City of Independence

Power & Light Department

Energy Master Plan Background

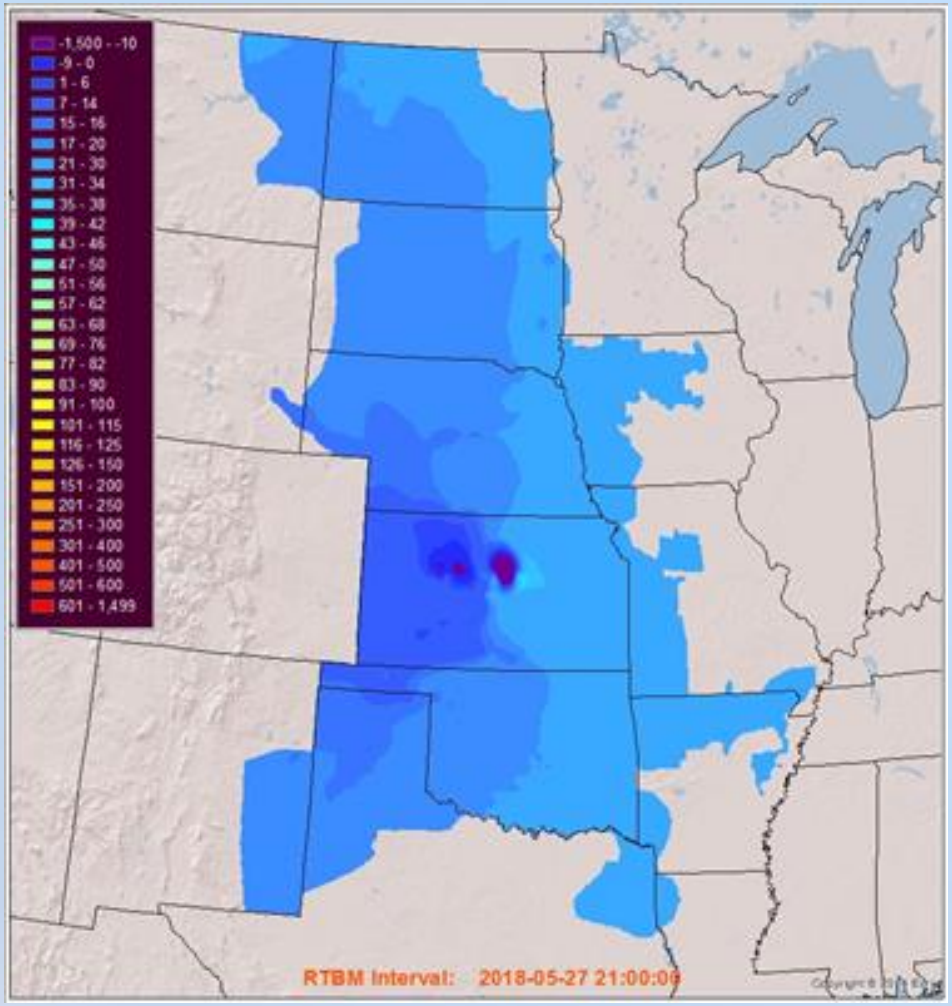
July 9, 2018

Randy Hughes, Manager, Planning & Rates

Agenda

1. Big Changes in the Electric Market
2. Master Plan Preliminary Results

Southwest Power Pool



Today's Electric Market

1. **SPP controls all generators**
2. **Utilities no longer generate to serve customers**
3. **All utility generation is sold to the SPP "Pool"**
4. **All energy for customer load is purchased from the SPP "Pool"**
5. **SPP sets the price of wholesale energy**

Utilities must provide "Capacity"

"Accredited" Capacity

"Installed" vs "Accredited" Capacity

- **Fossil units: 100% of "Installed" Capacity (100 MW plant = 100 MW of Capacity)**
- **Wind, 5% (100 MW = 5 MW)**
- **Solar, 10% (100 MW = 10 MW)**

<u>Penalty for Capacity shortage</u>:

125% of the cost of a new CT

The Cost of Accredited Capacity

"All-In" Cost of Capacity ($/MW-Month)			
Unit	FY 16-17	FY 17-18 (March 2018)	Capacity (MW)
IPL Units	$ 6,070	$ 5,659	192
Dogwood (Gas)	$ 3,559	$ 4,058	76
NC-2 (Coal)	$ 11,287	$ 10,269	52
Smoky (Wind)	$ 41,118	$ 46,301	4
Marshall (Wind)	$ 65,724	$ 78,944	1
Solar	$ 44,269	$ 64,714	0.5
ALL	$ 9,175	$ 9,199	

IPL Units: 2% of Energy

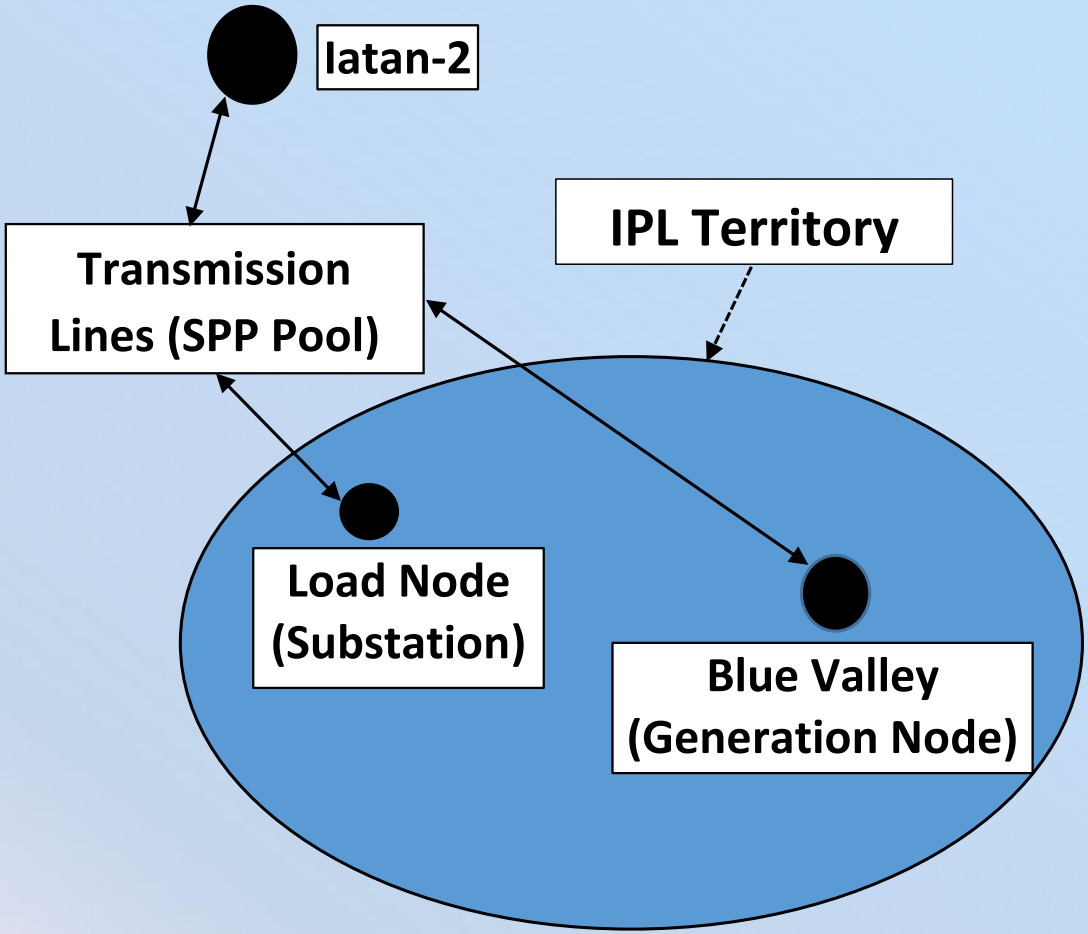
- **They provide low-cost Capacity**
- **We're buying 98% of our energy at lower cost than producing it ourselves**
- **When operating, they lower the cost we pay the SPP "Pool" to serve customer load**

The Price of Energy

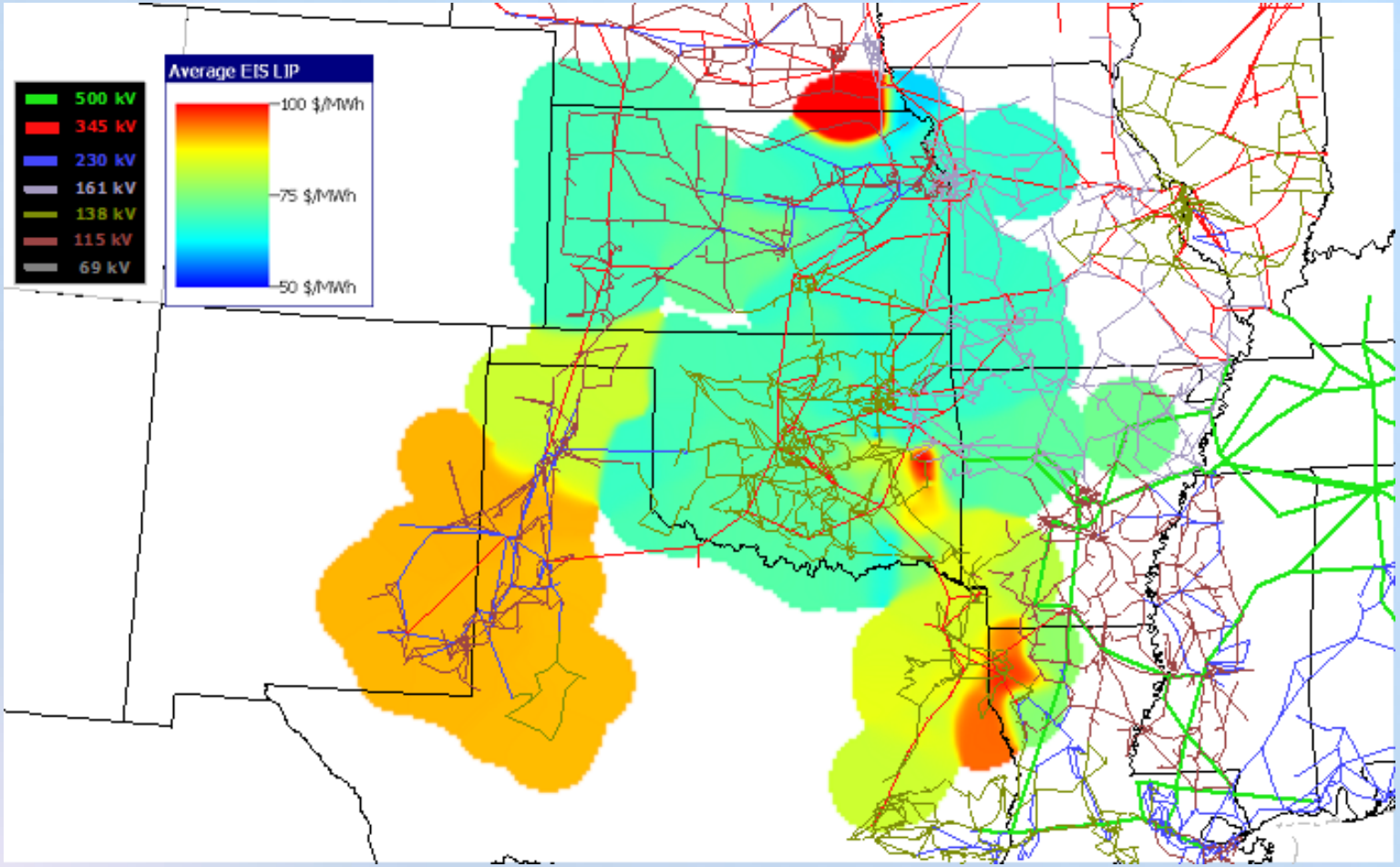
SPP Establishes the Price of energy

- **Prices are 'Location-Based': Called Location Marginal Prices (LMPs)**
- **Includes: Variable cost of energy and transmission "Congestion" and "Losses"**
- **SPP controls Generation to provide the lowest cost energy at any given time.**

IPL Price Locations



LMP Example


500 kV
345 kV
230 kV
161 kV
138 kV
115 kV
69 kV
Average EIS LIP
100 $/MWh
75 $/MWh
50 $/MWh

What These Changes Mean

- **PAST: IPL could purchased "ENERGY" daily, weekly or monthly at Very Low prices**
- **TODAY: Such ENERGY purchases are not economic.**
  - **SPP energy price: Lowest available**
  - **Contract: Pay seller contract price--Receive SPP's LMP**
  - **Still pay SPP for ALL Customer Load**

Short-term "Energy" deals add costs

1 TO 5 YEAR "CAPACITY" PURCHASES ARE STILL ECONOMIC

Wind and Negative LMPs

Kansas: The Saudi Arabia of Wind

- **IPL wind units are located in Kansas**
- **Lots of wind generation**
- **Low area loads: Limited transmission capability**
- **LMPs are often NEGATIVE**

  -Pay SPP to generate

  -Tax incentives make this profitable.

IPL LMP Impacts

AVERAGE ENERGY COSTS AND SPP ENERGY PRICES BY LOCATION (LMPs): LAST 12 MONTHS						
LOCATION	Iatan-2	Nebraska City-2	Dogwood	Smoky Hills Wind	Marshall Wind	IPL Solar
Average LMP ($/MWh)	$ 22.31	$ 19.50	$ 30.92	$ 11.61	$ 14.73	$ 28.24
Average Energy Cost ($/MWh)	$ 14.46	$ 15.61	$ 23.39	$ 45.00	$ 33.80	$ 81.50
Margin ($/MWh)	$ 7.84	$ 3.89	$ 7.53	$ (33.39)	$ (19.07)	$ (53.26)

Annual Results

ANNUAL SPP MARKET RESULTS						
LOCATION	Iatan-2	Nebraska City	Dogwood	Marshall Wind	Smoky Hills Wind	IPL Solar (11.5 MW)
Accredited Capacity (MW)	52	57	75	1	4	1
Energy (MWh)	341,640	384,476	210,240	84,096	60,444	20,148
Annual Mrkt. Revenue (Loss)	$ 2,678,458	$ 1,495,613	$ 1,583,107	$ (1,603,711)	$(2,018,225)	$ (1,073,082)

Decision Economics

Once Capacity requirements are met

The economics of adding ANY new resource is Totally Dependent on:

LMP Market Revenue MINUS

The total cost of the additional resource

Policy Decision

The Master Plan Consider Economics Only

- **It will not show value for renewable energy**

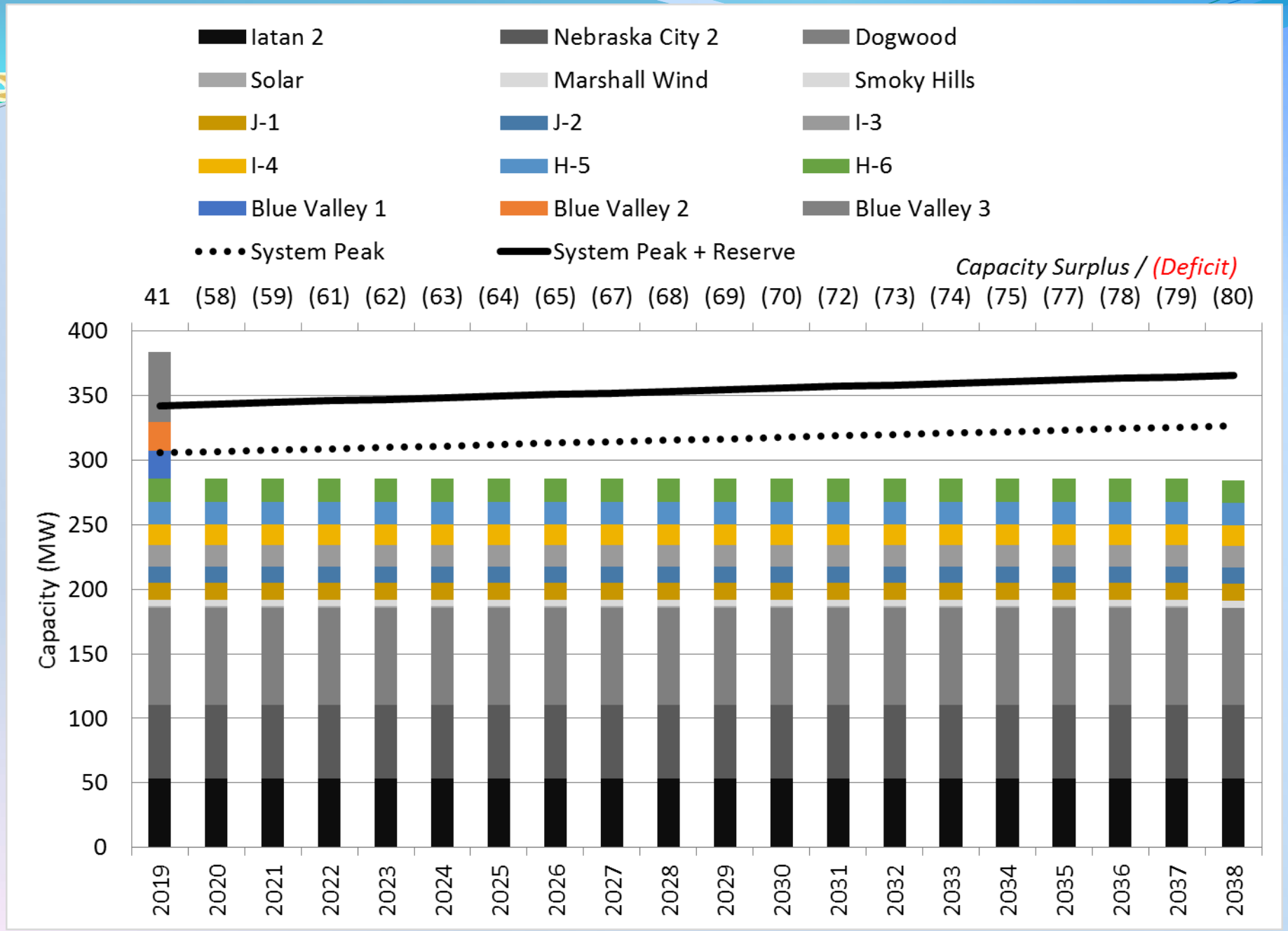
The decision to add more renewable energy will be a Policy decision we are free to make

Rates impacts need to be considered

Market Questions?

Master Plan

Preliminary Results


Iatan 2
Nebraska City 2
Dogwood
Solar
Marshall Wind
Smoky Hills
J-1
J-2
I-3
I-4
H-5
H-6
Blue Valley 1
Blue Valley 2
Blue Valley 3
System Peak
System Peak + Reserve
Capacity Surplus / (Deficit)
41 (58) (59) (61) (62) (63) (64) (65) (67) (68) (69) (70) (72) (73) (74) (75) (77) (78) (79) (80)
Capacity (MW)
400
350
300
250
200
150
100
50
0
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038

Sample Technologies

Technologies	CT - Aero	CT - Frame	Recip. Engines	Combined Cycle	Battery Storage
MW	36	216	37	1,060	15
Total Installed Cost ($x1,000)	$ 64,830	$125,630	$ 60,810	$696,000	$110,000
Installed Cost of Capacity ($/kW)	$ 1,550	$ 560	$ 1,220	$ 702	$ 2,230

Preliminary Results

PRELIMINARY Net Present Values (NPVs)				
2019	No Retirements	Retire BV, Add Dogwood	Retire BV, Purchases, Recips	Retire: BV, CTs in 2023, Purchases and Recips
2020		100 MW Dogwood	60 MW	60 MW
2021			70 MW	70 MW
2022			70 MW	70 MW
2023			70 MW	110 MW Recips
2024			110 MW Recips	50 MW
2025				50 MW
20-Yr NPV ($x1,000)	$ 746,208	$ 670,182	$ 741,185	$ 763,407

Dogwood Risks

- Too many eggs in one basket
  - 15-Year Old Plant
  - Up to 150 MW tied to one turbine
  - Future exposure: Replace 150 MW at one time
  - Life of Unit Commitment
- Future Market Changes
- Customer Trends: Lower future capacity needs?
- Short-Term Capacity Purchases offer flexibility

Some combination is likely preferred

Policy Decision

Master Plan: Looks at Economics Only

If Retiring Blue Valley is recommended:

We need a "Transition Plan"

Allows time to Consider impacts on personnel

Next Steps

- **Refine Assumptions (Costs, Capacity target)**
- **Evaluate Short-Term Capacity Options: Currently using recent contract prices**
- **Present Findings**

BEFORE FINAL DECISION

- **Issue an RFP to get firm pricing for preferred alternatives (2-3 month process)**
- **Finalize Decision**

Questions?