Report on the implementation of the Acquis under the Treaty Establishing the Energy Community*. Vienna, Austria.

[11] Rickerson, W., & Grace, R. C. (2007). The debate over fixed price incentives for renewable electricity in Europe and the United States: Fallout and future directions. Washington, DC: Heinrich Böll Foundation North America.

[12]Commission of the European Communities. (2005). *The support of electricity from renewable energy sources*. Brussels.

[13] Stern Review. (2006). Policy responses for mitigation: Accelerating technological innovation (Part IV, Chapter 16). In *The economics of climate change*. Cambridge, UK: Cambridge University Press.

Agency's Global Best Practice in Renewable Energy Policy Making Expert Meeting, which concluded that, "Renewable energy policy effectiveness is more affected by the perceived investment risks on renewables projects than on their potential profits and/or costs."[14]

A major focus of the Energy Commission's feed-in tariff stakeholder process is to identify the policy goals and objectives of a potential feed-in policy in California (Chapter 3). Based on those policy goals and objectives, sets of best practices for a broad array of design and implementation issues can be identified. California's policy objectives, electrical infrastructure, and market context may ultimately dictate a different set of feed-in tariff design choices than those found in Europe. However, a review of European experience with feed-in tariffs and lessons learned is useful to the stakeholder process.

Several recent studies have compared feed-in tariff designs internationally,[15] and the recent *Draft Issues & Options Report* prepared for the California Energy Commission references a broad range of international policy designs. Rather than summarizing these cases again, this section focuses on Europe's two largest renewable energy markets, Germany and Spain, and provides an overview of market performance to date, feed-in tariff policy evolution, and comparative policy design.

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[14] International Energy Agency. (2007, June 29). *Workshop Proceedings.* Proceedings of the Global Best Practice in Renewable Energy Policy Making Expert Meeting, Paris, France.

[15] Klein, A., Held, A., Ragwitz, M., Resch, G., & Faber, T. (2007). *Evaluation of different feed-in tariff design options: Best practice paper for the International Feed-in Cooperation*. Karlsruhe, Germany and Laxenburg, Austria: Fraunhofer Institut für Systemtechnik und Innovationsforschung and Vienna University of Technology Energy Economics Group; *See also* Morthorst, P. E., Jørgensen, B. H., Helby, P., Twidell, J., Hohmeyer, O., Mora, D., et al. (2005). *Support schemes for renewable energy: A comparative analysis of payment mechanisms in the EU*. Brussels, Belgium: European Wind Energy Association.

Germany

Market Growth to Date

Germany leads the world in terms of installed capacity for both photovoltaics (PVs) and for wind energy as a result of its feed-in tariff policies. By the end of 2007, Germany had 22,622 megawatts (MW) of wind and 3,800 MW of solar PV capacity installed in the country, with annual additions of 1,667 MW of wind and 1,100 MW of PVs added in 2007 alone.[16] Germany's biogas market has also seen explosive growth, doubling from 650 MW to 1,271 MW between 2005 and 2007.[17] In Germany renewables supplied 14.2 percent of the national portfolio in 2007.[18] The German national government subsequently revised its long-term targets to 25 to 30 percent by 2020.[19]

Feed-In Tariff Design

Germany's original feed-in tariff, which came into effect in 1991, guaranteed interconnection to renewable energy generators and a standard offer price set at a percentage of the average retail rate, which varied from year to year. Wind and solar projects received 90% of the retail rate. Hydropower, biogas, and biomass plants under 500 kW received 80% of the retail rate; whereas plants over 500 kW, but under 5 MW received 65% of the retail rate.[20] The ratepayers of each utility were responsible for the above market costs within their utility territory, and total generation was capped at 10% of each utility's portfolio. In the late 1990s, the retail rate began to fall, which caused renewable market growth to slow. Moreover, the utility-by-utility cost distribution system placed some utilities at a competitive disadvantage as electricity markets liberalized. Also, the tariff, although partially differentiated by technology and by size, was primarily an incentive for wind generation, and did not encourage emerging resources such as PVs.

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[16] European Wind Energy Association. (2008). Wind map 2007. Retrieved August 8, 2008, from http://www.ewea.org/fileadmin/ewea_documents/mailing/windmap-08g.pdf *See also* Bundesverband Solarwirtschaft. (2008). *Statistische Zahlen der deutschen Photovoltaikbranche*. Berlin, Germany.

[17]Rickerson, W., Baker, S. E., & Wheeler, M. (2008). Is California the next Germany? Renewable gas and California's new feed-in tariff. *BioCycle, 49*(3), 56-61

[18] Böhme, D., Dürrschmidt, W., van Mark, M., Staiß, F., Linkohr, C., Musiol, F., et al. (2008). *Development of renewable energies in Germany in 2007*. Berlin, Germany: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

[19] Bundesministerium für Umwelt Naturschutz und Reaktorsicherheit. (2007b). *The integrated energy and climate programme of the German government*. Berlin, Germany.

[20] International Energy Agency. (2008). Global renewable energy policies and measures database: Electricity Feed Law (EFL) (Stromeinspeisungsgesetz). Retrieved September 23, 2008, from http://www.iea.org/textbase/pm/?mode=re&id=1057&action=detail.

In response to these concerns, a new feed-in tariff was established in 2000, which established 20-year, fixed-price payments targeting specific technology types.[21] The payments were based on the estimated generation cost by technology type, plus a reasonable profit. Tariffs were further differentiated to prevent windfall profits for generators operating under more advantageous conditions. Most technologies, for example, were differentiated by size so large systems received a lower payment than did small systems that could not take advantage of the same economies of scale. Wind generators were differentiated by wind resource such that projects in better wind regimes received lower payments than those in slower wind regimes.

To control costs, the 2000 law set a schedule of rate declines by which the fixed-price payment decreased over time, based on each technology's projected experience curve. The law also required this so-called *digression rate* to be reviewed periodically to determine if the rate should be revised. Finally, to make the policy competitively neutral for utilities, the law established a national redistribution mechanism, managed by the transmission system operators.

In 2004, the German Parliament amended the new feed-in tariff. The 2004 law adjusted the payments for biomass, PVs, and geothermal generators to more accurately reflect generation costs and to target specific applications, such as façade-integrated PVs; fuels, such as manure and energy crops for biogas; and conversion technologies, such as fuel cells and organic Rankine cycles.[22]

In 2008, the German parliament again adjusted the feed-in tariff digression rates, most notably eliminating the bonus payment for façade-integrated PVs, and increasing the digression rate for PV tariffs from 5 to 6.5 percent annually to 8 to 10 percent annually in response to PV's rapid market growth under the 2004 law.[23]

Spain

Market Growth to Date

Like Germany, Spain's feed-in tariff has also driven it to a global leadership position in terms of both renewable energy installed capacity and market growth. By the end of 2007, Spain had

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[21] For an overview of the technologies supported by the German and Spanish feed-in tariffs, including incentives levels received, see Held, A., Ragwitz, M., Huber, C., Resch, G., Faber, T., & Vertin, K. (2007). *Feed-in systems in Germany, Spain and Slovenia: A comparison*. Karlsruhe, Germany: Fraunhofer Institut für Systemtechnik und Innovationsforschung

[22] Sösemann, F. (2007). *EG - The Renewable Energy Sources Act: The success story of sustainable policies for Germany*. Berlin, Germany: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

[23] Bundesministerium für Umwelt Naturschutz und Reaktorsicherheit. (2008). 2009 EEG payment provisions: Payment provisions in the future EEG for the year 2009, as adopted by the German Bundestag Parliamentary Decision from June 6, 2008. Berlin

installed 15,145 MW of wind capacity, and 500 MW of PV capacity.[24] During 2007, Spain's wind capacity additions set a European record, with 3,522 MW installed in a single year, and Spain's PV market grew by over 300 percent. Although Spain's biomass and hydropower markets remained relatively stagnant, its solar thermal electric market also appeared poised for growth. Spain was the first country in the world to include a specific solar thermal feed-in tariff. In 2007, there were only 10 MW of solar thermal installed in the country,[25] but there are 270 MW of additional capacity under development as of March, 2008 and there are projections that the market for large scale solar thermal electric generation could grow to 2,000 MW by 2025.[26]

Feed-In Tariff Design

Spain's feed-in tariff design evolved through a series of laws that built upon early legislation targeting renewable energy in 1980 and 1994.[27] In 1997 and 1998, Spain established the Special Regime for targeting renewable energy, which allowed generators to choose either a feed-in tariff, similar to Germany's, or a premium payment on top of the electricity market price. Both the tariff and the premium options were generation-cost based and differentiated by technology, with some tariffs also being differentiated by size. The price levels for both the tariff and the premium options were adjusted annually by the government to take changes in the market into account, and costs were nationally distributed from the outset. In contrast to the German system, the Spanish feed-in tariff also required that generators over 10 MW would need to forecast their generation 30 hours in advance..

In 2004, the feed-in tariff was amended to further differentiate resources by size, including an increase in the PV system size eligible for the most generous tariff from 5 kilowatts to 100 kilowatts.[28] To increase investor security, the annual price adjustments were pegged to the average annual retail price, rather than set by government decision, and full reviews of the payment levels were scheduled for every 4 years. The contract length was set at the life of the system. Unlike the German feed-in tariff, the 2004 Spanish feed-in tariff also included capacity goals for each technology, that would trigger a policy revision by the government when reached.[29] The 2004 amendment also clarified forecasting rules for generators, such that 30-hour forecasts could be altered up to 1 hour before the start of the daily market and that penalties

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[24] Ibid. European Wind Energy Association (2008); *See also* Salas, V., & Olias, E. (in press). Overview of the photovoltaic technology status and perspective in Spain. *Renewable and Sustainable Energy Reviews*

[25] Taggart, S. (2008). Hot stuff: CSP and the power tower. *Renewable Energy Focus, 9*(3), 51-54

[26] Geyer, M. (2008, March 4-7). *Introducing concentrated solar power on the international markets: Worldwide incentives, policies and benefits.* Proceedings of the 14th Biennial Solar Power and Chemical Energy Systems (SolarPACES) Symposium, Las Vegas, NV.

[27] Del Río González, P. (2008). Ten years of renewable electricity policies in Spain: An analysis of successive feed-in tariff reforms. *Energy Policy, 36*(8), 3345-3359

[28] Ibid.

[29] Ibid. Wind: 13,000 MW, biomass: 3,200 MW, hydro: 2,400 MW, solar thermal: 200 MW, PV: 150 MW.

would be assessed for deviations from the forecast. Finally, to encourage generator participation in the electricity market, the 2004 amendment included an additional incentive for generators to choose the premium option.[30]

In 2007, the feed-in tariff regime was revised again. Following the 2004 amendment, the majority of renewable generators opted to take advantage of the more generous premium option, rather than the tariff payment. Spot market prices increased more than projected, however. To control costs, the law removed the incentive for choosing the premium and established both a floor and a ceiling value for the premium. The law also pegged the annual adjustments to the consumer price index, rather than average retail price.[31] With regard to grid integration, the amendment required generators over 10 MW to bear the cost of connecting to a generation control center managed by the system operator and also provided an additional incentive for wind generators that install equipment to prevent voltage dips.

The 2007 amendment also raised the capacity goals for certain resources but included grid access deposits to discourage speculative queuing. The law further differentiated biomass by fuel type and increased biomass payment levels. Finally, the law also established a voluntary differentiation for on-peak and off-peak generation, whereby a generator would get 104.62 percent of the payment for on-peak power and 96.70 percent of the payment during off-peak generation.

In 2008, the Spanish PV market ballooned to four times larger than its capacity goal. As a result, the government introduced a cap of 300 MW on annual solar installations (200 MW for rooftop systems and 100 MW for ground-mounted systems) and reduced the incentives to between 65 percent and 75 percent of their previous levels.[32]

Comparing the German and Spanish Feed-In Tariffs

The German and Spanish feed-in policies provide long-term, technology-specific payments that are based on generation cost. They also contain fixed-price elements that encourage investor security. The policies also differ significantly, in terms of the availability of a premium option, the existence of capacity-based policy revision triggers, and the existence of an annually variable component to the payments. Table 2 compares some of the key components of the two

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[30] Ibid. Del Río González (2008)

[31] Ibid. Held et al. (2007).

[32] SustainableBusiness.com News. (2008, July 22). Spain to cut subsidies for solar PV, not solar thermal. Available at: http://www.sustainablebusiness.com/index.cfm/go/news.display/id/16449; see also Rutschmann, I. (2008, July) The paralyzed market: Spain's PV industry is concerned about deep subsidy cuts and is upset with its own association. *PHOTON International*, 44-49.

Table 2: Comparison of German and Spanish Feed-in Tariffs

Design Issue		Germany	Spain
Contract length		20 years	Project life
Tariff structure		Fixed payment	Fixed payment or fixed premium
Incentive basis		Generation cost	Generation cost
Differentiation	Technology	Yes	Yes
	Size	Yes	Yes
	Resource quality	Yes	No
Tariff adjustment		Tariffs locked in for 20 years, applicable to a generator coming online in a particular year; for each subsequent year, the fixed 20-year rate declines according to a schedule that tracks experience curves	• Annual tariff and premium rates pegged to CPI • Payment revised periodically by government • Premium payment sits atop variable wholesale electricity market price, but total remuneration is bounded by floor and ceiling
Tariff revision		4 years	4 years, or by capacity triggers
Policy caps		None	Technology-specific capacity triggers, with grid access deposits
Forecast obligation		No	Yes
Voltage support incentive available to generators		No	Yes
Peak generation differentiation		No	Voluntary

Source: KEMA

Lessons Learned

During the past two decades, both Germany and Spain have engaged in iterative feed-in policy development processes that have yielded several lessons that may guide feed-in tariff consideration in California. These include:

- **Long-term, generation-cost-based payments can rapidly grow renewable energy markets and achieve national targets.** In both Germany and Spain, incentives set according to generation cost have spurred rapid market growth and have significantly increased the proportion of renewable electricity in the national supply. Germany has achieved its renewable goals ahead of schedule and has set new targets as a result.

- **Technology-specific tariffs create diversity when set at the appropriate levels.** Germany's early value-based feed-in tariff created incentives for wind but did not accelerate markets for other technologies. The technology-specific tariffs in Germany and Spain, by contrast, caused rapid market acceleration across a portfolio of mature and emerging technologies. The portfolios differed, however, based on the policy priorities in both countries and the manner in which generation cost was defined. In Germany, biogas tariffs have been set high enough to encourage the cultivation of energy crops specifically for anaerobic digestion, whereas in Spain, the pending solar thermal electric development reflects the fact that tariffs have been set at levels sufficient to encourage thermal storage capacity.

- **Investor security is determined both by price certainty and policy certainty.** The European Commission study on comparative policy effectiveness highlighted the importance of investor security. From this perspective, it is interesting to compare the German and Spanish feed-ins. While both policies provide long-term payments to generators—minimizing risk to individual projects—the German feed-in tariff provides more price and policy certainty over time than the Spanish policy does. Not only does the Spanish tariff adjust each year (according to the Consumer Price Index), but the tariff also has revisions, triggered by capacity goals, without clear rules as to what types of revisions might occur. This uncertainty created widespread concern when PVs recently crossed its trigger point, and the market stalled.[33] The subsequent, sudden, and significant decrease in PV incentive levels contrasts with to the comparatively orderly and phased schedule of PV digression rate decreases in Germany.

- **Incentives may not put downward pressure on renewable energy prices.** Related to the issue of policy revision is the issue of incentive adjustment. In Germany, rates are fixed for 20 years, but the fixed rate available to generators declines each year according to a schedule based (at least theoretically) on experience curves.[34] This approach provides a degree of planning certainty to developers and also puts downward pressure on prices. By contrast, the Spanish approach includes more risk and does not put downward pressure on prices for investors and developers because both the fixed tariff and fixed premium options vary with the Consumer Price Index, and because the fixed premium option varies with the wholesale market price. By tying price to variable values, rather than a decreasing schedule of fixed payments, there is a greater chance that support levels and generation costs will diverge. If the value indicator decreases significantly, it can mean that generators will not receive the payments they need to remain viable, whereas if the value indicator increases significantly, this can lead to overcompensation, as with the Spanish fixed-premium option, which is now capped to avoid some of this risk. Moreover, setting feed-in tariffs at a premium on top of market prices diminishes the ability of fixed-price payments to serve as a hedge against rising electricity prices. This problem also occurs when feed-in tariff payments are pegged to indicators that increase over time.

- **Implementing support for emerging resources is challenging.** At the EU level, analysis has concluded that support for emerging resources in the short-term could decrease

[33] Ibid., Rutschmann, I. (2008, July).

[34] For example, a generator that came on line in Year 1 would get a certain fixed rate for 20 years. A generator coming on line in Year 2 would get a fixed rate that is 5 percent below the rate received by the generator in Year 1.

renewable energy policy costs in the long term.[35] Along these lines, Spain and Germany have each created feed-in tariffs for both near-market and emerging renewable resources. This policy decision can be challenging, however. In the case of PVs, for example, both countries have acknowledged that the high price paid for PVs creates additional policy costs, but that these costs are justified because they are blended with the savings created by the near-market resources and by the fact that promotion of PV is an industrial (that is, market capture) policy, in addition to an energy policy.[36] Despite their commitment to PV, both countries have also attempted to address political concerns over policy cost by recently decreasing their PV feed-in tariffs.[37]

- **Setting the correct price for biomass can be challenging.** In both the Spanish and German cases, the biomass markets initially did not respond as projected to the feed-in tariff levels and did not accelerate at rates comparable to either wind or solar. The European Commission[38] cited the comparative complexity of the biomass market, with its different feed stocks, plant sizes, fuel supply logistics, and conversion technologies, as one of the reasons that biomass market was slow to respond to initial feed-in tariff rates. In both the Spanish and German cases, the feed-in tariffs for biomass were increased and were further differentiated by fuel and/or conversion technology.

- **Feed-in tariffs can suppress wholesale market prices.** Despite the perceived high cost of feed-in tariff policies, recent analyses from both Germany[39] and Spain[40] have concluded that the rapid expansion of renewable electricity has decreased wholesale

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[35] Ibid. Held et al. (2007); see also Huber, C., Faber, T., Haas, R., Resch, G., Green, J., Ölz, S., et al. (2004). Green-X: Deriving optimal promotion strategies for increasing the share of RES-E in a dynamic European electricity market. Vienna, Austria: Vienna University of Technology Energy Economics Group; Huber, C., Ryan, L., Ó Gallachóir, B., Resch, G., Polaski, K., & Bazilian, M. D. (2007). Economic modeling of price support mechanisms for renewable energy: Case study on Ireland. Energy Policy, 35(2), 1172-1185

[36] del Río, P., & Gual, M. A. (2007). An integrated assessment of the feed-in tariff system in Spain. *Energy Policy, 35*(2), 994-1012; Nitsch, J., Krewitt, W., Nast, M., Viebahn, P., Gärtner, S., Pehnt, M., et al. (2004). *Environmental policy: Ecologically optimized extension of renewable energy utilization in Germany* (Summary). Berlin, Germany: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

[37] Podewils, C. (2008, July). Constant state of revision: The Conservatives are already looking for the next chance to revise the new EEG tariffs. *PHOTON International,* 28-33

[38] Ibid. Commission of the European Communities (2005).

[39] Bundesministerium für Umwelt Naturschutz und Reaktorsicherheit. (2007a). *Erfahrungsbericht 2007 zum Erneuerbaren-Energien-Gesetz (EEG)*. Berlin, Germany; Sensfuß, F., & Ragwitz, M2007). *Analysis of the price effect of renewable electricity generation on spot market prices*. Karlsruhe, Germany: Fraunhofer Institut System- und Innovationsforschung

[40] Sáenz de Miera, G., Del Río González, P., & Vizcaíno, I. (2008). Analysing the impact of renewable electricity support schemes on power prices: The case of wind electricity in Spain. *Energy Policy, 36*(9), 3345-3359

spot market prices. In both cases, the estimated savings have been comparable or have exceeded the cost of the policy itself. This wholesale market price suppression effect is not unique to feed-in tariffs and could result from large-scale renewable energy market growth spurred by any policy type (such as a Renewables Portfolio Standard). To the extent that price suppression benefits are realized through addition of renewable energy, if feed-in tariffs accelerate the pace of renewable energy development, then price suppression benefits may be realized earlier.

- **Long-term payments have been used successfully in Germany and Spain.** Both countries have guaranteed generators long-term feed-in tariff payments or contracts. The primary difference is that the payments are provided for a fixed term in Germany (20 years)[41], whereas the payment in Spain is guaranteed for the life of the system.[42] European analysts[43] have noted that the German system provides more certainty about policy cost and policy duration than the Spanish model.
- **Both Spain and Germany distribute policy costs nationally.** Both Germany and Spain both evenly distribute the costs of their feed-in tariff policies nationally. Germany initially limited its feed-in tariff cost distribution within each utility service territory but eventually switched to a broader socialization system in light of cost imbalances and their effect on competition in the electricity industry.

[41] After the 20 year term expires, generators are free to sell their electricity according to the options available at the time. Onsite systems which currently sell their power into the grid rather than offsetting onsite load (e.g. PV) may find that offsetting onsite load offers the most attractive alternative after the 20-year feed-in tariff ends. Other generators may opt to sell into the wholesale market. For a brief discussion of these options, *see* Solar Electric Power Association, Northwest Solar Center, & World Future Council. (2008). *Solar fact finding mission to Germany for utility decision makers: Suummary report, June 9-13, 2008*. Washington, DC

[42] As noted earlier, the feed-in tariff in Spain also varies annually with the Consumer Price Index, whereas the German feed-in tariff is fixed over its entire term.

[43] Ibid., Held et al. (2007).

CHAPTER 3: Feed-In Tariff Policy Goals, Objectives, and Evaluation Criteria

Since any feed-in tariff program is likely to have multiple goals and objectives, policy makers must first determine specifically what they wish to achieve and consider how they will prioritize or weigh those goals and objectives against one another. Only then can a feed-in tariff program be designed that achieves those goals subject to applicable constraints, such as achieving the objectives at the lowest possible cost.

Project Scale

The *Integrated Energy Policy Report* (IEPR) direction motivating this report focused on feed-in tariffs for electricity generation projects over 20 MW in California. However, Workshop 1 and subsequent stakeholder comments (as discussed further in Chapter 4) revealed a preference among many stakeholders for limiting feed-in tariffs to projects below 20 megawatts (MW). Others preferred a near-term focus on smaller generators in order to gain more experience prior to a wider application. As a result, this report explores various policy options for implementing a feed-in tariff over a range of project scales to support attaining Renewables Portfolio Standard (RPS) goals.

Policy Goals and Objectives

As articulated in the 2007 IEPR, there are two major policy goals driving renewable energy development in California:

1. Reducing green house gas emissions, and
2. Managing cost and risk to rate payers.

These policy goals are reflected in the policy objectives of achieving 20-percent renewable energy penetration in California by 2010 and 33-percent penetration by 2020. The state's current strategy for achieving those objectives is the RPS procurement process. Feed-in tariffs, the subject of this report, offer a second potential strategy for attaining these renewable energy objectives. The state has also articulated other policy goals pertaining to renewable energy, including supporting renewable energy resource diversity (reflected in objectives articulated in solar and biomass policy targets.[44]

With respect to feed-in tariffs, the Energy Commission's staff, in consultation with the Renewable Committee, articulated a set of additional policy drivers, prioritized as shown in Table 3. These policy drivers have been applied as evaluation criteria for considering feed-in tariff design choices in constructing and evaluating the alternative policy paths discussed in Chapter 6.

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[44] Governor Schwarzenegger's Executive Order S-06-06.

Table 3: Prioritized Feed-In Tariff Policy Drivers

	Category	Driver	Rationale	Priority
1	Quantity	Develop a sufficient quantity of renewable energy in the medium-term timeframe in order to meet California RPS objectives.	Promote projects that can feasibly help reach the RPS objective of 33 percent by the 2020 timeframe.	High
2	Financial Security	Market certainty and financial security for developers and investors.	Provide the market certainty and financial support that developers and investors need to bring new projects on line.	High
3	Diversity-A	Promote a diverse mix of renewable resources through technology-specific or attribute-specific tariffs (for example, feed-in tariff for solar not covered by CSI or higher tariff rate for peak generation).	Increase renewable energy generation across technology and attribute types to increase reliability and meet desired mix of "operational characteristics," such as peak generation or system integration.	Medium
4	Sustainable Renewable Energy	Develop a self-sustaining renewables industry.	Rates designed to help with market penetration, but eventually ratcheted down as facilities become able to compete effectively in the market.	Medium
5	Price Stabilization	Help stabilize the cost of generation.	By increasing the mix of renewable energy technologies, the cost of generation can be insulated from fluctuations in the price for natural gas.	Medium
6	Diversity-B	Meet specific policy objectives already articulated. Examples: IEPR recommendations or Biomass Executive Order (S-06-06).	Focusing on increasing renewable energy derived from biomass technologies will also help to increase system mix and reliability.	Low

Source: KEMA

Constraints

There are practical constraints that limit the ability of the State to achieve its renewable energy objectives through either the existing RPS solicitation or through an expanded feed-in tariff. For example, maximizing the quantity of renewable energy generated will be subject to the constraints of available transmission, the ability to site and permit generators, financing, and feasible build-out time. Another constraint that should be considered in selecting from among the potential feed-in tariff policy paths is cost-effectiveness; that is, accomplishing the objectives in a manner that seeks to minimize the rate impact of achieving a specific end point (including minimizing transmission and integration costs associated with meeting renewable energy objectives). Finally, resource sustainability should also be considered a constraint on an effective policy. Perhaps the most pertinent example is the physical constraint of the sustainable yield of biomass so that consumption does not exceed regeneration.

CHAPTER 4: Summary of Public Comments

Following the June 30, 2008 workshop, the Energy Commission sought oral and written comments on a range of potential policy goals for feed-in tariffs, both in response to questions posed in the first workshop notice and in response to the more explicit on-line questionnaire.[45] The workshop notice questions addressed the scale of resources for which a feed-in tariff might be created, the barriers such tariffs might help overcome, and the benefits of feed-in tariffs. The on-line questionnaire explicitly sought comment on the perceived need for feed-in tariffs at different project scales and the prioritization of a menu of potential broad policy goals for feed-in tariffs.

Energy Commission staff reviewed the oral and written comments and on-line questionnaire results to guide the development of this report. The questionnaire was intended to allow comment from participants who would not usually submit formal comments, as well as provide an opportunity to seek more targeted and detailed input on specific feed-in tariff design options. Questionnaire responses are considered official comments and will therefore be docketed and were considered in the drafting of this report. Those responding to the on-line questionnaire were skewed towards the small generation community, and questionnaire results should therefore be considered in that perspective.

Policy Goals and Objectives

The responses to the on-line questionnaire that sought explicit input on policy objectives are summarized in Table 4.

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[45] The questionnaire can be found at: http://www.energy.ca.gov/portfolio/documents/index.html#063008].

Table 4: Summary of On-Line Survey Responses

Answer Options	High Priority	Medium Priority	Low Priority	Not an Approriate Objective	Response Count
Maximize renewable energy generation (e.g. MW or % of retail sales)	12	1	1	1	15
Develop certain quantity of renewable energy in a specified time period (e.g. meet specific California RPS targets)	8	4	1	2	15
Minimize rate impact to retail customers of meeting renewable energy objectives	6	6	1	2	15
Minimize transmission costs associated with meeting renewable energy objectives	7	3	2	3	15
Minimize renewable energy contract regulatory oversight cost	6	2	5	2	15
Promote a diverse mix of renewable resources through technology-specific incentives	7	5	1	2	15
Support smaller projects or businesses	10	2	2	1	15
Promote projects in specific geographic locations	3	5	3	4	15
Promote projects in renewable energy zones	7	3	3	1	14
Promote projects that can be implemented in short-to medium-term timeframe	7	5	2	1	15
Meet specific policy objectives already articulated in law, regulation, executive order, etc. (For example, California Solar Initiative, AB 32 Greehouse Gas Targets, or the Governor's biomass energy targets) Please specify any other objectives you wish to identify below.	8	5	0	1	14

Source: KEMA

In addition to the above responses, respondents also offered comments about potential additional goals, including targeting feed-in tariffs at emerging renewable technologies, and assuring that tariffs only be available to those renewable energy sources that meet an appropriate measure of sustainability.

Based on the goals and objectives laid out in the *2007 IEPR* and the Renewables Portfolio Standard (RPS) program, and based on stakeholder comments, the Renewables Committee developed a set of policy drivers that were used as a basis for developing the potential future feed-in tariff policy paths that are consistent with the above goals and objectives and reflective of stakeholder feedback.

Expansion of Feed-In Tariffs

The majority of written and oral comments in response to Workshop 1 notice questions expressed opposition to expanding feed-in tariffs to projects larger than 20 megawatts (MW). Stakeholders representing utilities and the California Public Utilities Commission (CPUC) who did not support expanding feed-in tariffs to projects greater than 20 MW generally believed that the existing RPS solicitation is adequate and pointed out that the existing solicitation process has generated enough proposed contracts to exceed RPS renewable energy objectives. They also cited potential incompatibility of feed-in tariffs with the existing RPS program, limited experience with the current feed-in tariffs for projects below 1.5 MW, and the lack of clear objectives. However, the stakeholders who supported expanding feed-in tariffs, including renewable energy generators and environmental organizations, argued that the RPS program is not on track to meet its objectives and that a feed-in tariff may be necessary to help meet RPS targets. While the latter group of stakeholders supported expanded use of feed-in tariffs, most still recommended delaying consideration of a feed-in tariff over 20 MW until more experience is gained with the smaller feed-in tariff administered by the CPUC. Stakeholders responding to the on-line questionnaire expressed the following preferences for feed-in tariffs:

- 'Up to 1.5 MW': 77 percent indicated high priority, and 85 percent either high or medium priority.
- 'Between 1 and 20 MW', and 'up to 20 MW': 75 percent indicated either high or medium priority.
- 'Greater than 20 MW', 'up to 50 MW' and 'No size limits': 58 percent indicated either high or medium priority.

Given that the RPS program is not on track to meet the RPS objectives, the purpose of this report is to explore a variety of approaches for implementing a feed-tariff over a range of project scales to help achieve these objectives. A feed-in tariff offers the advantage of providing a second strategy, in addition to the RPS solicitation, to help meet renewable energy objectives mandated by law.

Benefits and Costs

Feed-in tariff supporters argued that feed-in tariffs can help with financing, reduce costs of contract negotiations, and make investment easier to obtain. On the other hand, stakeholders opposing feed-in tariffs believed that a feed-in tariff unfairly shifts project risk to the ratepayer, stifles efficiency and innovation, and that historically large numbers of standard offer contracts have led to high-priced power. However, it should be noted that long-term costs of not achieving RPS objectives, in the form of increase costs and adverse environmental impacts resulting from fossil fuel depletion and climate change, may significantly outweigh short-term costs of developing new renewable energy resources through a feed-in tariff.

In addition to being generally opposed to expansion of a feed-in tariff, many stakeholders expressed even more concern about barriers to renewable energy that a feed-in tariff may not address, such as lack of transmission, permitting, siting, and uncertainty of tax credits. Because of these barriers, many stakeholders did not see feed-in tariffs as likely to significantly increase the mix or quantity of renewable generation. Furthermore, these stakeholders suggested that it would be premature to estimate cost impacts of a broad feed-in tariff until after gaining further experience with the feed-in tariffs of narrower scale and scope.

The barriers identified are barriers to both the existing solicitation and any expanded feed-in tariff. With respect to the lack of transmission, however, a feed-in tariff can be designed to complement the Renewable Energy Transmission Initiative (RETI) program, thereby targeting zones with available transmission and supporting transmission development.

Concerning risk to rate payers, one of the renewable energy program goals is to help manage risk and cost to ratepayers. The use of an expanded feed-in tariff could potentially reduce risk and cost to ratepayers by increasing the mix and reliability of renewable energy resources that can act as buffer to fluctuations in the price for natural gas. By the 2020 time frame it is possible that the California may experience an environment of increasingly variable natural gas prices. This risk could be mitigated in part by more aggressive renewables expansion. Moreover, it is possible a feed-in tariff could suppress wholesale prices, to the extent that a feed-in tariff can bring renewable capacity on line more rapidly.

Compatibility With Other Programs

Many stakeholders oppose an expanded feed-in tariff, arguing that the existing RPS solicitation is adequate and that a feed-in tariff is incompatible with it. Further, stakeholders stated that implementing a feed-in tariff would be counterproductive by replacing a competitive process with a regulatory approach. As a result, stakeholders suggested alternative policy directions other than implementing a feed-in tariff, such as encouraging utilities to expand voluntary feed-in tariffs, similar to the current Southern California Edison biomass standard offer contract, within their territories, focusing on transmission issues, and implementing tradable renewable energy credits (RECs). However, a feed-in tariff does not preclude developers from participating in the RPS solicitation process; a feed-in tariff can probably be implemented in parallel with the competitive solicitation with careful consideration to design.

Most of the comments do not suggest that an expanded feed-in tariff replace the current market price referent (MPR) and above-MPR funds (AMF) system, though many do recommend decoupling renewable costs from fossil fuel costs. Some stakeholders consider AMFs to provide meaningful ratepayer protection. One comment, however, suggested that feed-in tariffs replace the current MPR system because it could eliminate much of the time-consuming negotiations necessary to implement the present solicitation based on the MPR.

For any expanded feed-in tariff it will likely be necessary to decouple the feed-in tariff price from the MPR to set the rate at a level that is appropriate to support new renewable energy generations based on differentiation by technology, size, and other factors. In addition, to help keep costs down, a feed-in tariff can be designed instead with a competitively benchmarked price.

Expanded feed-in tariffs could also support the RETI process by targeting Competitive Renewable Energy Zones (CREZs). Stakeholders pointed out that procurement should match transmission, and that building in CREZs could help contain costs, and that transmission costs should reflect the environmental values of the location. Some stakeholders suggested that feed-in tariffs should not be directly linked to the RETI process, and that other transmission areas should also be explored.

The majority of comments were in favor of linking the feed-in tariff with RPS targets. Stakeholders recommended that feed-in tariffs incorporate environmental attributes and RECs, and that all benefits should be held by the utility to count towards its RPS procurement targets.

Tariff Design

Comments generally reflected support for tariff differentiation by both technology and size, given that different technologies have differing costs, values, performance characteristics, reliability, and intermittency. One stakeholder proposed a value-based approach, with the idea that this approach might negate the need for technology-specific tariffs. Another stakeholder suggested using a feed-in tariff to target biomass to implement Executive Order S-06-06. One stakeholder argued that existing facilities should be allowed the tariff rate when negotiating a new contract; however, the majority of comments and questionnaire responses advocated limiting feed-in tariffs to new generators only.

The design elements included in the policy paths are generally reflective of stakeholder feedback, but specific decisions in regard to how to design the feed-in tariff are beyond the scope of this report.

Tariff Implementation and Administration

Stakeholders generally stated that costs of the feed-in tariff should be shared equally amongst all ratepayers since RPS and emission goals are statewide. One stakeholder suggested that only above-market costs be borne statewide.

Queuing was also a concern; one stakeholder suggested the independent system operator queue require a deposit to weed out frivolous bids. Another recommended that the queue be based on the value of the energy resource and the likelihood of being able to obtain financing. To prevent speculative queuing which may arise under certain tariff designs, it may be necessary for the feed-in tariff to include a deposit, project milestones, and security increases in exchange for time extensions. By including such requirements in a tariff, the tariff would help to prevent oversubscription.

Stakeholders recommended that costs of expanded feed-in tariff program should be allocated broadly across the customers of all load-serving entities, including publicly owned utilities (POUs), community choice aggregators, and electric service providers providing power to direct-access customers. This implies that the above entities would be required to purchase all eligible renewable energy generated as a result of the expanded tariff becoming available. Questionnaire results overwhelmingly favored including all investor-owned utility (IOU) and POU territories in a feed-in tariff, rather than just IOU territory only.

Conflict With Federal Law

One stakeholder pointed out that if the feed-in tariff is established as part of the RPS program, it would be set at the market price as determined by the CPUC. However, if the feed-in tariff is separate from the RPS program, the rate could be set at a level designed to attract the desired amount of renewable generation.

Another stakeholder noted that Public Utility Regulatory Policy Act and Federal Energy Regulatory Commission (FERC) regulations state that utilities can only purchase power from qualifying facilities at avoided cost. This argument holds that a feed-in tariff would have to be set at avoided cost or a FERC-approved market-based rate.

Stakeholders expressed doubts of the compatibility of AMFs with feed-in tariffs, since current law requires contracts for AMFs to be selected through a competitive solicitation process. This would in fact prevent AMFs from supporting a feed-in tariff.

There do not appear to be any conflicts with existing state or federal laws that would prohibit the implementation of a feed-in tariff in California. A more detailed discussion is included in Chapter 7, Policy Interactions.

Conclusions

While stakeholders were split in regard to the need for an expanded feed-in tariff, the state has so far fallen behind in meeting RPS objectives. Stakeholders identified several barriers to increased renewable energy generation, including transmission, financing, and siting and permitting. However, despite these barriers, experience with feed-in tariffs in Europe and North America clearly demonstrates that feed-in tariffs can be an effective tool for increasing renewable energy resources relatively quickly. This experience lends credence to the belief that feed-in tariffs offer a second effective strategy that is available to the State for increasing renewable energy to help meet the 33-percent renewable energy objective by 2020. This report therefore discusses and evaluates several potential options for implementing feed-in tariffs in California. These options form a basis for policy makers to make a reasoned decision in regard to a specific strategy for implementing expanded feed-in tariffs in California.

CHAPTER 5: Analysis/Narrowing the Options

Approach

The *Draft Issues & Options Report* outlined a broad range of policy options that California would need to consider as it moved from feed-in tariff design to feed-in tariff implementation. Issues identified in the *Draft Issues & Options Report* were subdivided into three categories:

- **Core policy issues** are issues that would dictate California's feed-in tariff strategy and that constitute critical characteristics of alternative feed-in tariff policy paths. These are essentially the high-level policy decisions, most of which would create different approaches to implementing expanded feed-in tariffs in California.
- **Non-core policy issues** consist of important policy issues that would modify the feed-in tariff design, but not fundamentally alter its core structure. They would require decisions in order to move forward with expanded feed-in tariffs, but they are independent of the policy path selected. The resulting design choice could be appended to any of the selected policy paths.
- **Implementation details** are issues that must be addressed in implementing feed-in tariffs but do not require major policy decisions. For these, further discussion can be deferred until after a decision on whether to pursue expanded feed-in tariffs is made.

For those feed-in tariff design issues in the first category, this chapter narrows the design options identified in the *Draft Issues & Options Report* to those deemed viable for further consideration as components of alternative future policy paths. The narrowing was accomplished through:

- Consideration of the advantages and disadvantages of options as identified in the *Draft Issues & Options Report*.
- Consideration of practical constraints and California precedent.
- Consideration of stakeholder comments as described in Chapter 4.
- Input from the Energy Commission's Renewables Committee members.
- Analyses from Energy Commission staff and consultants.

This process resulted in a narrower range of design components from which alternative policy paths could be crafted for further consideration. After review, some issues were determined to have a single possible design choice. The narrowing of design options is described further in this chapter.

Table 5 outlines key issues examined for:

- Core feed-in tariff design policies.

- Non-core feed-in tariff design policies.
- Implementation issues.

This report deals principally with core threshold design issues, with the goal of organizing these options into different, representative policy paths for stakeholder consideration (see Chapter 6).

Table 5: Feed-in Tariff Design Issue Summary

Issue	Sub-issues
Core Design Issues	
1. Generator eligibility	• Resource type • Vintage • Project size
2. Price-setting methodology	• Value-based • Generation cost-based • Competitive benchmark
3. Price adjustment	• Approaches • When to adjust • How to adjust
4. Caps and limitations (for example, based on capacity and/or cost)	• Not Applicable
5. Tariff Differentiation (for example, by size, by technology, etc.)	• Not Applicable
6. Contract Duration	• Not Applicable
7. Access	• Who pays costs of interconnection • Who pays for upstream transmission
8. Tariff structure	• Not Applicable
9 Which entity offers the tariff (who buys?)	• Not Applicable
10. Timing	• Not Applicable
11. Scope	• Not Applicable
Non-core Policy Issues	
12. Generator eligibility - location	• Based on generator location, for which tariff(s) is a generator eligible? - Interconnecting utility, other • If other than interconnecting utility, under what conditions? - no restriction or condition - only if no interconnecting option - to nearest or any tariff • If other than interconnecting utility, energy delivery or RECs? • Generators within CA only, or WECC?
13. Price-setting methodology, secondary issues	• If value-based: wholesale vs. retail measure of value? Adders to value for time of production, or grid-side benefits or air emissions? • If cost-based: how to set profit level? Aggressive or conservative estimate of cost? • If competitive benchmark: Is everything eligible or differentiated? What is mechanism and frequency for determining benchmark? Is there an adjustment facto?
14. Interconnecting utility requirements offered by all (statewide) or just IOUs?,	• Not Applicable
15. What is being sold/purchased?	• Not Applicable
16. Who pays (cost allocation/distribution)?	• Not Applicable
17. Cost recovery mechanisms	• Not Applicable
18. Integration of purchased energy and other commodities into power supply of utilities and others	• Not Applicable
19. Development security requirements	• Not Applicable
Implementation Issues	
20. Operational security requirements	• Not Applicable
21. Tariff standardization with CPUC Rule 21	• Not Applicable
22. Management and oversight of feed-in tariff payments	• Not Applicable
23. Queuing procedures if caps are in place	• Not Applicable

Core Characteristics Comprising Potential Feed-In Tariff Policy Paths

The components of each issue are discussed below.

Issue 1: Generator Eligibility

The issue of generator eligibility addresses whether to allow all generator types to participate in a feed-in tariff, or whether to limit the feed-in tariff only to certain subsets of generators.

- **1. a. Generator Eligibility—Resource Type.** This issue pertains to whether to allow the same resources that are eligible under the Renewables Portfolio Standard (RPS) to participate under a feed-in tariff or allow only certain technology types.

  Narrowed options: The primary option would be to design a feed-in tariff open to all RPS-eligible technology types—similar to the current feed-in tariff for small-scale generators. Based on stakeholder input and on California policy priorities, such as the Executive Order targeting biomass, feed-in tariffs targeting single resources—solar and biomass—were also selected as options for further consideration. In addition, based on stakeholder input, a stipulation that feed-in tariffs target only sustainable biomass was added to the options.

- **1. b. Generator Eligibility—Vintage.** This issue involves whether to allow all generators, regardless of their date of operation, to qualify for the feed-in tariff rate or limit eligibility to resources of only a certain vintage.

  Narrowed Options: The vintage eligibility options identified in the *Draft Issues & Options Report* included all generators, regardless of age; only new generators; and generators that came on line after a target date. A fourth option was to create a "qualification life" for feed-in tariffs, based on an approach proposed under the recent New Jersey RPS proceedings. Stakeholder support for the qualification life option and for the option to define eligible vintage based on a certain date was low, so these were removed from consideration. Based on the Energy Commission policy priority to meet RPS goals and maximize generation, the options selected for further consideration were to allow either only new resources or to allow both new and repowered resources.

- **1. c. Generator Eligibility—Project Size.** This issue addresses whether to allow generators of all sizes to participate in the feed-in tariff or limit the feed-in tariff to projects of certain sizes.

  Narrowed Options: The initial options included caps or floors based either on capacity or on energy production. There was little stakeholder support for energy-based caps or floors, so these were discarded. As described in the stakeholder comment summary in Chapter 4, stakeholders suggested a broad range of specific capacity caps and floors, including support for a scenario without size limits. The original scope of the Energy Commission study was to explore feed-in tariffs for projects over 20 megawatts (MW).

Based on stakeholder comments, however, a range of policy options were selected for inclusion in the final policy paths in order to reflect the broad range of opinion. These options included: no limits, setting 1.5 MW as the capacity floor, setting 20 MW as the capacity floor, and setting 20 MW as the capacity ceiling.

Issue 2: Price-Setting Methodology

The three choices for price-setting methodology are whether to set the price based on the value of the electricity supplied, based on the generation cost of eligible technologies, or to use a competitive benchmark to establish the price.

Options: Each of the three price setting methodologies has its own subset of policy options to consider. For example, if a value-based methodology is selected, then value could be defined as a function of wholesale or retail prices (for example, 80 percent of average retail electricity as in Germany during the 1990s), or using a definition of avoided cost that takes externalities such as grid-side benefits or air emissions into account. For the cost-based methodology, choices include whether to set the price on an aggressive or conservative basis. Each of these secondary options depends on the primary methodology selected, however. As a result, the secondary options could be viewed as non-core policy options.

On the one hand, the value-based approach fits within the current least-cost/best-fit framework of the California RPS. On the other hand, nearly half of the stakeholders favored a cost-based approach. As discussed in Chapter 2, generation cost-based feed-in tariffs have driven rapid market growth internationally and could support the objective of meeting state renewable energy targets on schedule. A large proportion of stakeholders also supported a competitive benchmark approach to setting the tariff, although it was noted that this approach has not been implemented elsewhere. As a result of the broad range of opinions and the potential merits of all three approaches, all were selected for further consideration. Some secondary policy options were also specified in the policy paths (for example, the decision to use a differentiated competitive benchmark) to encourage dialogue during the next round of stakeholder engagement.

Issue 3: Price Adjustment

- **3. a. Price Adjustment—Approach.** This design issue deals with whether to have one price that does not adjust over time, or whether to adjust the price based on reference indicators or a pre-established schedule.

  Options: The initial options considered were to have fixed price with no adjustment (and therefore have the price automatically devalue over time with inflation), index the tariff to economic indicators such as the consumer price index or inflation, adjust the tariff based on a measure of value (similar to the market price referent), or whether to set a digression schedule that would reduce the price over time in line with technology advances and scale economies, as is in place in Germany. There was little stakeholder support for the 'no adjustment' option and so it was discarded. Opinion was fairly evenly divided regarding the remaining three options, and it is conceivable that any of the three could be integrated into any of the policy paths.

- **3. b. Price Adjustment—When to Adjust.** If tariff prices are to be adjusted, the issue of when to make such price adjustments must be addressed.

  Options: The initial options identified in the *Draft Issues & Options Report* were to schedule periodic price adjustments based on a specified amount of time (for example, the digression schedule in Germany), have revisions automatically occur when certain capacity amounts are reached (for example, the California Solar Initiative block schedules), or to schedule a periodic administrative review to determine how the policy should be adjusted. There was no clear best practice or stakeholder preference expressed among the three "pure" options, and in fact many current feed-in tariffs opt for hybrids and combinations of the three options. Germany, for example, combines periodic price adjustments with periodic administrative review, whereas Spain uses capacity goals to trigger administrative review—in addition to a scheduled administrative periodic review. In light of this, a hybrid combining capacity-based revisions with periodic administrative review (to make sure the preset capacity-based revisions still make sense) was selected for further consideration.

- **3. c. Price Adjustment—How to Adjust.** If tariff prices are to be adjusted, policymakers must decide whether to pre-schedule incentive decreases in uniform steps or tie the decreases to other benchmarks.

  Options: This issue becomes relevant if a regular schedule of declining incentives (for example, time based or capacity based, etc.) is selected. In this case, it becomes necessary to determine in what increments the incentive will be adjusted. The two options identified in the *Draft Issues & Options Report* were to decrease the payments in uniform steps, or alternatively, try to tie the adjustments to a technology's projected experience curve. The experience curve approach is theoretically compelling, but it can be challenging to set correctly since experiential improvements are not always smooth.[46] Both of these options were retained for further consideration.

Issue 4: Cap and Limitations

This issue involves whether to allow generators to access the incentive indefinitely or whether to limit the tariff.

Options: The initial options considered were to have no cap on the policy, to cap the policy based on capacity, to cap the policy based on a target amount of energy generation, or to cap the policy based on its cost impact. Although a slight majority of stakeholders favored an

[46] Alsema, E., Seebregts, A., Beurskens, L., de Moor, H., Durstewitz, M., Perrin, M., et al. (2004). *Synthesis report Photex project*: European Union PHOTo-voltaic systems and EXperience curves (PHOTEX) Project.

unlimited policy, there was also strong support for caps under certain circumstances. With regard to the type of cap that could be employed, a cost-based cap was discarded because it is the least transparent and conflicts with the policy objectives of encouraging investor security. The remaining options—no cap, a capacity cap, and a generation cap— were retained to be considered in design potential feed-in tariff policy paths.

Issue 5: Tariff Differentiation

The issue of tariff differentiation involves whether to have a single "neutral" tariff for all generators types or whether to differentiate tariff payment levels to take into account different generation costs and production profiles.

Options: The tariff differentiation options would only need to be considered if California moves forward with a differentiated, rather than a neutral, feed-in tariff structure. The original differentiation options identified in the draft *Issues & Options Report* included project size, resource quality, ownership structure, transmission access, location (for example, to target a load pocket), and commercial operation date (for example, to encourage repowering). Differentiating by resource quality, as is done in Germany for wind, and differentiating by ownership structure, such as the proposed community-ownership feed-in tariff in Minnesota, were removed from consideration because of lack of support during the stakeholder process. Differentiating the tariff by generator location (for example, different rates for Competitive Renewable Energy Zone (CREZ) than non-CREZ generators) was eliminated from consideration as a means of tariff differentiation; however, a related concept was considered as a dimension of policy scope, e.g. tariff only in a CREZ.

There was clear support from a broad range of stakeholders for both differentiation by technology and differentiation by project size, and both were selected for inclusion in the policy path scenarios. To respond to the Executive Order on Biomass, tariff differentiation by biomass fuel type was selected for inclusion in a biomass-only policy path. The policy objectives embodied by the other tariff differentiation options were generally captured by other design options and were judged not to need explicit, differentiated tariff levels.

Issue 6: Contract or Payment Duration

This issue involves the duration of the standard contract, if a contract is used, or the payment, more generally.

Options: The initial contract duration options included short-term (3 to 7 years), medium term (8 to 14 years), long-term (15 to 20 years), generator choice, and indefinite. The indefinite payment option was discarded because of the uncertainties it created over policy duration and policy cost and because of a lack of stakeholder support. In addition, it does not contribute to the policy goal of sustainable renewable energy. There was little or no stakeholder support for either allowing the generator to select its own term (this was also rejected from further consideration for reasons of administrative complexity) or for short-term durations. The long-term contract option was selected as the primary choice because of its positive impact on investor security and its potential to enable lower contract prices.

The one exception to this was for the biomass-only policy path, under which a short- or medium-term option was selected to reflect the fact that longer-term contracts increase biomass generators' exposure to fuel price risks.

Issue 7: Access to the Grid

The issue here is which entity would be responsible for paying the interconnection and upstream transmission system costs associated with new generation.

Option: This was an instance where a single option was selected. No parties advocated for reversing or amending status quo that generators would be responsible for paying for interconnection, and that the cost of upstream transmission improvements would be allocated to the transmission owner, per current California Independent System Operator practice.

Issue 8: Tariff Structure

The tariff structure refers whether to structure the payment as a fixed price payment, or not.

Options: Although several options were discussed, including a fixed price with a tradable renewable energy credit hybrid, a contract-for-differences structure, and a fixed premium like that used in Spain, there seemed to be clear support through stakeholder opinion and reviews of international experience to date that a fixed price would be the most appropriate structure for California.

Issue 9: Which Entity Offers the Tariff (Who Buys?)

This issue involves identifying which entities are responsible for offering the feed-in tariff and providing the feed-in tariff payments to generators.

Options: The *Draft Issues & Options Report* identified two alternatives, the transmission and distribution system operators (investor-owned utilities (IOUs) or publicly owned utilities (POUs) if applicable) or load serving entities (IOUs, POUs, community choice aggregators (CCAs) and energy service providers (ESPs)). Due to practical constraints, the only option included for further consideration is assigning providers of transmission and distribution the task of providing the feed-in tariff payment to generators. While each generator can only have one interconnecting utility, generation service providers were ruled out as incompatible with the market structure. There is no clear and unique choice for which generation service provider would be obligated to purchase the output of a generator feeding into the wholesale grid, and ESPs and CCAs may not operate within a service territory for the duration of the payment obligation.

Issue 10: Timing

The issue of timing refers to when a feed-in tariff policy would go into effect.

> Options: This issue was initially related to the issue of how the feed-in tariff might interact with the RPS, but was subsequently identified as a distinct characteristic of potential policy paths in response to stakeholder and Energy Commission staff input. The options include having a feed-in tariff take effect immediately, having the feed-in tariff come into effect at a specified future date, or having the feed-in tariff come into effect when triggered by a certain milestone (for example, failure to meet the 2010 RPS target). All three options were integrated into the final policy paths to elicit further stakeholder comment. Under one scenario, the feed-in tariff goes into effect immediately; under a second scenario, the feed-in tariff goes into effect if the 2010 RPS goals are not met; and under a third scenario, the RPS goes into effect automatically in 2011 in parallel with the commitment to construction of CREZ transmission. A fourth and final option was selected to complement the pilot scope discussed below, under which the expanded feed-in tariff would go into effect immediately as a pilot, which would then terminate after 3 years.

Issue 11: Scope

The scope of a feed-in tariff policy involves whether the feed-in tariff should be offered comprehensively to the full market, or instead on a more limited basis, either only in specific locations, or introduced as a limited pilot at first.

> Options: The three primary options are whether to roll out the feed-in tariff statewide upon implementation, whether to limit a tariff to generators only in specific locations, or whether to create a limited pilot policy in order to test the policy's impact. This option was not among the options introduced in the *Draft Issues & Options Report* but was subsequently added in response to stakeholder and staff input. During the stakeholder proceedings and subsequent Renewables Committee review process, the issues of transmission constraints and CREZ planning was identified as a policy priority in need of further consideration. Under the pilot scenario, the feed-in tariff would be available only within one utility's territory, and/or would be available only for a limited time. This approach has been employed by California for several of its policies, including the development of the pilot performance-based incentive for photovoltaics and the development of a pilot program for solar hot water heating. Full-scale tariff availability, the option of limiting feed-in tariff eligibility to only those generators located within a CREZ, and pilot feed-in tariffs were selected as options for further consideration.

Non-Core Policy Issues

The non-core policy issues would modify the feed-in tariff design but not fundamentally alter its core structure. They represent important policy design decisions that will need to be made to implement expanded feed-in tariffs, but they are independent of the policy path selected. These design choices could be appended to any of the selected policy paths. Table 5 provides a summary of these issues, whereas the full menu of options that impact each issue is included in Appendix A.

Implementation Issues

The implementation issues outlined in Table 5 will not be addressed within the scope of this paper because they are issues related to policy implementation, rather than core design. As a result, further discussion of these issues can be deferred until after a decision on whether to pursue expanded feed-in tariffs is made. The full list of options associated with each of the issues below is included in Appendix A.

CHAPTER 6: Six Potential Policy Paths for Feed-In Tariffs in California

The core design issues listed in Table 5 and their associated options could be combined into many different permutations and could be used to create a broad range of very different feed-in tariff policies. Exploring all possible combinations would be neither practical nor fruitful. Based on the stakeholder process, input from the Renewables Committee, and staff analysis, the core design issues and associated options were packaged into six representative *policy paths* as a useful starting point for the next round of discussions in Workshop 2. These policy paths do not reflect the full range of possible feed-in tariff designs that California could consider but reflect a range of different approaches to achieving the policy objectives outlined by the Energy Commission.

These feed-in tariff policy paths are not posed as substitutes for the current Renewables Portfolio Standard (RPS) solicitation process, but complements that could either focus narrowly on gaps not well addressed by the RPS solicitation process, or broader policies that could operate in parallel.

Representative Policy Paths for Future Discussion

The six different policy paths listed in Table 6 contain options selected for further consideration following Workshop 1. These policy paths span a range of policy directions, as well as timing and scope. In addition to the six options below, there is an implicit seventh choice—maintaining the status quo—which will be considered as a reference point in this and future analyses. This section provides a short profile for each policy path and discusses the pros and cons of each of the policy path.

Table 6: Policy Paths for Further Discussion

	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Feed-in tariff Policy Attribute	Full-Market, unlimited size, differentiated cost-based with competitive benchmark, triggered by failure to meet 2010 RPS target	> 20 MW, undifferentiated value-based 3-yr pilot in 1 utility	Differentiated Cost-based CREZ-Only, > 1.5 MW	Solar > net metering pilot in 1 utility, cost-based with competitive benchmark	Sustainable biomass > 1.5 MW only, cost-based	Full market < 20 MW cost-based differentiated by technology & size
Resource Type	All	All	All	Solar	Biomass (sustainable)	All
Vintage	New, separate price for repowering	New + repowering	New	New	New	New, separate price for repowering
Size	No limit	> 20	>1.5	> Net metering threshold	>1.5	<20
Timing	Trigger (RPS < 20 percent under contract by 2010, implement Feed-in Tariff in 2012-13)	Now (available for 3-year duration)	automatically in 2010-11 (so projects are developed in parallel with transmission)	Now	Now	Now
Scope	Full Market	Pilot (limited time, one utility)	CREZ-Only	Pilot (e.g. within one utility)	Full Market	Full Market
Setting the Price	Cost-based with initial differentiated auction without MPR to set competitive benchmark for subsequent tariff	Value Based (time & peak differentiated with CO_2 & other adders)	Cost-based	Cost-Based w/ Competitive benchmark	Cost-based, calculated to consider sustainable yield of local biomass sources	Cost-based
Contract Duration	Long-term	Long-term	Long-term	Long-term	ST/MT	Long-term
Tariff Differenti-ation	Differentiation by technology & size	Not Applicable	Wind by size, geothermal, biomass by size, solar by technology	By size, type	By fuel and size	Differentiation by technology & size
Limits	Capped at RPS targets; caps on more expensive technologies	Uncapped	Capped at CREZ Transmission limit	Capacity limit will be established for the sponsoring utility.	Uncapped	Uncapped

Source: KEMA

Policy Path 1

This policy path is designed to be similar to the feed-in tariff system currently in place in Germany, but only to be implemented if the RPS fails to make progress in meeting policy objectives. Under this option, long-term, fixed-price contracts would be made available to all new renewable resources that are eligible under the RPS, regardless of size. There would be no cap on generator size, and the tariffs would be differentiated by technology and by project size. This policy path also includes preferential treatment for repowered resources.

The key differences between this policy path and the German feed-in tariff approach are that the initial price would be set using a differentiated competitive benchmark process, rather than through an administrative process, and there would be caps on certain emerging resources to limit policy cost impacts.

A central feature of this policy path is that its imposition would be conditional, only taking effect if the RPS target of 20 percent by 2010 was not satisfied. If the RPS targets were not successfully achieved, the feed-in tariff would come into effect in 2012 or 2013 to provide additional tools to ensure that the state goal of 33 percent by 2020 would be met.

Pros: This policy could rapidly accelerate the development of renewable resources in California to help meet the 2020 goal on schedule. The long-term, technology-differentiated contracts would also likely contribute to investor security and promote a diverse mix of renewable resources. The existence of uncapped, standard-offer contracts for near-market renewables could also help stabilize rates and potentially suppress wholesale prices, whereas the cap on emerging renewables could help control policy costs. Finally, the inclusion of a trigger mechanism allows the RPS more time to perform, while at the same time providing insurance that increased progress toward the 33-percent goal could be made if the RPS does not meet the 2010 target.

Cons: As discussed previously, an uncapped feed-in tariff open to generators of all sizes creates uncertainty in terms of the level of policy response, and therefore, policy impact and policy cost. Exactly how such a tariff would interact with the RPS solicitations would need to be worked out. Also, the competitive benchmark approach has not been used widely in the U.S. or internationally, and it is uncertain how it would perform. Finally, this policy path would not address technical barriers such as the lack of transmission in the most resource-rich areas.

Policy Path 2

Similar to Policy Path 1, Policy Path 2 would provide generators with a long-term, fixed-price contract but would have several critical differences. This policy path would go into effect immediately, rather than waiting for a trigger mechanism, but would be implemented as a short-term, 3-year pilot program, rather than a full-scale, unbounded incentive program. Generators would have a 3-year window to come on line and lock into their long-term feed-in tariff rates, after which the program would be evaluated. The pilot would only be available to projects 20 MW and larger and would have no caps. Finally, the tariff would be value based, rather than cost based, and would be technology neutral.

Pros: Option 2 moves into feed-in tariff implementation immediately and would give the state experience with standing prices offered to larger projects in conformance with the original scope of the 2007 *Integrated Energy Policy Report* (IEPR) direction for feed-in tariff evaluation. Moreover, the pilot nature of the tariff and the fact that it was value based could address stakeholder concerns over uncertain policy duration and cost.

By focusing on larger projects that might respond to RPS but in the context of a pilot program, this policy path would help identify the degree to which some issues identified with respect to the current RPS solicitations process are actually barriers. Some questions that could be answered by such a pilot include:

- Will a standing price at a comparable level help reduce development costs and transaction costs to make projects more viable?
- Will certainty of a long-term contract make more projects viable at a value-based price by lowering risk and cost of capital?
- Will availability of a price similar to those available under RPS solicitations on a standing basis overcome issues associated with solicitation timing and the chicken-and-egg challenge of providing firm pricing before resolving all permitting/transmission issues?

Cons: By targeting only technologies larger than 20 MW using a value-based methodology, it is unlikely that the feed-in tariff would achieve the policy priority of creating a diverse mix of renewable resources—both in terms of project size and technology type. Furthermore, given the pilot nature of the policy, it is unlikely that a sufficient quantity of renewable resources would be developed to meet the RPS objectives. In particular, long lead-time projects such as biomass projects would not be likely to participate unless already well into the development process by the time the tariff was offered. Finally, depending on the value upon which the policy is based was determined (for example, a natural-gas-based market price referent (MPR)), the policy might not allow for long-term contracts for renewable resources to serve effectively as hedges against conventional fuel prices.

Policy Path 3

Like Policy Path 1 this option also resembles the German feed-in tariff in which generators are eligible for long-term, fixed-price contracts that are technology specific and differentiated by project size. The primary differences with Policy Path 1 are that the tariffs would be set administratively, rather than through a competitive benchmark, and the policy would be triggered not by RPS performance, but by the establishment of Competitive Renewable Energy Zones (CREZs) by 2010/2011. Most significantly, the feed-in tariff would be geographically limited to resources located within a CREZ footprint and the quantity eligible to take the feed-in tariff price would be capped at the transmission capacity in place and /or planned for the CREZ. This policy path would specifically be designed to encourage generation within a CREZ as soon as possible after transmission becomes available, but renewable energy projects would proceed along their own development timeline and would not be otherwise constrained by the timing of transmission completion and associated RPS solicitations. It would also be designed to limit exercise of market power in CREZ areas, a concern discussed in the 2007 IEPR. Finally, the policy would target systems over 1.5 MW, in acknowledgment of the fact that there is already a feed-in tariff in place for generators below that threshold and that few small projects would likely be developed in a CREZ footprint whose purpose is to assist in transmission planning to bring large amounts of energy from renewable rich areas to load.

Pros: According to recent state estimates, there is sufficient renewable resource potential in the CREZs to meet the long-term renewable goal of 33 percent by 2020.[47] As a result, Option 3 would have many of the same positive aspects as Option 1 in that the policy would help meet the state targets, would contribute to a diverse mix of renewable resources, and would encourage investor security. The primary benefit over Policy Path 1 is that CREZs will define areas with high quality renewable energy resources. As a result, cost-based feed-in tariffs could be set lower than comparable tariffs in less resource rich areas of the state.

The limitation of a feed-in tariff for renewable development to the CREZ would also address some of the concerns about how to implement a feed-in tariff more generally, about how a feed-in tariff would interact with the RPS, and the effectiveness of feed-in tariffs in a transmission-constrained environment. By establishing the feed-in tariff availability and pricing once the commitment was made to move forward with constructing transmission to the CREZ, this policy path could eliminate the multiple-contingency (transmission being built and winning a solicitation) chicken-and-egg barriers to renewables development, allowing generators to move more aggressively in their development once transmission construction is committed.

This policy option could also help streamline administrative review of proposed renewable generation by encouraging CREZ-based interconnection studies and programmatic environmental impact studies.

Cons: This policy path would face many of the same concerns as Policy Path 1 over cost control, especially since there is no cap on emerging resources, but to a lesser degree since the quantity would be limited by CREZ transmission capacity. By limiting the categories of eligible resources to nearer-market types, or limiting the quantity of emerging resources, these concerns could be mitigated. This policy path would also face the challenges inherent in establishing the "right" cost-based price administratively, as discussed in the draft *Issues & Options Report*. Finally, because of the quantity limits imposed by CREZ transmission capacity, there could be speculative queuing issues that would need to be addressed.

Policy Path 4

This policy path constitutes a solar-only pilot feed-in tariff. It combines elements of Policy Paths 1 and 2, in that it is cost-based and a pilot program. Rather than being limited to a specific window of time, however, the pilot-scale for the tariff would be accomplished by

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[47] For more information see 2004 IEPR Update http://www.energy.ca.gov/reports/CEC-100-2004-006/CEC-100-2004-006CMF.PDF

limiting it to a single utility territory. Eligibility would be limited to solar installations larger than the net metering limit of 1 MW. It is also envisioned that there would also be a capacity cap on this option.

Pros: The availability of long-term, technology-specific contracts for solar power would provide investors and developers with market certainty and enhance financial security (particularly if the tariff was set at an aggressive price point), and the existence of a solar-specific feed-in tariff would provide an incentive for systems larger than the net metering threshold. The technology would also provide an opportunity to develop solar thermal electric systems in resource-rich areas in the near term. This policy path directly contributes towards meeting the diversity goals enumerated by the Energy Commission, and as discussed below, could be established independently (in concert with) another policy path.

Cons: This policy path is unlikely to fully achieve the state's diversity or renewable energy quantity goals unless combined with other paths. Moreover, the focus on solar energy alone might not contribute to the goal for renewable energy to help stabilize rates since solar energy is likely to be above-market. The quantified caps could undermine some of the investor confidence created by the long-term contracts, depending on the structure of the cap.

Policy Path 5

Similar to Policy Path 4, this policy path is limited to a single technology—in this case, sustainable biomass. Tariffs would be cost-based and differentiated by size, and also differentiated by fuel to take into account different costs and characteristics of different feedstocks. All feedstocks would need to meet applicable sustainability criteria.[48] Unlike the solar-only option, the biomass path would be available in every market, rather than on a pilot scale in a single utility, and would not be capped. Finally, unlike the other policy paths, which would incorporate long-term contracts or price guarantees, the contract term in this path would be either short- or medium-term in acknowledgement of the fuel price risk that longer term contracts would place on biomass developers and investors. As discussed below, this option could be established independently (in concert with) another policy path.

Pros: The feed-in tariff would respond to Executive Order S-06-06 relative to biomass, contribute to diversity goals, and also reinforce the importance of identifying sustainable feedstocks and resource management strategies for biomass.

Cons: Similar to the solar option (Policy Path 4), the limited eligibility of the biomass-only option would prevent this policy path alone from fully achieving a diverse mix of renewable energy resources or 33 percent by 2020.

[48] The specific definition of sustainability would need to be worked out if this policy path is pursued.

Policy Path 6

This policy path follows the approach advocated through stakeholder comments to concentrate feed-in tariff attention on generators under 20 MW. Like Policy Paths 1 and 3, it resembles the German approach—cost-based long-term prices, differentiated by technology and size. Unlike Policy Path 1, however, prices would not be based on a competitive benchmark, and the tariff quantity would be uncapped. It would be established immediately statewide.

Pros: As RPS stakeholders suggested solicitations have done little for generation less than 20 MW, this approach fills a perceived gap. As such, it would augment the RPS and therefore help contribute to meeting the quantity goals, accelerating the pace of development towards 33 percent by 2020 without delay. As it involves smaller generators, the ultimate rate impact concerns are mitigated.

Cons: The biggest drawbacks to this policy path are that it would make only limited progress towards meeting a 33-percent goal due to the maximum generator size, and would present the challenge of choosing the "right" price administratively, as discussed in the draft *Issues & Options Report*.

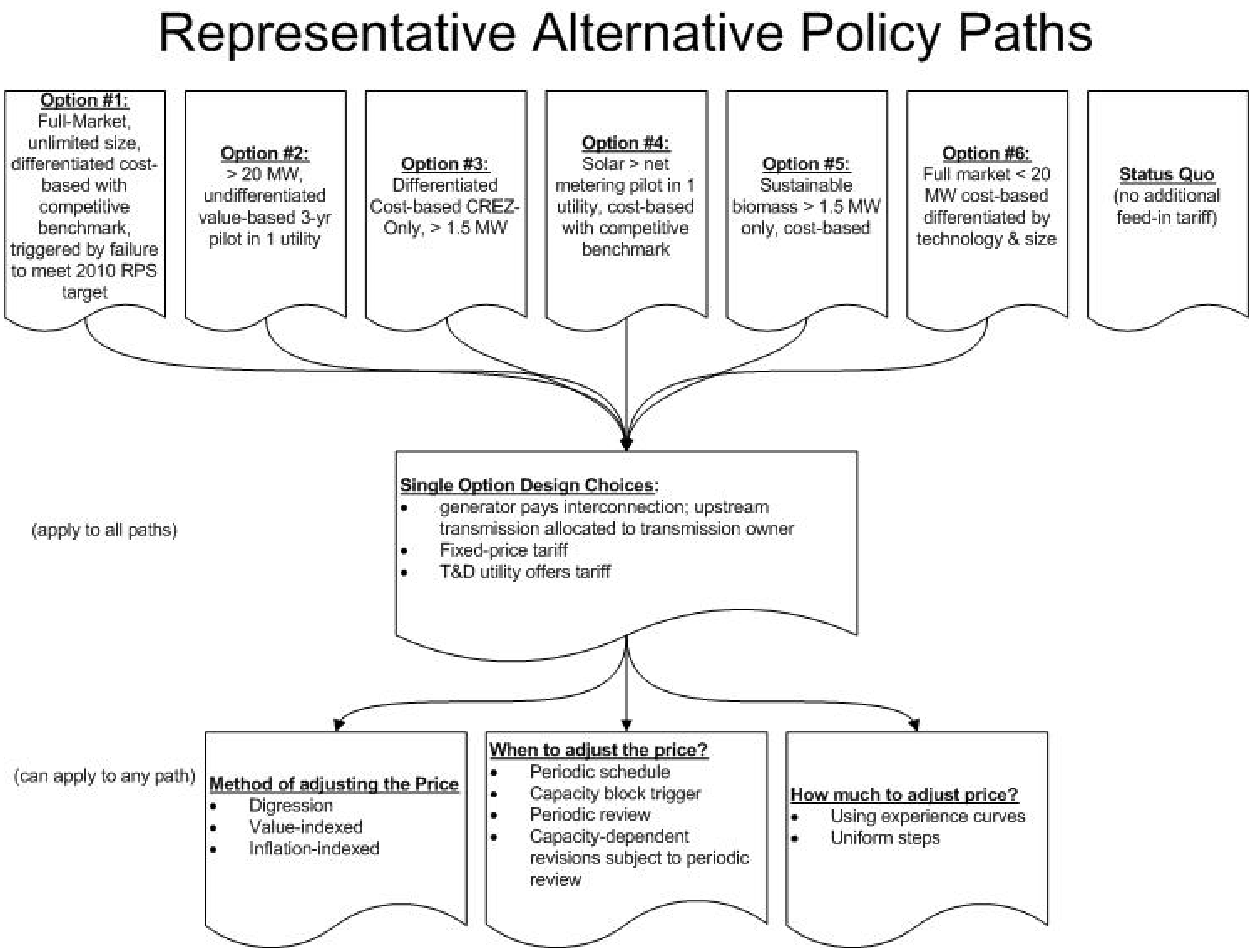
Expanded Policy Paths

The policy paths outlined in Table 6 above are incomplete, in that they do not list options for all of the design issues designated as *core issues*. This is because the remainder of the core issues did not constitute distinguishing features among the policy paths. Once the policy path is decided, the policy path characterization can be completed by:

- Adding the design features from the three core design issues for which a single viable design choice has been identified—a fixed-price tariff, offered by the transmission and distribution utility to whom the generator interconnects, with the generator paying for interconnection (and transmission company supporting network upgrades) as done today.
- Selecting from among the remaining design options for three price-related dimensions of policy design—the method of adjusting price, as well as when and by how much to adjust the price.

A diagram depicting these expanded policy paths is shown in Figure 2.

Figure 2: Expanded Policy Paths

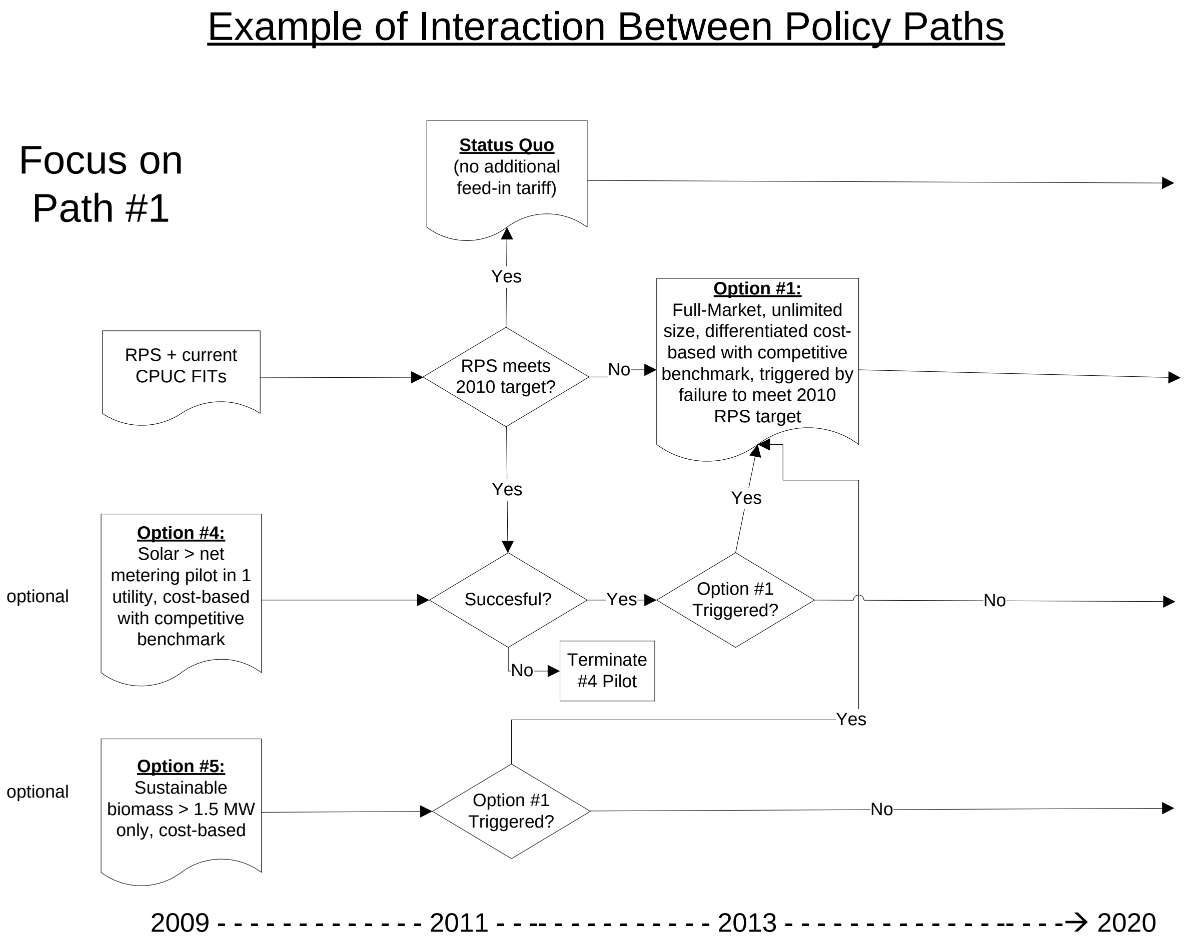


An additional choice, when a cost-based approach without competitive benchmark is used, is whether to set a cost-based tariff at an aggressive or conservative price level.

Policy Trajectories—The Potential Interaction of Policy Paths

The policy paths identified in this report, while distinct, need not be thought of as independent alternatives. Some could be adopted in concert with others or interact, and those that do not apply to the whole of the California market, or are on a pilot scale or duration, can be thought of as potentially working together along a *policy trajectory*. A policy trajectory might allow for incremental steps in advance of a comprehensive feed-in tariff policy regime. One example of a policy trajectory map is laid out in Figure 3.

Figure 3: Illustration of the Interaction of Policy Paths 1, 4, and 5



This example is focuses on the perspective of Policy Path 1, Policy Path 4, and/or Policy Path 5 being implemented, Policy Path 4 on a pilot scale for solar, Policy Path 5 for biomass only statewide—while waiting to see if the trigger event for implementing the comprehensive cost-based feed-in tariff outlined in Policy Path 1 would occur. If the RPS targets are met and the Policy Path 1 feed-in tariff is not triggered, then Policy Path 4 can be judged on its own merits as either successful and continued, or not. Similarly, Policy Path 5 would continue unaffected. However, if Policy Path 1 was to be triggered, then Policy Path 4 could be folded into the broader statewide, cost-based, differentiated set of tariffs if it were deemed successful, thereby constituting a transition policy. If Policy Path 4 is deemed unsuccessful at the end of the pilot period, it could be shut down. Similarly, the biomass tariff of Policy Path 5 could also be folded into Policy Path 1's set of differentiated tariffs.

Similar policy trajectory maps could be developed from the perspective of Policy Paths 2, 3, and 6. Policy Path 4 can be thought of as a transition to a broader policy that would, if successful, potentially be expanded to all utilities. Policy Path 5, on the other hand, would either constitute its own path, or be an adjunct to broader policy paths.

CHAPTER 7: Policy Interaction

As stated in the 2007 *Integrated Energy Policy Report* (IEPR), there is currently a need to establish more cohesive statewide approach for renewable development that identifies preferred renewable generation and transmission projects. This chapter examines areas of policy overlap related to feed-in tariffs and other statewide initiatives.

Integration of Feed-In Tariffs With the Existing RPS Framework

As examined in the *Draft Issues & Options Report*, a key question is how best to integrate feed-in tariff design with the existing framework in California. Feed-in tariffs offer an alternative approach to funding renewable generation and may help to achieve larger deployment of renewable generation at lower costs, provided that the tariffs are designed in a cost-effective manner. California is already experimenting with feed-in tariffs through several different mechanisms:

- Assembly Bill 1969[49] requires that each electrical corporation develop a tariff for public water and wastewater facilities up to 1.5 megawatts (MW) in size, priced at the market price referent (MPR), up to a statewide cap of 250 MW.
- California Public Utilities Commission (CPUC) Decision 07-07-027 implemented Assembly Bill 1969 and also requires that Pacific Gas and Electric Company (PG&E) and Southern California Edison Company (SCE) implement feed-in tariffs priced at the MPR for up to about 230 MW of renewable facilities, each up to 1.5 MW in size and owned by customers other than public water and wastewater agencies.[50]
- SCE offers standard contracts for biogas and biomass generators less than 20 MW priced at the 2006 MPR of approximately $0.08 per kilowatt hour (kWh). [51]
- In June 2008, the CPUC issued an amended scoping memo and ruling of assigned commissioner on whether to extend the feed-in tariff to customers of SDG&E and whether to raise the project cap from 1.5 MW to 20 MW.[52]

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[49] Assembly Bill 1969 (Statutes of 2006, Chapter 731), codified in Public Utilities Code Section 399.20.

[50] In Decision 07-07-027, the CPUC chose not to apply a feed-in tariff for customers other than public water and wastewater agencies to SDG&E, Sierra Pacific, or PacifiCorp.

[51] The expiration date for SCE's Standard Contract for Biomass is 12/31/2008 or 250 MW, whichever comes first. As of early June 2008, SCE has 11 MW under contract, 23 MW in negotiation, and 22 MW of inquiries. If SCE does not reach 250 MW by 12/31/2008, SCE may consider continuing to offer the contracts in 2009. The SCE "Protocol" document is available at http://www.sce.com/NR/rdonlyres/F0F1759B-8D9B-4DD9-B249-6879680DD531/0/080314_BSC_Protocol.pdf

To meet the RPS requirements, California investor-owned utilities (IOUs) conduct annual RPS procurement solicitations that are approved by the CPUC. The RPS least-cost best-fit provisions are somewhat at odds with a feed-in tariff policy, particularly if the state is considering a feed-in tariff that includes generation cost-based payments for emerging technologies. One option for incorporating the two is for the IOUs to continue preparing annual transmission ranking cost recovery reports and incorporate the estimates into the feed-in tariffs. A second possibility is to make the feed-in tariffs region-specific and offer higher tariff rates where transmission is less constrained and lower rates in more transmission constrained areas. The "best-fit" provisions could also be incorporated as adders to feed-in tariffs to favor such elements as dispatchability and on-peak delivery, among other factors. The IOUs could prepare periodic least-cost best-fit reports and indicate to the CPUC which system factors they would like to see reflected in the feed-in tariff rates. Finally, if the feed-in tariff were defined as a wholly separate policy from the RPS, it is conceivable that the least-cost-best-fit strictures would not apply to the feed-in tariff.

As noted earlier in chapter 4, stakeholders recommended that feed-in tariffs incorporate environmental attributes and renewable energy credits (RECs), and that all benefits should be held by the utility to count towards its RPS procurement targets.

Senate Bill 107 (Smitian and Perata, Chapter 464, Statutes of 2006) granted the California Public Utilities Commission (CPUC) the ability to authorize the use of tradable renewable energy credits (RECs) toward RPS obligations. However, before the CPUC can authorize tradable RECs, the CPUC and the Energy Commission must jointly conclude that the tracking system is operational, capable of independently verifying that all renewable energy used for RPS compliance is generated by an eligible facility and delivered to the retail seller, and can ensure that renewable energy credits shall not be double counted by any seller of electricity within the service territory of the Western Electricity Coordinating Council (WECC). To this end, the CPUC and Energy Commission are collaborating on a *Joint Commission Staff Report*, estimated to be finalized and approved by both commissions in November 2008, to demonstrate that the tracking system has met these conditions.

Interaction of Feed-In Tariffs with Assembly Bill 32

The California Air Resource Board released the AB 32 Draft Scoping Plan in June 2008 which states the following: "Based on Governor Schwarzenegger's call for a statewide 33 percent RPS, the Draft Scoping Plan anticipates that California will have 33 percent of its electricity provided by renewable resources by 2020, and includes greenhouse gas emission reductions based on this level in the Draft Plan."[53]

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[52] California Public Utilities Commission. *Amended Scoping Memo and Ruling of Assigned Commissioner Regarding Phase 2 of Tariff and Standard Contract Implementation for RPS Generators*. June 5, 2008. http://docs.cpuc.ca.gov/efile/RULC/83784.pdf.

[53] California Air Resources Board. AB 32 Draft Scoping Plan. June 2008.

AB 32 sets a goal of reaching 1990 emissions by 2020. The Governor has set a long-term goal of GHGs being 80 percent below 1990 levels by 2050. Renewable energy development policies should be designed to meet the 2020 goals in a way that sets the state on a path to reach the 2050 goals.

Feed-in tariffs should be looked at as a mechanism that may for help the state achieve the 33 percent renewables by 2020 and AB 32-green house gas reduction goals. Toward this end, the 2007 IEPR specifically recommends that the greenhouse gas reductions attributable to the RPS should be removed from any cap and trade system. The need for the separation between the RPS and a cap-and trade system is due to the additionality issues that exist in the carbon markets. In August 2008, the CPUC issued an order defining a renewable energy credit as including all renewable energy and environmental attributes, and further stating that a REC can be issued for RPS compliance or as an offset for greenhouse gas emissions, but not both.[54]

Interaction With Competitive Renewable Energy Zones

As noted in the 2007 IEPR, investments in California's transmission infrastructure are required to access in-state and out-of-state renewable resources. For that reason, any distinction among the policy mechanism(s) used to support renewables will be severely muted unless additional transmission is built.

Efforts to address this need include the California Independent System Operator's location-constrained resource interconnection process and the Renewable Energy Transmission Initiative (RETI), which the Energy Commission is funding and is a major participant. Some early successes have been realized—the Tehachapi transmission project is under construction that will access up to 5,000 MW of wind when fully in service. Competitive Renewable Energy Zones are being developed in the RETI process to facilitate transmission planning to renewable rich areas.[55] There is a similar renewable energy zone process underway for the WECC.[56] A successful example of the CREZ like process is the Tehachapi transmission project which is under construction and will access up to 5,000 MW of wind when fully in service.

Transmission additions are lumpy, adding hundreds or even thousands of megawatts, depending on the size of the transmission project. To avoid the risk of under-utilized transmission lines, keep downward price pressure on renewable generators in newly interconnected CREZ areas, facilitate geographically clustered interconnection studies and programmatic environmental impact studies, and build investor confidence in renewable energy development, the timing and capacity levels of feed-in tariffs should be designed to

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54 California Public Utilities Commission. *Decision on Definition and Attributes of Renewable Energy Credits for Compliance with the California Renewables Portfolio Standard.* D.08-08-028, August 21, 2008. http://docs.cpuc.ca.gov/word_pdf/FINAL_DECISION/86954.pdf.

55 For more information visit http://www.energy.ca.gov/reti/index.html

56 For more information visit http://www.westgov.org/wga/initiatives/wrez/index.htm

match expected new transmission additions. Applying expanded feed-in tariffs should be in place before the transmission is placed into operation so that development of renewable energy projects can proceed while the transmission is being constructed may have some potential to more effectively utilize transmission built to reach these areas, and should be explored further.

Many of the areas rich in renewable resources are located far from load in California. In light of once-through cooling requirements, aging near-load power plants, and pending greenhouse gas emission reduction policies, near-load resources are likely to be needed to maintain system stability and local area reliability.[57] Although the use of distributed generation PV is expanding through the California Solar Initiative (3,000 MW expected by 2017)[58] and the 2007 IEPR[59] recommended ambitious goals for net-zero energy homes and buildings, further changes will be needed.[60] The California Independent System Operator (California ISO) is studying the potential for increased energy storage and demand response to help accommodate 33 percent renewable energy by 2020, including a scenario with as much as 8 percent of the 33 percent target met with distributed generation.[61]

Interaction With a Feed-In Tariff and the Public Utility Regulatory Policies Act

There have been concerns raised in California, and beyond, that the Public Utility Regulatory Policies Act (PURPA) would effectively cap the CPUC's ability to set rates at short run avoided cost (SRAC). This limitation only applies to Qualified Facilities, rather than to wholesale rate setting in general. For PURPA to apply to a feed-in tariff, a generator would have to register at the Federal Energy Regulatory Commission (FERC) as a Qualifying Facility. This is unlikely, precisely because of payments being capped at SRAC. Furthermore, it would not be surprising if in the near future, particularly once the California ISO implements its Market Redesign and

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[57] For more information visit http://www.energy.ca.gov/2008_energypolicy/documents/2008-07-21_workshop/2008-07-21_TRANSCRIPT.PDF

[58] For more information visit http://www.gosolarcalifornia.org/

[59] For more information visit Chapter 3 "Meeting Energy Needs with Efficiency and Demand Response" recommendations (P. 99) of the 2007 IEPR at http://www.energy.ca.gov/2007publications/CEC-100-2007-008/CEC-100-2007-008-CMF.PDF

[60] For more information visit CERTS presentation from the July 23, 2008 IEPR Workshop http://www.energy.ca.gov/2008_energypolicy/documents/2008-07-23_workshop/presentations/John_Ballance%20Renewables_Integration.pdf and the study to be published at http://www.energy.ca.gov/reports/index.html

[61] For more information visit http://www.energy.ca.gov/2008_energypolicy/documents/2008-07-21_workshop/presentations/David_Hawkins_CAISO_Plan_for_Integration_of_Renewable_Resources.pdf and the transcript from the July 21, 2008 IEPR Workshop http://www.energy.ca.gov/2008_energypolicy/documents/2008-07-21_workshop/2008-07-21_TRANSCRIPT.PDF

Technology Update, FERC is petitioned by California utilities to exempt them from future PURPA purchases as allowed by the Energy Policy Act (EPAct) of 2005 under certain conditions. Therefore, PURPA may not be relevant to California in the mid-to-long term.

More likely, a feed-in tariff generator will register as an exempt wholesale generator under EPAct. FERC may rule on purchases from a feed-in tariff generator but under a "market-based" doctrine, where the market will likely be defined as the market for renewable energy generators.

Loading Order of Renewable Energy Generation Types

California's Energy Action Plan[62] establishes a loading order for resources that lists energy efficiency as first in the loading order, followed by demand reduction measures, distributed generation, renewable generation and conventional generation resources. However, there are no policies that establish preferences or a loading order for the different renewable energy technologies within the renewable energy generation category at this time. Although there are incentive programs for some existing and emerging renewable energy technologies, the current RPS procurement policy requires all eligible technologies to compete based on ability to meet the least-cost-best-fit criteria. Alternative policies could establish a preferential hierarchy of different renewable energy generation or simply remove the natural bias towards cheaper technologies.[63] Key design issues include:

- The policy can favor particular characteristics of renewable energy generation, for example, technology, fuel type, size, vintage, or ownership type.
- Alternatively, the policy can eliminate the price bias that favors cheaper technologies. The goal of such a policy would be to reduce contract failure and achieve a more diverse portfolio of renewable energy generation.

If a loading order for renewable energy is established, feed-in tariffs could be designed to target technologies at the top of the loading order or the technologies that are under-served by the current procurement policy.

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[62] http://www.energy.ca.gov/2008publications/CEC-100-2008-001/CEC-100-2008-001.PDF

[63] For more information visit Green Power Institute's comments for the July 21, 2008 IEPR Workshop http://www.energy.ca.gov/2008_energypolicy/documents/2008-07-21_workshop/comments/TN_47448_Green_Power_Institutes_Comments_on_Staff_Workshop.pdf and discussion from the August 21, 2008 IEPR Workshop http://www.energy.ca.gov/2008_energypolicy/documents/2008-08-21_workshop/2008-08-21_TRANSCRIPT.PDF

CHAPTER 8: Conclusion and Next Steps

As directed by the 2007 *Integrated Energy Policy Report* (IEPR), this report investigates the advantages and disadvantages of a range of feed-in tariff policy paths for California. In addition, based on public comments on the *Draft Issues & Options Report* and guidance from the Energy Commission's Renewables Committee, this report discusses potential policy path interactions for California. A workshop is scheduled for October 1 to discuss whether the potential expanded feed-in tariff policy options included in the report represent the best approaches for helping California meet its renewable energy objectives.

The six policy paths evaluated in this report are not mutually exclusive and represent a range of options, from pilot programs to implementation of an expanded feed-in tariff open to all technologies and project sizes. As discussed in Chapter 7, feed-in tariffs do not preclude developers from participating in the RPS solicitation process; feed-in tariffs can be implemented in parallel with the competitive solicitation process.

Achieving 33 percent renewables by 2020 is an important part of the non cap-and-trade efforts to bring greenhouse gas emissions to 1990 levels by 2020 through the AB 32 implementation process. The pathways used to achieve this renewable energy goal should be designed to help set a course toward achieving the Governor's goal of GHGs being 80 percent below 1990 levels by 2050.

In addition, the procurement processes used to achieve 33 percent should be designed to stimulate development in geographically preferred areas, such as resource rich areas targeted for transmission development and areas where adding renewable generation strengthens the reliability and operational stability of the state's electricity system. Expanded feed-in tariffs can help expedite development of new generation in these areas.

In regard to next steps, comments received from the workshop on October 1, 2008, will be taken into consideration in developing a final *California Feed-In Tariff Design and Policy Options Report*, to be presented and discussed at a Joint Renewables and IEPR Committee workshop scheduled for November 20. A final report will be published in December 2008 or January 2009. The final report is intended to inform further consideration of this issue in the 2009 IEPR.

As directed by the 2007 *Integrated Energy Policy Report* (IEPR), this report investigates the advantages and drawbacks of adopting feed-in tariffs in California and, based on public comments on the *Draft Issues & Options Report* and direction from the Energy Commission's Renewables Committee, articulates possible future feed-in tariff policy paths for California. The report's specific purpose is to stimulate stakeholder and policymaker input and feedback on which potential future policy options for using feed-in tariffs will best help California meet its renewable energy objectives.

The six policy paths evaluated in this report are not mutually exclusive and represent a range of options, from pilot programs to full implementation of an expanded feed-in tariff open to all technologies and project sizes. A possible implementation path reflecting stakeholder comments that the Energy Commission should adopt a go-slow approach and further evaluate the success of the existing feed-in tariff program, (Assembly Bill 1969, Yee, Chapter 731, Statutes 2006), but also recognizing the urgent need to develop new and expanded renewable energy to reduce green house gas emissions and to insulate California's electrical generation system from adverse price and reliability impacts resulting from oil and gas depletion. The implementation pathway presented in this report (Figure 3, pg. 47) was developed to provide policy makers with a possible blueprint for how to successfully introduce an expanded feed-in tariff into California in a measured approach.

Before an expanded feed-in tariff for California can be implemented, areas of key policy interaction between a feed-in tariff program and the existing Renewables Portfolio Standard RPS and Climate Change Programs will need to be resolved. In addition, the efficacy of tying expanded feed-in tariffs to the development of new transmission in CREZs must also be considered. This report provides the Energy Commission with the information it needs to address necessary policy and statutory changes in order to implement any of the options included in this report. Specifically, the Energy Commission will consider appropriate policy recommendations during the development of the 2009 IEPR, and during this process also identify any necessary statutory changes for implementing an expanded California feed-in tariff. And finally, implementation of an expanded feed-in tariff must be coordinated with California Public Utilities Commission, taking into account their proceeding to examine the desirability of offering an expanded feed-in tariff for projects potentially as large as 20 MW.

Glossary

AMF	Above-MPR Funds
CCA	Community Choice Aggregator
CREZ	Competitive Renewable Energy Zone
CPUC	California Public Utilities Commission
EPAct	Energy Policy Act
ESP	Energy Service Provider
EU	European Union
FERC	Federal Energy Regulatory Commission
IEPR	Integrated Energy Policy Report
IOU	Investor-Owned Utility
kWh	Kilowatt hour
LSE	Load Serving Entity
MPR	Market Price Referent
MW	Megawatt
PG&E	Pacific Gas and Electric Company
POU	Publicly Owned Utility
PURPA	Public Utility Regulatory Policies Act
PV	Photovoltaic
REC	Renewable Energy Credit
RETI	Renewable Energy Transmission Initiative
RPS	Renewables Portfolio Standard
SCE	Southern California Edison
SRAC	Short Run Avoided Cost

APPENDIX A: Feed-In Tariff Design Issues and Options

Design Issue Category & Dimensions	Initial Options
Resource Type: Which Technologies Targeted?	1. All RPS-eligible renewables 2. Only for a certain subset of eligible resources, for example, mature vs. emerging resources 3. Specific ownership models (for example, community-owned, or wastewater or water treatment facilities)
Generator & Technology Eligibility - Vintage	1. Current RPS definitions (includes existing resources) 2. New generators only (typical European approach) 3. Qualification life = Contract duration - years in operation 4. Generators online after a certain date
Generator & Technology Eligibility - Generator Location	Generator eligible for… 1. Only for tariff of interconnecting utility 2. Any feed-in tariff for generators within California (with delivery, or without (for example, RECs)?) 3. Any California feed-in tariff conditioned on energy delivery?
Generator & Technology Eligibility - Generator Location: If a generator may choose from available feed-in tariffs…	1. Can any generator elect do so? Or only generators with no local option? 2. Could the generator elect any tariff or just the nearest? 3. Generation transmitted to utility paying feed-in tariff, or via RECs? 4. Open only to generators within California, or regardless of location?
Generator & Technology Eligibility - Interconnecting Utility Requirements	1. Require POUs and IOUs to establish feed-in tariff (statewide) 2. - Require only IOUs to establish feed-in tariff
Generator & Technology Eligibility - Project Size	1. -No Size limit - Capacity-based project size caps - Capacity-based project size floors 2. - Energy-based project size limits, for example, resource intensity or capacity factor
Setting the Price – Approach	1. Value based?

Design Issue Category & Dimensions	Initial Options
	2. Cost-based? 3. Competitive benchmark (all head-to-head, vs. stratified?)
Setting the Price – Approach: If value based….	1. Base payments on value of energy delivered 2. Modified Avoided Cost Approaches (Time-of Delivery; Adders: Environmental Externalities, Grid-side benefits) 3. Wholesale vs. Retail Price Reference
Setting the Price – Approach: If cost-based…	1. Setting the profit level 2. Defining a generator cost level (Conservative: vs. Aggressive)
Setting the Price – Approach: If competitive benchmark…	1. What is eligible? (All, or differentiated by type?) 2. Mechanism and Frequency for determining benchmarks (for example, All prices determined by periodic auctions vs. Recent/ representative benchmark) 3. Adjustment Factor
Tariff Structure over multi-year contract	1. Fixed price 2. Stepped fixed-price 3. Fixed premium (adder on top of the market price) 4. Hybrid: only some disaggregated products sold under tariff 5. Contract-for-difference
Contract Duration	1. Short term (3-7 yrs) 2. Medium term (10-14 yrs) 3. Long term (10-20 yrs) 4. Developer choice 5. Indefinite term
Adjusting Price over Time	1. No adjustment 2. Fixed with inflation adjustment 3. Tariff digression 4. Indexed to change in measure of value
Adjusting Price over Time: When to adjust price?	1. Periodic revisions: Scheduled price decreases 2. Capacity dependent revisions: Quantity blocks. Price declines when a block is fully subscribed 3. Periodic review
Adjusting Price over Time - How much to Adjust Price?	1. Experience Curves 2. Uniform Steps
Tariff Differentiation	1. Technology Type

Design Issue Category & Dimensions	Initial Options
	2. Project Size 3. Resource Quality 4. Commercial Operation Date (for example, target existing or repowered generators) 5. Ownership Structure 6. Transmission Access – Higher payments to facilities that are near transmission or load 7. Location – for example, Target load pocket or discourage transmission constraint area
What is being sold/purchased?	1. All commodities bundled 2. Commodity-only (for example, energy without RECs) 3. RECs only 4. Energy + RECs (that is, unbundled capacity rights & ancillary services) 5. Commodity + RECs
Cost Distribution/Allocation - Who Buys?	1. Retail generation sellers (IOUs, POUs, ESPs, CCAs) 2. - Providers of T&D service (IOUs & POUs if applicable)
Cost Distribution/Allocation - Who pays? (cost allocation)	1. Without statewide reallocation 2. Reallocate the aggregate annual feed-in tariff costs to equalize the costs among utilities with feed-in tariffs 3. All customer classes vs. exempting some classes
Cost Distribution/Allocation - Cost Recovery Mechanisms	1. Through Generation rates 2. Through separate charge on T&D rates
Management of Cost Collection & Distribution - who manages/oversees?	1. State regulators? 2. Utilities? 3. Third party under contract?
Integration into Power Supply of Utilities & Others	1. All generation products sold into the spot markets; 2. All Generation products delivered to utility's system incorporated into the utility's own power supply 3. Allocate dollars if necessary 4. All generation products allocated to and delivered to each utility in proportion to their respective load.

Design Issue Category & Dimensions	Initial Options
Access - Who pays for direct costs of interconnecting feed-in tariff generators to the grid?	1. Generators pay (current policy) 2. Costs socialized
Access - Who pays for upstream transmission improvements required to interconnect a feed-in tariff generator for upgrades < 200 kV?	1. Costs allocated to local transmission owner (current California ISO practice) 2. Costs socialized more broadly
Access – Should CPUC Rule 21 address grid access for distributed generation for up to 10 MW? Should greater tariff standardization be pursued?	1. Update Rule 21 2. Status quo
Credit and Performance Assurance - Queuing Procedures: If price declines with quantity or quantity caps apply.	1. (non-refundable) Application fee 2. Security accompanied with project milestones (Up-front fee, refundable if project reaches fruition by milestone date) 3. Security increases in exchange for time extensions
Credit and Performance Assurance	1. Development security ; 2. Operation collateral or security
Quantity & Cost Limits	1. Quantity cap based on capacity 2. Quantity cap based on generation 3. Cost cap