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Renewable Energy Policy and Regulation

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Agenda

- Competitive Procurement of Renewable Energy
 - Requirements and Statutory Authority
 - Process
- Evaluation of Proposed Generation
 - Review of Request for Proposals Document
 - Cost-Benefit Analysis of Contract Products
 - Other Economic Benefits (e.g., Externalities)
- Economic Evaluation of Proposed Projects
 - Cash Flow Model & Rate of Return Evaluation
 - Community-Based Renewable Contracting
 - Quantification of Economy-wide Benefits
 - Ocean Energy Contracting
 - Other Models
- Conclusions

Background: Electricity Generation Markets

- Generation is not economically regulated
 - Price discipline enforced through competitive marketplace
 - Only general business regulations apply
 - business regulators, not utility regulators
- Despite advantages, some potential disadvantages of Competitive Electricity Markets are
 - Price Volatility and Uncertainty
 - Limited Access to Long-Term Contracts
 - Power plant financing & development may be difficult
- Authority to enter into Long-Term contracts is a policy mechanism meant to alleviate some of these disadvantages
- A long-term contract in a competitive electrical generation market is similar in ways to buying a commodity futures contract (e.g., as a hedge)

Maine PUC Long-Term Contracting Authority

- Maine PUC Authority to Direct Utilities to Enter Into Long-Term Contracts for Energy Supply
- Objective is acquire long-term contracts to reduce electricity costs for Maine consumers and/or to serve as a hedge against market price volatility
- Qualifying Resources are defined by Maine statute and PUC Rule and include new and existing and renewable and non-renewable resources
- Term Up to 10 Years, Unless Maine PUC Determines Longer Term in Public Interest
- Priority Order:
 - New renewable resources located in Maine
 - New capacity resources with no net emission of greenhouse gases
 - New nonrenewable capacity resources located in Maine, with preference given to resources with no net emission of greenhouse gases
 - Capacity resources that enhance the reliability of the Maine's electric grid

Maine PUC Long-Term Contracting Process

- Maine PUC conducts competitive solicitation process
- Bids are evaluated based upon statutorily specified energy policy goals:
 - Lower Electricity Rates
 - Costs below long-term market projections
 - Hedge Against Price Volatility (Electricity Market Uncertainty)
 - Promote Development of New Generation Resources
 - Provide price stability for new generation resources seeking financing
 - Ensure growth in renewable energy capacity to help mitigate greenhouse gas emissions
 - Cost-Effective Substitution for Transmission
- Comment on bids is provided from the electric utilities and the Maine Office of the Public Advocate
- Bid proposals remain confidential unless selected
- Long-term contract becomes public upon execution

Maine PUC Long-Term Contracting Transparency and Confidential Information

- Proposals and other bidder information submitted in confidential docket
 - Identity of bidder
 - Project information and status
 - Pricing terms and conditions
- Remains confidential unless and until term sheet is approved by Commission and contract negotiations completed
- Protects competitively sensitive information, including proprietary information
- Ensures robust competitive process

Maine PUC Request for Proposals (RFP) Document

- Maine PUC initiates competitive solicitation process by issuing RFP
- Request for Proposals document specifies requirements of a bid package
- Required components of the bid include:
 - Description of the project, including how the project meets the statutory requirements and its resource priority ranking
 - Form of Product (energy, capacity)
 - Structure of the transaction and pricing structure
 - Proposed changes to Maine PUC standard form power purchase agreement
 - Proposed term
 - Project cost data
 - Proposed performance security arrangements (letter of credit, corporate guarantee, other security)

Economic Evaluation of Bids: Development of Market Forecasts

- First step is to get market forecasts
 - Forecasts for all proposed contract products
 - Energy, Capacity, Renewable Energy Credits (RECs)
- Maine PUC hires consultant to develop forecasts
 - Sophisticated New England energy market simulation model
 - Fuel price forecasts
 - Natural gas, oil, coal
 - Carbon price forecast
 - Regional Greenhouse Gas Initiative (RGGI) cap-and-trade program
 - Generator retirements and new entry forecasts
 - Based upon forecasted renewable portfolio standard requirements and new natural gas entry
 - Transmission forecasts
 - Both electricity and natural gas networks
 - Load forecast
 - Incorporates New England market rules, mechanisms, and physical topology
 - Forward Capacity Market
 - Electricity Transmission Network Topology
 - congestion and losses in New England “zones”

Economic Evaluation of Bids: Use of Energy Market Forecasts

- Forecast is for annual average prices at the market reference hub
 - Also on-peak and off-peak prices, and monthly resolution possible
 - 20 year forecast
- Consultant may develop multiple forecasts following different future scenarios
 - Maine PUC may develop its own additional scenarios or sensitivities
- Maine PUC applies forecasts to individual generation project proposals
 - Account for location of project
 - De-rate New England market reference hub forecast based upon estimated losses and congestion
 - Extrapolation of forecast sometimes necessary (if proposed contract >20 years)
 - Evaluation varies by technology
 - Natural Gas facility economics hinge on relative efficiency (heat rate) compared to market
 - Biomass, Hydro, and Nuclear may simply look at proposed long-term contract pricing relative to annual average price forecasted (de-rated for location)
 - Wind, Solar, and other price-taking technologies may require an hourly analysis because of coincidence of project output with hourly wholesale market prices

Economic Evaluation of Bids: Use of Capacity Market Forecasts

- Forecast is for annual average clearing price of Forward Capacity Market
 - 20 year forecast
 - First few years prices are already known (capacity commitments are 3-year forward-looking)
- Maine PUC applies forecast to individual generation project proposals
 - Account for location of project
 - Some areas in Maine are transmission constrained = not eligible for capacity payments
 - Extrapolation of forecast sometimes necessary (if proposed contract >20 years)
 - Evaluation varies by technology
 - Use ISO-NE guidelines for likely amount of qualifying capacity (varies by technology)
 - Capacity quantity a function of the expected capacity factor at the time of system summer and winter peaks
 - For example, for summer qualified capacity
 - » Solar = qualifying capacity higher than suggested by average capacity factor
 - » Wind = qualifying capacity lower than suggested by average capacity factor

Economic Evaluation of Bids: Net Benefit or Cost Result

- Apply discount rate to annual costs or benefits of proposed pricing
 - 7%, 10%
 - Present Value Benefit or Cost
- Levelize (normalize) to MWh output
 - Helps to compare present value benefit or cost across different size projects
- Examine results from different forecast scenarios
- May negotiate back and forth with bidder on proposed pricing depending upon analysis results

Economic Evaluation of Bids: Externalities and Other Factors

- External Benefits and Costs
 - Marginal Benefits
 - Market suppression effect
 - Hedge value
 - Carbon emission avoidance (social cost of carbon)
 - Marginal Costs
 - System integration
 - Capacity market
- Financial strength of developer
 - Ability to obtain financing
 - Ability to execute project

Other Economic Evaluation Methodologies

Other Maine Incentive Programs

- Long-term contracting for ocean energy pilot projects
- Long-term contracting for community-based renewable energy projects
- Generally, similar economic evaluation approach
 - Obtain and develop market forecasts
 - Assess net contract product costs, on present value basis, of projects
- Some differences because above-market contracts
 - May examine developer “pro forma” (project cash flow model)
 - Assess reasonableness of financing sources and expected rate of return
 - May examine macroeconomic impacts of project
 - Modeling net job creation, addition to State economic output

Community-Based Renewable Energy Pilot Program Overview

- Encourage development of community based renewable energy resources
- Incentive based program providing either
 - Renewable Energy Credit (REC) multiplier of 150%
 - Long-Term Contract (feed-in tariff) capped at 10 cents / kWh
- Overall program capacity limitation of 50 MW
- Individual utility service territory limitations
- Details of Program specified in Rule, Chapter 325:
 - <http://www.maine.gov/sos/cec/rules/65/407/407c325.doc>

Community-based Project Eligibility

- Eligible Resources
 - Fuel cells, tidal power, solar installations, wind power, geothermal, hydroelectric, biomass
- Capacity Limitations
 - May not exceed 10 MW
- Community-Based
 - Maine residents, municipalities, nonprofits, Indian tribes or corporations at least 51% owned by Maine residents
- Local Support
 - Resolution of support from municipal legislative body
- Grid Interconnection
- In-Service Date
 - Within three years of certification

Economic Evaluation: Community-based Long-Term Contracts

- Program Cost Containment Provisions
 - May not exceed 10 cents/kWh
 - May not exceed project cost and reasonable rate of return
 - Contract term may not exceed 20 years
 - 50 MW limit in program participation
- Evaluate bid prices versus market forecasts
 - Similar to regular long-term contracting evaluation
 - However, may exceed market value (contract can be a net cost), but not exceed 10 cents/kWh
- Evaluate “pro forma” (cash flow model)
 - Assess viability of financing sources
 - Assess for reasonable rate of return

Additional Economic Evaluation of Community-Based Energy: Cash Flow Model

- Developers provided “pro forma” (project cash flow model) and Internal Rate of Return (IRR) Calculation
 - Confidential (protective order)
 - Yearly cash flows
 - Costs
 - Capital Expenditures
 - Operational Expenditures
 - Financing costs (debt, equity)
 - Revenues
 - Long-term contract sales
 - tax credits
 - grants

Other Economic Evaluation Methodologies

Other States

- NREL “CREST” Model
 - **C**ost of **R**enewable **E**nergy **S**preadsheet **T**ool
 - Economic cash flow model to assess project economics, design cost-based incentives and evaluate the impact of state and federal support structures
 - Resource specific cost based model (solar, wind, geothermal, anaerobic digestion)
- Vermont “SPEED”
 - **S**ustainably **P**riced **E**nergy **E**nterprise **D**evelopment
 - Vermont’s feed-in-tariff program
 - Periodic request for proposals
 - Maximum resource size 2.2 MW
 - Specific Commission proceeding to establish avoided cost price caps for participating resources

Ocean Energy Long-Term Contract Solicitation: Overview

- **Qualifying Projects**
 - Deep-Water Offshore Wind Energy Pilot
 - Located in Gulf of Maine
 - Connected to Transmission System in Maine
 - Employs Floating Turbines
 - 300 Feet or Greater Depth
 - No Less than 10 Nautical Miles from Land Area
 - Tidal Energy Demonstration
 - Tidal Action as Source of Electrical Power
 - Primary Purpose Testing Tidal Energy Technology
- **Solicitation Requirements**
 - Long-Term Contracts
 - Up to 20 Years
 - No More than 30 MW
 - Energy, Capacity, Renewable Energy Credits
 - Price Mitigation
 - Take Advantage Federal Support and other State funds
 - Limitation on Electric Rate Impact
 - No More Than 0.145 cents per kWh (\$1.45 / MWh)

Ocean Energy Long-Term Contract Evaluation

- Statutory Evaluation Criteria
 - Technical and Financial Capability
 - Tangible Economic Benefits
 - Relevant Experience
 - Commitment to Invest in Manufacturing Facilities
 - Federal Support
 - Project Information
 - Size, Location, Technology, Cost
 - Permitting Status
- Long-Term Contract Economic Evaluation
 - Assess proposed product pricing compared to market forecasts
 - examine developer “pro forma” (project cash flow model)
 - examine macroeconomic impacts of project

Additional Economic Evaluation of Ocean Energy: Economic Impacts

- Examine macroeconomic impacts of project
 - Models of economic output
 - JEDI model
 - **J**obs and **E**conomic **D**evelopment **I**mpact
 - Department of Energy, National Renewable Energy Lab (NREL)
 - REMI model
 - **R**egional **E**conomic **M**odels, Inc.
 - IMPLAN model
 - **I**mpact analysis for **P**LANning
 - Economic impact is defined as
 - Output (i.e., sales revenue) & employment and labor income (e.g., wages and salaries)
 - Jobs created
 - Direct and indirect impacts
 - multiplier effects

JEDI Model

- Uses project-specific data or default inputs (derived from industry norms)
 - Users can specify inputs (Construction Costs, Equipment Costs, Annual Operating and Maintenance Costs, Financing Parameters, Other Costs)
- Estimates:
 - Jobs
 - Earnings
 - Output
- Impacts distributed across three categories:
 - Project Development and Onsite Labor
 - Local Revenue and Supply Chain Impacts
 - Induced Impacts
- Estimates “gross” economic benefits
- Economic multipliers contained within the model are derived from IMPLAN and state data files

REMI Model

- Incorporates aspects of four major modeling approaches:
 - Input-Output
 - Captures industry structure of a particular region (e.g., Maine)
 - General Equilibrium (net economic impact)
 - Reached when supply and demand are balanced.
 - Economic system stabilizes (prices, production, consumption, imports, exports, and other changes)
 - Econometric
 - Underlying equations and responses are estimated using advanced statistical techniques
 - Estimates are used to quantify the structural relationships in the model
 - Economic Geography
 - Productivity and competitiveness benefits of labor and industry concentrations

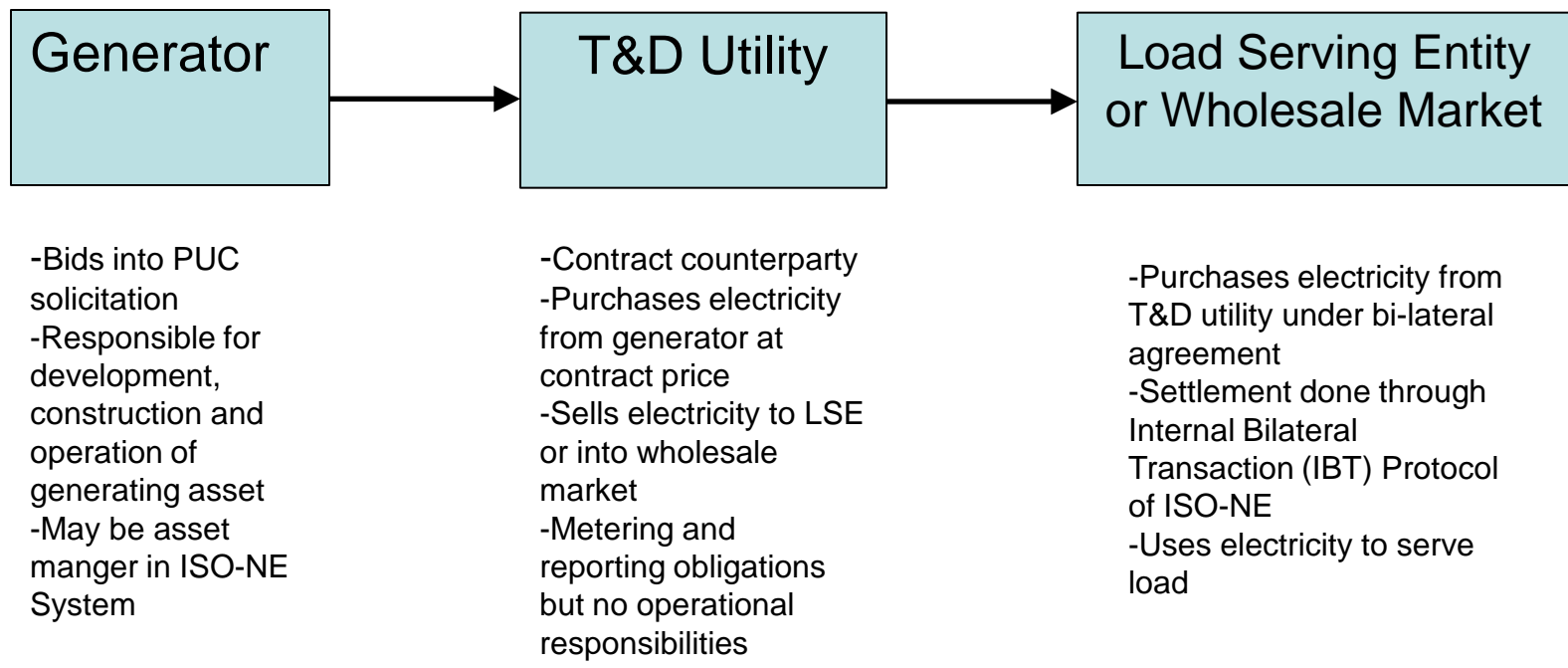
IMPLAN Model

- Input-output framework that traces the flows of expenditures and income through the Maine economy
- Uses a complex system of accounts that are uniquely tailored to the region
 - Version 3.0 of IMPLAN model has information on 440 sectors of the economy
 - Information regarding
 - transactions occurring among businesses located in Maine
 - the spending patterns of households
 - transactions occurring between Maine entities and the world

Integration of Contract Electricity into ISO-NE Market

- PUC authorizes power purchase agreement between generator and T&D utility
- T&D utilities in Maine are not load serving entities, thus must arrange to sell the electricity into the New England market
- Sale can occur through bi-lateral agreement with load serving entity (and approved by the PUC) or through real-time or day-ahead sale into the wholesale market
- Capacity covered by the power purchase agreement is either sold through a bi-lateral contract converted into a financial payment
- Any costs incurred by T&D utility through these transactions are considered to be prudently incurred and are recovered from ratepayers through stranded cost rates

Contract Transactions for Electricity



Physical Integration of Contract Energy into ISO-NE

- When contract electricity is delivered to the grid, it is subject to the same operational considerations and rules as electricity coming from any other generating asset in the system
- Because T&D utilities in Maine are “poles and wires” utilities, they do not typically participate in the ISO-NE system as a manager of generation
- Solution has been for either the final purchaser of the electricity or the generator to serve as the asset manager in the ISO-NE system

Summary

- Competitive solicitation process conducted by Maine PUC to meet statutory goals and requirements
- Economic evaluation of contract products is market forecast focused and includes evaluation of additional costs and benefits
- Additional economic benefits and factors may be included

Questions?

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