Operation & Maintenance Cost Drivers

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Five Plants Revenue

Small and large plants
Binary and flash
2 years data
Expense Drivers

- Payroll & Benefits: 35%
- Administrative & General: 25%
- Variable Operations: 18%
- Plant Systems: 11%
- Royalty: 7%
- Fixed Operations: 4%
Payroll and Benefits

• Salary and overhead
• Range 20-48% of expense not including Wells and Major Maintenance
• $10-12 /Megawatt hour (MWhr) smaller plants
• $3-5 /MWhr bigger plants
Administration & General (A&G) Expense

• Property tax and insurance (94% of the G&A budget)
• Accounting, audits, consultants for bank and other (4% of G&A budget)
• Range of 12-35% of expense not including Wells and Major Maintenance
• Operations has little influence
Variable Operations Expense

- Costs that change with changes in brine flow or generation:
  - Chemicals cooling tower, scale inhibition
  - Water purchase quantity
  - Back feed power quantity
  - Fuel
  - Royalties

- Range 7-17% (average 12%) of expense not including Wells and Major Maintenance

- One plant buys pump power 37%

- Salton Sea has large expenses, filter cake disposal, water purchase, process chemicals and cooling tower chemicals

- Binary and large flash plant has lower variable expense $1.1-$2.8 MWhr

- Operations can influence chemical costs through supply and services contract negotiations
Corrosion Mitigation and Chemical Skids
Fixed Operations Expense

- Those costs that do not change with changes in brine flow or generation
  - Water purchase capacity
  - Laboratory supplies
  - Environmental regulatory consulting
  - Oil & lubricants
  - Back feed power capacity charge
  - Permit fees
  - Equipment rentals

- Range 7-34% of expense not including Wells and Major Maintenance

- $0.4-0.9/MWhr

- Operations can influence back feed power capacity charges
Remaining Expenses

• Plant Systems
  – Planned and forced outage maintenance
  – Range 7-15% of expense not including Wells and Major Maintenance

• Royalty
  – Range 4-9% of expense not including Wells and Major Maintenance
Major Maintenance (MM)  
Plant Overhaul

- 127-143% annual maintenance expense increase due to MM
- 1-3 year cycles
- Banks normally require MM reserve fund
- Extending MM from 3 to 4 years reduces MM life cost by 20% and increases revenue slightly
- Operations can influence the length, the frequency of MM
- Techniques to measure performance include mean time to failure, Root Cause Analysis
- Capital projects, spare rotor, generator may be required
Plant Well Systems
Event Driven

• Down hole pump maintenance, scale cleanouts
  » $500k Pump pulls

• Scale cleanouts
  » $85k hydro-blast
  » $150k coiled tubing mud motor
  » $1+ M rig

• Down hole pump maintenance $1 – 4/MWhr
• Well repair can be expensive. Banks normally require well reserve fund.
• Like MM extending the time between maintenance has strong expense and revenue impacts. Operations has some influence.
Sensitivity Analysis
Key O&M Drivers

- 10% Decrease in Enthalpy (flash $10M/well)
- Extend Major Maintenance 1 year ($3,200/MM)
- 1% increase in PPA Price ($125/MWhr)
- 1% Increase in Capacity Factor

Annualized Value ($000)
Summary

• Payroll and Benefits and A&G are largest component of expense @ 60%.
  – Operations has little influence
• Operations can have large impact by
  – Extending the time between Major Maintenance and Well Work
  – Reducing forced outage
  – Increased generation during peak hours