

HDR



How do you do it? Technical & Regulatory

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Industrial & Institutional Power and Energy Essential Services

**Balancing Reliability with Budget
Constraints – Finding Savings (or
Revenues) in Energy Operations**

Keys to Assessing Alternatives





One thing is consistent -
Every Situation is Different!

Alternatives must be evaluated in context of the *Owner's existing culture* – evaluation factors include:

- Reliability & Responsiveness
- Operational Complexity
- Operational Flexibility
- Cost of Lost Production
- Implications of Service Interruptions
- Risk Tolerance
- Management and Administrative Control
- Efficiency / Utilization Attained

Alternative Evaluation Factors (continued)

- Cost of Service
- Savings / Revenues / Profit
- Sustainability
- Permitting Implications
- Pending Regulations
- Human Resources
- Legal / Ethical
- Political

*These factors, **as weighted by the Owner**, become the Evaluation Parameters to judge the Efficacy of Alternatives Considered.*

A disciplined approach is needed to vet Alternatives vs. Current Operations

- Clearly Define Objectives – Revisit & Confirm Often!
- Establish Evaluation Metrics
- Clearly Identify Assumptions and Variables
- Identify and Screen Potential Project Concepts
- Anticipate Iterations!

Key Evaluation Metrics & Variables

- System Performance
- System Utilization / Capacity Factor
- Energy Displacement Accounting
- Valuation of Savings / Escalation Factors
- Normal O&M Expenses
- Major Overhaul Frequency & Cost
- Financial Metrics (Bonds/Insurance, Debt/Equity, Discount Rate, Depreciation)
- Tax Implications (Property, Fed/State, Gross Receipts, ITCs)
- Legal and Political Implications

Two Classic Scenarios

- **Consideration of :**
 - Cogeneration / On Site Power Generation
 - Outsourcing Energy Plant Operations (or Energy Assets Entirely)

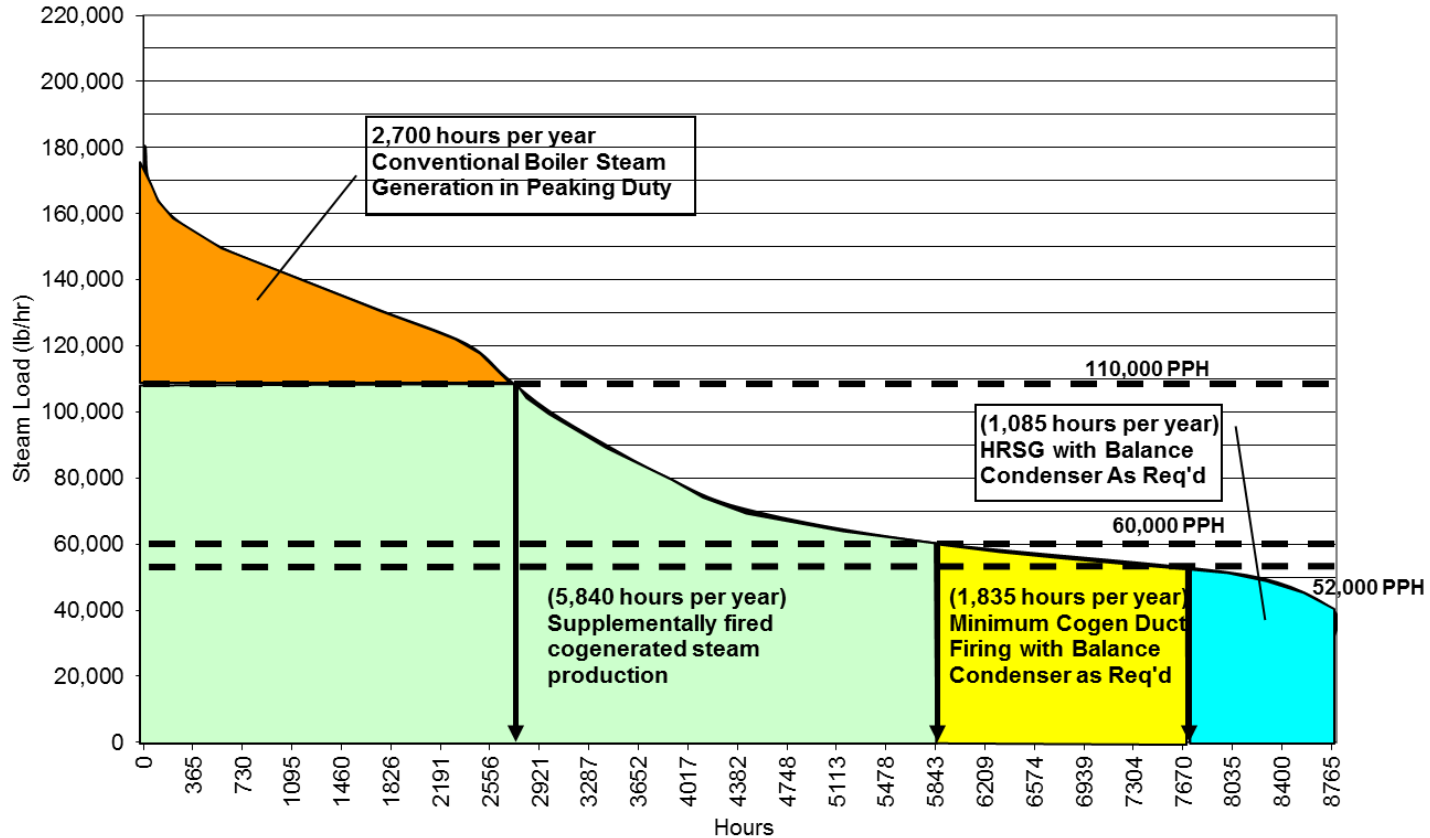
Cogeneration

Cogeneration

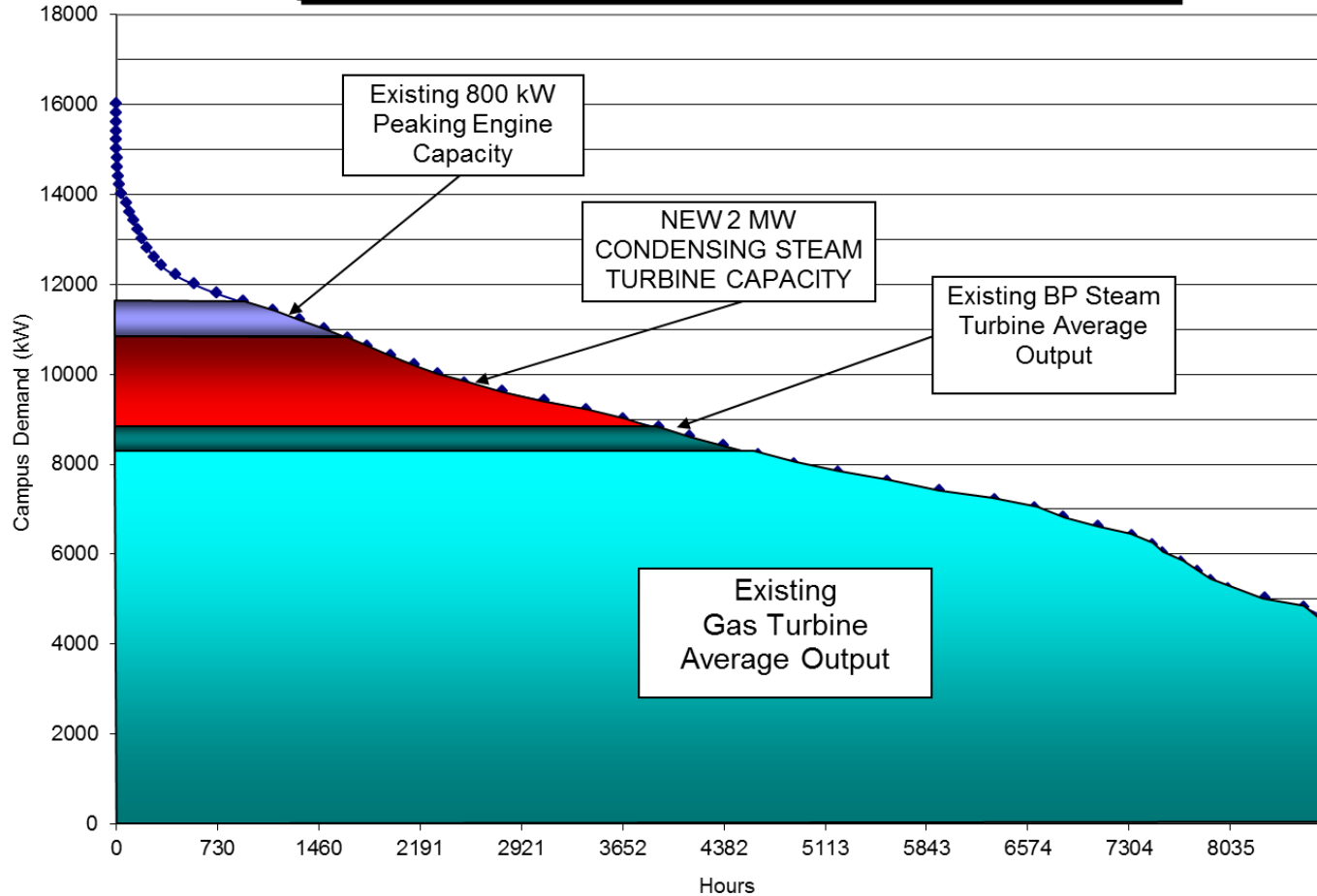
- **Quantify Existing Operations as Base Case for Comparison to Cogen**
 - Existing Unit Capacity / Dispatch / Turndown
 - Fuels / Costs / Escalations
 - Expected Maintenance & Refurbishment
 - Purchased Power – If Demand Based Structure; Value of On-Peak & Off-Peak Energy and Demand

- **Review Coincident Thermal / Electrical Demands**
 - Max / Min / Average / Load Duration

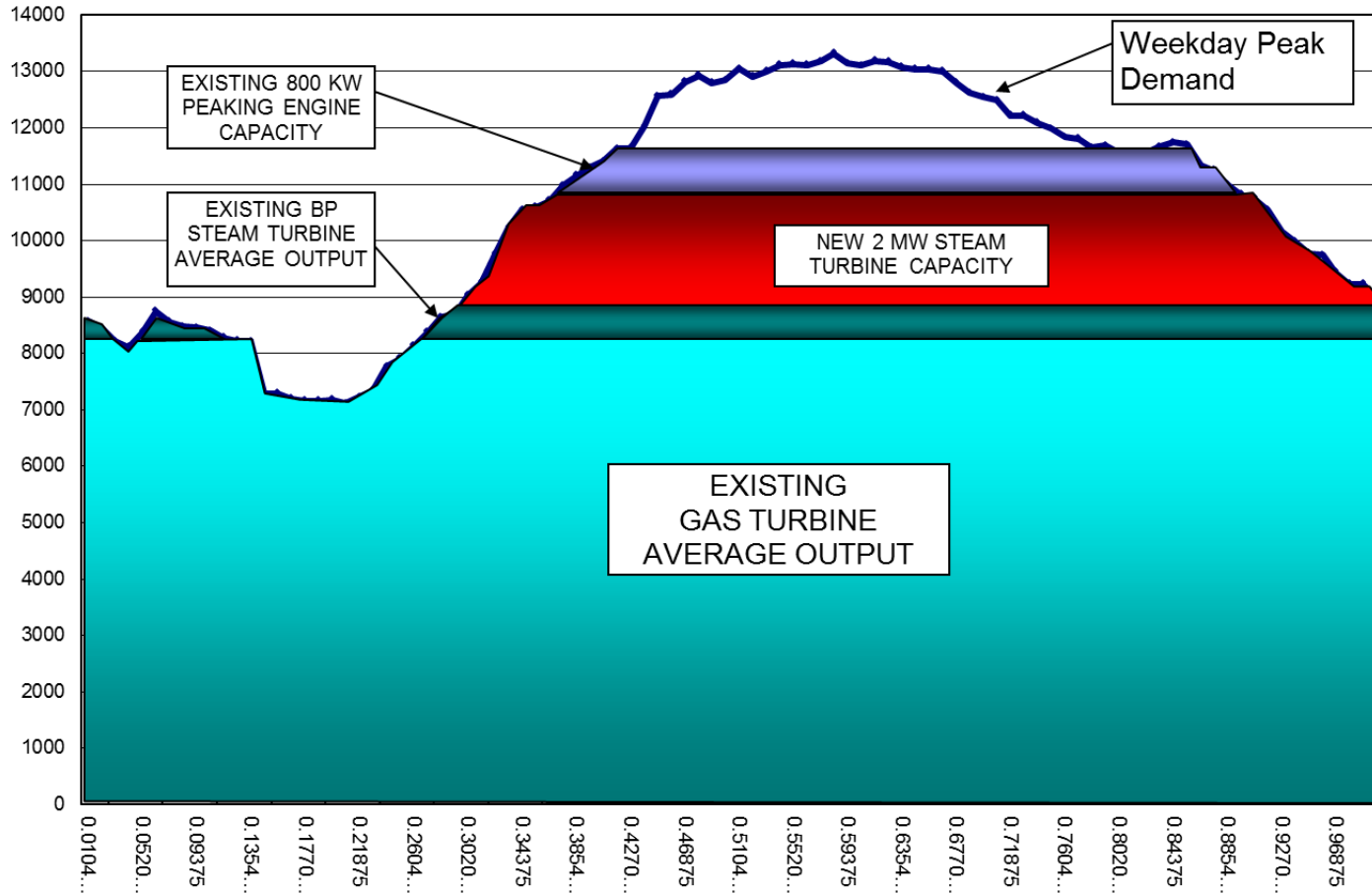
Steam Load Duration with Cogeneration



Electric Load Duration vs. Generator Capacity



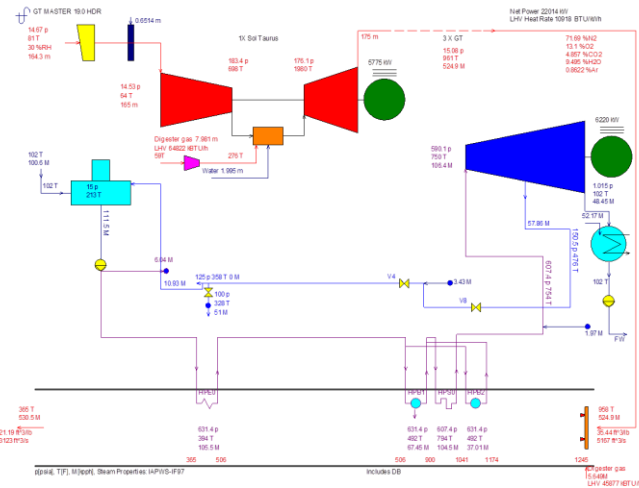
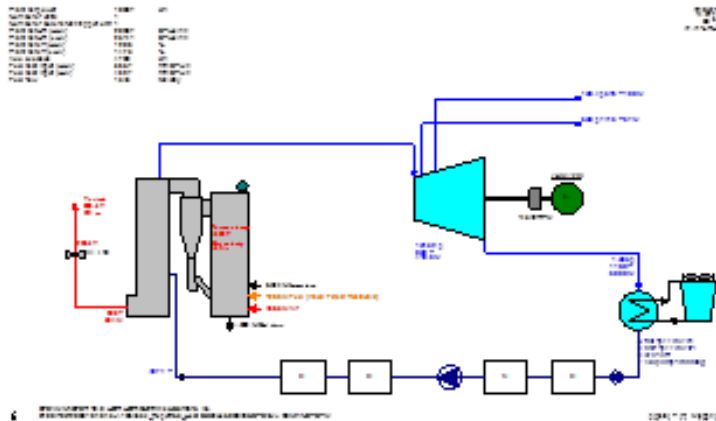
SEPTEMBER ELECTRIC DEMAND AND CAPACITY



Cogeneration

■ Candidate Generation Technology Review and Selection

- Combustion Turbine Generator
- Reciprocating Engine Generator
- Backpressure (Topping) Steam Turbine Generator
- Extraction / Condensing Steam Turbine Generator



Cogeneration

■ Fuel Supply Requirements

- Adequate Distribution Capacity in Region / Local Area
- Local Service Delivery Pressure – Compression Needed?
- Facility Service Entrance Upgrades Needed?

■ Electric Interconnection Requirements

- Serving Utility Interconnect Guidelines / Application Process
- System Impact Study
- Utility System Modifications Needed?
- Service Entrance Modifications Needed?

Cogeneration

- **Location and General Arrangement Considerations**

- Building Enclosure Requirements
- Service Interfaces to Existing Plant / Site Systems Tie-in Points

- **Redundancy and Backup Provisions**

- Electric Utility Standby Power Agreement / Charges
- Retain Existing Boilers or Include new Auxiliary Boiler as Backup
- Balance of Plant System Requirements – Existing vs. New / Upgrades

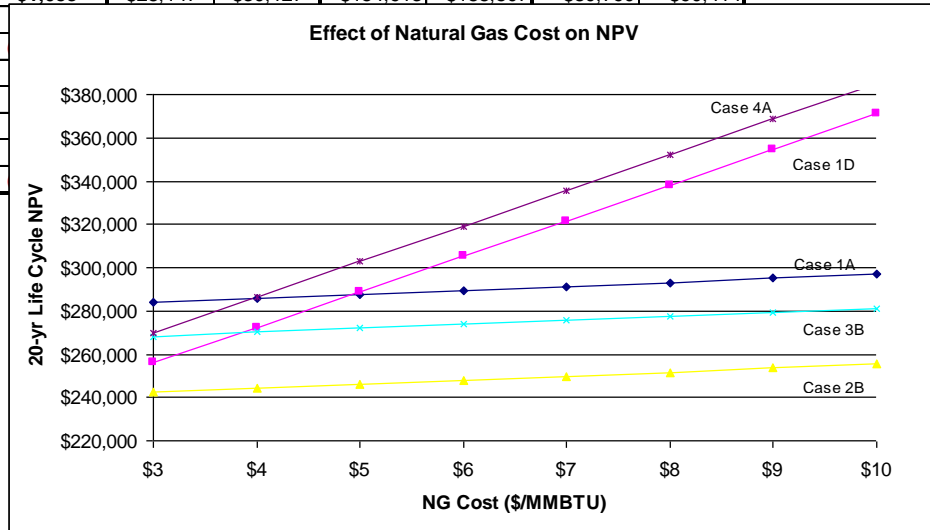
Cogeneration

- **Initially Screen Alternatives by Inspection or Very High Level Analysis Against Agreed Evaluation Parameters**
- **Refined Analysis based on Life Cycle Cost Evaluation**
 - Account for Capital, Operations, Maintenance, Owner's Costs
 - Reduce Comparison to NPV of 20 or 30-year Costs
 - Itemize Intangible Factors and Relate to Culture & Values

Cogeneration

Summarize Alternatives in Comparison to Base w/ Sensitivities on Key Variables

NPV Project Comparison Summary (all \$ in 1,000's)											
Case	Description	NPV of Life Cycle Cost		Savings from Base		NPV of Project Capital		Electrical Purchases		Fuel Costs	
		20-year	30-year	20-year	30-year	20-year	30-year	20-year	30-year	20-year	30-year
Case 1A:	Existing Boilers	\$293,527	\$344,497	\$0	\$0	\$20,177	\$21,668	\$154,913	\$188,507	\$101,743	\$115,048
Case 1B:	Non-Compliance Coal	\$293,393	\$343,443	\$134	\$1,053	\$28,147	\$30,127	\$154,913	\$188,507	\$80,790	\$90,414
Case 1C:	Package Boiler Addition	\$297,676	\$348,081	(\$4,150)							
Case 1D:	15 MW Gas Turbine Addition	\$341,299	\$395,043	(\$47,772)							
Case 2A:	Back Pressure STG Add	\$271,703	\$314,344	\$21,823							
Case 2B:	Condensing STG Add	\$252,051	\$285,944	\$41,476							
Case 3A:	2x200 KPPH CFBs + STG	\$277,179	\$312,884	\$16,348							
Case 3B:	2x300 KPPH CFBs + STG	\$277,961	\$308,628	\$15,565							
Case 4A:	1x1 15 MW CTG + BP STG	\$355,355	\$410,433	(\$61,829)							



Outsourcing

Outsourcing – Two Premises to be Considered

- Outsource *Plant Operations*
- Outsource *Plant Assets Entirely (Transfer Ownership)*

The question is . . .

Are you really ready

to tie the knot & get hitched?

Continue Ownership & Operation

- Owner retains complete control of Energy Plant operations as well as associated risks and liabilities
- *Potential* advantages include surety of service, asset longevity and ongoing relationships with “customers”, regulators and O&M staff
- If ‘*all is well*’, there is likely little motivation to outsource; conversely, aging assets, labor disputes, lack of needed capital and other factors could prompt serious consideration of outsourcing

Outsource Plant Operations

- Owner delegates a significant amount of control to the 3rd Party; Owner retains a significant portion of political, legal, and environmental risk and liability associated with the facility
- Results can vary significantly based upon contract agreements, philosophy of the 3rd Party and cooperation between organizations
- 3rd Party not responsible for capital infusions and does not participate in any power or steam sales agreements; Owner retains ultimate responsibility for Permitting and associated risks/liabilities

Outsource Plant Operations (Cont.)

- Perceived benefits of 3rd Party operations typically driven by reductions in O&M costs and budgets; 3rd Party management fees (profit) can impact savings ultimately derived
- A lack of O&M expertise or desire to focus on core business (making products) may be another driver for an Owner to consider outsourcing of energy plant operations
- 3rd Party services contract assumed to include guarantees and penalties for plant availability and reliability

Outsource Plant Assets

- 3rd Party accepts Ownership, operations and maintenance of energy plant and all assets as negotiated in the agreement
- Following sale and transfer of assets, 3rd Party would then contract to host facility with specific limitations and penalties incorporated into power and/or steam sales agreements
- Owner maintains liability for interfacing systems, condensate return quantities and political liability associated with the actions of the 3rd Party operator

Outsource Plant Assets (Cont.)

- Perceived benefits achieved by reductions in capital outlay, increased cash flow, reduced legal & environmental liabilities and possible savings achieved by operating efficiencies and cost reductions
- Primary drivers include desire to monetize assets or by need to expand capacity or initiate capital intensive plant betterment and renewal
- Contract arrangements typically include provisions to return the assets to the Owner at the end of contract term; value dependent upon the care and custody of the assets by the 3rd Party over the contract life

Decision Criteria

Decision Criteria

In order to allow an Owner to evaluate alternative Ownership and Management approaches, *decision criteria* can be established for each approach considered:

- Continue Ownership & Operation
- Outsource Operations
- Outsource Assets

Decision Criteria: Financial Value

- Competitive Cost of Services
- Funding / Budget Directives
- Cost Transparency
- Capital Planning
- Bulk Servicing / Parts Advantages
- Desire / Need to Monetize Assets
- Owner vs IPP Funding (Tax exemption potentials, etc.)

Which approach achieves the lowest cost of operation?

Decision Criteria: Human Resources

- Union Considerations
- Staff Turnover / Requirements
- Availability / Selection of Qualified Staff
- Staff Training / Continuity
- Ownership of Operations

Can a 3rd Party operator out-perform your current staff?

Decision Criteria: Management and Control

- Long-term / Life of Assets – Are Incentives Aligned?
- Integration with Owner's Management / Operations
- Degree of Owner Control / Participation
- Communication / Reporting Requirements

Owner has vested interest; contract provisions crucial to incentivize 3rd Party operator

Decision Criteria: Level of Service

- Reliability of Service
- Responsiveness
- Knowledge of Owner's Internal Customers and Demands
- Ability to React to Emergency Situations

How does the selected approach impact level of service?

Decision Criteria: Legal / Ethical

- Power / Steam Sales Agreements
- Services Agreements
- Union
- Employment

Type of agreement and complexity is situation dependent

Decision Criteria: Mission / Culture

- Culture of Cooperation
- Culture of Service
- Lifecycle Optimization vs Revenue / Profit Maximization

Alignment of Owner & 3rd Party philosophies is crucial

Decision Criteria: Environmental

- Desire to Incorporate Renewable Energy
- Greenhouse Gas Reductions
- Impact of Future Environmental Regulations

3rd Parties are driven by revenues and profits; is there an ROI?

Decision Criteria: Political

- Owner's Internal Customer Considerations
- Union Considerations
- City/State Government Considerations

Ultimate perception is likely that Owner is responsible politically

Decision Criteria: Core Values

- Best-In-Class Organization
- Sustainability of Operations
- Build a Foundation for the Future

Are the 3rd Party's Core Values in common with the Owner?

Decision Criteria Matrix

Decision Criteria Evaluation

Challenge – How to evaluate often-conflicting decision criteria, some of which are tangible, together with many others that are intangible and qualitative?

Solution – Establish a weighted alternative ranking tool and involve as many viewpoints as appropriate in representing various Owner decision makers and stakeholders that would be impacted by an Energy Sourcing decision

The following evaluation matrix is a sample evaluation tool with Owner's team weightings incorporated - The management alternative with the highest score represents the best evaluated option

Decision Criteria Evaluation Matrix



Criteria	Weighting	Management Alternative		
		Owner Operations	Third Party Operations	Third Party Ownership
Financial	50.0%	1.15	0.9	0.65
Competitive Cost of Service	10.0%	3	2	1
Funding / Budget Directives	5.0%	0	0	0
Cost Transparency	5.0%	3	2	1
Capital Planning	10.0%	3	2	1
Bulk Service / Parts Advantages	5.0%	1	2	3
Desire to Monetize Assets	5.0%	1	2	3
State Funding Advantages	10.0%	3	2	1
Human Resources	3.0%	0.07	0.06	0.05
Union Considerations	1.0%	3	2	1
Staff Turnover / Retirements	0.5%	3	2	1
Sourcing of Qualified Staff	0.5%	1	2	3
Staff Training / Continuity	0.5%	1	2	3
Ownership of Operations	0.5%	3	2	1
Management and Control	10.0%	0.3	0.2	0.1
Long-term / Life of Assets	4.0%	3	2	1
Integration with University Management	2.0%	3	2	1
University Control / Participation	2.0%	3	2	1
Communication / Reporting Requirements	2.0%	3	2	1
Level of Service	25.0%	0.75	0.5	0.25
Reliability of Service	10.0%	3	2	1
Responsiveness	5.0%	3	2	1
Knowledge of Customers and Demands	5.0%	3	2	1
Ability to React to Emergency Situations	5.0%	3	2	1

Decision Criteria Evaluation Matrix (Cont.)

Criteria	Weighting	Management Alternative		
		Owner Operations	Third Party Operations	Third Party Ownership
Legal / Ethical	3.0%	0.09	0.045	0.045
Power / Steam Sales Agreements	1.0%	3	2	1
Services Agreements	0.5%	3	1	2
Union	1.0%	3	1	2
Employment	0.5%	3	2	1
Mission / Culture	2.0%	0.06	0.04	0.02
Culture of Cooperation	1.0%	3	2	1
Culture of Service vs Revenue / Profit	1.0%	3	2	1
Environmental	3.0%	0.05	0.06	0.07
Renewable Energy	1.0%	3	2	1
Greenhouse Gas Reductions	1.0%	1	2	3
Impact of Future Environmental Regulations	1.0%	1	2	3
Political	2.0%	0.06	0.04	0.02
Customer Considerations	1.0%	3	2	1
Union Considerations	0.5%	3	2	1
State Considerations	0.5%	3	2	1
Core Values	2.0%	0.04	0.04	0.04
Best Practices Organization	1.0%	1	2	3
Sustainability of Operations	0.5%	3	2	1
Build a Foundation for the Future	0.5%	3	2	1
Total Evaluation	100.0%	2.57	1.885	1.245



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