Municipal Light & Power

Board of Director's Presentation
ML&P's Draft Integrated Resource Plan

August 26, 2009

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Overview of IRP

- **ML&P's Goal is to Ensure a Long-Term, Reliable, Safe and Cost-Effective Electric Supply to Meet Customer Load Requirements**
- **Modeling and Planning Horizon – 2012 to 2035**
- **IRP is a Long-Term Plan Intended to be Updated Periodically**
- **Planning Study – Not a Detailed Engineering/Operations Plan**
- **IRP Process**
  - Assessment of existing resources
  - Determination of future needs
  - Examination of potential new resources
  - Analysis of new Resource Options
  - Selection of Preferred Portfolio
  - Action Plan/Timeline

Overview of IRP (cont' d)

- **Objectives of the IRP**
  - Ensure reliable and safe service to ML&P' s customers and employees
  - Address declining natural gas reserves
  - Continue providing heat to the municipal water system
  - Minimize carbon exposure
  - Encourage conservation and the development of renewable resources
  - Keep costs as low as possible in keeping with sound utility practice
  - Implement necessary changes on a timely basis
- **This IRP is Unique – Power Supply Additions are Needed to Replace Aging Generation Assets -- Not to Add Capacity to Meet Load Growth**

2009 Power Supply Issues

- **Key Issues**
  - The existing generation fleet is aging
    - ✓ Age of existing fleet
    - ✓ Increased maintenance cost
    - ✓ Increased risk of catastrophic failure
    - ✓ Dwindling gas reserves
    - ✓ Safety risk to employees
  - SPP planned for 2014 will not meet all future power supply needs
  - Proximity of new power supply to commercial business district is important
  - A preferred plan should include municipal water heating
  - Contractual reserve requirements must be met
  - Flexibility is needed to meet an ever changing power supply planning horizon

2009 Power Supply Issues (cont' d)

Existing Generating Units			
	Age (Years)	100 % Unit Capacity[1] [2] (MW)	Operation
Unit 1	47	14	Operated only for testing
Unit 2	45	14	Operated only for testing
Unit 3	2	29.3	Operated for base load as well as for peaking requirements
Unit 4	37	31.1	Operated for peak loads and to provide spinning reserve
Unit 5	34	33.8	Operated for base load
Unit 6	30	34	Operated to use steam from Unit 5 and 7 to generate electricity
Unit 7	30	74.4	Operated for base load
Unit 8	25	77.3	Operated primarily as backup for Units 7, 6 and 5

(1) Capacities rated at ISO 59-60 degrees Fahrenheit.
(2) Two small diesel generators (1.6 MW) located at Plant 1 used for "black start" purposes not listed.

Resource Options to Replace Older Unreliable Units

- **Energy Efficiency**
  - Conservation Potential Study was performed using data available for ML&P's service area
  - Study demonstrated that approximately 16 aMW of energy and 24.5 MW of capacity savings may be available in ML&P's service area by 2035
  - The majority of savings related to residential and commercial lighting programs
  - The average real levelized cost in $2012 is estimated at $34 per MWh
- **Renewable Resource Evaluation**
  - Many options reviewed; actual projects currently under review in Alaska & "generic" projects

Conventional Supply-Side Resource Options

Summary of Supply-Side Resource Costs and Operating Characteristics ($2012)

Resource	Earliest Availability Years	Capacity MW	Heat Rate Btu/kWh	Capacity Factor	Capital Cost $/kW	Fixed O&M $/kW-yr	Variable O&M and Integration $/MWh	24-Year Levelized Cost* $/MWh	24-Year Levelized Cost* Without Carbon** $/MWh
CCCT	1-3	115	7,100	88%	1,847	13.0	2.80	$78	$68
SCCT	1-3	30	10,000	88%	1,440	13.0	5.00	$98	$87
Coal	Unknown	150	10,000	90%	2,100	35.0	3.00	$75	$52
Nuclear	Unknown	200	9,200	88%	8,500	63.2	1.33	$81	$81
Diesel	1-3	30	9,267	90%	1,600	N/A	0.19	$199	$199
Fire Island Wind*	1-3	54	NA	33%	3,100	35.6	2.00	$94	$94
Mt Spur Geothermal*	5+	100	NA	80%	3,820	46.0	18.40	$65	$65
Knik Arm Tidal*	5+	17	NA	40%	6,796	235.3	0.00	$209	$209
Grant Lake & Falls Creek Hydro	3	10	NA	40%	2,700	0.0	3.70	$56	$56
Susitna (Watana/Devil Canyon)	15+	1,880	NA	44%	7,004	50.0	15.0	$152	$152
Chakachamna	9+	330	NA	45%	5,972	50.0	15.0	$130	$130
Landfill *	5+	3.8	NA	90%	1,330	250.7	0.0	$54	$54
Biomass*	5+	5	NA	91%	2,300	0.0	23.00	$38	$38
Glacier Fork Hydro	5-10	75	NA	49%	4,133	0.0	3.70	$70	$70
UAA/Providence Cogeneration*	1-3	10	10,979	91%	5,550	5.8	2.39	$80	$72

*Includes Production Tax Credit or Investment Tax Credit for Cogeneration.

**Costs without $20 per ton carbon tax.

Resource Options

- **Initial Evaluation of Supply-Side Resource Options**
  - Biomass, small hydro and geothermal lower cost, but not yet available and/or determined feasible
  - Coal represents a high carbon emissions/high future price risk option
  - Tidal and solar too expensive
  - Nuclear not available/practical
  - Wind lowest priced, available renewable resource
  - Gas turbines lowest priced, available non-renewable resource option
  - Not enough demand-side/renewables available to replace existing generation fleet/meet resource deficit
  - With acquisition of cost-effective and available demand-side/ renewables, ML&P still needs **90 -100 MW** of replacement generation capacity
  - Natural gas turbines the most cost-effective way to meet this resource deficit

Analysis of Natural Gas Turbine Options

- **Overview of Natural Gas Turbine Technology**
- **Options Include**
  - Scenario 0: Base - Maintain Status Quo with Existing Generating Units plus SPP
  - Scenario 1: 1 x LM 2500+ SC plus SPP(1) (30 MW)
  - Scenario 2: 1 x LM 6000PF SC plus SPP (45.6 MW)
  - Scenario 3: 1 x LM 6000PF CC plus SPP (57.5 MW)
  - Scenario 4: 2 x LM 6000PF CC plus SPP (115 MW)
  - Scenario 5: 2 x 6FA CC plus SPP (226 MW)
  - Scenario 6: 1 x LM6000PF CC, 2 x LM 2500+ CC plus SPP (135.3 MW)
  - Scenario 7: 1 x LM 2500+ SC, 1 x LM6000PF CC plus SPP (87.6 MW)
  - Scenario 8: Add 4th LM6000PF CC at SPP (57.5 MW)

(1) SPP, which is common to each scenario, adds 54 MW.

Analysis of Natural Gas Turbine Options (cont' d)

- **Economic Analysis**
  - Detailed cost and dispatch analysis – 2012 to 2035
  - Economic modeling based on capital, fixed & variable O&M, and fuel costs for each scenario
  - Capital costs developed from GE cost quotations and in-house data from similar projects
  - Fixed and variable O&M costs based on historic ML&P O&M costs
  - Fuel costs calculated by ML&P based on market price forecast
  - All cost comparisons in $2012
  - SPP included in all analyses/on-line 1/1/14

Analysis of Natural Gas Turbine Options (cont' d)

- **Additional Qualitative Analysis of Options**
  - Savings in gas use
  - Sharing of spare parts
  - Reduced air pollutants
  - Reduced greenhouse gas emissions
  - Ability to place older units into standby
  - Power source near CBD
  - Ease of future expansion
  - Ability to make economy energy sales
  - Provides heat to AWWU water system
  - Provides balanced generation to the transmission system
  - Avoids concentration of resources at one site
  - Keeps spinning reserves low
  - Reduces impacts to existing 115kV transmission system

Qualitative Evaluation

ML&P IRP Options Comparison Matrix—Comparison of Qualitative Selection Criteria

Score 1 (least benefit) to 10 (most benefit)

Option	Savings In Gas Use	Shares Spare Parts w/ Other units	Reduces Pollutant Emissions	Reduces Greenhouse Gas Emissions	Old Units can be placed on Standby Only	Power Source Near CBD	Ease of Future Expansion	Ability to Make Surplus Sales	Provides Water Heating for AWWU	Provides Balanced Power Supply	Reduces Concentration of Generation at One Site	Reduces Spinning Reserve Requiremen ts	Avoids Overload of 115 kV System	Total Score
Base Case	1	1	1	1	1	3	4	8	9	3	1	1	1	35
Scenario 1: 1 LM2500+ SC plus SPP	2	6	4	2	2	7	7	7	1	8	8	3	6	61
Scenario 2: LM6000PF SC plus SPP	2	7	5	3	2	3	7	6	1	3	3	2	2	46
Scenario 3: LM6000PF CC plus SPP	7	7	7	7	8	3	8	3	7	3	2	7	2	71
Scenario 4: 2x LM6000PF CC plus SPP	10	8	10	10	9	3	4	3	9	3	1	8	2	80
Scenario 5: 2 6FA CC plus SPP	7	1	6	6	9	3	4	10	9	2	1	1	2	61
Scenario 6: 1 LM6000PF CC, 2 LM2500+ CC plus SPP	9	7	9	9	9	9	5	3	7	9	9	8	7	100
Scenario 7: LM6000PF CC, 1 LM2500+ SC plus SPP	8	7	8	8	8	7	9	3	7	8	8	8	6	95
Scenario 8: LM6000PF CC plus SPP	7	7	7	7	8	4	2	2	1	3	1	7	4	60

Analysis of Natural Gas Turbine Options (cont' d)

- **Key Results**

Total NPV, Generation Costs ($2012) and Qualitative Ranking

Resource Option	NPV Total Generation Costs ($ millions)	Average Annual NPV Unit Costs ($/MWh)	Total Qualitative Score
Scenario 3: LM6000PF CC plus SPP	$1,453	$50.21	71
Scenario 8: LM6000PF CC at SPP plus SPP	$1,466	$50.66	60
Scenario 4: 2x LM6000PF CC plus SPP	$1,471	$50.86	80
Scenario 7: LM6000PF CC, 1 LM2500+ SC plus SPP	$1,479	$51.14	95
Scenario 2: LM6000PF+ SC plus SPP	$1,513	$52.28	46
Scenario 1: 1 LM2500+ SC plus SPP	$1,518	$52.46	61
Scenario 6: 1 LM6000PF CC, 2 LM2500+ CC plus SPP	$1,573	$54.38	100
Scenario 5: 2 6FA CC plus SPP	$1,664	$57.53	61
Base Case: Status Quo plus SPP	$1,666	$57.59	35

- **Observations**
  - Closeness of costs across scenarios/accuracy of estimates
  - Next consideration is the qualitative score
  - Correct size – 80 to 90 MW; old units to go into standby

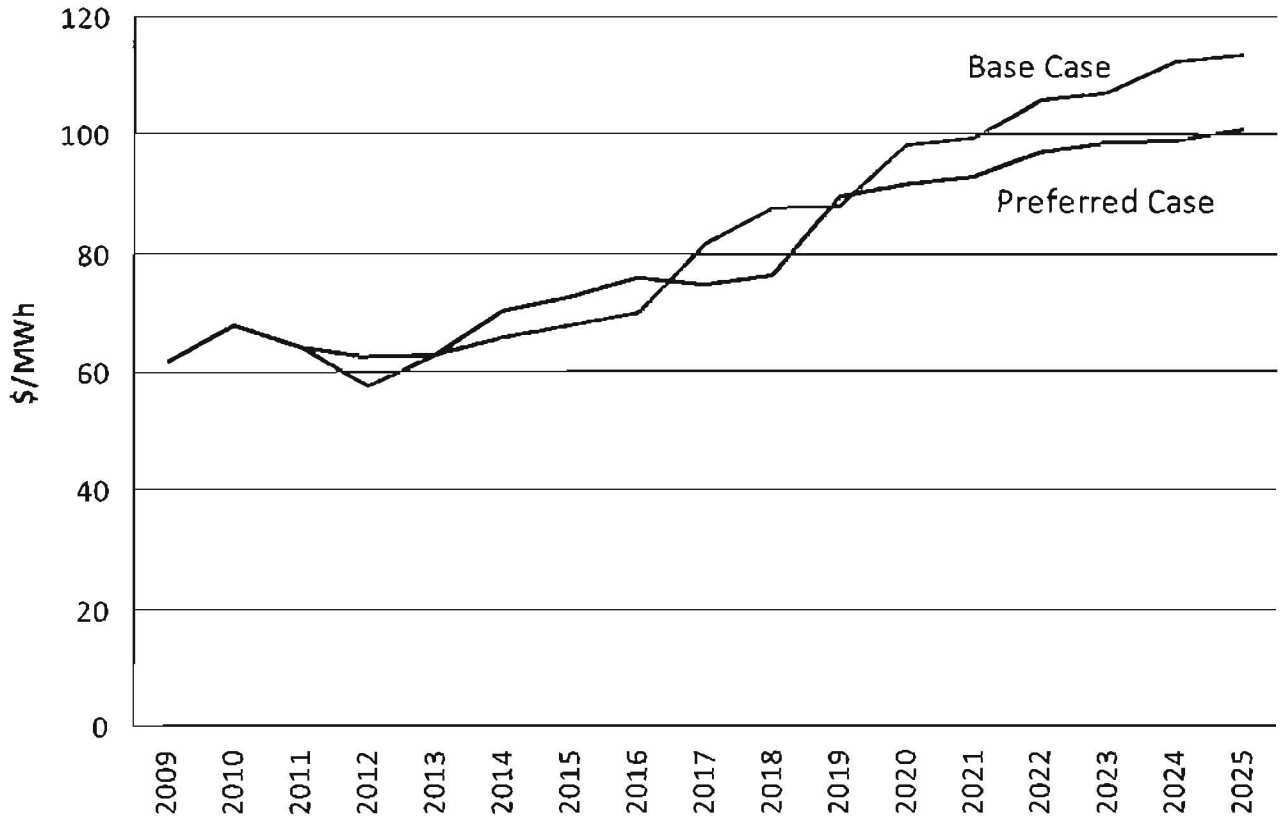
Recommended Action Plan

- **Promote Cost-Effective Energy Efficiency Options**
- **Pursue Fire Island Wind (if a reasonable deal can be negotiated)**
- **Continue to Monitor the Development of Other Renewable Resources**
  - Hydro
  - Geothermal
- **Proceed with One LM2500+ at Plant 1 (On-Line by 1/1/13) and One LM6000PF CC at Plant 2 (On-Line by 1/1/14)**
  - Finalize project configuration and siting
  - Start preliminary design
  - Develop RFP for Long-Lead Equipment Purchase, Engineering & Construction
  - Begin permitting process

Financial Impacts—Scenario 7 vs. Base Case

- **Financial Impacts ($2012)**
  - Scenario 7 capital cost – $248 million
    - ✓ New Plant 1 & 2 units' capital cost – $137 million
    - ✓ SPP capital cost – $111 million
  - NPV generation savings (2012-2035) – $186.4 million
    - ✓ 11.2% reduction in generation costs
  - DSCR during 2012-2035 planning horizon – 1.45 to 1.62; minimum 1.35 required
- **Fuel Impacts**
  - Fuel savings (2012-2035) – 25,339 MMCF; 11.2% fuel reduction

Typical Residential Rate—Scenario 7 vs. Base Case (1)



(1) From ML&P's Equity Management Plan. Monthly rate for 500 kWh – includes COPA.

Summary of Benefits—Recommended Approach

- Balanced Approach for Resource Acquisition—Both Supply- and Demand-Side Resources
- Addresses Reliability Risk Associated with Current Resources/Replaces Inefficient Must-Run Gas Units
- Invests in Resources that are Currently Available, Feasible and Cost-Effective
- Reduces Carbon Exposure/Footprint
- Maintains Future Resource Portfolio Flexibility/Adaptable to Large Hydroelectric Developments
- Implements Changes on a Timely Basis
- Reduces Gas Consumption
- Addresses Safety Issues
- Less Costly than Status Quo

Next Steps and Schedule

Date	Event
	Comments on Draft IRP from Board
	Finalize IRP
	Finalize CIP
September 14	ML&P Budget to Administration
October 1	ML&P Budget to Assembly
	Assembly Work Session?
November 17	Assembly Budget Approval
By November 30	ML&P Revenue Bond Sale
	Begin Implementing Approved IRP

Proposed Schedule/Action Plan