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# **BPA Contract Assessment**

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**September 16, 2009**

## *The BPA Contract*



- **In 2007-2008 Tacoma Power faced a decision about entering into the new 20-year Regional Dialogue contract (Power Sales Agreement) with BPA. Tacoma Power's contract choices were:**
  - Shaped Block or
  - Slice/Block Combination
  
- **Tacoma Power had faced the same decision in 1999-2000, for a 10-year BPA Subscription contract. Because of the following concerns, we decided upon a Block contract:**
  - Risk that high energy costs in a dry water year could negate the economic advantages of the Slice product in all other years combined.
  - Increased staffing costs associated with Slice
  - Wide differences between forecast and actual timing of runoff volumes coupled with owned resources hydro generation volatility made planning difficult with Slice
  - The expected Slice shape was not a good match with our load profile

# The BPA Contract



## ■ Tacoma Power's 1999-2000, Block contract decision, continued:

- Uncertainty regarding how Slice would incorporate dynamic scheduling and reserve requirements
- Supply surplus with Slice expected to correlate with a regional surplus implying low market prices
- Tacoma's system flexibility needs were greatest in the summer months, the period when Slice offered the least flexibility
- Potential changes to the federal system that could reduce generation and the amount of electricity delivered under Slice:
  - Canadian entitlement
  - Fish obligations

## ■ So Tacoma Power chose a block product with shaping capacity:

- Term: 10-year contract from October 1, 2001 through September 30, 2011
- Quantity: 428 aMW of Power (annual average)
- Product: Block Power with Shaping Capacity
- Price: Average Price is approx. \$27 per MWh in 2007

## “Basics” of the Slice & Block Contracts

	Contract Characteristics	Advantages	Disadvantages
Shaped Block	<p>Subscription of a predetermined <i>Block</i> (amount) of power from BPA – the <u>firm</u> portion of BPA resources (about 435 aMW for Tacoma Power)</p> <p>Subscriber receives benefits from BPA’s secondary sales revenues in rates</p>	<p>Supply amount set</p> <p>Cost certainty (fixed bill, including non-firm benefits)</p> <p>Diversifies supply portfolio (not hydro dependent)</p>	<p>Less operational flexibility</p> <p>Less generation (avg. 90 aMW)</p> <p>Little ability to maximize the value of non-firm energy</p>
Slice	<p>Combination of Block (30%) and Slice (70%). The slice portion provides the subscriber a percentage of BPA’s resources including storage and <u>non-firm</u> energy (usually totals at least 435 aMW per year, but could be less short term)</p> <p>Subscriber markets surplus energy</p>	<p>Intra-day operational flexibility (storage &amp; operating range)</p> <p>Control over non-firm energy (market non-firm on own)</p> <p>Diversifies TP supply portfolio (inflow diversification)</p>	<p>Less supply certainty</p> <p>More market risk</p> <p>Higher costs to manage</p> <p>More transmission needed</p>

## *Evaluation of BPA Contract Choices*

- **Amount and Timing of Electricity Provided**
- **Slice vs. Block Economics**
- **Resource Adequacy Perspective**

# Contract Amounts

## Shaped Block Electricity Amounts



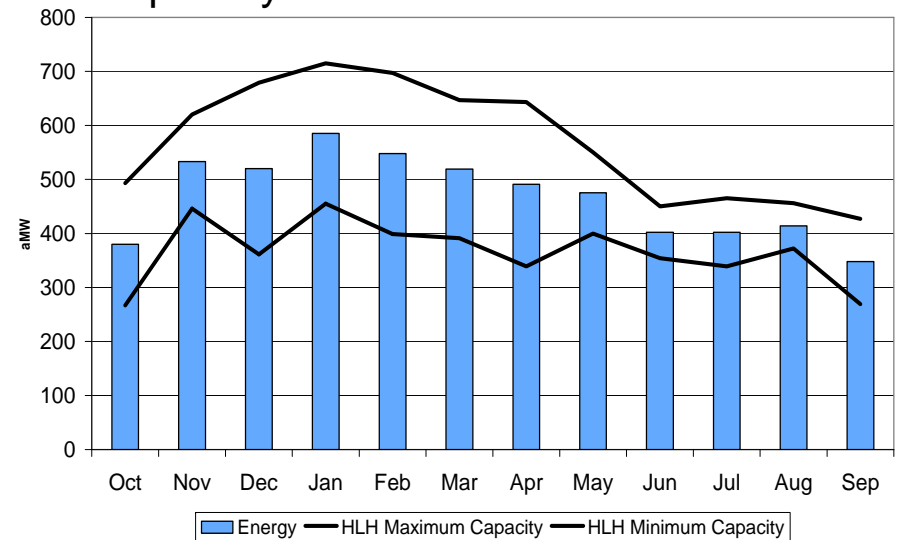
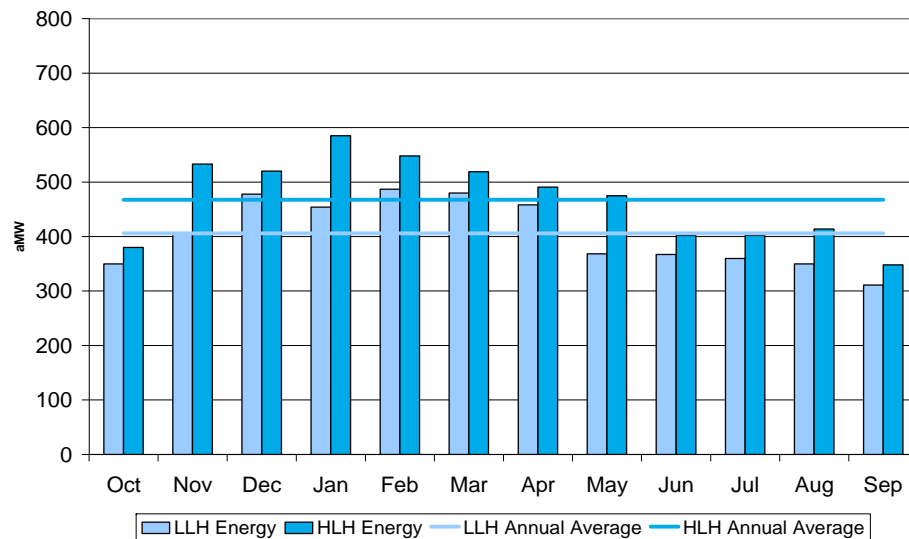
### ■ Based on High Water Mark Calculation

- Calculated by subtracting expected own generation (183 aMW at critical water) from load (617 aMW) = **435 aMW** (estimated net requirement)
  - Tacoma Power represents 5.9% of the BPA system (435/7400)
  - Calculation based on year 2010 data
  - HWM calculated for each month

### ■ Shaped Block product includes important operational flexibility

Splits delivery of Heavy Load Hour (548 MW) and Light Load Hour (487 MW)

148 MW of heavy load hour shaping capability



## ***Contract Amounts***

### ***Slice Contract***



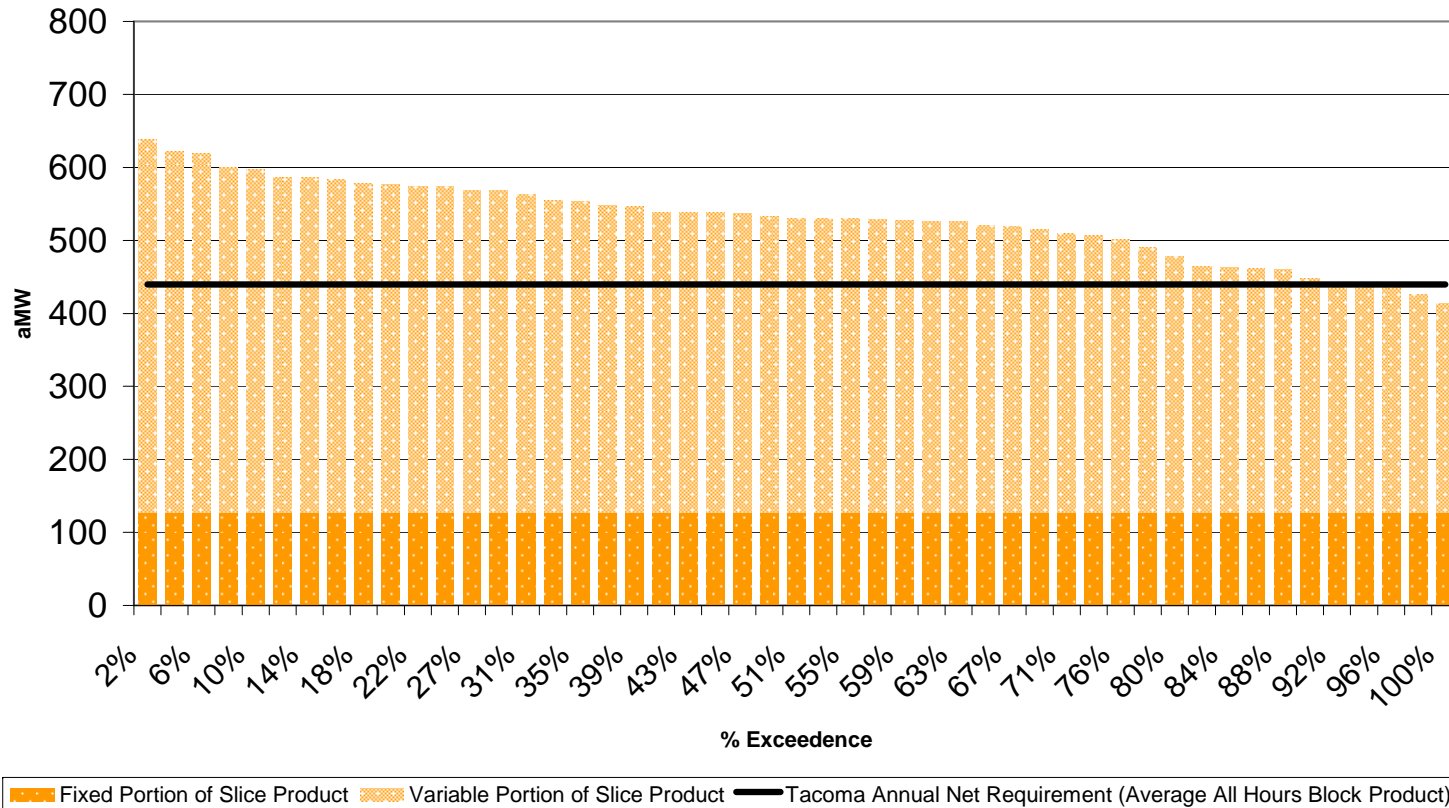
- **Includes both fixed (i.e. block) and variable (i.e. slice) portions**
- **Block portion modeled as 30% of HWM calculation - i.e. 30% of monthly block quantities**
- **Slice portion calculates to be 4.16% of BPA system (= 70% of 5.9%)**
  - The HWM calculation indicates that Tacoma Power represents 5.9% of the BPA system
- **Block portion of the Slice contract does not include HLH / LLH split or HLH shaping**
- **Analysis uses 48 years of BPA inflow data to model slice output (1950 – 1997)**

# Contract Amounts

## Diversity of Annual Deliveries



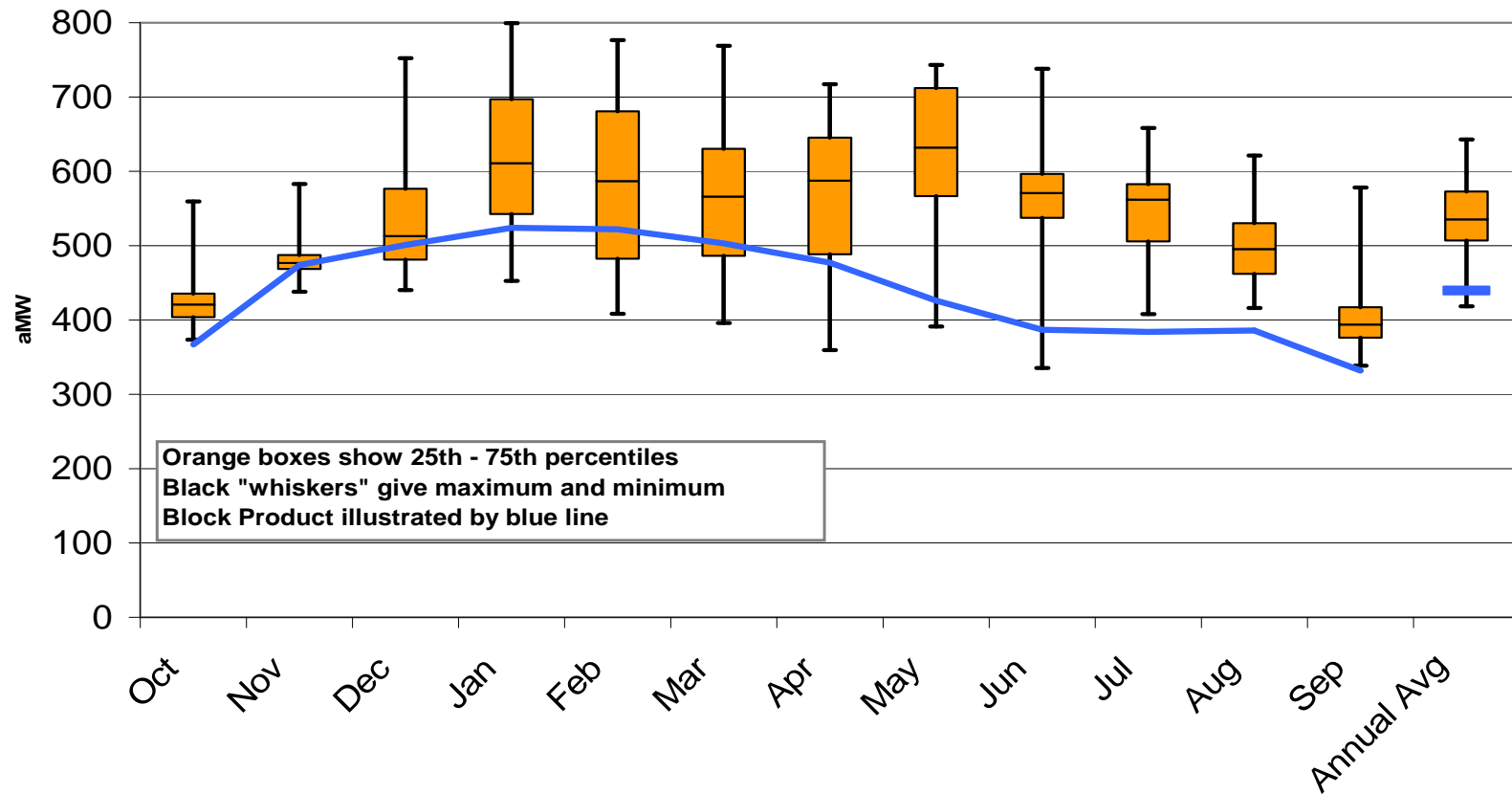
**BPA Product Choices**  
**Slice Product Average Annual Energy Exceedence**  
**& Block Product Average Annual Energy**



# Contract Amounts Monthly Variability



### Monthly Slice Variability & Block Monthly Net Requirements



## *Discussion Topics*

- Amount and Timing of Electricity Provided
- Slice vs. Block Economics
- Resource Adequacy Perspective

## *Slice vs. Block Economics*

### *Highlights of Economic Analysis*



#### ■ **Estimate Monetary Costs and Benefits of Each Product**

- Benefits estimated using a portfolio optimization computer model that simulates dispatch of each product
- Product cost was estimated using a Tacoma Power developed BPA rates model
- Models are run under multiple potential futures
  - Wholesale Power & Natural Gas Prices (i.e. what we can sell / buy power for)
  - Tacoma Retail Load (i.e. how much power we need for retail load)
  - Tacoma Hydroelectric Inflows
  - BPA Hydroelectric Inflows
- Net Benefit = Benefits minus Costs

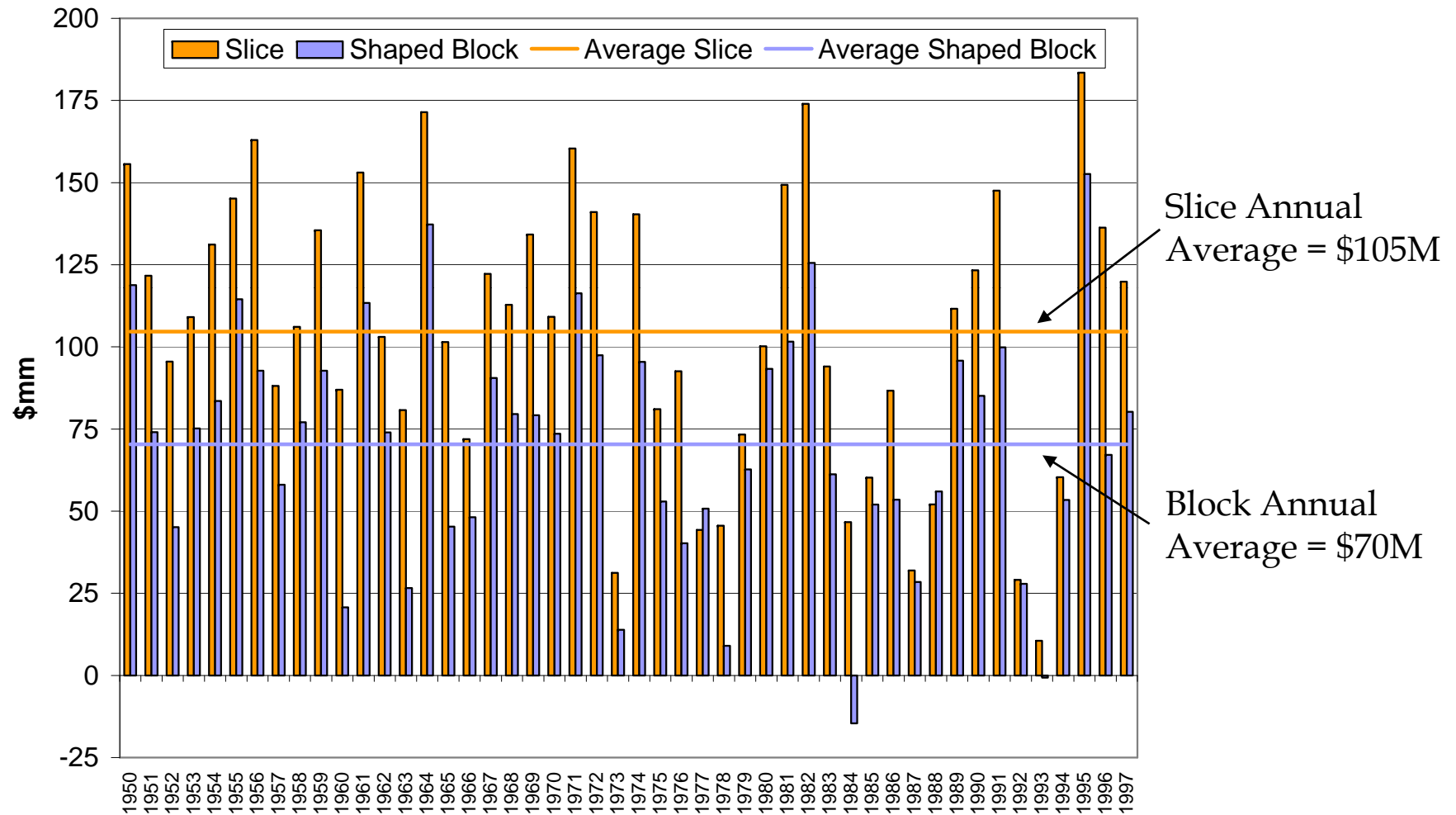
## *Slice vs. Block Economics Benefits Simulation Methods*



- **“Benefits” side of Benefit/Cost equation are based on simulation runs by the Vista portfolio linear optimization model**
  - Model simulates the operation of Tacoma’s portfolio including owned resources, contracted resources, and the BPA contract
  - Run under 48 hydro / price / load futures for 16 calendar years (2012-2027). A total of 768 runs for each product
  - Model optimizes available generation to serve load
    - Surplus electricity is sold into the wholesale marketplace at prices that were projected with another model (Aurora)
    - Revenue from these surplus sales make up the “benefits” side of the benefit/cost calculation

# Slice vs. Block Economics

## Modeled 2012 Wholesale Portfolio Revenues



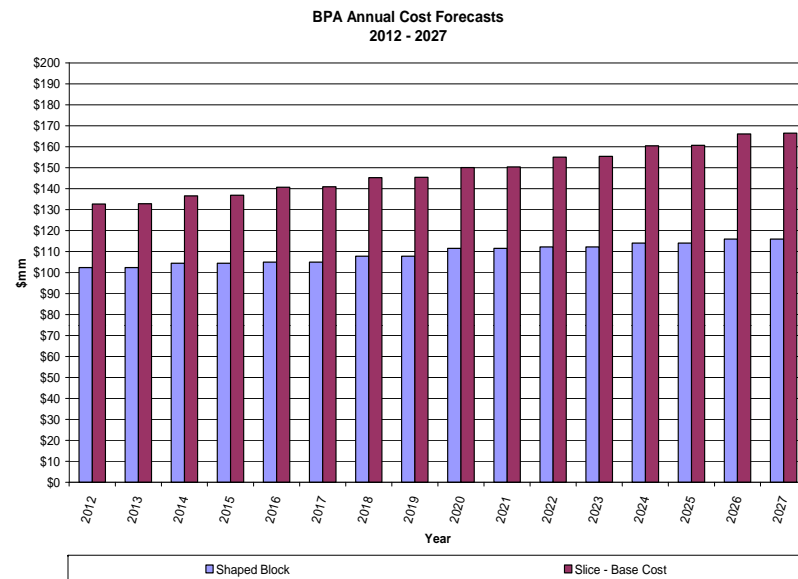
# Slice vs. Block Economics

## BPA Product Direct Cost Estimates



### ■ Tacoma Power developed a model in house to estimate the cost of BPA's Slice and Block products

- Forecasted BPA's revenue requirement and rates over IRP period (2008-2027)
  - Based on Tacoma Power's forecast of wholesale market prices
  - Model has capability to do rate sensitivity analysis on either product
- Calculated Tacoma's annual "Shaped Block" and "Slice" bills under various hydro, market price conditions and Tier I designs. For 2012, the cost of each product averaged:
  - \$111 Block
  - \$131 Slice



# Slice vs. Block Economics

## BPA Product Cost Estimates with Indirect Costs



■ **Certain incremental costs were added to Slice bill for an “apples-to-apples” comparison**

1) Incremental Staff – 3 FTE’s

- 1 for day-ahead and real-time support
- 1 for BPA Slice operations/storage analysis
- 1 for back office

2) Incremental Transmission

- Assumed the need for 100 MW of additional transmission capacity

3) Risk Mitigation

- Premiums – \$3M per year

2012 Rates	Block	Slice
Base Rate	\$111M	\$131M
Staff		\$0.6M
Transmission		\$2.1M
Risk Mitigation		\$3.0M
<b>Total</b>	<b>\$111M</b>	<b>\$137M</b>

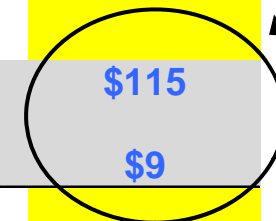
# Slice vs. Block Economics

## Expected Net Values (in millions \$)



	<b>Benefits</b>		<b>Costs</b>		<b>Benefits - Costs</b>		<b>Incremental Slice Benefit</b>
	<b>Wholesale Portfolio Revenue (Cost)</b>		<b>BPA Product Cost</b>		<b>Net Wholesale Portfolio Revenue (Cost)</b>		
	Block	Slice	Block	Slice*	Block	Slice	
<i>Present Value (2008\$)</i>	<b>\$704</b>	<b>\$1,120</b>	<b>(\$1,123)</b>	<b>(\$1,424)</b>	<b>(\$419)</b>	<b>(\$304)</b>	<b>\$115</b>
<i>Annualized PV (2008\$)</i>	<b>\$56</b>	<b>\$89</b>	<b>(\$89)</b>	<b>(\$113)</b>	<b>(\$33)</b>	<b>(\$24)</b>	<b>\$9</b>
Year							
			<i>values in nominal dollars</i>				
2012	70	105	-111	-137	-41	-32	8
2013	69	104	-111	-137	-42	-33	9
2014	71	109	-114	-142	-43	-32	11
2015	65	104	-114	-142	-49	-38	11
2016	70	109	-116	-146	-46	-37	9
2017	74	115	-116	-146	-42	-32	10
2018	74	118	-120	-151	-46	-33	13
2019	70	116	-120	-152	-50	-36	14
2020	70	113	-124	-157	-54	-43	11
2021	76	120	-124	-157	-49	-37	11
2022	79	128	-126	-163	-47	-35	13
2023	87	141	-126	-163	-39	-22	17
2024	85	142	-129	-169	-44	-26	18
2025	91	146	-129	-169	-38	-23	15
2026	89	149	-133	-175	-44	-26	17
2027	95	158	-133	-176	-38	-18	21

Slice Higher Value by:



\*Includes cost of additional 100 MW firm transmission capacity, additional 3 Operations FTEs, & incremental risk mitigation costs

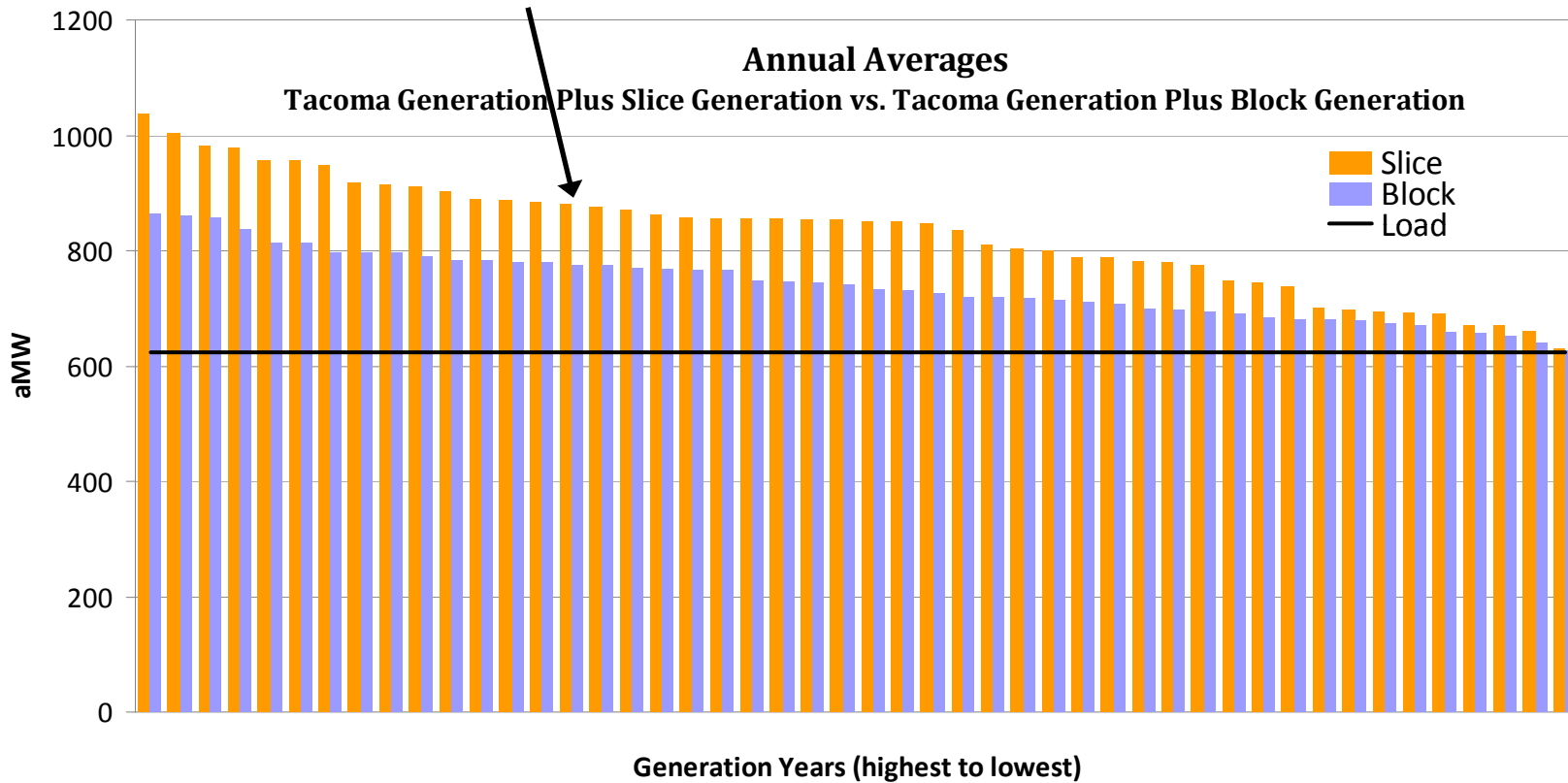
## *Discussion Topics*

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- Resource Adequacy Perspective

# Resource Adequacy Comparison of Annual Generation of BPA Products



On an annual basis, always  
get more with Slice

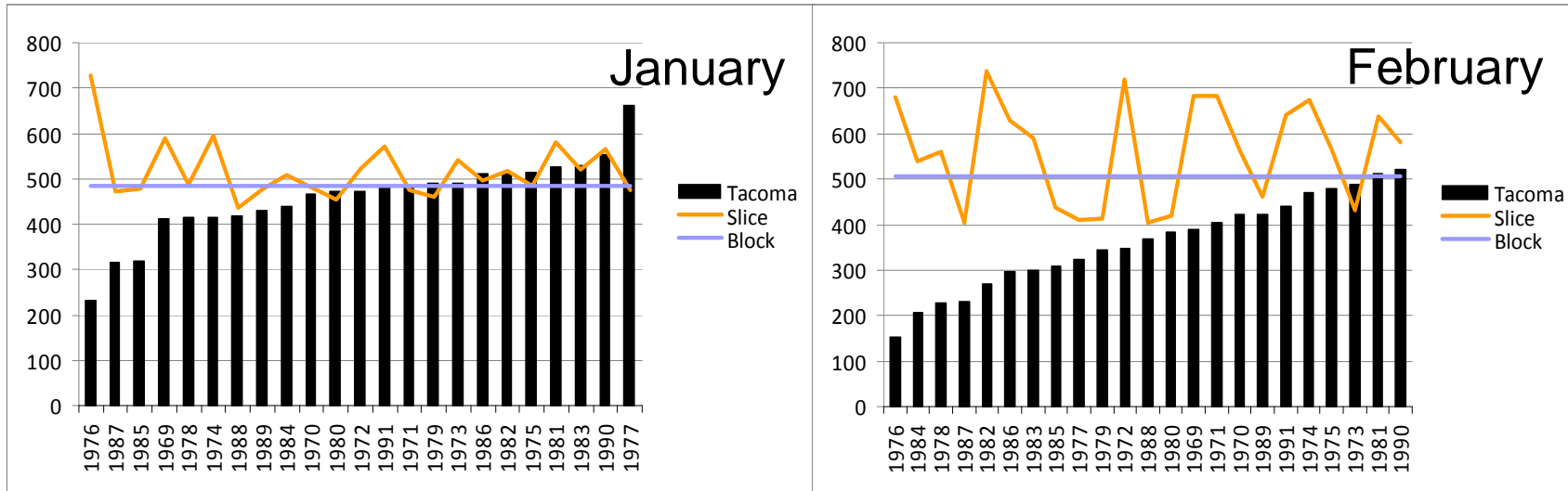


Modeled Generation Data 1950 – 1997 Inflows

# Resource Adequacy Consequence of Resource Diversity



- On a monthly basis, resource diversity is more pronounced



- Despite this diversity (and contrary to internal expectations), the Model results found little difference in utility monthly resource capabilities with either the Slice or Block product in dry years.
  - Diversity between Tacoma and BPA system inflows mitigates bad outcomes
  - Model coordinated output of Tacoma’s own generation and Slice product with system load
- Outcome variability mostly occurred on the upside for the Slice product

## ***BPA Contract – Conclusions***



- **Analysis completed at the time of this decision suggested that the Slice product would provide an incremental financial benefit of \$9M per year relative to the Block product**
  - The Vista model and better information from BPA enabled this analysis
- **Results of the modeling were highly influenced by the assumptions about Slice and Block contract characteristics**
  - One of the most important was the assumption about the Slice/Block split in the Slice product
    - Assumed a 30/70 split
    - Actual split turned out to be about 50/50 (\$6M Slice incremental benefit)
- **Principle differences that benefit Slice economically**
  - Four river resource diversity helps avoid bad outcomes
  - Addition of BPA storage to our own allows Tacoma Power to better manage/optimize resource utilization

# QUESTIONS?