

EXHIBIT NO. ____ (RG-6HC)
DOCKET NO. UE-07 ____
2007 PSE PCORC
WITNESS: ROGER GARRATT

**BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION**

**WASHINGTON UTILITIES AND
TRANSPORTATION COMMISSION,**

Complainant,

v.

PUGET SOUND ENERGY, INC.,

Respondent.

Docket No. UE-07 ____

**FIFTH EXHIBIT (HIGHLY CONFIDENTIAL) TO THE
PREFILED DIRECT TESTIMONY OF
ROGER GARRATT
ON BEHALF OF PUGET SOUND ENERGY, INC.**

**REDACTED
VERSION**

MARCH 20, 2007

Puget Sound Energy, Inc 2005 RFP Update

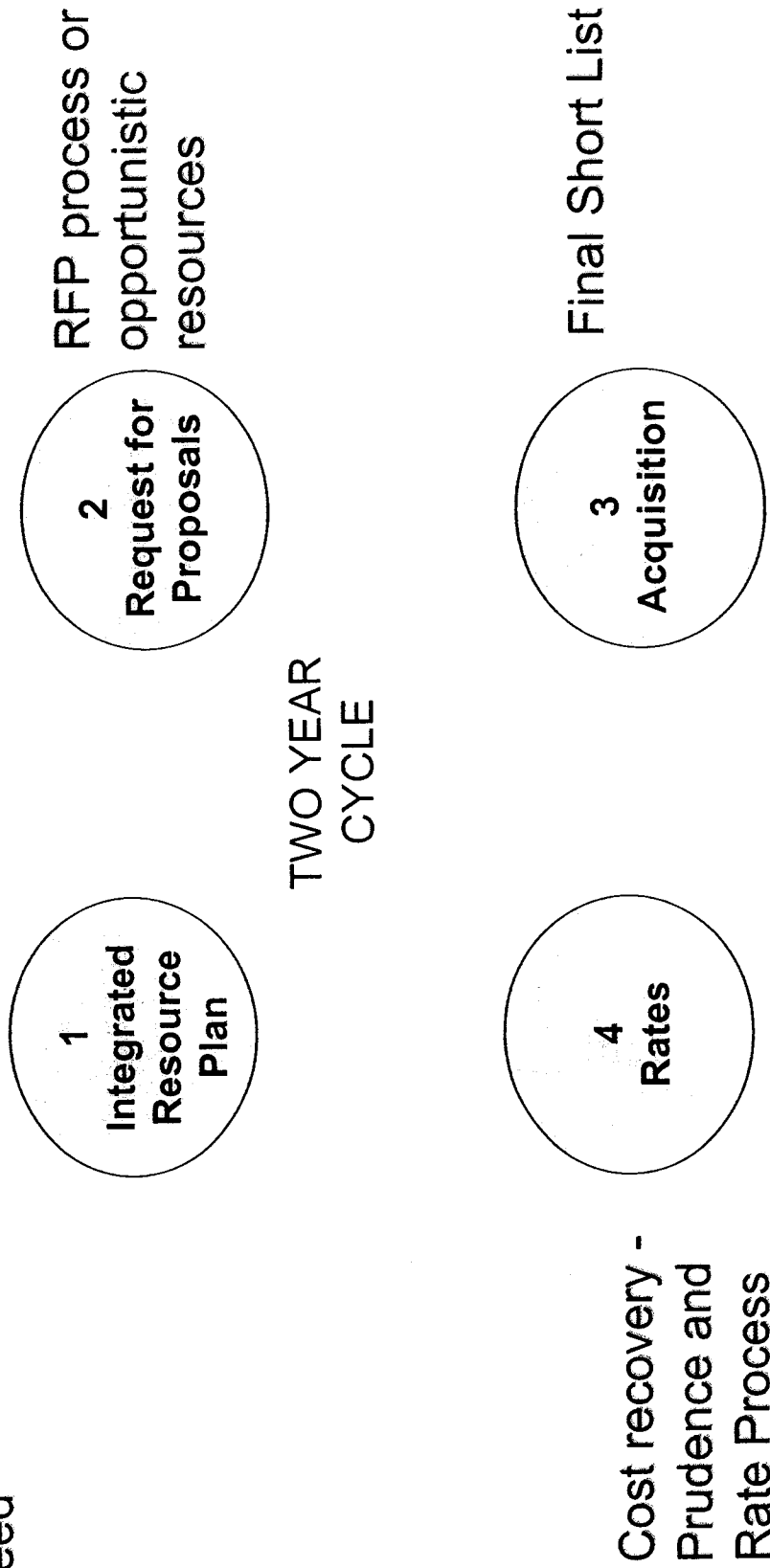
July 20, 2006

Presentation Outline

- └ Resource Planning and Acquisition Process
- └ PSE's Resource Needs
- └ RFP Process
- └ Quantitative Evaluation
- └ Phase I Detail

Resource Planning & Acquisition Process

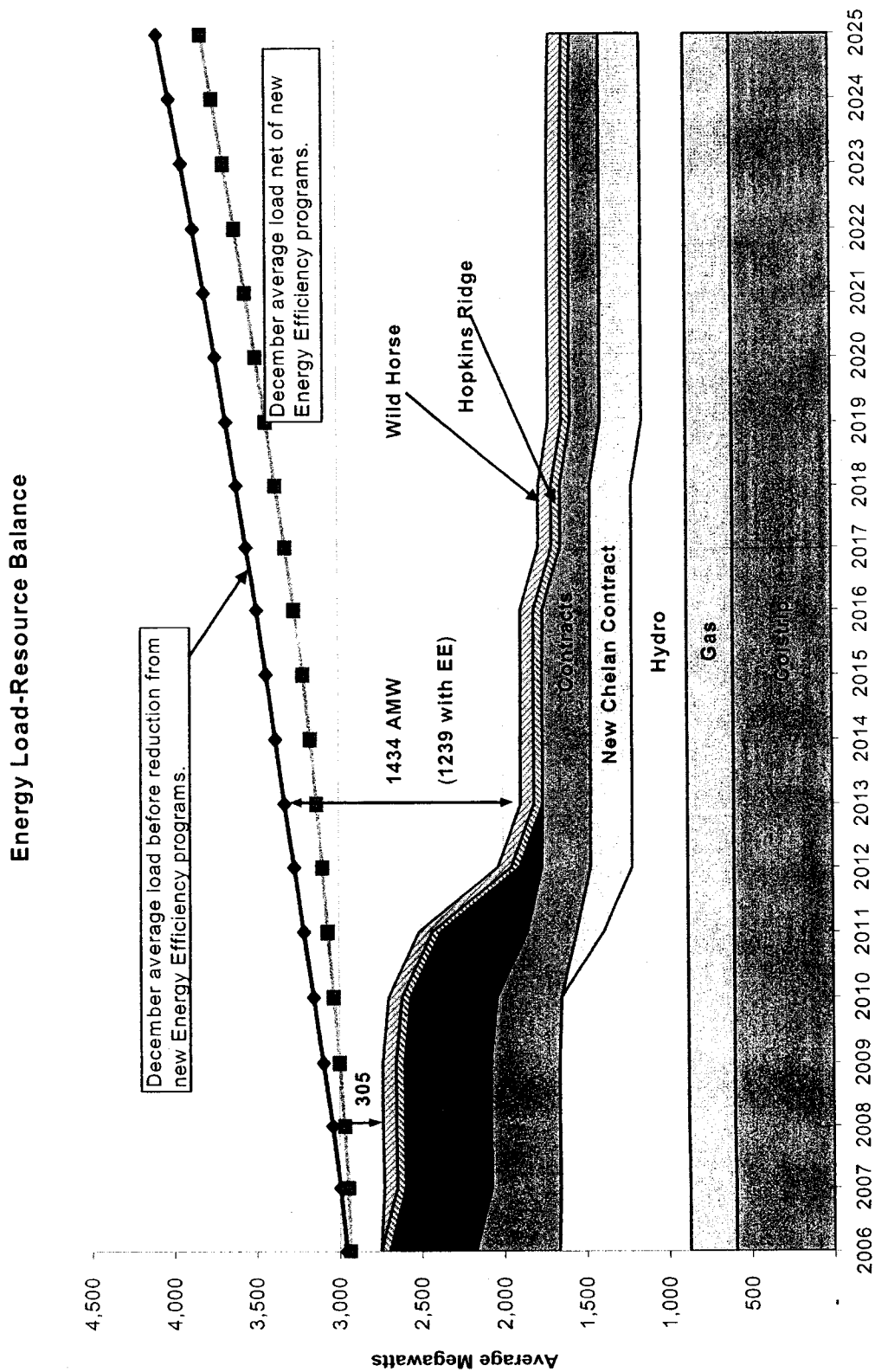
2005 LCP identified
need



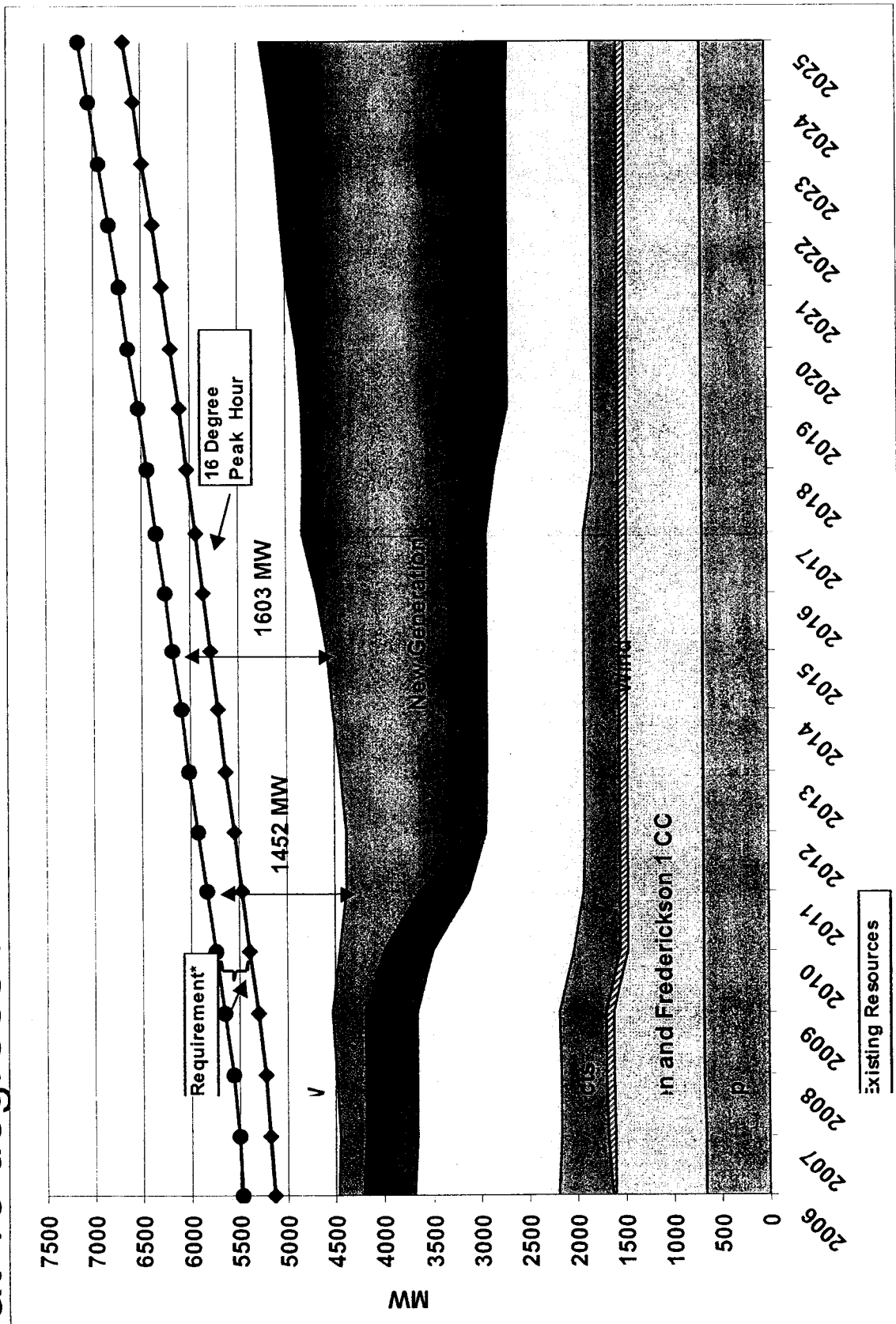
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PSE's energy need is significant = average load minus average generation based on highest deficit month



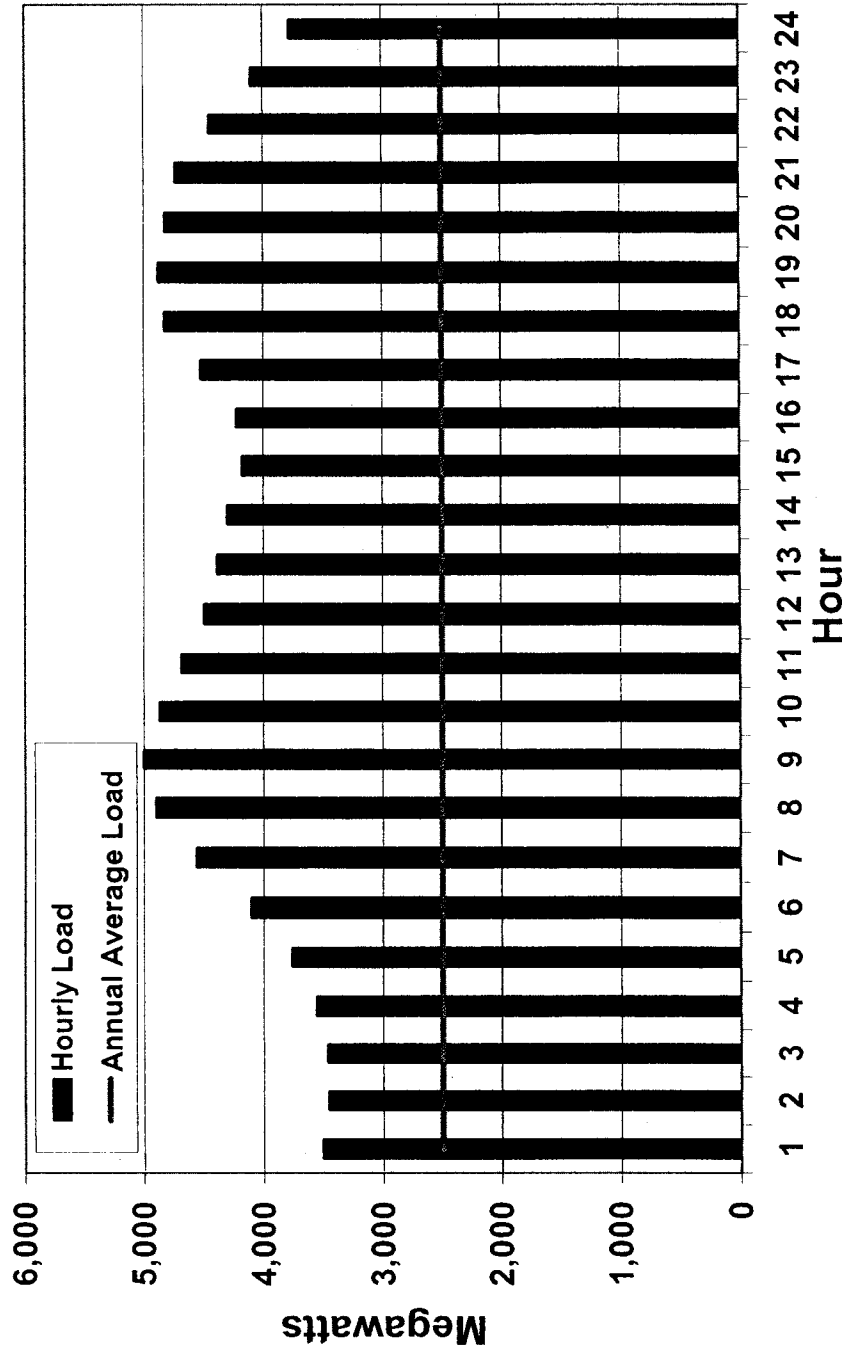
PSE's capacity need is defined as the one hour peak at 16 degrees F



WOTG Meeting July 29, 2016

PSE's intraday dual peak

For Illustrative Purposes Only PSE 24 Hour Peak Day

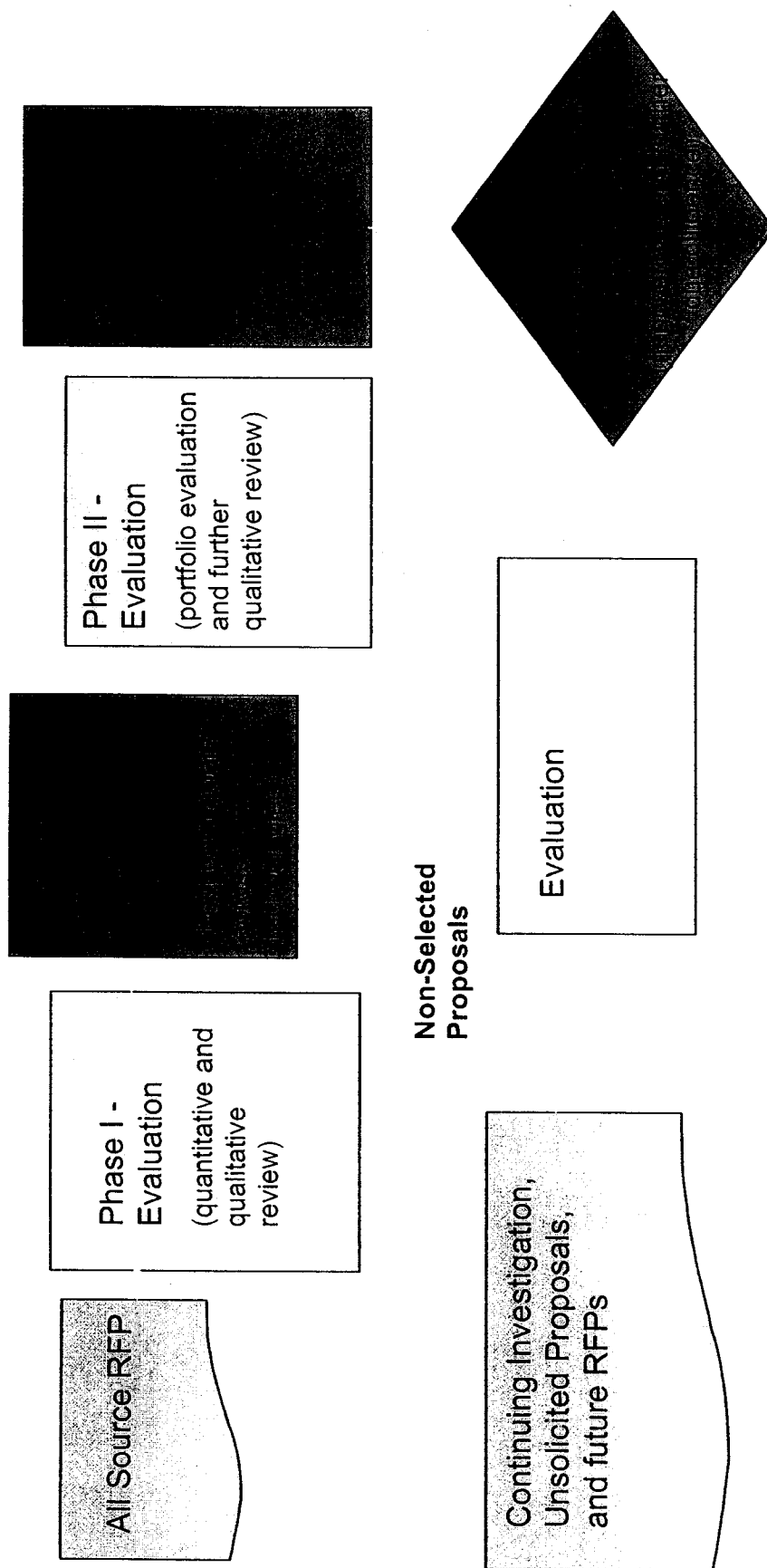


PSE's load factor is 0.50

Presentation Outline

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2005 RFP Evaluation Process



RFP Evaluation Criteria

<ul style="list-style-type: none"> • Timing • Resource match to monthly need • Match to monthly need through contract • Operational flexibility • Performance within existing PSE generation portfolio • Resource mix/diversity 	<ul style="list-style-type: none"> • Resource cost including imputed debt and credit costs • Transmission • Portfolio cost impact (Phase II only) 	<ul style="list-style-type: none"> • Status and schedule • Price volatility • Resource flexibility and stability • Resource technology • Long-term flexibility • Project risk • Impact on PSE's overall risk position • Environmental and permitting risk • Respondent risk • Ability to deliver as proposed • Status of transmission rights • Managerial control • Security and control • Federal regulatory approvals 	<ul style="list-style-type: none"> • Environmental impacts • Resource location • Community impacts 	<ul style="list-style-type: none"> • Capital structure impacts • Future exposure to environmental regulations and/or taxes including greenhouse gas emissions • Guarantees and security
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WUTC Meeting/July 20, 2016

Evaluation Team

Fuel Supply

Quantitative

Community Impacts

Real Estate

Operations

Legal

Business /
Commercial Issues

Technology

Transmission

Credit, Finance,
Insurance and
Accounting

Regulatory

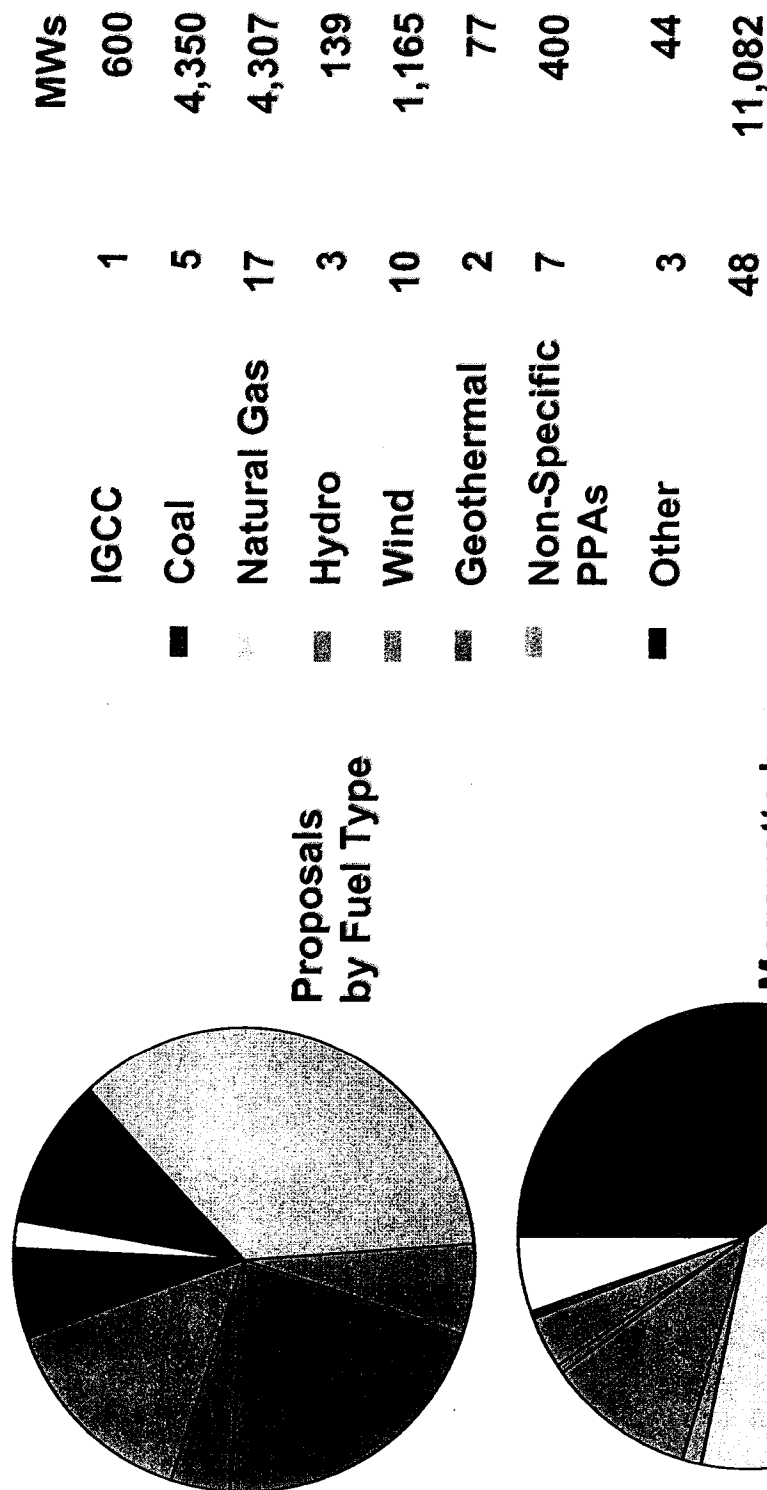
Environmental



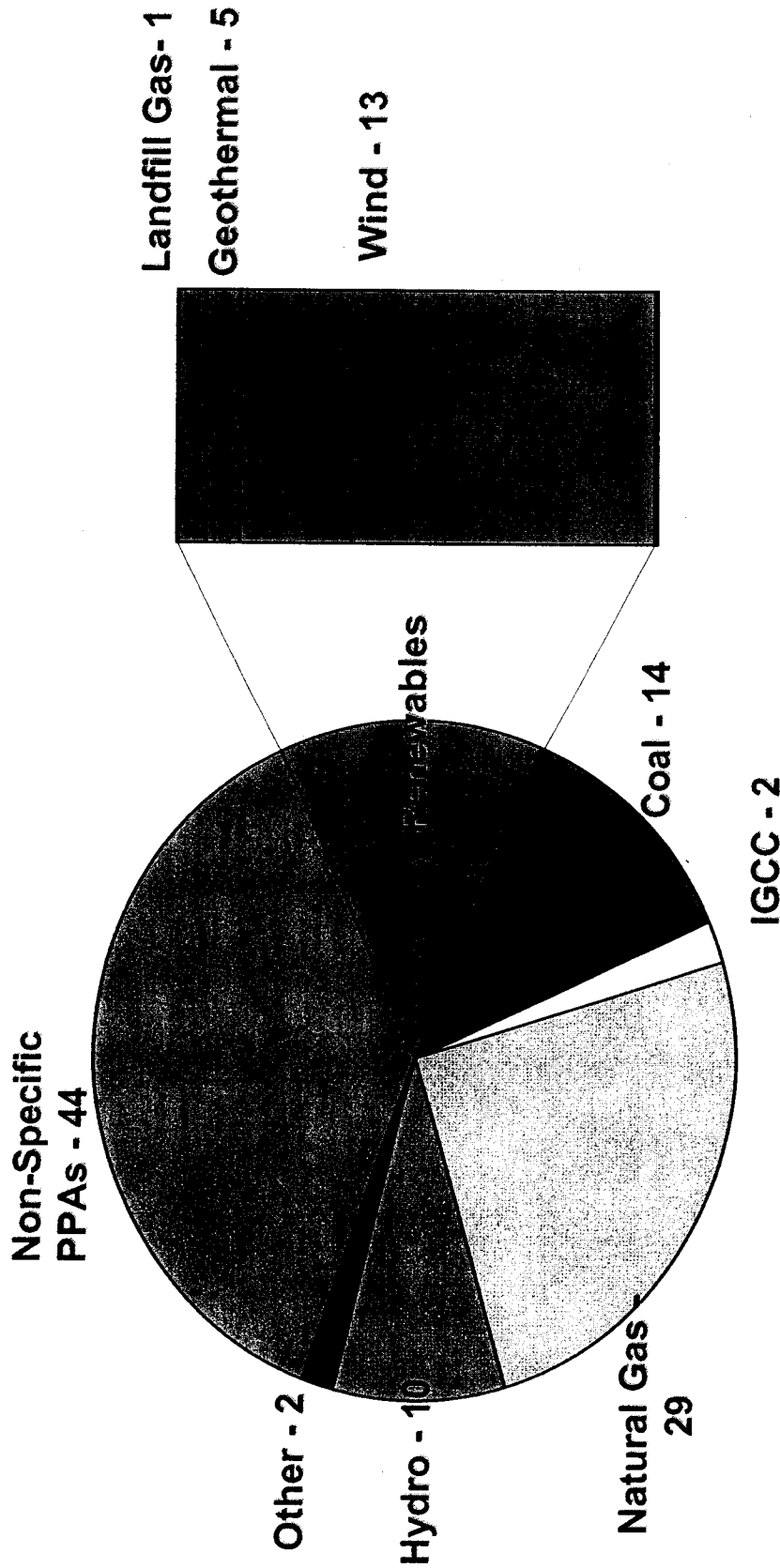
Page 11 of 46

48 Respondent Proposals Received

More coal, less wind in this RFP cycle

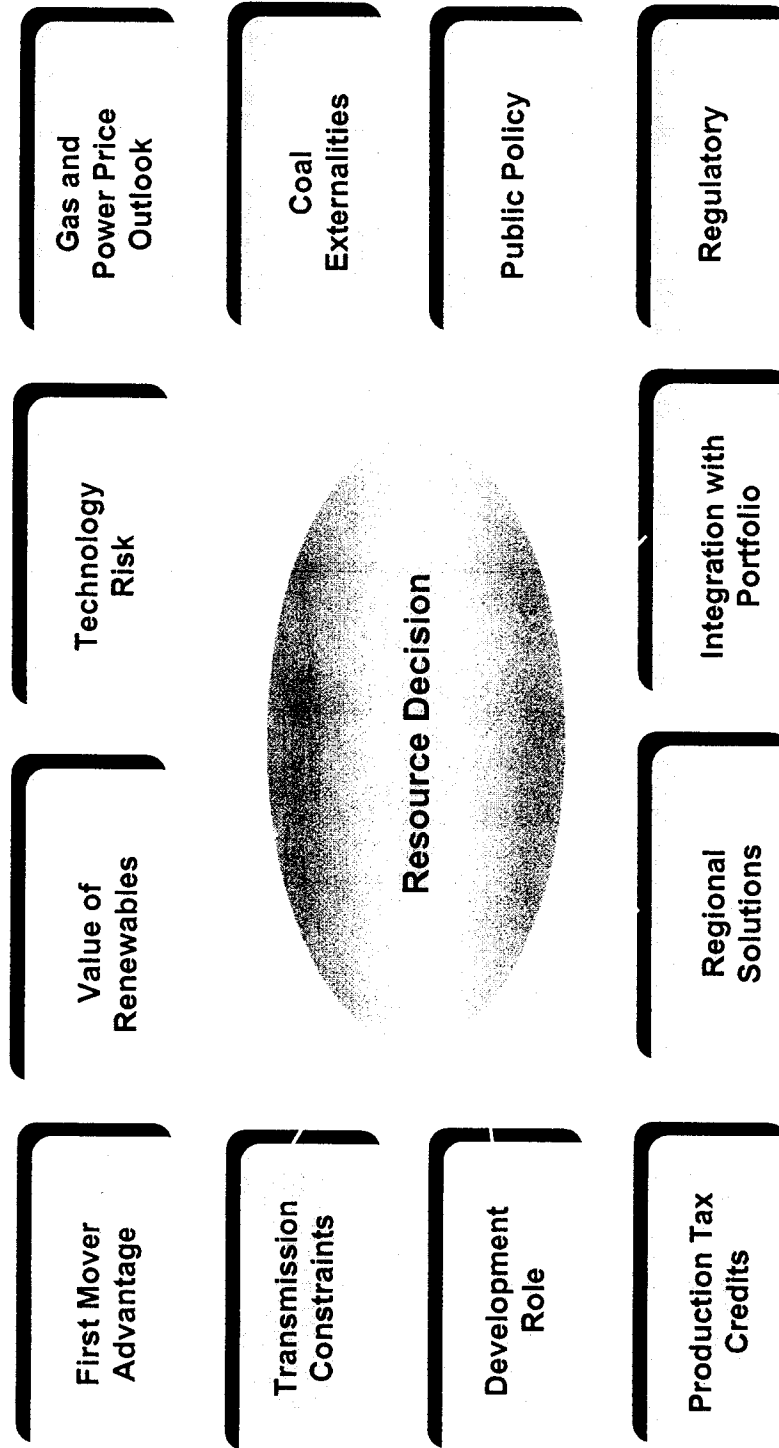


...Over 120 Offers Evaluated



10/11/10, Westinghouse, 2009

In addition to the RFP criteria, all factors that could reasonably affect the decision are considered



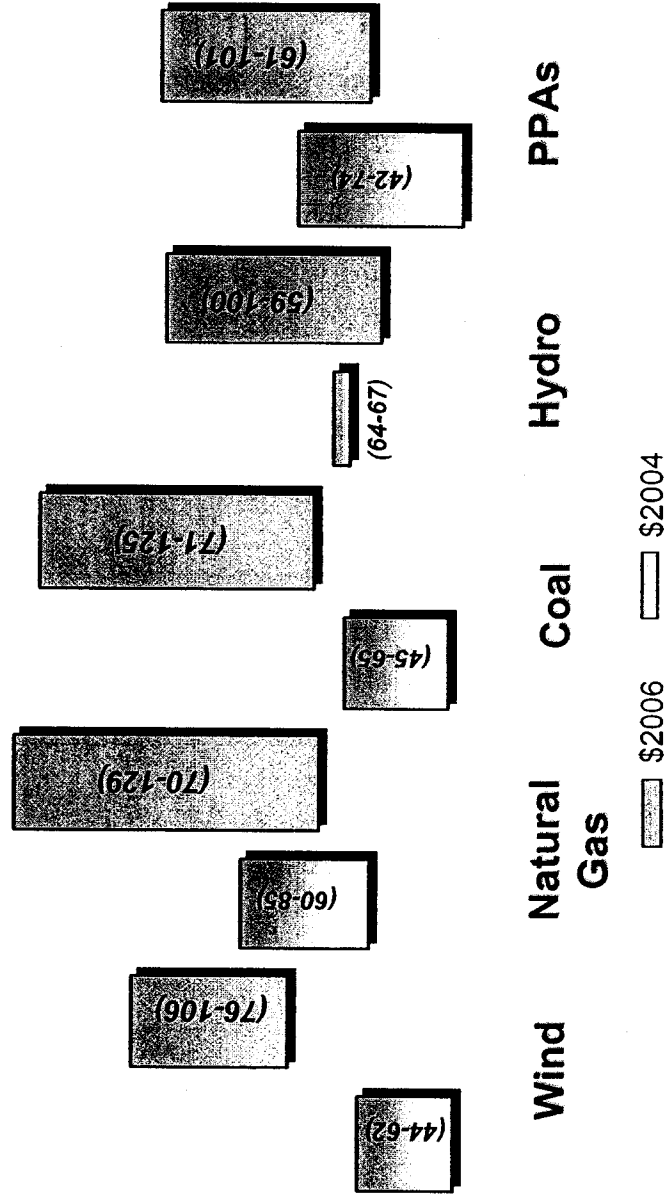
10/10/2010 10:10:10 AM

Market Observations

- Resource costs are higher
- Limited number of 2007 wind projects
 - Wind turbine manufacturers sold out for 2007
 - Only half of proposed projects have turbines
- Evaluation of new generation technology
 - IGCC, GE simple cycle LMS 100's
- Transmission will continue to be challenging
- Increasing environmental regulation
 - Potential RPS by the end of this year
 - Increasing likelihood of GHG regulation

Resource costs have increased significantly since 2004 RFP

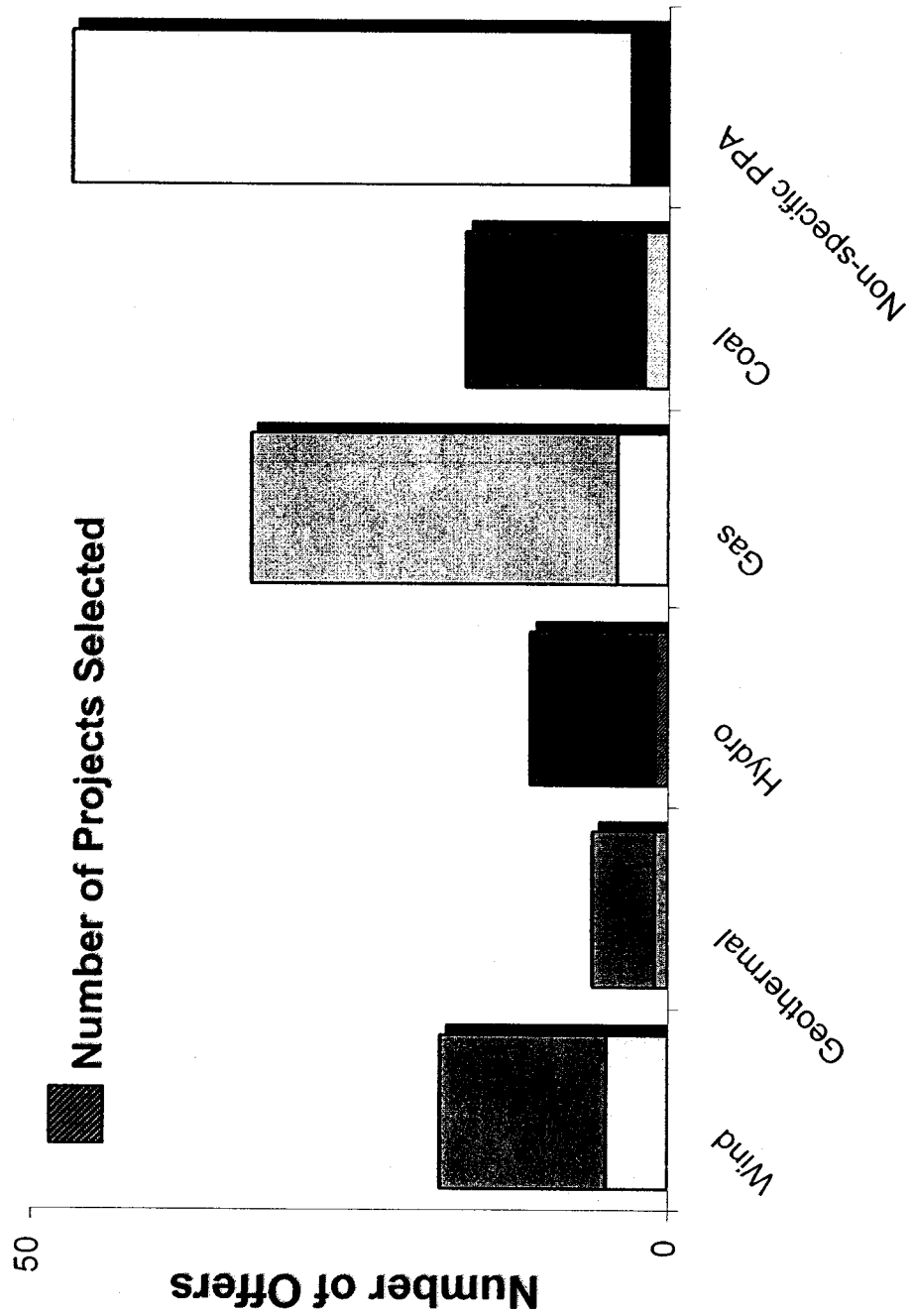
20-year levelized cost - \$/MWh



1. PPA range represents fixed price offers only and is inclusive of imputed debt and exclusive of credit
2. 2004 levelized costs do not include transmission from Mid-C to PSE's system

WSP - Resource Costs

Candidate Short List



11/15/2016 10:45 AM

Candidate Short List - 13 projects/3 PPAs

Fuel	Project/Offr	Owner/Developer	MW	Benefit Ratio ¹	Levelized Cost \$/MWh	Portfolio Benefit \$/000	Comments
G				0.07		9,121	
H				0.31		145,414	
W				0.17		42,744	
W				0.12		20,991	
W				0.10		24,447	
W				0.06		16,443	
NG				0.28		237,558	
NG	Goldendale	Calpine	272	0.25		241,097	Attractive gas plant; potential to redirect; participation in bankruptcy auction process required
NG				0.24		198,188	
NG				0.24		171,629	
NG				0.04		621	
C				0.14		217,528	
C				0.07		41,986	
PPA				0.50-0.30		2	
PPA				0.17-0.22		2	
PPA				0.14		2	

¹ Benefit ratio is the primary quantitative selection metric.

² These are short term offers ranging from 3-5 year terms and were evaluated using both KWI and PSM; portfolio benefit is determined by strategic fit, impact to EPS, portfolio exposure.

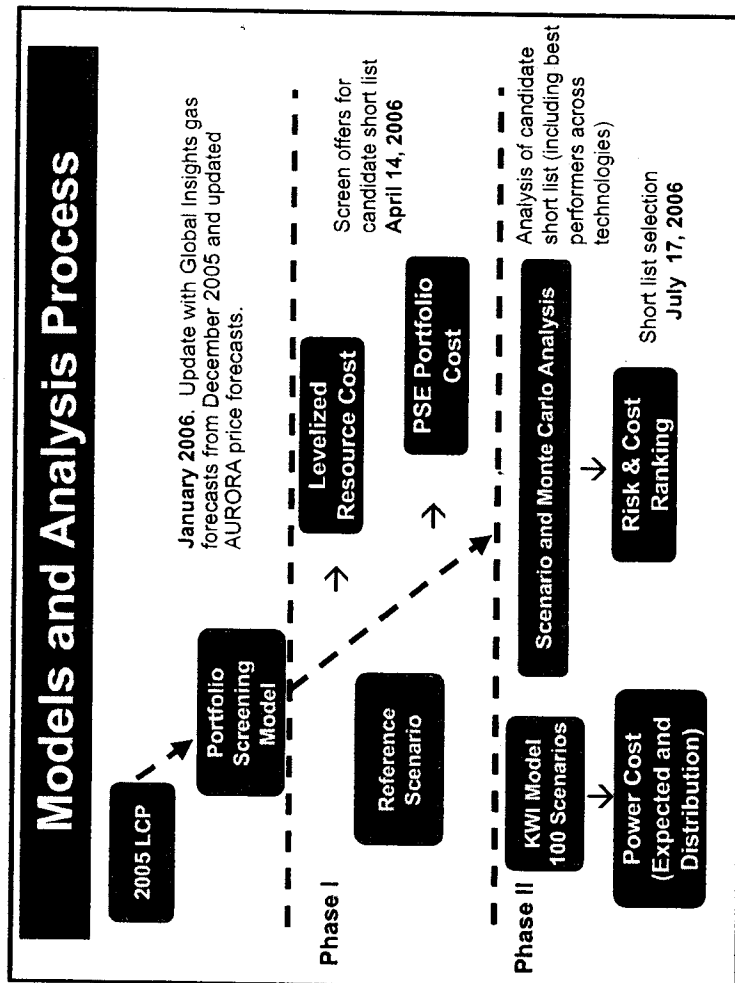
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Presentation Outline

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Quantitative Analysis Process



Phase I – Screening of 120+ different alternative bids through Portfolio Screening Model reference scenario.

Phase II – Evaluation of Candidate Short List resources through PSM. Anticipate several combination portfolios.

Some Changes to Anticipated Analysis Process:

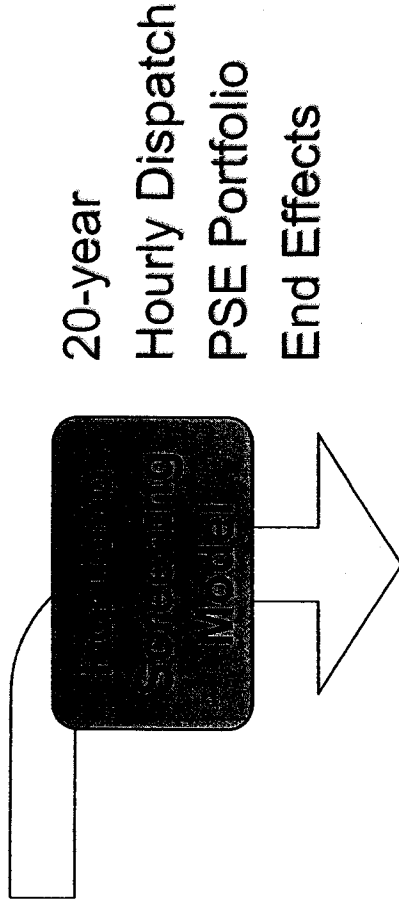
- Dates: Phase I completed 4-25-06, and Phase II date is similarly delayed
- KWI Model was used in Phase I for testing of PPA contribution to portfolio benefit and risk reduction through 2008

U.S. Department of Energy

Portfolio Screening Model- Phase I and II

Key Inputs

Capital Costs
Fixed & Variable O&M
Fuel Cost
Fuel Transportation
Transmission & Integration
Plant Heat Rate
Plant Availability
PPA Price & Terms
Asset Book & Tax Life
Global Insights Gas Price
Forecast
Aurora Power Prices
Imputed Debt Percent
Emissions Rate (CO₂, NO_x,
SO₂)



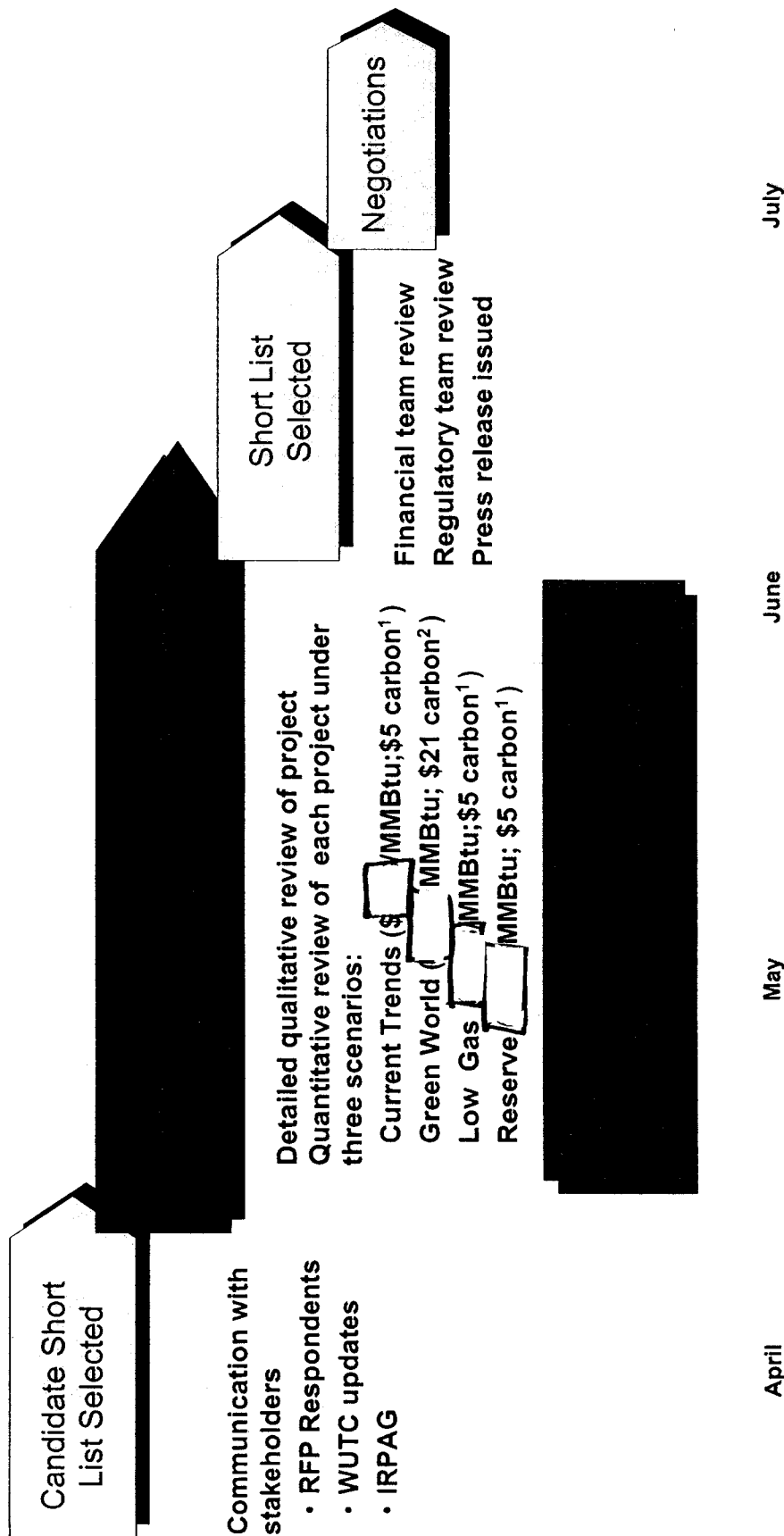
20-year
Hourly Dispatch
PSE Portfolio
End Effects

Key Outputs

Levelized Cost of Acquisition
or PPA
20-Year NPV Portfolio
Revenue Requirement
Portfolio Market Purchases
and Sales
Emissions Output

Updated March 2019

Phase II Evaluation



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WUTC meeting on 12/29/2012

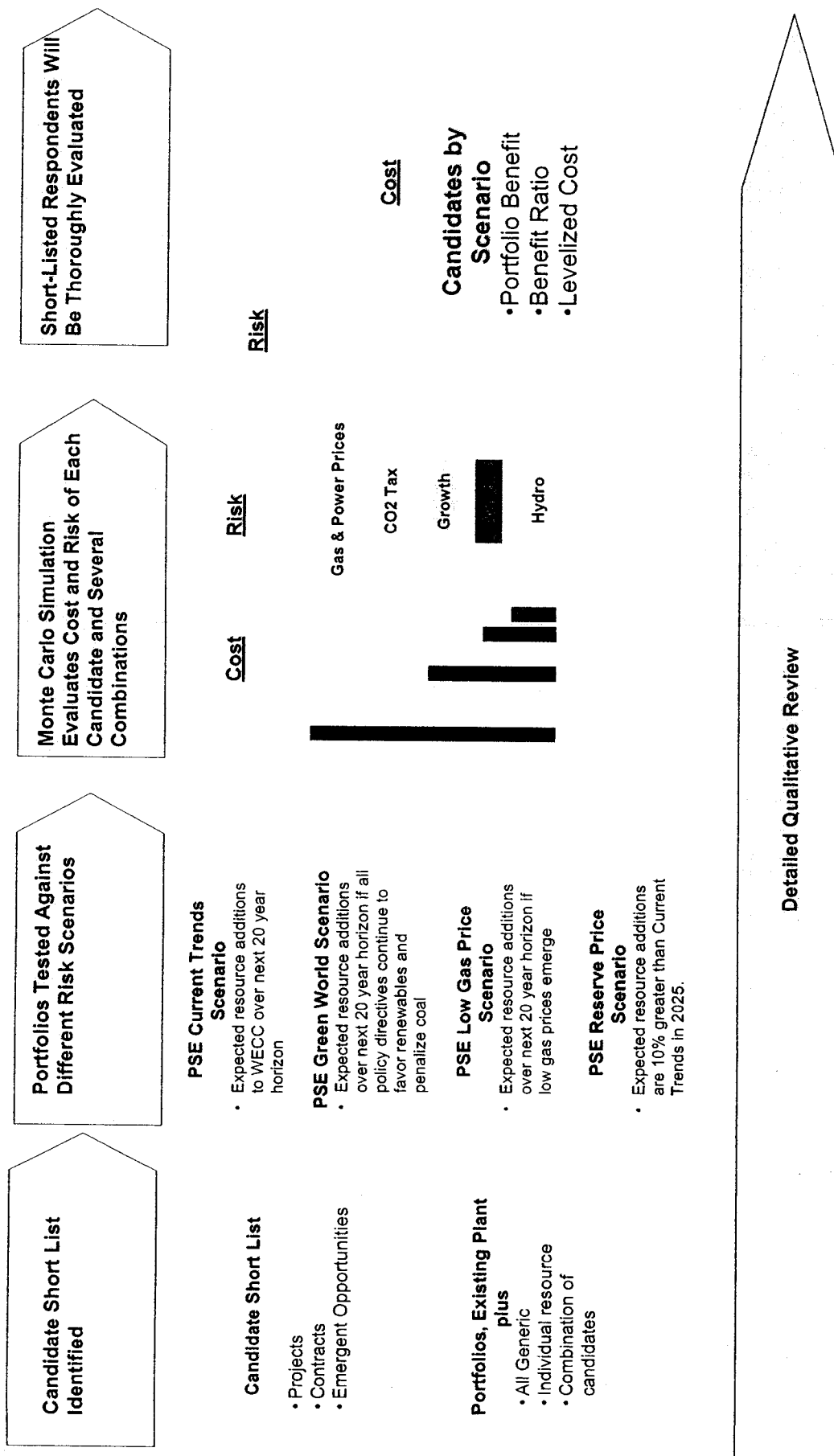
Four Scenarios

Scenario	Reference Current Trends	Reserve/ Overbuild	High Price/Green World	Low Gas Price	Notes
WECC Demand (AURORA)	Reference (from EPIS) WECC Average Growth Rate 1.8%	Reference (from EPIS) WECC Average Growth Rate 1.8%	Low WECC Average Growth Rate 1.1%	Reference WECC Average Growth Rate 1.8%	Low Growth Rate is 60% of Reference Growth Rate for each area
Gas Price (Nominal \$ Levelized for 2007-2026)	Global Insights Reference; Levelized, plus Kioderx forwards 2007 – 2010 [redacted] MMBTU	Global Insights Reference; Levelized, plus Kioderx forwards 2007 – 2010 [redacted] MMBTU	Global Insights High Price; Levelized, plus Kioderx forwards 2007 – 2010 [redacted] MMBTU	Global Insights Low Economic Growth; Levelized; Kioderx forwards 2007 – 2008 [redacted] MMBTU	Global Insights (12/05) and Kioderx forwards (2007-2010) as of 12/19/2005
PSE Demand (PSM)	Reference	Reference	Low	Reference	Most recent PSE load forecast.
Carbon Costs (AURORA)	NCEP Nominal \$/ton by year: 2010: \$5.00 2015: \$6.38 2020: \$8.14	NCEP Nominal \$/ton by year: 2010: \$5.00 2015: \$6.38 2020: \$8.14	Clean Power (Jeffords) Nominal \$/ton by year: 2010: \$21.00 2015: \$31.17 2020: \$45.35	NCEP Nominal \$/ton by year: 2010: \$5.00 2015: \$6.38 2020: \$8.14	NCEP increases 2.5% real per year. Clean Power increases about 4% per year real over 20 years
Overbuild	No	Net Additions are approx. 30% greater in 2015 and 10% greater in 2025	No	No	

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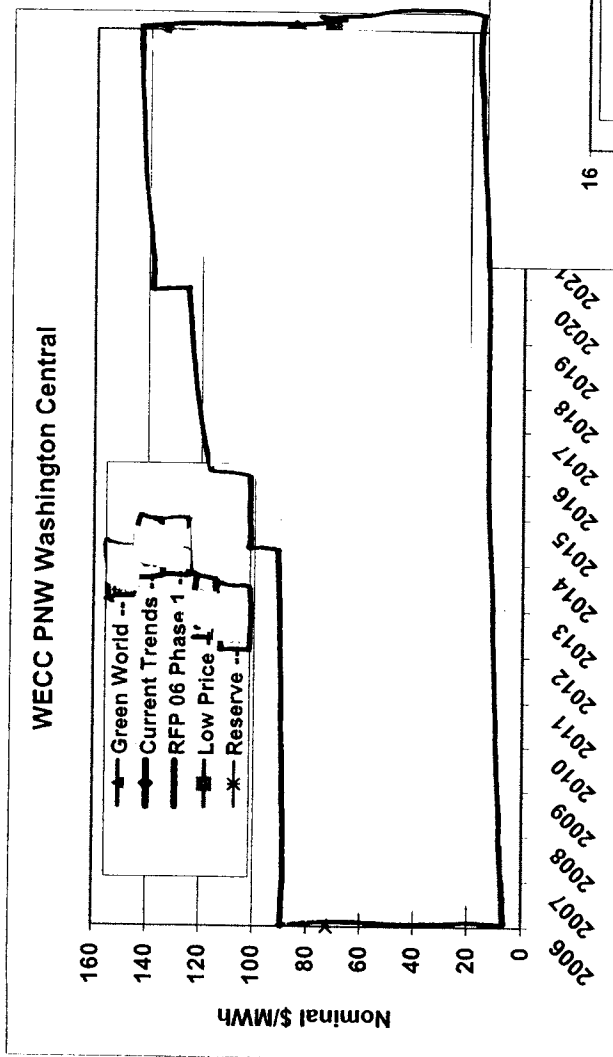
WAC 480-07-160
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Phase II – variety of portfolios tested under 4 scenarios



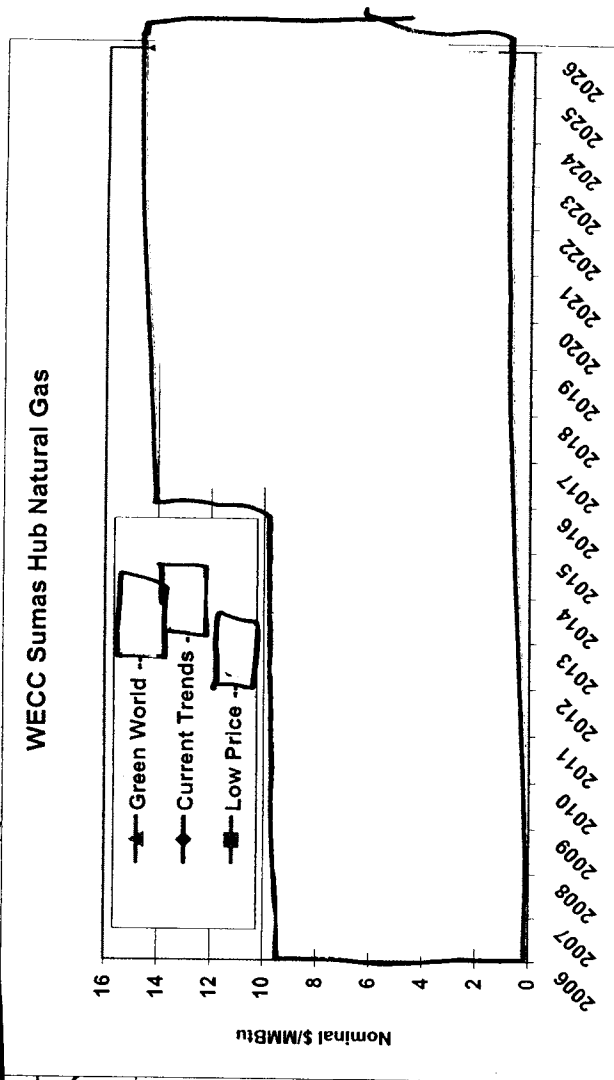
YUT/01/2009/01/20/2009

Scenario Power and Gas Prices



AURORA model power prices forecasts

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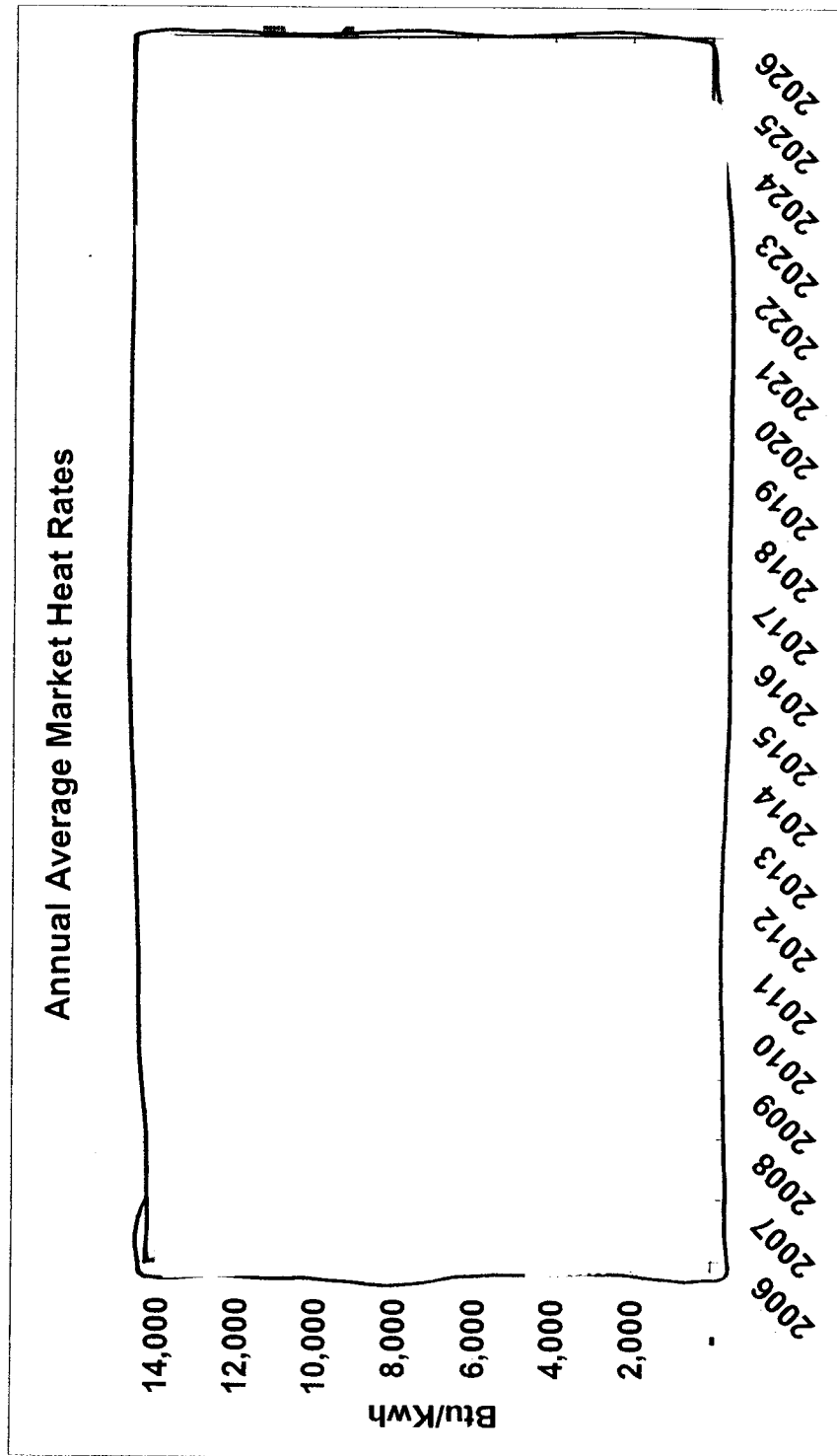


Global Insights Gas (12/05):
Reference, High and Low for
2011 - 2026

Kiodex forwards 2007 – 2010,
except through 2008 for Low
Gas

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Scenario Heat Rates

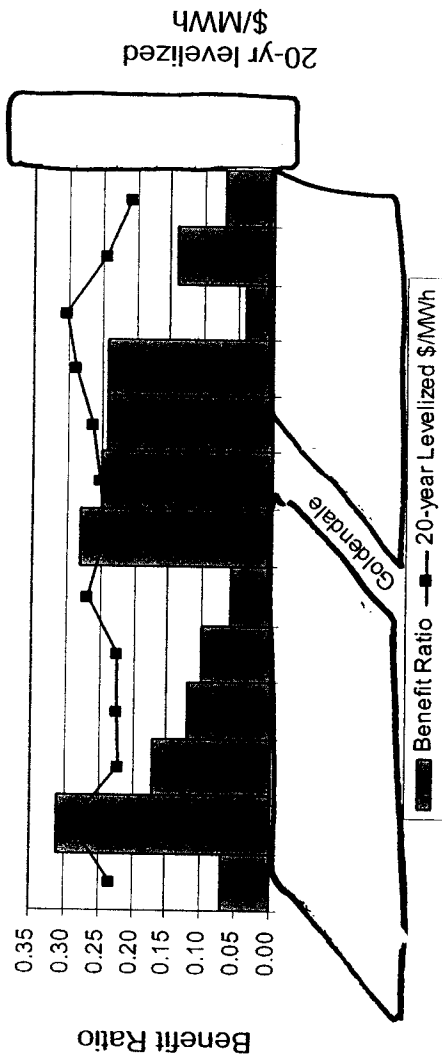


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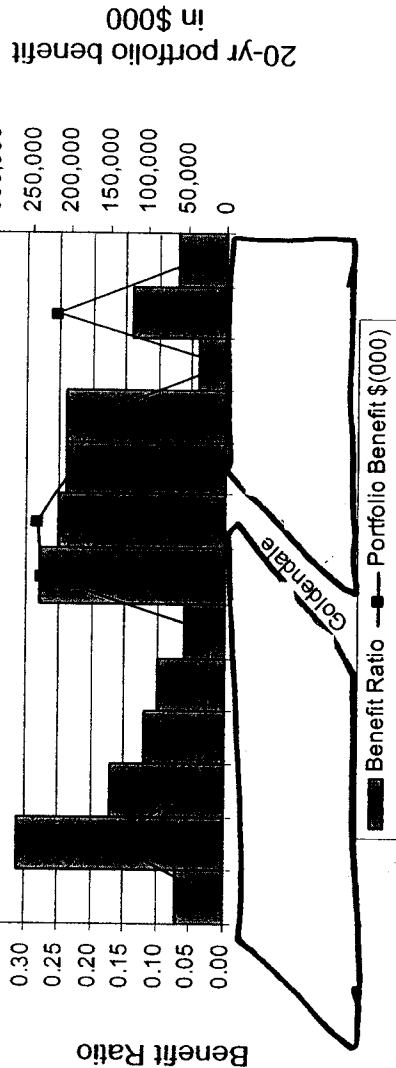
20, 2006

Quantitative selection metrics: levelized cost, portfolio benefit, and portfolio benefit ratio



Levelized cost is the average annual cost per MWh produced during a 20-year period for each project.

Portfolio benefit is the 20-year present value of all portfolio benefits derived from each project in comparison to the 2005 LCP generic portfolio.



Portfolio benefit ratio is the present value of portfolio benefits divided by the present value of the project revenue requirements

HIGHLY CONFIDENTIAL
Per WAC 480-07-160

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WUTC Meeting/July 29, 2009

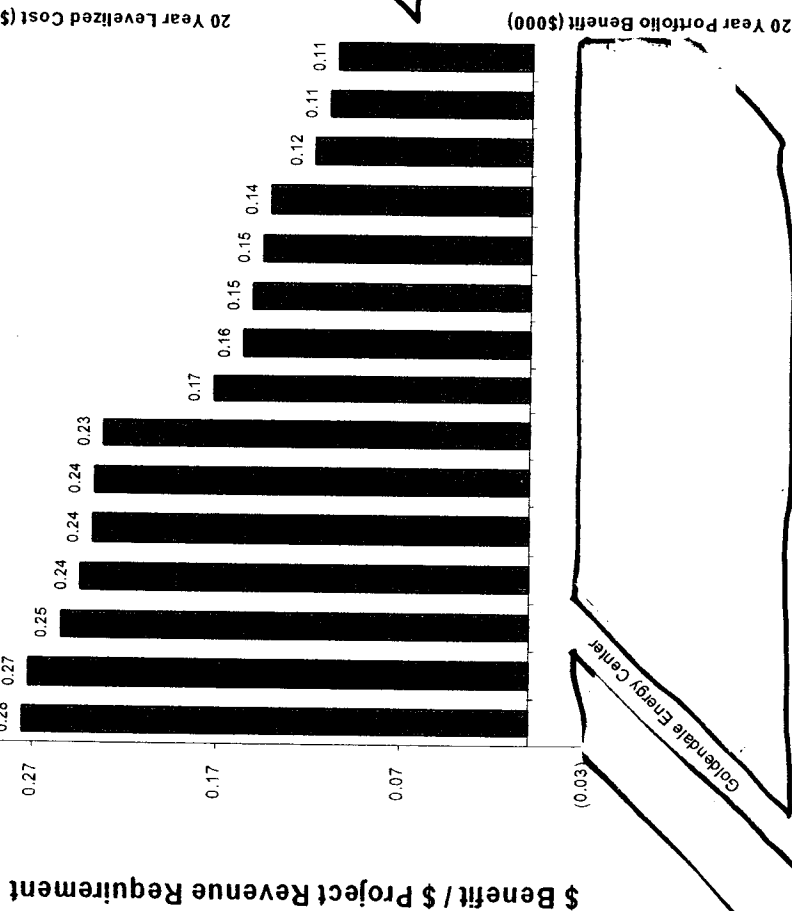
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Size and Heat Rate Impacts

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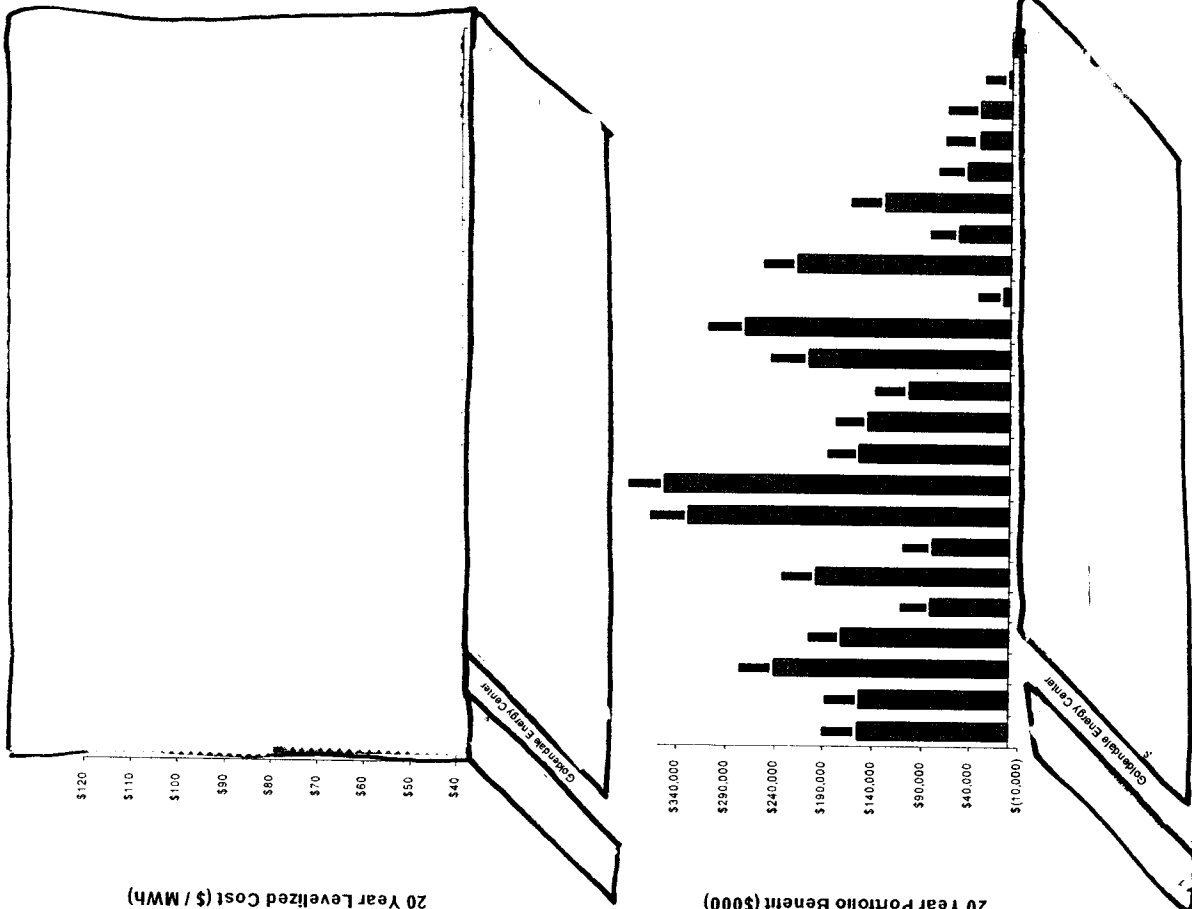
Levelized Cost lower if CF higher →

DRAFT as of 4-12-06



PV Portfolio Benefit depends upon plant size, start year, and heat rate →

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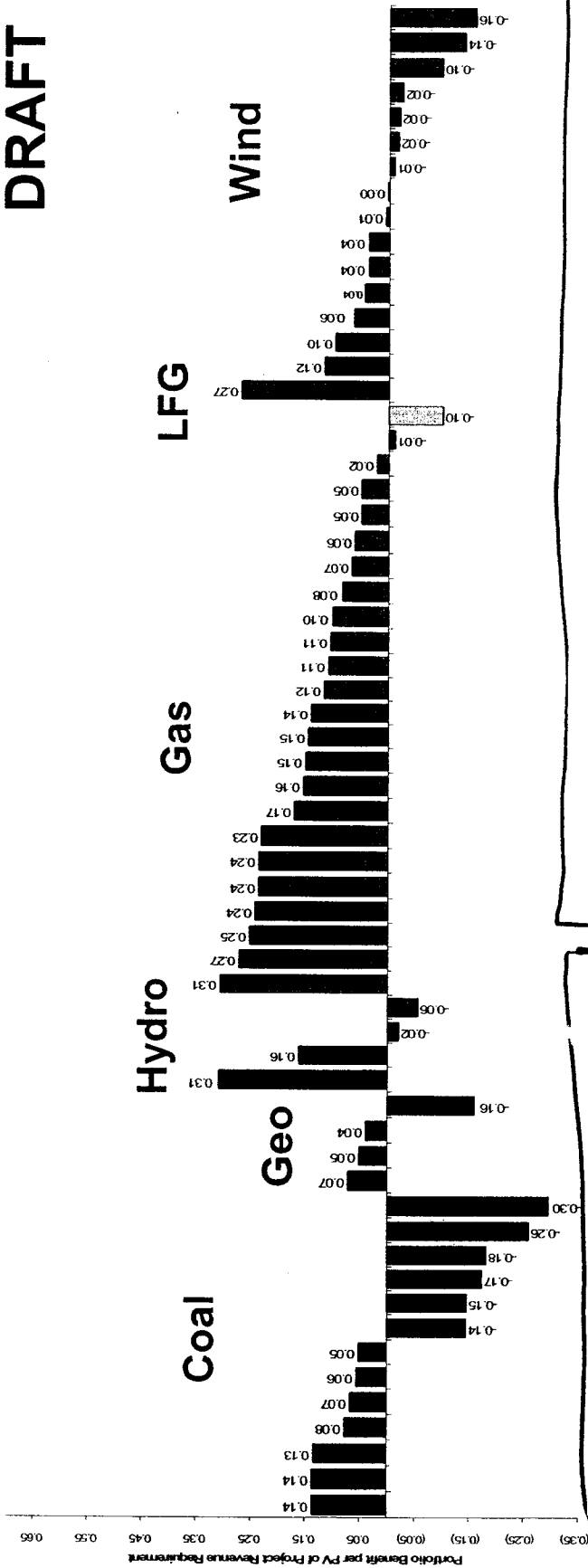
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Portfolio Benefit Ratio

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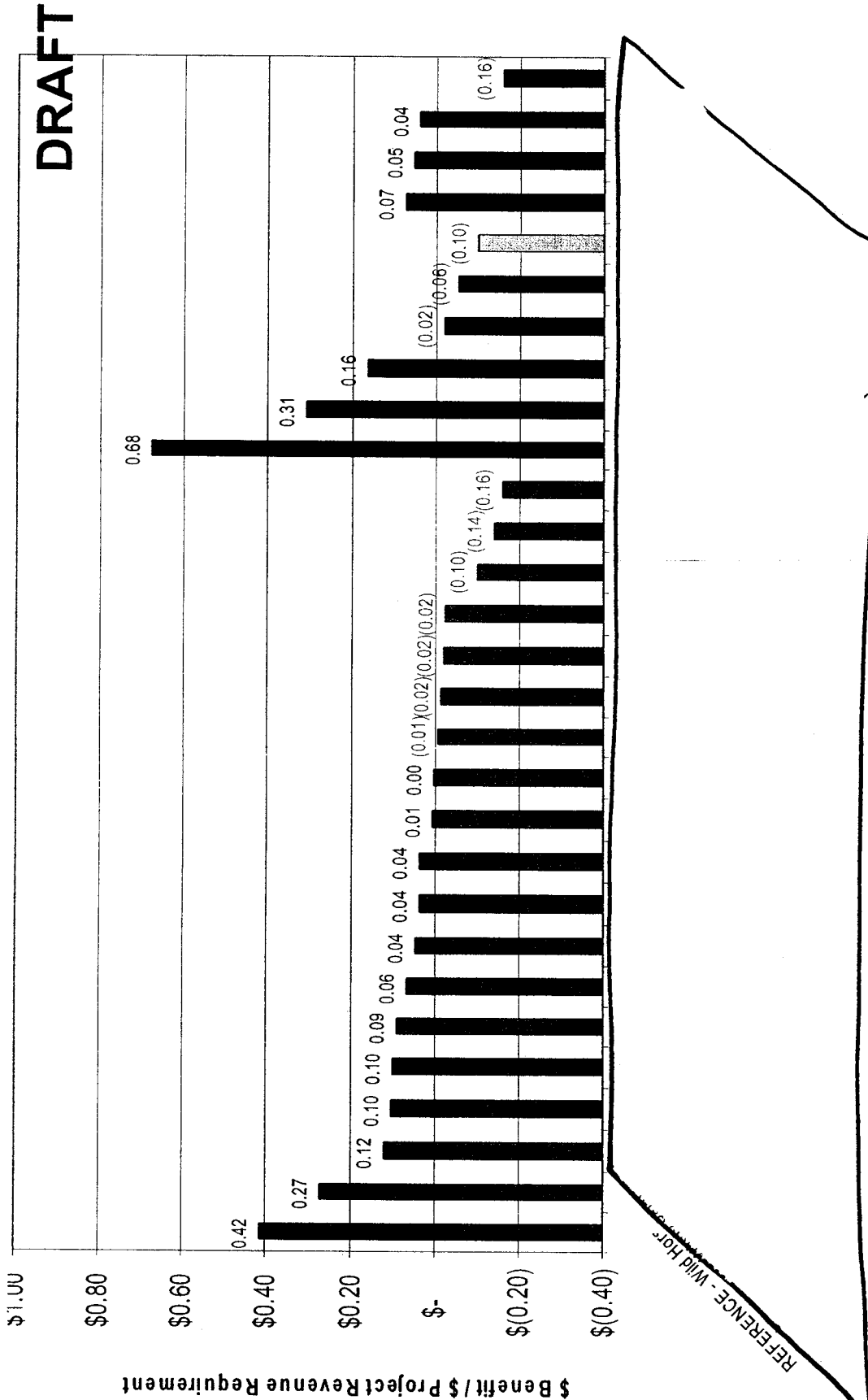
552 - Goldendale Energy Center

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UTC Wednesday 20, 2006

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Renewable Projects – Portfolio Benefit Ratio



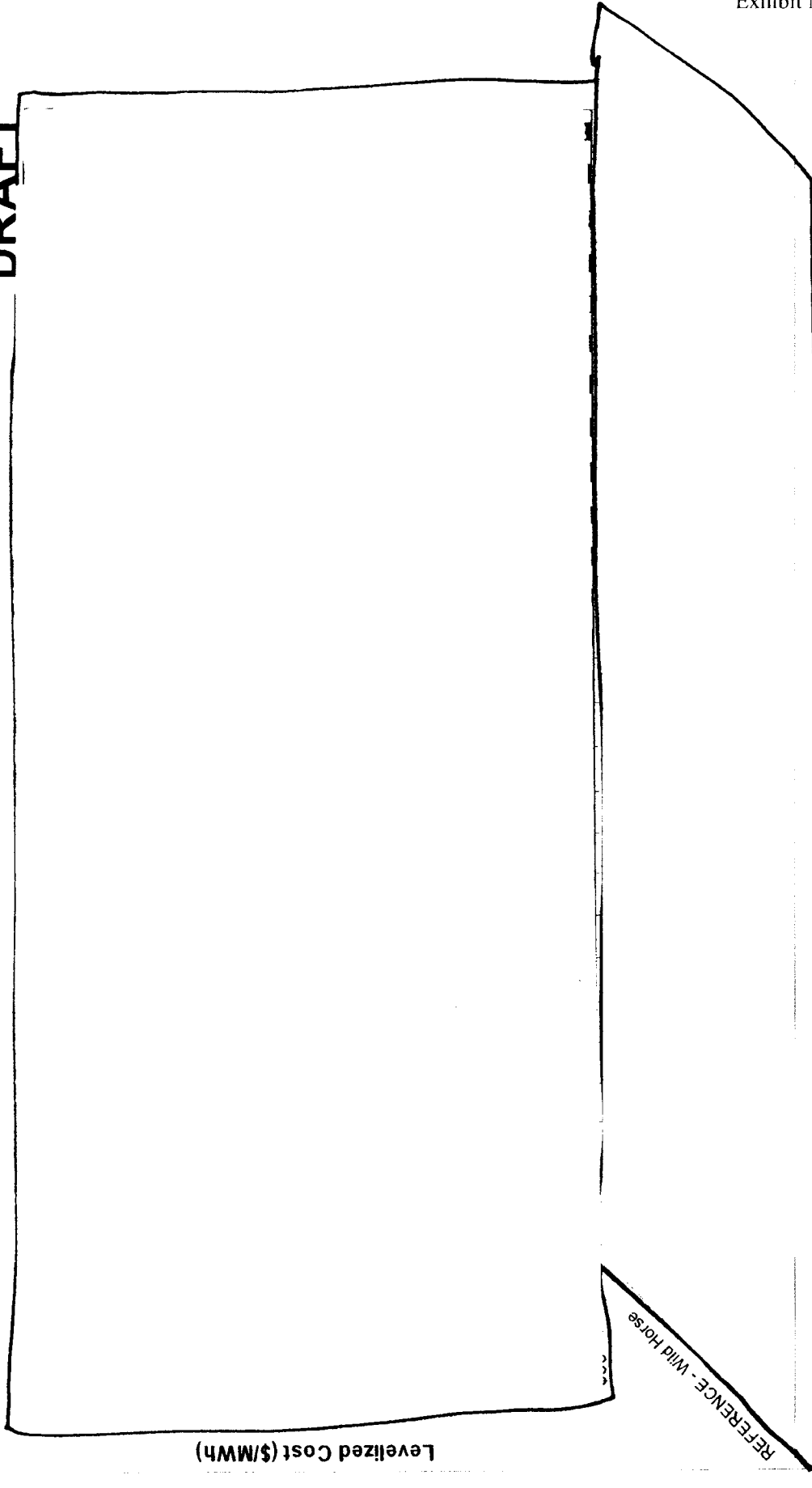
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VJTC Meeting/July 20, 2006

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Renewable Projects – Levelized Cost

DRAFT



Levelized Cost (\$/MWh)

REFERENCE - Wild Horse

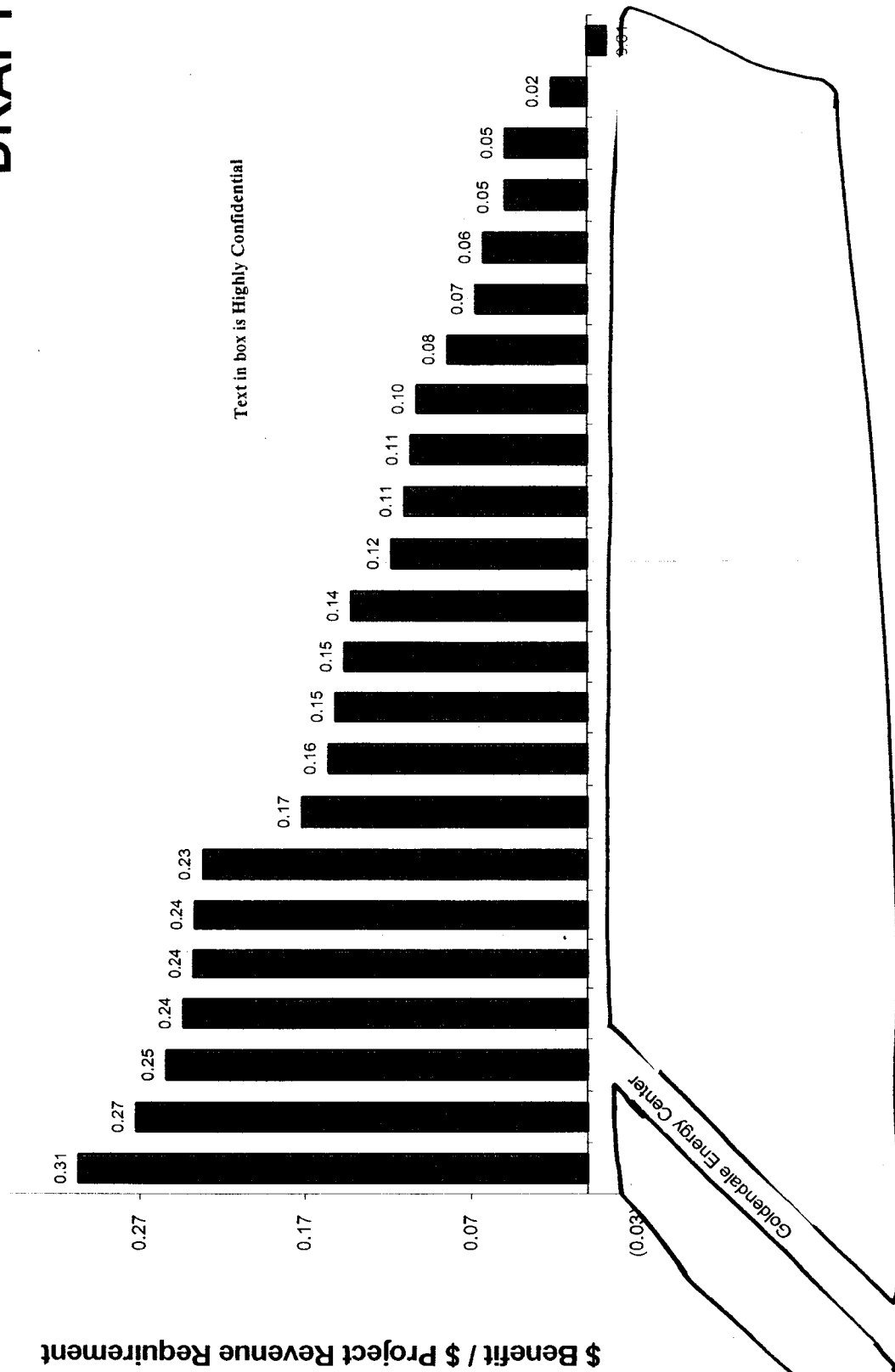
Note: 1) [REDACTED] wind project appears high due to a prorata allocation of the transmission expense for the HVDC line; PTC value is reduced to [REDACTED] which is current expected case.

Redacted

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Natural Gas Plants – Portfolio Benefit Ratio

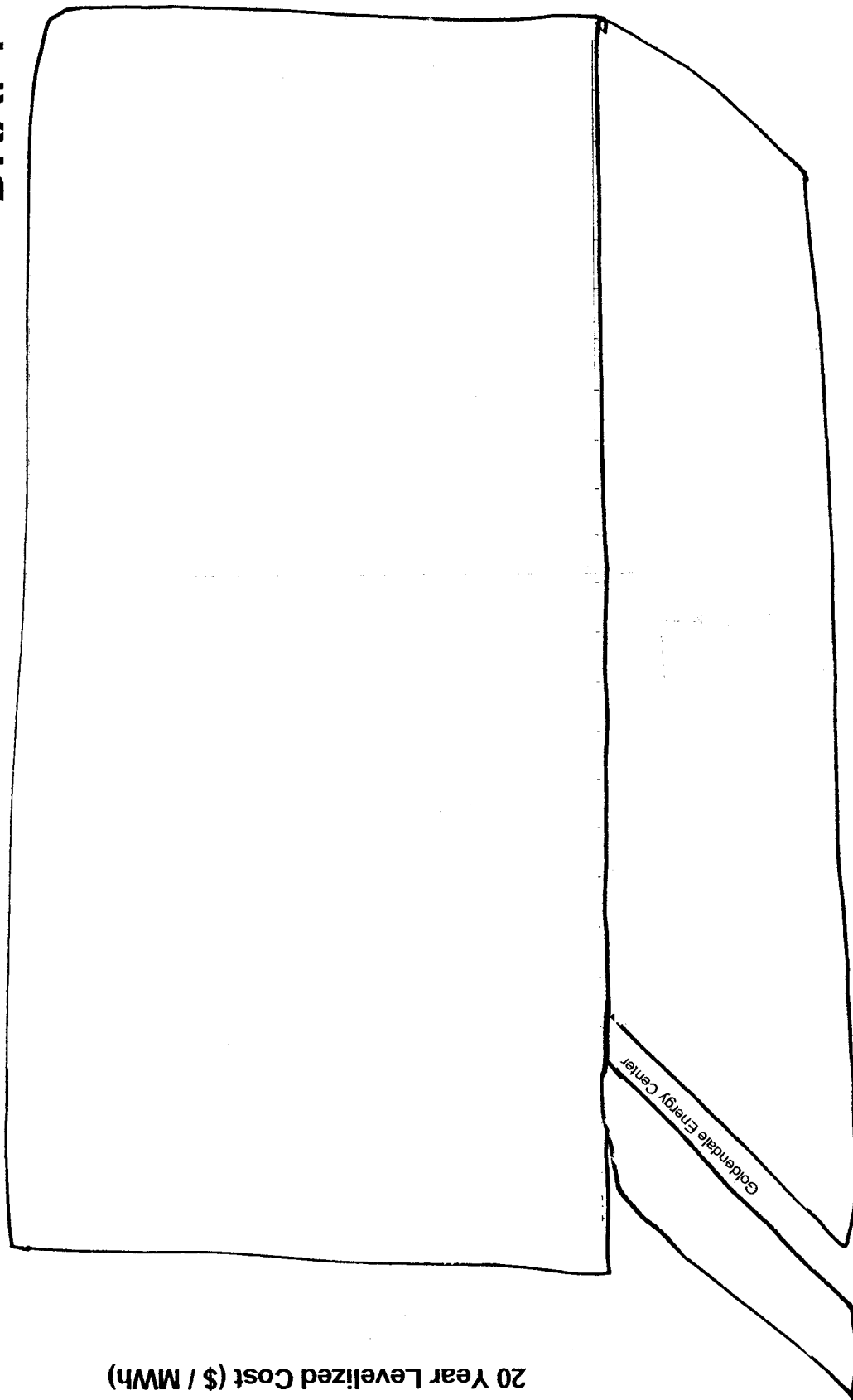
DRAFT



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Natural Gas Plants - Levelized Cost

DRAFT



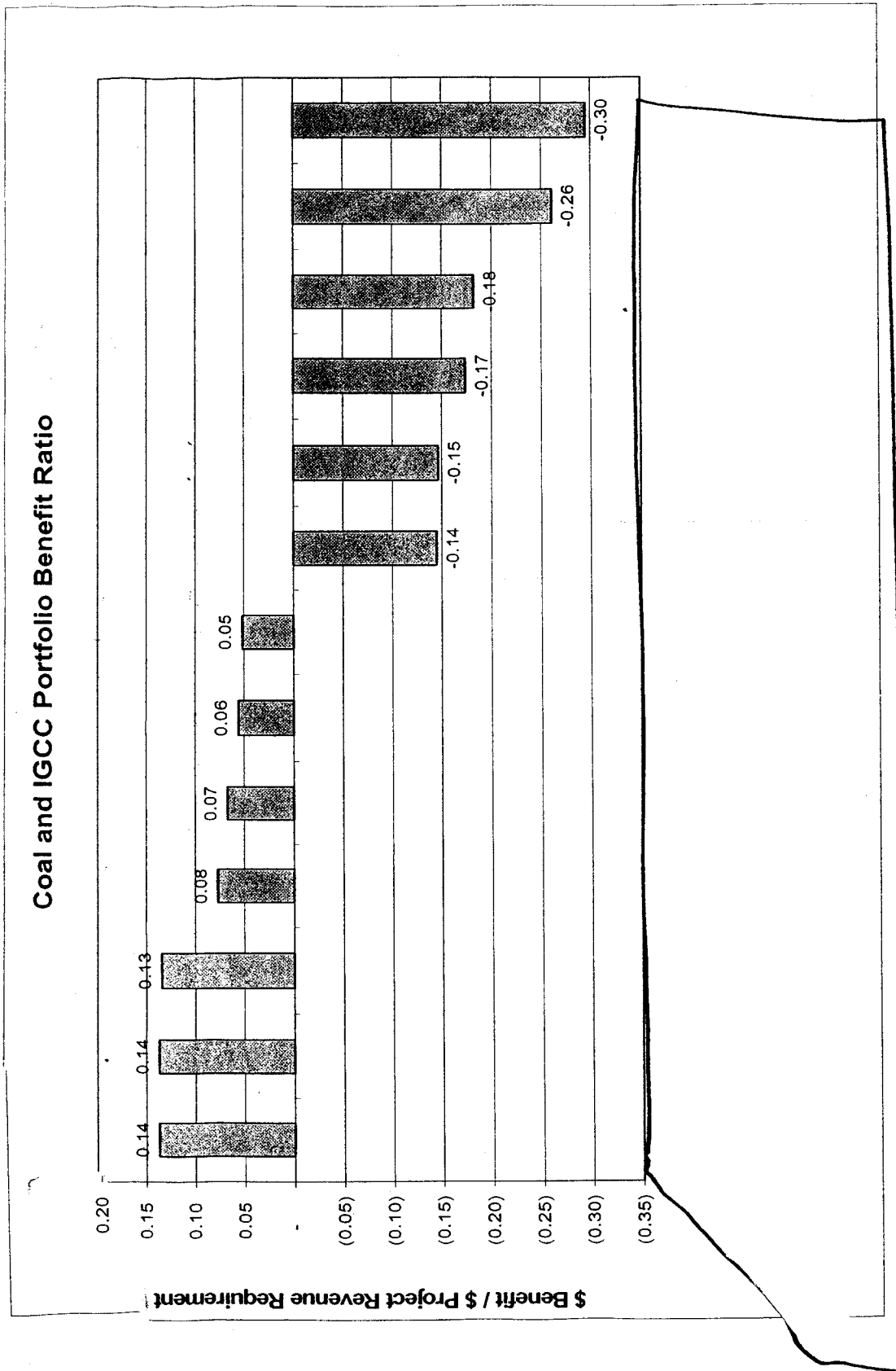
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WJTC Meeting/ July 29, 2003

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Coal / IGCC – Portfolio Benefit Ratio



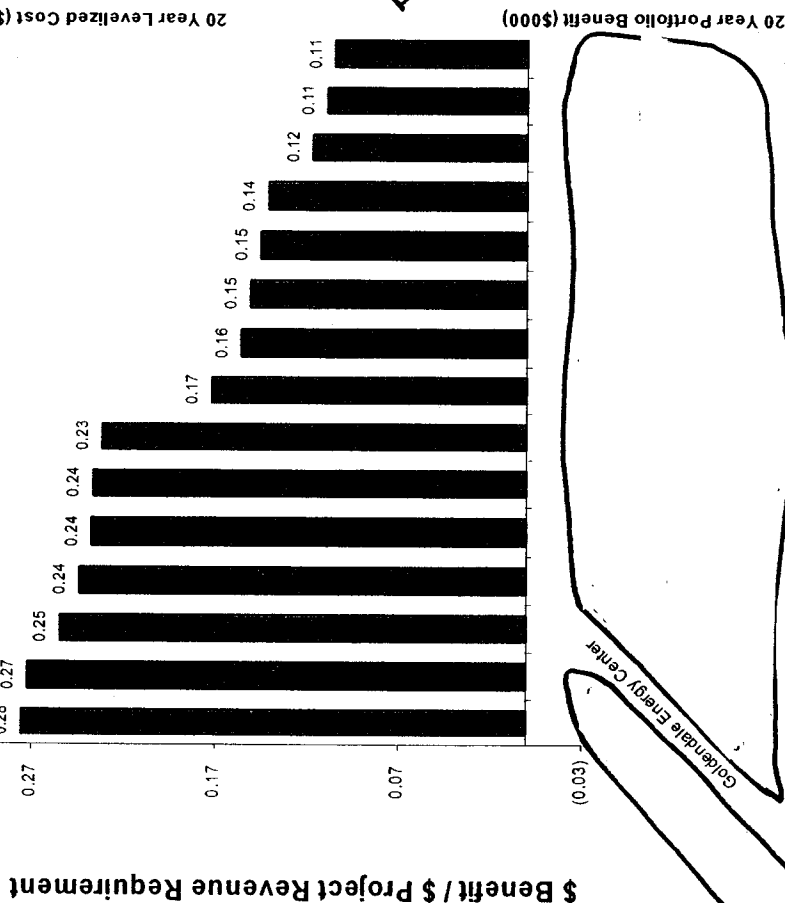
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Size and Heat Rate Impacts

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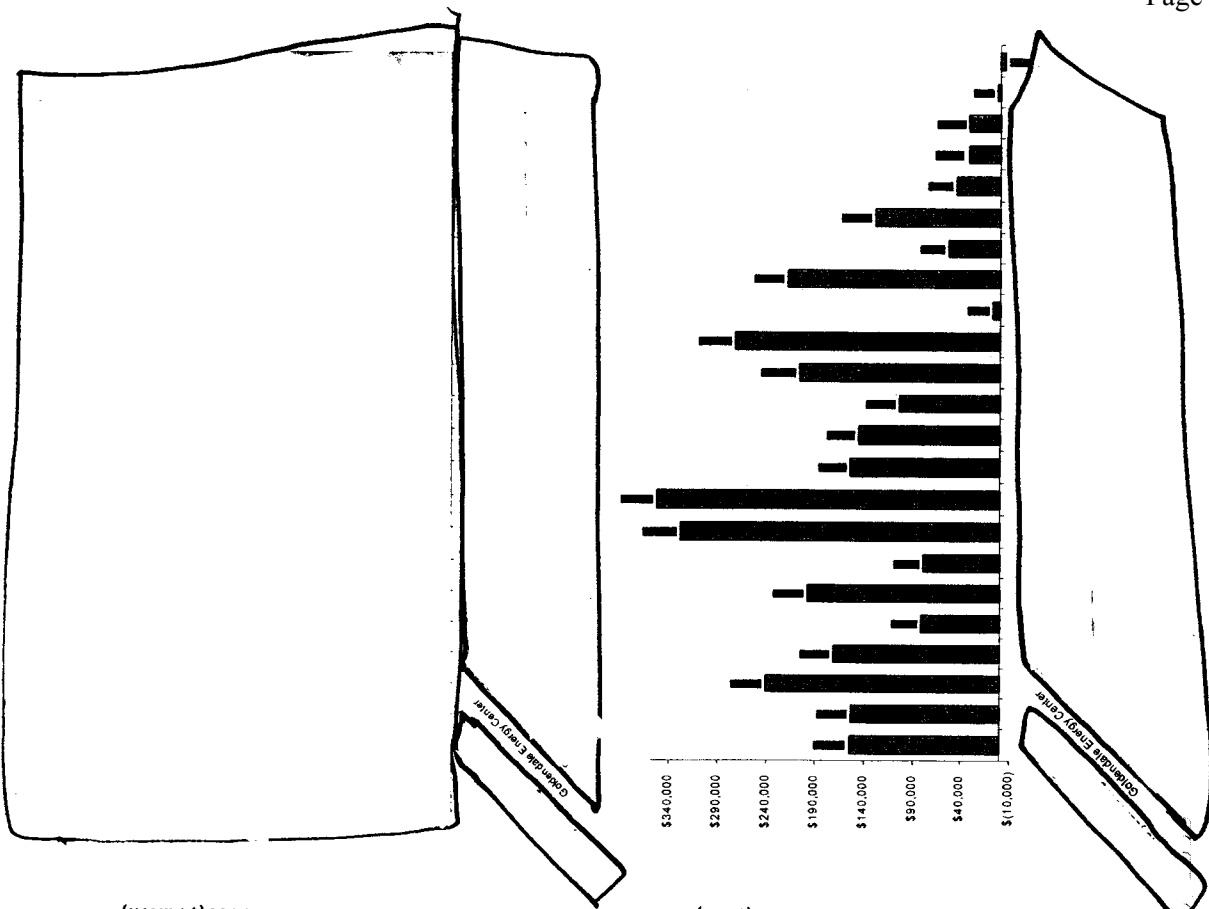
Levelized Cost lower if CF higher →

DRAFT as of 4-12-06



PV Portfolio Benefit depends upon plant size, start year, and heat rate →

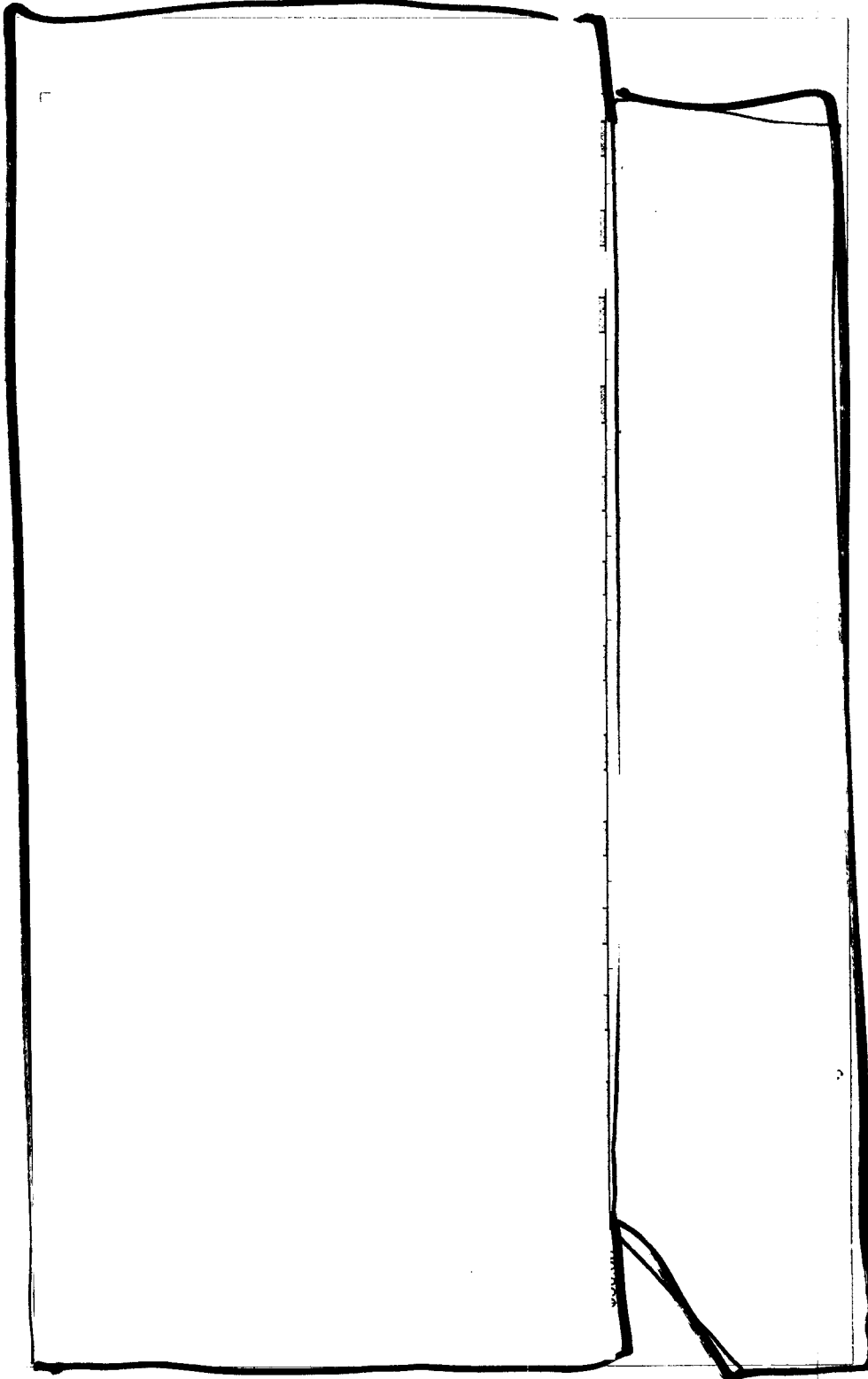
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Coal / IGCC – Levelized Cost

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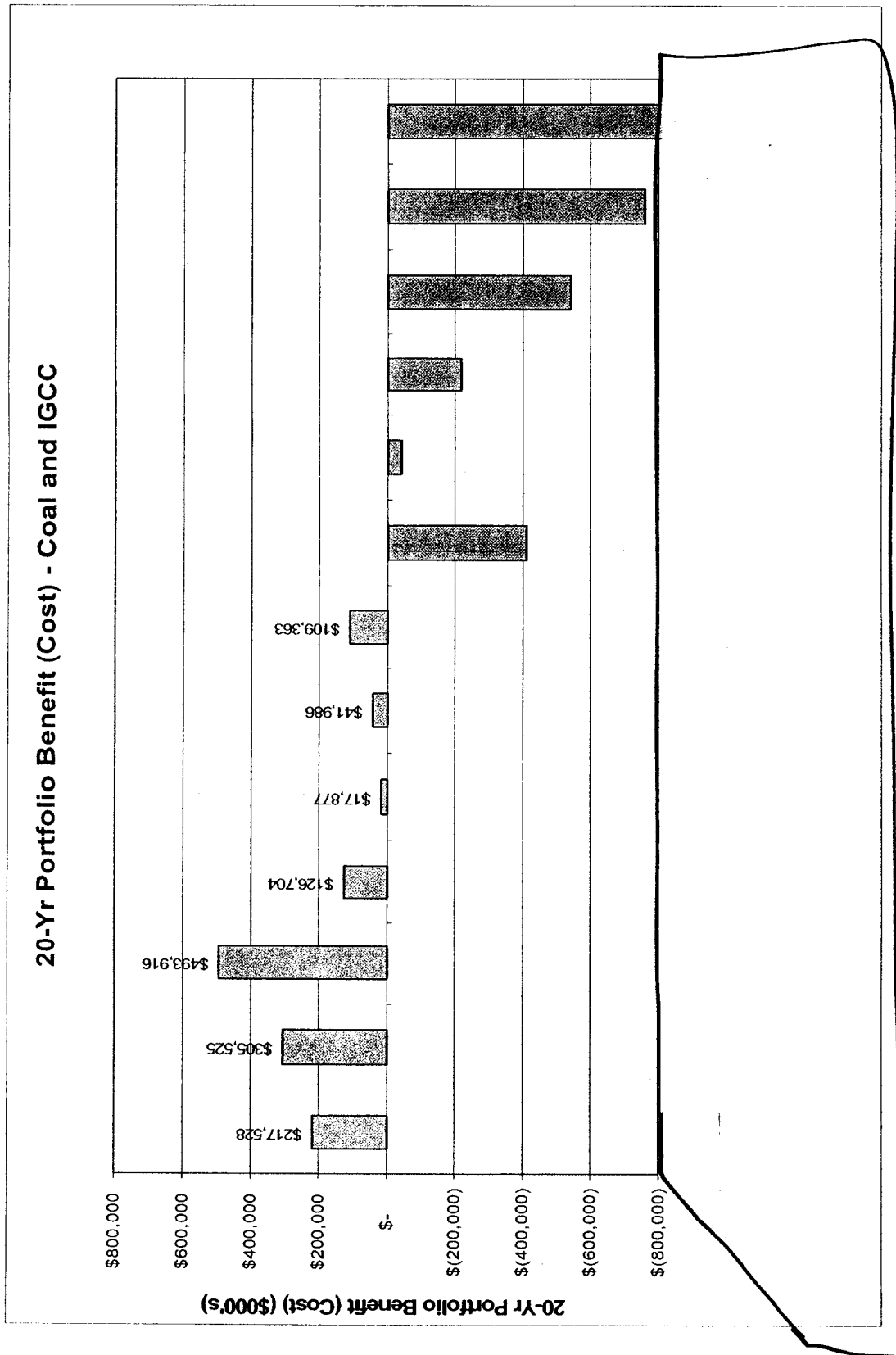
Levelized Costs - Coal and IGCC



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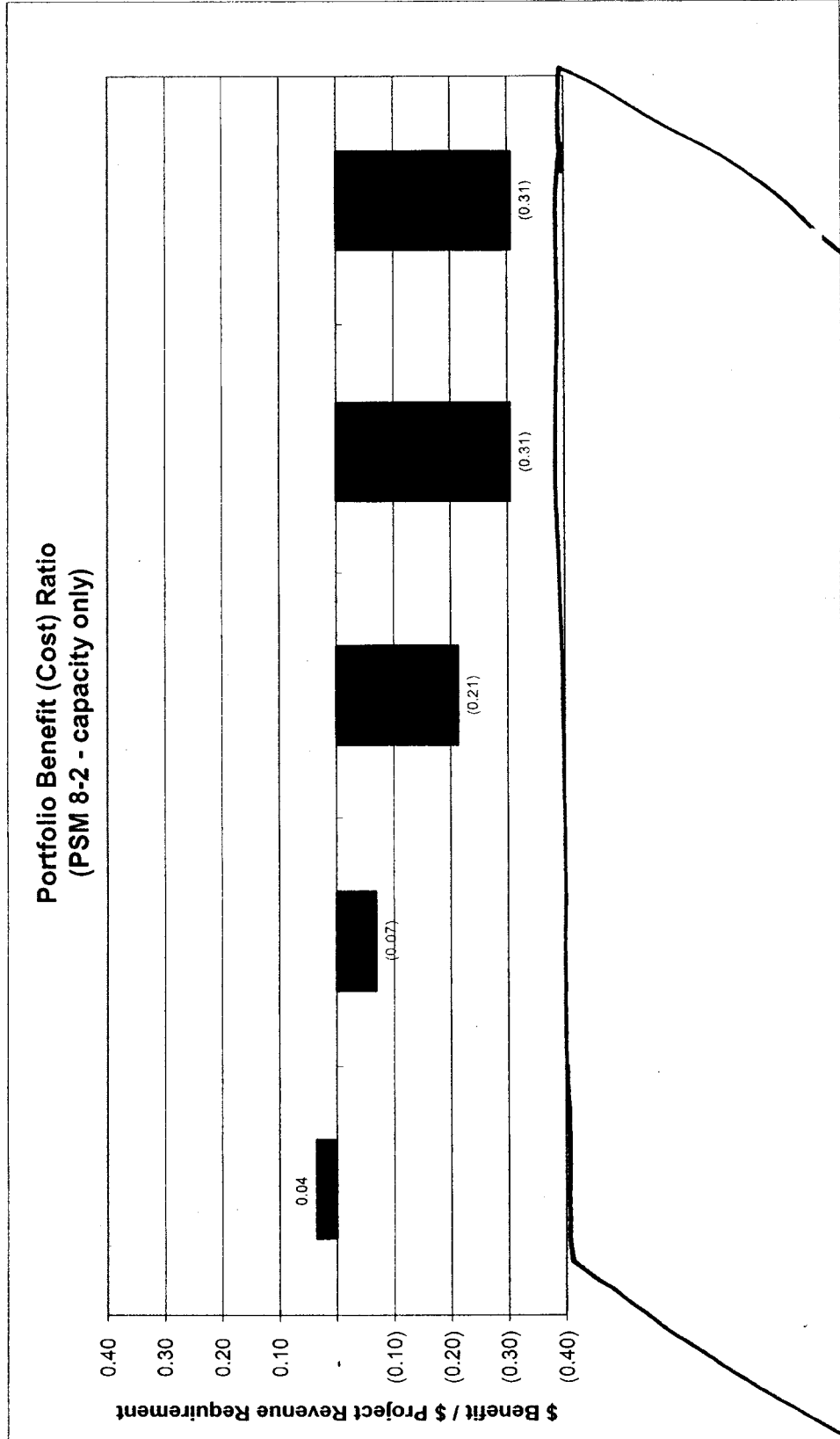
Coal / IGCC - Portfolio Benefit (Absolute)



Highly Confidential

Redacted

Capacity Projects/PPAs – Portfolio Benefit Ratio

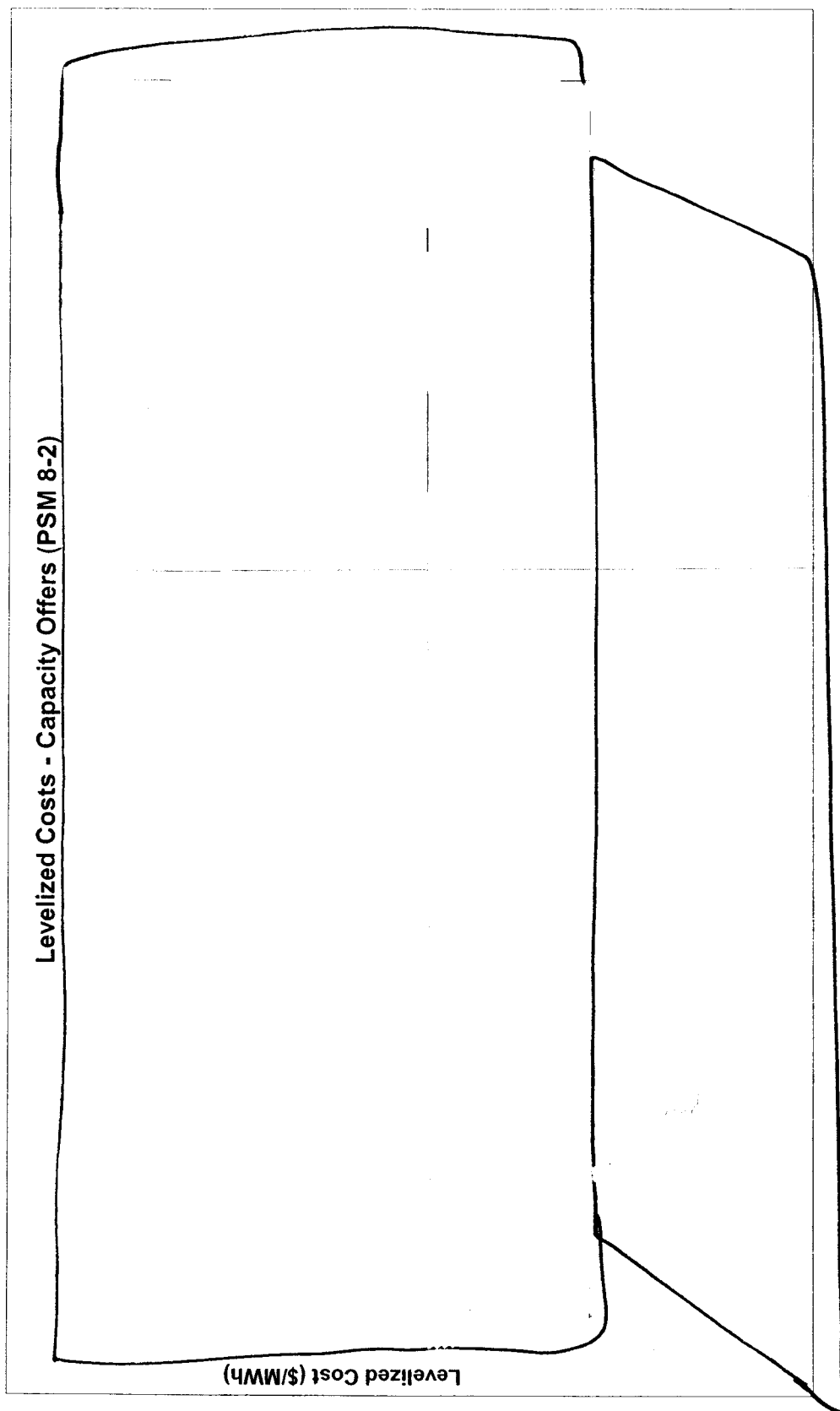


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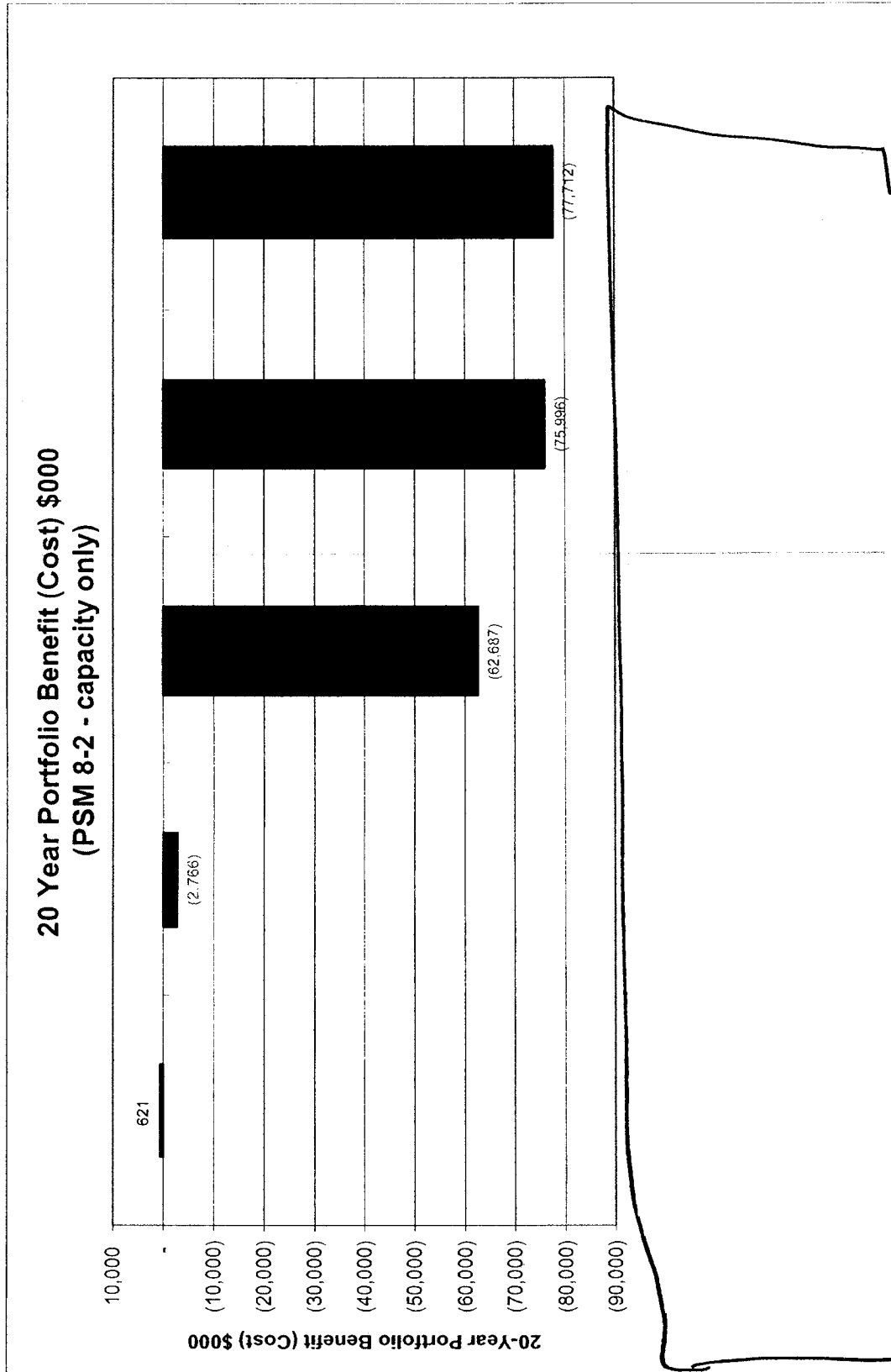
Capacity Projects/PPAs – Levelized Cost

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Capacity Projects/PPAs - Portfolio Benefit (Absolute)



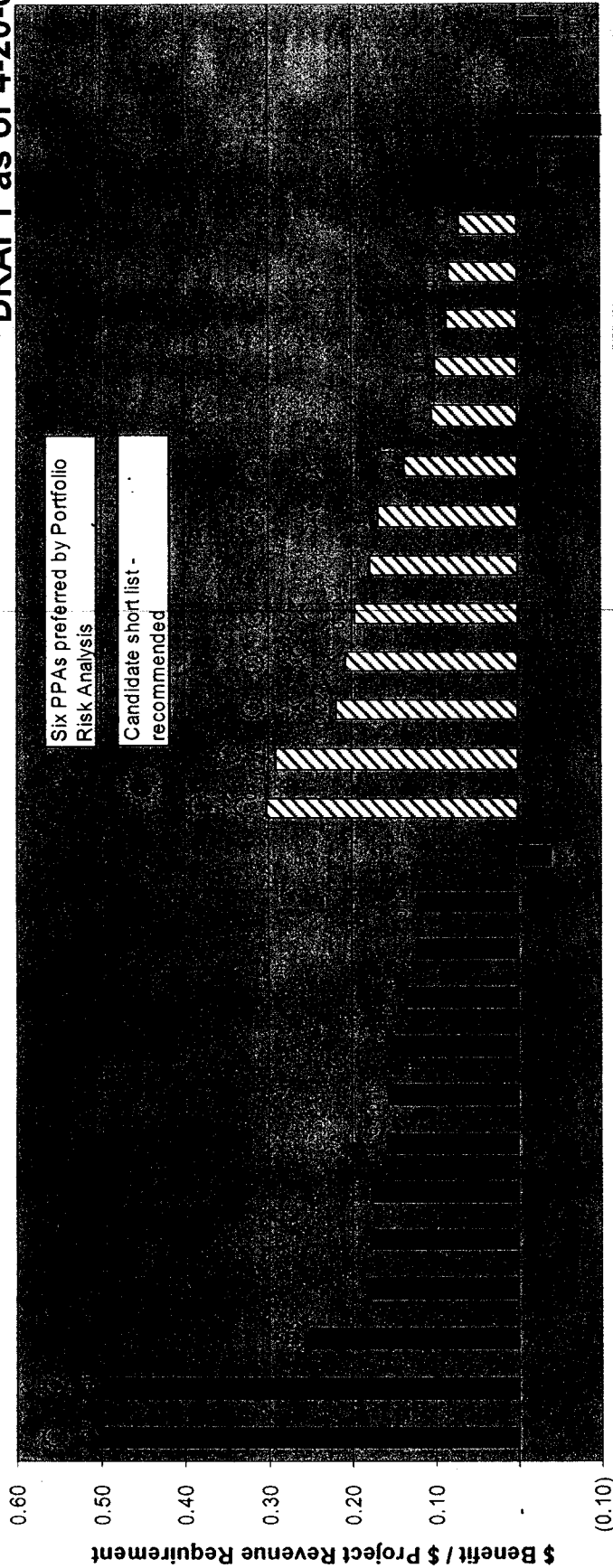
WJTC Hearing July 20, 2016

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PPAs - Portfolio Benefit Ratio

Portfolio Benefit (Cost) per PV of PPA Revenue Requirement **DRAFT as of 4-20-06**

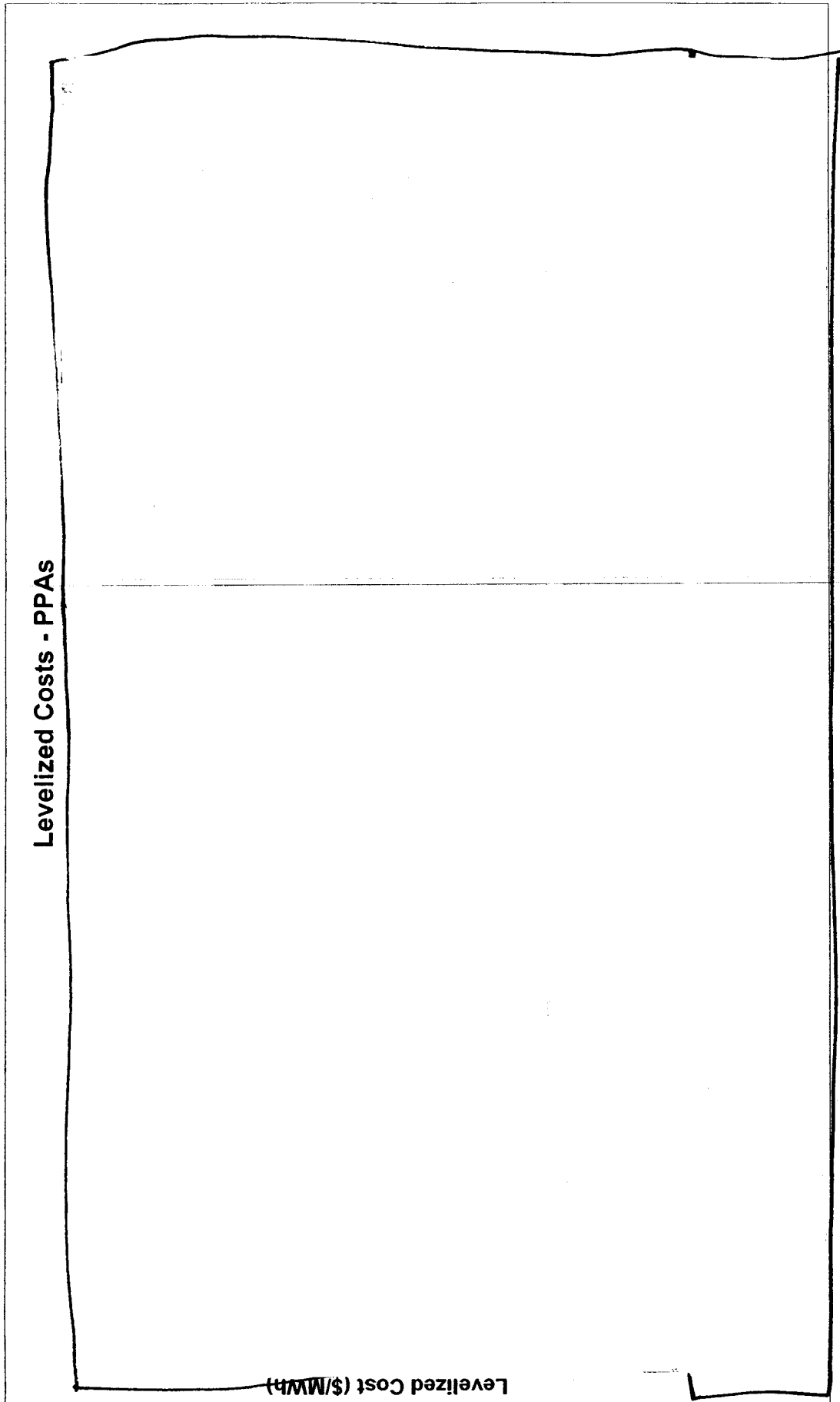


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WUTC Meeting/ July 20, 2006

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PPAs - Levelized Cost

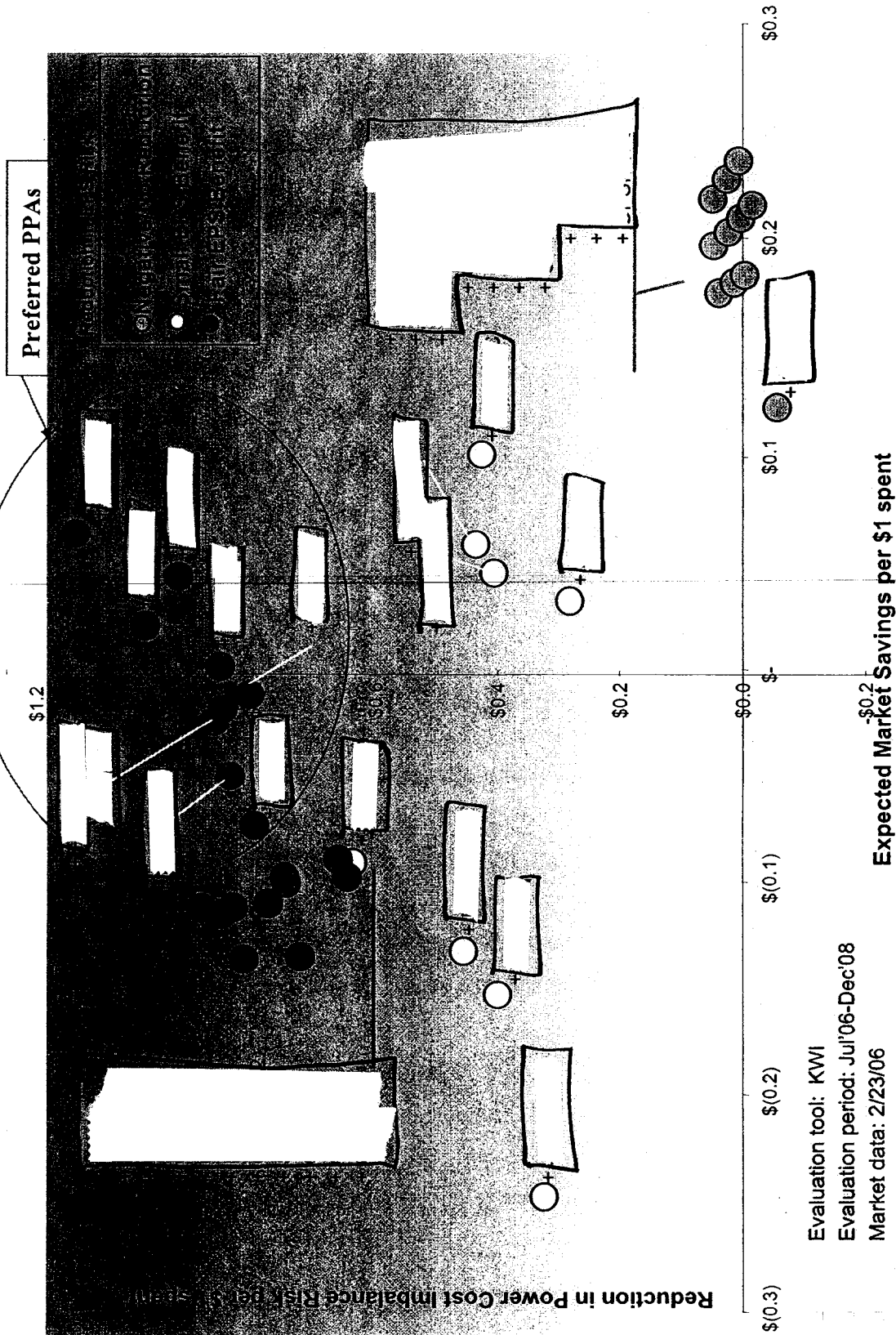


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WUTC Meeting/July 20, 2006

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PPA Evaluation using KWI (2006-2008)



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WUTC Meeting/July 20, 2009

Redacted

Questions?

VJTC Meeting/July 20, 2016

Next Steps

- ┐ Schedule Periodic Updates?
- ┐ Point of Contact?
- ┐ Other Areas of Interest?

WJTC Meeting/July 20, 2006