# Feed-in Tariff Design Implications for Financing of Renewable Energy Projects Over 20 MW

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# Objectives

- To explore the impact of Feed-in Tariffs ("FITs") on financing new renewable energy ("RE") generators in excess of 20 MW
  - not a comprehensive FIT design review for RE generators > 20 MW
- Summarize current conditions in RE finance markets
- Discuss policy, market & infrastructure conditions necessary to attract lowest cost financing for RE projects
- Outline specific Feed-In Tariff ("FIT") options and financing implications
- Recommend FIT design characteristics that:
  - enable RE projects > 20 MW to access lowest-cost capital
  - address stakeholder interests to maximum extent possible
  - could be applied to Competitive Renewable Energy Zones ("CREZ")



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# What is the current financing challenge?

# RE finance: U.S. landscape

| | Pre-Crisis (up to mid-2008) | Post-Crisis (Current) |
|---|---|---|
| Market Characterization | • Tax-based incentives<br>• Well-defined structures<br>• Moderate investor risk tolerance | • Tax-based incentives → Grant in lieu of ITC provides temporary cash incentive<br>• Overall market uncertainty<br>• Re-evaluation of structures: lease vs. partnership flip (PTC-based projects)<br>• Low investor risk tolerance |
| Capital Supply and Demand | • Capital supply exceeds demand (fewer projects than investment $) | • Capital demand exceeds supply (fewer investment $ than projects) |
| Tax Equity | • Robust market<br>• Many participants<br>• Low-cost | • Severely limited supply (consolidation, loss of tax appetite)<br>• Few participants<br>• High cost |
| Debt | • Robust market<br>• Long tenors (~15 year) available<br>• Low spreads | • Limited supply<br>• Shorter tenors (5-7 year "mini-perms")<br>• Widening spreads offset low cost of borrowing |
| Development Activity | • Ever increasing number of projects in development | • The pace of development has slowed considerably |
| Overall | • Capital readily available<br>• Many types of products available<br>• Low cost of capital<br>• Creative structuring | • Limited capital available<br>• Reduced number of products (e.g. turbine financing) available<br>• High cost of capital<br>• "Flight to quality" (only best projects financed) |



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# RE finance: U.S. landscape

- American Reinvestment & Recovery Act
  - Extends PTC, and offers optional ITC or Cash Grant in lieu of PTC for projects in construction by year-end 2010
  - Creates $6 billion government loan guarantee program
  - Bonus depreciation for projects in-service by year-end 2009
- Near term market drivers
  - ITC and Cash Grant: increases financing options (e.g. lease transactions for wind); increases pool of investors; eliminates production risk
  - Reduced access to development capital slows the new project pipeline
- Longer-term trends
  - Discussions of national RPS and Carbon Cap & Trade
  - Sunset date on Cash Grant may suggest continued tax-based incentives; however, limited tax appetite and budgetary constraints may require transition to policy-based incentives such as RPS, FIT and/or Carbon Cap & Trade
- Summary
  - The current supply of capital is limited, and costlier than pre-credit crisis, with only the best projects being financed
  - The number of financial products (e.g. turbine financing) is reduced
  - Long-term recovery will be driven by regulatory policy and general economic conditions



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# How to minimize the cost of financing RE?

## Identify and mitigate risk

- Policy Maker Influence = Policy Maker Ability to Increase or Decrease Risk
- The decision to invest is an evaluation of the combined risk relative to the return
- In general, the greater the risk the higher the required return

# Risks associated with RE financing (1)

| | Risk | Mitigation Strategy | Policy Maker Influence |
|---|---|---|---|
| Development (Timing) | • Project will be delayed or not be completed at all<br>• Missed milestones increase (1) cost of development capital, risk of achieving permanent financing; (2) exposure to contractual penalties (liquidated damages), loss of security, off-take contract termination risk | • Clearly defined process for siting, permitting and interconnection<br>• Off-take contract (contract for the sale of electricity and/or RECs) flexibility in commercial operation date | • High |
| Development (Contracting) | • Investment in development, proposal development, contract negotiations without yielding off-take agreement | • Assured access to off-take contract | • High |
| Contract Price Risk | • Setting a firm power purchase price before development contingencies are resolved and project costs fully known | • Minimize time gap between finalizing project costs and financial closing | • High |
| Revenue | • Adequacy of revenues to provide target returns<br>• Revenue volatility | • Long-term fixed-price contract for both energy and RECs | • High |
| Operating | • Min. availability, performance penalties<br>• Project curtailment (adds volume risk) | • O&M contract guarantees<br>• Off-take contract operational performance flexibility<br>• Priority dispatch or curtailment limitations/compensation | • High |

# Risks associated with RE financing (2)

| | Risk | Mitigation Strategy | Policy Maker Influence |
|---|---|---|---|
| Regulatory | • Incentive structure that is short-term focused, unstable, and not transparent | • Long-term, stable and transparent incentive structure | • High |
| Transmission & Interconnection | • Cost allocation exceeds pro forma | • Fix cost allocation<br>• Provide contract provisions that enable cost adjustment if allocation is higher than expected | • High |
| Credit | • Off take counterparty is unable or unwilling to pay | • Entering into contract with investment grade counterparty or securing a like guarantee | • High |
| Legal | • Time and cost of contract negotiations<br>• Appeals/lawsuits challenging procurement results | • Price incentive policy with a defined process and standardized contract | • High |
| Construction | • Delays and cost overruns | • Fixed-price date-certain construction contract | • Low |
| Resource | • Resource (i.e. sun, wind) is not available as predicted | • Third party independent assessments | • Low |
| Technology | • Technology does not perform as expected<br>• Contractual damages for performance failures | • Equipment & construction contractual guarantees and warranties | • Low |



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## How does a FIT minimize risk?

It depends on design

## Why minimize risk?

To reduce cost of energy

To increase likelihood of financing given current market low risk tolerance levels



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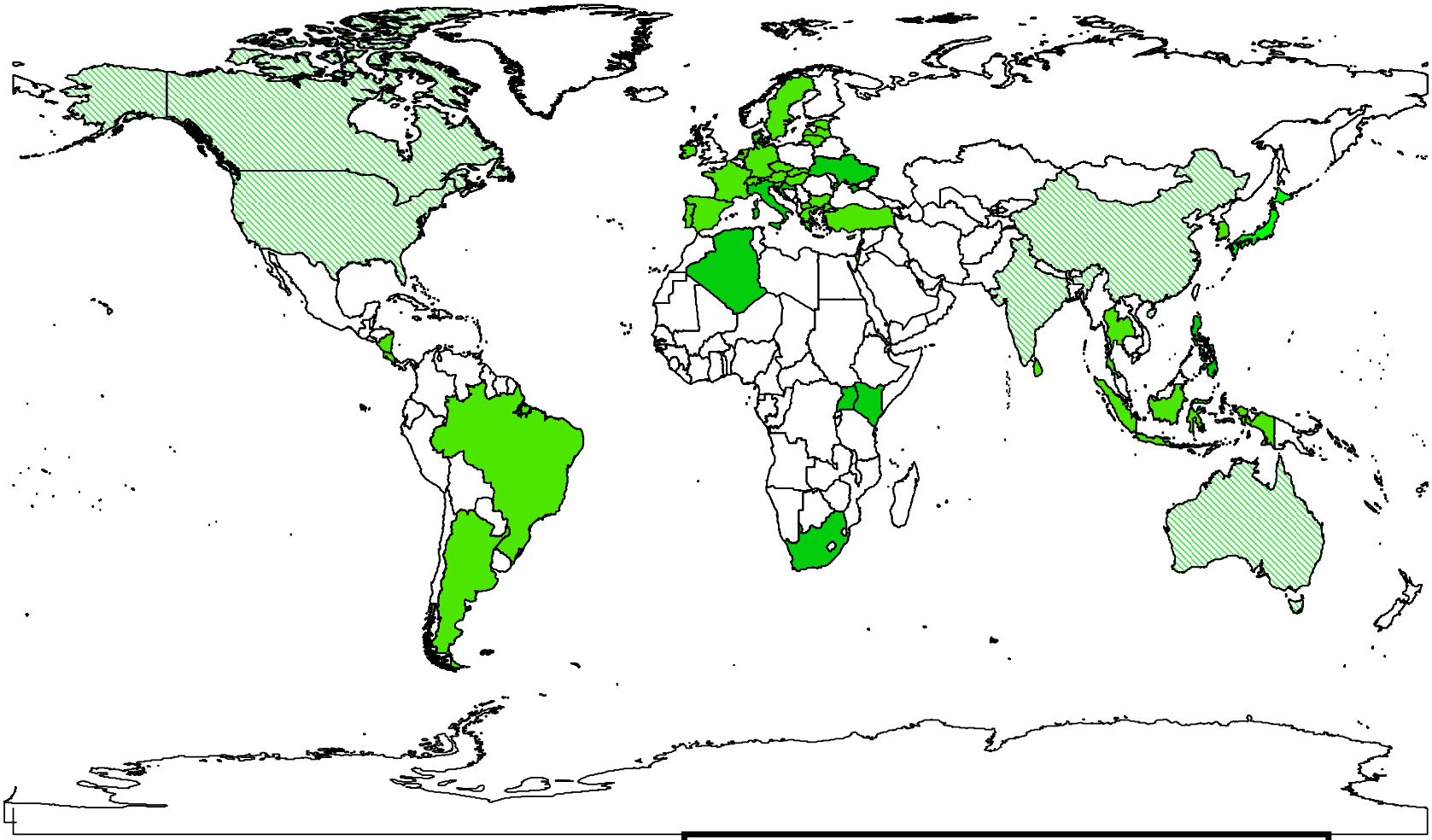
# FITs worldwide



National Feed-in Tariffs
Regional Feed-in Tariffs

Source: REN21. (2009). Renewables Global Status Report: 2008.



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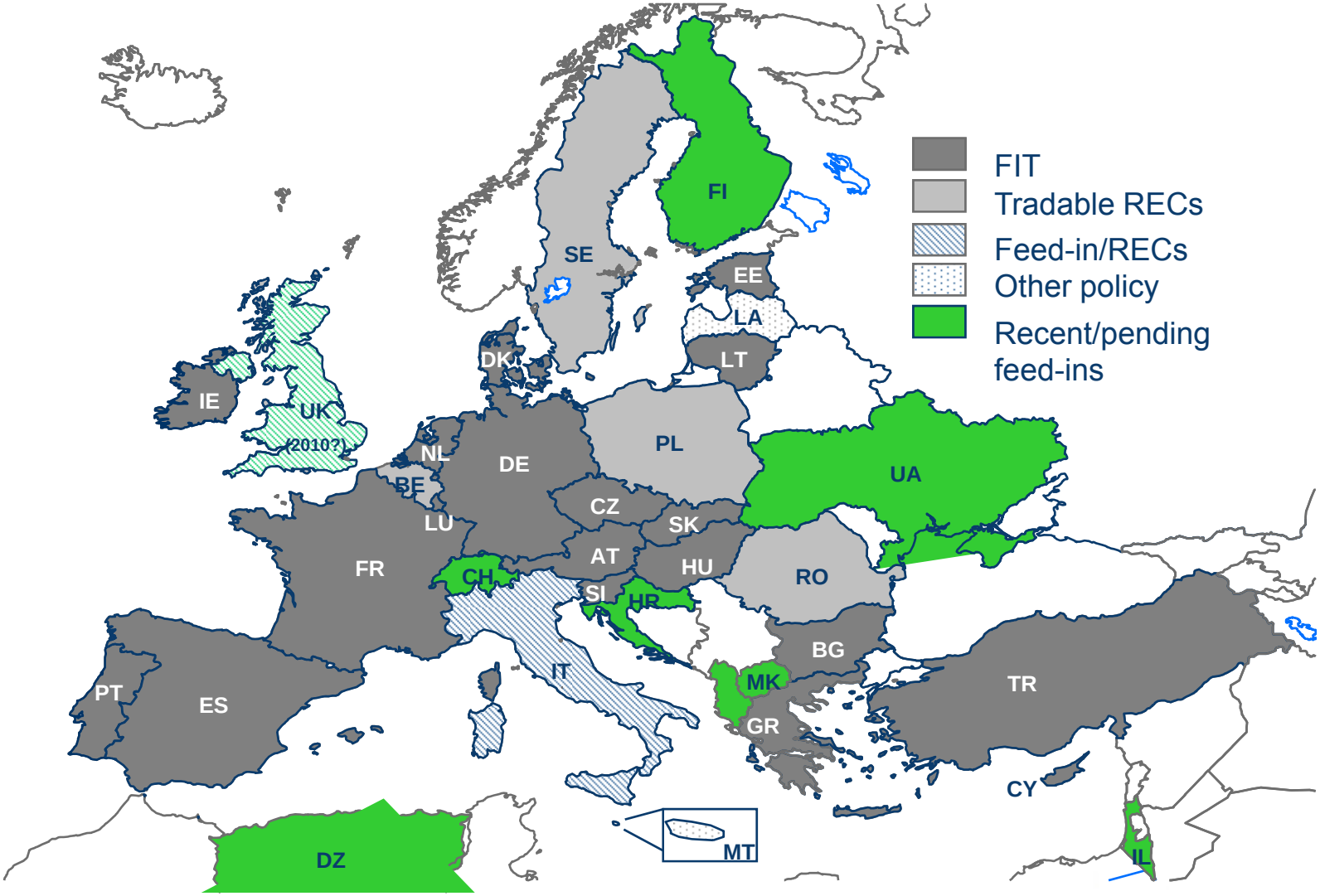
# FIT design varies widely in Europe



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# Characteristics of successful European FITs[1]

- Tariff is guaranteed and binding
- Fixed-price payment ($/kWh)
- Long-term (e.g. 20 years)
- Guaranteed interconnection
- Must-take requirement for power
- Prices based on generation cost
- Differentiated
  - By technology
  - By size
  - By application, by fuel, by resource
- Rates for new projects adjust over time

[1]As defined by the European Commission, International Feed-in Cooperation, and others



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# Achieving lowest-cost financing via FITs

- Investor confidence is determined by both price and policy certainty
- FITs providing transparency, stability and simplicity will drive long-term, lowest-cost financing
- General FIT characteristics beneficial for capital providers:

| General Characteristic | Financing Perspective |
|---|---|
| Regulatory Stability | • Avoid boom-bust cycles (i.e. PTC)<br>• Policy adjustments should be limited in frequency and market-based<br>• No adjustments (other than inflationary) for operating projects |
| Long-Term Political and Societal Support | • Long-term contracts are a financing necessity<br>• Pricing that provides a fair rate of return will attract a broader pool of investors<br>• Necessary government guarantees and support |
| Simplicity | • Incentive structure simplicity lowers cost and decreases time to completion<br>• Complexity acts as a barrier to entry for many investors |
| Transparency | • A clearly defined policy allows for assessment of risk |
| Price and Contract Certainty | • Mitigating contracting risks reduces development financing cost magnitude and risk exposure (cost)<br>• Investors will not take market price risk<br>• Creditworthy contract counterparty |
| Interconnection | • Minimize curtailment (eliminate volume risk)<br>• Clarity on interconnection cost allocation |



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# Key FIT design characteristics and financing implications – Structure

| Characteristic | Options | Financing Preference | Financing Implication |
|---|---|---|---|
| Setting Price & Tariff Differentiation | Value, Cost of Generation, Competitive Bench Marks | Cost-based pricing designed to ensure reasonable profitability; | Ensuring sufficient return is very important for securing financing |
| Tariff Structure | Fixed, Stepped Fixed, Fixed Premium, Hybrid, Contract for Differences | Options fixing all revenues are preferable to those fixing part of revenue (e.g. fixed premium) (consider inflation indexing O&M portion) | Price certainty and stability, even if there is step down, is valuable for financing |
| What is Being Sold | Bundled, Unbundled | Bundled | A bundled product reduces exposure to market price counterparty credit risk |
| Quantity and Cost Limits | Capacity Cap, Generation Cap, Cost Cap | No limits, or ample notice of changes | Quantity limits, if any, need to be clearly defined, transparent and stable |
| Queuing | Application Fee, Performance milestones, Fee for Extensions | Only as needed to address quantity/cost limits or declining tariff rates | Queuing protocols need to be clearly defined, transparent to discourage speculative queuing and ensure stable eligibility requirements |

# Key FIT design characteristics and financing implications – Contract Terms & Conditions

| Characteristic | Options | Financing Preference | Financing Implication |
|---|---|---|---|
| Counterparty (follows from cost allocation policy decision) | Who Buys, Who Pays, Cost Recovery | Credit-worthy entity and collection mechanism not exposed to revision during contract term | Need to ensure that the buyer of the power is a creditworthy counterparty or have additional contractual guarantees from a creditworthy entity for life of contract |
| Contract Duration | Short-Term (3-7 yrs), Medium-Term (10-14 yrs), Long-Term (15-20 yrs) | Long-Term , accounting for fuel price risk where applicable | Long-term (i.e.20-year) contracts will reduce risk and enable the most favorable & lowest-cost financing terms, accounting for fuel price risk, if applicable |
| (Pre-Operational) Development Credit and Performance | Deposit Requirements, Financial Information, Development Security | No credit, security or development milestone performance requirements* | Imposing substantial credit requirements or development milestones would eliminate potential to mitigate development risk |
| Operational Collateral or Security | Operational Collateral & Liquidated Damages | Must-take: no minimum performance requirements or associated liquidated damages/collateral | Mitigating timing and performance risks should lower cost of capital |
| Contract Breakage Penalty | Explicit contract language; Collateral and Liquidated Damages | Explicit contract language; otherwise, collateral as low as possible to achieve buyer protection | Discourage generator from seeking better price without raising financing cost |

* Trade-off with managing queuing issues



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# Key FIT design characteristics and finance implications – Changes in Available Tariff over Time

| Characteristic | Options | Financing Preference | Financing Implication |
|---|---|---|---|
| Price Adjustment Approach | No Adjustment, Fixed with Inflation, Degression, Indexed to Value | If degression required, it is subject to periodic adjustments based on current market conditions (supply & demand, capital cost, financing cost, etc.) | Degression subject to periodic adjustments, or "refresh" of rates, based on market conditions to allow a fair rate of return for new generation will promote continued access to capital |
| Price Adjustment Timing | Scheduled Reductions, Capacity-Dependent, Administrative Review | Administrative Review | Automatic reductions do not account for market conditions. Administrative Review is acceptable as long as process is clearly defined and transparent |
| Price Adjustment Magnitude | Experience Curves, Uniform Steps | No preference, as long as periodic adjustment possible to assure sufficient revenue to support financing | Market-based adjustments will support financing. Automatic price reductions, taken outside the context of current market conditions, may create a barrier to financing |

# Lowest-Cost Financing ("LCF") FIT Design Summary

Recommendations specific to FIT elements for maximizing least-cost financing of new RE generators > 20 MW; a comprehensive FIT design must be completed prior to implementation

| Characteristic | Recommendation |
|---|---|
| Tariff Structure | Fixed revenue<br>(consider inflation indexing O&M portion) |
| Setting Price & Tariff Differentiation | Cost-based |
| Contract Duration | 20 years, accounting for fuel price risk where applicable |
| Counterparty (Cost Allocation) | Credit-worthy counterparty; Not exposed to revision during term |
| What is Being Sold | Bundled energy & RECs |
| Operational Collateral or Security | Must take; no minimum performance |
| Price Adjustment Approach | Periodic market-based adjustment |
| Price Adjustment Timing | Administrative review |
| Price Adjustment Magnitude | No preference as long as revenue supports financing |
| Development Credit and Performance (Pre-Op) | No credit or performance requirements |
| Quantity and Cost Limits | No limits |
| Queuing | To address caps & rate changes only |
| Contract Breakage Penalty | Explicit contract language |
| Eligibility | No preference |



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# How does this LCF design compare with the CA RPS from a financing perspective?

# FIT relative to Current CA RPS

Reducing risk lowers cost of financing and thereby reduces generator revenue requirements, increasing probability of project penciling out as viable at a given price.

| | Proposed FIT | Current CA RPS* |
|---|---|---|
| Development Risk | • Reduced risk if minimal development milestones, and if long-term contract is guaranteed to be available upon project completion | • Increased development risk associated with bid solicitation process |
| Development Cost | • Reduced by elimination of cost associated with RPS bid preparation and contract negotiation | • Increased costs associated with bid preparation and contract negotiations |
| Development Life-Cycle | • Shorten development time by eliminating required bid/contracting and re-costing/re-pricing stages (prior to closing) | • Lengthens the development life-cycle, as development is usually slowed or stopped during bid evaluation and contract negotiation |
| Market Participants | • Increase the number of developers by eliminating market barrier caused by bid process | • Bid process acts as a barrier to entry for small or thinly capitalized developers |
| Financing | • Increase development and contract certainty, in conjunction with an overall stable and transparent structure, should increase the number of investors | • Capital providers will usually not get involved until after an RFP bid is successful |

*Includes proposed penalties for under- and non-performance



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# FIT & Cost of Meeting RE Goals

- What are you trying to accomplish?
  - FITs can allow meeting diversity goals, and growing emerging[1] technologies to reach more cost-effective scale more quickly
  - FITs may allow price differentiation and, potentially, paying less than a competitive solicitation may yield in some cases
- FITs can reduce cost of financing. What are implications?
  - The basis of comparison and details are critical
  - Studies have suggested that cost savings of 10 – 30% may be possible from maximizing investor certainty (de Jager 2008)
  - To illustrate, reducing costs by $10/MWh (on the lower end of this range) could place large parts of supply curve into a more economic range
  - See illustration using RETI supply curves (next page)

1. commercially-proven but currently not cost-competitive under RPS solicitations



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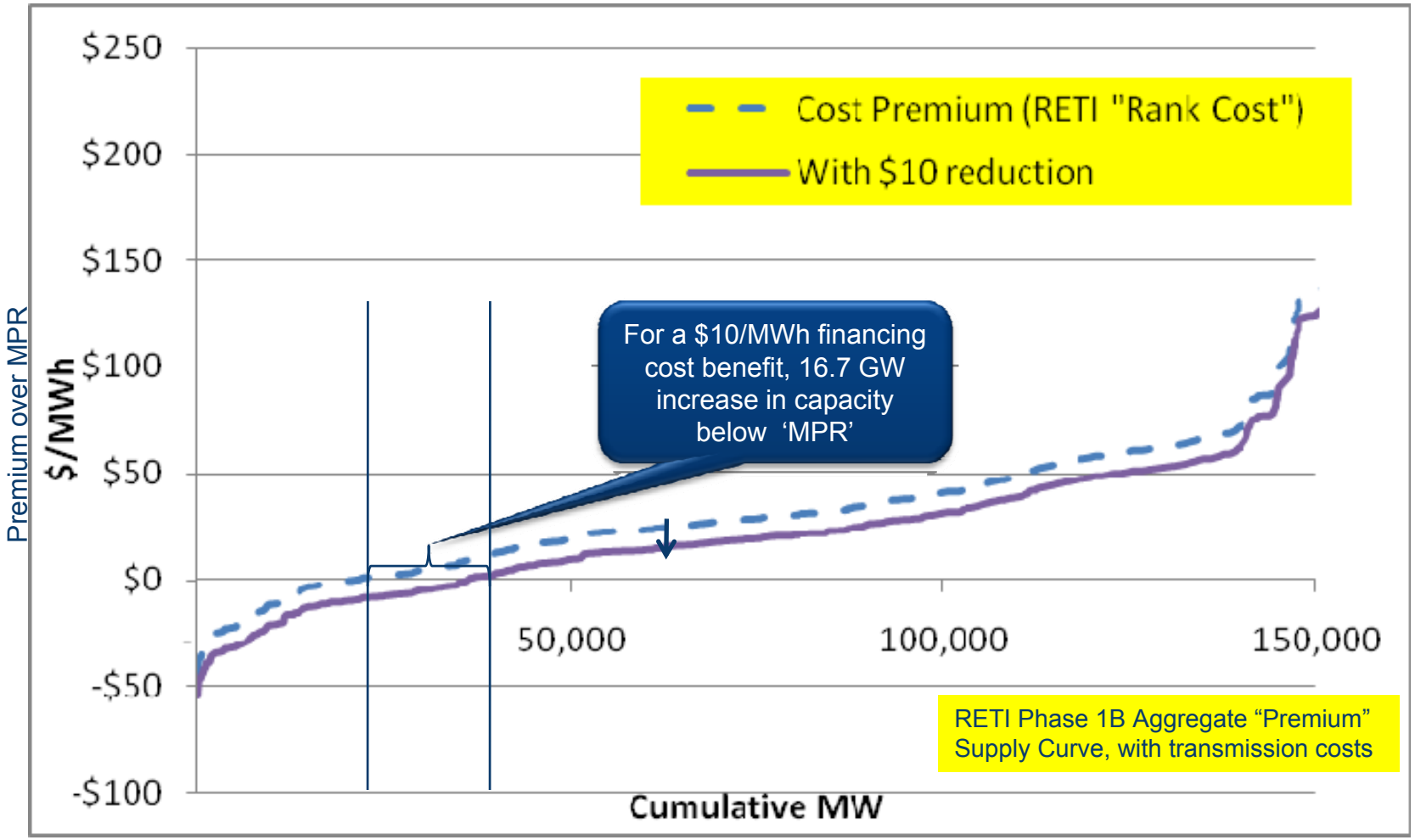
# Illustration: What if FIT could reduce RE costs by $10/MWh?



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# How do other stakeholder concerns relate to financing?

# Stakeholder Concerns: A financing cost perspective

- Stakeholder concerns unrelated to FIT policy design
  - Siting
  - Permitting
  - Cost-control
- Stakeholder concerns related to financing[1]
  - Interaction with current RPS
  - Tradable RECs
  - Resource and Transmission Planning
  - Transmission constraints

[1]Drawn from comments prepared for Staff Workshops on Renewable Energy "Feed-in Tariffs" (June 30, October 1, and December 1, 2009) by PG&E, SDG&E, SCE, Alliance for Retail Energy Markets, Western Power Trading Forum, and Constellation



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# RPS – FIT Interaction > 20 MW

Issues with contemporaneous applicability:

- Could create additional opportunities for developers between RPS cycles without detracting from RPS solicitations, or
- Could result in projects gravitating toward whichever avenue – FIT or requests for offers (RFOs) – offered more lucrative contracts, to the exclusion of the other
- Where technology-specific FIT price is higher, this is a policy decision to encourage that technology beyond the level under RFO
- When FIT might be below an RFO price outcome (MPR), developers might either participate in RFO-only, or prefer the terms and conditions and avoided transaction costs, and certainty of FIT even if price might be lower than a possible RFO contract price

Mitigation:

- Options may be limited, but deserve further study
- Impose restrictions, e.g. once participate in RFO and have contract, may not change to FIT (and vice versa)
- Limit FITs to priority CREZ(s) near permitted transmission line; competitive RFO elsewhere



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# Interaction with tradable RECs

- In most current Power Purchase Agreements RECs are bundled with electricity and sold in long-term contracts, so the existence of RECs by themselves will not be likely to aid project financing
- The sale of RECs and electricity as separate, unbundled commodities increases investor risk – even under long-term contracts
- Short-term REC markets are inherently risky and therefore lead to higher risk premiums and financing costs
- Financiers deeply discount projected revenues from spot-market sales of short-term RECs
- Empirical studies from the International Energy Agency, European Commission, and others have demonstrated that spot tradable REC markets are less cost-efficient than policies based on solicitations or FITs[1]

[1] Commission of *the European Communities. (2005). The support of electricity from renewable energy sources. Brussels. Summit Blue Consulting, & Rocky Mountain Institute. (2007). An analysis of potential ratepayer impact of alternatives for transitioning the New Jersey solar market from rebates to market-based incentives (Final Report). Boulder, CO: Summit Blue Consulting. Prepared for the New Jersey Board of Public Utilities, Office of Clean Energy; de Jager, D., & Rathmann, M. (2008). Policy instrument design to reduce financing costs in renewable energy technology projects. Utrecht, the Netherlands: Ecofys International BV. Prepared for the International Energy Agency, Renewable Energy Technology Development*



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# How can utilities plan for the price paid, location and total amount of renewable energy interconnected through FITs?

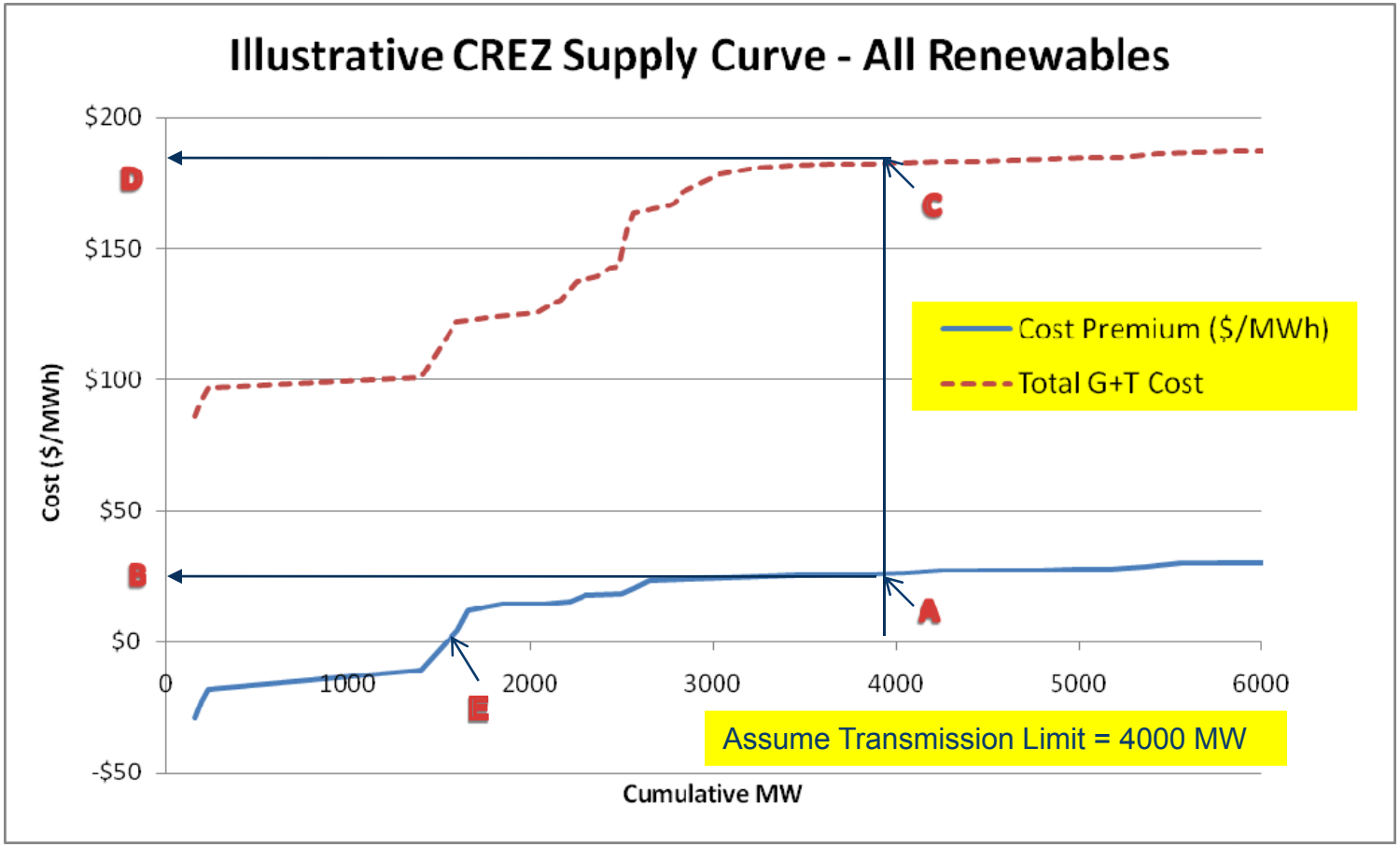
- For example, should FITs vary based on renewable energy located in a priority CREZ with proximity to a permitted transmission line?

# Interaction with transmission: Conceptual Design Issues for CREZ-Based Feed-in Tariff

- Additional objectives: efficiently utilize new transmission capacity quickly at least societal cost
- FIT could also address RPS interaction by applying in a capped context, only in a limited footprint (i.e. CREZ)
- Additional issues (beyond FIT in general):

| Issue | RPS | FIT Design Recommendation | FIT Implications |
|---|---|---|---|
| Timing | Does not target CREZs or consider CREZ transmission limits | • Offer FIT effective once transmission is permitted | • More development activity/investment likely earlier, while transmission being developed (developers don't need to wait for selection and contracting);<br>• More flexible timing and less risk placed on generators, so that can unleash faster development and wider range of participants |
| Quantity | Signed contracts may leave CREZs undersubscribed; Contract failures may also leave transmission under-subscribed. | • Technology-specific rates set using supply curves to fill the line<br>• To avoid using a cap (which would increase developer risk), set rates to avoid oversubscription. | • Whether projects pay for transmission or transmission cost is socialized impacts the FIT rate level<br>• May need a second pass (higher rate) if line ultimately undersubscribed |
| Pricing/Rates | Competitive bid likely to result in strategic pricing, clustering around publicly-available supply curve clearing price. | • Price setting for FIT is different in CREZ → set rates for each technology just high enough to yield a reasonable return on enough generation to subscribe the line without oversubscribing | • Policy choices re: how aggressive, conservative or differentiated<br>• Diversity of prices can achieve combination of technology/size diversity and cost minimization objectives ; prices below MPR possible (see supply curve example on following pages) |
| Allocation of Available Capacity Among Technologies | Favors large, least-cost, best-fit projects. | • Depends on policy objectives; see discussion of pricing/rates | • Greater diversity of project technology, size, and type of developer possible |

# Illustration: Fictitious CREZ example based loosely on RETI Phase 1B supply curves



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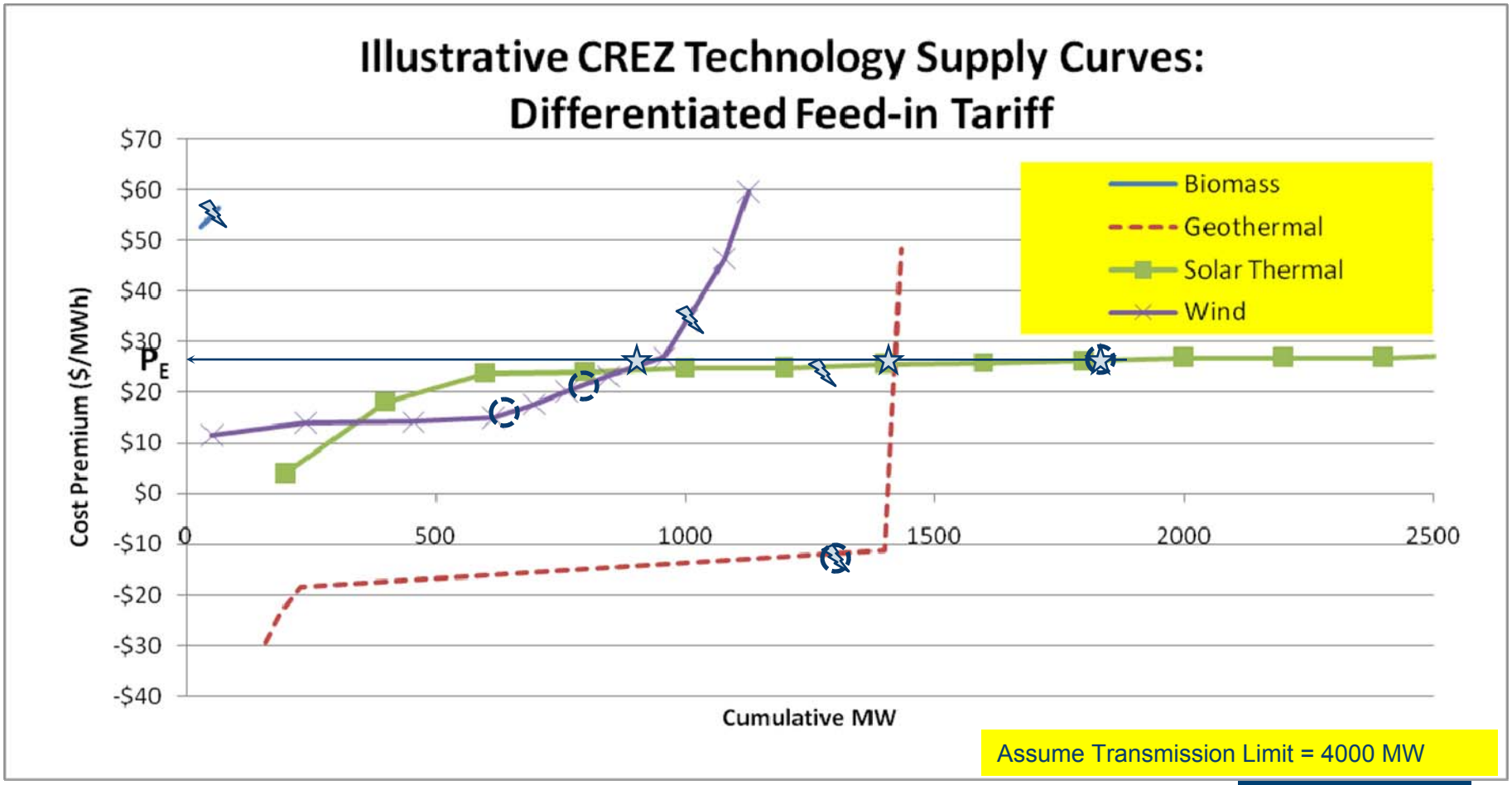


See next slide for key to ☆ ⚡ ◌ which represent price/quantity implications of different FIT designs

# Illustrative 'FIT for CREZ' Pricing Designs & Their Implications

☆ $P_E$

| "Equal Premium" | Solar | Geo | Bio | Wind | Total |
|---|---|---|---|---|---|
| Premium ($/MWh) | $ 26.00 | $ 26.00 | $ 26.00 | $ 26.00 | |
| FIT Rate (G&T Cost) | $ 183.00 | $ 101.00 | $ - | $ 137.00 | |
| Expected MW | 1,800 | 1,400 | - | 850 | 4,050 |

| "Diversified" | Solar | Geo | Bio | Wind | Total |
|---|---|---|---|---|---|
| Premium ($/MWh) | $25.00 | $ (11.00) | $ 56.00 | $ 34.00 | |
| FIT Rate (G&T Cost) | $182.00 | $ 101.00 | $ 171.00 | $ 143.00 | |
| Expected MW | 1,400 | 1,400 | 70 | 1,030 | 3,900 |

| "Cost Minimizing" | Solar | Geo | Bio | Wind c.f. > 31% | Wind c.f. < 31% | Total |
|---|---|---|---|---|---|---|
| Premium ($/MWh) | $ 26.00 | $ (11.00) | $ - | $ 17.00 | $ 23.00 | |
| FIT Rate (G&T Cost) | $ 183.00 | $ 101.00 | $ - | $ 125.00 | $ 137.00 | |
| Expected MW | 1,800 | 1,400 | - | 630 | 210 | 4,040 |



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# Next steps for the development of a FIT for RE projects > 20 MW

- Financing
  - Attempt to quantify cost reduction benefits of specific financing-related design choices, including the LCF FIT design discussed
- Consideration of Implications and Interactions
  - E.g. potential impact of a 20+ MW FIT on system planning
- Process
  - Involve members of the financing, development and manufacturing communities, and utilities, in the FIT evaluation and development process
  - Determine price-setting process
- Tariff Design
  - Identifying appropriate technology differentiation
  - Policy decisions on how aggressive or conservatively to set prices
  - Price setting

# Thank you for your attention.

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