Cost of Generation Workshop: Financing Assumptions

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Introduction and Overview

- Introduction
- Methodology for gathering and updating data Summary of findings and key highlights for renewables
- Summary of findings and key highlights for gas-fired

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Introduction

- Financial parameters key to LCOE
- Increasingly complex in response to tax policies and market conditions
- Relied on more detailed survey and data collection in 2013 model
- Financial parameters now vary by technology

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Methodology

- Informal telephone survey of financial institutions
  - Spoke with 5 different institutions
    - Geographically diverse
    - Different market focus
    - All requested confidentiality in order to participate in survey
  - Provided list of questions prior to call to focus discussion
  - Compiled survey results to summarize findings
- Cross-checked results with findings from other sources
  - NREL's Renewable Energy Finance Tracking Initiative
  - Bloomberg New Energy Finance white papers
  - Chadbourne & Parke webinar on financing trends
- Reviewed terms of publicly available PPAs from CPUC database
  - Calculated average escalation factors for power purchase price

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Findings and Key Highlights: All Technologies

- Inter-related assumptions:
  - Interest rate, leverage, debt service coverage ratio, term of debt
- Quality of Sponsor
- Accepting "merchant risk" is rare but not unheard of
  - banks require PPA with a term greater than debt term
- Size of project can influence financing costs
  - Larger projects perceived to have greater risk
- Japanese and Canadian banks still active

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Findings and Key Highlights: Renewables

- Wind and solar are considered less risky than biomass and geothermal projects
  - Technology and fuel source risks
- Lenders are structuring to account for technology risk of solar projects
- Resource uncertainty affects financing costs (P99 forecasts used to set minimum 1-year DSCR)
- Tax credits are key part of financing package
- Tenor of debt for renewable projects getting much shorter as result of bank balance sheet risk from long-term debt
  - Other sources of longer-term debt (e.g. institutional investors) may allow for hybrid structures

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Renewable Results from Survey:

- Model for financing costs for IPPs
  - Start with BOE Capitalization Study model
    - Update with parameters for specific technologies
  - LIBOR swaps plus spread as proxy for cost of debt
  - Tax efficient structuring for equity
    - Used to maximize value of tax credits and other incentives
      - Wind uses partnership flip structure
      - Other technologies use sales/leaseback structure

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Renewable Results from Survey: Quantitative

	Bio		Geo		Solar		Wind	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
DSCR (Average)	1.65	1.39	1.70	1.88	1.24	1.34	1.24	1.42
DSCR (Minimum)	1.65	1.39	1.70	1.88	1.24	1.34	1.24	1.42
Leverage (% of debt)	64	81	65	73	75	83	75	83
Pricing over LIBOR	3.08%	3.10%	3.08%	3.17%	2.55%	2.90%	2.55%	2.90%
Tenor	6.0	10.8	6.7	10.0	7.6	13.2	8.8	16.5

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Findings and Key Highlights: Gas-Fired Generation

- Somewhat higher debt costs for gas projects than renewables
  - Larger projects?
- Tenors for loans shorter for gas projects than for renewables
  - PPA duration?
- Some lenders willing to take a small amount of "merchant risk"
  - Merchant "tail"
  - Portion of project un-contracted

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Gas-Fired Results from Survey: Quantitative

	Gas	
	Minimum	Maximum
DSCR (Average)	1.35	1.39
DSCR (Minimum)	1.35	1.39
Leverage (% of debt)	76	81
Pricing over LIBOR	2.60%	3.10%
Tenor	6.8	10.8

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Financing by IOUs and POUs

- Investor owned utilities (IOUs)
  - Rely on BOE Capitalization Study model and inputs
  - Derive ranges from WECC and national data
  - Apply to all technologies
- Publicly owned utilities (POUs)
  - Assume 100% debt financed
  - Use highly rated public bond rates

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Findings Applied to COG Model

- Incorporating tax equity financing important for renewables
  - New feature from 2009 with end of ARRA
- Reported debt terms don't cover entire project life
  - COG financing relies on long-term project bonds

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Financial Parameters by Case

Mid-Cost Case				
	Equity Share	Cost of Equity	Cost of Debt	WACC
Merchant Fossil	33.00%	13.25%	4.52%	6.17%
Merchant Alternative	40.00%	Var*	Var*	Var*
IOU	55.0%	10.04%	5.28%	6.93%
POU	N/A	N/A	3.20%	3.20%
High-Cost Case				
Merchant Fossil	60.00%	15.00%	6.63%	10.57%
Merchant Alternative	50.00%	Var*	Var*	Var*
IOU	70.00%	10.31%	5.65%	8.22%
POU	N/A	N/A	5.96%	5.96%
Low-Cost Case				
Merchant Fossil	20.00%	10.41%	4.64%	4.28%
Merchant Alternative	Var	Var*	Var*	Var*
IOU	9.71%	9.71%	4.55%	6.06%
POU	N/A	N/A	3.02%	3.02%

* Var = Technology dependent. See next table.

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Financial Parameters for Renewables

Mid-Cost Case									
Technology	Equity Share			Cost of Equity			Debt		WACC
	Developer's Share	Investor's Share	Total Equity	Developer's Cost	Equity Investor's Cost	Weighted Cost of Equity	Percent Debt	Cost of Debt	
Biomass & Geothermal	33.60%	6.40%	40%	13.25%	8.00%	12.41%	60%	6.31%	7.21%
Solar Technologies	33.60%	6.40%	40%	13.25%	8.00%	12.41%	60%	5.91%	7.07%
Wind Technologies	25.47%	14.53%	40%	13.25%	8.00%	11.34%	60%	5.91%	6.64%
High-Cost Case									
Biomass & Geothermal	42.00%	8.00%	50%	15.00%	10.00%	14.20%	50%	7.63%	9.36%
Solar Technologies	42.00%	8.00%	50%	15.00%	10.00%	14.20%	50%	7.36%	9.28%
Wind Technologies	42.00%	8.00%	50%	15.00%	10.00%	14.20%	50%	7.36%	9.28%
Low-Cost Case									
Biomass & Geothermal	15.92%	9.08%	25%	10.41%	7.00%	9.17%	75%	5.12%	4.57%
Solar Technologies	12.60%	2.40%	15%	10.41%	7.00%	9.86%	85%	4.59%	3.79%
Wind Technologies	9.55%	5.45%	15%	10.41%	7.00%	9.17%	85%	4.59%	3.69%

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