

**KANSAS CITY POWER & LIGHT
COMPANY (KCP&L)**

INTEGRATED RESOURCE PLAN

2016 ANNUAL UPDATE

MARCH, 2016



TABLE OF CONTENTS

SECTION 1: EXECUTIVE SUMMARY	1
1.1 UTILITY INTRODUCTION	1
1.2 CHANGES FROM THE 2015 TRIENNIAL IRP	7
1.3 2016 ANNUAL UPDATE PREFERRED PLAN.....	7
SECTION 2: LOAD ANALYSIS AND LOAD FORECASTING UPDATE	14
2.1 CHANGES FROM THE 2015 TRIENNIAL IRP	14
SECTION 3: SUPPLY-SIDE RESOURCE ANALYSIS UPDATE.....	17
3.1 FUEL AND EMISSION FORECAST CHANGES FROM THE 2015 TRIENNIAL IRP.....	17
3.1.1 SUPPLY-SIDE TECHNOLOGY CANDIDATE RESOURCE OPTIONS	33
3.1.2 LIFE ASSESSMENT & MANAGEMENT PROGRAM	36
SECTION 4: TRANSMISSION AND DISTRIBUTION UPDATE	37
4.1 CHANGES FROM THE 2015 TRIENNIAL IRP.....	37
4.2 RTO EXPANSION PLANNING	37
4.1 ADVANCED DISTRIBUTION TECHNOLOGIES DISCUSSION	38
4.1.1 SCADA-LIKE MONITORING AND CONTROL VIA OMS	38
4.1.2 FAULT ISOLATION AND SERVICE RESTORATION (FISR)	39
4.1.3 OMS FAULT LOCATION FUNCTIONALITY	42
4.1.4 COMMUNICATING FAULTED CIRCUIT INDICATOR (CFCI) PILOTS.....	42
4.1.5 2G CELLULAR COMMUNICATIONS REPLACEMENT	43
4.1.6 4G CELLULAR COMMUNICATIONS PILOT	43
4.1.7 DEVELOP A MULTIYEAR DISTRIBUTION AUTOMATION ROADMAP	44
SECTION 5: DEMAND-SIDE RESOURCE ANALYSIS UPDATE.....	45
5.1 MEEIA CYCLE 2 2016-2018 PROGRAMS	45

5.2	CHANGES FROM THE 2015 TRIENNIAL IRP	47
SECTION 6: INTEGRATED RESOURCE PLAN AND RISK ANALYSIS UPDATE.....		48
6.1	CHANGES FROM THE 2015 TRIENNIAL IRP	48
6.2	ALTERNATIVE RESOURCE PLAN DEVELOPMENT	49
6.3	REVENUE REQUIREMENT	56
6.4	PERFORMANCE MEASURES.....	57
6.5	UNSERVED ENERGY	58
6.6	JOINT-PLANNING KCP&L/GMO RESOURCE PLANS.....	59
6.7	JOINT-PLANNING ECONOMIC IMPACT	69
6.8	JOINT-PLANNING ANNUAL GENERATION	70
6.9	JOINT-PLANNING ANNUAL EMISSIONS	71
SECTION 7: RESOURCE ACQUISITION STRATEGY.....		72
7.1	2016 ANNUAL UPDATE PREFERRED PLAN.....	72
7.1.1	PREFERRED PLAN COMPOSITION	73
7.1.2	PREFERRED PLAN ECONOMIC IMPACT	74
7.1.3	PREFERRED PLAN ANNUAL GENERATION	75
7.1.4	PREFERRED PLAN ANNUAL EMISSIONS.....	76
7.1.5	PREFERRED PLAN DISCUSSION	77
7.2	CRITICAL UNCERTAIN FACTORS.....	78
7.2.1	CRITICAL UNCERTAIN FACTOR – HIGH LOAD GROWTH	80
7.2.2	CRITICAL UNCERTAIN FACTOR – LOW LOAD GROWTH.....	81
7.2.3	CRITICAL UNCERTAIN FACTOR – HIGH NATURAL GAS PRICES	82
7.2.4	CRITICAL UNCERTAIN FACTOR – LOW NATURAL GAS PRICES.....	83
7.2.5	CRITICAL UNCERTAIN FACTOR –CO ₂ - YES.....	84
7.2.6	CRITICAL UNCERTAIN FACTOR –CO ₂ - NO	85

7.2.7	CRITICAL UNCERTAIN FACTORS – SUMMARY AND EVALUATION	86
7.3	IMPLEMENTATION PLAN.....	88
7.3.1	DEMAND-SIDE MANAGEMENT SCHEDULE	89
SECTION 8: SPECIAL CONTEMPORARY ISSUES		90
8.1	IMPACTS OF EMERGING ENERGY EFFICIENCY TECHNOLOGIES	90
8.2	IMPACTS OF EMERGING ENERGY STORAGE TECHNOLOGIES	93
8.3	ENVIRONMENTAL CAPITAL AND OPERATING COSTS FOR COAL-FIRED GENERATING UNITS	101
8.4	TRANSMISSION GRID IMPACTS	112
8.5	DISTRIBUTED GENERATION POTENTIAL.....	112
8.6	ENERGY EFFICIENCY FINANCING	116
8.7	CLEAN POWER PLAN COMPLIANCE.....	118
8.8	SOLAR ASSESSMENT	119
8.9	TRANSMISSION GRID IMPACTS	120
8.10	GENERATION COST AND PERFORMANCE DATA	120
8.11	IMPACT OF EMERGING ENERGY EFFICIENCY TECHNOLOGIES	122

TABLE OF TABLES

Table 1: KCP&L Customers, Retail Sales and Peak Demand	3
Table 2: KCP&L Capacity and Energy by Resource Type	3
Table 3: 2016 Annual Update Preferred Plan Capacity Additions	12
Table 4: 2016 Annual Update Preferred Plan	13
Table 5: KCP&L Mid-Case Annual NSI and Peak Forecast ** Highly Confidential **	16
Table 6: Coal Forecasts - 2015 IRP Vs. 2016 Annual Update Graphic ** Highly Confidential **	18
Table 7: Coal Forecasts - 2015 IRP Vs. 2016 Annual Update ** Highly Confidential ** ..	19
Table 8: Natural Gas Forecasts - 2015 IRP Vs. 2016 Annual Update Graphic ** Highly Confidential **	20
Table 9: Natural Gas Forecasts - 2015 IRP Vs. 2016 Annual Update ** Highly Confidential **	21
Table 10: Fuel Oil Forecasts - 2015 IRP Vs. 2016 Annual Update Graphic ** Highly Confidential **	22
Table 11: Fuel Oil Forecasts - 2015 IRP Vs. 2016 Annual Update ** Highly Confidential **	23
Table 12: SO ₂ Forecasts - 2015 IRP Vs. 2016 Annual Update Graphic ** Highly Confidential **	24
Table 13: SO ₂ Forecasts - 2015 IRP Vs. 2016 Annual Update ** Highly Confidential ** ..	25
Table 14: NO _x Annual Forecasts - 2015 IRP Vs. 2016 Annual Update Graphic ** Highly Confidential **	26
Table 15: NO _x Annual Forecasts - 2015 IRP Vs. 2016 Annual Update ** Highly Confidential **	27
Table 16: NO _x Seasonal Forecasts - 2015 IRP Vs. 2016 Annual Update Graphic ** Highly Confidential **	28

Table 17: NO _x Seasonal Forecasts - 2015 IRP Vs. 2016 Annual Update ** Highly Confidential **	29
Table 18: CO ₂ Forecasts - 2015 IRP Vs. 2016 Annual Update Graphic ** Highly Confidential **	30
Table 19: CO ₂ Forecast - 2016 Annual Update ** Highly Confidential **	31
Table 20: Fuel Forecast Sources	32
Table 21: Emission Forecast Sources	32
Table 22: Supply-Side Technology Candidates ** Highly Confidential **	34
Table 23: KCP&L-MO - MEEIA 36 Month Plan Period**Highly Confidential**	46
Table 24: KCP&L-MO Option C	47
Table 25: Alternative Resource Plan Naming Convention	50
Table 26: Alternative Resource Plan Overview	51
Table 27: Alternative Resource Plan Overview (continued)	53
Table 28: Twenty-Year Net Present Value Revenue Requirement	56
Table 29: Expected Value of Performance Measures ** Highly Confidential **	57
Table 30: Unserved Energy	58
Table 31: Joint-Planning Alternative Resource Plan Naming Convention	60
Table 32: Overview of Joint-Planning Resource Plans	61
Table 33: Joint-Planning Twenty-Year Net Present Value Revenue Requirement	63
Table 34: Joint Plan Results With CO ₂ Restrictions	64
Table 35: Joint Plan Results Without CO ₂ Restrictions	64
Table 36: Joint-Planning Expected Value of Performance Measures ** Highly Confidential **	65
Table 37: Joint-Planning Alternative Resource Plan	68

Table 38: Joint-Planning Alternative Resource Plan - Economic Impact ** Highly Confidential **	69
Table 39: Joint-Planning Alternative Resource Plan CBBCA Annual Generation.....	70
Table 40: Joint-Planning Alternative Resource Plan CBBCA Annual Emissions	71
Table 41: 2016 Annual Update Preferred Plan	72
Table 42: Preferred Plan Capacity Additions	73
Table 43: Preferred Plan Economic Impact ** Highly Confidential **	74
Table 44: Preferred Plan Annual Generation.....	75
Table 45: Preferred Plan Annual Emissions	76
Table 46: Alternative Resource Plan NPVRRs	86
Table 47: Endpoint/Lowest NPVRR Alternative Resource Plan	87
Table 48: Cumulative Probabilities of Lowest NPVRR Plans	87
Table 49: DSM Program Schedule.....	89
Table 50: Environmental Capital Cost Estimates ** Highly Confidential **	103
Table 51: Environmental Fixed O&M Estimates ** Highly Confidential **	104
Table 52: Retrofit Variable O&M Estimates ** Highly Confidential **	105
Table 53: Projected Annual CO ₂ Emissions With CO ₂ Restrictions	108
Table 54: Projected Annual CO ₂ Emissions Without CO ₂ Restrictions.....	110
Table 55: KCP&L Solar PV Projections.....	114
Table 56: Supply Side Technology Analysis ** Highly Confidential **	121

TABLE OF FIGURES

Figure 1: Great Plains Energy Service Territory	1
Figure 2: KCP&L Capacity by Resource Type.....	5
Figure 3: KCP&L Energy by Resource Type	5
Figure 4: 2016 Annual Update Preferred Plan - Years 2016 through 2026	9
Figure 5: Joint Planning Alternative Resource Plan CBBCA - 2016 through 2026	67
Figure 6: Critical Uncertain Factors With Decision Tree Probabilities.....	78
Figure 7: Maturity of Energy Storage Technologies	94
Figure 8: Storage Capacity in 2050	95
Figure 9: Value of Distributed Electric Storage in Texas Findings.....	98
Figure 10: PESS Installation at SmartGrid Demonstration House	100

TABLE OF APPENDICES

Appendix A: 2016 SPP Transmission Expansion Plan Report

Appendix A1: 2016 SPP Transmission Expansion Plan Project List

Appendix B: Capacity Balance Spreadsheets HC

Appendix C: 2015 Final Technical Report Smart Grid

Appendix D: Generation and Emissions for Each Alternative Resource Plan

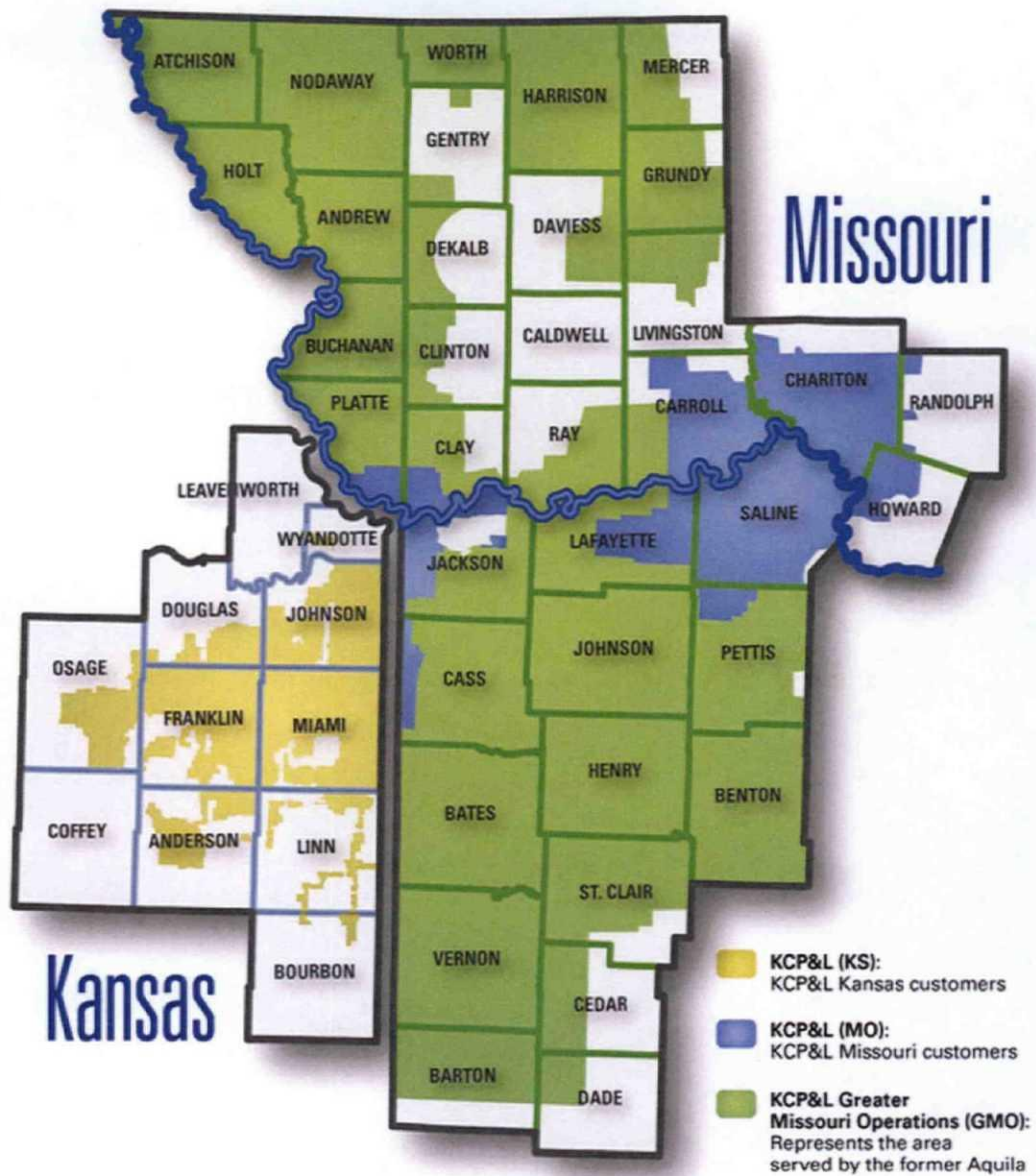
Appendix E: Economic Impact for Each Alternative Resource Plan HC

SECTION 1: EXECUTIVE SUMMARY

1.1 UTILITY INTRODUCTION

KCP&L is an integrated, mid-sized electric utility serving the metropolitan region surrounding the Kansas City, Missouri metropolitan area including customers in Kansas and Missouri. A map of the Great Plains Energy (GPE) service territory which includes KCP&L is provided in Figure 1 below:

Figure 1: Great Plains Energy Service Territory



KCP&L is significantly impacted by seasonality with approximately one-third of its retail revenues recorded in the third quarter. Table 1 provides a snapshot of the number of customers served, retail sales and peak demand for 2015.

Table 1: KCP&L Customers, Retail Sales and Peak Demand

Jurisdiction	Number of Retail Customers	Retail Sales (MWh)	Net Peak Demand (MW)
KCP&L-Missouri	275,805	8,432,160	1,802
KCP&L-Kansas	249,183	6,265,906	1,623
KCP&L	524,988	14,698,066	3,425

KCP&L owns and operates a diverse generating portfolio and Power Purchase Agreements (PPA) to meet customer energy requirements. Two recent generation projects that KCP&L has 20-year PPAs with, the 150 MW Slate Creek and 200 MW Waverly wind facilities, were constructed in 2015 and are now commercially operating. Table 2, Figure 2, and Figure 3 reflect KCP&L's generation assets including PPAs currently in place.

Table 2: KCP&L Capacity and Energy by Resource Type

Capacity By Fuel Type	Capacity (MW)	% of Total Capacity	Estimated Energy (MWh)	% of Annual Energy
Coal	2,524	47.1%	17,404,583	70.1%
Nuclear	549	10.2%	4,272,778	17.2%
Oil	375	7.0%	-	0.0%
Nat. Gas	808	15.1%	149,677	0.6%
Wind	1,030	19.2%	2,799,340	11.3%
Hydro	62	1.1%	181,747	0.7%
Solar	13	0.2%	20,300	0.1%
Total	5,361	100.0%	24,828,425	100.0%

* Wind capacity is based upon nameplate capacity

Figure 2: KCP&L Capacity by Resource Type

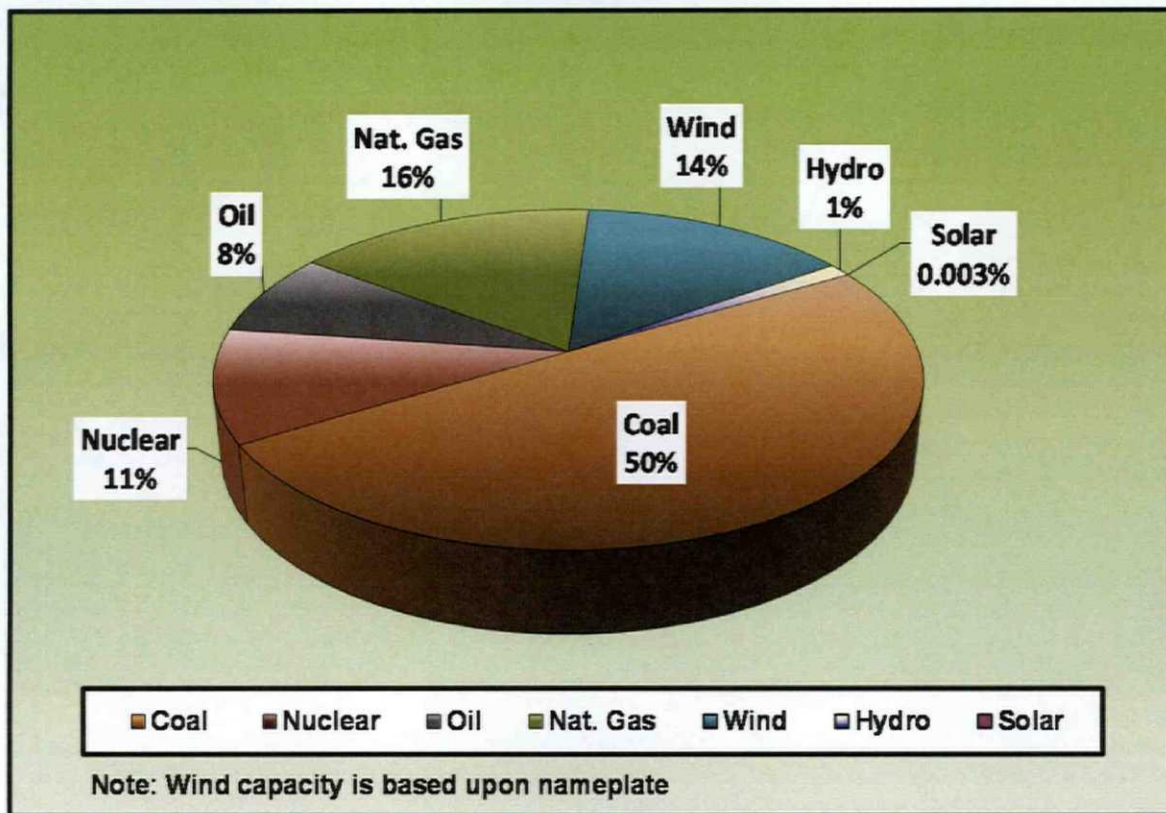
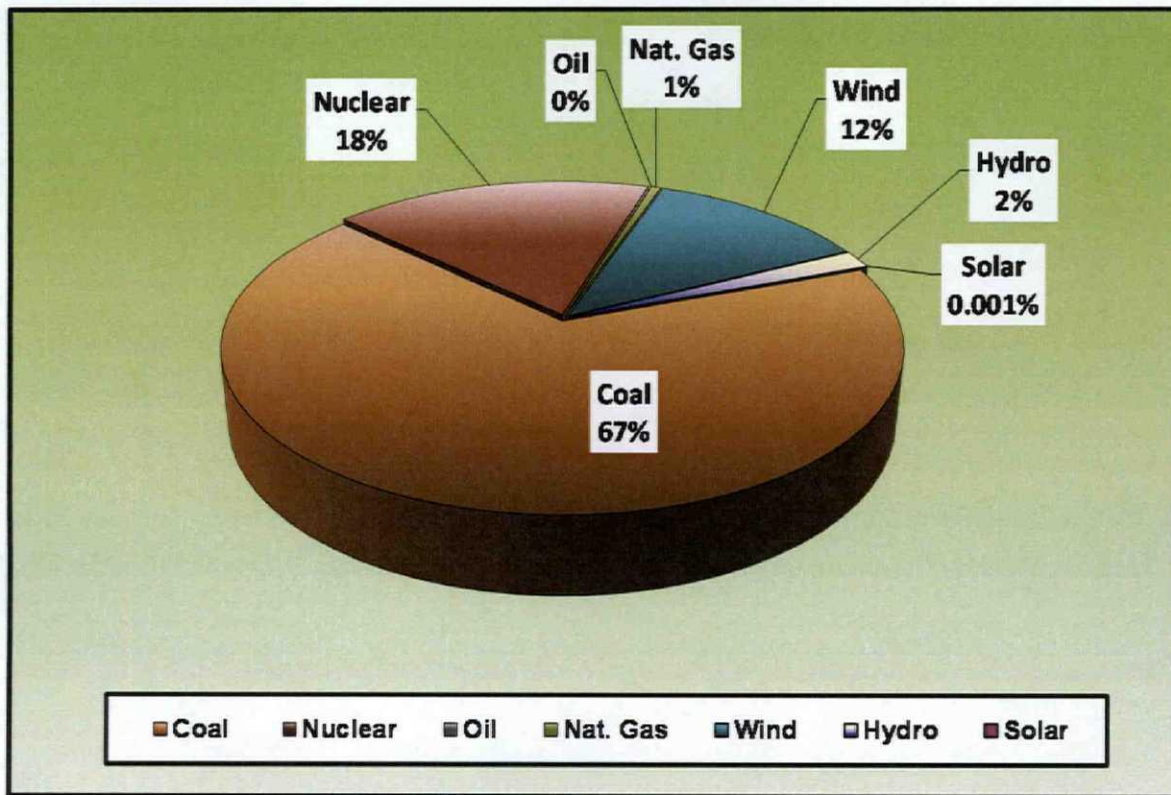


Figure 3: KCP&L Energy by Resource Type



1.2 CHANGES FROM THE 2015 TRIENNIAL IRP

Since the filing of the 2015 Triennial IRP, changing conditions, or major drivers, were refreshed to reflect the latest information and forecasts available to determine if the Preferred Plan and associated Resource Acquisition Strategy identified in 2015 Triennial IRP continue to be the company's path forward. The information and forecasts that have been updated for the 2016 Annual Update included:

- Proposed and Potential Environmental Regulations
- Load, Fuel, and Emissions Forecast Projections
- Demand-Side Management (DSM) Program levels

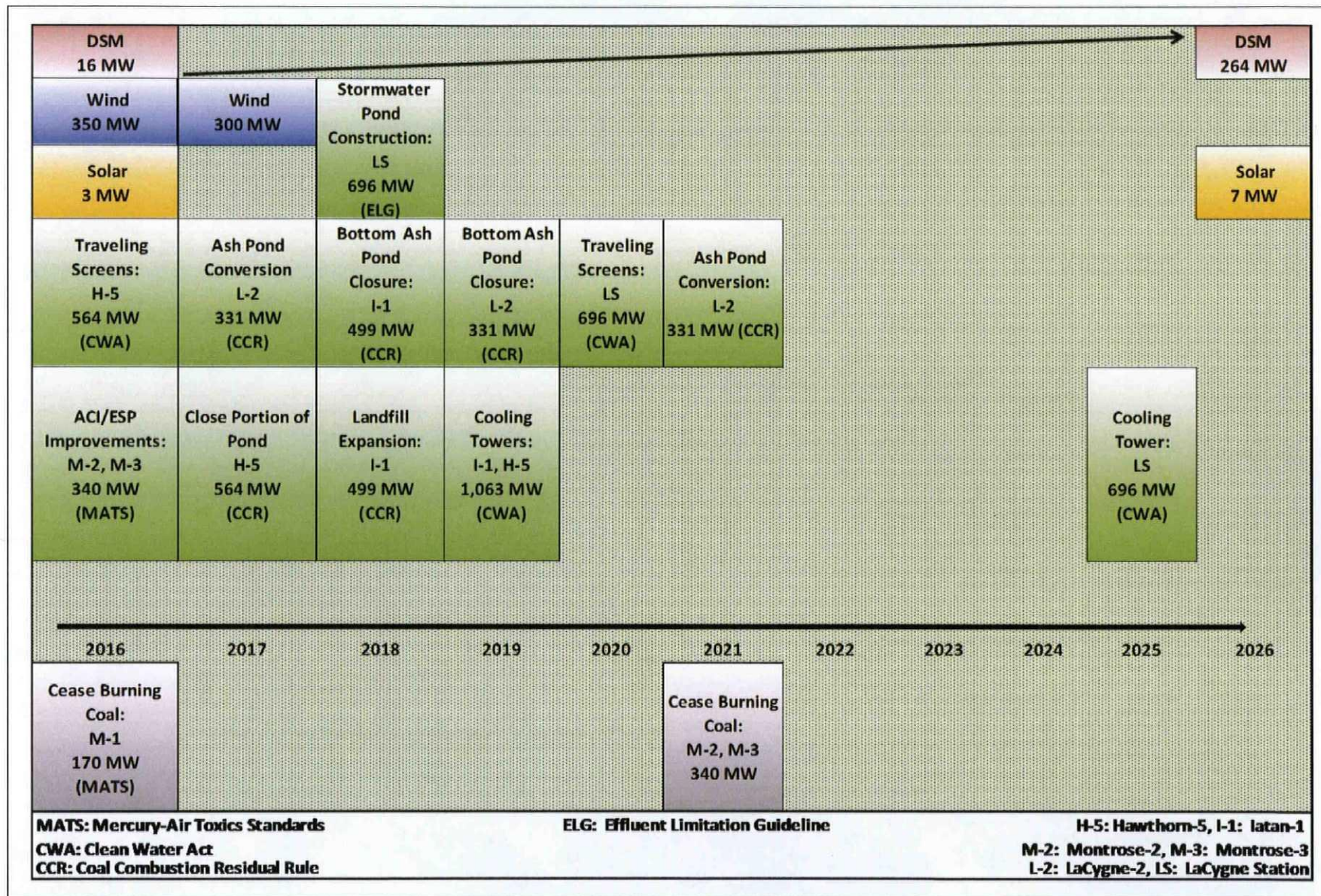
1.3 2016 ANNUAL UPDATE PREFERRED PLAN

The 2016 Annual Update analysis resulted in no material changes to the Preferred Plan. The Preferred Plan is comprised of the following components for years 2016 – 2026 shown in Figure 4 below. Based in part upon current Missouri RPS rule requirements, the Preferred Plan includes 10 MW of solar additions and 650 MW of wind additions over the twenty-year planning period. It should be noted that the solar resource addition in 2016 is expected to consist of ownership of 3 MW of Commercial and Industrial rooftop installations. A 350 MW wind addition was recently placed in service. An additional 300 MW of wind is planned for 2017. DSM resources consist of a suite of eight residential and eight commercial programs three of which are demand response programs, two are educational programs, and eleven are energy efficiency programs.

The Preferred Plan reflects Montrose Unit 1 ceasing to burn coal by April, 2016 and Montrose Units 2 and 3 ceasing to burn coal by 2022. The environmental drivers that contributed to the discontinuing of burning of coal includes Mercury and Air Toxics Standards Rule, Ozone National Ambient Air Quality Standards (NAAQS), PM NAAQS, Clean Water Act Section 316(a) and (b), Effluent Guidelines, Coal Combustion Residuals Rule, and Clean Power Plan.

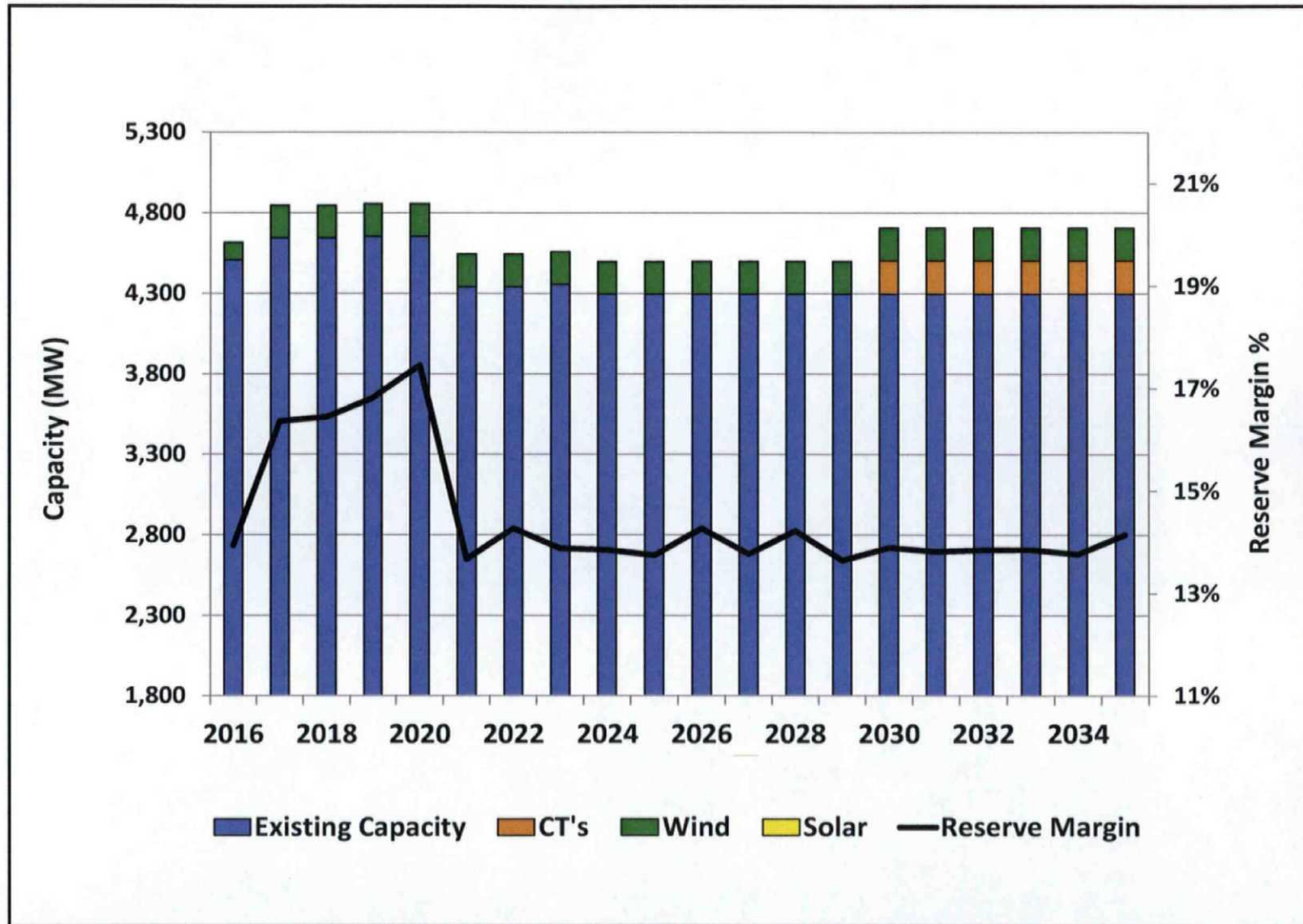
In the timeframe of 2027 through 2035, there is a 207 MW combustion turbine addition anticipated in year 2030.

Figure 4: 2016 Annual Update Preferred Plan - Years 2016 through 2026



Existing and new capacity additions for the 2016 Annual Update Preferred Plan are shown in Table 3 below:

Table 3: 2016 Annual Update Preferred Plan Capacity Additions



The 2016 Annual Update Preferred Plan for the 20-year planning period is shown in Table 4 below:

Table 4: 2016 Annual Update Preferred Plan

Year	CT's (MW)	Wind (MW)	Solar (MW)	DSM (MW)	Retire (MW)	Total Capacity
2016	0	350	3	16	170	4356
2017	0	300		43		4444
2018	0			79		4444
2019	0			105		4454
2020	0			142		4454
2021	0			171	340	4291
2022	0			193		4316
2023	0			214		4306
2024	0			231		4320
2025	0			249		4320
2026	0		7	264		4346
2027	0			273		4346
2028	0			281		4396
2029	0			289		4396
2030	207			298		4428
2031	0			301		4453
2032	0			305		4478
2033	0			309		4503
2034	0			313		4528
2035	0			315		4578

Based upon current RPS rule requirements, the Preferred Plan includes 10 MW of solar additions. The 350 MW wind resource addition in 2016 is comprised of two wind facilities that are in commercial operation. An additional 300 MW of wind is planned for 2017. The Preferred Plan reflects Montrose Unit 1 ceasing to burn coal by 2017 and Montrose Units 2 and 3 ceasing to burn coal by 2022. A 207 MW combustion turbine (CT) resource addition is currently anticipated in 2030.

SECTION 2: LOAD ANALYSIS AND LOAD FORECASTING UPDATE

2.1 CHANGES FROM THE 2015 TRIENNIAL IRP

Several inputs to the load forecasting models were updated for this filing.

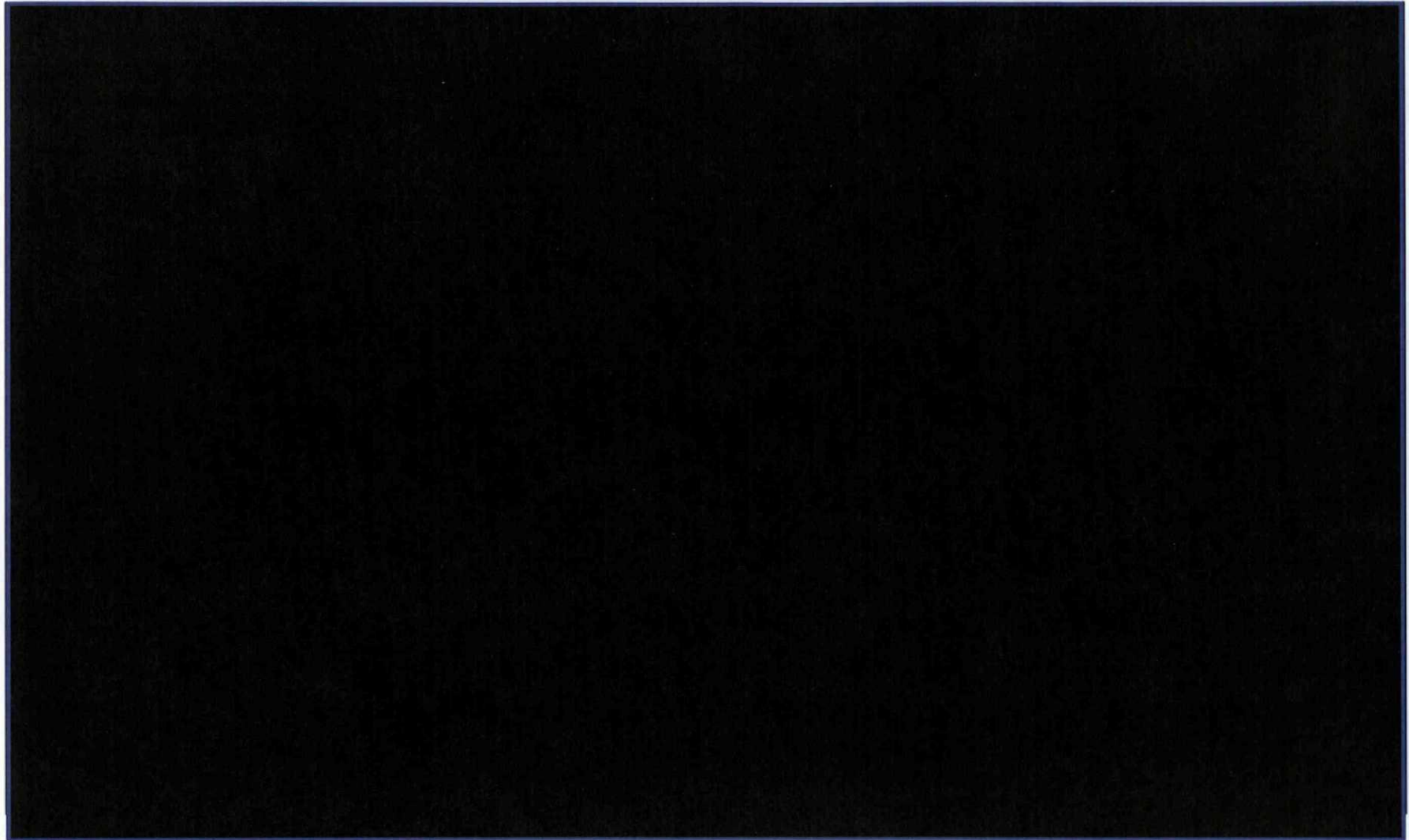
- The economic forecasts for the KC metro area were updated. In the 2015 Triennial filing, KCP&L used forecasts produced by Moody's Analytics in July 2014. In this 2016 Annual Update filing, the forecasts were produced in June 2015.
- Billing statistics were updated through June 2015 for this filing. In the 2015 Triennial filing, the statistics were current through July 2014. These statistics include the number of customers, kWh sales and dollars per kWh.
- Forecasts of saturations and appliance use are updated annually by the US Department of Energy (DOE). In this filing, KCP&L used the results from DOE's 2015 models. In the 2015 Triennial filing, KCP&L used results from the 2014 models.
- The industrial models structure in the 2015 Triennial has change to an industrial based Statistically Adjusted Employment-Intensity Model in the 2016 Annual Update. This structure utilizes a framework that incorporates sector employment, price and sector intensities (MWh/Employee). This results in a sector weighted employment index used within the regression model.
- The methodology used to calculate peak load in the 2015 Triennial has changed from a bottom up approach to standalone jurisdictional peak models which incorporates the energy end use forecast by class in to the model. The models are also designed to weather normalize peak loads. This approach was adopted in the 2016 Annual Update.
- Historical weather normalized kWh sales are no longer derived within the forecasting models as in the 2015 Triennial filing. Historical weather normalized results for billed

kWh sales, calendar kWh sales and unbilled kWh sales are now calculated in a separate weather normalization model for the 2016 Annual update.

- Class models in the 2016 Annual update are the same as the 2015 Triennial filing: residential, small commercial (small general service commercial), big commercial (medium general service commercial, large general service commercial, and large power commercial), and industrial (small general service industrial, medium general service industrial, large general service industrial, and large power industrial).
- The Company also re-evaluated the output elasticities used in the commercial and industrial models and the elasticity used in the residential model. Adjustments made were to increase the R^2 .

The mid-case load forecast is shown in Table 5 below.

Table 5: KCP&L Mid-Case Annual NSI and Peak Forecast ** Highly Confidential **



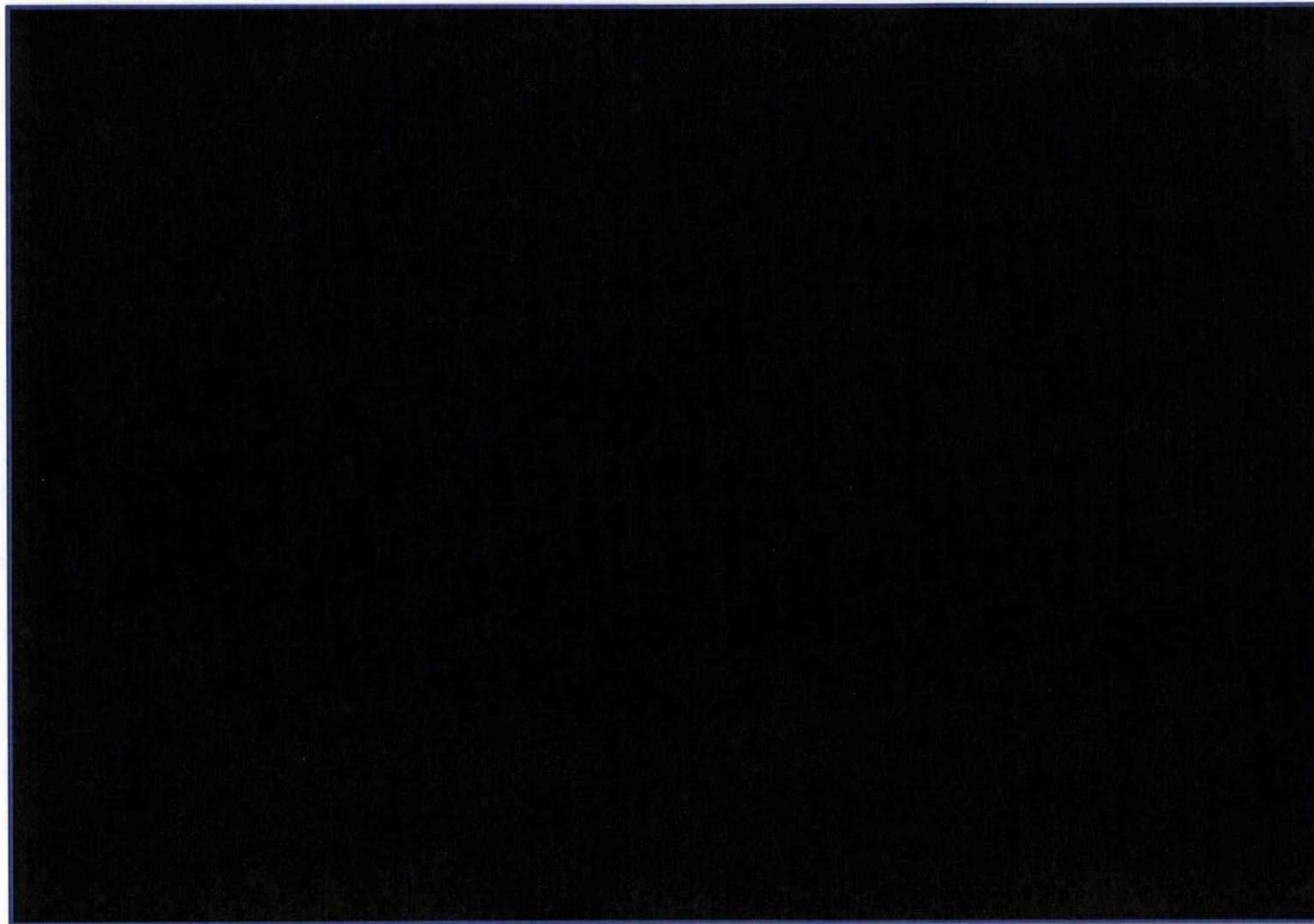
Note: 2002-2015 Gross Peak data has been weather-normalized

SECTION 3: SUPPLY-SIDE RESOURCE ANALYSIS UPDATE

3.1 FUEL AND EMISSION FORECAST CHANGES FROM THE 2015 TRIENNIAL IRP

The forecasts for coal, natural gas, fuel oil, SO₂, NO_x, NO_x Seasonal, and CO₂ have been updated for the 2016 Annual Update filing. Note that the methodology used in determining the forecast range has not changed from the 2015 Triennial IRP. The data is presented in graphical and tabular form on the next pages.

Table 6: Coal Forecasts - 2015 IRP Vs. 2016 Annual Update Graphic ** Highly Confidential **



HC

Table 7: Coal Forecasts - 2015 IRP Vs. 2016 Annual Update ** Highly Confidential **

Coal Forecast	
2015 IRP: Mid	
2015 IRP: High	
2015 IRP: Low	
Coal Forecast	
2015 IRP: Mid	
2015 IRP: High	
2015 IRP: Low	
Coal Forecast	
2016 IRP: Mid	
2016 IRP: High	
2016 IRP: Low	
Coal Forecast	
2016 IRP: Mid	
2016 IRP: High	
2016 IRP: Low	

Table 8: Natural Gas Forecasts - 2015 IRP Vs. 2016 Annual Update Graphic ** Highly Confidential **

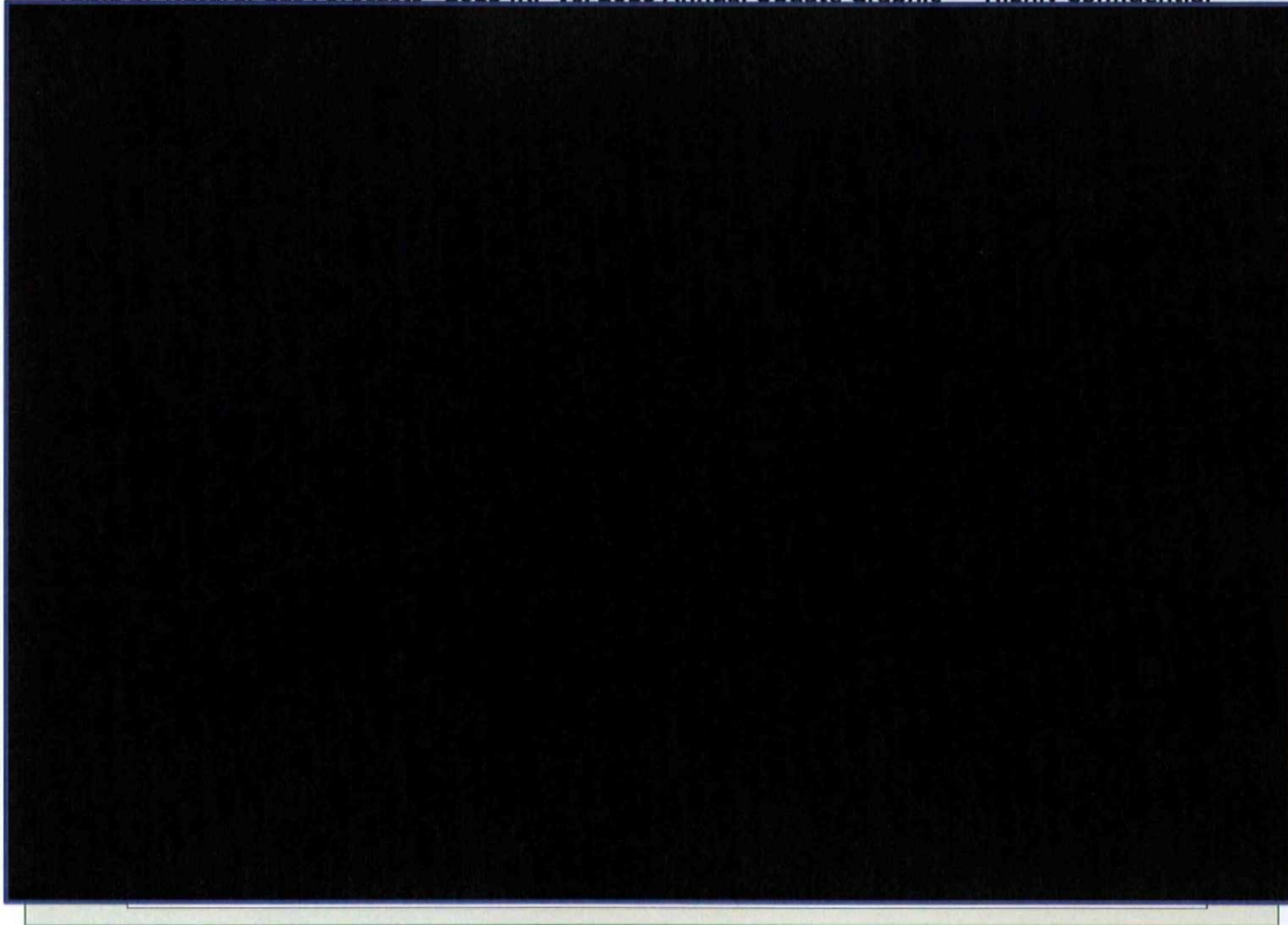


Table 9: Natural Gas Forecasts - 2015 IRP Vs. 2016 Annual Update ** Highly Confidential **

Natural Gas Forecast	
2015 IRP: Mid	
2015 IRP: High	
2015 IRP: Low	
Natural Gas Forecast	
2015 IRP: Mid	
2015 IRP: High	
2015 IRP: Low	
Natural Gas Forecast	
2016 IRP: Mid	
2016 IRP: High	
2016 IRP: Low	
Natural Gas Forecast	
2016 IRP: Mid	
2016 IRP: High	
2016 IRP: Low	

Table 10: Fuel Oil Forecasts - 2015 IRP Vs. 2016 Annual Update Graphic ** Highly Confidential **

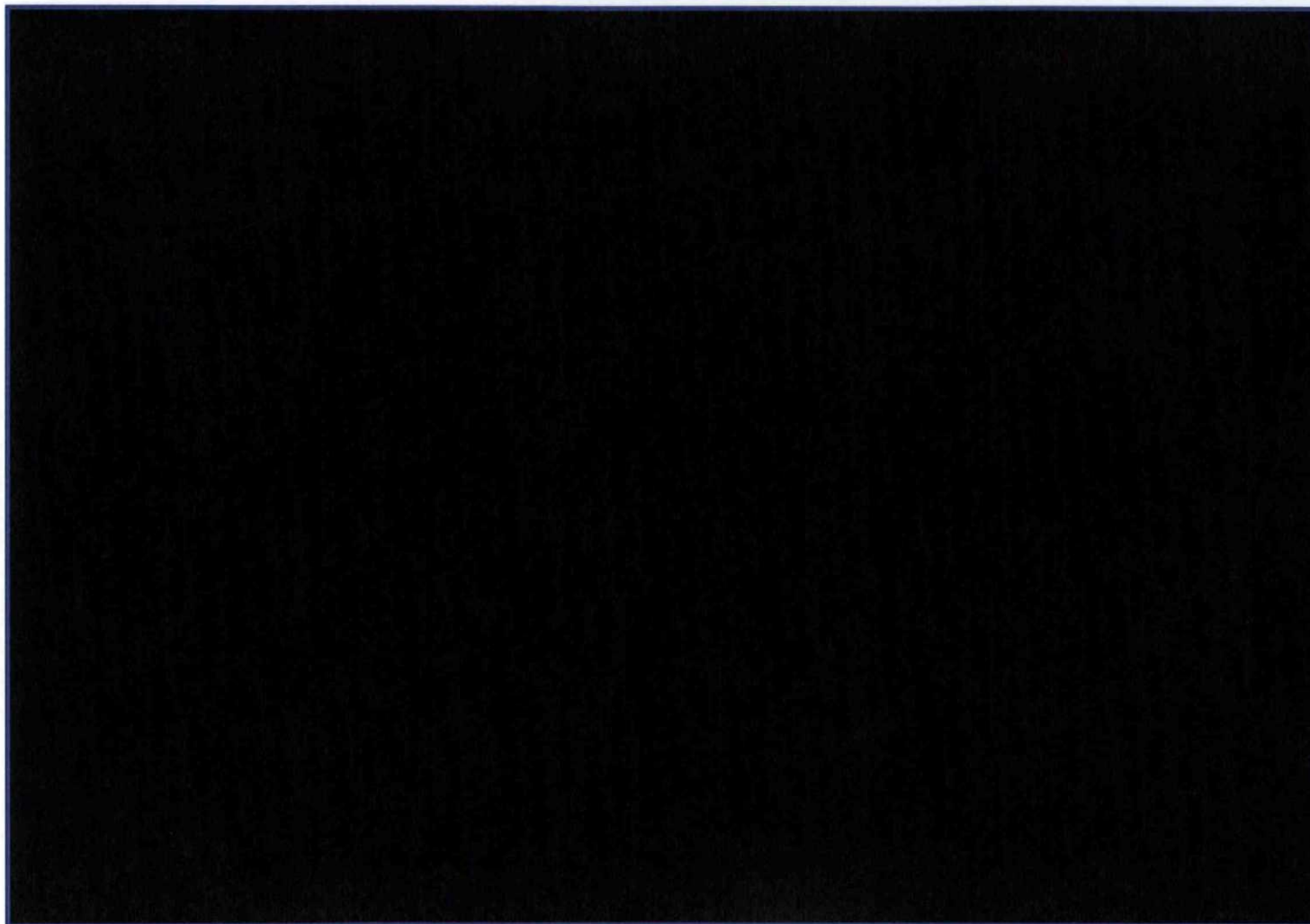


Table 11: Fuel Oil Forecasts - 2015 IRP Vs. 2016 Annual Update ** Highly Confidential **

Fuel Oil Forecast	
2015 IRP: Mid	
2015 IRP: High	
2015 IRP: Low	
Fuel Oil Forecast	
2015 IRP: Mid	
2015 IRP: High	
2015 IRP: Low	
Fuel Oil Forecast	
2016 IRP: Mid	
2016 IRP: High	
2016 IRP: Low	
Fuel Oil Forecast	
2016 IRP: Mid	
2016 IRP: High	
2016 IRP: Low	

HC

Table 12: SO₂ Forecasts - 2015 IRP Vs. 2016 Annual Update Graphic ** Highly Confidential **

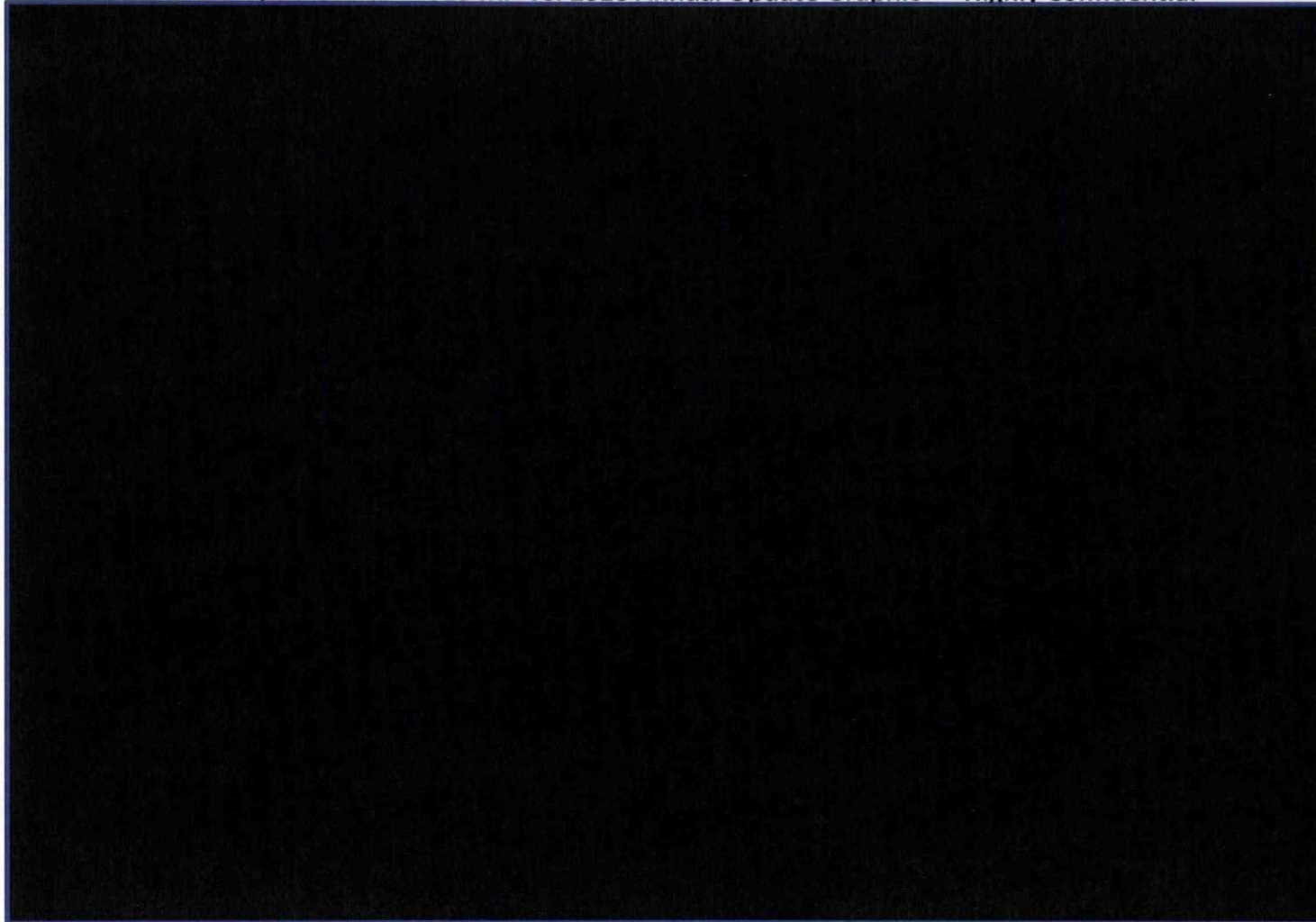


Table 13: SO₂ Forecasts - 2015 IRP Vs. 2016 Annual Update ** Highly Confidential **

SO2 Group 1 Forecast	
2015 IRP: Mid	
2015 IRP: High	
2015 IRP: Low	
SO2 Group 1 Forecast	
2015 IRP: Mid	
2015 IRP: High	
2015 IRP: Low	
SO2 Group 1 Forecast	
2016 IRP: Mid	
2016 IRP: High	
2016 IRP: Low	
SO2 Group 1 Forecast	
2016 IRP: Mid	
2016 IRP: High	
2016 IRP: Low	

HC

Table 14: NO. Annual Forecasts - 2015 IRP Vs. 2016 Annual Update Graphic ** Highly Confidential **

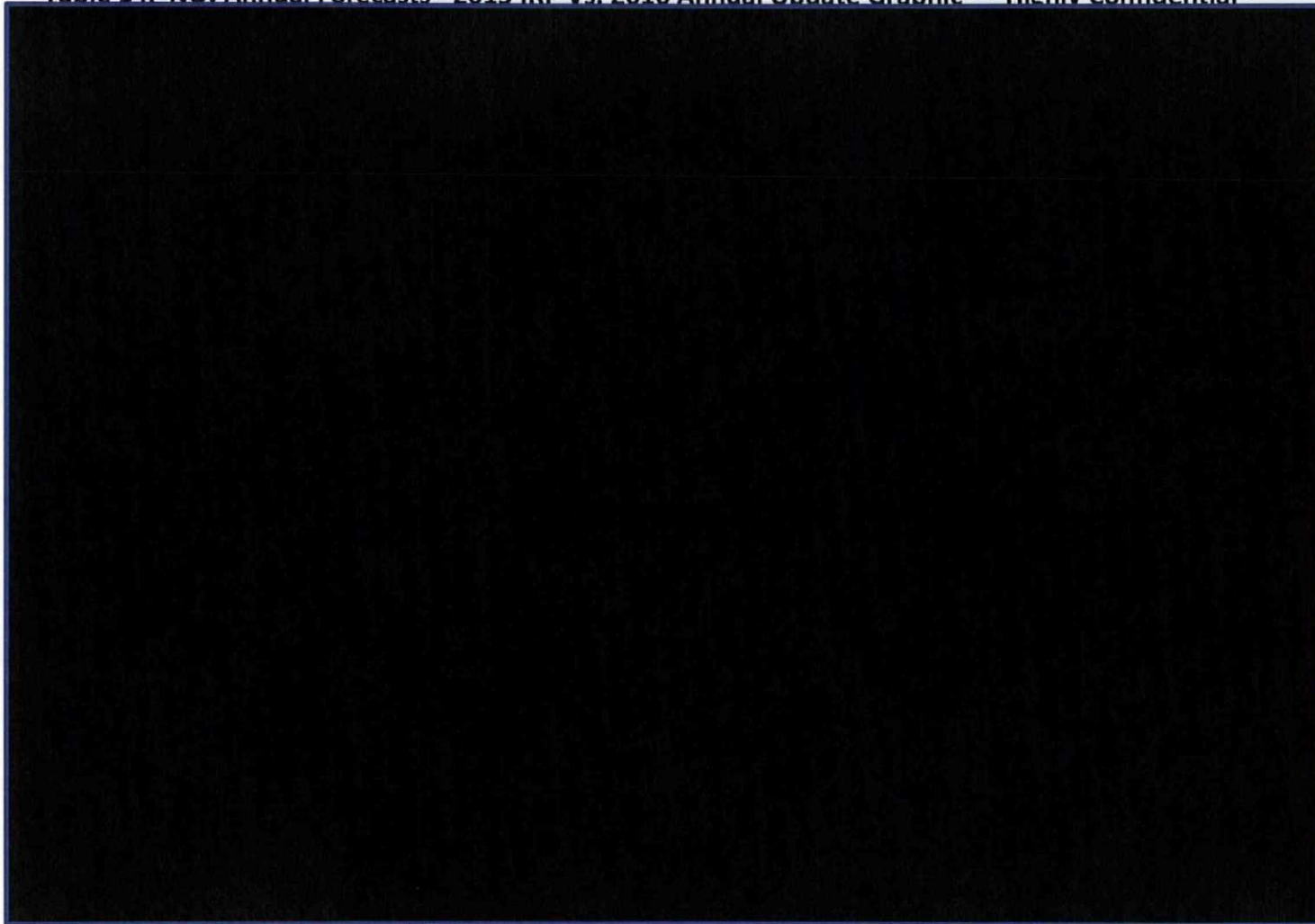


Table 15: NO_x Annual Forecasts - 2015 IRP Vs. 2016 Annual Update ** Highly Confidential **

NO _x Annual Forecast	
2015 IRP: Mid	
2015 IRP: High	
2015 IRP: Low	
NO _x Annual Forecast	
2015 IRP: Mid	
2015 IRP: High	
2015 IRP: Low	
NO _x Annual Forecast	
2016 IRP: Mid	
2016 IRP: High	
2016 IRP: Low	
NO _x Annual Forecast	
2016 IRP: Mid	
2016 IRP: High	
2016 IRP: Low	

Table 16: NOx Seasonal Forecasts - 2015 IRP Vs. 2016 Annual Update Graphic ** Highly Confidential **

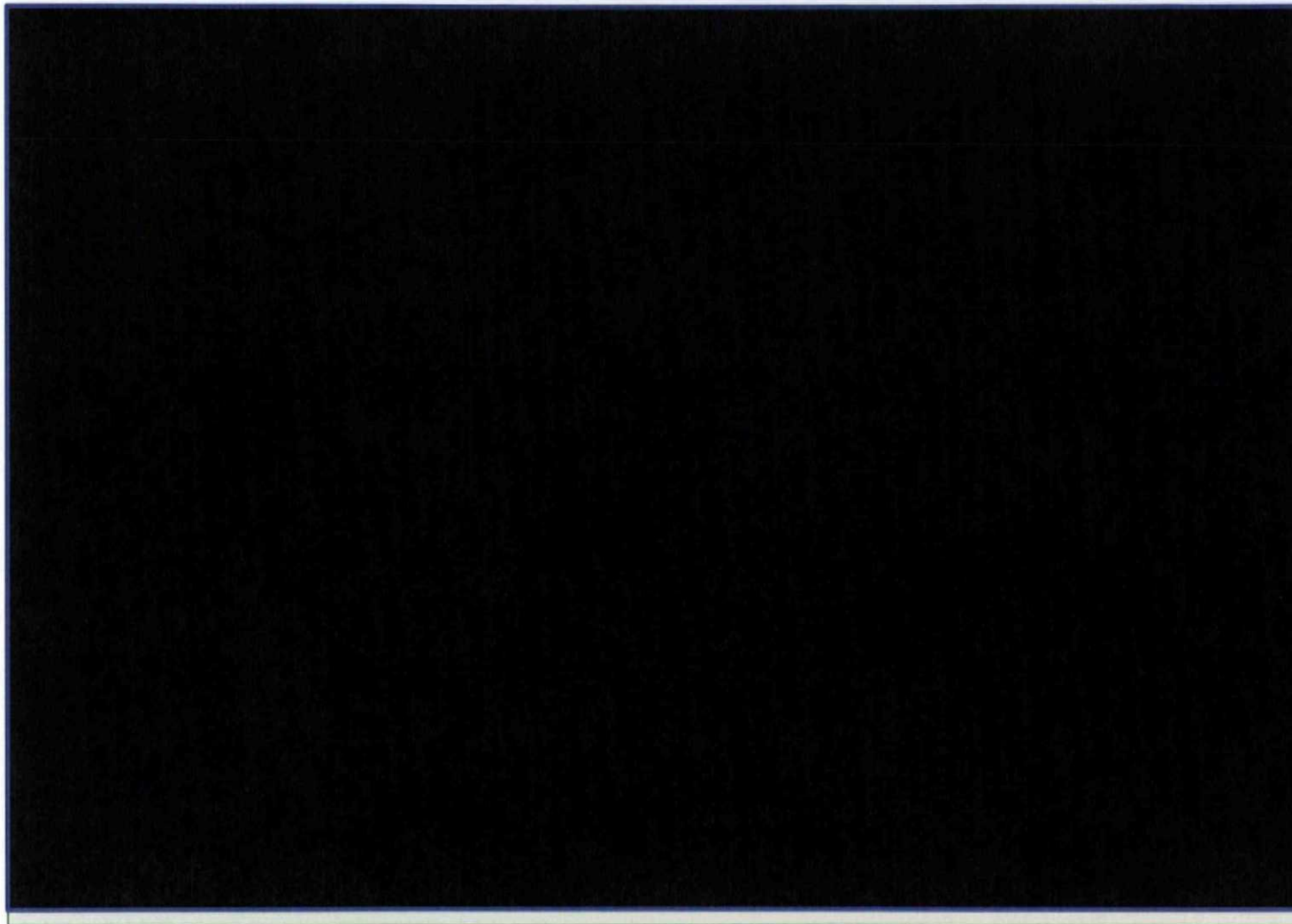


Table 17: NO_x Seasonal Forecasts - 2015 IRP Vs. 2016 Annual Update ** Highly Confidential **

NO _x Seasonal Forecast				
2015 IRP: Mid				
2015 IRP: High				
2015 IRP: Low				
NO _x Seasonal Forecast				
2015 IRP: Mid				
2015 IRP: High				
2015 IRP: Low				
NO _x Seasonal Forecast				
2016 IRP: Mid				
2016 IRP: High				
2016 IRP: Low				
NO _x Seasonal Forecast				
2016 IRP: Mid				
2016 IRP: High				
2016 IRP: Low				

Table 18: CO₂ Forecasts - 2015 IRP Vs. 2016 Annual Update Graphic ** Highly Confidential **

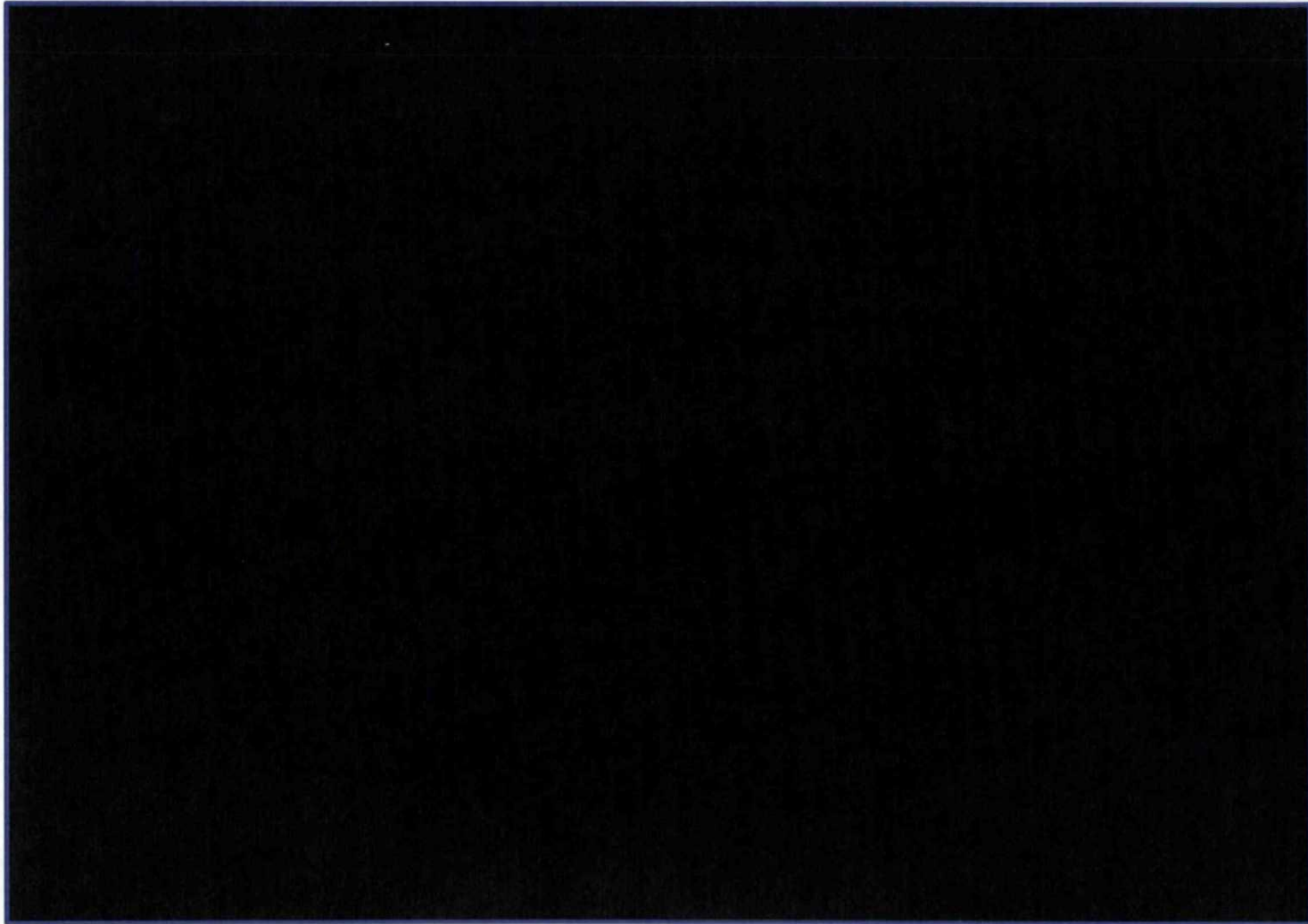


Table 19: CO₂ Forecast - 2016 Annual Update ** Highly Confidential **

CO ₂ Forecast	
2015 IRP: Yes	
2015 IRP: No	
CO ₂ Forecast	
2015 IRP: Yes	
2015 IRP: No	
CO ₂ Forecast	
2016 IRP: Yes	
2016 IRP: No	
CO ₂ Forecast	
2016 IRP: Yes	
2016 IRP: No	

The following two tables provide the sources of the fuel and emission forecasts reflected in the above charts.

Table 20: Fuel Forecast Sources

Forecast Source	Coal	Natural Gas	Fuel Oil
IHS	x	x	x
EIA	x	x	x
PIRA		x	x
Energy Ventures Analysis	x	x	x
Wood Mac			
JD Energy	x		
Synapse			
SNL Financial			
Hanou Energy Consulting	x		

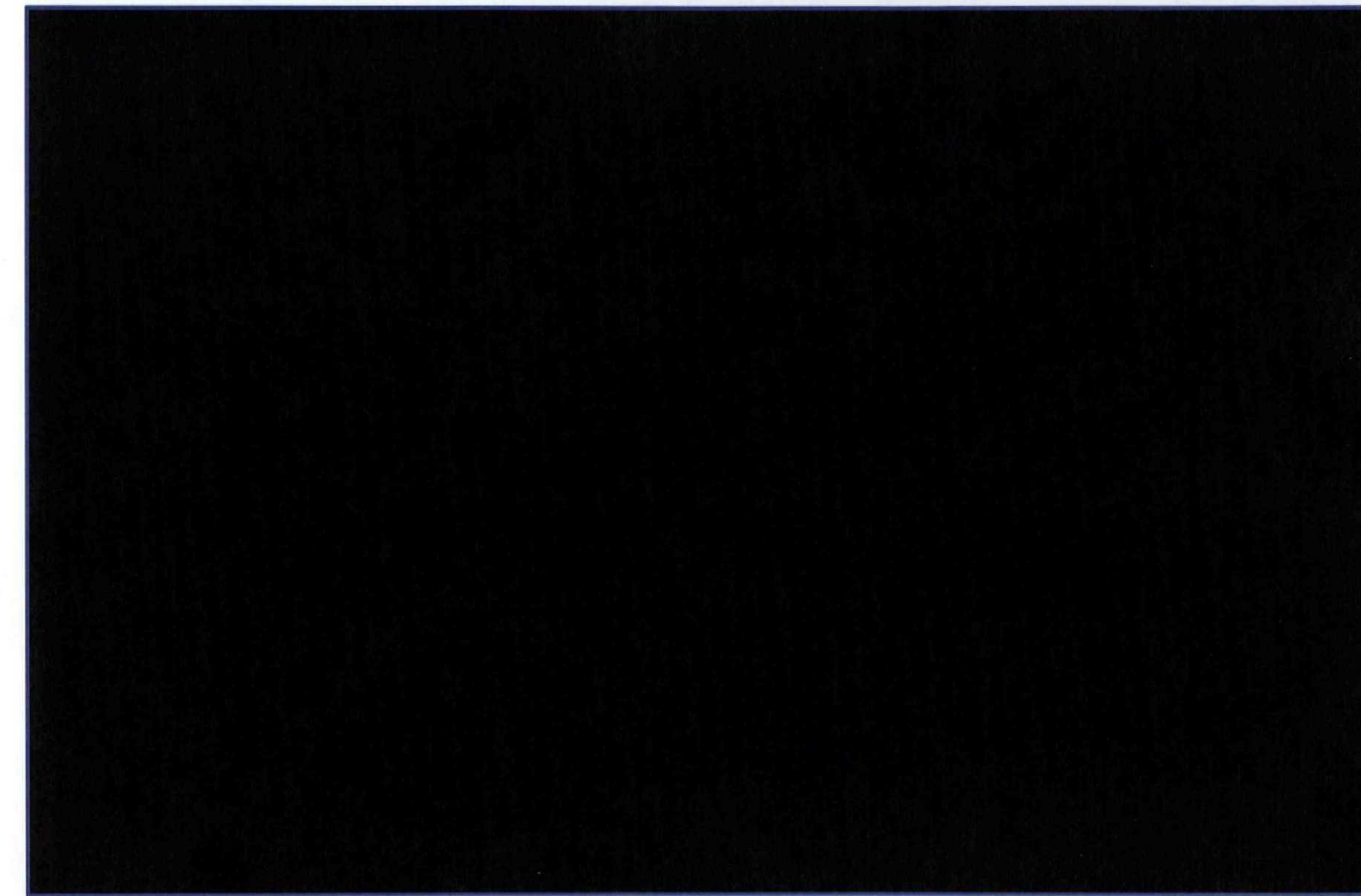
Table 21: Emission Forecast Sources

Forecast Source	SO ₂	NO _x	CO ₂
IHS	x	x	x
EIA			
PIRA			
Energy Ventures Analysis	x	x	x
Wood Mac			
JD Energy	x	x	x
Synapse			x
SNL Financial			
Hanou Energy Consulting			

3.1.1 SUPPLY-SIDE TECHNOLOGY CANDIDATE RESOURCE OPTIONS

Supply-side technology candidates reviewed for potential integrated resource analysis in the 2016 Annual Update are shown in Table 22 below. The cost and operating data sources for these technologies were obtained from Electric Power Research Institute Technical Assessment Guide (EPRI-TAG®), the Energy Information Administration, and recently obtained market intelligence. These supply-side options include natural gas, coal, nuclear and renewable alternatives. The following table compares the all-in cost of the supply side options on a 2016 dollar per MWh basis which includes capital cost, fixed O&M, variable O&M, fuel, and emissions.

Table 22: Supply-Side Technology Candidates ** Highly Confidential **



3.1.2 LIFE ASSESSMENT & MANAGEMENT PROGRAM

The 2016 Annual Update included an update of the Life Assessment and Management Program (LAMP) data for the KCP&L coal-fired generating units.

SECTION 4: TRANSMISSION AND DISTRIBUTION UPDATE

4.1 CHANGES FROM THE 2015 TRIENNIAL IRP

4.2 RTO EXPANSION PLANNING

KCP&L assessment of RTO expansion plans is an ongoing process that occurs throughout the various regional planning processes conducted by SPP. These assessments include review and approval of plan scope documents, review and approval of plan input assumptions, review of plan study analysis and results with feedback from KCP&L staff, and review and approval of final plan reports. All transmission projects for the KCP&L service territory are included in SPP's annual Transmission Expansion Plan Report and Project List. By meeting the performance standards established for transmission planning the assessment ensures that adequate transmission is available in the near term and long term to meet the firm load and transmission service requirements included in the SPP Regional Plan for KCP&L. These documents are attached as Appendix A 2016 SPP Transmission Expansion Plan Report.pdf and Appendix A1 2016 SPP Transmission Expansion Plan Project List.xls.

4.1 ADVANCED DISTRIBUTION TECHNOLOGIES DISCUSSION

Having completed the SmartGrid Demonstration project in 2015, the company is has implemented and is planning more targeted Advanced Distribution Technologies (ADT).

Main items on the near-term ADT plan include:

- Implementing SCADA-like monitoring and control into the Company's recently implemented Operations Management System (OMS).
- Fault Isolation and System Restoration (FISR) pilots for proof of concept.
- Fault Location functionality with the new OMS system.
- Pilots and proof of concept for Communicating Faulted Circuit Indicators (CFCI).
- Replace "2G" vintage distribution end-device cellular communications equipment.
- Pilot new "4G" distribution end-point communications equipment.
- Develop a multi-year Distribution Automation Roadmap.

4.1.1 SCADA-LIKE MONITORING AND CONTROL VIA OMS

The company has over ten years experience using cellular communications for monitoring, operating, controlling and maintaining Intelligent End Devices (IEDs) on the distribution system. Up through mid-2015, this technology has been limited to internet-based web applications. This required company distribution dispatchers to utilize a separate system to operate this communicating equipment. This added complexity to the dispatcher role and there was a desire to consolidate as much functionality as possible into the new OMS system. Phase 2 of the Company's OMS implementation project included integration of the internet-based system directly into the OMS. This project was placed in service in 2015.

Distribution dispatchers now monitor and operate the communicating IEDs directly from the OMS system without the need to swap between systems with very different interfaces. The internet-based web applications still underlie the OMS integration, providing an emergency back-up system to operate this equipment in the event of issues with the OMS system.

Engineering and other non-dispatch organizations mainly utilize the web applications to manage and maintain the fleet of communicating IEDs in the field.

4.1.2 FAULT ISOLATION AND SERVICE RESTORATION (FISR)

The company plans to pilot two schemes for FISR: one using peer-to-peer communications between smart switching devices and a second one with a loop scheme (without peer-to-peer communications).

4.1.2.1 FISR Using Peer-to-Peer (PTP) Communications

The company is planning two initial pilots (Phase 1) for FISR with PTP communications for proof of concept. One is targeted for the Lee's Summit area within GMO and the second is in the Roeland Park area within KCPL-KS. A second phase of pilots is planned on the heels of the first two, but locations have not been selected as this point.

The switching devices chosen for this pilot are S&C Electric's Intellirupter Pulseclosers. PTP is a term meaning that there is specific communications between the switches on the feeder so these intelligent devices share information before performing any automated switching operations. The PTP communications will be provided by S&C Electric's Speednet radio system. The intelligent switching and restoration in this scheme is managed by S&C Electric's Intelliteam distributed control system embedded into the switching device controls.

In essence, switches will be placed at middle points on adjacent circuits as well as the normally open switch points between these circuits. This is similar to historical system design where field personnel are dispatched to patrol the circuit and manually operate the switches

to isolate a faulted section as well as using the tie switch to restore circuit sections not directly affected by the fault.

In the FISR pilot, the Intelliteam system and the PTP communications will automatically identify a faulted circuit section (without requiring a human patrol), perform switching to isolate the faulted section and perform switching to restore sections not affected by the fault. The Company anticipates this will all occur in less than five (5) minutes and involves little to no human intervention.

After the automated switching is completed, the Intelliteam system will communicate the results via cellular communications to Company operators informing them of the faulted section and the restoration switching already performed. Dispatchers will then have information to dispatch crews directly to the faulted section to identify the physical problem and make repairs. Field crews will not need to patrol non-faulted sections, reducing patrol times.

After repairs are completed, dispatchers can remotely switch the system back to its normal configuration without requiring a field crew to perform the switching.

If the Company finds the initial two pilots (Phase 1) successful over an estimated nine month period, the next set of circuits will be piloted (Phase 2). After this second phase of pilot circuits is observed, the Company will complete a study of the performance and make recommendations whether to proceed with this scheme as a standard solution and establish criteria for its application.

4.1.2.2 FISR Using Loop Scheme

The company is planning two initial pilots (Phase 1) for FISR using a Loop Scheme for proof of concept. Locations have not been selected as yet, but the Company will plan at least one for GMO as well as KCPL-MO.

The switching devices chosen for this pilot are G&W Electric's Viper Recloser using a Sweitzer Engineering Labs control. A Loop Scheme is based on conditions measured at each intelligent switch as well as coordinated timing between the switches. PTP is not required for Loop Scheme. Each individual switch will communicate via cellular communications back to the Company's OMS. This is also a distributed intelligence system since switching decisions are made locally by the switches, not by a centralized control system (such as a Distribution Management System).

In essence, switches will be placed at middle points on adjacent circuits as well as the normally open switch points between these circuits. This is similar to historical system design where field personnel are dispatched to patrol the circuit and manually operate the switches to isolate a faulted section as well as using the tie switch to restore circuit sections not directly affected by the fault.

In the Loop Scheme FISR pilot, each switch will sense fault current and voltage conditions, while allowing sufficient time for upstream equipment to complete an operational sequence. Using this local data/sensing, switches decide to open or close in order to automatically isolate a faulted circuit section (without requiring a human patrol), and perform switching to restore sections not affected by the fault. The Company anticipates this will all occur in less than ten (10) minutes (and possibly less than five minutes) and involves little or no human intervention.

After the automated switching is completed, the each switch will communicate the results via cellular communications to Company OMS informing dispatchers of the faulted section and the restoration switching already performed. Dispatchers will then have information to dispatch crews directly to the faulted section to identify the physical problem and make repairs. Field crews will not need to patrol non-faulted sections, reducing patrol times.

After repairs are completed, dispatchers can remotely switch the system back to its normal configuration without requiring a field crew to perform the switching.

If the Company finds the initial pilots successful, another set of circuits will be piloted (Phase 2). After this second phase of pilot circuits is observed, the Company will complete a study of the performance and make recommendations whether to proceed with this scheme as a standard solution and establish criteria for its application.

4.1.3 OMS FAULT LOCATION FUNCTIONALITY

The supplier of the Company's new OMS system claims it has an advanced application for predicting Fault Location. The concept is fairly simple in nature. The OMS will use data from communicating field equipment to predict sections of a feeder where a fault may be physically located. The more fault sensors (such as communicating faulted circuit indicators, or communicating switches) on the circuit, the more accurately the OMS will be able to predict the fault location.

Benefits anticipated from Fault Location prediction are mainly reduced patrol time for field crews. Dispatchers can direct field crews to focus on predicted faulted sections vs. patrolling an entire circuit to identify a fault.

If this proves to be highly accurate, communicating switches could be added to circuits to enable dispatchers to isolate the faulted section before a field patrol is completed as well as restoring as many customers as possible via remote switching. This would in essence be a human-supervised form of FISR.

No specific timeline has been established to pilot and study this function.

4.1.4 COMMUNICATING FAULTED CIRCUIT INDICATOR (CFCI) PILOTS

The company is working with suppliers to pilot current technologies for CFCIs. The usefulness of CFCIs to Company dispatchers has escalated due to the new functionality discussed previously in the "SCADA-like Monitoring and Control in OMS" section.

Dispatchers will now have the ability to receive alarms in OMS and to “see” the CFCI indication on the OMS’s One-line diagram while troubleshooting an outage within OMS. This will greatly enhance the “visability” and usefulness of CFCIs to dispatchers, vs. having to go to a web application as in the past.

CFCIs are also anticipated to be a cost-effective way to enhance the OMS Fault Location functionality discussed previously. Although CFCIs cannot perform switching operations, they can enhance the effectiveness of dispatching and manual switching.

Specific pilot locations have not been selected yet, but will include both GMO and KCPL-MO locations.

4.1.5 2G CELLULAR COMMUNICATIONS REPLACEMENT

The company has cellular-based communications to field devices that utilize AT&T 2G generation communications. AT&T plans to retire its 2G network in 2016, so the Company has a plan to replace 2G endpoints with 3G cellular or private cellular. This replacement is ongoing and planned to complete in 2016.

4.1.6 4G CELLULAR COMMUNICATIONS PILOT

The Company’s cellular communications provider recently introduced a series of endpoint devices using “4G” cellular communications. The Company has begun bench testing this equipment and plans to pilot this equipment in the field in 2016.

The pilot will also include integration into the OMS platform.

Pilot locations have not been selected yet, but will include both GMO and KCPL-MO locations.

4.1.7 DEVELOP A MULTIYEAR DISTRIBUTION AUTOMATION ROADMAP

The Company plans to develop a framework for a multiyear Distribution Automation Roadmap and prepare a first iteration of the Roadmap in 2016. The roadmap will include aspects across the entire company, including GMO, KCPL-MO and KCPL-KS.

SECTION 5: DEMAND-SIDE RESOURCE ANALYSIS UPDATE

5.1 MEEIA CYCLE 2 2016-2018 PROGRAMS

Since the 2015 Triennial IRP filing KCP&L has filed an application to implement its second MEEIA plan (MEEIA cycle 2) for KCP&L. After extensive review with numerous parties, the Company made numerous modifications to the plan to address many of the suggestions and recommendations made by the parties. As a result, the Company was able to reach a non-unanimous stipulation and agreement, and on March 2, 2016 the Commission issued an Order approving the stipulation and agreement.

Table 23 below shows the budgets and annual energy and demand savings targets for each MEEIA program for the 36-month cycle period. The 36-month cycle is expected to begin on April 1, 2016 and would conclude on March 31, 2019.

Table 23: KCP&L-MO - MEEIA 36 Month Plan Period**Highly Confidential**

Program	Budget	kWh	kW
Business Energy Efficiency Rebate - Standard		58,370,690	10,934
Business Energy Efficiency Rebate - Custom		44,361,460	12,128
Strategic Energy Management		9,027,253	2,021
Block Bidding		10,059,398	1,744
Small Business Direct Install		3,509,634	562
Business Programmable Thermostat		98,406	268
Demand Response Incentive		-	15,000
Online Business Energy Audit		-	-
Home Lighting Rebate		24,692,870	2,498
Home Appliance Recycling Rebate		6,330,270	1,057
Home Energy Report		13,861,941	2,866
Income-Eligible Home Energy Report		1,682,756	474
Whole House Efficiency		11,137,986	3,265
Income-Eligible Multi-Family		10,577,132	1,543
Income-Eligible Weatherization		-	-
Residential Programmable Thermostat		4,388,076	11,967
Online Home Energy Audit		-	-
Total Commercial		125,426,841	42,657
Total Residential		72,671,031	23,671
Research & Pilot		-	-
General Administration		-	-
Total		198,097,872	66,328

It should also be noted that KCP&L is exploring a behind-the-meter demand response (DR) system as a pilot project. The DR system, Innovari, enables two-way, real time communication and load control between the utility and customers.

HC

5.2 CHANGES FROM THE 2015 TRIENNIAL IRP

DSM Option C for the 2016 Annual Update updates the 2015 Triennial preferred plan to reflect the MEEIA cycle 2 plan. Thus, the annual incremental energy and demand impacts for the period through March 31, 2019 for Option C were updated. Note that there are no program impacts for the 3-month period from January 1, 2016 through March 31, 2016. Beginning April 1, 2019, the incremental annual energy and demand impacts are the same as the preferred plan adopted in the 2015 Triennial IRP. Table 24 shows the revised annual cumulative energy and demand impacts for Option C. The MAP and RAP scenarios are unchanged from the 2015 Triennial filing.

Table 24: KCP&L-MO Option C

Year	MW	MWh
2016	16.2	22,438.4
2017	35.3	84,466.1
2018	53.6	146,534.6
2019	69.4	221,895.4
2020	86.5	264,999.8
2021	101.5	297,266.8
2022	116.1	328,537.1
2023	130.7	359,851.2
2024	141.4	387,117.8
2025	152.8	422,639.3
2026	162.6	449,951.4
2027	167.5	477,229.6
2028	172.3	504,058.3
2029	177.1	530,494.2
2030	181.7	555,146.2
2031	183.6	565,466.3
2032	185.7	576,891.6
2033	187.8	588,229.3
2034	189.8	599,372.8

SECTION 6: INTEGRATED RESOURCE PLAN AND RISK ANALYSIS UPDATE

6.1 CHANGES FROM THE 2015 TRIENNIAL IRP

Since the filing of the 2015 Triennial IRP, changing conditions, or major drivers, were refreshed to reflect the latest information and forecasts available to determine if the Preferred Plan and associated Resource Acquisition Strategy identified in 2015 Triennial IRP continue to be the company's path forward. The information and forecasts that have been updated for the 2016 Annual Update included:

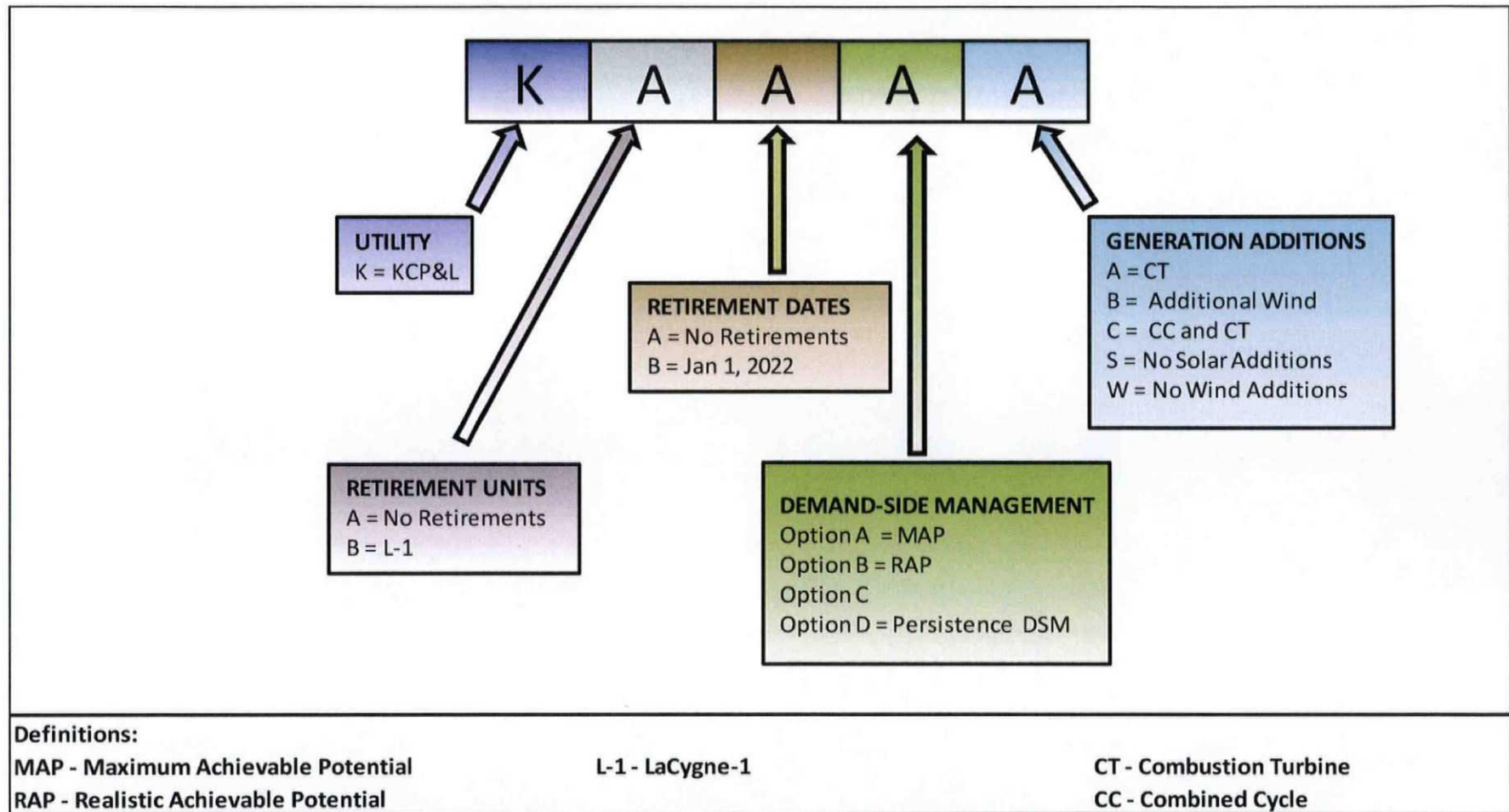
- Proposed and Potential Environmental Regulations
- Load Forecast Projections
- Demand-Side Management Program levels

6.2 ALTERNATIVE RESOURCE PLAN DEVELOPMENT

Alternative Resource Plans (ARPs) were developed using a combination of supply-side resources, demand-side resources, various resource addition timings, as well as generation retirement options and timings. Because some of the supply-side technology candidates were either considerably more costly in comparison to other technologies considered and/or permitting is currently expected to be extremely difficult to achieve, only a portion of the candidates were utilized in development of ARPs. The plan-naming convention utilized for the ARPs developed is shown in Table 25 and an overview of the ARPs is shown in Table 26 and Table 27 below:

below:

Table 25: Alternative Resource Plan Naming Convention



Note: All Alternative Resource Plans include Montrose Units 1-3 no longer burning coal by 2022.

Table 26: Alternative Resource Plan Overview

Plan Name	DSM Level	Facility	Year to Cease Burning Coal	Renewable Additions		Generation Addition (if needed)
KAAAA	Option A - MAP	Montrose-1 Montrose-2 Montrose-3	2016 2021 2021	Solar: 2016 - 3 MW 2026 - 7 MW	Wind: 2016 - 350 MW 2017 - 300 MW	n/n
KAABA	Option B - RAP	Montrose-1 Montrose-2 Montrose-3	2016 2021 2021	Solar: 2016 - 3 MW 2026 - 7 MW	Wind: 2016 - 350 MW 2017 - 300 MW	n/n
KBBBA	Option B - RAP	Montrose-1 Montrose-2 Montrose-3 LaCygne-1	2016 2021 2021 2022	Solar: 2016 - 3 MW 2026 - 7 MW	Wind: 2016 - 350 MW 2017 - 400 MW	207 MW CT in 2031
KAACA	Option C	Montrose-1 Montrose-2 Montrose-3	2016 2021 2021	Solar: 2016 - 3 MW 2026 - 7 MW	Wind: 2016 - 350 MW 2017 - 300 MW	207 MW CT in 2030
KAACB	Option C	Montrose-1 Montrose-2 Montrose-3	2016 2021 2021	Solar: 2016 - 3 MW 2026 - 7 MW	Wind: 2016 - 350 MW 2017 - 300 MW	200 MW Wind in 2020 207 MW CT in 2032

Table 27: Alternative Resource Plan Overview (continued)

Plan Name	DSM Level	Facility	Year to Cease Burning Coal	Renewable Additions		Generation Addition (if needed)
KBBCA	Option C	Montrose-1 Montrose-2 Montrose-3 LaCygne-1	2016 2021 2021 2022	Solar: 2016 - 3 MW 2026 - 7 MW	Wind: 2016 - 350 MW 2017 - 300 MW	414 MW CT in 2022 207 MW CT in 2031
KBBCC	Option C	Montrose-1 Montrose-2 Montrose-3 LaCygne-1	2016 2021 2021 2022	Solar: 2016 - 3 MW 2026 - 7 MW	Wind: 2016 - 350 MW 2017 - 300 MW	414 MW CC in 2022 207 MW CT in 2031
KAADA	Option D - Persistence	Montrose-1 Montrose-2 Montrose-3	2016 2021 2021	Solar: 2016 - 3 MW 2026 - 7 MW	Wind: 2016 - 350 MW 2017 - 300 MW	207 MW CT in 2021 207 MW CT in 2026 207 MW CT in 2032
KAACS	Option C	Montrose-1 Montrose-2 Montrose-3	2016 2021 2021	No Solar Adds	Wind: 2016 - 350 MW 2017 - 300 MW	207 MW CT in 2029
KAACW	Option C	Montrose-1 Montrose-2 Montrose-3	2016 2021 2021	Solar: 2016 - 3 MW 2026 - 7 MW	Wind: 2016 - 350 MW	207 MW CT in 2024 207 MW CT in 2034

Refer to Appendix B, Capacity Balance Spreadsheets HC, for tables which provide the KCP&L forecast of capacity balance over the twenty-year planning period for each of the Alternative Resource Plans outlined above. These capacity forecasts include renewable and generation additions. The capacity for wind facilities is based on SPP's criteria for calculating wind net capability using actual generation or wind data. Solar capacity is based on SPP criteria indicating that absent a net capability calculation, 10% of the facility's nameplate rating be used.

6.3 REVENUE REQUIREMENT

For each of the Alternative Resource Plans developed, integrated analysis yielded an expected value of the Net Present Value of Revenue Requirement shown in Table 28 below.

Table 28: Twenty-Year Net Present Value Revenue Requirement

Rank (L-H)	Plan	NPVRR (\$mm)	Delta
1	KAACS	\$ 21,463	\$ -
2	KAACA	\$ 21,464	\$ 1.6
3	KAACB	\$ 21,517	\$ 54.4
4	KAABA	\$ 21,533	\$ 70.5
5	KBBBA	\$ 21,547	\$ 83.8
6	KAADA	\$ 21,622	\$ 159.2
7	KAACW	\$ 21,675	\$ 212.3
8	KBBCA	\$ 21,741	\$ 278.4
9	KBBCC	\$ 21,843	\$ 379.8
10	KAAAA	\$ 23,053	\$ 1,590.1