From: Cherry, Brian K
Sent: 9/9/2010 8:05:54 AM
To: 'agc@cpuc.ca.gov' (agc@cpuc.ca.gov)
Cc:
Bcc:
Subject: Fw: FITs: Summary of NREL Report on FIT Policy Design

Not sure if you saw this.

From: Redacted
To: Reg Rel RenewPortfolioOIR Core
Sent: Wed Sep 08 18:08:55 2010
Subject: FITs: Summary of NREL Report on FIT Policy Design

*Per request I am sending this around to the larger RPS team - apologies for the duplication if you have already received it Redacted

Purpose: Provide summary of pricing information reviewed in NREL's recent report, "A Policymaker's Guide to Feed-in Tariff Policy Design" (http://www.nrel.gov/docs/fy10osti/44849.pdf).

Action Requested: None, information only.

Summary: NREL conducted a comprehensive literature review of FIT experience around the world and distilled key lessons and best practices for use in US FIT discussions. Four approaches to payment are identified: 1) levelized cost of renewable energy (RE) generation + a reasonable profit, 2) estimated value of RE generation, 3) fixed-price incentives that are based on neither cost nor value, or 4) auction-based mechanisms. In any approach, policymakers have a choice between two types of payment - either establishing a fixed-price payment, or a premium-based payment that is incremental to market prices. The report focuses on the choice between payment types, and weighs the costs and benefits of each option - including a wide variety of price design and differentiation levers that can be used to tailor the FIT to specific policy objectives. On balance, the authors recommend that **a fixed-price payment differentiated based on key policy objectives (e.g. size, technology, location) is the most effective in terms of both cost and meeting deployment objectives.**

Further Detail:

Introduction: NREL emphasizes that the **FIT payment structure should be closely tied to the goal that the policy is intended to achieve**, whether that is GHG emissions reduction, rapid small-scale DG penetration, greater resource diversity, or technology development. There are a multitude of ways to design FIT prices, and policymakers must weigh how different options will function together in an integrated framework in order to avoid either overpaying or failing to stimulate the market.

Overarching conclusion: Fixed-Price FITs based on differentiated renewable generation costs have experienced greater success, and are more likely to provide a minimum payment level that is required to stimulate substantial renewable energy development. Complex revenue streams with multiple

components, especially if they are not fixed, tend to reduce the transparency and predictability of the investment environment, leading to higher ROI requirements. **Experience has shown that the per-kWh costs required to encourage every new kWh of production in a given technology category are lower under fixed-price policies, largely due to the lower risks for both developers and investors.**

Payment design options:

- *Percentage-based*: Set price as a percentage of retail prices. Initially attractive in Europe, but abandoned in favor of cost-based FIT frameworks due to a disconnect between cost of RE generation and retail prices set by conventional generators. Lead to opportunity for windfall profits, or alternately insufficient cost recovery.
- *Fixed-Price*: Regulator (or utility in some cases) sets a fixed price and guarantees purchase of output. Price can be front-loaded or degressed over time to achieve certain policy outcomes such as cost reductions or technology advancement, but if going that route transparency and predictability in price changes is paramount. Presumes that policymakers are able to select the desired portfolio amounts and the prices - not the case in the US.
    - Price differentiation is key to approximating cost of generation and avoiding overpayment - can differentiate prices based on project size, technology, location, resource quality, or some combination thereof to achieve multiple objectives simultaneously. One issue with price differentiation is that it can tend toward 'reasonable cost' instead of 'least cost' RE generation, but much depends on how the policymaker chooses to set up the different price signals and program caps.
    - Tariff degression is considered a FIT policy best practice. It reduces the marginal cost of RE development to society and accelerates the push toward economies of scale. One problem with degression is that it only adjusts prices downward, and cannot respond to unique situations when costs increase.
    - Time-of-Delivery (TOD) adjustments provide a more market-oriented structure by recognizing the added value to utilities and system operators of peaking energy sources.
    - *Benefits of Fixed-Price payments*: remove price risk for generators and investors, better approximates actual project costs, reduces market risk with guaranteed purchase, hedge against electricity price volatility, encourages DG, and supports emerging technologies.
    - *Challenges of Fixed-Price payments*: unresponsive to market prices, distort electricity markets, high public cost if targeted toward expensive technologies or resource areas, and limited incentive to optimize project location.
- *Premium Payment*: Renewable generator is paid a premium above the average spot market price to approximate renewable generation costs and reflect the social and environmental benefits of renewable energy. Typically does not include a purchase guarantee (e.g., must-take mandate). Assumes renewable generator is bidding into the spot market.
    - Two types: constant premium that is set and does not fluctuate, and sliding premiums that respond to market changes.
    - Constant premiums compensate for the additional risk taken when a renewable generator bids into the spot market, but can lead to overpayment.
    - Sliding premiums can increase exposure to volatility significantly, leading to overpayment or under-recovered costs, and are best applied with a cap or floor on either the premium level, or the overall payment level, to limit the possible price range.
    - Spot Market Gap Model is one option that loosely blends Fixed-Price and Premium

Payment methods: developers get a guaranteed minimum total price as a floor, with the gap between the spot market price and the guaranteed price paid to developers out of funds collected through social benefits charges. If spot market price exceeds the minimum payment guarantee, the premium goes to zero.

- *Benefits of Premium Payments*: better for optimizing market participation, able to target more efficient grid management by exposing RE to price signals, more compatible with deregulated generation markets, and encourage competition between new generators.
- *Challenges of Premium Payments*: higher average payments per kWh, increased risk without a purchase guarantee, decreased emphasis on wind and solar PV, and loses the hedge value of fixed-price renewables.

Best Practices Related to Pricing:

1. Follow the principle of cost-covering compensation: differentiate tariffs based on generation costs to encourage deployment in a wide variety of technology types

2. Use tariff degression to anticipate cost reductions in the future and encourage technological innovation and change

3. Differentiate prices by Time of Delivery (TOD) for dispatchable resources

4. If using a premium-price FIT policy, offer a sliding premium. Offers more security than a constant premium price design, reduce the chances of over or under-compensation, and is market-oriented. Use premium or total price caps and floors to retain the hedging value provided by RE development

Other Interesting Items: On a broader scale, European analyses indicate that REC markets lead to more expensive renewable procurement than FITs because the revenue streams are less predictable, increasing overall investment risk and leading to higher ROI requirements.

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Pacific Gas & Electric Co.

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