Estimate of % FPL Net Incremental Sales vs. Latest Fossil Unit 2015 Generation

Year	Threshold	Sales Above Threshhold	Total Incremental MWh Sales	Total Incremental MWh Purchases	**Net Incremental MWh Sales**
2013	514,000	1,430,763	1,944,763	147,977	1,796,786
2014	514,000	1,496,679	2,010,679	413,070	1,597,609
2015	514,000	1,697,963	2,211,963	523,866	1,688,097
Total MWh			6,167,405	1,084,913	**5,082,492**

Net Incremental MWh Sales vs New Unit 2015 Gen			
Unit ->	Riviera 5	CCEC 3	
2015 Gen ->	6,982,871	7,046,083	
% of Gen ->	**72.8%**	**72.1%**	**~70%**

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to calculate or use FERC accounts to determine VOM costs for various types of units when they are providing energy or ancillary services.

Combined Cycle and Combustion Turbine units can receive Long Term Service Contract Cost Recovery if they have a contract with a third party vendor to provide overhaul and maintenance work that have their long term maintenance costs included if they are consistent with Manual 15 and the dollar value of each component set in the contract.[4] Furthermore, Combustion Turbine and Combined Cycle Plant major inspection and overhaul expenses may be included in variable maintenance expenses if these costs are due to incremental degradation directly related to generation, starts or a combination of both. Also, long term maintenance expenses cannot be counted if they are included elsewhere in VOM. [5]

Operating Agreement of PJM Interconnection (OA) states that for generating units powered by machines, incremental maintenance cost and other incremental operating costs may be included in cost based offers[6] and the PJM Open Access Transmission Tariff (OATT) also allows for the above incremental cost components used by members on the interconnection to be defined in detail by the Board from time to time.[7]

The OATT and the OA also mention VOM in other ways:

1. "Black Start Unit O&M" must equal the annual variable O&M in M15.[8]
2. Cost Based Regulation offers can include a cost increase in variable operating and maintenance costs resulting from operating the unit at lower megawatt output.[9]
3. There is a specific VOM for providing Synchronized Reserve.[10]
4. Reliability Pricing Model Auction Clearing Requirements assumed variable operation and maintenance expenses for such resource of $6.47 per MWh.[11]
5. Each Capacity Market Seller submitting a Sell Offer that is accepted in a Reliability Backstop Auction shall be paid the offer price in such Sell Offer ....net of the Variable Operations and Maintenance costs of such resource, as determined in accordance with the PJM Manuals.[12]
6. Development of Economic Transmission Enhancements and Expansions use variable O&M costs in the calculations to determine the economic benefits of accelerating or modifying planned reliability-based enhancements or expansions or of constructing additional economic based enhancements or expansions.[13]

Other RTO practices regarding VOM

Electric Reliability Council of Texas (ERCOT) Verifiable Cost Manual M14 states that "For purposes of calculating Mitigated Offer Caps, Variable O&M costs are limited to the incremental

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Author Company	UTILICAST LLC
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Final Methodology for Calculating Variable Operation and Maintenance Cost Under the Variable Cost Option

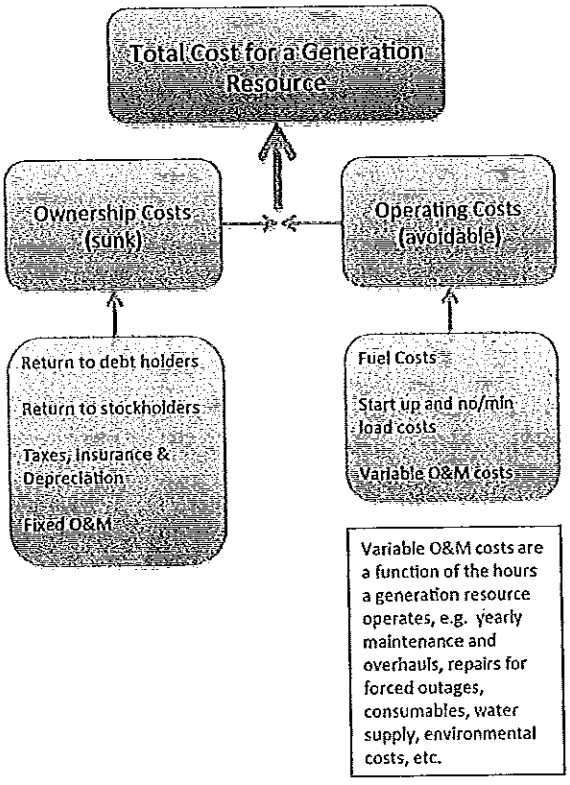
1. Introduction

At its core, the electricity market designed, implemented and operated by the California ISO is based on a series of integrated processes that take place before and during real time. These processes are described in Sections 31-34 of the FERC-approved CAISO Tariff. The overarching intent of these processes including the Day Ahead, Intra Day and Real Time Markets is to minimize the production cost of balancing supply and demand given the offers from generation resources and constraints imposed by reliable operation of the grid and network topology.

The purpose of this paper is to derive the appropriate methodology for determining a portion of the costs that are included in the Variable Cost Option. More specifically, the objective of this paper is to recommend (1) the methodology used to calculate/determine the adder for Variable O&M (VOM[1]) costs and (2) the appropriate values for this specific cost adder.

Figure 1, provides a disaggregation of the total costs for a generation resource into (1) Ownership or "sunk" costs and (2) Operating or "avoidable" costs. A generator will only operate if the latter costs are covered, since they incur the former expenditures regardless of the level of production.

Figure 1: Disaggregation of Total Generation Costs



It is important to note that with respect to many operational activities, accepted accounting standards allow generators to allocate the respective costs in different ways. Thus costs that one generator allocates to running at minimum load, another generator may allocate to the costs associated with start-up. As is discussed in Section 5, the recognition that not all costs must be defined similarly by all generators, underpins the differences found in the methodologies currently used by the RTO/ISO markets in the US.

Finally, the scope and direction of this paper and, therefore, the resulting recommendations are based Board approval[2] following the commitment cost

[1]The acronyms O&M and VOM are used interchangeably.

[2]See the following links: http://www.caiso.com/Documents/Board%206)%20Decision%20on%20Modifications%20to%20Bidding%20Provisions%20for%20Commitment%20Costs and http://www.caiso.com/informed/Pages/StakeholderProcesses/BiddingMitigationCommitmentCosts.aspx.

Maintenance Cost Categories

Maintenance Costs that fall within the categories listed in NERC's Data Reporting Instructions or as shown in Tables 4-6 below may be included as a Resource's Verifiable Maintenance Costs. Submitted Maintenance Costs may include a reference to an appropriate GADS Code. Additionally, submitted maintenance costs will only be approved to the extent that they comply with all other relevant provisions within this Manual. This means, for example, fixed maintenance costs, maintenance costs which cannot be verified, and *Event Specific Verifiable Maintenance Costs* will not be approved, even if they fall within a GADS category.

NERC's Data Reporting Instructions with an effective date of January 2007 may be found at the following link:
ftp://www.nerc.com/pub/sys/all_updl/gads/dri/2007_GADS_DRI.pdf

Currently, the Data Reporting Instructions may be found by following these steps:

Step 1: Connect to www.nerc.com
Step 2; From the drop down menu, choose GADS Services
Step 3: From the title menu, select Data Reporting Instructions
Step 4: Choose Appendix B1-B9

Operating Cost Categories

Other permissible categories of Operating Costs are listed tables 4-6 below. Additionally, submitted Operating Costs will only be approved to the extent that they comply with all other relevant provisions within this Manual.

Table 4: O&M Categories applicable to all generating plants

1. Water consumption in plant operations.
2. Emission credits.
3. Incremental operating labor.
4. Auxiliary equipment repair.
5. Replacement of consumables and normal wear-and-tear items (e.g., seals, lockplates, nuts, bolts, gaskets, etc.).
6. Mechanical parts replacement.
7. On-line running maintenance.
8. Performance testing.
9. Vibration analysis monitoring.
10. Waste water treatment.
11. Auxiliary equipment maintenance.
12. Filter changes.
13. Oil changes.
14. Oil and water level checks.
15. Condensate Pump Inspection and Overhaul.
16. Circulation Pump Inspection and Overhaul.
17. Replacement of Cooling Tower Fill and Drift Eliminators.
18. Steam Turbine Generator inspection.
19. Preventive maintenance tests.
20. Auxiliary power consumption.
21. Auxiliary fuels/lubricants.
22. Compressor and turbine rotors inspection.
23. Minor Generators repairs.

24. Fuel metering equipment replacement.
25. Gas turbine auxiliaries.
26. Controls and accessories replacement.
27. Pre-air heater test.
28. Transformer maintenance.
29. Relay cleaning.
30. Battery system service.
31. Oxygen boiler test.
32. Condenser inspections.
33. Condenser cleaning.
34. Water demineralization and treatment.
35. On-line performance testing.
36. Condenser tube cleaning.
37. Boiler tube repair resulting from cycling operations.
38. Generator field rewinds.
39. Stop valve inspection.
40. Control valve inspection.
41. Boiler casing leak repair (where applicable).

Table 5: O&M Categories applicable to Coal-Fired Generating Plants

1. Boiler safety valve testing
2. Steam drum repairs
3. Water wall repairs
4. Seals replacement
5. Coal hopper repair
6. Coal crusher repair
7. Coal freeze proofing
8. Chemical cleaning of internal heating surfaces
9. Repair or stud surfaces
10. Evaporator tubing repairs
11. Superheater and reheater tubing and headers repairs
12. Heat exchanger cleaning
13. Conveyor belt repair
14. Coal drying
15. Coal-handling and distribution equipment repair
16. Stack, fans and draft repair
17. Seal welding of tubes
18. Coal pulverizing equipment repair

Table 6: O&M Categories applicable to Combustion Turbine/Combined-Cycle Generating Plants

1. Alignment check of the gas turbine to the generator, as well as of the gas turbine to the accessory gear.
2. BFW Pump Inspection and Overhaul.
3. Borescope inspections of compressor casings and turbine shells.
4. Casings, shells, and frames/diffusers inspected for cracks and erosion.
5. Checks of alignment between gas turbine and generator; gas turbine and accessory gear.
6. Radial and axial clearances check.
7. Seals for rubs and deterioration of clearance checks.
8. Device calibrations check.
9. Chemical Cleaning or Hydro-Blasting of Heat Transfer Surfaces.
10. Fluorescent penetrant inspection of bucket vane sections.
11. Combustion Turbine Generator Evaporative cooling system media replacement.
12. Combustion Turbine Generator Inspections.
13. Compressor inlet and flow-path inspection for fouling, erosion, corrosion, and leakage.
14. Cooling Tower Fan Motor and Gearbox Inspection and Overhaul.
15. Compressor wash systems repair.
16. Distillate Fuel Pumps Inspection and Overhaul.
17. Electric generator inspection and overhaul.
18. Environmental: SCR replacement.
19. Evaporative cooling system media.

20. Inlet Air Filter Replacement.
21. Inspection of bearing liners and seals for clearance and wear.
22. Buckets inspection.
23. Fuel Gas Compressors Inspection and Overhaul.
24. Fuel System replacement.
25. Heat Transfer Surface Replacements.
26. Inspection of compressor blades for rubs.
27. Hydrogen embrittlement testing.
28. Inspection of flow sleeve welds for cracking.
29. Inspection of fuel nozzles for plugging and erosion of tip holes.
30. Detectors, combustor flow sleeves, flow sleeve welds, combustion system and discharge casing.
31. Maintenance of fuel treatment system.
32. Mechanical inlet air cooling chiller and pump inspection and overhaul.
33. Sampling of turbine lube oil for viscosity, chemical composition, contamination, particulate, and water-contamination.
34. Water Treatment: Resin Replacement.
35. Impact damage, corrosion, and buildup of deposits.
36. Inspection of cross-fire tube, retainer, and combustion liner for cracking, oxidation, corrosion, and erosion.
37. Inspection of fluid, air, and gas passages in the nozzle assembly for plugging, erosion, corrosion, etc.
38. Inspection of fuel nozzles, liners, transition pieces, crossfire tubes and retainers, spark plug assemblies, flame.
39. Inspection of inlet systems for corrosion, cracked silencers, and loose parts.
40. Maintenance of inlet filtration systems and inlet evaporative coolers for compressors.
41. Refurbishing bucket coatings.
42. Turning and ratchet gear maintenance.
43. Water Treatment: RO Cartridges Replacement.
44. Inspection of combustion chamber interior.
45. Inspection of fuel nozzles.
46. Inspection of spark plug assembly.
47. Inspection of later-stage diaphragm packing.
48. Inspection of bucket seals for clearances, rubs, and deterioration.
49. Inspection of turbine stationary shrouds.
50. Inspection of wheelspace instrumentation.
51. Inspection of variable inlet guide vanes (VIGVs).
52. Repair and refurbishment of second and third-stage nozzles.
53. Recoating of turbine buckets.
54. Replacement or refurbishment of hot gas parts.

Appendix 5: Specification of Relevant Equations

Equation 1: Verifiable Start-up Offer Cap (Hot Start) ($/Start)

Verifiable Startup Offer Cap ($/Start) = AFCRSrt (MMBtu/Start) * [(GASPERSU*FIP + OILPERSU*FOP)/100] + VOMS

Where: AFCRSrt = the verified fuel consumption for a hot start (MMBtu/Startup)
GASPERSU = Percentage of natural gas used for a start