Appendix 1
KCP&L- GMO
IRP
Stakeholder
Meeting
April 21,
2010

April 21, 2010
GMO IRP EE-2009-0237

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2009 IRP SUPPLEMENTAL FILING

KCP&L GREATER MISSOURI OPERATIONS COMPANY (GMO)

INTEGRATED RESOURCE PLAN

CASE NO. EE-2009-0237

** PUBLIC **

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SUPPLEMENTAL FILING

SECTION 1: INTRODUCTION

KCP&L Greater Missouri Operations Company (GMO) filed an Integrated Resource Plan (IRP) on August 5th, 2009. Subsequent to the filing, GMO met with Parties on five separate occasions to present overviews of the major sections of the filing and to provide further clarification when necessary. During the presentations, Parties requested additional information, and GMO agreed to provide corrected or missing information that was discovered after the filing was submitted. Information is provided by subject matter: supply-side resource analysis, demand-side resource analysis, integrated resource analysis, and risk analysis and strategy selection. No additional information was requested regarding the load analysis and forecasting submittal.

SECTION 2: SUPPLY-SIDE RESOURCE ANALYSIS

As noted at the Supply-Side meeting on October 1st, 2009 Table 18 in Volume 4: Supply-Side Resource Analysis was incorrect. The corrected table was provided in the October 1st PowerPoint © presentation and is shown below:

Table 1: Technology Ranking By Nominal Probable Environmental Cost No. 1-20 ** Highly Confidential **

RANK	Technology	Capacity Factor (%)	Nominal Probable Environmental
1	Municipal Solid Waste (MSW) Gasification	[redacted]	[redacted]
2	Municipal Solid Waste (MSW) Incinerator	[redacted]	[redacted]
3	Wind	[redacted]	[redacted]
4	Nuclear GE ESBWR	[redacted]	[redacted]
5	Nuclear GE ABWR	[redacted]	[redacted]
6	Nuclear Westinghouse AP1000	[redacted]	[redacted]
7	Nuclear US EPR	[redacted]	[redacted]
8	Nuclear ACR-1000	[redacted]	[redacted]
9	USCPC PRB WFGD	[redacted]	[redacted]
10	SCPC PRB SDA	[redacted]	[redacted]
11	CAES	[redacted]	[redacted]
12	SCPC ILL #6 WFGD	[redacted]	[redacted]
13	Landfill Gas	[redacted]	[redacted]
14	USCPC PRB WFGD CO2 Cap	[redacted]	[redacted]
15	Fluidized Bed Combustion	[redacted]	[redacted]
16	NaS Batteries	[redacted]	[redacted]
17	SCPC ILL #6 WFGD CO2 CAP	[redacted]	[redacted]
18	IGCC ILL #6 Cop	[redacted]	[redacted]
19	Combined Cycle Full Owner Offer	[redacted]	[redacted]
20	Combined Cycle Partial Owner Offer	[redacted]	[redacted]

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SECTION 3: DEMAND-SIDE RESOURCE ANALYSIS

3.1 IDENTIFICATION OF END-USE MEASURES

Rule 22.050 (1) (D) Renewable energy sources and energy technologies that substitute for electricity at the point of use.

Referred to in the August 5th, 2009 IRP submittal was a cost study of small-scale renewable technologies. The results of the study produced by The Energy Savings Store entitled "A Renewable Energy System Performance Analysis Report for Kansas City Power and Light Company and Greater Missouri Operations Company" has been attached as Appendix 1.

Also, a screening of small-scale renewables cost effectiveness has been attached as Appendix 2.

3.2 PROGRAM MEASURES

At the Demand-Side Resource Analysis meeting held September 18th, 2009 in Jefferson City, a request was made to provide a listing of end-use measures in the existing and proposed demand-side management programs:

3.2.1 LOW INCOME AFFORDABLE NEW HOMES PROGRAM

GMO provides incentives to builders who implement energy efficiency measures during the building stage of qualified new homes

Measures include:

Energy efficient central cooling equipment (14 SEER or greater)

Insulation upgrades R42 Attic, R25 Floor or R19 Crawlspace

Energy Star-rated refrigerator

Energy Star-rated lighting fixtures

3.2.2 LOW INCOME WEATHERIZATION PROGRAM

The Weatherization Assistance Program enables low-income families to permanently reduce their energy bills by making their homes more energy efficient. Typical measures include:

Installing insulation,

Caulking windows, and

Conducting repairs to heating and central cooling systems.

3.2.3 CHANGE A LIGHT PROGRAM

Energy Star qualified compact fluorescent lamps.

3.2.4 HOME PERFORMANCE WITH ENERGY STAR® PROGRAM

Home Performance with ENERGY STAR is a collaboration between Missouri Gas Energy, KCP&L, GMO, and the Kansas City Metropolitan Energy Center. The program is sponsored by the Missouri Department of Natural Resources and is part of the government's ENERGY STAR program. This program is for Missouri customers only. Qualifying energy saving measures include;

Attic and ceiling insulation ≥ R49.

Wall insulation ≥ R13

Floor insulation ≥ R19

Ductwork insulation ≥ R13

Windows and doors Energy Star qualified with U-factor ≥ 0.30 and Solar Heat Gain Co-Efficient (SHGC) ≥ 0.30

Reduce infiltration between indoors and outdoors by 20%

Reduce air leakage between ductwork and outdoors by 20%

3.2.5 ENERGY STAR® NEW HOMES PROGRAM

To earn the ENERGY STAR, a home must meet guidelines for energy efficiency set by the U.S. Environmental Protection Agency. These homes are at least 15% more energy efficient than homes built to the 2004 International Residential Code (IRC), and include additional energy-saving features that typically make them 20–30% more efficient than standard homes. More information about the program can be found on the Energy Star website,

http://www.energystar.gov/index.cfm?c=new_homes.nh_features

Qualifying energy savings measures include:

Effective Insulation

Properly installed and inspected insulation in floors, walls, and attics ensures even temperatures throughout the house, reduced energy use, and increased comfort.

High-Performance Windows

Energy-efficient windows employ advanced technologies, such as protective coatings and improved frames, to help keep heat in during winter and out during summer.

Tight Construction and Ducts

Sealing holes and cracks in the home's "envelope" and in heating and cooling duct systems helps reduce drafts, moisture, dust, pollen, and noise.

Efficient Heating and Cooling Equipment

A list of qualified Energy Star heating, cooling and mechanical ventilation equipment can be found on the Energy Star website.

http://www.energystar.gov/index.cfm?c=new_homes.nh_features

Efficient Products

ENERGY STAR qualified homes may also be equipped with ENERGY STAR qualified products — lighting fixtures, compact fluorescent bulbs, ventilation fans, and appliances, such as refrigerators, dishwashers, and washing machines. A list of Energy Star qualified appliances, lighting systems and water heaters can be found on the Energy Star website.

http://www.energystar.gov/index.cfm?c=new_homes.nh_features

Third-Party Verification

With the help of independent Home Energy Raters, ENERGY STAR builder partners choose the most appropriate energy-saving features for their homes. Additionally, raters conduct onsite testing and inspections to verify the energy efficiency measures, as well as insulation, air tightness, and duct sealing details.

3.2.6 BUILDING OPERATOR CERTIFICATION (BOC) PROGRAM

BOC is a professional development program for building operators and maintenance staff which offers a series of seven courses on energy-efficient and resource-efficient operation of buildings. Successful completion of these courses qualifies the participant for certification. The goal of the program is to train individuals responsible for day-to-day operations to achieve measurable energy savings in the operation of buildings. Visit Midwest Energy Efficiency Alliance for more information on the program.

http://www.boccentral.org/page.php?content=about

3.2.7 ENERGY OPTIMIZER PROGRAM

This program offers a free programmable thermostat, including installation, for participating GMO residential and small commercial customers to help manage energy consumption throughout the year.

3.2.8 MPOWER PROGRAM

This summer load-management program incents commercial and industrial customers to reduce peak electric usage.

3.2.9 APPLIANCE TURN-IN PROGRAM

Incentive payments for;

Refrigerators,

Freezers,

Room air-conditioners, and

Dehumidifiers

3.2.10 RESIDENTIAL BLUE LINE, IN-HOME ENERGY DISPLAY PROGRAM

Participants receive an energy usage monitoring device that displays energy usage in real-time.

3.2.11 COOL HOMES PROGRAM

Cool Homes is a rebate program that helps KCP&L customers maintain the operating efficiency of central A/C systems and offsets the cost of upgrading to a new high-efficiency system. KCP&L customers may have their existing central air-cooling system tested by Check-Me!-trained HVAC contractors to see if it can be brought back to manufacturers' specifications – or receive a rebate if it needs to be replaced with a high-efficiency A/C or heat pump. Program measures include;

Re-commissioning of existing system back to 8.0 Energy Efficiency Rating (EER).

If the existing system can not be re-commissioned to an 8.0 EER than the participant could qualify for an incentive payment to replace the system. Existing system must be operational and replacement unit must have a Seasonal Energy Efficiency Rating (SEER) of 14 or higher.

3.2.12 <u>ON LINE AUDIT PROGRAM</u>

Residential participants can complete an on-line energy usage profile and audit which will identify historical usage and make recommendations for saving energy. Participants will also receive an energy savings kit upon completion of the on-line audit. This kit includes six compact fluorescent lamps, an LED night light and two switch/ outlet gaskets.

3.2.13 <u>C&I CUSTOM REBATE PROGRAM</u>

This energy efficiency programs helps reduce operating costs and increase efficiency - necessary for operating any successful businesses - by providing incentives that lower the cost of identifying and purchasing energy-efficient equipment for use in the participant's facilities. Projects are evaluated on a case by case basis and can be for new construction or facility retrofit. Proposed energy savings measures are evaluated by an independent engineering consultant. Participants are eligible for equipment rebates up to the lesser of 50% of the incremental equipment cost, or an amount that reduces the incremental cost to a two-year simple payback, and is also subject to an annual per customer maximum payment.

Qualifying energy efficient equipment includes but is not limited to;

1. High-efficiency lighting,

2. Air conditioning,

3. Heating systems,
4. Motors,
5. Refrigeration,
6. Energy management systems, etc.

An energy audit incentive is also available in this program. The energy audit rebate will be set at 50% of the audit cost up to $300 for customers with facilities less than 25,000 square feet and up to $500 for customers with facilities over 25,000 square feet. Customers with multiple buildings are eligible for multiple audit rebates.

3.2.14 C&I PRESCRIPTIVE INCENTIVE PROGRAM

Measures included in the C&I prescription program were provided in Volume 5 of the August 5, 2009 filing as Tables 5, 13, 17, 42 and 49. These tables are also shown below:

Table 2: C&I Lighting Measures

ID#	Potential Situation	Improvement	Quantity
C&I L1	T12 - 20W -2' 1 Lamp - Magnetic	T8 - 17W -2' 1 Lamp - Electronic	1 Fixture
C&I L2	T12 - 20W -2' 2 Lamp - Magnetic	T8 - 17W -2' 2 Lamp - Electronic	1 Fixture
C&I L3	T12 - 20W -2' 3 Lamp - Magnetic	T8 - 17W -2' 3 Lamp - Electronic	1 Fixture
C&I L4	T12 - 20W -2' 4 Lamp - Magnetic	T8 - 17W -2' 4 Lamp - Electronic	1 Fixture
C&I L5	T12 - 30W -3' 1 Lamp - Magnetic	T8 - 25W -3' 1 Lamp - Electronic	1 Fixture
C&I L6	T12 - 30W -3' 2 Lamp - Magnetic	T8 - 25W -3' 2 Lamp - Electronic	1 Fixture
C&I L7	T12 - 30W -3' 3 Lamp - Magnetic	T8 - 25W -3' 3 Lamp - Electronic	1 Fixture
C&I L8	T12 - 30W -3' 4 Lamp - Magnetic	T8 - 25W -3' 4 Lamp - Electronic	1 Fixture
C&I L9	T12- 34W - 4' 1 Lamp - Magnetic	T8 32W - 4' 1 Lamp - Electronic	1 Fixture
C&I L10	T12- 34W - 4' 2 Lamp - Magnetic	T8 32W - 4' 2 Lamp - Electronic	1 Fixture
C&I L11	T12- 34W - 4' 3 Lamp - Magnetic	T8 32W - 4' 3 Lamp - Electronic	1 Fixture
C&I L12	T12- 34W - 4' 4 Lamp - Magnetic	T8- 32W - 4' 4 Lamp - Electronic	1 Fixture
C&I L13	T12 - 60W - 8' 1 Lamp - Magnetic	T8 - 59W - 8' 1 Lamp - Electronic	1 Fixture
C&I L14	T12 - 60W - 8' 2 Lamp - Magnetic	T8 - 59W - 8' 2 Lamp - Electronic	1 Fixture
C&I L15	T12 - 95W - 8' 1 Lamp - Magnetic - HO	T8 - 86W - 8' 1 Lamp - HO - Electronic	1 Fixture
C&I L16	T12 - 95W - 8' 2 Lamp - Magnetic - HO	T8 - 86W - 8' 2 Lamp - HO - Electronic	1 Fixture
C&I L17	32 W T8 Lamp	Low Watt T8 Lamp	1 Lamp
C&I L18	T12- 34W - 4' 1 Lamp - Magnetic	T5 - 4' 1 Lamp - 28 watt	1 Fixture
C&I L19	T12- 34W - 4' 2 Lamp - Magnetic	T5 - 4' 2 Lamp - 28 watt	1 Fixture
C&I L20	T12- 34W - 4' 3 Lamp - Magnetic	T5 - 4' 3 Lamp - 28 watt	1 Fixture
C&I L21	T12- 34W - 4' 4 Lamp - Magnetic	T5 - 4' 4 Lamp - 28 watt	1 Fixture
C&I L22	T12- 34W - 4' 2 Lamp - Magnetic	T5 - 4' 1 Lamp HO - 54 watt	1 Fixture
C&I L23	T12 - 60W - 8' 2 Lamp - Magnetic	T5 - 4' 2 Lamp HO - 54 watt	1 Fixture
C&I L24	T12- 34W - 4' 4 Lamp - Magnetic	T5 - 4' 2 Lamp HO - 54 watt	1 Fixture
C&I L25	T12 - 8' and 4' Avg	T5 - 4' 2 Lamp HO - 54 watt	1 Fixture
C&I L26	T12 - 95W - 8' 2 Lamp - Magnetic - HO	T5 - 4' 3 Lamp HO - 54 watt	1 Fixture
C&I L27	T12 - 60W - 8' 4 Lamp - Magnetic	T5 - 4' 4 Lamp HO - 54 watt	1 Fixture
C&I L28	T12 - 95W - 8' 2 Lamp - Magnetic - HO	T5 - 4' 4 Lamp HO - 54 watt	1 Fixture
C&I L29	T12 - 95W - 8' 2 Lamp - Magnetic - VHO	T5 - 4' 4 Lamp HO - 54 watt	1 Fixture
C&I L30	T12 - 95W - 8' 2 Lamp - Magnetic - HO - VHO Avg	T5 - 4' 4 Lamp HO - 54 watt	1 Fixture
C&I L31	Hi-Bay 250 W Hi Intensity Discharge	Hi-Bay 3L T5 HO Fluorescents	1 Fixture
C&I L32	Hi-Bay 400 W Hi Intensity Discharge	Hi-Bay 4L T5 HO Fluorescents	1 Fixture
C&I L33	Hi-Bay 400W Hi Intensity Discharge	Hi-Bay 6L T5 HO Fluorescents	1 Fixture
C&I L34	Hi-Bay 1000W Hi Intensity Discharge	Hi-Bay 2-6L T5 HO Fluorescents	1 Fixture
C&I L35	Hi-Bay 250 W Hi Intensity Discharge	Hi-Bay 4L F32 T8 Fluorescents	1 Fixture
C&I L36	Hi-Bay 400 W Hi Intensity Discharge	Hi-Bay 6L F32 T8 Fluorescents	1 Fixture
C&I L37	Hi-Bay 400W Hi Intensity Discharge	Hi-Bay 8L F32 T8 Fluorescents	1 Fixture
C&I L38	Hi-Bay 1000W Hi Intensity Discharge	Hi-Bay 2-8L F32 T8 Fluorescents	1 Fixture
C&I L39	Hi-Bay 400 W Hi Intensity Discharge	Hi-Bay 8L 42W CFL	1 Fixture
C&I L40	Hi-Bay 400 W Hi Intensity Discharge	Hi-Bay 320 Watt Metal Halide - Pulse Start	1 Fixture
C&I L41	Hi-Bay 400 W Hi Intensity Discharge	Hi-Bay 350 Watt Metal Halide - Pulse Start	1 Fixture
C&I L42	Hi-Bay 400 W Hi Intensity Discharge	Hi-Bay 400 Watt Metal Halide - Pulse Start	1 Fixture
C&I L43	60W Inc	15W CFL	1 Lamp
C&I L44	2-60W Inc Fixture	2-13 W CFL Fixture	1 Fixture
C&I L45	Exit Signs have CFLs	Retrofit to LED EnergyStar Exit sign	1 Fixture
C&I L46	Standard lighting switch	Install Occupancy Sensor	1 switch
C&I L47	Traffic Signal, Incandescent	Install EnergyStar Rated LED Traffic Signal	1 Fixture
C&I L48	No Skylight or light tube	Install Light Tube Commercial Skylight	1 Fixture
C&I L49	No centralized lighting controls	Install centralized lighting controls	Per Sq. Ft
C&I L50	No lighting controls	Install Multilevel Lighting Controls	Per Sq. Ft
C&I L51	No lighting controls	Install Daylight Lighting Control Sensors	Per Sq. Ft

Table 3: Refrigeration And Food Service Measures

ID#	Potential Situation	Improvement	Quantity
C&I Refrig 1	No Controls on Vending Machine	Install Cold Beverage Vending Machine Controllers	1 each
C&I Refrig 2	No anti-sweat heater control	Install Anti-sweat heater controls	per door
C&I Refrig 3	Standard condenser	Install Efficient Refrigeration Condenser	40 Ton capacity
C&I Refrig 4	No covers on food cases	Install Night Covers for Food Cases	Per lineal Ft
C&I Refrig 5	No compressor head controls	Install compressor head controls	Per Ton
C&I Refrig 6	Standard Commercial Solid Door Refrigerators less than 20ft3	ENERGY STAR Commercial Solid Door Refrigerators less than 20ft3	per unit
C&I Refrig 7	Standard Commercial Solid Door Refrigerators 20-48 ft3	ENERGY STAR Commercial Solid Door Refrigerators 20-48 ft3	per unit
C&I Refrig 8	Standard Commercial Solid Door Refrigerators more than 48ft3	ENERGY STAR Commercial Solid Door Refrigerators more than 48ft3	per unit
C&I Refrig 9	Standard Commercial Solid Door Freezers less than 20ft3	ENERGY STAR Commercial Solid Door Freezers less than 20ft3	per unit
C&I Refrig 10	Standard Commercial Solid Door Freezers 20-48 ft3	ENERGY STAR Commercial Solid Door Freezers 20-48 ft3	per unit
C&I Refrig 11	Standard Commercial Solid Door Freezers more than 48ft3	ENERGY STAR Commercial Solid Door Freezers more than 48ft3	per unit
C&I Refrig 12	Standard Ice Machines less than 500 lbs	Energy Efficient Ice Machines less than 500 lbs	per unit
C&I Refrig 13	Standard Ice Machines 500-1000 lbs	Energy Efficient Ice Machines 500-1000 lbs	per unit
C&I Refrig 14	Standard Ice Machines more than 1000 lbs	Energy Efficient Ice Machines more than 1000 lbs	per unit

Table 4: HVAC Measures

ID	Potential Situation	Improvement	Quantity
C&I HVAC 1	AC 65,000 1 Ph, 66 kWh/ton	AC 65,000 1 Ph, 59 kWh/ton	per Ton
C&I HVAC 2	AC 65,000 3 Ph, 49 kWh/ton	AC 65,000 3 Ph, 44 kWh/ton	per Ton
C&I HVAC 3	AC 65,000 - 135,000, 77 kWh/ton	AC 65,000 - 135,000, 60 kWh/ton	per Ton
C&I HVAC 4	AC 135,000 - 240,000, 120 kWh/ton	AC 135,000 - 240,000, 107 kWh/ton	per Ton
C&I HVAC 5	AC 240,000 - 760,000, 63 kWh/ton	AC 240,000 - 760,000, 56 kWh/ton	per Ton
C&I HVAC 6	AC >760,000, 93 kWh/ton	AC >760,000, 83 kWh/ton	per Ton
C&I HVAC 7	HP 65,000 1 Ph, 96 kWh/ton	HP 65,000 1 Ph, 99 kWh/ton	per Ton
C&I HVAC 8	HP 65,000 3 Ph, 58 kWh/ton	HP 65,000 3 Ph, 57 kWh/ton	per Ton
C&I HVAC 9	HP 65,000 - 135,000, 108 kWh/ton	HP 65,000 - 135,000, 108 kWh/ton	per Ton
C&I HVAC 10	HP 135,000 - 240,000, 119 kWh/ton	HP 135,000 - 240,000, 124 kWh/ton	per Ton
C&I HVAC 11	HP >240,000, 150 kWh/ton	HP >240,000, 153 kWh/ton	per Ton
C&I HVAC 12	Ground Source HP Closed Loop <135,000, 9 kWh/ton	Ground Source HP Closed Loop <135,000, 7 kWh/ton	per Ton
C&I HVAC 13	WLHP <17,000, 24 kWh/ton	WLHP <17,000, 22 kWh/ton	per Ton
C&I HVAC 14	WLHP 17,000-65,000, 21 kWh/ton	WLHP 17,000-65,000, 19 kWh/ton	per Ton
C&I HVAC 15	WLHP 65,000-135,000, 21 kWh/ton	WLHP 65,000-135,000, 19 kWh/ton	per Ton
C&I HVAC 16	PTAC, 28 kWh/ton	PTAC, 24 kWh/ton	per Ton
C&I HVAC 17	PTAC-HP, 45 kWh/ton	PTAC-HP, 48 kWh/ton	per Ton
C&I HVAC 18	Economizer, 159 kWh/ton	Economizer, 109 kWh/ton	per Ton
C&I HVAC 19	Tuneup - Refrigerant Charge, 145 kWh/ton	Tuneup - Refrigerant Charge, kWh/ton	per Ton
C&I HVAC 20	No ES Sleeve AC over 14,000 Btu hr	Install ES Sleeve AC over 14,000 Btu hr	1 Each
C&I HVAC 21	No ES Sleeve AC under 14,000 Btu hr	Install ES Sleeve AC under 14,000 Btu hr	1 Each
C&I HVAC 22	No Setback_Programmable Thermostat	Install Setback_Programmable Thermostat	1 Each
C&I HVAC 23	Chilled Water Reset Air Cooled 0-100 tons	Replace with Min ARI rated Efficiency	per Ton
C&I HVAC 24	Chilled Water Reset Air Cooled 100-200 tons	Replace with Min ARI rated Efficiency	per Ton
C&I HVAC 25	Chilled Water Reset Air Cooled 200-300 tons	Replace with Min ARI rated Efficiency	per Ton
C&I HVAC 26	Chilled Water Reset Air Cooled 300-400 tons	Replace with Min ARI rated Efficiency	per Ton
C&I HVAC 27	Chilled Water Reset Air Cooled 400-500 tons	Replace with Min ARI rated Efficiency	per Ton
C&I HVAC 28	Chilled Water Reset Water Cooled 0-1000 tons	Replace with Min ARI rated Efficiency	per Ton
C&I HVAC 29	Chilled Water Reset Water Cooled 1000-2000 tons	Replace with Min ARI rated Efficiency	per Ton
C&I HVAC 30	Chilled Water Reset Water Cooled 2000-3000 tons	Replace with Min ARI rated Efficiency	per Ton
C&I HVAC 31	Air Cooled Chillers	Replace with Min ARI rated Efficiency	per Ton
C&I HVAC 32	Water Cooled Chillers less than 150 ton	Replace with Min ARI rated Efficiency	per Ton
C&I HVAC 33	Water Cooled Chillers 150 - 300 ton	Replace with Min ARI rated Efficiency	per Ton
C&I HVAC 34	Water Cooled Chillers more than 300 ton	Replace with Min ARI rated Efficiency	per Ton
C&I HVAC 35	No Window Film	Install Window Film	per Sq. Ft.
C&I HVAC 36	Electric Water heater	HP Water Heater 500 gal_day	Gal per day
C&I HVAC 37	Electric Water heater	HP Water Heater 1000 gal_day	Gal per day
C&I HVAC 38	Electric Water heater	HP Water Heater 1500 gal_day	Gal per day

Table 5: Pumps and Variable Frequency Drive (VFD) Measures

ID3	Potential Situation	Improvement	Quantity
CI Motive Power 1	Std. EPACT Motors 1-5 HP	NEMA Premium Motors 1-5 HP	per HP
CI Motive Power 2	Std. EPACT Motors 7.5-20 HP	NEMA Premium Motors 7.5-20 HP	per HP
CI Motive Power 3	Std. EPACT Motors 25-100 HP	NEMA Premium Motors 25-100 HP	per HP
CI Motive Power 4	Std. EPACT Motors 125-250 HP	NEMA Premium Motors 125-250 HP	per HP
CI Motive Power 5	Std. Pump HP 1.5	Hi Efficiency Pump HP 1.5	per HP
CI Motive Power 6	Std. Pump HP 2	Hi Efficiency Pump HP 2	per HP
CI Motive Power 7	Std. Pump HP 3	Hi Efficiency Pump HP 3	per HP
CI Motive Power 8	Std. Pump HP 5	Hi Efficiency Pump HP 5	per HP
CI Motive Power 9	Std. Pump HP 7.5	Hi Efficiency Pump HP 7.5	per HP
CI Motive Power 10	Std. Pump HP 10	Hi Efficiency Pump HP 10	per HP
CI Motive Power 11	Std. Pump HP 15	Hi Efficiency Pump HP 15	per HP
CI Motive Power 12	Std. Pump HP 20	Hi Efficiency Pump HP 20	per HP
CI Motive Power 13	No Variable Frequency Drive HP 1.5	Install Variable Frequency Drive HP 1.5	per HP
CI Motive Power 14	No Variable Frequency Drive HP 2	Install Variable Frequency Drive HP 2	per HP
CI Motive Power 15	No Variable Frequency Drive HP 3	Install Variable Frequency Drive HP 3	per HP
CI Motive Power 16	No Variable Frequency Drive HP 5	Install Variable Frequency Drive HP 5	per HP
CI Motive Power 17	No Variable Frequency Drive HP 7.5	Install Variable Frequency Drive HP 7.5	per HP
CI Motive Power 18	No Variable Frequency Drive HP 10	Install Variable Frequency Drive HP 10	per HP
CI Motive Power 19	No Variable Frequency Drive HP 15	Install Variable Frequency Drive HP 15	per HP
CI Motive Power 20	No Variable Frequency Drive HP 20	Install Variable Frequency Drive HP 20	per HP
CI Motive Power 21	No Variable Frequency Drive HP 25	Install Variable Frequency Drive HP 25	per HP
CI Motive Power 22	No Variable Frequency Drive HP 30	Install Variable Frequency Drive HP 30	per HP
CI Motive Power 23	No Variable Frequency Drive HP 40	Install Variable Frequency Drive HP 40	per HP
CI Motive Power 24	No Variable Frequency Drive HP 50	Install Variable Frequency Drive HP 50	per HP

Table 6: Other Office Equipment

Potential Situation	Improvement	Quantity
No Plug Load Occupancy Sensors Document Stations	Plug Load Occupancy Sensors Document Stations	Per Unit
Std. Power Supply Desktop Unit	80Plus Power Supply Desktop Unit	Per Unit
Std. Power Supply Server Unit	80Plus Power Supply Server Unit	Per Unit
No Computer Power Manager	Computer Power Manager	Per Unit

3.3 END-USE MEASURE TECHNICAL POTENTIAL

22.050 (4) The utility shall estimate the technical potential of each end-use measure that passes the screening test. There were errors in two paragraphs in Volume 5, Page 166 beginning with the paragraph "The total estimated commercial and industrial…"The corrected paragraphs are:

"The total estimated commercial and industrial energy efficiency potential over the 20 year forecast period is about 2,264 GWh and 511 peak MW. Approximately half of this energy efficiency potential is projected to come from energy efficient lighting products, about 19% is projected to come from energy efficient HVAC equipment and controls, and about 23% of the total potential is expected to come from custom and motors measures. The total C&I energy efficiency potential amounts to approximately 32% of GMO's forecast 2029 C&I energy consumption of about 6,790 GWh. This is equal to annual average energy savings of about 113 GWh, or 2.4% of GMO's forecast 2010 C&I sales.

The total C&I energy efficiency program costs over the 20 year forecast period are estimated at about ** $[redacted]**, or about ** $[redacted]** per year on average."

3.4 REPORTING REQUIREMENTS

22.050 (11) (D) 4 (I) The results of the utility cost test and the total resource cost test for each demand-side program developed pursuant to section (6) of this rule;. The utility cost test and the total resource cost analysis for the complete DSM portfolio is shown in Table 7 below:

Table 7: Utility Cost Test and Total Resource Cost Test for the DSM Portfolio ** Highly Confidential **

Complete DSM Portfolio

Tests	
	Benefit / Cost Test Results
Utility Test	[redacted]
TRC Test	
RIM Test	
Societal Test	
Participant Test	
NPV Lost Revenues, Costs,	
Lost Revenue (Electric)	
Participant Costs (net free)	
Avoided Electric Production with Adders	
Cost-Based Avoided Electric Capacity	
Avoided T&D Electric	
Total	
NPV Administration Costs	
NPV Implementation / Participation Costs	
NPV Incentives	
NPV Total	
Environmental Benefits	

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SECTION 4: INTEGRATED RESOURCE ANALYSIS

4.1 ALTERNATIVE RESOURCE PLANS

At the Integrated Resource Analysis and Risk Analysis and Strategic Selection meeting held October 2nd, 2009 in Jefferson City, a request was made to provide addition information regarding the methodology of the development of alternative resource plans. The following is a discussion of the methodology used:

After the resource option screening conducted as part of Rule 22.040 was completed, resource options that passed screening were included in the preliminary sensitivity analysis required by Rule 22.070 (2). This analysis was conducted using a linear programming based model from Ventyx called System Optimizer®. This model uses as input a fixed set of future market assumptions on load growth, fuel and allowance prices, etc. It also uses as an input a set of supply, DSM and retirement options. For our analysis we used the screened supply options as our set of inputs, with DSM options and retirements of two coal-fired units.

The model takes these options and selects from among them to build a long-term least cost expansion plan for the utility for a given set of future market assumptions. This model is ideally situated to test the company's risk sensitivity to uncertain factors. The output however is the lowest cost plan possible, given market conditions and alternatives for supply, DSM and retirements.

The company used the System Optimizer® output for the case where all market conditions were assumed at the Mid level of uncertain factor risk. The results of this case should be very similar to the results of the integrated analysis on an expected value basis. The first set of 11 alternative plans were based on this information and adhering to three additional criteria. The plans would include enough renewable energy resources to comply with Missouri Prop C targets for renewable energy and solar energy. The plans would keep maintain margins for the company above 12% in order to comply with SPP requirements. The company would not exceed 25% reserve margin for any year in the planning timeframe.

The first set of plans focused on timing and amount of renewable energy development, verified DSM impacts, tested retirements of coal units, and evaluated the feasibility of biomass retrofits.

An additional request was made to provide the twenty-four alternative resource plans showing the "All DSM" data in terms of annualized additions. Also requested was disaggregating "All DSM" into Demand Response and Energy Efficiency program types. The plans are as shown in Table 8 through Table 31 below:

Table 8: Alternative Resource Plan 1

	Plan 1: Install Prop C Wind and Solar, CT's, and All DSM					
Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Demand Response Annualized	Energy Efficiency Annualized
2009	0				5.6	0.3
2010	0				22.3	9.5
2011	0	1.79			21.4	10.9
2012	0	0.03			13.4	11.9
2013	0	0.02			9.0	10.9
2014	0	2.80			3.3	10.2
2015	0	0.05			1.5	2.9
2016	0	0.11	100		1.7	2.7
2017	0	0.08			1.7	1.6
2018	0	5.02	100		1.6	2.0
2019	0	0.15			1.7	1.8
2020	0	0.20			1.8	-0.4
2021	0	5.33	100		1.8	-1.0
2022	154	0.24			1.8	-1.7
2023	0	0.24	100		1.8	-2.0
2024	0	0.32			2.0	-2.4
2025	0	0.26			2.2	-4.8
2026	0	0.32			2.2	-5.1
2027	154	0.32			2.3	-5.3
2028	0	0.35			2.2	-6.3
2029	0	0.25			2.3	-6.8

Table 9: Alternative Resource Plan 3

Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Demand Response Annualized	Energy Efficiency Annualized
	Plan 2: Install Prop C Wind and Solar, CT's, and No DSM					
2009	0				0.0	0.0
2010	0				0.0	0.0
2011	0	1.79			0.0	0.0
2012	0	0.03			0.0	0.0
2013	0	0.02			0.0	0.0
2014	154	2.80			0.0	0.0
2015	0	0.05			0.0	0.0
2016	0	0.11	100		0.0	0.0
2017	0	0.08			0.0	0.0
2018	0	5.02	100		0.0	0.0
2019	0	0.15			0.0	0.0
2020	0	0.20			0.0	0.0
2021	0	5.33	100		0.0	0.0
2022	154	0.24			0.0	0.0
2023	0	0.24	100		0.0	0.0
2024	0	0.32			0.0	0.0
2025	0	0.26			0.0	0.0
2026	0	0.32			0.0	0.0
2027	154	0.32			0.0	0.0
2028	0	0.35			0.0	0.0
2029	0	0.25			0.0	0.0

Table 10: Alternative Resource Plan 3

Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Demand Response Annualized	Energy Efficiency Annualized
	Plan 3: Install Prop C Wind and Solar, CT's, Additional 200 MW Wind Above Prop C beginning in 2017, and All DSM					
2009	0				5.6	0.3
2010	0				16.7	9.2
2011	0	1.79			21.4	10.9
2012	0	0.03			13.4	11.9
2013	0	0.02			9.0	10.9
2014	0	2.80			3.3	10.2
2015	0	0.05			1.5	2.9
2016	0	0.11	100		1.7	2.7
2017	0	0.08		100	1.7	1.6
2018	0	5.02	100		1.6	2.0
2019	0	0.15			1.7	1.8
2020	0	0.20			1.8	-0.4
2021	0	5.33	100		1.8	-1.0
2022	154	0.24			1.8	-1.7
2023	0	0.24	100		1.8	-2.0
2024	0	0.32		100	2.0	-2.4
2025	0	0.26			2.2	-4.8
2026	0	0.32			2.2	-5.1
2027	154	0.32			2.3	-5.3
2028	0	0.35			2.2	-6.3
2029	0	0.25			2.3	-6.8

Table 11: Alternative Resource Plan 4

Date	Plan 4: Install Prop C Wind and Solar, CT's, Additional 100 MW Wind Above Prop C beginning in 2014, and No DSM					
	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Demand Response Annualized	Energy Efficiency Annualized
2009	0				0.0	0.0
2010	0				0.0	0.0
2011	0	1.79			0.0	0.0
2012	0	0.03			0.0	0.0
2013	0	0.02			0.0	0.0
2014	0	2.80		100	0.0	0.0
2015	154	0.05			0.0	0.0
2016	0	0.11	100		0.0	0.0
2017	0	0.08			0.0	0.0
2018	0	5.02	100		0.0	0.0
2019	0	0.15			0.0	0.0
2020	0	0.20			0.0	0.0
2021	0	5.33	100		0.0	0.0
2022	0	0.24			0.0	0.0
2023	154	0.24	100		0.0	0.0
2024	0	0.32			0.0	0.0
2025	0	0.26			0.0	0.0
2026	0	0.32			0.0	0.0
2027	154	0.32			0.0	0.0
2028	0	0.35			0.0	0.0
2029	0	0.25			0.0	0.0

Table 12: Alternative Resource Plan 5

Date	Plan 5: Install Prop C Wind and Solar, CT's, All DSM, 100% Biomass CFB (less Prop C Wind Needed Due to 100% Biomass CFB)						
	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	100% Biomass	Demand Response Annualized	Energy Efficiency Annualized
2009	0					5.6	0.3
2010	0					16.7	9.2
2011	0	1.79				21.4	10.9
2012	0	0.03				13.4	11.9
2013	0	0.02				9.0	10.9
2014	0	2.80				3.3	10.2
2015	0	0.05				1.5	2.9
2016	0	0.11			50	1.7	2.7
2017	0	0.08				1.7	1.6
2018	0	5.02	100			1.6	2.0
2019	0	0.15				1.7	1.8
2020	0	0.20				1.8	-0.4
2021	0	5.33	100			1.8	-1.0
2022	0	0.24				1.8	-1.7
2023	154	0.24	100			1.8	-2.0
2024	0	0.32				2.0	-2.4
2025	0	0.26				2.2	-4.8
2026	0	0.32				2.2	-5.1
2027	154	0.32				2.3	-5.3
2028	0	0.35				2.2	-6.3
2029	0	0.25				2.3	-6.8

Table 13: Alternative Resource Plan 6

	Plan 6: Install Prop C Wind and Solar, CT's, All DSM, and Sibley 1&2 converted to using 10% biomass					
Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Demand Response Annualized	Energy Efficiency Annualized
2009	0				5.6	0.3
2010	0				16.7	9.2
2011	0	1.79			21.4	10.9
2012	0	0.03			13.4	11.9
2013	0	0.02			9.0	10.9
2014	0	2.80			3.3	10.2
2015	0	0.05			1.5	2.9
2016	0	0.11	100		1.7	2.7
2017	0	0.08			1.7	1.6
2018	0	5.02	100		1.6	2.0
2019	0	0.15			1.7	1.8
2020	0	0.20			1.8	-0.4
2021	0	5.33	100		1.8	-1.0
2022	154	0.24			1.8	-1.7
2023	0	0.24	100		1.8	-2.0
2024	0	0.32			2.0	-2.4
2025	0	0.26			2.2	-4.8
2026	0	0.32			2.2	-5.1
2027	154	0.32			2.3	-5.3
2028	0	0.35			2.2	-6.3
2029	0	0.25			2.3	-6.8

Table 14: Alternative Resource Plan 7

	Plan 7: Retire Sibley 1&2, Install Prop C Wind and Solar, CT's, and All DSM					
Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Demand Response Annualized	Energy Efficiency Annualized
2009	0				5.6	0.3
2010	0				16.7	9.2
2011	0	1.79			21.4	10.9
2012	0	0.03			13.4	11.9
2013	0	0.02			9.0	10.9
2014	0	2.80			3.3	10.2
2015	154	0.05			1.5	2.9
2016	0	0.11	100		1.7	2.7
2017	0	0.08			1.7	1.6
2018	0	5.02	100		1.6	2.0
2019	0	0.15			1.7	1.8
2020	0	0.20			1.8	-0.4
2021	0	5.33	100		1.8	-1.0
2022	0	0.24			1.8	-1.7
2023	0	0.24	100		1.8	-2.0
2024	154	0.32			2.0	-2.4
2025	0	0.26			2.2	-4.8
2026	0	0.32			2.2	-5.1
2027	0	0.32			2.3	-5.3
2028	154	0.35			2.2	-6.3
2029	0	0.25			2.3	-6.8

Table 15: Alternative Resource Plan 8

	Plan 8: Retire 108 MW Coal, Install Prop C Wind and Solar, CT's, and No DSM					
Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Demand Response Annualized	Energy Efficiency Annualized
2009	0				5.6	0.3
2010	0				16.7	9.2
2011	0	1.79			21.4	10.9
2012	0	0.03			13.4	11.9
2013	0	0.02			9.0	10.9
2014	154	2.80			3.3	10.2
2015	0	0.05			1.5	2.9
2016	0	0.11	100		1.7	2.7
2017	154	0.08			1.7	1.6
2018	0	5.02	100		1.6	2.0
2019	0	0.15			1.7	1.8
2020	0	0.20			1.8	-0.4
2021	0	5.33	100		1.8	-1.0
2022	0	0.24			1.8	-1.7
2023	0	0.24	100		1.8	-2.0
2024	154	0.32			2.0	-2.4
2025	0	0.26			2.2	-4.8
2026	0	0.32			2.2	-5.1
2027	0	0.32			2.3	-5.3
2028	154	0.35			2.2	-6.3
2029	0	0.25			2.3	-6.8

Table 16: Alternative Resource Plan 9

	Plan 9: Retire 108 MW Coal, Install Prop C Wind and Solar, CT's, Additional 200 MW Wind Above Prop C beginning in 2017, and All DSM					
Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Demand Response Annualized	Energy Efficiency Annualized
2009	0				5.6	0.3
2010	0				16.7	9.2
2011	0	1.79			21.4	10.9
2012	0	0.03			13.4	11.9
2013	0	0.02			9.0	10.9
2014	0	2.80			3.3	10.2
2015	154	0.05			1.5	2.9
2016	0	0.11	100		1.7	2.7
2017	0	0.08		100	1.7	1.6
2018	0	5.02	100		1.6	2.0
2019	0	0.15			1.7	1.8
2020	0	0.20			1.8	-0.4
2021	0	5.33	100		1.8	-1.0
2022	0	0.24			1.8	-1.7
2023	0	0.24	100		1.8	-2.0
2024	0	0.32		100	2.0	-2.4
2025	154	0.26			2.2	-4.8
2026	0	0.32			2.2	-5.1
2027	0	0.32			2.3	-5.3
2028	154	0.35			2.2	-6.3
2029	0	0.25			2.3	-6.8

Table 17: Alternative Resource Plan 10

	Plan 10: Retire 108 MW Coal, Install Prop C Wind and Solar, CT's, Additional 100 MW Wind Above Prop C beginning in 2014, and No DSM					
Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Demand Response Annualized	Energy Efficiency Annualized
2009	0				5.6	0.3
2010	0				16.7	9.2
2011	0	1.79			21.4	10.9
2012	0	0.03			13.4	11.9
2013	0	0.02			9.0	10.9
2014	0	2.80		100	3.3	10.2
2015	154	0.05			1.5	2.9
2016	0	0.11	100		1.7	2.7
2017	154	0.08			1.7	1.6
2018	0	5.02	100		1.6	2.0
2019	0	0.15			1.7	1.8
2020	0	0.20			1.8	-0.4
2021	0	5.33	100		1.8	-1.0
2022	0	0.24			1.8	-1.7
2023	0	0.24	100		1.8	-2.0
2024	0	0.32			2.0	-2.4
2025	154	0.26			2.2	-4.8
2026	0	0.32			2.2	-5.1
2027	0	0.32			2.3	-5.3
2028	0	0.35			2.2	-6.3
2029	154	0.25			2.3	-6.8

Table 18: Alternative Resource Plan 11

	Plan 11: Retire 108 MW Coal, Install Prop C Wind and Solar, CT's, All DSM, 100% Biomass						
Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	100% Biomass	Demand Response Annualized	Energy Efficiency Annualized
2009	0					5.6	0.3
2010	0					16.7	9.2
2011	0	1.79				21.4	10.9
2012	0	0.03				13.4	11.9
2013	0	0.02				9.0	10.9
2014	0	2.80				3.3	10.2
2015	0	0.05			50	1.5	2.9
2016	0	0.11				1.7	2.7
2017	154	0.08				1.7	1.6
2018	0	5.02	100			1.6	2.0
2019	0	0.15				1.7	1.8
2020	0	0.20				1.8	-0.4
2021	0	5.33	100			1.8	-1.0
2022	0	0.24				1.8	-1.7
2023	0	0.24	100			1.8	-2.0
2024	0	0.32				2.0	-2.4
2025	154	0.26				2.2	-4.8
2026	0	0.32				2.2	-5.1
2027	0	0.32				2.3	-5.3
2028	0	0.35				2.2	-6.3
2029	154	0.25				2.3	-6.8

Table 19: Alternative Resource Plan 12

Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Demand Response Annualized	Energy Efficiency Annualized
	Plan 12: Install Prop C Wind and Solar, CT's, Additional 400 MW Wind Above Prop C beginning in 2017, and All DSM					
2009	0.0				5.6	0.3
2010	0.0				16.7	9.2
2011	0.0	1.8			21.4	10.9
2012	0.0	0.0			13.4	11.9
2013	0.0	0.0			9.0	10.9
2014	0.0	2.8			3.3	10.2
2015	0.0	0.0			1.5	2.9
2016	0.0	0.1	100		1.7	2.7
2017	0.0	0.1		100	1.7	1.6
2018	0.0	5.0	100		1.6	2.0
2019	0.0	0.2		100	1.7	1.8
2020	0.0	0.2		100	1.8	-0.4
2021	0.0	5.3	100		1.8	-1.0
2022	0.0	0.2			1.8	-1.7
2023	0.0	0.2	100		1.8	-2.0
2024	154.0	0.3		100	2.0	-2.4
2025	0.0	0.3			2.2	-4.8
2026	0.0	0.3			2.2	-5.1
2027	0.0	0.3			2.3	-5.3
2028	154.0	0.3			2.2	-6.3
2029	0.0	0.2			2.3	-6.8

Table 20: Alternative Resource Plan 13

Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Coal with CCS	Demand Response Annualized	Energy Efficiency Annualized
	Plan 13: Install Prop C Wind and Solar, CT's, Coal w/CCS, and All DSM						
2009	0					5.6	0.3
2010	0					16.7	9.2
2011	0	1.79				21.4	10.9
2012	0	0.03				13.4	11.9
2013	0	0.02				9.0	10.9
2014	0	2.80				3.3	10.2
2015	0	0.05				1.5	2.9
2016	0	0.11	100			1.7	2.7
2017	0	0.08				1.7	1.6
2018	0	5.02	100			1.6	2.0
2019	0	0.15				1.7	1.8
2020	0	0.20			150	1.8	-0.4
2021	0	5.33	100			1.8	-1.0
2022	0	0.24				1.8	-1.7
2023	0	0.24	100			1.8	-2.0
2024	0	0.32				2.0	-2.4
2025	0	0.26				2.2	-4.8
2026	0	0.32				2.2	-5.1
2027	154	0.32				2.3	-5.3
2028	0	0.35				2.2	-6.3
2029	0	0.25				2.3	-6.8

Table 21: Alternative Resource Plan 14

	Plan 14: Install Prop C Wind and Solar, CT's, Additional 400 MW Wind Above Prop C beginning in 2016, and All DSM					
Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Demand Response Annualized	Energy Efficiency Annualized
2009	0				5.6	0.3
2010	0				16.7	9.2
2011	0	1.79			21.4	10.9
2012	0	0.03			13.4	11.9
2013	0	0.02			9.0	10.9
2014	0	2.80			3.3	10.2
2015	0	0.05			1.5	2.9
2016	0	0.11	100	100	1.7	2.7
2017	0	0.08		200	1.7	1.6
2018	0	5.02	100		1.6	2.0
2019	0	0.15			1.7	1.8
2020	0	0.20			1.8	-0.4
2021	0	5.33	100		1.8	-1.0
2022	0	0.24			1.8	-1.7
2023	0	0.24	100		1.8	-2.0
2024	154	0.32		100	2.0	-2.4
2025	0	0.26			2.2	-4.8
2026	0	0.32			2.2	-5.1
2027	0	0.32			2.3	-5.3
2028	154	0.35			2.2	-6.3
2029	0	0.25			2.3	-6.8

Table 22: Alternative Resource Plan 15

	Plan 15: Install Prop C Wind and Solar, CT's, Additional 400 MW Wind Above Prop C beginning in 2017, and DSM only comprised of Existing DSM					
Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Demand Response Annualized	Energy Efficiency Annualized
2009	0				0.3	5.6
2010	0				1.0	16.7
2011	0	1.79			1.7	21.4
2012	0	0.03			1.7	13.4
2013	0	0.02			1.5	9.0
2014	0	2.80			0.0	3.3
2015	154	0.05			0.0	1.5
2016	0	0.11	100		0.0	1.7
2017	0	0.08		100	0.0	1.7
2018	0	5.02	100		0.0	1.6
2019	0	0.15		100	0.0	1.7
2020	0	0.20		100	0.0	1.8
2021	0	5.33	100		0.0	1.8
2022	0	0.24			0.0	1.8
2023	0	0.24	100		0.0	1.8
2024	0	0.32		100	0.0	2.0
2025	154	0.26			0.0	2.2
2026	0	0.32			0.0	2.2
2027	0	0.32			0.0	2.3
2028	0	0.35			0.0	2.2
2029	154	0.25			0.0	2.3

Table 23: Alternative Resource Plan 16

Date	Plan 16: Install Prop C Wind and Solar, CT's, Additional 400 MW Wind Above Prop C beginning in 2017, and DSM at 1% of retail energy level					
Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Demand Response Annualized	Energy Efficiency Annualized
2009	0				22.7	22.3
2010	0				23.2	21.4
2011	0	1.79			23.7	13.4
2012	0	0.03			24.1	9.0
2013	0	0.02			24.5	3.3
2014	0	2.80			24.9	1.5
2015	0	0.05			25.4	1.7
2016	0	0.11	100		25.7	1.7
2017	0	0.08		100	26.1	1.6
2018	0	5.02	100		26.5	1.7
2019	0	0.15		100	0.0	0.0
2020	0	0.20		100	4.2	1.8
2021	0	5.33	100		4.1	1.8
2022	0	0.24			4.1	1.8
2023	0	0.24	100		4.1	1.8
2024	0	0.32		100	4.3	2.0
2025	0	0.26			4.3	2.2
2026	0	0.32			4.4	2.2
2027	0	0.32			4.6	2.3
2028	0	0.35			4.8	2.2
2029	0	0.25			4.8	2.3

Table 24: Alternative Resource Plan 17

Date	Plan 17: Install Prop C Wind and Solar, CT's, Additional 400 MW Wind Above Prop C beginning in 2012, and All DSM					
Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Demand Response Annualized	Energy Efficiency Annualized
2009	0				5.6	0.3
2010	0				16.7	9.2
2011	0	1.79			21.4	10.9
2012	0	0.03		100	13.4	11.9
2013	0	0.02			9.0	10.9
2014	0	2.80			3.3	10.2
2015	0	0.05			1.5	2.9
2016	0	0.11	100	100	1.7	2.7
2017	0	0.08		200	1.7	1.6
2018	0	5.02	100		1.6	2.0
2019	0	0.15			1.7	1.8
2020	0	0.20			1.8	-0.4
2021	0	5.33	100		1.8	-1.0
2022	0	0.24			1.8	-1.7
2023	0	0.24	100		1.8	-2.0
2024	0	0.32		100	2.0	-2.4
2025	154	0.26			2.2	-4.8
2026	0	0.32			2.2	-5.1
2027	0	0.32			2.3	-5.3
2028	154	0.35			2.2	-6.3
2029	0	0.25			2.3	-6.8

Table 25: Alternative Resource Plan 18

Plan 18: Install Prop C Wind and Solar, CT's, Additional 500 MW Wind Above Prop C beginning in 2010, and All DSM

Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Demand Response Annualized	Energy Efficiency Annualized
2009	0				5.6	0.3
2010	0			100	16.7	9.2
2011	0	1.79			21.4	10.9
2012	0	0.03			13.4	11.9
2013	0	0.02			9.0	10.9
2014	0	2.80			3.3	10.2
2015	0	0.05			1.5	2.9
2016	0	0.11	100	100	1.7	2.7
2017	0	0.08		200	1.7	1.6
2018	0	5.02	100		1.6	2.0
2019	0	0.15			1.7	1.8
2020	0	0.20			1.8	-0.4
2021	0	5.33	100		1.8	-1.0
2022	0	0.24			1.8	-1.7
2023	0	0.24	100		1.8	-2.0
2024	0	0.32		100	2.0	-2.4
2025	154	0.26			2.2	-4.8
2026	0	0.32			2.2	-5.1
2027	0	0.32			2.3	-5.3
2028	154	0.35			2.2	-6.3
2029	0	0.25			2.3	-6.8

Table 26: Alternative Resource Plan 19

Plan 19: Install Prop C Wind and Solar, CT's, Additional 500 MW Wind Above Prop C beginning in 2010, All DSM, and Sibley 1&2 converted to using 10% biomass usage

Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Demand Response Annualized	Energy Efficiency Annualized
2009	0				5.6	0.3
2010	0			100	16.7	9.2
2011	0	1.79			21.4	10.9
2012	0	0.03			13.4	11.9
2013	0	0.02			9.0	10.9
2014	0	2.80			3.3	10.2
2015	0	0.05			1.5	2.9
2016	0	0.11	100	100	1.7	2.7
2017	0	0.08		200	1.7	1.6
2018	0	5.02	100		1.6	2.0
2019	0	0.15			1.7	1.8
2020	0	0.20			1.8	-0.4
2021	0	5.33	100		1.8	-1.0
2022	0	0.24			1.8	-1.7
2023	0	0.24	100		1.8	-2.0
2024	0	0.32		100	2.0	-2.4
2025	154	0.26			2.2	-4.8
2026	0	0.32			2.2	-5.1
2027	0	0.32			2.3	-5.3
2028	154	0.35			2.2	-6.3
2029	0	0.25			2.3	-6.8

Table 27: Alternative Resource Plan 20

Plan 20: Install Prop C Wind and Solar, CT's, Additional 500 MW Wind Above Prop C beginning in 2010, All DSM, and Coal w/CCS

Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Coal with CCS	Demand Response Annualized	Energy Efficiency Annualized
2009	0					5.6	0.3
2010	0			100		16.7	9.2
2011	0	1.79				21.4	10.9
2012	0	0.03				13.4	11.9
2013	0	0.02				9.0	10.9
2014	0	2.80				3.3	10.2
2015	0	0.05				1.5	2.9
2016	0	0.11	100	100		1.7	2.7
2017	0	0.08		200		1.7	1.6
2018	0	5.02	100			1.6	2.0
2019	0	0.15				1.7	1.8
2020	0	0.20			150	1.8	-0.4
2021	0	5.33	100			1.8	-1.0
2022	0	0.24				1.8	-1.7
2023	0	0.24	100			1.8	-2.0
2024	0	0.32		100		2.0	-2.4
2025	0	0.26				2.2	-4.8
2026	0	0.32				2.2	-5.1
2027	0	0.32				2.3	-5.3
2028	154	0.35				2.2	-6.3
2029	0	0.25				2.3	-6.8

Table 28: Alternative Resource Plan 21

Plan 21: Install Prop C Wind and Solar, CT's, Additional 500 MW Wind Above Prop C beginning in 2010, All DSM, Coal w/CCS, and Sibley 1&2 converted to 10% biomass usage

Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Coal with CCS	Demand Response Annualized	Energy Efficiency Annualized
2009	0					5.6	0.3
2010	0			100		16.7	9.2
2011	0	1.79				21.4	10.9
2012	0	0.03				13.4	11.9
2013	0	0.02				9.0	10.9
2014	0	2.80				3.3	10.2
2015	0	0.05				1.5	2.9
2016	0	0.11	100	100		1.7	2.7
2017	0	0.08		200		1.7	1.6
2018	0	5.02	100			1.6	2.0
2019	0	0.15				1.7	1.8
2020	0	0.20			150	1.8	-0.4
2021	0	5.33	100			1.8	-1.0
2022	0	0.24				1.8	-1.7
2023	0	0.24	100			1.8	-2.0
2024	0	0.32		100		2.0	-2.4
2025	0	0.26				2.2	-4.8
2026	0	0.32				2.2	-5.1
2027	0	0.32				2.3	-5.3
2028	154	0.35				2.2	-6.3
2029	0	0.25				2.3	-6.8

Table 29: Alternative Resource Plan 22

	Plan 22: Install Prop C Wind and Solar, CT's, Additional 500 MW Wind Above Prop C beginning in 2012, All DSM, and Sibley 1&2 converted to 10% biomass usage					
Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Demand Response Annualized	Energy Efficiency Annualized
2009	0				5.6	0.3
2010	0				16.7	9.2
2011	0	1.79			21.4	10.9
2012	0	0.03		100	13.4	11.9
2013	0	0.02			9.0	10.9
2014	0	2.80			3.3	10.2
2015	0	0.05			1.5	2.9
2016	0	0.11	100	100	1.7	2.7
2017	0	0.08		200	1.7	1.6
2018	0	5.02	100		1.6	2.0
2019	0	0.15			1.7	1.8
2020	0	0.20			1.8	-0.4
2021	0	5.33	100		1.8	-1.0
2022	0	0.24			1.8	-1.7
2023	0	0.24	100		1.8	-2.0
2024	0	0.32		100	2.0	-2.4
2025	154	0.26			2.2	-4.8
2026	0	0.32			2.2	-5.1
2027	0	0.32			2.3	-5.3
2028	154	0.35			2.2	-6.3
2029	0	0.25			2.3	-6.8

Table 30: Alternative Resource Plan 23

	Plan 23: Install Prop C Wind and Solar, CT's, Additional 500 MW Wind Above Prop C beginning in 2012, All DSM, and Coal w/CCS						
Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Coal with CCS	Demand Response Annualized	Energy Efficiency Annualized
2009	0					5.6	0.3
2010	0					16.7	9.2
2011	0	1.79				21.4	10.9
2012	0	0.03		100		13.4	11.9
2013	0	0.02				9.0	10.9
2014	0	2.80				3.3	10.2
2015	0	0.05				1.5	2.9
2016	0	0.11	100	100		1.7	2.7
2017	0	0.08		200		1.7	1.6
2018	0	5.02	100			1.6	2.0
2019	0	0.15				1.7	1.8
2020	0	0.20			150	1.8	-0.4
2021	0	5.33	100			1.8	-1.0
2022	0	0.24				1.8	-1.7
2023	0	0.24	100			1.8	-2.0
2024	0	0.32		100		2.0	-2.4
2025	0	0.26				2.2	-4.8
2026	0	0.32				2.2	-5.1
2027	0	0.32				2.3	-5.3
2028	154	0.35				2.2	-6.3
2029	0	0.25				2.3	-6.8

Table 31: Alternative Resource Plan 24

	Plan 24: Install Prop C Wind and Solar, CT's, Additional 500 MW Wind Above Prop C beginning in 2012, All DSM, Coal w/CCS, and Sibley 1&2 converted to 10% biomass usage						
Date	Install CT's	Install Solar	Install Prop C Wind	Install Other Wind	Coal with CCS	Demand Response Annualized	Energy Efficiency Annualized
2009	0					5.6	0.3
2010	0					16.7	9.2
2011	0	1.79				21.4	10.9
2012	0	0.03		100		13.4	11.9
2013	0	0.02				9.0	10.9
2014	0	2.80				3.3	10.2
2015	0	0.05				1.5	2.9
2016	0	0.11	100	100		1.7	2.7
2017	0	0.08		200		1.7	1.6
2018	0	5.02	100			1.6	2.0
2019	0	0.15				1.7	1.8
2020	0	0.20			150	1.8	-0.4
2021	0	5.33	100			1.8	-1.0
2022	0	0.24				1.8	-1.7
2023	0	0.24	100			1.8	-2.0
2024	0	0.32		100		2.0	-2.4
2025	0	0.26				2.2	-4.8
2026	0	0.32				2.2	-5.1
2027	0	0.32				2.3	-5.3
2028	154	0.35				2.2	-6.3
2029	0	0.25				2.3	-6.8

SECTION 5: RISK ANALYSIS AND STRATEGIC SELECTION

5.1 SCHEDULE OF DSM PROGRAMS

22.070 (9) (B) A schedule and description of ongoing and planned demand-side programs, program evaluations and research activities

As noted on the teleconference meeting on October 15th, 2009 Figure 1 and Figure 2 in Appendix 7A: Implementation Plan and Acquisition Strategy were incorrect. The corrected figures are shown in Figure 1 and Figure 2 below:

Figure 1: Existing Energy Efficiency and Demand Response Programs

	Budgets approved and tariffs filed	Program Launch	EM&V Report Due
Existing Energy Efficiency Programs - Residential			
Change a Light	Jan-07	Jan-07	Jul-09
Home Performance with Energy Star®	Apr-08	Apr-08	Oct-10
Low Income Weatherization	Mar-08	Mar-08	Sep-10
Low Income Affordable New Homes	Mar-08	Mar-08	Sep-10
Energy Star New Homes	Mar-08	Mar-08	Sep-10
On-Line Energy Information and Analysis	Oct-08	Oct-08	Apr-11
Cool Homes	Oct-08	Oct-08	Apr-11
Existing Energy Efficiency Programs - C&I			
Building Operator Certification	Mar-08	Mar-08	Sep-10
Energy Audit and Energy Savings Measures	Apr-08	Apr-08	Oct-10
Existing Demand Response Programs			
Energy Optimizer	Oct-08	Oct-08	Apr-11
MPower	Oct-08	Oct-08	Apr-11

Figure 2: Proposed Energy Efficiency and DSM Research Activities

	Programs in IRP	Budgets approved and tariffs filed	Program Launch	EM&V Report Due
Proposed Energy Efficiency Programs - Residential				
Appliance Turn In	Jan-10	Jan-10	Apr-10	Jul-12
Energy Use Monitor (Blue Line)	Jan-10	Jan-10	Apr-10	Jul-12
Cool Homes - Enhanced	Jan-10	Jan-10	Apr-10	Jul-12
Home Performance with Energy Star® - Enhanced	Jan-10	Jan-10	Apr-10	Jul-12
On-Line Energy Information and Analysis Plus	Jan-10	Jan-10	Apr-10	Jul-12
Proposed Energy Efficiency Programs - Commercial & Industrial				
Custom & RFP Rebate	Jan-10	Jan-10	Apr-10	Jul-12
Prescriptive Rebate	Jan-10	Jan-10	Apr-10	Jul-12
		Research Completed		
Research Activities				
Evaluation of Financing Efficiency Programs		Oct-09		
Evaluation of Street Lighting and Other Outdoor Lighting Programs		Oct-10		
Multi-family Dwelling Energy Efficiency Study		Feb-10		
Time of Use, Peak Pricing and Demand Response Tariff Evaluation		Jun-10		

5.2 SMARTGRID

Also noted on the teleconference meeting on October 15th, 2009 the August 5th filing did not include any reference to Smart Grid technology. Prior to the August 5th filing of the GMO IRP, an internal discussion was held to decide whether to include information regarding SmartGrid initiatives. The concern was that current SmartGrid initiatives are within the KCP&L service territory, not the GMO service territory. After the October 15th teleconference with Parties, the following information is being submitted - noting that the information is based upon current KCP&L initiatives but could extend to GMO in the future:

KCP&L is proposing a five year SmartGrid Demonstration Project that truly creates an end-to-end SmartGrid – from SmartGeneration to SmartEnd-Use – built around a major SmartSubstation. It introduces new technologies, business models, applications, and protocols that will be tested and refined in this "laboratory". The project will include detailed analysis and testing to demonstrate the benefits of optimizing energy and information flows and utility operations across supply and demand resources, T&D operations, and customer end-use programs. Done successfully, the demonstration project will quantify smart grid costs, benefits and cost-effectiveness, verify SmartGrid technology viability, and validate new SmartGrid business models, at a scale that can be readily adapted and replicated to both the KCP&L and GMO service areas.

Additional SmartGrid information has been attached as Appendix 3.

5.3 RANGES OF CRITICAL UNCERTAIN FACTORS

22.070 (10) (C) A specification of the ranges or combinations of outcomes for the critical uncertain factors that define the limits within which the preferred resource plan is judged to be appropriate and an explanation of how these limits were determined;

At the Integrated Resource Analysis and Risk Analysis and Strategic Selection meeting held October 2nd, 2009 in Jefferson City, a request was made to provide additional discussion regarding determination of ranges for the critical uncertain factors. The following is an additional discussion:

In order to calculate ranges of critical uncertain factors, a scenario in which a plan other than the Preferred Plan would be the lowest-NPVRR plan. To perform this calculation the mid-case scenario would be compared to the scenario which the critical uncertain factor alone was extreme. Due to the robust nature of the Preferred Plan, it was lowest-NPVRR on many of the scenarios in which only one Critical Uncertain Factor was at an extreme value.

To allow for calculation of ranges to occur, scenarios had to be selected in which an alternative resource plan was lowest-NPVRR. The company selected scenarios that were representative of the extreme case of the critical uncertain factor but included a different lowest-NPVRR Alternative Resource Plan other than the Preferred Plan.

Table 32 below documents which scenarios contain the isolated extreme case of the Critical Uncertain Factor and which scenario was used in the calculations.

Table 32: Critical Uncertain Factor Sensitivity vs. Scenario

Sensitivity	Isolated CUF	Utilized Scenario
High CO2	Scenario 23	Scenario 21
High Natural Gas	Scenario 28	Scenario 28
High Load Growth	Scenario 7	Scenario 4
High Construction	Scenario 16	Scenario 18
High Coal	Scenario 31	Scenario 26
High Interest	Scenario 32	Scenario 37
Low CO2	Scenario 43	Scenario 42
Low Natural Gas	Scenario 38	Scenario 37
Low Load Growth	Scenario 59	Scenario 61
Low Construction	Scenario 50	Scenario 47
Low Coal	Scenario 35	Scenario 29

5.4 CONTINGENCY OPTIONS

22.070 (10) (D) A set of contingency options that are judged to be appropriate responses to extreme outcomes of the critical uncertain factors and an explanation of why these options are judged to be appropriate responses to the specified outcomes

in Appendix 7A: the Implementation Plan and Acquisition Strategy included the following table to highlight which alternative plans may become the low NPVRR plan in the event of an extreme change in a critical uncertain factor value:

Table 33: Original Alternative Plans for Each Critical Uncertain Factor

Sensitivity	Plan06	Plan07	Plan21	Plan23	Plan24
High CO2			X		X
High Gas			X	X	X
High Load Growth				X	X
High Construction	X	X			X
High Coal					X
High Interest	X	X			X
Low CO2	X	X			
Low Gas	X	X			
Low Load Growth		X			X
Low Construction		X	X		
Low Coal		X		X	

This table was meant to be qualitative, showing which plans would be reviewed as a critical uncertain factor value became extreme.

Parties requested that the table be modified to include the effects of the Preferred Plan and to quantify relative frequency of a plan being lowest-NPVRR under extreme cases. The modified table is shown below:

Table 34: Alternative Plans for Each Critical Uncertain Factor

Sensitivity [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Total
High CO2	-	-	9.1%	63.2%	-	27.7%	100.0%
High Gas	-	-	9.1%	27.0%	36.2%	27.7%	100.0%
High Load Growth	-	-	-	81.3%	9.1%	9.6%	100.0%
High Construction	9.1%	9.1%	-	81.3%	-	0.6%	100.0%
High Coal	-	-	-	81.3%	-	18.7%	100.0%
High Interest	8.3%	8.3%	-	82.9%	-	0.5%	100.0%
Low CO2	26.9%	1.1%	-	72.0%	-	-	100.0%
Low Gas	9.0%	28.0%	-	63.0%	-	-	100.0%
Low Load Growth	-	10.1%	-	80.9%	-	9.0%	100.0%
Low Construction	-	1.1%	18.0%	80.9%	-	-	100.0%
Low Coal	-	1.1%	-	89.9%	9.0%	-	100.0%

5.5 MONITORING CRITICAL UNCERTAIN FACTORS

22.070 (10) (E) A process for monitoring the critical uncertain factors on a continuous basis and reporting significant changes in a timely fashion to those managers or officers who have the authority to direct the implementation of contingency options when the specified limits for uncertain factors are exceeded.

At the Integrated Resource Analysis and Risk Analysis and Strategic Selection meeting held October 2nd, 2009 in Jefferson City, a request was made to further explain the process used to monitor Critical Uncertain Factors. The following is the expanded explanation:

In the course of reviewing the long term value of a Critical Uncertain Factor, if the Energy Resource Management (ERM) department has determined that its value has exceeded the range under which the Preferred Plan would still be optimal, the ERM department will initiate an update of the Integrated Analysis. The Critical Uncertain Factor will be adjusted to its new level while all other Critical Uncertain Factors will be updated with new forecasts.

The update of the Integrated Analysis will compare the Preferred Plan to the pre-determined alternative resource plans listed in Table 9, Alternative Plans for

Each Uncertain Factor, in Appendix 7A, Implementation Plan and Resource Acquisition Strategy.

Should the results of the updated Integrated Analysis show that the Preferred Plan remains optimal, the ERM department will communicate its findings to the company's Senior Strategy Team(SST). If an Alternative Resource Plan is found to be optimal, the ERM department will communicate its findings to the SST and to the Regulatory Department. The Regulatory Department will provide guidance on the method and requirements to communicate this information to parties.

Based upon the differences inherent within the plans, SST, ERM, Regulatory and Parties may require varying levels of documenting the changes to the Preferred Plan. For example, if the change to the Preferred Plan occurs within the time-frame of the Implementation Plan and Resource Acquisition Strategy, a full review of the IRP may be required by Parties. If the changes occur in the later years of the IRP timeframe, Parties may simple request documentation of the updated Integrated Analysis.

APPENDIX 1

THIS ENTIRE DOCUMENT IS HIGHLY CONFIDENTIAL AND NOT AVAILABLE TO THE PUBLIC

ORIGINAL FILED UNDER SEAL

Kansas City Power & Light-Greater Missouri Operations

Renewable Energy System Performance Analysis

Cost Effectiveness Screening

Eighteen renewable energy technologies were evaluated for their cost effectiveness. The field modeling of these renewable technologies was completed by Mr. Bob Solger of "The Energy Savings Store" (TESS) based on his experience having sized and installed many of these technologies in the Kansas City area. His results, summarized in a report dated June 01, 2009, were used as inputs in the DSMore cost effectiveness modeling tool.

The technologies analyzed were:

- Solar Photovoltaic (PV) System 2.0 kW – Northeast Kansas City
- Solar PV System 3.2 kW – Northeast Kansas City
- Solar PV System 2.0 kW – Southwest Overland Park, KS
- Solar PV System 3.2 kW – Southwest Overland Park
- Solar Photovoltaic (PV) System 2.0 kW – St. Joseph, MO
- Solar PV System 3.2 kW – St. Joseph, MO
- Solar PV System 2.0 kW – Sedalia, MO
- Solar PV System 3.2 kW – Sedalia, MO

- Wind Turbine 2.4 kW System Northeast
- Wind Turbine 6 kW System Northeast
- Wind Turbine 2.4 kW System Southwest
- Wind Turbine 6 kW System Southwest
- Wind Turbine 2.4 kW System Sedalia
- Wind Turbine 6 kW System Sedalia
- Wind Turbine 2.4 kW System St. Joseph
- Wind Turbine 6 kW System St. Joseph

- Solar Hot Water System – All areas
- Solar Air Heating System – All areas

All renewable energy technologies were applied to a residential single family home. The PV and Wind technologies were modeled assuming that any excess power generated from the system and not needed by the home would be sold back to the utility by reversing the meter (net metering).

The value of renewable energy produced and consumed by the customer is equal to the value of the retail kWh rate. Four different residential tariff rates were used in the DSMore screening evaluations; 1) KCP&L-GMO L&P, 2) KCP&L-GMO MPS, 3) KCP&L KS and 4) KCP&L MO.

Utility avoided costs included avoided energy, generation capacity, and transmission and distribution (T&D) capacity. Avoided generation capacity was valued at $97 per kW-yr. KCP&L-GMO requested and received a waiver to use the levelized cost of a combustion turbine for avoided generation capacity. Avoided T&D was valued at $25 per kW-yr for KCP&L and $153 per kW-yr for KCP&L-GMO.

Load summaries by hour were generated for these technologies indicating when the power was generated, used or sold back to the utility. These load summaries were then averaged across the year by hour to create load curves for the DSMore model to use. Two examples are shown below.

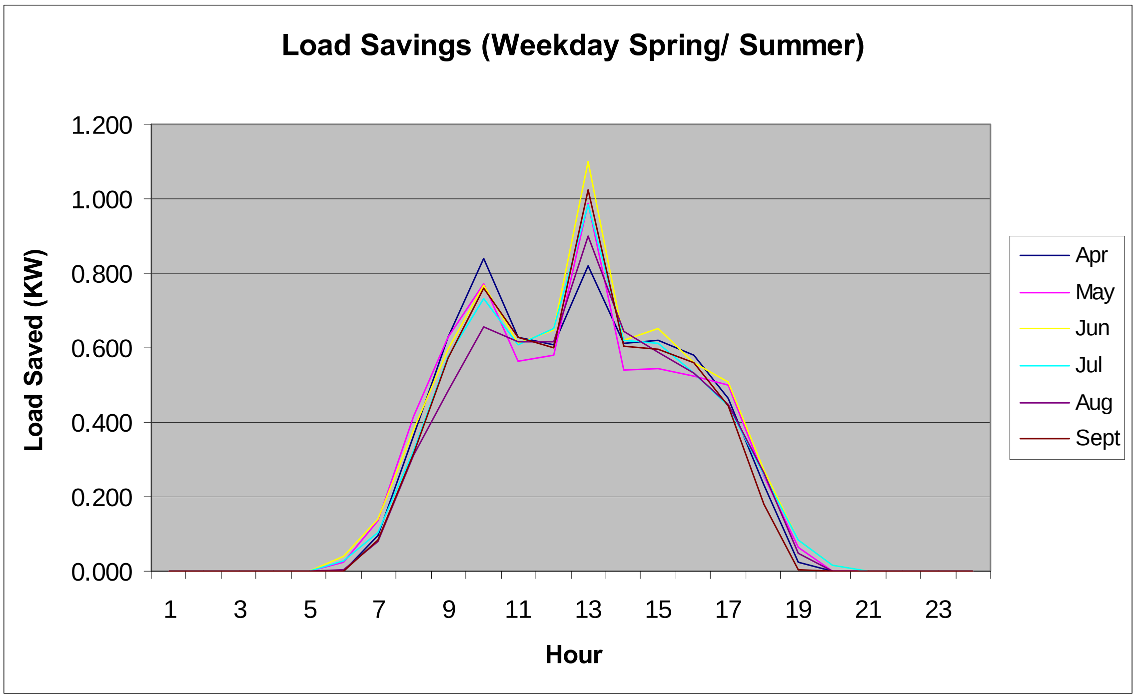

Figure 1: PV 2.0 South – Savings

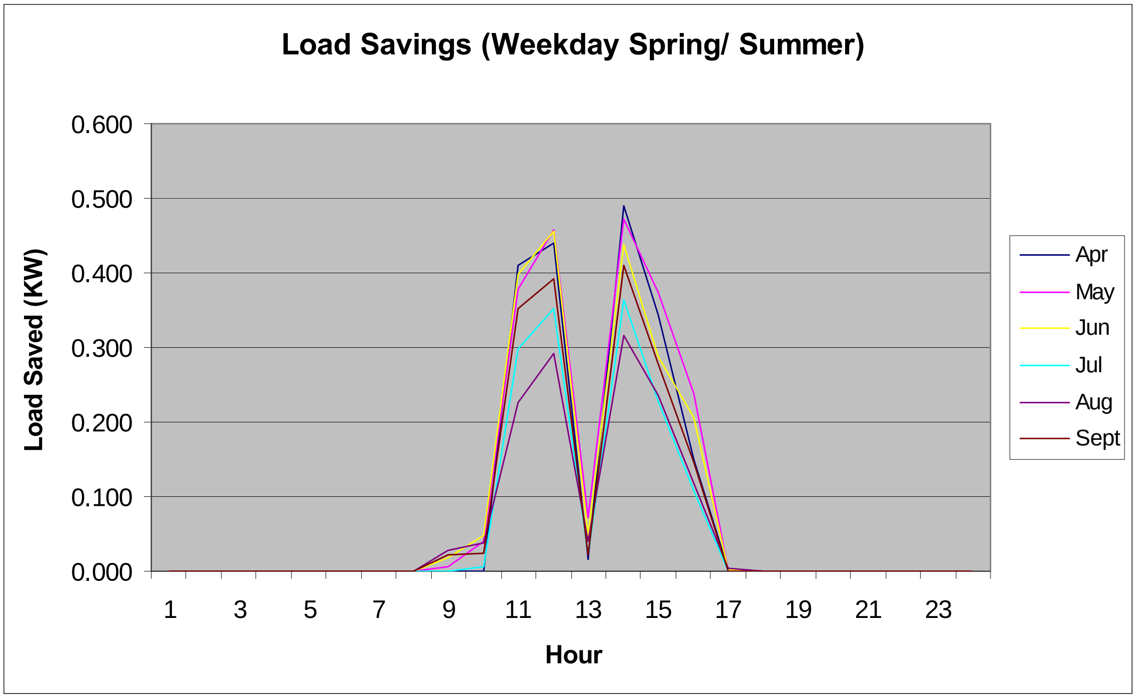

Figure 2: PV 2.0 South – Buy Back

To run the DSMore model for the PV and Wind technologies and reflect the value from both the saved energy at the home by using the generated power (avoiding purchasing kWh from the utility) and the utility "buy back" portion of the energy generated (kWh fed back through the meter), DSMore was run twice.

For the first run, the "buy back" mode, DSMore uses the generated load curve for the kWh fed back into the grid (see Figure 2 above). This modeling generated the retail value to the customer for that reversal of the meter and the utility avoided cost for the amount of energy fed back into the meter. The customer value of this net metering or "buy back" sale is $0.023 per kWh for KCP&L customers and $0.035 per kWh for KCP&L-GMO customers.

The second run of the model uses the load curve depicting the energy "saved" by the customer (see Figure 1 above) or the amount of kWh that customer did not have to buy from the utility to fulfill his internal needs. This represents the value to the customer of the avoided retail energy not purchased.

The Probable Environmental Benefits Test (PEBT) as defined in MO 4 CSR 240-22.050 (3), "Cost-Effectiveness Screening of End-Use Measures", was used to evaluate each of the renewable energy technologies. The DSMore model evaluates load, cost and benefits on an hourly basis. Inputs into this model include residential customer hourly load profiles, hourly net metering sales to the utility by the customer, and the net hourly energy production of the renewable energy technology. Outputs from the DSMore model include annual energy and capacity savings in kWh and kW, annual customer costs, annual utility avoided costs, annual utility lost revenue and environmental cost savings.

KCP&L-GMO requested and was granted a waiver to use the DSMore model for screening purposes. No program administrative or delivery costs were included in the PEBT screening.

For the Solar Domestic Hot Water systems (SDHW) and the Space Heat systems (SH) DSMore was again used to analyze the technologies for cost effectiveness. For these technologies there is no “buy-back” to the utility grid system. These are thermal technologies so they only affect the thermal loads. Consequently DSMore only needed to be run once to get the results and these results were applied against the standard load curve of the home to get the “savings” from these technologies.

Table 1 below is a summary of the screening results for each renewable energy technology. None of the technologies evaluated passed the PEBT screening test. Detailed screening results for each technology are in shown in Appendix A.

Table 1: Renewable Energy System Performance

Measure Description	Measure Cost	KCP&L, KCP&L GMO Incentive Payment	Measure Life (Years)	Probable Environmental Benefits Test	Annual Energy Savings, kWh	Net Metering Sales, kWh	Total Energy Production, kWh	Summer Co-Incident demand reduction, kW	NPV Total Utility Avoided Cost	NPV Environmental Benefits
Solar PV System Analysis 2.0 KW - Northeast Kansas City	$ 15,000	$ 4,000	20	0.29	2,147	624	2,770	0.59	$ 2,700	$ 324
Solar PV System Analysis 2.0 KW - Southwest Kansas City	$ 15,000	$ 4,000	20	0.29	2,114	598	2,712	0.56	$ 2,630	$ 319
Solar PV System Analysis 2.0 KW - St. Joseph	$ 15,000	$ 4,000	20	0.37	2,119	609	2,728	0.56	$ 3,455	$ 319
Solar PV System Analysis 2.0 KW - Sedalia	$ 15,000	$ 4,000	20	0.37	2,121	598	2,719	0.57	$ 3,464	$ 320
Solar PV System Analysis 3.2 KW - Northeast Kansas City	$ 21,000	$ 6,400	20	0.30	2,793	1,675	4,469	0.70	$ 3,781	$ 420
Solar PV System Analysis 3.2 KW - Southwest Kansas City	$ 21,000	$ 6,400	20	0.29	2,747	1,615	4,362	0.68	$ 3,696	$ 414
Solar PV System Analysis 3.2 KW - St. Joseph	$ 21,000	$ 6,400	20	0.36	2,751	1,630	4,381	0.68	$ 4,562	$ 415
Solar PV System Analysis 3.2 KW - Sedalia	$ 21,000	$ 6,400	20	0.36	2,758	1,613	4,371	0.69	$ 4,580	$ 416
Wind Turbine Analysis 2.4 kW System Northeast of K.C.	$ 15,000	$ 4,000	20	0.29	2,503	376	2,879	0.37	$ 2,628	$ 376
Wind Turbine Analysis 2.4 kW System Southwest of K.C.	$ 15,000	$ 4,000	20	0.29	2,573	458	3,031	0.28	$ 2,618	$ 386
Wind Turbine Analysis 2.4 kW System Sedalia	$ 15,000	$ 4,000	20	0.27	2,289	321	2,609	0.24	$ 2,489	$ 343
Wind Turbine Analysis 2.4 kW System St. Joseph	$ 15,000	$ 4,000	20	0.31	2,599	439	3,039	0.27	$ 2,816	$ 390
Wind Turbine Analysis 6 kW System Northeast of K.C.	$ 45,000	$ 11,250	20	0.26	6,027	4,197	10,225	0.64	$ 7,085	$ 906
Wind Turbine Analysis 6 kW System Southwest of K.C.	$ 45,000	$ 11,250	20	0.27	6,190	4,503	10,693	0.66	$ 7,306	$ 930
Wind Turbine Analysis 6 kW System Sedalia	$ 45,000	$ 11,250	20	0.26	5,736	3,650	9,387	0.61	$ 6,993	$ 862
Wind Turbine Analysis 6 kW System St. Joseph	$ 45,000	$ 11,250	20	0.29	6,188	4,523	10,711	0.64	$ 7,604	$ 930
Solar Hot Water System Analysis, KCP&L MO	$ 9,500	$ 4,750	15	0.70	4,635	-	4,635	0.61	$ 4,096	$ 579
Solar Hot Water System Analysis, KCP&L KS	$ 9,500	$ 4,750	15	0.70	4,635	-	4,635	0.61	$ 4,096	$ 579
Solar Hot Water System Analysis, St. Joseph	$ 9,500	$ 4,750	15	0.91	4,635	-	4,635	0.61	$ 5,503	$ 579
Solar Hot Water System Analysis, Sedalia	$ 9,500	$ 4,750	15	0.91	4,635	-	4,635	0.61	$ 5,503	$ 579
Solar Air Heating System Analysis, KCP&L MO	$ 4,900	$ 2,450	15	0.43	2,807	-	2,807	-	$ 1,713	$ 370
Solar Air Heating System Analysis, KCP&L KS	$ 4,900	$ 2,450	15	0.42	2,807	-	2,807	-	$ 1,710	$ 370
Solar Air Heating System Analysis, St. Joseph	$ 4,900	$ 2,450	15	0.43	2,807	-	2,807	-	$ 1,713	$ 370
Solar Air Heating System Analysis, Sedalia	$ 4,900	$ 2,450	15	0.42	2,807	-	2,807	-	$ 1,710	$ 370

APPENDIX A

Detailed screening results

** Highly Confidential **

Solar PV KCPL 2.0KW Northeast

Utility Avoided Cost			
Avoided Capacity	$	712.00	
Avoided T&D	$	183.50	
Avoided Energy @ market	$	1,542.55	
Avoided energy on net metering purchase		262.28	
Total Avoided Cost	**$**	**2,700.33**	(1)
Environmental Benefits		**323.60**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		4,000.00	
Total		**4,000.00**	(3)
Customer Expense	$	15,000.00	(4)
Rebate	$	(4,000.00)	(5)
Grid sales Benefit	$	(179.01)	(6)
Renewable Energy Tax Credit	$	(4,500.00)	(7)
Net Customer Cost	**$**	**6,320.99**	(8)
Probable Environmental Benefits Test		**0.29**	
(1 + 2) / (3 + 8)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Total annual solar PV production, kWh		2,770	kW-hr
Annual grid sales, kWh		624	kW-hr
Annual Energy Savings		2,147	kW-hr
Net Metering Buyback rate	$	0.0230	per kW-hr

** Highly Confidential **

Solar PV KCPL 2.0KW Southwest

Utility Avoided Cost			
Avoided Capacity	$	682.22	
Avoided T&D	$	181.02	
Avoided Energy @ market	$	1,516.43	
Avoided energy on net metering purchase		250.61	
Total Avoided Cost	**$**	**2,630.28**	(1)
Environmental Benefits		**318.69**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		4,000.00	(3)
Total		**4,000.00**	
Customer Expense	$	15,000.00	(4)
Rebate	$	(4,000.00)	(5)
Grid sales Benefit	$	(188.73)	(6)
Renewable Energy Tax Credit	$	(4,500.00)	(7)
Net Customer Cost	**$**	**6,311.27**	(8)
Probable Environmental Benefits Test		**0.29**	
(1 + 2) / (3 + 8)			

$ / kWh	
$ 0.00175	SOx
$ 0.00187	NOx
$ 0.01000	CO2

Total annual solar PV production, kWh		2,712	kW-hr
Annual grid sales, kWh		598	kW-hr
Annual Energy Savings		2,114	kW-hr
Net Metering Buyback rate	$	0.0230	per kW-hr

** Highly Confidential **

Solar PV KCPL-GMO 2.0KW Sedalia, MO

Utility Avoided Cost			
Avoided Capacity	$	688.12	
Avoided T&D	$	1,090.26	
Avoided Energy @ market	$	1,523.97	
Avoided energy on net metering purchase		161.61	
Total Avoided Cost	**$**	**3,463.96**	(1)
Environmental Benefits		**319.82**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		4,000.00	(3)
Total		**4,000.00**	
Customer Expense	$	15,000.00	(4)
Rebate	$	(4,000.00)	(5)
Grid sales Benefit	$	(275.04)	(6)
Renewable Energy Tax Credit	$	(4,500.00)	(7)
Net Customer Cost	**$**	**6,224.96**	(8)
Probable Environmental Benefits Test		**0.37**	
(1 + 2) / (3 + 8)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Total annual solar PV production, kWh		2,719	kW-hr
Annual grid sales, kWh		598	kW-hr
Annual Energy Savings		2,121	kW-hr
Net Metering Buyback rate	$	0.0350	per kW-hr

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Solar PV KCPL-GMO 2.0KW St. Joseph, MO

Utility Avoided Cost			
Avoided Capacity	$	684.17	
Avoided T&D	$	1,084.63	
Avoided Energy @ market	$	1,521.55	
Avoided energy on net metering purchase		164.31	
Total Avoided Cost	**$**	**3,454.66**	(1)
Environmental Benefits		**319.44**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		4,000.00	(3)
Total		**4,000.00**	
Customer Expense	$	15,000.00	(4)
Rebate	$	(4,000.00)	(5)
Grid sales Benefit	$	(280.37)	(6)
Renewable Energy Tax Credit	$	(4,500.00)	(7)
Net Customer Cost	**$**	**6,219.63**	(8)
Probable Environmental Benefits Test		**0.37**	
(1 + 2) / (3 + 8)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Total annual solar PV production, kWh		2,728	kW-hr
Annual grid sales, kWh		609	kW-hr
Annual Energy Savings		2,119	kW-hr
Net Metering Buyback rate	$	0.0350	per kW-hr

** Highly Confidential **

Solar PV KCPL 3.2 KW Northeast

Utility Avoided Cost			
Avoided Capacity	$	846.77	
Avoided T&D	$	226.19	
Avoided Energy @ market	$	2,001.35	
Avoided energy on net metering purchase		706.92	
Total Avoided Cost	**$**	**3,781.23**	(1)
Environmental Benefits		**419.76**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		6,400.00	
Total		**6,400.00**	(3)
Customer Expense	$	21,000.00	(4)
Rebate	$	(6,400.00)	(5)
Grid sales Benefit	$	(479.74)	(6)
Renewable Energy Tax Credit	$	(6,300.00)	(7)
Net Customer Cost	**$**	**7,820.26**	(8)
Probable Environmental Benefits Test		**0.30**	
(1 + 2) / (3 + 8)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Total annual solar PV production, kWh		4,469	kW-hr
Annual grid sales, kWh		1,675	kW-hr
Annual Energy Savings		2,793	kW-hr
Net Metering Buyback rate	$	0.0230	per kW-hr

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Solar PV KCPL 3.2KW Southwest

Utility Avoided Cost			
Avoided Capacity	$	828.69	
Avoided T&D	$	213.58	
Avoided Energy @ market	$	1,972.46	
Avoided energy on net metering purchase		681.75	
Total Avoided Cost	**$**	**3,696.47**	(1)
Environmental Benefits		**414.27**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		6,400.00	
Total		**6,400.00**	(3)
Customer Expense	$	21,000.00	(4)
Rebate	$	(6,400.00)	(5)
Grid sales Benefit	$	(510.05)	(6)
Renewable Energy Tax Credit	$	(6,300.00)	(7)
Net Customer Cost	**$**	**7,789.95**	(8)
Probable Environmental Benefits Test		**0.29**	
(1 + 2) / (3 + 8)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Total annual solar PV production, kWh		4,362	kW-hr
Annual grid sales, kWh		1,615	kW-hr
Annual Energy Savings		2,747	kW-hr
Net Metering Buyback rate	$	0.0230	per kW-hr

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Solar PV KCPL-GMO 3.2 KW Sedalia, MO

Utility Avoided Cost			
Avoided Capacity	$	834.42	
Avoided T&D	$	1,323.33	
Avoided Energy @ market	$	1,982.25	
Avoided energy on net metering purchase		440.24	
Total Avoided Cost	**$**	**4,580.23**	(1)
Environmental Benefits		**415.85**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		6,400.00	
Total		**6,400.00**	(3)
Customer Expense	$	21,000.00	(4)
Rebate	$	(6,400.00)	(5)
Grid sales Benefit	$	(775.35)	(6)
Renewable Energy Tax Credit	$	(6,300.00)	(7)
Net Customer Cost	**$**	**7,524.65**	(8)
Probable Environmental Benefits Test		**0.36**	
(1 + 2) / (3 + 8)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Total annual solar PV production, kWh		4,371	kW-hr
Annual grid sales, kWh		1,613	kW-hr
Annual Energy Savings		2,758	kW-hr
Net Metering Buyback rate	$	0.0350	per kW-hr

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Solar PV KCPL-GMO 3.2 KW St. Joseph, MO

Utility Avoided Cost			
Avoided Capacity	$	827.74	
Avoided T&D	$	1,313.73	
Avoided Energy @ market	$	1,976.78	
Avoided energy on net metering purchase		443.92	
Total Avoided Cost	**$**	**4,562.17**	(1)
Environmental Benefits		**414.81**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		6,400.00	
Total		**6,400.00**	(3)
Customer Expense	$	21,000.00	(4)
Rebate	$	(6,400.00)	(5)
Grid sales Benefit	$	(750.81)	(6)
Renewable Energy Tax Credit	$	(6,300.00)	(7)
Net Customer Cost	**$**	**7,549.19**	(8)
Probable Environmental Benefits Test		**0.36**	
(1 + 2) / (3 + 8)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Total annual solar PV production, kWh		4,381	kW-hr
Annual grid sales, kWh		1,630	kW-hr
Annual Energy Savings		2,751	kW-hr
Net Metering Buyback rate	$	0.0350	per kW-hr

** Highly Confidential **

Wind Turbine KCPL 2.4KW Northeast

Utility Avoided Cost			
Avoided Capacity	$	442.89	
Avoided T&D	$	294.51	
Avoided Energy @ market	$	1,743.21	
Avoided energy on net metering purchase		147.55	
Total Avoided Cost	**$**	**2,628.16**	(1)
Environmental Benefits		**375.77**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		4,000.00	
Total		**4,000.00**	(3)
Customer Expense	$	15,000.00	(4)
Rebate	$	(4,000.00)	(5)
Grid sales Benefit	$	(107.36)	(6)
Renewable Energy Tax Credit	$	(4,500.00)	(7)
Net Customer Cost	**$**	**6,392.64**	(8)
Probable Environmental Benefits Test		**0.29**	
(1 + 2) / (3 + 8)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Total annual Wind production, kWh		2,879	kW-hr
Annual grid sales, kWh		376	kW-hr
Annual Energy Savings		2,503	kW-hr
Net Metering Buyback rate	$	0.0230	per kW-hr

** Highly Confidential **

Wind Turbine KCPL 2.4KW Southwest

Utility Avoided Cost			
Avoided Capacity	$	342.73	
Avoided T&D	$	313.68	
Avoided Energy @ market	$	1,781.41	
Avoided energy on net metering purchase		180.64	
Total Avoided Cost	**$**	**2,618.45**	(1)
Environmental Benefits		**386.05**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		4,000.00	(3)
Total		**4,000.00**	
Customer Expense	$	15,000.00	(4)
Rebate	$	(4,000.00)	(5)
Grid sales Benefit	$	(144.40)	(6)
Renewable Energy Tax Credit	$	(4,500.00)	(7)
Net Customer Cost	**$**	**6,355.60**	(8)
Probable Environmental Benefits Test		**0.29**	
(1 + 2) / (3 +8)			

$ / kWh	
$ 0.00175	SOx
$ 0.00187	NOx
$ 0.01000	CO2

Total annual Wind production, kWh		3,031	kW-hr
Annual grid sales, kWh		458	kW-hr
Annual Energy Savings		2,573	kW-hr
Net Metering Buyback rate	$	0.0230	per kW-hr

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Wind Turbine KCPL-GMO 2.4KW Sedalia, MO

Utility Avoided Cost			
Avoided Capacity	$	294.59	
Avoided T&D	$	538.33	
Avoided Energy @ market	$	1,577.96	
Avoided energy on net metering purchase		78.01	
Total Avoided Cost	**$**	**2,488.90**	(1)
Environmental Benefits		**343.14**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		4,000.00	(3)
Total		**4,000.00**	
Customer Expense	$	15,000.00	(4)
Rebate	$	(4,000.00)	(5)
Grid sales Benefit	$	(152.71)	(6)
Renewable Energy Tax Credit	$	(4,500.00)	(7)
Net Customer Cost	**$**	**6,347.29**	(8)
Probable Environmental Benefits Test		**0.27**	
(1 + 2) / (3 + 8)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Total annual Wind production, kWh		2,609	kW-hr
Annual grid sales, kWh		321	kW-hr
Annual Energy Savings		2,289	kW-hr
Net Metering Buyback rate	$	0.0350	per kW-hr

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Wind Turbine KCPL-GMO 2.4KW St. Joseph, MO

Utility Avoided Cost			
Avoided Capacity	$	324.97	
Avoided T&D	$	596.52	
Avoided Energy @ market	$	1,788.47	
Avoided energy on net metering purchase		106.04	
Total Avoided Cost	**$**	**2,816.00**	(1)
Environmental Benefits		**389.81**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		4,000.00	(3)
Total		**4,000.00**	
Customer Expense	$	15,000.00	(4)
Rebate	$	(4,000.00)	(5)
Grid sales Benefit	$	(209.23)	(6)
Renewable Energy Tax Credit	$	(4,500.00)	(7)
Net Customer Cost	**$**	**6,290.77**	(8)
Probable Environmental Benefits Test		**0.31**	
(1 + 2) / (3 + 8)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Total annual Wind production, kWh		3,039	kW-hr
Annual grid sales, kWh		439	kW-hr
Annual Energy Savings		2,599	kW-hr
Net Metering Buyback rate	$	0.0350	per kW-hr

** Highly Confidential **

Wind Turbine KCPL 6KW Northeast

Utility Avoided Cost			
Avoided Capacity	$	782.11	
Avoided T&D	$	385.01	
Avoided Energy @ market	$	4,236.03	
Avoided energy on net metering purchase		1,681.45	
Total Avoided Cost	**$**	**7,084.60**	(1)
Environmental Benefits		**905.81**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		11,250.00	
Total		**11,250.00**	(3)
Customer Expense	$	45,000.00	(4)
Rebate	$	(11,250.00)	(5)
Grid sales Benefit	$	(1,199.88)	(6)
Renewable Energy Tax Credit	$	(13,500.00)	(7)
Net Customer Cost	**$**	**19,050.12**	(8)
Probable Environmental Benefits Test		**0.26**	
(1 + 2) / (3 + 8)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Total annual wind production, kWh		10,225	kW-hr
Annual grid sales, kWh		4,197	kW-hr
Annual Energy Savings		6,027	kW-hr
Net Metering Buyback rate	$	0.0230	per kW-hr

** Highly Confidential **

Wind Turbine KCPL 6KW Southwest

Utility Avoided Cost			
Avoided Capacity	$ 796.86		
Avoided T&D	$ 388.93		
Avoided Energy @ market	$ 4,327.97		
Avoided energy on net metering purchase	1,792.18		
Total Avoided Cost	**$ 7,305.95**	(1)	
Environmental Benefits	**930.42**	(2)	
Utility Program Cost			
Administration Costs	-		
Implementation / Participation Costs	-		
Incentives	11,250.00	(3)	
Total	**11,250.00**		
Customer Expense	$ 45,000.00	(4)	
Rebate	$ (11,250.00)	(5)	
Grid sales Benefit	$ (1,413.02)	(6)	
Renewable Energy Tax Credit	$ (13,500.00)	(7)	
Net Customer Cost	**$ 18,836.98**	(8)	
Probable Environmental Benefits Test	**0.27**		
(1 + 2) / (3 + 8)			

$ / kWh	
$ 0.00175	SOx
$ 0.00187	NOx
$ 0.01000	CO2

Total annual wind production, kWh	10,693	kW-hr
Annual grid sales, kWh	4,503	kW-hr
Annual Energy Savings	6,190	kW-hr
Net Metering Buyback rate	$ 0.0230	per kW-hr

** Highly Confidential **

Wind Turbine KCPL-GMO 6KW Sedalia, MO

Utility Avoided Cost			
Avoided Capacity	$	742.93	
Avoided T&D	$	1,346.65	
Avoided Energy @ market	$	4,002.90	
Avoided energy on net metering purchase		900.40	
Total Avoided Cost	**$**	**6,992.89**	(1)
Environmental Benefits		**861.95**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		11,250.00	(3)
Total		**11,250.00**	
Customer Expense	$	45,000.00	(4)
Rebate	$	(11,250.00)	(5)
Grid sales Benefit	$	(1,741.45)	(6)
Renewable Energy Tax Credit	$	(13,500.00)	(7)
Net Customer Cost	**$**	**18,508.55**	(8)
Probable Environmental Benefits Test		**0.26**	
(1 + 2) / (3 + 8)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Total annual wind production, kWh		9,387	kW-hr
Annual grid sales, kWh		3,650	kW-hr
Annual Energy Savings		5,736	kW-hr
Net Metering Buyback rate	$	0.0350	per kW-hr

** Highly Confidential **

Wind Turbine KCPL-GMO 6KW St. Joseph, MO

Utility Avoided Cost			
Avoided Capacity	$	777.32	
Avoided T&D	$	1,408.03	
Avoided Energy @ market	$	4,312.39	
Avoided energy on net metering purchase		1,106.53	
Total Avoided Cost	**$**	**7,604.28**	(1)
Environmental Benefits		**929.94**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		11,250.00	
Total		**11,250.00**	(3)
Customer Expense	$	45,000.00	(4)
Rebate	$	(11,250.00)	(5)
Grid sales Benefit	$	(2,158.39)	(6)
Renewable Energy Tax Credit	$	(13,500.00)	(7)
Net Customer Cost	**$**	**18,091.61**	(8)
Probable Environmental Benefits Test		**0.29**	
(1 + 2) / (3 + 8)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Total annual wind production, kWh		10,711	kW-hr
Annual grid sales, kWh		4,523	kW-hr
Annual Energy Savings		6,188	kW-hr
Net Metering Buyback rate	$	0.0350	per kW-hr

** Highly Confidential **

Solar Domestic Hot Water KCPL Northeast

Utility Avoided Cost			
Avoided Capacity	$	1,066.52	
Avoided T&D	$	412.24	
Avoided Energy @ market	$	2,616.97	
Total Avoided Cost	**$**	**4,095.73**	(1)
Environmental Benefits		**579.44**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		4,750.00	
Total		**4,750.00**	(3)
Customer Expense	$	9,500.00	(4)
Rebate	$	(4,750.00)	(5)
Renewable Energy Tax Credit	$	(2,850.00)	(6)
Net Customer Cost	**$**	**1,900.00**	(7)
Probable Environmental Benefits Test		**0.70**	
(1 + 2) / (3 +7)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Total annual energy savings, kWh	4,393	kW-hr
Co-Incident demand reduction, kW	0.64	kW

** Highly Confidential **

Solar Domestic Hot Water KCPL Southwest

Utility Avoided Cost			
Avoided Capacity	$	1,066.52	
Avoided T&D	$	412.24	
Avoided Energy @ market	$	2,616.97	
Total Avoided Cost	**$**	**4,095.73**	(1)
Environmental Benefits		**579.44**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		4,750.00	
Total		**4,750.00**	(3)
Customer Expense	$	9,500.00	(4)
Rebate	$	(4,750.00)	(5)
Renewable Energy Tax Credit	$	(2,850.00)	(7)
Net Customer Cost	**$**	**1,900.00**	(8)
Probable Environmental Benefits Test		**0.70**	
(1 + 2) / (3 + 8)			

$ / kWh	
$ 0.00175	SOx
$ 0.00187	NOx
$ 0.01000	CO2

Total annual energy savings, kWh	4,393	kW-hr
Co-Incident demand reduction, kW	0.64	kW

** Highly Confidential **

Solar Domestic Hot Water KCPL-GMO Sedalia, MO

Utility Avoided Cost		
Avoided Capacity	$ 1,066.52	
Avoided T&D	$ 1,819.60	
Avoided Energy @ market	$ 2,616.97	
Total Avoided Cost	**$ 5,503.09**	(1)
Environmental Benefits	**579.44**	(2)
Utility Program Cost		
Administration Costs	-	
Implementation / Participation Costs	-	
Incentives	4,750.00	
Total	**4,750.00**	(3)
Customer Expense	$ 9,500.00	(4)
Rebate	$ (4,750.00)	(5)
Renewable Energy Tax Credit	$ (2,850.00)	(6)
Net Customer Cost	**$ 1,900.00**	(7)
Probable Environmental Benefits Test	**0.91**	
(1 + 2) / (3 +7)		

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Total annual energy savings, kWh	4,393	kW-hr
Co-Incident demand reduction, kW	0.64	kW

** Highly Confidential **

Solar Domestic Hot Water KCPL-GMO St. Joseph, MO

Utility Avoided Cost			
Avoided Capacity	$	1,066.52	
Avoided T&D	$	1,819.60	
Avoided Energy @ market	$	2,616.97	
Total Avoided Cost	**$**	**5,503.09**	(1)
Environmental Benefits		**579.44**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		4,750.00	
Total		**4,750.00**	(3)
Customer Expense	$	9,500.00	(4)
Rebate	$	(4,750.00)	(5)
Renewable Energy Tax Credit	$	(2,850.00)	(6)
Net Customer Cost	**$**	**1,900.00**	(7)
Probable Environmental Benefits Test		**0.91**	
(1 + 2) / (3 +7)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Total annual energy savings, kWh	4,393	kW-hr
Co-Incident demand reduction, kW	0.64	kW

** Highly Confidential **

Solar Space Heat KCPL Northeast

Utility Avoided Cost			
Avoided Capacity	$	-	
Avoided T&D w OATT	$	85.47	
Avoided Energy @ market	$	1,624.37	
Total Avoided Cost	**$**	**1,709.85**	(1)
Environmental Benefits		**370.24**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		2,450.00	
Total		**2,450.00**	(3)
Customer Expense	$	4,900.00	(4)
Rebate	$	(2,450.00)	(5)
Net Customer Cost	**$**	**2,450.00**	(7)
Probable Environmental Benefits Test		**0.42**	
(1 + 2) / (3 +7)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Annual Energy Savings	2,807	kW-hr
Summer Co-Incident demand reduction	-	kW-hr

** Highly Confidential **

Solar Space Heat KCPL Southwest

Utility Avoided Cost			
Avoided Capacity	$	-	
Avoided T&D w OATT	$	85.47	
Avoided Energy @ market	$	1,624.37	
Total Avoided Cost	**$**	**1,709.85**	(1)
Environmental Benefits		**370.24**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		2,450.00	(3)
Total		**2,450.00**	
Customer Expense	$	4,900.00	(4)
Rebate	$	(2,450.00)	(5)
Grid sales Benefit	$	-	(6)
Net Customer Cost	**$**	**2,450.00**	(8)
Probable Environmental Benefits Test		**0.42**	
(1 + 2) / (3 + 4 + 5 +6 + 7)			

$ / kWh	
$ 0.00175	SOx
$ 0.00187	NOx
$ 0.01000	CO2

Annual Energy Savings	2,807	kW-hr
Summer Co-Incident demand reduction	-	kW-hr

** Highly Confidential **

Solar Space Heat KCPL-GMO Sedalia, MO

Utility Avoided Cost			
Avoided Capacity	$	-	
Avoided T&D w OATT	$	85.47	
Avoided Energy @ market	$	1,624.37	
Total Avoided Cost	**$**	**1,709.85**	(1)
Environmental Benefits		**370.24**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		2,450.00	
Total		**2,450.00**	(3)
Customer Expense	$	4,900.00	(4)
Rebate	$	(2,450.00)	(5)
Net Customer Cost	**$**	**2,450.00**	(7)
Probable Environmental Benefits Test		**0.42**	
(1 + 2) / (3 +7)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Annual Energy Savings	2,807	kW-hr
Summer Co-Incident demand reduction	-	kW-hr

** Highly Confidential **

Solar Space Heat KCPL-GMO St. Joseph, MO

Utility Avoided Cost			
Avoided Capacity	$	-	
Avoided T&D w OATT	$	85.35	
Avoided Energy @ market	$	1,627.99	
Total Avoided Cost	**$**	**1,713.34**	(1)
Environmental Benefits		**370.24**	(2)
Utility Program Cost			
Administration Costs		-	
Implementation / Participation Costs		-	
Incentives		2,450.00	(3)
Total		**2,450.00**	
Customer Expense	$	4,900.00	(4)
Rebate	$	(2,450.00)	(5)
Net Customer Cost	**$**	**2,450.00**	(7)
Probable Environmental Benefits Test		**0.43**	
(1 + 2) / (3 +7)			

$ / kWh	
0.00175	SOx
0.00187	NOx
0.01000	CO2

Annual Energy Savings	2,807	kW-hr
Summer Co-Incident demand reduction	-	kW-hr

Renewable Energy System Performance

Measure Description	Measure Cost	KCP&L, KCP&L GMO Incentive Payment	Measure Life (Years)	Probable Environmental Benefits Test	Annual Energy Savings, kWh	Net Metering Sales, kWh	Total Energy Production, kWh	Summer Co-Incident demand reduction, kW	NPV Total Utility Avoided Cost	NPV Environmental Benefits
Solar PV System Analysis 2.0 KW - Northeast Kansas City	$ 15,000	$ 4,000	20	0.29	2,147	624	2,770	0.59	$ 2,700	$ 324
Solar PV System Analysis 2.0 KW - Southwest Kansas City	$ 15,000	$ 4,000	20	0.29	2,114	598	2,712	0.56	$ 2,630	$ 319
Solar PV System Analysis 2.0 KW - St. Joseph	$ 15,000	$ 4,000	20	0.37	2,119	609	2,728	0.56	$ 3,455	$ 319
Solar PV System Analysis 2.0 KW - Sedalia	$ 15,000	$ 4,000	20	0.37	2,121	598	2,719	0.57	$ 3,464	$ 320
Solar PV System Analysis 3.2 KW - Northeast Kansas City	$ 21,000	$ 6,400	20	0.30	2,793	1,675	4,469	0.70	$ 3,781	$ 420
Solar PV System Analysis 3.2 KW - Southwest Kansas City	$ 21,000	$ 6,400	20	0.29	2,747	1,615	4,362	0.68	$ 3,696	$ 414
Solar PV System Analysis 3.2 KW - St. Joseph	$ 21,000	$ 6,400	20	0.36	2,751	1,630	4,381	0.68	$ 4,562	$ 415
Solar PV System Analysis 3.2 KW - Sedalia	$ 21,000	$ 6,400	20	0.36	2,758	1,613	4,371	0.69	$ 4,580	$ 416
Wind Turbine Analysis 2.4 kW System Northeast of K.C.	$ 15,000	$ 4,000	20	0.29	2,503	376	2,879	0.37	$ 2,628	$ 376
Wind Turbine Analysis 2.4 kW System Southwest of K.C.	$ 15,000	$ 4,000	20	0.29	2,573	458	3,031	0.28	$ 2,618	$ 386
Wind Turbine Analysis 2.4 kW System Sedalia	$ 15,000	$ 4,000	20	0.27	2,289	321	2,609	0.24	$ 2,489	$ 343
Wind Turbine Analysis 2.4 kW System St. Joseph	$ 15,000	$ 4,000	20	0.31	2,599	439	3,039	0.27	$ 2,816	$ 390
Wind Turbine Analysis 6 kW System Northeast of K.C.	$ 45,000	$ 11,250	20	0.26	6,027	4,197	10,225	0.64	$ 7,085	$ 906
Wind Turbine Analysis 6 kW System Southwest of K.C.	$ 45,000	$ 11,250	20	0.27	6,190	4,503	10,693	0.66	$ 7,306	$ 930
Wind Turbine Analysis 6 kW System Sedalia	$ 45,000	$ 11,250	20	0.26	5,736	3,650	9,387	0.61	$ 6,993	$ 862
Wind Turbine Analysis 6 kW System St. Joseph	$ 45,000	$ 11,250	20	0.29	6,188	4,523	10,711	0.64	$ 7,604	$ 930
Solar Hot Water System Analysis, KCP&L MO	$ 9,500	$ 4,750	15	0.70	4,635	-	4,635	0.61	$ 4,096	$ 579
Solar Hot Water System Analysis, KCP&L KS	$ 9,500	$ 4,750	15	0.70	4,635	-	4,635	0.61	$ 4,096	$ 579
Solar Hot Water System Analysis, St. Joseph	$ 9,500	$ 4,750	15	0.91	4,635	-	4,635	0.61	$ 5,503	$ 579
Solar Hot Water System Analysis, Sedalia	$ 9,500	$ 4,750	15	0.91	4,635	-	4,635	0.61	$ 5,503	$ 579
Solar Air Heating System Analysis, KCP&L MO	$ 4,900	$ 2,450	15	0.43	2,807	-	2,807	-	$ 1,713	$ 370
Solar Air Heating System Analysis, KCP&L KS	$ 4,900	$ 2,450	15	0.42	2,807	-	2,807	-	$ 1,710	$ 370
Solar Air Heating System Analysis, St. Joseph	$ 4,900	$ 2,450	15	0.43	2,807	-	2,807	-	$ 1,713	$ 370
Solar Air Heating System Analysis, Sedalia	$ 4,900	$ 2,450	15	0.42	2,807	-	2,807	-	$ 1,710	$ 370

Kansas City Power & Light
SmartGrid Demonstration Project

1. INTRODUCTION AND APPROACH

Kansas City Power & Light (KCP&L or the Company) is a firm believer in the need to advance our energy infrastructure and the critical role that SmartGrid technologies and solutions will play in industry progression. Throughout its history, KCP&L has been at the forefront of designing, testing, implementing, and operating new technologies, business models, systems and protocols to improve the delivery of energy to customers. The Company also has a strong record and history of community and customer involvement and views its infrastructure investments as a means to provide benefits to its service territory by:

- Deferring the need for more costly generation;
- Positively impacting our environment and reducing emissions;
- Helping our customers reduce their energy costs;
- Enabling economic investment and job creation in both the local and national economy through job training and workforce development; and
- Reducing our reliance on fossil fuels, which leads to increased energy independence.

This approach is nothing new to KCP&L as the Company has a strong track record of community and customer service involvement. Kansas City Power & Light (KCP&L) is known for its commitment to community engagement and a demonstrated ability to bring together diverse stakeholder groups to develop regional energy solutions. In 2007, KCP&L won the Edison Electric Institute's top award for innovation and contribution to the advancement of the electric industry and is the only utility in the U.S. to reach an agreement with the Sierra Club to pursue renewable energy and energy efficiency projects while building a high-efficiency coal generating station. Recognizing the need for a new approach to electricity generation, transmission, and distribution, KCP&L intends to deploy a fully integrated SmartGrid demonstration. KCP&L believes a demonstration or pilot approach is required to further prepare us to understand how a SmartGrid can enable, or integrate new technologies, business models, systems and protocols to improve the delivery of energy to customers. The pace of enterprise level SmartGrid deployments is dependent on many yet to be fully understood factors, technical advancement and adoption of distributed energy resources, environmental goals and policies, demand growth and optimization of current infrastructures.

KCP&L's demonstration approach is being driven by rising environmental awareness and increasingly price sensitive consumers that will require the energy industry to become more responsive to the need for timely energy usage and pricing information, more tailored energy options and greater individual customer control. The utility of the future involves a shift from a model in which electricity is generated and controlled centrally to one in which energy is generated at a local level and integrated into the grid to improve energy efficiency and reduce transmission losses while taking advantage of renewable energy sources. Recognizing this paradigm shift, KCP&L is planning to design and deploy a demonstration program to develop, operate, test and report on a complete, end-to-end regional SmartGrid demonstration (the SmartGrid Demonstration) in a socially and economically diverse area of Kansas City, Missouri (the Demonstration Area). The SmartGrid Demonstration will be critical not only for developing and proving concepts, technologies, and protocols, but also for serving as a blueprint for capturing, understanding and demonstrating economic costs and benefits.

2. SMARTGRID DEMONSTRATION COMPONENTS

The primary objective of the SmartGrid Demonstration project is twofold: (1) to demonstrate, test and report on the feasibility of combining, integrating and applying existing and emerging SmartGrid technologies and solutions to build innovative SmartGrid solutions and (2) to demonstrate, measure, and report on the costs, benefits, and business model viability of the demonstrated solution. The proposed technologies and solutions will be evaluated both individually, and as part of a complete end-to-end integrated SmartGrid system in a defined geographical area. The project will demonstrate certain operational, economic, consumer, and environmental benefits that can be enabled by single SmartGrid technologies and further enhanced by integrated solutions as proposed for this demonstration. For specific parts of the solution, KCP&L intends to demonstrate the potential for innovative and flexible business models that can be employed in the integration of its solutions.

The objectives of individual initiatives are focused on implementing a next-generation, end-to-end SmartGrid that will include Distributed Energy Resources (DER), enhanced customer facing technologies, and a distributed-hierarchical grid control system.

2.A. Transmission & Distribution (T&D) Infrastructure

2.A.1) SmartSubstation

The primary objective of the SmartSubstation program is to develop and demonstrate a fully automated, next-generation distribution SmartSubstation with a local distributed control system based on IEC 61850 protocols. The new SmartSubstation will enable the following benefits that will be quantified throughout the demonstration period:

- Improved real-time operating data on critical substation equipment
- Reduced O&M costs of relay maintenance, and
- Improved reliability by enabling distribution automation

By achieving these objectives, we expect to demonstrate Advanced Distribution Automation (ADA) capabilities such as the ability to monitor and capture real-time transformer temperature and gas data; the enablement of real-time equipment ratings; full substation automation with intelligent bus throw-over; and all the benefits of intelligent electronic relays such as peer-to-peer communication, fault recording, fault location, circuit breaker monitoring and increased ease of maintenance.

2.A.2) SmartDistribution

The primary objective of the SmartDistribution program is to develop and demonstrate a fully automated, next generation Distributed Control and Data Acquisition (DCADA) controller that incorporates a Customer Information Management (CIM) based model of the local distribution network and performs local grid assessment and control of individual intelligent electronic device (IED) field controls. The DMS and Smart-Substation™ Controllers will provide the operational backbone of the system supporting significant levels of automation on the feeders, complex and automated feeder reconfiguration decisions, and tightly integrated supervision with the Control Centers. The DMS serves as the primary point of integration for the grid facilities and network management functionality including Distributed System Control and Data Acquisition (D-SCADA) systems, Distributed Network Architecture (DNA) systems, Outage Management Systems (OMS), Distributed Energy Resource Management (DERM) systems, Geographical Information Systems (GIS) and other supporting systems.

The new SmartDistribution implementation will enable the following benefits that will be quantified throughout the demonstration period:

- Improved service reliability by reducing the frequency and duration of sustained outages.
- Reduced frequency of momentary outages.
- Reduced operational expenses as many functions will occur automatically without human intervention or be performed remotely without a field crew.
- Reduced maintenance expenses by providing rich data to enable predictive and proactive maintenance strategies

In achieving the above objectives, we expect to demonstrate a family of automatic, distributed "first responder" distribution grid monitoring and control functions:

- Sub and Feeder Load Profile Metering at 15-minute intervals
- Circuit outage and faulted section identification and isolation switching
- Sub and Feeder VAR Management
- Sub and Feeder Voltage Management
- Sub and Feeder Integrated Volt/VAR Management
- Sub and Feeder Overload Management w/ Dynamic Voltage Control (DVC & CVR)
- Distributed DER monitoring & management
- Sub and Feeder Overload Management w/ DER
- Feeder Overload Management with Ambient & Duct Temperature
- Digital Fault Recording on Breaker Relays
- Incipient Fault Detection and Reporting

We also expect to demonstrate time-synchronized voltage and current from strategic points on the circuits, which will improve the accuracy of capacity planning models and will enable better load balancing and improved decision-making for capacity additions.

2.A.3) SmartMetering

The primary objective of the SmartMetering program is to develop and demonstrate state-of-the-art integrated AMI & meter data management (MDM) capabilities that support two-way communication with 14,000 SmartMeters in the Demonstration Area and provide the integration with CIS, DMS, OMS, and DERM. The SmartMetering infrastructure will provide the technology basis for recording customer and grid data that will be used to measure many SmartGrid benefits. The new AMI/MDM implementation will enable the following operational benefits that will be quantified throughout the demonstration period:

- Improved accuracy of meter reads, frequency of reads and flexibility of read scheduling by enabling customers to select dates for turn on/turn off requests without associated field visits.
- Improved accuracy of meter inventory and reduction in untracked meters.
- Increased percentage of automated reads and reduced amount of stale reading within the existing automated one-way meter reading system.
- Increased percentage of near real-time outage notifications and power restoration that would be supplied by a two-way metering system, and:
- Provided real-time, two-way communication for Demand Response (DR) program control initiation and verification of program participation

The SmartMetering technology will also provide advanced meter-to-HAN communications to facilitate in-home display, home energy management systems, and other consumer-facing programs.

2.B. SMARTGENERATION (DISTRIBUTED ENERGY RESOURCE TECHNOLOGY)

2.B.1) Smart DR/DER Management

The primary objective of the Smart DR/DERM program is to develop and demonstrate a next-generation, end-to-end DERM system that provides balancing of renewable and variable energy sources with controllable demand as it becomes integrated in the utility grid, coordination with market systems, and provision of pricing signals. We expect to demonstrate a number of capabilities including:

- The ability to manage and control diverse types of Distributed Energy Resources (e.g. DVC, DG, bulk and mobile storage)
- The ability to manage and control various DR programs including dispatchable/direct load control programs.
- The ability to manage price-based and voluntary programs with market-based and dynamic tariffs similar to those described under SmartEnd-Use
- The ability to manage various market and transmission operation support products such as

mapping DR/DER capabilities to wholesale energy products and managing energy and ancillary services capacity

- The interoperability with the DMS to monitor distribution grid conditions and manage distribution grid congestion, and
- The ability to track and manage renewable portfolio standards (RPS) and greenhouse gas (GHG) reduction capabilities of distributed and demand side resources

By achieving these objectives, KCP&L expects to demonstrate advanced capabilities in demand side resource management, including the ability to leverage those capabilities for operational and environmental efficiencies as well as the ability to aggregate and use such capabilities in support of wholesale market operations.

2.B.2) SmartGeneration

KCP&L's primary objective in its SmartGeneration program is the implementation of DER technologies and DR programs sufficient in quantity and diversity to support the DERM development and demonstration. To achieve this objective, the demonstration program will include:

- Installation of a variety of roof-top solar systems on a mix of residential and commercial buildings (a larger scale, 100kw, installation is planned for a school or public building)
- Installation of a 1MWh grid-connected battery to provide grid support.
- Integration of the existing EnergyOptimizer DR thermostat program in the demonstration area
- Integration of the existing MPower load curtailment program customers in the demonstration area
- Implementation of public accessible plug-in hybrid electric vehicle (PHEV) charging stations to demonstrate smart-charging strategies.

In addition to the primary objective, KCP&L expects to demonstrate the ability to offset fossil-based generation with renewable sources as well as the potential for flexible, alternative business ownership models. With respect to PHEVs and charging stations, KCP&L expects to demonstrate an intelligent, two-way communication between plug-in vehicles, charging stations and the utility grid while controlling the flow of electricity to plug-in vehicles, balancing real-time grid conditions with the needs of individual drivers.

2.B.3) SmartEnd-Use

The primary objective of the SmartEnd-Use program is two-fold. The program will achieve a sufficient number of consumers enrolled in a variety of consumer-facing programs to 1) support the DERM development and demonstration; and 2) measure, analyze, and evaluate the impact that consumer education, enhanced energy consumption information, energy cost and pricing programs and other consumer-based programs have on end-use consumption. We have identified several secondary objectives for the suite of SmartEnd-Use programs expected to be deployed in the Demonstration Area:

- First, we intend to improve customer satisfaction by increasing awareness and reducing costs through energy efficiency and demand response program execution.
- Second, we expect to improve KCP&L productivity through increased knowledge of customer behavior and usage patterns.
- Third, we expect to improve peak load profiles, reducing the need for capacity expansion, as customers are incented to utilize energy in off peak periods.
- Fourth, we expect to pilot alternative time-of-use (TOU) rate programs designed to provide the incentives to reduce energy usage during peak periods.

By achieving these objectives, we expect to demonstrate how the integration of a broad suite of efficiency and innovative rate programs into a complete SmartGrid solution can enhance the overall benefits of the solution and optimally leverage the additional technical and operational capabilities that the investment will enable.

3. PROJECT PHASES & TIMELINE

In it's application to the DOE for a SmartGrid Demonstration Grant, KCP&L organized the project into five phases according to a timeline that complied with DOE grant guidelines. In Phase 1, we will further develop our project approach, install a formal project management structure and ensure we meet NEPA compliance requirements. In Phase 2, implementation of the AMI solution will take place, which will be foundational to gather baseline information around operational and financial performance of the network area covered by the SmartGrid demonstration. In Phase 3, we will deploy the T&D SmartGrid infrastructure components, including building our SmartSubstation implementing the SmartDistribution capabilities. Phase 4 is focused on deployment of DER applications such as SmartGeneration components, end-user incentive programs and the DERM systems implementation. Phase 5 will involve the actual operation, testing and demonstration of the solution and is expected to last approximately two years from mid 2012 to mid 2014.

Proposed SmartGrid Demonstration Project Timeline

Phase	Task Name	2010				2011				2012				2013				2014			
		1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
PHASE 1	**Project Definition and NEPA Compliance**																				
Task 1.0	Update PMP for SmartGrid Demonstration																				
Task 2.0	National Environmental Protection Act (NEPA) Compliance																				
Task 3.0	SmartMetering Implementation																				
Task 4.0	Project Management, Administration & Reporting																				
PHASE 2	**Project Performance Baseline**																				
Task 5.0	Project Integration Architecture Definition & Design																				
Task 6.0	Public Outreach and Education Planning																				
Task 7.0	Performance Baseline Data Collection																				
PHASE 3	**T&D Smart Grid Infrastructure Deployment**																				
Task 8.0	SmartSubstation Implementation																				
Task 9.0	Distribution SmartGrid ADA Implementation																				
PHASE 4	**Distributed Energy Resource Deployment**																				
Task 10.0	Smart EndUse Implementation																				
Task 11.0	Smart Generation Deployment																				
Task 12.0	Smart DER/DR Management Implementation																				
PHASE V	**Commissioning & Operations**																				
Task 13.0	Integrated System Operational Test & Demonstration																				
Task 14.0	Operate Integrated Solution																				
Task 15.0	Program Data Collection																				

4. MERIT & CRITERIA DISCUSSION

4.A. PROJECT APPROACH

4.A.1) Comprehensiveness and completeness of the Statement of Project Objectives (SOPO) that describes the proposed interrelated tasks and of the Project Management Plan that includes a schedule with milestones and explains how the project will be managed to achieve objectives on time and within budget

The Company has established an aggressive, yet achievable SmartGrid Demonstration project organized into five phases. This plan was developed by the KCP&L SmartGrid Demonstration project team along with the assistance of experienced KCP&L managers and strategic partner experts. This plan is explicitly linked, project by project, to the Project Budget and will be funded in accordance with the Project Funding Profile.

The SmartGrid Demonstration is organized into five distinct, yet interrelated phases, which align with the DOE's expectation with regard to approval stages, operations and reporting. These five stages were specifically designed to manage the SmartGrid Demonstration deployment in the most expeditious and cost-effective manner possible over the expected project time frame.

The SmartGrid demonstration architecture will evolve over time as additional applications, requirements, and technologies evolve. Throughout the execution of the Demonstration, the Company will access the capabilities of industry resources and associates such as EPRI as well as the expertise, capabilities and planning resources of its strategic partners.

4.A.2) Completeness of the proposed demonstration approach to effectively address each of the goals of the SmartGrid Demonstration Initiative.

The SmartGrid Demonstration has been explicitly designed to be a complete end-to-end SmartGrid demonstration program in a geographically defined area of Kansas City. By focusing on the circuits and distribution feeders surrounding its Midtown Substation, the Company will be able to assess the potential benefits of a SmartGrid solution from SmartGeneration through to SmartEnd-Use in a regionally unique, controlled "laboratory" environment. The goals of this demonstration are in sync with those of the SmartGrid Demonstration Initiative – to quantify SmartGrid costs, benefits and cost-effectiveness as well as verify SmartGrid technology viability, and validate new SmartGrid business models, at a scale that can be readily adapted and replicated around the country. Each of these goals in the context of KCP&L's demonstration is addressed below:

- Quantify SmartGrid costs, benefits and cost-effectiveness**:** A key objective in our SmartGrid Demonstration will be to quantify the costs and benefits of each of our solutions separately and as a complete solution. The Demonstration is designed as a regionally unique effort to display the benefits of single initiatives and the overall synergies and interrelations that can occur as a result of building complete programs. In our budgeting process, we have defined the operating and capital costs of each of the initiatives along with an estimate of potential benefits. These benefits include operational, economic, customer and environmental improvements. Where possible, specific, quantifiable methodologies were developed to translate benefit metrics into potential monetary value. For the overall solution, additional program management costs were included and synergistic benefits were estimated. These costs and benefits will be periodically evaluated during the Demonstration as part of the required DOE reporting process. Additionally, where possible, we will quantify the cost-effectiveness of the technology solutions developed for the demonstration vs. existing and / or alternative technologies and solutions to determine the cost-effectiveness of our demonstration vs. existing and emerging alternatives.
- Verify SmartGrid technology viability: As part of the Demonstration, we are implementing a number of new and emerging technologies and combining and integrating both new and existing technologies in unique ways to form an end-to-end solution. Such technologies include the installation of DCADA/SmartSubstation components, the integration of DER and DR Management systems, the addition of a complete DMS system, an AMI system implementation along with associated smart meters and Field Area Network (FAN), and Smart Home devices including DR thermostats and residential and commercial EMS. Each of these technologies will be tested against anticipated net benefits and their ability to generate sufficient savings or other benefits to justify their cost of implementation and use. Each of these systems will be evaluated separately and as part of a complete solution to determine their most optimal use and application, either as separate systems or as part of the more holistic demonstration.
- Validate new SmartGrid business models: A key reason we designed the Demonstration as an end-to-end solution from SmartGeneration through SmartEnd-Use is to test and evaluate the potential for a variety of business models. For example, with SmartGeneration applications such as roof-top solar, we will test the viability and practicality of eventual customer-owned generation assets and capabilities with the potential to sell excess capacity back to the grid. The Company expects to test this concept in other DER applications as well such as parallel generation and potential PHEV vehicle-to-grid applications.

4.A.3) Adequacy of the proposed demonstration approach to quantifiably advance program metrics.

The SmartGrid Demonstration has been specifically designed to address as many program metrics as possible. The complete solution approach to the SmartGrid Demonstration will allow KCP&L to evaluate, test and report on the program's effect on a wide variety of metrics, including economic (e.g. T&D system losses, % of MWh served by DG), reliability and power quality (e.g. SAIFI, SAIDI, CAIDI, MAIFI), and environmental (% of MWh served by renewables, % of feeder peak load served by renewables). This testing process will be further enabled by focusing on one substation for which substantial historical data already exists. Prior to receiving approval for Final Design and Construction, we will establish a formal baseline of all metrics to be measured.

4.A.4) Validity of the proposed approach and likelihood of success based on current technology maturity and regulatory / stakeholder acceptance of the technology. Innovativeness of the project, including introduction of new technologies and creative applications of new and state-of-the-practice SmartGrid technologies

Our Project Team seeks to demonstrate the value of using SmartGrid technology and communications to manage distributed energy resources within a utility's service territory. In particular, we are targeting edge of grid resources using a comprehensive SmartGrid platform in order to integrate and manage distributed grid assets. In developing the scope, objectives and approach for this project, KCP&L explicitly balanced the inclusion of widely accepted technologies with new and emerging concepts and approaches. We also evaluated innovative combinations and applications of best of breed technologies rather than single solutions or the implementation of single vendor platforms.

The goal of the Demonstration is to design, develop, and deploy a <u>next generation end-to-end (or top-to-bottom) distribution grid management infrastructure</u>, which will be based on distributed-hierarchical control concepts, an emerging technology. Our approach is centered on the upgrade of our Midtown Substation, an existing urban substation, to create a next-generation Smart Substation with IEC-61850 communication protocols and control processors to implement distributed, unattended control with automated "first responder" monitoring and control functions. Ten distribution circuits served by the Midtown Substation will be upgraded with a variety of feeder based monitoring and control IED to evaluate the impact of a variety of Advanced Distribution Automation (ADA) functions and leading edge smart customer initiatives will provide consumers with enhanced information regarding energy use and cost. Finally, SmartGeneration initiatives including emerging photo-voltaic solar technologies and PHEV charging stations and vehicles will be implemented to test the potential for distributed generation and innovative business models. Each of these initiatives utilizes some combination of existing and accepted technologies combined with emerging technologies, protocols or systems. In addition, we believe the combination of best of breed technologies and the unique application of these technologies in an end-to-end, regionally-defined urban application is unique and could serve as an urban renewal blueprint for future applications.

4.A.5) Appropriateness and completeness of the demonstration plan including performance objectives of the demonstration, the criteria and requirements used in selecting demonstration site(s), the data collection and evaluation plan, the metrics for success, and the measurements that will be made to confirm success. Adequacy and completeness of the proposed approach in delivering demonstration project data and information to the SmartGrid Clearinghouse, the DOE and the public.

KCP&L has a rich history of performance data in the region and has begun work on establishing a set of baseline parameters on the economic, operational and environmental performance metrics to be reviewed. As we prepare for the execution of the demonstration, a preliminary performance and cost model will be developed to define a baseline case for this project. A complete range of baseline data will be collected by individual project teams and across projects as defined in the project plan. This will include both operational/performance (reliability, usage, etc.) and financial (cost to serve, rates, etc.) information. This baseline data will be the basis for measuring the impact on grid performance, system efficiencies, and end-use consumption patterns achieved by the demonstrated technologies. KCP&L will collaborate with the DOE to determine the distribution feeder and customer data needed to support the DOE standardized cost benefit analysis methodology.

The defined site for the project – the Company's Midtown substation along with multiple circuits served by the substation – will provide a very efficient testing and demonstration environment. The Company has served this area for many years and has a rich history of data for the region as well as the capabilities to collect and report data to the SmartGrid Clearinghouse on a regular basis. The final demonstration solution will be compared with this baseline case to measure the benefits of the approach and quantify performance relative to expectations.

The project team will develop a grid monitoring and test plan for the two-year demonstration. The plan will address various modes of grid, DR, and DER, operation; validate key operating features of the distributed resources (e.g., stand-alone and parallel operation); validate the key operating and control features of the distributed-hierarchical grid control systems; and confirm the safe and reliable operation of the electric grid with integrated distributed resources. The monitoring plan will provide for compilation of the necessary data to measure improvements in grid efficiency, grid performance, reduced consumer energy consumption and demand reduction.

During the 24 month demonstration, our team will collect the detailed data in different operational modes, including normal and contingency switching configurations. Both grid performance and consumption data will be collected, compiled and analyzed for the project area This data will be compared against the baseline data to measure the impact on grid performance, system efficiencies, and end-use consumption patterns achieved by the demonstrated technologies.

As a member of EPRI's five-year SmartGrid demonstration project, our project data transfer activities will be coordinated through EPRI's formalized SmartGrid demonstration project. Specifically, EPRI will coordinate the sharing of field results, lessons learned, architectural challenges, issues impacting standards, key technology gaps, and useful tools to help interoperability of SmartGrid technologies and systems related to the project. Project data including scope, schedule, and results of the project will be supplied to the "SmartGrid Information Clearinghouse."

4.A.6) Suitability and availability of the proposed project site(s) to meet the overall program objectives for scope and scale appropriate for the technology(ies) being demonstrated.

As noted above, the Demonstration Area is an ideal project site for this type of demonstration as it consists of 10 circuits served by one substation across 2 square miles with approximately 14,000 customers comprising both commercial and residential customers with a broad array of demographics, income levels and energy usage and needs. Since this area is explicitly defined and served by one substation, it can provide the ideal "laboratory" environment from which to demonstrate and test program results.

Part of the Demonstration Area also contains the Green Impact Zone, a wider urban revitalization project designed as a means to use Federal funds to redevelop an urban core. Key to this redevelopment is the provision of a modern energy infrastructure. The Green Impact Zone has significant political and community support which will provide the catalyst for high customer engagement to better demonstrate our integrated view of the SmartGrid.

4.A.7) Adequacy of plans for data collection and analysis of project costs and benefits, including the following aspects:

- **Thoroughness of the discussion of data requirements (including what types of data and their**

availability) and how that data will be provided to the DOE so that project costs and benefits can be properly analyzed

- **Logic and completeness of the discussion of how the data can be used by the DOE to develop estimates of project costs and benefits, including the discussion of the Applicant's quantified estimates of project benefits**
- **Comprehensiveness of the plan for determining the baseline against which the costs and benefits will be assessed**

A range of baseline data will be collected by individual project teams and across projects as defined in the Project Management Plan. This will include both operational / performance (e.g. reliability, usage, etc.) and financial (cost to serve, rates, etc.) information. As much as possible, we will include metrics that not only show monetary benefits, but also progress on demonstrating SmartGrid "characteristics" as defined in the FOA. Based on historical data on our performance in the Demonstration Area, a preliminary performance and cost model will be developed to define a baseline case for this project. The final demonstration solution will be compared with this baseline case to measure the benefits of the approach and quantify performance relative to expectations.

The Company intends to provide a variety of data to the SmartGrid Clearinghouse using the DOE's cost-benefit analysis methodology or an approach that is very similar and provides the input data required for the DOE to evaluate project success along a wide variety of metrics. The Company plans to actively track and measure a complete set of performance data at regular intervals and report results to the DOE versus the project baseline.

4.A.8) The degree of the proposed estimates of project benefits

KCP&L expects this demonstration to show significant improvements in monetary benefits and the progress of the Demonstration Area toward exhibiting SmartGrid characteristics. This information is not all-inclusive and the estimates will be further refined and quantified over the next few months and will be formalized with the DOE after Notice of Award and prior to the Operational Readiness Review Approval. Specific benefits, sources, metrics and potential degree of impact are shown below:

4.B. SIGNIFICANCE & IMPACT

4.B.1) Significance of the proposed demonstration application vs. current practices – Completeness of this assessment to consider benefits in terms of anticipated performance improvements (technical, operational, and environmental aspects) and the cost savings of the proposed application over current practices

This Demonstration effort is designed as a means to test and evaluate a potential step change improvement in KCP&L's electricity distribution system. Specifically, we are designing a system with a communication architecture that will facilitate automated system monitoring and control with open systems that will allow the integration of technologies and components from multiple vendors in a "best-of-breed" solution along with a new electrical architecture and protection system that will enable an interoperable, secure network of components.

We expect this Demonstration to display significant performance improvements as a result of the technologies and solutions considered. Substation and distributed feeder line automation systems can significantly reduce O&M costs, improve reliability and enhance the environmental footprint through automated fault location detection, automated switch operation, improved voltage control and regulation, improved Outage Management System communications, enabled two-way end-user communication and information flow and the integration of distributed energy resources, allowing for a greater role of renewable energy generation into grid operations.

4.B.2) Degree to which the demonstration project is broadly applicable and adaptable throughout the region, including the completeness and adequacy of the deployment plan for large-scale deployment in and/or beyond the proposed region

The Demonstration Area is a self contained distribution network anchored by KCP&L's Midtown Substation within the Green Impact Zone. The Demonstration will design, deploy, test and report on the implementation of a complete end-to-end SmartGrid system within multiple circuits served by the Midtown Substation over a 2 square mile area with approximately 14,000 commercial and residential customers. Both the commercial and residential customer base is very diverse with large public institutions such as the University of Missouri at Kansas City and the Midwest Research Center as well as a residential population from virtually all demographics and income groups.

By designing this Demonstration as a complete end-to-end SmartGrid research and testing project in a geographically defined area, the Company has effectively designed a demonstration program that could either be scaled up as a large scale SmartGrid "Investment" program or deployed in different urban areas of the United States. It is truly a transferable and scalable solution.

4.B.3) Adequacy and impact of the public outreach and education plan on public acceptance of SmartGrid transformation

In order to promote this Demonstration in the Green Impact Zone and the Demonstration area in general, we have worked with our partners to design a comprehensive marketing, education and training program. In addition, as part of the Demonstration, we have designed a number of end-use programs.. In order to demonstrate the full value of these programs, KCP&L has developed both a business-to-business and business-to-consumer marketing and education campaign.

KCP&L will serve as the primary point-of-contact for our Demonstration Partners and will manage and coordinate all resources required, including KCP&L marketing and customer service professionals and third-party service providers (i.e., advertising agency, call center and printer). KCP&L will also work with our Demonstration Partners' marketing teams to create a highly targeted customer enrollment program that achieves goals and meets brand objectives and preferences for interacting with customers.

For more information and description of the Company's public outreach and education plan, please see Section 3 (Project Description) above.

4.B.4) Completeness of the proposed commercialization strategy for the technology(ies) being demonstrated

In designing this demonstration, KCP&L's initial goals are similar to those under this Application – to quantify SmartGrid costs, benefits and cost-effectiveness, verify SmartGrid technology viability, and validate new SmartGrid business models, at a scale that can be readily adapted and replicated around the country. We have explicitly incorporated the advanced digital technologies that support the SmartGrid Regional Demonstration Initiative, as described under section 1304 (b) (2) (A)–(E) of the Energy Independence and Security Act (EISA) of 2007. As such, we believe that this is a demonstration project and not a commercial endeavor. However, certain solutions that are developed as part of this demonstration could be commercialized in the future, particularly by our strategic partners, and also may become readily transferrable and applied as use cases for national implementation and replication.

4.B.5) Extent to which demonstration advances research and demonstration objectives of the program

The SmartGrid Demonstration is explicitly designed to advance the research and demonstration objectives of the SmartGrid Demonstration Initiative. Specifically, we have developed a proposed SmartGrid architecture that employs and integrates emerging technologies being developed for use in the planning and operations of the electric power system. Such technologies include microprocessor-based measurement and control, advanced two-way communications, and next generation computing and information systems. These systems (e.g. electronic substation relays, DA automation circuits, electronic capacitor controls, communicating faulted circuit indicators, voltage monitors and two-way communication devices throughout the distribution test area) will be combined in a unique and innovative manner to enable distribution automation and facilitate the integration of end-use and SmartGeneration add-ons to form a self contained complete "SmartGrid". This regional "laboratory" will serve as a research and demonstration site for the explicit testing of these advanced technologies as specified under the EISA.

4.B.6) Viability and practicality of the proposed technology to meet the needs of the target market in a cost effective manner.

The SmartGrid Demonstration is explicitly designed to advance the research and demonstration objectives of the SmartGrid Demonstration Initiative. Specifically, we have developed a proposed SmartGrid architecture that employs and integrates emerging technologies being developed for use in the planning and operations of the electric power system. Such technologies include microprocessor-based measurement and control, advanced two-way communications, and next generation computing and information systems. These systems (e.g. electronic substation relays, DA automation circuits, electronic capacitor controls, communicating faulted circuit indicators, voltage monitors and two-way communication devices throughout the distribution test area) will be combined in a unique and innovative manner to enable distribution automation and facilitate the integration of end-use and SmartGeneration add-ons to form a self contained complete "SmartGrid". This regional "laboratory" will serve as a research and demonstration site for the explicit testing of these advanced technologies as specified under the EISA.

4.C. INTEROPERABILITY & CYBER SECURITY

4.C.1) Adequacy and completeness of approach to address interoperability, how integration is supported to achieve interoperability, and how interoperability concerns will be addressed throughout all phases of the engineering lifecycle, including design, acquisition, implementation, integration, test, deployment, operations, maintenance and upgrade

KCP&L fully understands that one of DOE's SmartGrid priorities is to use its work with NIST and FERC on a framework for interoperability standards. KCP&L has been an active participant in the development of the NIST SmartGrid Interoperability Standards Roadmap and believes that this SmartGrid Demonstration provides an ideal opportunity to field test the interoperability standards.

The SmartGrid Demonstration project is based on an integrated end-to-end solution that demonstrates interoperability of key Smart Grid components and will provide a commercial application for five (5) SmartGrid use cases – Demand Response, Electric Storage, Electric Transportation, AMI Systems, and Distribution Grid Management – that form the basis of the proposed NIST' Interim Smart Grid Interoperability Standards Roadmap.

The SmartGrid Demonstration will implement bulk power energy management, scheduling and market systems, enterprise systems, distribution network management system, substation, feeder and distribution automation systems, distributed resource and demand-side management systems, advanced metering infrastructure and customer-based energy management and behind-the-meter resources and loads. We will leverage EPRI's IntelliGrid^{SM} methodology to support the technical foundation for a smart power grid that links electricity with communications and computer control to achieve tremendous gains in reliability, capacity, and customer services. The IntelliGrid Architecture is an open-standards, requirements-based approach for integrating data networks and equipment that enables interoperability between products and systems. This methodology provides tools and recommendations for standards and technologies when implementing systems such as advanced metering, distribution automation, and demand response and also provides an independent, unbiased approach for testing technologies and vendor products.

The Project Team will assess the applicability and the gaps of the NIST standards, and will adopt, and extend where necessary, these standards in this project. To the extent feasible, our project will coordinate our implementation efforts with NIST and the Standards Development Organizations acceleration efforts.

4.C.2) Adequacy and completeness of approach for cyber security concerns and protections and how they will be addressed throughout the project, including the adequacy of the discussion of the integration of the new SmartGrid application into the existing environment, and how any new cyber security vulnerabilities will be mitigated through technology or other measures.

Securing the networked communications, intelligent equipment, and information is critical to the operation of the future SmartGrid. Due to the complexity and far reaching aspects of the SmartGrid, planning for physical and cyber security, in advance of deployment, is essential to provide a more complete and cost effective solution.

As a member of EPRI's five-year Smart Grid demonstration project, our cyber security requirements and design will be coordinated through EPRI's formalized smart grid demonstration project. KCP&L intends to leverage EPRI's IntelliGrid^{SM} Architectures' strategic vision to support our technical approach on cyber security.

The development of the SmartGrid T&D infrastructure will involve cyber security considerations in every aspect and phase of the project and also numerous standards at all levels of the IT and grid infrastructure. One of the objectives of the proposed project is to demonstrate end-to-end cyber security and incorporate the appropriate NIST identified "low-hanging fruit" standards. The Project Team will assess the applicability and the gaps of these and other standards, and will adopt, and augment where necessary, these standards in this project. To the extent feasible, our project will coordinate our implementation efforts with NIST and the Standards Development Organizations acceleration efforts.

KCP&L has also chosen to implement the demonstration using private communications media wherever practical. By using the Corporate IT WAN and utility owned FAN, the KCP&L SmartGrid system designs can still leverage the vast amount of research and development into Internet Protocols (IP) and technologies. They will just be implemented over a private Intranet instead of the public Internet to minimize the exposure to cyber security attacks.

The far reaching and complex nature of the SmartGrid dictates that no-single security policy can be developed to properly secure the SmartGrid. The hierarchical nature of the technologies that will be implemented to create the SmartGrid Communication Network provides for security "check-points" between control and network layers that may have different security requirements. Therefore, it is a natural extension for the Security Architecture to be constructed around Security Domains.

These Security Domain represent a set of resources (e.g. network, computational, and physical) that share a common security requirements and risk assessment. For example; within the 'bulk power system' there are two distinct Security Domains: NERC-CIP and NERC-nonCIP. While having different security requirements, all Security Domains will be secured and managed through a consistent set of security policies and processes. Secure connectivity, data encryption, firewall protection, intrusion detection, access logging, change control and the audit reports associated with these applications will likely be required for all SmartGrid security domains.

5. RELEVANCE AND OUTCOMES / IMPACTS

5.A. RELEVANCE

KCP&L's Green Impact Zone SmartGrid Demonstration initiative is a collaborative effort by all parties focused on addressing prevalent challenges with integrating distributed resources in grid and market operations as well as in system planning. Multiple demonstration components will be designed and implemented to address the variety of barriers and incompatibilities associated with the integration of distributed resources (e.g., local storage, demand response, distributed generation, renewable resource, and grid management) into system operations. These barriers include lack of appropriate technical operations and decision-aiding models, insufficient communication and control infrastructure, incompatible market and pricing structures, and the lack of interoperability standards. The project will demonstrate a variety of approaches for overcoming these barriers and identify appropriate standards and best practices for distributed resource integration.

Electric utilities around the world are assessing the technical issues and the related benefits and costs of modernizing the grid. Many are already investing in the communication and information infrastructure that is expected to be the backbone of the SmartGrid. These infrastructures will require tens of billions of dollars of capital investment in equipment and new technologies. Investors and regulators want to know if the investments will be a technical and financial success. Customers want to understand if benefits will justify the costs that may ultimately be borne by them as ratepayers. Our project contributes to addressing these concerns by leveraging the investments in communication infrastructure to demonstrate effective integration of multiple components and systems.

The scope of the demonstrations encompasses numerous SmartGrid network component, grid management and control systems, and distributed resources that operate together including:

- AMI - Advanced Metering Infrastructure including RF mesh FAN providing IP based AMI and ADA field communications
- MDM – Meter Data Management for management and analysis energy consumption patterns.
- DMS – Distribution Management System with D-SCADA and OMS functions
- ESB – Enterprise Service Bus providing IEC61968 integration for all distribution management systems components
- SA – Distribution Substation Automation with IEC61850 protocols and advanced IEDs
- ADA – Advanced Distribution Automation with automated "first responder" monitoring and control functions with substation DCADA controller.
- Adopting distributed, hierarchical control methods between DCADA, DMS, and DERM
- DERM – Distributed Energy Resource (DR/DER) Management system that interoperates with DMS, MDM
- DER – A variety of utility managed DER components will be integrated including DVC, DR thermostats, roof-top solar, grid-connected battery, and conversion of stand-by to parallel generation.
- DSM- A variety of consumer demand side management technologies will be integrated including In-home Display, EMS-Web Portal, HAN, experimental TOU rates, PHEV charge management and critical peak signals.

Enabling widespread penetration of SmartGrid systems and technologies in support of grid operations requires overcoming prevalent integration barriers. Integration barriers range from technical and economic to institutional and customer-driven barriers. Technical barriers relate to lack of infrastructure, accepted standards and processes/protocols to aggregate and automate distributed resources in a fashion that meets system operator requirements. The requirements themselves need to be carefully defined to achieve system operator confidence in relying on distributed resources on the one hand, yet not overly burden the demand-side and thereby discourage aggregation and demand-side participation. Economic type barriers include establishing justification for integration costs and designing retail incentive structures to incent sufficient response from distributed resources in support of grid needs. Institutional barriers surround the need to better connect wholesale with retail electricity markets and to bridge organizational silos to better achieve end-to-end integration, from wholesale to retail markets and down to end-use.

The Smart Grid project will demonstrate a variety of approaches for overcoming these barriers and identify appropriate standards and best practices for distributed resource integration. Lack of standards and associated high integration costs are prevalent challenges in enabling widespread penetration of distributed resources. Other challenges include lack of appropriate decision-aiding models, insufficient communication and control infrastructure, incompatible market and pricing structures, and the lack of interoperability standards. EPRI's IntelliGrid methodology will be applied to identify approaches for interoperability and integration. Methods, processes, and technologies will be researched, developed, and applied to demonstrate and measure project effectiveness in overcoming integration barriers.

5.B. Outcome/Impacts

The primary outcome/impact of the SmartGrid Demonstration project will be multifaceted:

- (a) When combined the individual project components will implement and demonstrate a next-generation, end-to-end SmartGrid that will include Distributed Energy Resources, enhanced customer facing technologies, and a distributed-hierarchical control system of a significant regional distribution grid serving 14,000 customers, the Kansas City Green Impact Zone, and UMKC with 69.5 MVA demand.
- (b) Demonstration, measurement, and reporting on the costs, benefits, and business model feasibility of the demonstrated solution. The project will demonstrate certain operational, economic, consumer, and environmental benefits that can be enabled by single SmartGrid technologies and further enhanced by integrated solutions as proposed for this demonstration.
- Our project will use existing and emerging integration technologies and standards for implementing the T&D SmartGrid Infrastructure. By applying NIST identified SmartGrid interoperability, the project can help NIST and relevant SDOs identify issues and gaps associated with the standards (e.g., common object models, communications interfaces, etc.). This effort is focused on an accelerated timetable for the development of a standards development roadmap and a process for getting standards for interoperability in place as rapidly as possible.

In addition to the above specific Smart Grid metrics and impacts, the project will demonstrate the following key capabilities:

5.C. SmartGrid Metrics

The following table lists the relevant SmartGrid statistics that have been established by the DOE to measure the progress SmartGrid adoption and what will be demonstrated and or quantified by our project related to each of these statistics

DOE SmartGrid Statistics

Relevance and Outcomes/Impacts	What will be demonstrated
Transmission and Distribution Infrastructure	
• T&D system reliability: duration and frequency of power outages	• Using DR/DER capabilities to relieve load on distribution equipment and facilities
	• Utilizing DR/DER for balancing variable generation (solar PV), e.g., dispatching the proposed 1MW storage capability.
	• Provision of ancillary services from demand-side

	DR/DER • DMS real-time information and model will be used to track SAIDI/SAIFI and provide before/after comparison using 12 months of data for demonstrating the magnitude of improvements.
• T&D automation: percentage of substations using automation	• Rate of feeders automated for the selected substation will be measured as a model for further deployment.
• Advanced meters: percentage of total demand served by advanced metered customers	• The ability for the substation and control center to track and manage demand based on improved load models and Distribution Network Management will be measured/assessed per feeder.
• Capacity factors: yearly average and peak-generation capacity factor	• By utilizing DR/DER including storage, the project will be able to flatten the Load Factor and thus improve the capacity factors of the generating resources serving the load.
• Generation and T&D efficiencies: energy conversion efficiency of electricity generation, and electricity T&D efficiency	• Line losses will be optimized through better monitoring and management of feeder/circuit Voltage/VAr and phase balances. This will be achieved in part through scheduling and dispatch of DR/DER on distribution circuits.
• Dynamic line ratings: percentage miles of transmission circuits being operated under dynamic line ratings	Dynamic line/facility rating will be demonstrated on distribution feeders through monitoring of the equipment loading and environmental conditions.
• Power quality: percentage of customer complaints related to power quality issues (e.g., flicker), excluding outages	• PQ will be improved through proper planning, deployment, interconnection and operation of distributed energy resources (DER)
Information Networks and Finance	
• Open architecture/standards: Interoperability Maturity Level – the weighted average maturity level of interoperability realized between electricity system stakeholders	• Interoperability between DMS and DR/DER Management using IEC 61968/61970 application integration & IEC 60870/TASE.2 (ICCP) communications
	• Integration of DR/DER Management with AMI system using applicable IEC 61968/61970 protocols
	• Adaptation and extensions of IEC 61850-7-420 for interfaces and management of DER
	• Adaptation and demonstration of NERC CIP and applicable AMI SEC cyber security for DR/DER management
	• Integration
	• Adaptation and extensions of the Open ADR protocols for demand response.
Interoperability:	• Demonstrates an end-to-end interoperable solution that supports a general architecture with product component options. The number, type and system level of interoperable applications and devices

	communicating through standard protocols to achieve the defined solution functionality will be measured as the project progresses. This will be expressed as a number and a percentage of total components within the proposed project.
Cyber Security:	• Demonstrates an end-to-end solution that extends cyber security methodology and protection to ensure required security
Distributed energy resources technology	
• Load participating based on grid conditions: fraction of load served by interruptible loads, utility-directed load control, and incentive-based, consumer-directed load control	• This will be extensively demonstrated through the implementation of the DR programs in the Green Impact Zone, including utility-directed load control, incentive-based and customer-directed load control
• Load served by microgrids: fraction of entire load served by microgrids	• The project will assess microgrid potential in the Green Impact Zone including self-sustainable building with local generation/storage.
• Grid-connected distributed generation (renewable and non-renewable) and storage: percentage of all generation capacity that is distributed generation and storage	• The demonstration project will include both renewable (solar PV) and non-renewable (customer distributed generation) resources. Also included will be a 1MW Feeder level storage capability.
• EVs and PHEVs: percentage shares of on-road, light-duty vehicles comprised of EVs and PHEVs	• The demonstration project will include a representative set of PEVs and PHEV Charging stations. These capabilities will be fully integrated with the proposed solution in a scalable manner. The demonstration will include all aspects of managing the charging process, tracking the state of charge, monitoring the distribution network loading, as well as assessing the utilization of the PEV storage capability for grid support.
• Grid-responsive, non-generating, demand-side equipment: total load served by smart, grid-responsive equipment (smart appliances, industrial/commercial equipment including motors and drivers)	• The project will include integration of HAN based devices as well as in-home displays. Also included are integration of commercial/industrial customer demand-side resources and on-site energy management systems.

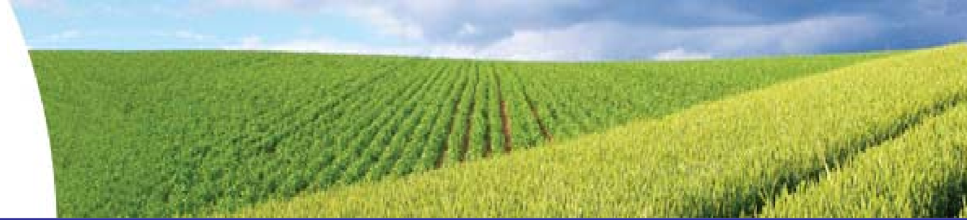
KCP&L- GMO IRP Stakeholder Meeting

April 21, 2010

Agenda

- Load Forecasting – McCollister/Okenfuss
- DSM Programs/20-year plan – O'Donnell
- Menu of End-Use Measures – O'Donnell
- Alternative Levels of DSM – O'Donnell

Load Forecasting



- Compare 2010-2014 budget Load forecast to the Load Forecast used in the 2009 GMO IRP

- Compare this load forecast to the Critical Ranges calculated in the 2009 GMO IRP

- Conclusion: Current Budget Load Forecast falls within the critical range of the 2009 GMO IRP.

Load Forecast Comparison of IRP to Latest Budget

** Highly Confidential **

Load Comparison, Cont.

** Highly Confidential **

- IRP Load Forecast conducted in January 2009.
  - Based on Economy.com November 2008 economic view
- Budget Forecast conducted in June 2009.
  - Based on Economy .com May 2009 economic view

Load Forecast Comparison to Critical Limits

** Highly Confidential **

Chart of Load Forecasts

** Highly Confidential **

Load Forecast Detail Chart

** Highly Confidential **

DSM

- DSM Programs/20-year plan

Questions:
Appendix 1, paragraph 23

- Q: Did the integrated resource modeling for the filing include more than five years of implementation budget?

- A: Yes, the integrated resource modeling included more than five years of implementation budget and is shown in table #1, on slide #11.

- Q: Do the implementation plans in GMO's officially adopted resource acquisition strategy include expenditure of funds to acquire new demand-side resources for more than the first five years of the planning horizon?

- A: The implementation plans included expenditure of funds for more than the first five years of the planning horizon and is shown in table #1, on slide #3.

Table #1:
KCP&L-GMO 20 Year DSM Budget $$$ "ALL DSM"

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20 Year Program Exceptions

<u>On-Line Audit</u>

- An educational program that will be reevaluated after five years.
- We had been seeing minimal participation from our C&I segment, modest for residential.

<u>Appliance Turn-In Program, five years</u>

- A “sunset” program. The size of the market shrinks as you remove the old refrigerators.
- We are relying on the recommendations and a forecast provided by JACO.
- JACO is one of the largest vendors providing this service in California and elsewhere.
- They provided us with their estimate of the potential.
- Program will run for five years and the potential re-evaluated

20 Year Program Exceptions

Change A Light, 3 years

- Lighting standards will phase out incandescent lamps.
- We will be canceling this program.

Building Operator Certification, 5 years

- Participation is declining because:
- Most large property management companies have sent their building operators through the course. Plan was modeled as a five-year program because of current participation issues but GMO will re-evaluate in next IRP.

Blue Line, 3 years

- This is a pilot demo, we will re-evaluate after M&V impact.

Example of DSMore Model Results
Install T-8 Fixture
Issue: Appendix 1, paragraph 22 & 25

** Highly Confidential **

Assumptions:

Baseline measure:
- T-12 4 ft / 4 lamp T-12 fixture with magnetic ballast
- T-12 Standard Wattage 150W

Energy Efficient measure:
- 4 ft / 4 lamp T-8 lamps and electronic ballast.
- T-8 Wattage 112W

- Energy Savings = 38W per Hr.
- 140 kWh per year

- Estimated useful life = 10 years

GMO 20 Year DSM
kWh Cumulative Electric Impacts/Savings, Gross

Year	Change-A-Light_73_77	HPwES_78_82	LIWx_83_87	AFNH_88_92	BOC_98_102	Optimizer_103_107	MPower_108_112	Turn-In 113-117	Blue Line_118_122	Cool Homes_123_127	EStarProd_128_132	OLA_Kit_133_137	Cnl Custom RFP_138_142	Cnl Prescriptive_143_147	All Programs	All Programs Incremental	GMO Load Forecast, mWh	
	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh			
1	3,327,305	151,076	412,696	40,934	263,750	-	-	9,686,206	9,231,250	6,586,819	6,112,877	3,133,350	2,532,000	14,592,487	56,070,749	56,070,749	8,797,010	0.64%
2	6,654,609	302,152	825,392	122,802	791,250	-	-	19,372,412	18,462,500	13,173,639	15,281,852	6,266,700	7,089,600	30,327,434	118,670,342	62,599,593	8,977,918	0.70%
3	9,981,914	453,228	1,238,088	204,670	1,582,500	-	-	29,058,618	27,693,750	19,760,458	27,572,158	9,400,050	15,192,000	45,955,035	188,092,468	69,422,126	9,167,301	0.76%
4	9,981,914	604,304	1,650,784	286,538	2,110,000	-	-	38,697,785	27,693,750	26,347,277	28,863,509	12,533,400	27,345,600	62,978,231	239,093,092	51,000,624	9,311,161	0.55%
5	9,981,914	755,380	2,063,480	368,406	1,846,250	-	-	47,058,115	27,693,750	32,934,097	30,154,860	15,666,750	43,550,400	78,658,988	290,732,388	51,639,297	9,461,415	0.55%
6	9,981,914	906,456	2,476,176	450,274	1,055,000	-	-	37,371,909	18,462,500	39,391,784	31,446,211	15,666,750	59,755,200	93,363,737	310,327,910	19,595,522	9,612,561	0.20%
7	9,981,914	1,057,532	2,888,872	532,142	263,750	-	-	27,685,703	9,231,250	45,720,324	32,737,562	15,666,750	75,960,000	107,603,923	329,329,721	19,001,811	9,807,808	0.19%
8	6,654,609	1,208,608	3,301,568	614,010	-	-	-	17,999,497	-	50,476,845	28,562,052	12,533,400	92,164,800	121,609,729	335,125,118	5,795,397	9,939,440	0.06%
9	3,327,305	1,359,684	3,714,264	695,878	-	-	-	8,360,330	-	55,107,321	21,653,110	9,400,050	108,369,600	134,943,525	346,931,066	11,805,948	10,087,594	0.12%
10	-	1,510,760	4,126,960	777,746	-	-	-	-	-	59,615,926	11,945,506	6,266,700	124,574,400	147,929,094	356,747,092	9,816,026	10,241,944	0.10%
11	-	1,661,836	4,539,656	859,614	-	-	-	-	-	62,310,620	13,236,857	3,133,350	139,260,000	152,997,868	377,999,800	21,252,708	10,438,727	0.20%
12	-	1,812,912	4,952,351	941,482	-	-	-	-	-	64,886,481	14,528,208	-	152,426,400	155,678,404	395,226,239	17,226,439	10,576,189	0.16%
13	-	1,963,988	5,365,047	1,023,350	-	-	-	-	-	67,380,007	15,819,559	-	164,326,800	155,604,560	411,483,311	16,257,072	10,737,073	0.15%
14	-	2,115,064	5,777,743	1,105,218	-	-	-	-	-	69,791,994	16,786,979	-	174,961,200	153,379,116	423,917,314	12,434,002	10,898,277	0.11%
15	-	2,266,140	6,190,439	1,187,086	-	-	-	-	-	72,122,380	17,270,482	-	184,582,800	149,245,135	432,864,462	8,947,148	11,112,334	0.08%
16	-	2,266,140	6,190,439	1,228,020	-	-	-	-	-	74,412,739	17,431,317	-	190,659,600	143,200,249	435,388,504	2,524,042	11,286,698	0.02%
17	-	2,266,140	6,190,439	1,228,020	-	-	-	-	-	76,663,004	17,431,317	-	193,698,000	136,591,555	434,068,475	(1,320,030)	11,498,893	-0.01%
18	-	2,266,140	6,190,439	1,228,020	-	-	-	-	-	78,873,112	17,431,317	-	192,432,000	129,489,457	427,910,485	(6,157,989)	11,708,268	-0.05%
19	-	2,266,140	6,190,439	1,228,020	-	-	-	-	-	77,594,196	17,431,317	-	186,608,400	121,944,608	413,263,120	(14,647,365)	11,940,064	-0.12%
20	-	2,266,140	6,190,439	1,228,020	-	-	-	-	-	76,275,925	17,431,317	-	176,227,200	114,031,667	393,650,709	(19,612,412)	12,105,976	-0.16%

DSM MEASURES

- Menu of End-Use Measures
- Handout document

Discussion of Alternative DSM Portfolios

Roundtable Discussion

Contact Information

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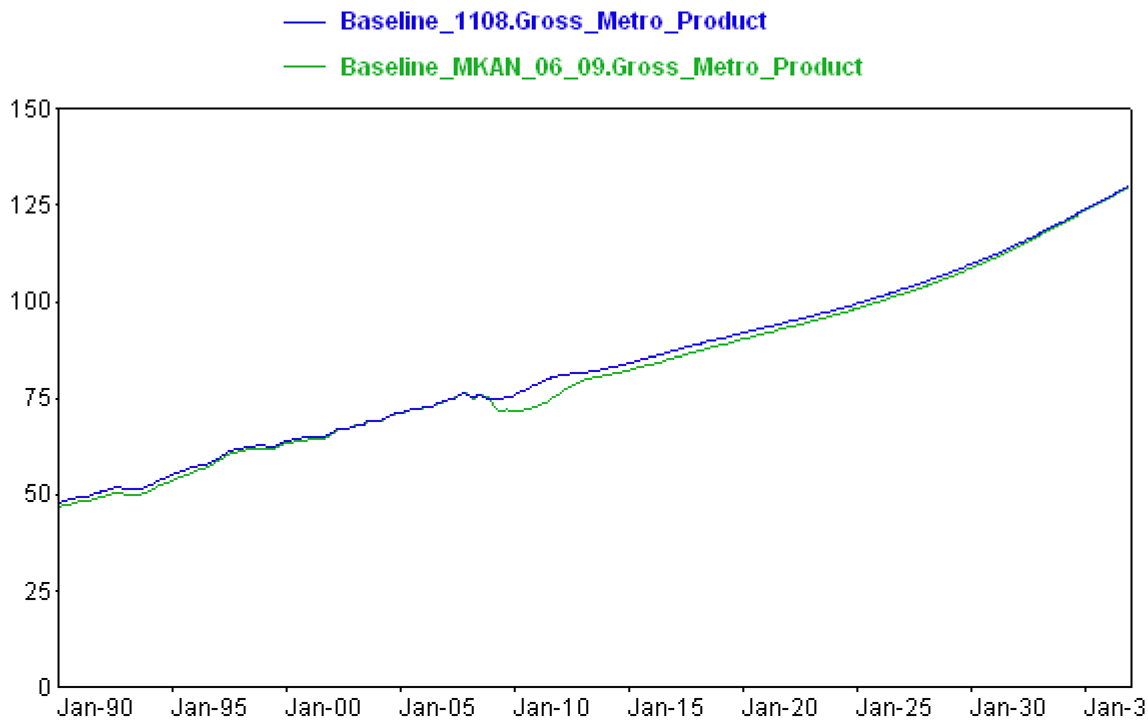
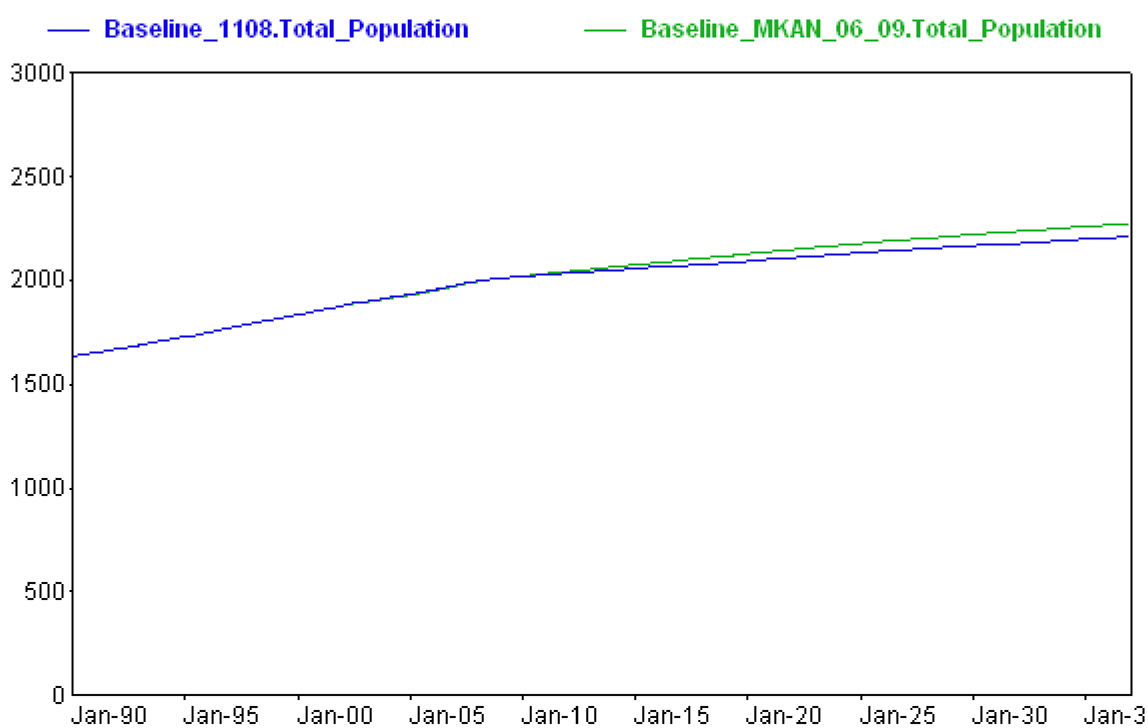
Comparison of MPS base line economic drives for IRP forecast (11/08) and '10-'14 Budget forecast (5/09)

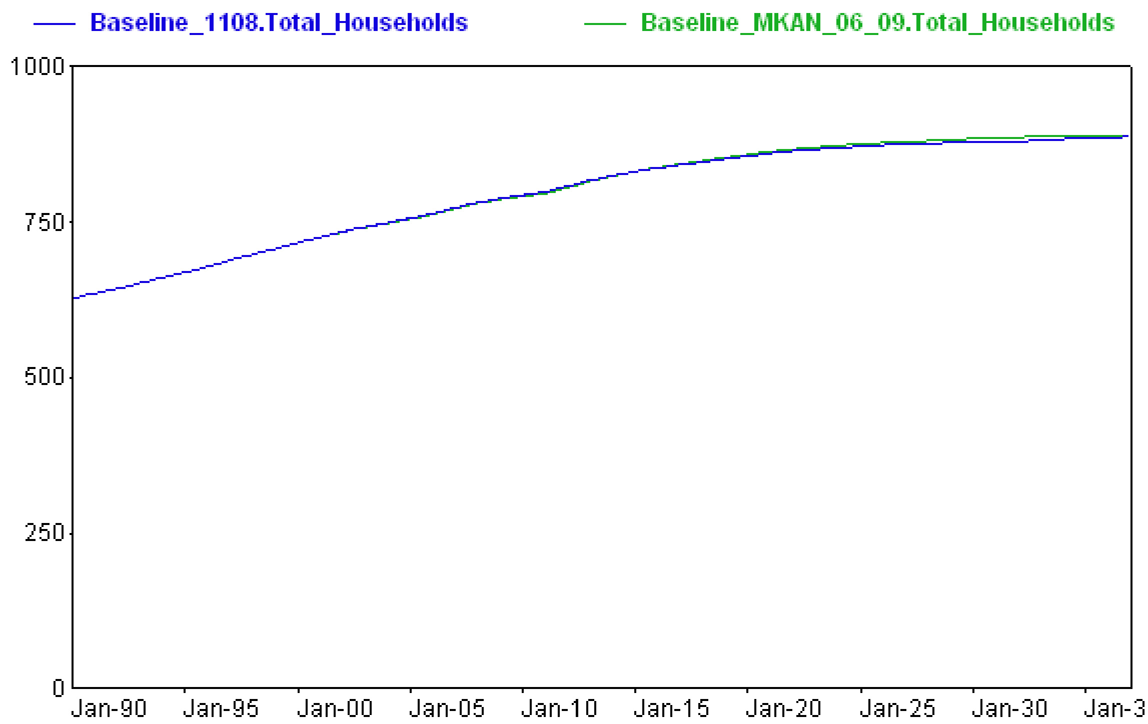
1. Gross Metro Product – Kansas City MSA (MPS)



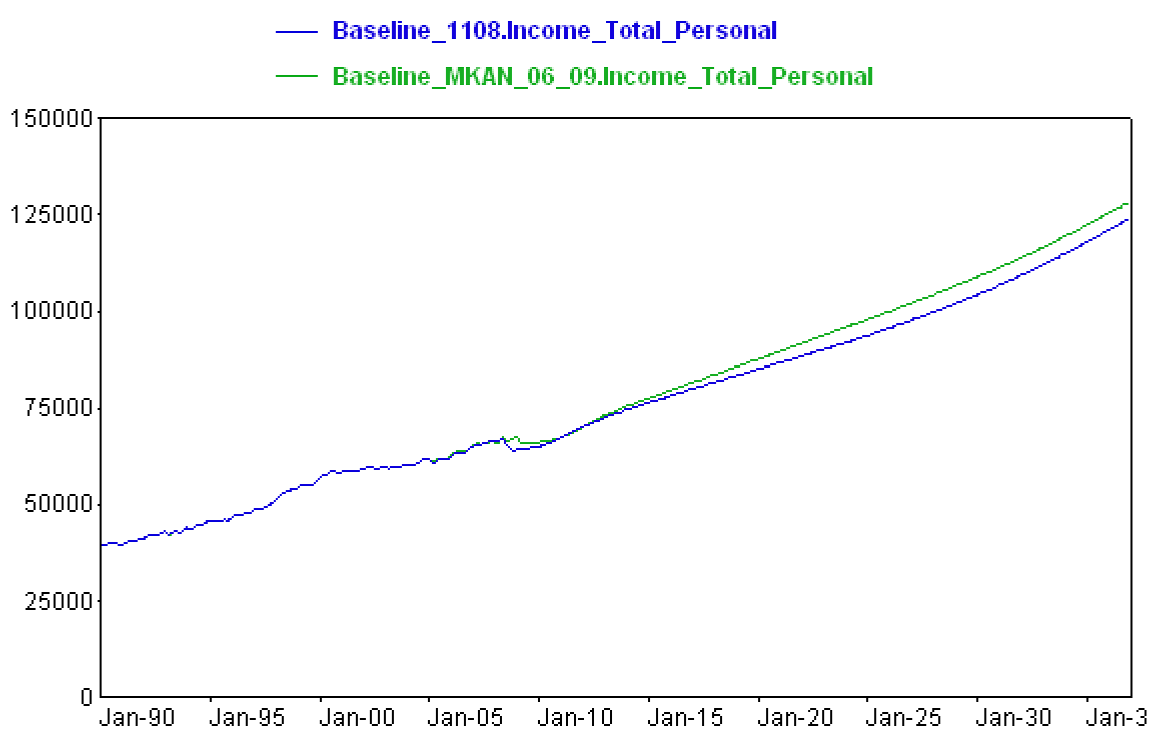
2. Population – Kansas City MSA (MPS)



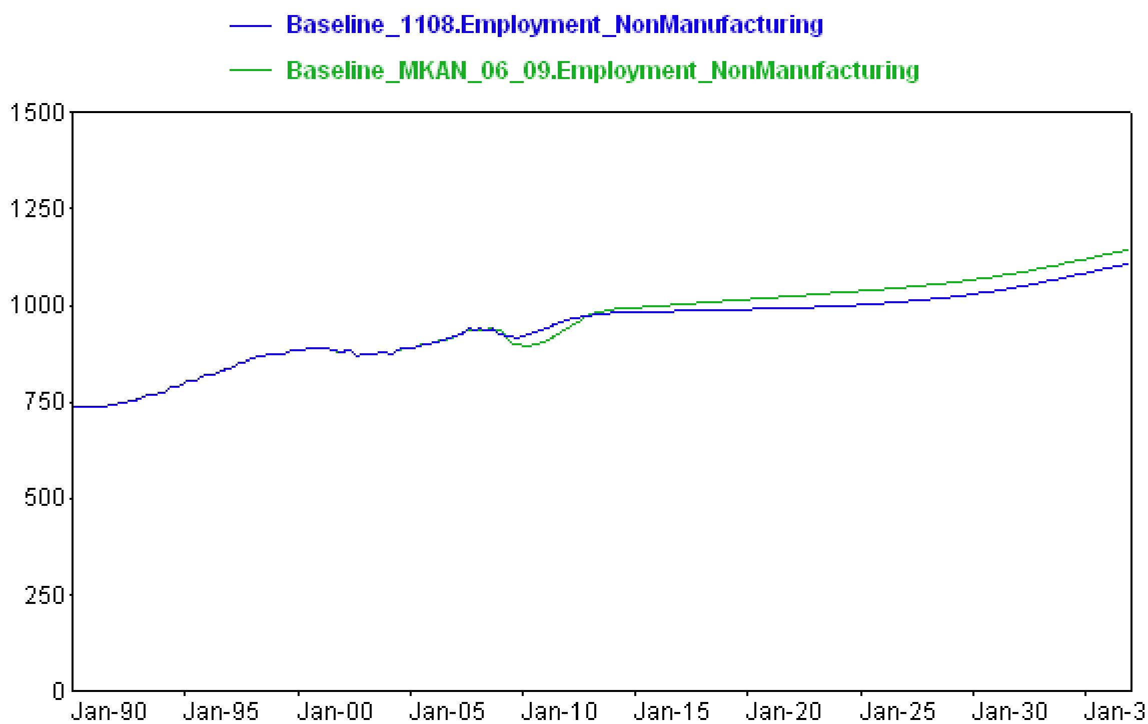
3. Households – Kansas City MSA (MPS)



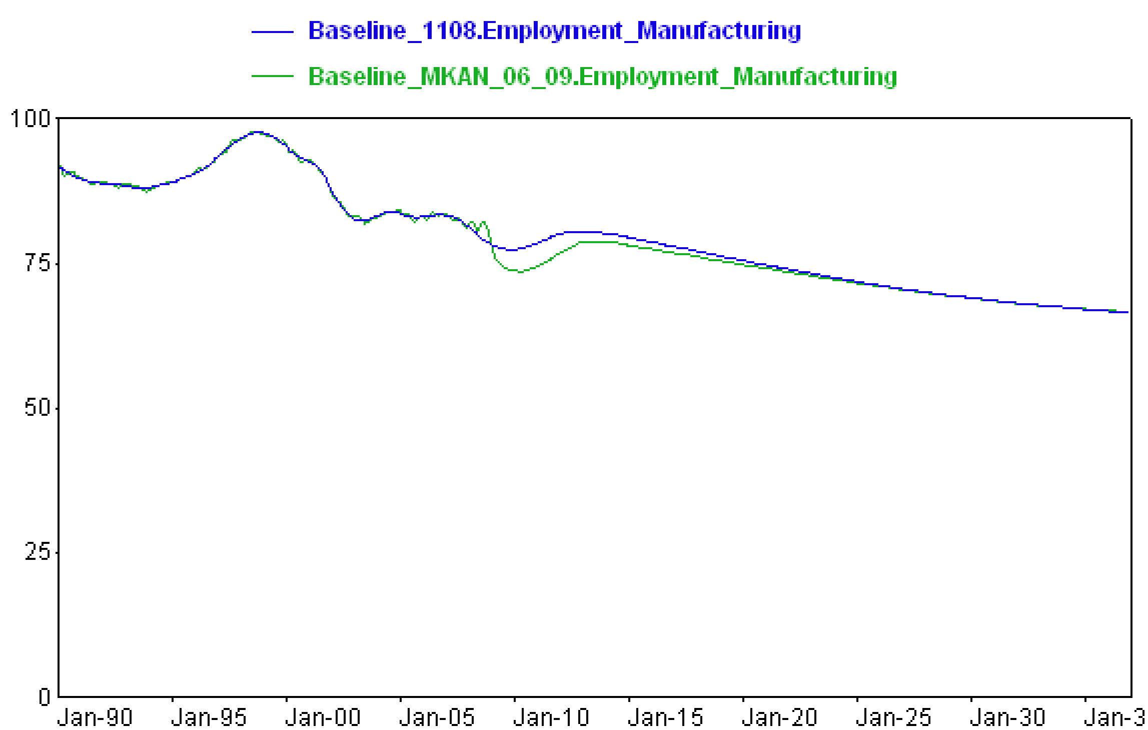
4. Personal Income – Kansas City MSA (MPS)



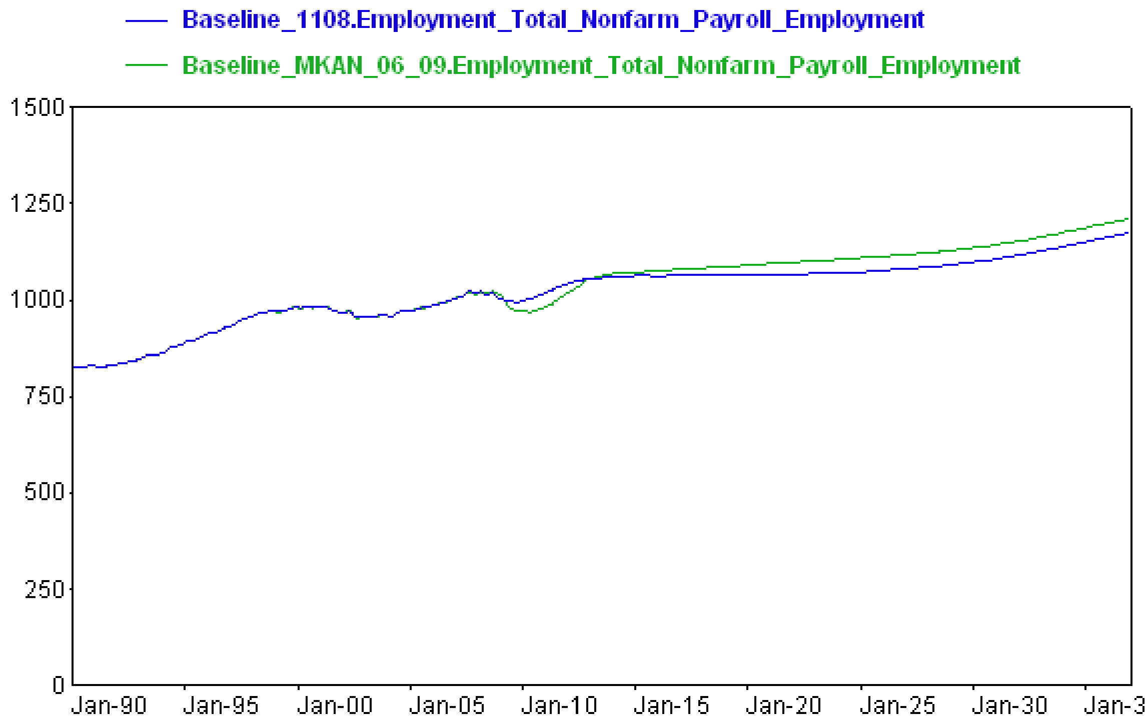
5. Employment Non-Manufacturing – Kansas City MSA (MPS)



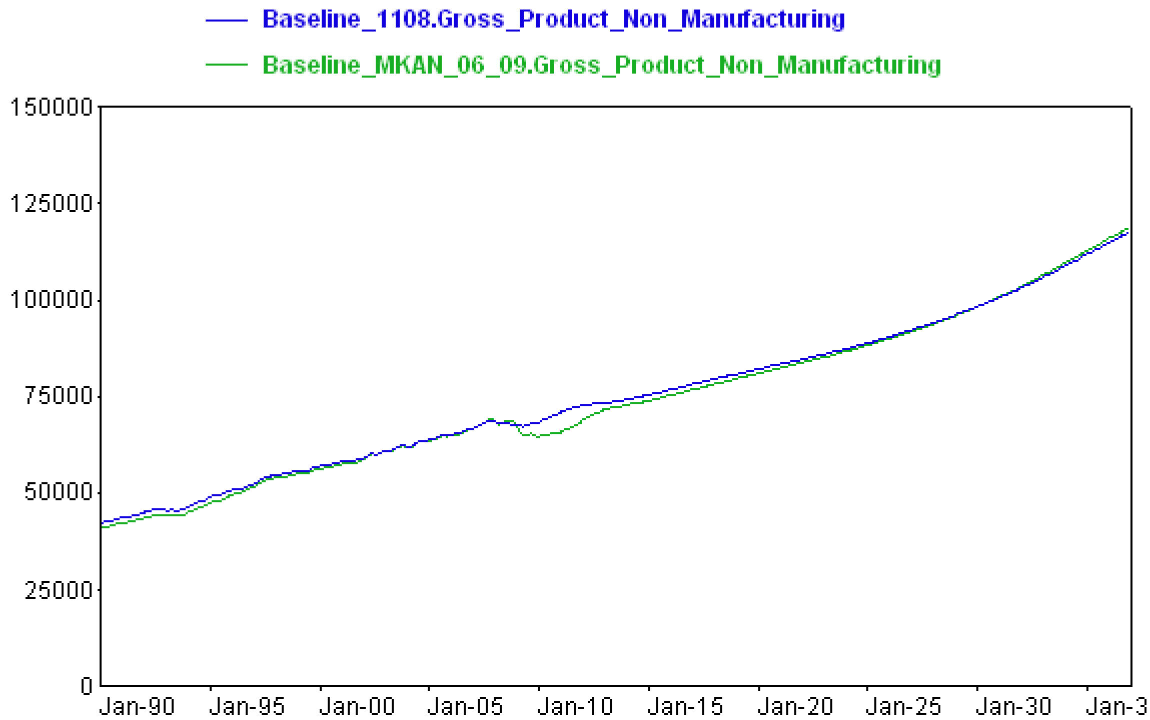
6. Employment Manufacturing – Kansas City MSA (MPS)



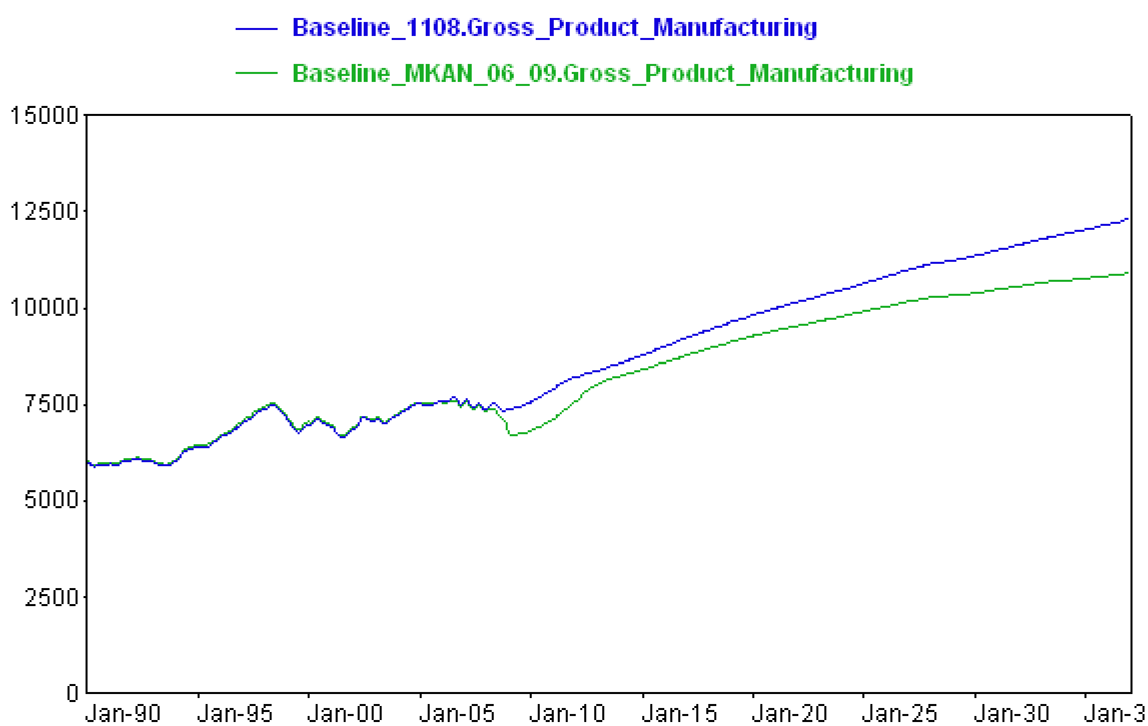
7. Employment Non-Farm Payroll – Kansas City MSA (MPS)



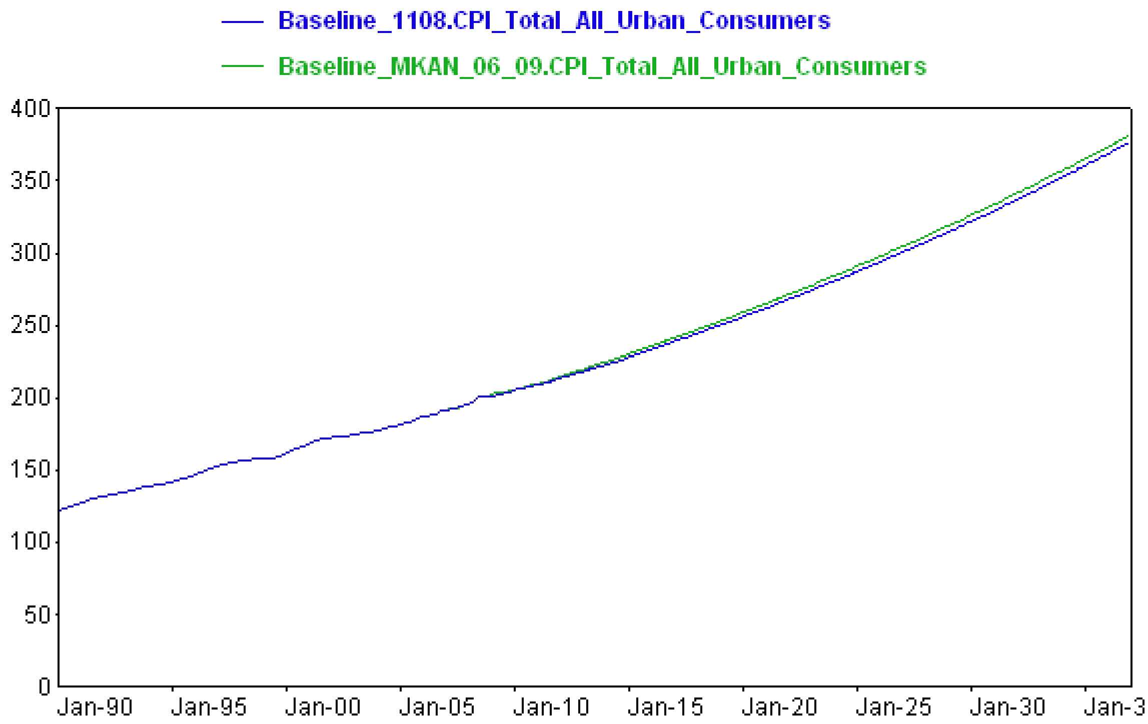
8. Gross Product Non-Manufacturing – Kansas City MSA (MPS)



9. Gross Product Manufacturing – Kansas City MSA (MPS)

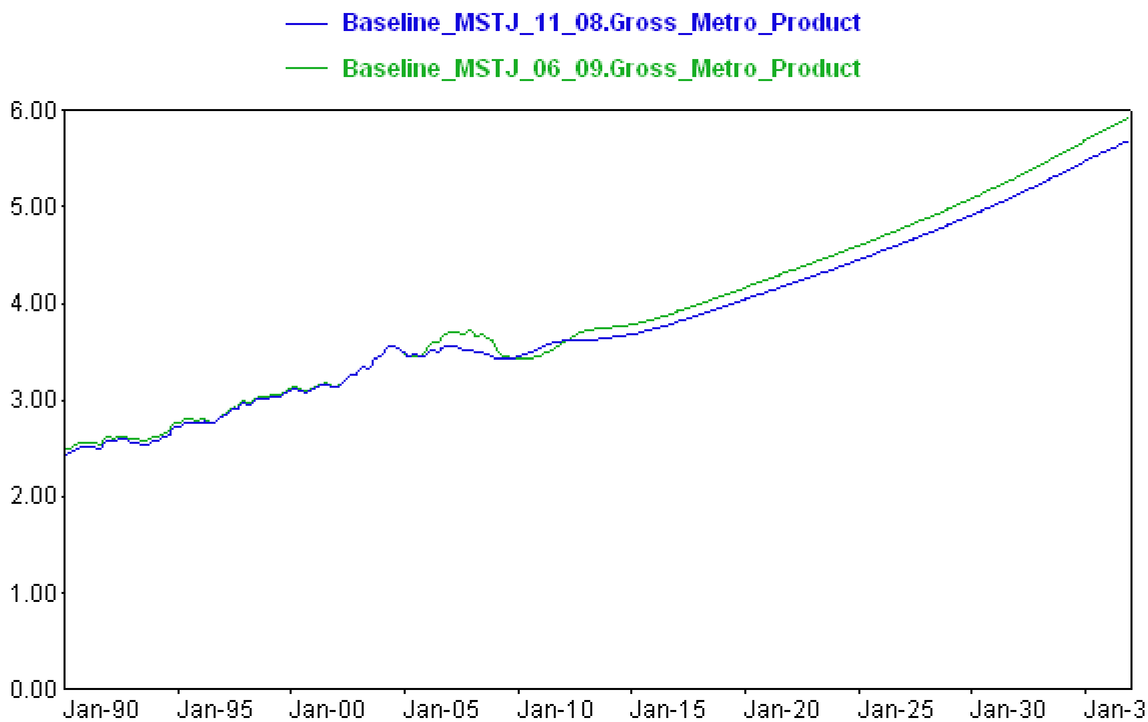


10. Consumer Price Index – Kansas City MSA (MPS)

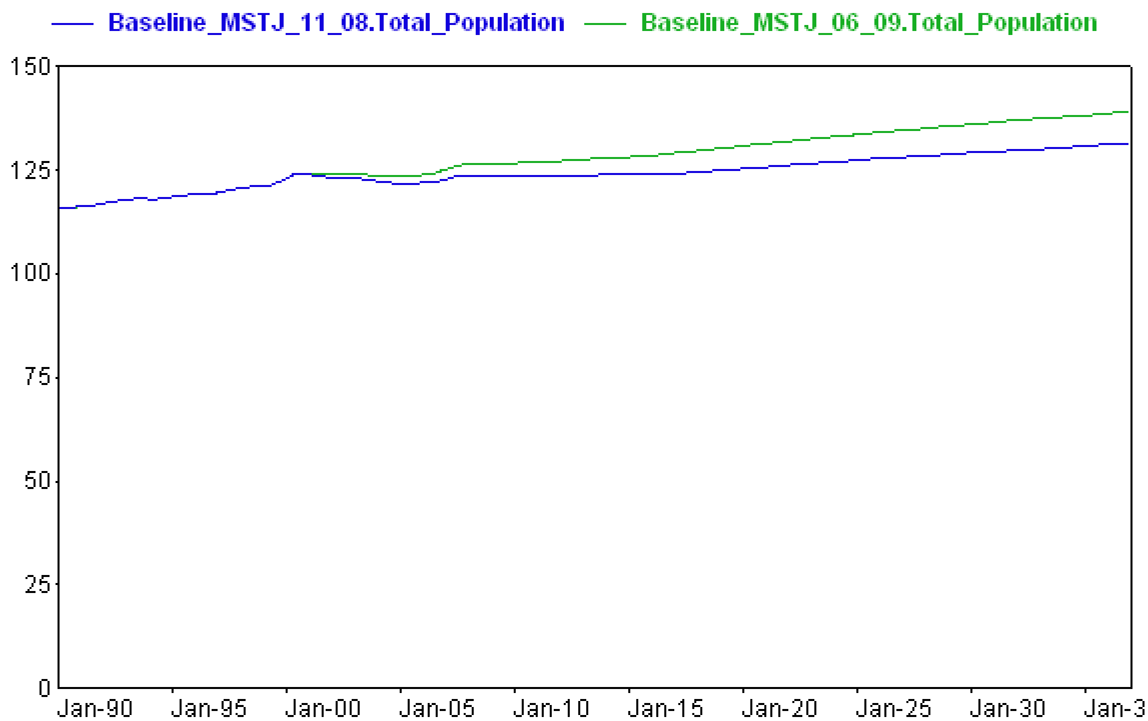


Comparison of SJLP base line economic drives for IRP forecast (11/08) and '10-'14 Budget forecast (5/09)

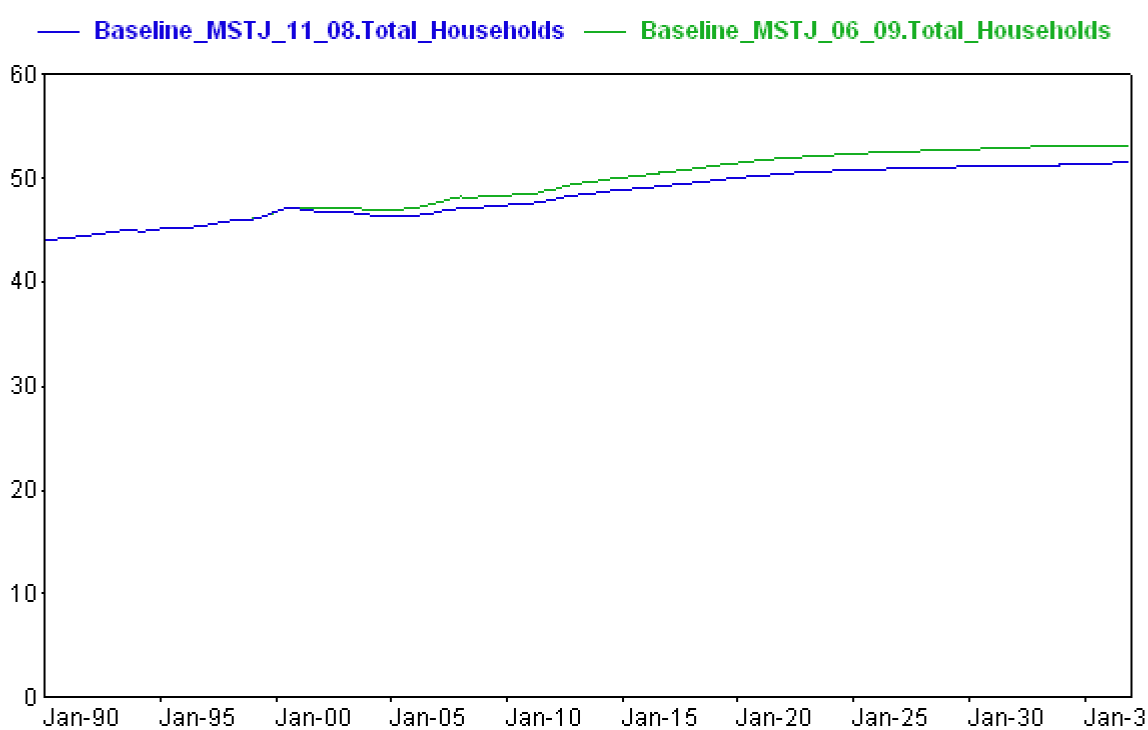
1. Gross Metro Product – St. Joseph MSA (SJLP)



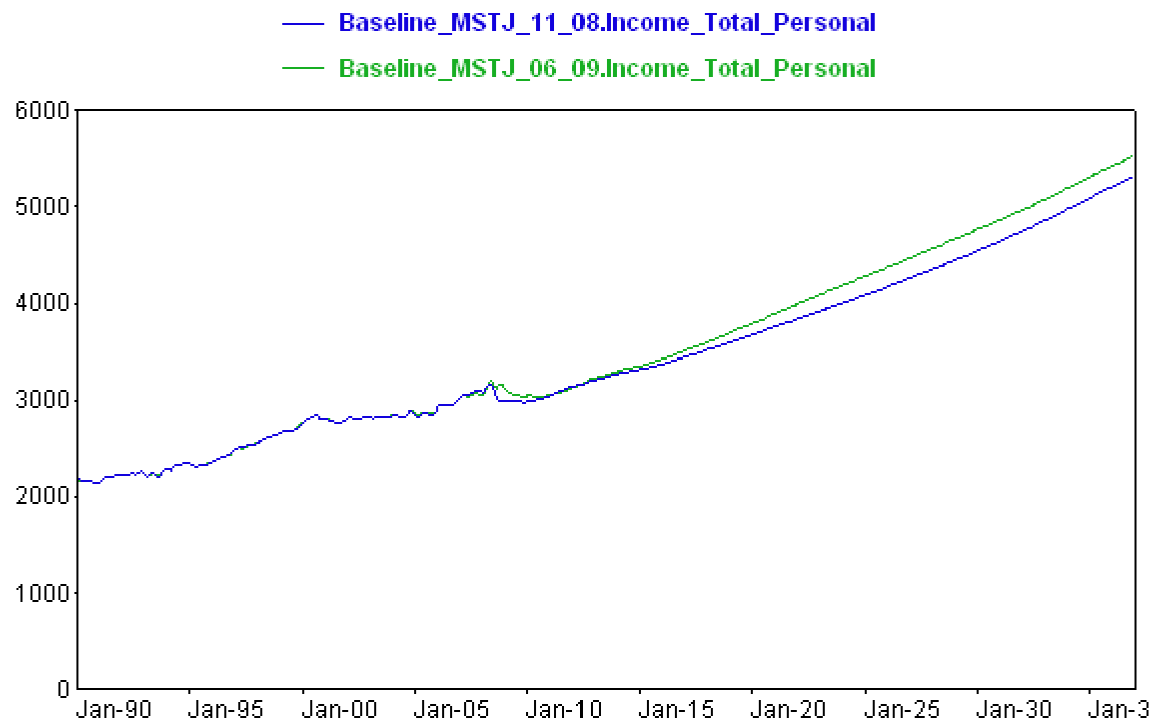
2. Population – St. Joseph MSA (SJLP)



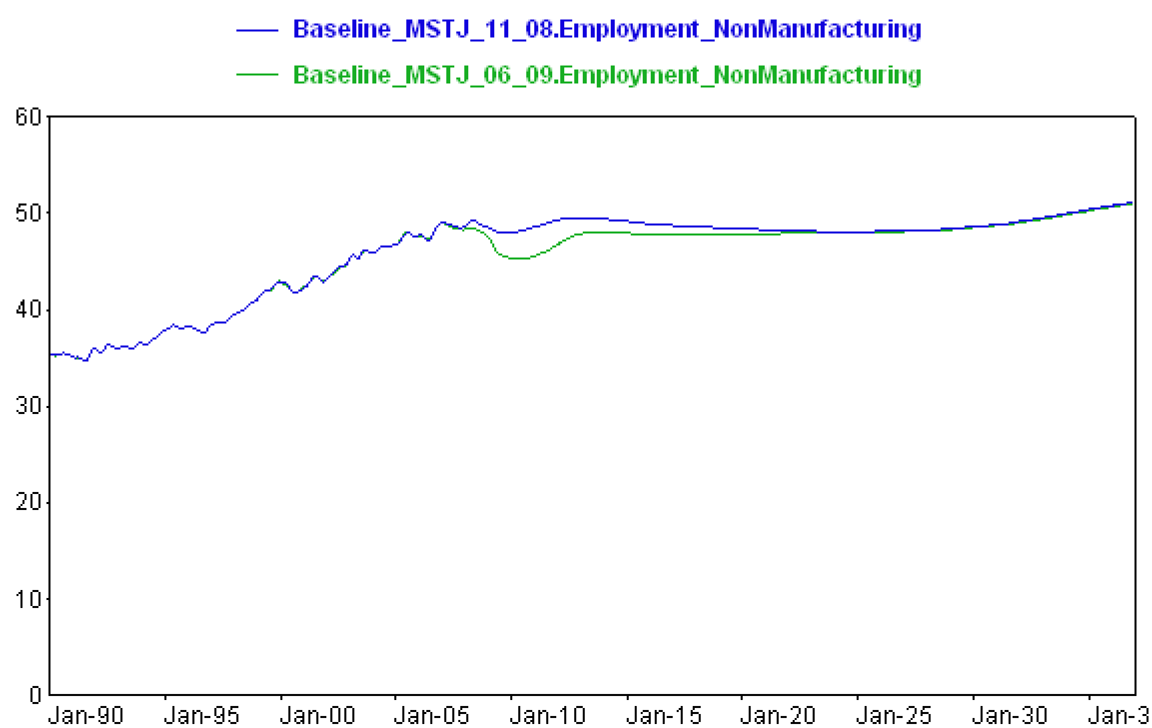
3. Households – St. Joseph MSA (SJLP)



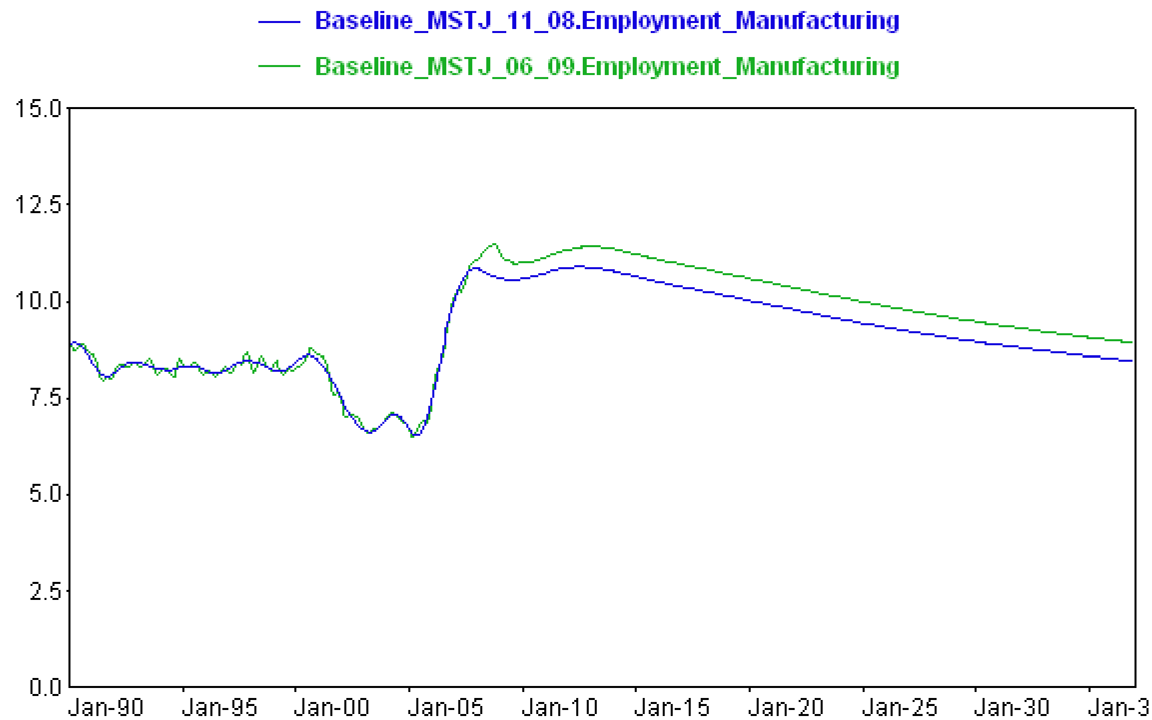
4. Personal Income – St. Joseph MSA (SJLP)



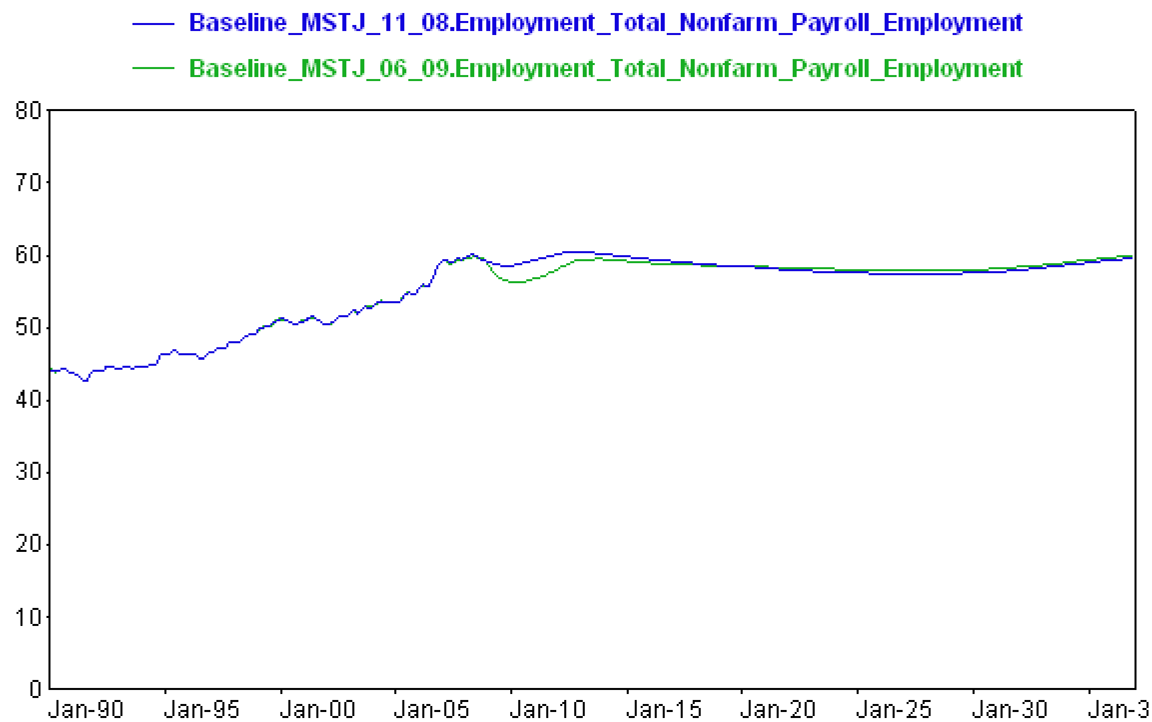
5. Employment Non-Manufacturing – St. Joseph MSA (SJLP)



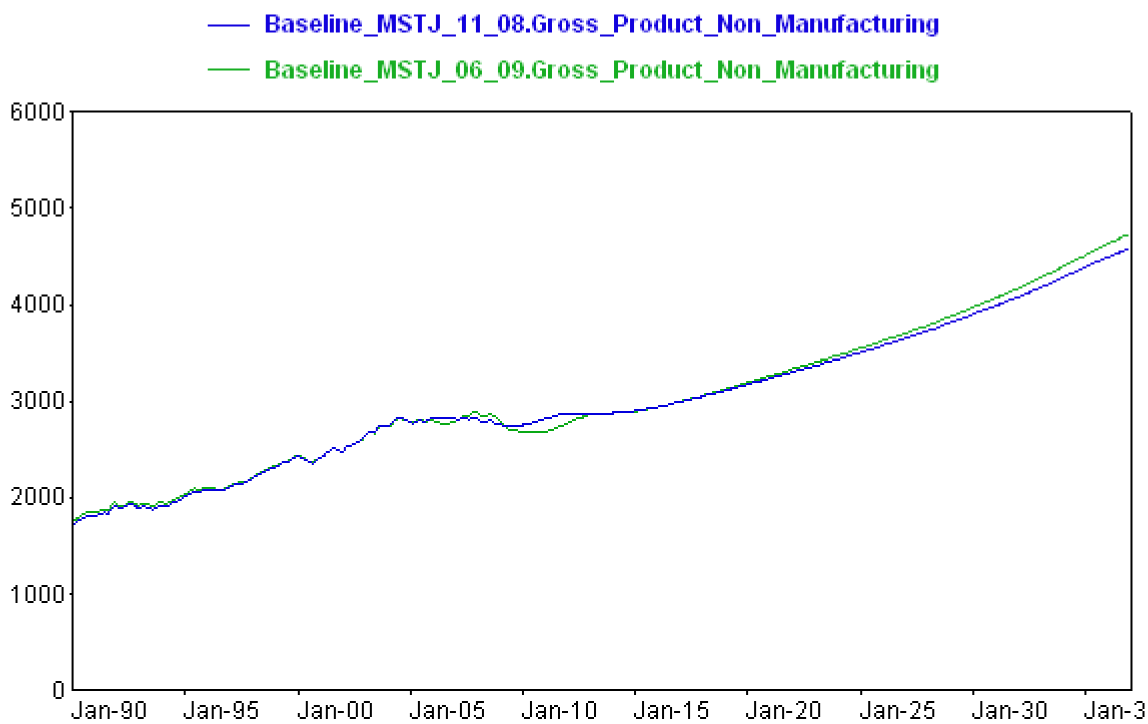
6. Employment Manufacturing – St. Joseph MSA (SJLP)



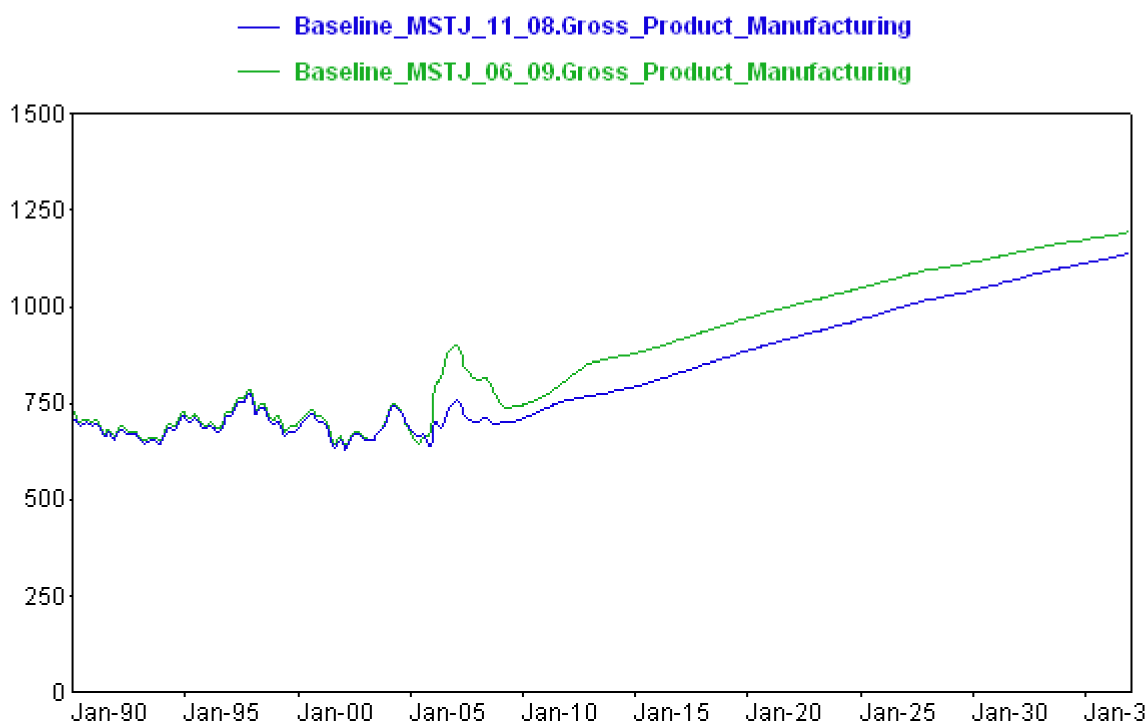
7. Employment Non-Farm Payroll – St. Joseph MSA (SJLP)



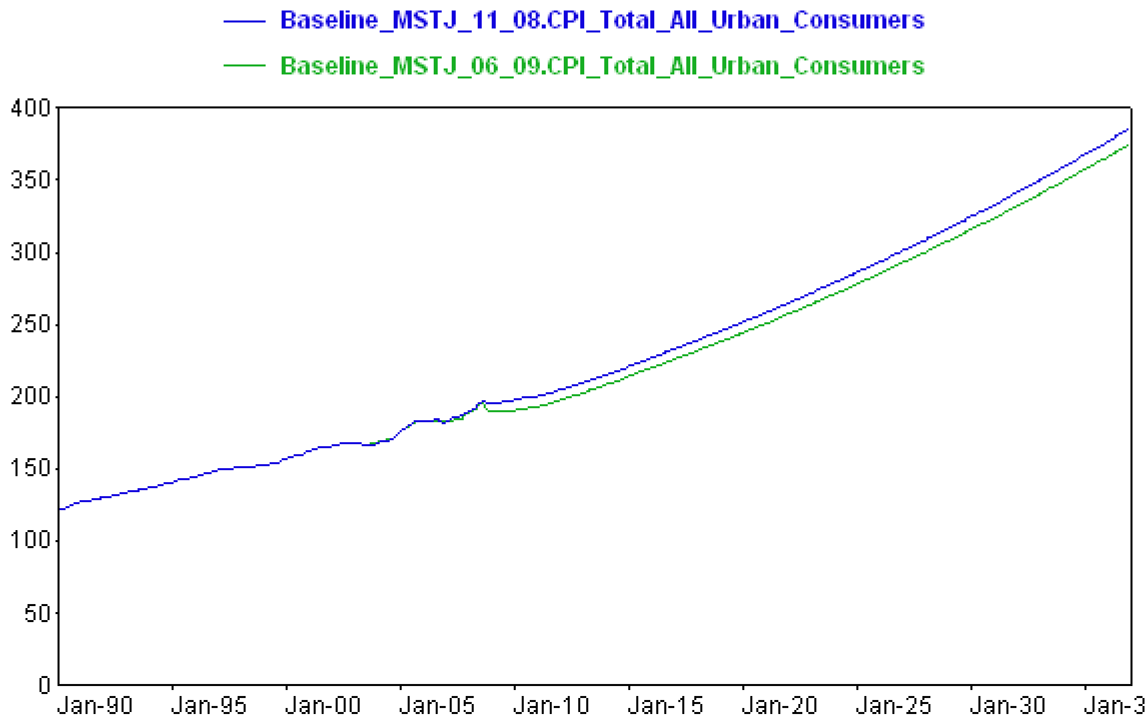
8. Gross Product Non-Manufacturing – St. Joseph MSA (SJLP)



9. Gross Product Manufacturing – St. Joseph MSA (SJLP)



10. Consumer Price Index – St. Joseph MSA (SJLP)



KCP&L- GMO
IRP
Stakeholder
Meeting
April 21,
2010

(1) Identification of End-Use Measures.

The analysis of demand-side resources shall begin with the development of a menu of energy efficiency and energy management measures that provide broad coverage of—

(A) All major customer classes, including at least residential, commercial, industrial and interruptible;

(B) All significant decision-makers, including at least those who choose building design features and thermal integrity levels, equipment and appliance efficiency levels, and utilization levels of the energy-using capital stock;

(C) All major end uses, including at least

- lighting,
- refrigeration,
- space cooling,
- space heating,
- water heating
- and motive power; and

(D) Renewable energy sources and energy technologies that substitute for electricity at the point of use.

Table 4 Residential End-Use Measures

Residential ID	Baseline measure	End-Use Improvement	End-Use Category
R1	AC Refrigerant under charged	Add refrigerant	Space Cooling
R2	AC Refrigerant over charged	Remove refrigerant	Space Cooling
R3	Low evaporator airflow A	Increase duct sizes or add new ducts	Space Cooling
R4	Low evaporator airflow B	Increase blower speed	Space Cooling
R5	High duct leakage (25%)	Reduce duct leakage to 5%	Space Heating & Cooling
R6	Oversized AC units A	Size AC units to 100% of Manual J	Space Cooling
R7	Oversized AC units B	Size AC units to 100% of Manual J	Space Cooling
R8	One inch insul. on ducts in attic	Add two more inches of insulation	Space Heating & Cooling
R9	Gas heat and 13 SEER AC	Install AC SEER = 16	Space Cooling
R10	Home has 13 SEER heat pump	Install Heat Pump SEER = 16	Space Heating & Cooling
R11	Home has electric strip heat	Install Heat Pump SEER = 16	Space Heating & Cooling
R12	Attic insulation = R-7	Add another R-23 attic insulation	Space Heating & Cooling
R13	Attic insulation = R-11	Add another R-19 attic insulation	Space Heating & Cooling
R14	Exposed walls not insulated	Add R-11 wall insulation	Space Heating & Cooling
R15	Floor over basement not insulated	Add R-19 Insulation to floor	Space Heating & Cooling
R16	House infiltration = 0.8 ACH	Reduce infiltration to 0.35 ACH	Space Heating & Cooling
R17	Single pane windows A	Add storm windows	Space Heating & Cooling
R18	Single pane windows B	Install Low E double pane window 2904	Space Heating & Cooling
R19	Standard double pane windows	Install Low E double pane window 2904	Space Heating & Cooling
R20	No E & W window shading A	Add solar screens to E & W glass	Space Heating & Cooling
R21	No E & W window shading B	Plant deciduous trees on E & W sides	Space Heating & Cooling
R22	No Compact Fluorescent Lamps	Use 10 more CFLs throughout house	LIGHTING
R23	Refrigerator needs to be replaced	Purchase Energy Star refrigerator	REFRIGERATION
R24	Refrigerator early retirement	Removed unit uses no energy	REFRIGERATION
R25	Dishwasher to be replaced	Purchase Energy Star dishwasher	HOME APPLIANCE
R26	Clothes washer to be replaced	Purchase Energy Star clothes washer	HOME APPLIANCE
R27	No prgrammable thermostat	Install programmable thermostat	Space Heating & Cooling
R28	No faucet aerators	Install faucet aerators	Water Heating
R29	No low flow shower heads	Install low fow shower heads	Water Heating
R30	Hot water pipes not insulated	Insulate hot water pipes	Water Heating
R31	Electric water heater not wrapped	Wrap electric water heater	Water Heating
R32	Electric Meter	Energy Usage and Display Monitor	Usage Device
R33	Early Retirement of HVAC system, if SEER< 8.5	Install Heat Pump SEER = 16	Space Heating & Cooling
R34	Early Retirement of HVAC system, if SEER< 8.5	Install Heat Pump SEER = 14	Space Heating & Cooling
R35	Early Retirement of HVAC system, if SEER< 8.5	Install Heat Pump SEER = 15	Space Heating & Cooling
R36	De-humidifier early retirement	Removed unit uses no energy	HVAC
R37	Room A/C Unit early retirement	Removed unit uses no energy	HVAC
R38	Freezer early retirement	Removed unit uses no energy	REFRIGERATION
R39	Failure of HVAC system, Replace with 13 SEER	Replace with 14 SEER Unit	Space Cooling
R40	Failure of HVAC system, Replace with 13 SEER	Replace with 15 SEER Unit	Space Cooling
R41	Failure of HVAC system, Replace with 13 SEER	Replace with 16 SEER Unit	Space Cooling

Table 5: C&I lighting measures

ID#	Potential Situation	Improvement	Quantity
C&I L1	T12 - 20W -2' 1 Lamp - Magnetic	T8 - 17W -2' 1 Lamp - Electronic	1 Fixture
C&I L2	T12 - 20W -2' 2 Lamp - Magnetic	T8 - 17W -2' 2 Lamp - Electronic	1 Fixture
C&I L3	T12 - 20W -2' 3 Lamp - Magnetic	T8 - 17W -2' 3 Lamp - Electronic	1 Fixture
C&I L4	T12 - 20W -2' 4 Lamp - Magnetic	T8 - 17W -2' 4 Lamp - Electronic	1 Fixture
C&I L5	T12 - 30W -3' 1 Lamp - Magnetic	T8 - 25W -3' 1 Lamp - Electronic	1 Fixture
C&I L6	T12 - 30W -3' 2 Lamp - Magnetic	T8 - 25W -3' 2 Lamp - Electronic	1 Fixture
C&I L7	T12 - 30W -3' 3 Lamp - Magnetic	T8 - 25W -3' 3 Lamp - Electronic	1 Fixture
C&I L8	T12 - 30W -3' 4 Lamp - Magnetic	T8 - 25W -3' 4 Lamp - Electronic	1 Fixture
C&I L9	T12- 34W - 4' 1 Lamp - Magnetic	T8 32W - 4' 1 Lamp - Electronic	1 Fixture
C&I L10	T12- 34W - 4' 2 Lamp - Magnetic	T8 32W - 4' 2 Lamp - Electronic	1 Fixture
C&I L11	T12- 34W - 4' 3 Lamp - Magnetic	T8 32W - 4' 3 Lamp - Electronic	1 Fixture
C&I L12	T12- 34W - 4' 4 Lamp - Magnetic	T8- 32W - 4' 4 Lamp - Electronic	1 Fixture
C&I L13	T12 - 60W - 8' 1 Lamp - Magnetic	T8 - 59W - 8' 1 Lamp - Electronic	1 Fixture
C&I L14	T12 - 60W - 8' 2 Lamp - Magnetic	T8 - 59W - 8' 2 Lamp - Electronic	1 Fixture
C&I L15	T12 - 95W - 8' 1 Lamp - Magnetic - HO	T8 - 86W - 8' 1 Lamp - HO - Electronic	1 Fixture
C&I L16	T12 - 95W - 8' 2 Lamp - Magnetic - HO	T8 - 86W - 8' 2 Lamp - HO - Electronic	1 Fixture
C&I L17	32 W T8 Lamp	Low Watt T8 Lamp	1 Lamp
C&I L18	T12- 34W - 4' 1 Lamp - Magnetic	T5 - 4' 1 Lamp - 28 watt	1 Fixture
C&I L19	T12- 34W - 4' 2 Lamp - Magnetic	T5 - 4' 2 Lamp - 28 watt	1 Fixture
C&I L20	T12- 34W - 4' 3 Lamp - Magnetic	T5 - 4' 3 Lamp - 28 watt	1 Fixture
C&I L21	T12- 34W - 4' 4 Lamp - Magnetic	T5 - 4' 4 Lamp - 28 watt	1 Fixture
C&I L22	T12- 34W - 4' 2 Lamp - Magnetic	T5 - 4' 1 Lamp HO - 54 watt	1 Fixture
C&I L23	T12 - 60W - 8' 2 Lamp - Magnetic	T5 - 4' 2 Lamp HO - 54 watt	1 Fixture
C&I L24	T12- 34W - 4' 4 Lamp - Magnetic	T5 - 4' 2 Lamp HO - 54 watt	1 Fixture
C&I L25	T12 - 8' and 4' Avg	T5 - 4' 2 Lamp HO - 54 watt	1 Fixture
C&I L26	T12 - 95W - 8' 2 Lamp - Magnetic - HO	T5 - 4' 3 Lamp HO - 54 watt	1 Fixture
C&I L27	T12 - 60W - 8' 4 Lamp - Magnetic	T5 - 4' 4 Lamp HO - 54 watt	1 Fixture
C&I L28	T12 - 95W - 8' 2 Lamp - Magnetic - HO	T5 - 4' 4 Lamp HO - 54 watt	1 Fixture
C&I L29	T12 - 95W - 8' 2 Lamp - Magnetic - VHO	T5 - 4' 4 Lamp HO - 54 watt	1 Fixture
C&I L30	T12 - 95W - 8' 2 Lamp - Magnetic - HO - VHO Avg	T5 - 4' 4 Lamp HO - 54 watt	1 Fixture
C&I L31	Hi-Bay 250 W Hi Intensity Discharge	Hi-Bay 3L T5 HO Fluorescents	1 Fixture
C&I L32	Hi-Bay 400 W Hi Intensity Discharge	Hi-Bay 4L T5 HO Fluorescents	1 Fixture
C&I L33	Hi-Bay 400W Hi Intensity Discharge	Hi-Bay 6L T5 HO Fluorescents	1 Fixture
C&I L34	Hi-Bay 1000W Hi Intensity Discharge	Hi-Bay 2-6L T5 HO Fluorescents	1 Fixture
C&I L35	Hi-Bay 250 W Hi Intensity Discharge	Hi-Bay 4L F32 T8 Fluorescents	1 Fixture
C&I L36	Hi-Bay 400 W Hi Intensity Discharge	Hi-Bay 6L F32 T8 Fluorescents	1 Fixture
C&I L37	Hi-Bay 400W Hi Intensity Discharge	Hi-Bay 8L F32 T8 Fluorescents	1 Fixture
C&I L38	Hi-Bay 1000W Hi Intensity Discharge	Hi-Bay 2-8L F32 T8 Fluorescents	1 Fixture
C&I L39	Hi-Bay 400 W Hi Intensity Discharge	Hi-Bay 8L 42W CFL	1 Fixture
C&I L40	Hi-Bay 400 W Hi Intensity Discharge	Hi-Bay 320 Watt Metal Halide - Pulse Start	1 Fixture
C&I L41	Hi-Bay 400 W Hi Intensity Discharge	Hi-Bay 350 Watt Metal Halide - Pulse Start	1 Fixture
C&I L42	Hi-Bay 400 W Hi Intensity Discharge	Hi-Bay 400 Watt Metal Halide - Pulse Start	1 Fixture
C&I L43	60W Inc	15W CFL	1 Lamp
C&I L44	2-60W Inc Fixture	2-13 W CFL Fixture	1 Fixture
C&I L45	Exit Signs have CFLs	Retrofit to LED EnergyStar Exit sign	1 Fixture
C&I L46	Standard lighting switch	Install Occupancy Sensor	1 switch
C&I L47	Traffic Signal, Incandescent	Install EnergyStar Rated LED Traffic Signal	1 Fixture
C&I L48	No Skylight or light tube	Install Light Tube Commercial Skylight	1 Fixture
C&I L49	No centralized lighting controls	Install centralized lighting controls	Per Sq. Ft
C&I L50	No lighting controls	Install Multilevel Lighting Controls	Per Sq. Ft
C&I L51	No lighting controls	Install Daylight Lighting Control Sensors	Per Sq. Ft

Table 13: Refrigeration and food service measures

ID#	Potential Situation	Improvement	Quantity
C&I Refrig 1	No Controls on Vending Machine	Install Cold Beverage Vending Machine Controllers	1 each
C&I Refrig 2	No anti-sw eat heater control	Install Anti-sw eat heater controls	per door
C&I Refrig 3	Standard condenser	Install Efficient Refrigeration Condenser	40 Ton capacity
C&I Refrig 4	No covers on food cases	Install Night Covers for Food Cases	Per lineal Ft
C&I Refrig 5	No compressor head controls	Install compressor head controls	Per Ton
C&I Refrig 6	Standard Commercial Solid Door Refrigerators less than 20ft3	ENERGY STAR Commercial Solid Door Refrigerators less than 20ft3	per unit
C&I Refrig 7	Standard Commercial Solid Door Refrigerators 20-48 ft3	ENERGY STAR Commercial Solid Door Refrigerators 20-48 ft3	per unit
C&I Refrig 8	Standard Commercial Solid Door Refrigerators more than 48ft3	ENERGY STAR Commercial Solid Door Refrigerators more than 48ft3	per unit
C&I Refrig 9	Standard Commercial Solid Door Freezers less than 20ft3	ENERGY STAR Commercial Solid Door Freezers less than 20ft3	per unit
C&I Refrig 10	Standard Commercial Solid Door Freezers 20-48 ft3	ENERGY STAR Commercial Solid Door Freezers 20-48 ft3	per unit
C&I Refrig 11	Standard Commercial Solid Door Freezers more than 48ft3	ENERGY STAR Commercial Solid Door Freezers more than 48ft3	per unit
C&I Refrig 12	Standard Ice Machines less than 500 lbs	Energy Efficient Ice Machines less than 500 lbs	per unit
C&I Refrig 13	Standard Ice Machines 500-1000 lbs	Energy Efficient Ice Machines 500-1000 lbs	per unit
C&I Refrig 14	Standard Ice Machines more than 1000 lbs	Energy Efficient Ice Machines more than 1000 lbs	per unit

Table 17: HVAC Measures

ID	Potential Situation	Improvement	Quantity
C&I HVAC 1	AC 65,000 1 Ph, 66 kWh/ton	AC 65,000 1 Ph, 59 kWh/ton	per Ton
C&I HVAC 2	AC 65,000 3 Ph, 49 kWh/ton	AC 65,000 3 Ph, 44 kWh/ton	per Ton
C&I HVAC 3	AC 65,000 - 135,000, 77 kWh/ton	AC 65,000 - 135,000, 60 kWh/ton	per Ton
C&I HVAC 4	AC 135,000 - 240,000, 120 kWh/ton	AC 135,000 - 240,000, 107 kWh/ton	per Ton
C&I HVAC 5	AC 240,000 - 760,000, 63 kWh/ton	AC 240,000 - 760,000, 56 kWh/ton	per Ton
C&I HVAC 6	AC >760,000, 93 kWh/ton	AC >760,000, 83 kWh/ton	per Ton
C&I HVAC 7	HP 65,000 1 Ph, 96 kWh/ton	HP 65,000 1 Ph, 99 kWh/ton	per Ton
C&I HVAC 8	HP 65,000 3 Ph, 58 kWh/ton	HP 65,000 3 Ph, 57 kWh/ton	per Ton
C&I HVAC 9	HP 65,000 - 135,000, 108 kWh/ton	HP 65,000 - 135,000, 108 kWh/ton	per Ton
C&I HVAC 10	HP 135,000 - 240,000, 119 kWh/ton	HP 135,000 - 240,000, 124 kWh/ton	per Ton
C&I HVAC 11	HP >240,000, 150 kWh/ton	HP >240,000, 153 kWh/ton	per Ton
C&I HVAC 12	Ground Source HP Closed Loop <135,000, 9 kWh/ton	Ground Source HP Closed Loop <135,000, 7 kWh/ton	per Ton
C&I HVAC 13	WLHP <17,000, 24 kWh/ton	WLHP <17,000, 22 kWh/ton	per Ton
C&I HVAC 14	WLHP 17,000-65,000, 21 kWh/ton	WLHP 17,000-65,000, 19 kWh/ton	per Ton
C&I HVAC 15	WLHP 65,000-135,000, 21 kWh/ton	WLHP 65,000-135,000, 19 kWh/ton	per Ton
C&I HVAC 16	PTAC, 28 kWh/ton	PTAC, 24 kWh/ton	per Ton
C&I HVAC 17	PTAC-HP, 45 kWh/ton	PTAC-HP, 48 kWh/ton	per Ton
C&I HVAC 18	Economizer, 159 kWh/ton	Economizer, 109 kWh/ton	per Ton
C&I HVAC 19	Tuneup - Refrigerant Charge, 145 kWh/ton	Tuneup - Refrigerant Charge, kWh/ton	per Ton
C&I HVAC 20	No ES Sleeve AC over 14,000 Btu hr	Install ES Sleeve AC over 14,000 Btu hr	1 Each
C&I HVAC 21	No ES Sleeve AC under 14,000 Btu hr	Install ES Sleeve AC under 14,000 Btu hr	1 Each
C&I HVAC 22	No Setback_Programmable Thermostat	Install Setback_Programmable Thermostat	1 Each
C&I HVAC 23	Chilled Water Reset Air Cooled 0-100 tons	Replace w ith Min ARI rated Efficiency	per Ton
C&I HVAC 24	Chilled Water Reset Air Cooled 100-200 tons	Replace w ith Min ARI rated Efficiency	per Ton
C&I HVAC 25	Chilled Water Reset Air Cooled 200-300 tons	Replace w ith Min ARI rated Efficiency	per Ton
C&I HVAC 26	Chilled Water Reset Air Cooled 300-400 tons	Replace w ith Min ARI rated Efficiency	per Ton
C&I HVAC 27	Chilled Water Reset Air Cooled 400-500 tons	Replace w ith Min ARI rated Efficiency	per Ton
C&I HVAC 28	Chilled Water Reset Water Cooled 0-1000 tons	Replace w ith Min ARI rated Efficiency	per Ton
C&I HVAC 29	Chilled Water Reset Water Cooled 1000-2000 tons	Replace w ith Min ARI rated Efficiency	per Ton
C&I HVAC 30	Chilled Water Reset Water Cooled 2000-3000 tons	Replace w ith Min ARI rated Efficiency	per Ton
C&I HVAC 31	Air Cooled Chillers	Replace w ith Min ARI rated Efficiency	per Ton
C&I HVAC 32	Water Cooled Chillers less than 150 ton	Replace w ith Min ARI rated Efficiency	per Ton
C&I HVAC 33	Water Cooled Chillers 150 - 300 ton	Replace w ith Min ARI rated Efficiency	per Ton
C&I HVAC 34	Water Cooled Chillers more than 300 ton	Replace w ith Min ARI rated Efficiency	per Ton
C&I HVAC 35	No Window Film	Install Window Film	per Sq. Ft.
C&I HVAC 36	Electric Water heater	HP Water Heater 500 gal_day	Gal per day
C&I HVAC 37	Electric Water heater	HP Water Heater 1000 gal_day	Gal per day
C&I HVAC 38	Electric Water heater	HP Water Heater 1500 gal_day	Gal per day

Table 42: Pumps and Variable Frequency Drive (VFD) measures

ID#	Potential Situation	Improvement	Quantity
CI Motive Power 1	Std. EPACT Motors 1-5 HP	NEMA Premium Motors 1-5 HP	per HP
CI Motive Power 2	Std. EPACT Motors 7.5-20 HP	NEMA Premium Motors 7.5-20 HP	per HP
CI Motive Power 3	Std. EPACT Motors 25-100 HP	NEMA Premium Motors 25-100 HP	per HP
CI Motive Power 4	Std. EPACT Motors 125-250 HP	NEMA Premium Motors 125-250 HP	per HP
CI Motive Power 5	Std. Pump HP 1.5	Hi Efficiency Pump HP 1.5	per HP
CI Motive Power 6	Std. Pump HP 2	Hi Efficiency Pump HP 2	per HP
CI Motive Power 7	Std. Pump HP 3	Hi Efficiency Pump HP 3	per HP
CI Motive Power 8	Std. Pump HP 5	Hi Efficiency Pump HP 5	per HP
CI Motive Power 9	Std. Pump HP 7.5	Hi Efficiency Pump HP 7.5	per HP
CI Motive Power 10	Std. Pump HP 10	Hi Efficiency Pump HP 10	per HP
CI Motive Power 11	Std. Pump HP 15	Hi Efficiency Pump HP 15	per HP
CI Motive Power 12	Std. Pump HP 20	Hi Efficiency Pump HP 20	per HP
CI Motive Power 13	No Variable Frequency Drive HP 1.5	Install Variable Frequency Drive HP 1.5	per HP
CI Motive Power 14	No Variable Frequency Drive HP 2	Install Variable Frequency Drive HP 2	per HP
CI Motive Power 15	No Variable Frequency Drive HP 3	Install Variable Frequency Drive HP 3	per HP
CI Motive Power 16	No Variable Frequency Drive HP 5	Install Variable Frequency Drive HP 5	per HP
CI Motive Power 17	No Variable Frequency Drive HP 7.5	Install Variable Frequency Drive HP 7.5	per HP
CI Motive Power 18	No Variable Frequency Drive HP 10	Install Variable Frequency Drive HP 10	per HP
CI Motive Power 19	No Variable Frequency Drive HP 15	Install Variable Frequency Drive HP 15	per HP
CI Motive Power 20	No Variable Frequency Drive HP 20	Install Variable Frequency Drive HP 20	per HP
CI Motive Power 21	No Variable Frequency Drive HP 25	Install Variable Frequency Drive HP 25	per HP
CI Motive Power 22	No Variable Frequency Drive HP 30	Install Variable Frequency Drive HP 30	per HP
CI Motive Power 23	No Variable Frequency Drive HP 40	Install Variable Frequency Drive HP 40	per HP
CI Motive Power 24	No Variable Frequency Drive HP 50	Install Variable Frequency Drive HP 50	per HP

Table 49: Other office equipment

Table 49: Other office equipment		
Potential Situation	Improvement	Quantity
No Plug Load Occupancy Sensors Document Stations	Plug Load Occupancy Sensors Document Stations	Per Unit
Std. Power Supply_Desktop Unit	80Plus Power Supply_Desktop Unit	Per Unit
Std. Power Supply_Server Unit	80Plus Power Supply_Server Unit	Per Unit
No Computer Power Manager	Computer Power Manager	Per Unit

Other Measures – Small Scale Renewable Energy Systems

Small Scale Renewable Systems

- 2.0 kW PV Solar System
- 3.20 kW PV Solar System
- 2.4 kW Wind Turbine
- 6 kW Wind Turbine
- Solar Hot Water System
- Solar Air Heating System

Appendix 1, paragraph 18

- Stakeholders provide proposed list of end-use measures

Stakeholder GMO IRP issues
MDNR #8

1. Include "Plug Load" Electronics

   GMO Proposed plug load List
   Plug load electronics will be collectively reviewed as one potential measure. Under this measure the following technologies will be reviewed:

   a)televisions;
   b) set top boxes (cable or satellite);
   c) home computers/notebooks;
   d) printers;
   e) wireless routers;
   f) modems;
   g) compact audio systems;
   h) home entertainment systems; and
   i) DVD players.

   The qualification threshold for each of these measures will be whether or not they meet Energy Star standards.

2. Combined Heat & Power

3. Table 14: End-Use Measures to be Considered

End-Use (Sector)	**Measures**
Food Service (C&I)	• Hot water boost heaters • Efficient hood systems • Efficient fryolators • Efficient Ovens (combination, convection, conveyor, rack) • Efficient steam cookers & griddles • Insulated holding cabinets • Scroll and discus compressors • Zero Energy Doors (refrigeration)
Lighting & HVAC (C&I)	• Integrated energy management systems • Dual Enthalpy Economizer • Compressed Air (C&I) Efficient compressors • Cycling dryers • No Loss Condensate Drains • Air Receivers for Load/No Load Compressors • Air system audits and leak elimination • Compressed Air Controls
Transformers (C&I)	• Energy Star Transformers
Accommodations (C&I)	• Key activated systems
HVAC (Res)	• Efficient furnace fans (ECM, variable speed,etc.) • Efficient ceiling fan • Efficient ventilation fans
Clothes Dryer (Res)	• Clothes dryer fuel switch
Waterbed (Res)	• Replace waterbed with conventional mattress

OPC

1. Street Lighting
2. Combined Heat & Power
3. Alternative Rate Structures
4. Financing program

MO PUC STAFF

1. Multi-family
2. Demand response
3. Street Lighting

KCP&L GREATER MISSOURI OPERATIONS COMPANY
2009 INTEGRATED RESOURCE PLAN
CORPORATE APPROVAL STATEMENT FOR
RESOURCE ACQUISITION STRATEGY

The 2009 Integrated Resource Plan ("IRP") of KCP&L-Greater Missouri Operations Company ("GMO") was prepared under our direction and control. This includes eight (8) Volumes that comprise the IRP. To the best of our knowledge, information, and belief, the methods used and the procedures followed by GMO in formulating the resource acquisition strategy contained in the IRP comply with the provisions of Chapter 22 of the regulations of the Missouri Public Service Commission ("Commission") subject to waivers previously granted by the Commission. GMO has approved the Resource Acquisition Strategy shown as Appendix 7A.

As required by 4 CSR 240-22.080(10) the referenced resource acquisition strategy includes: 1) the Preferred Resource Plan, 2) an implementation plan for the new resource additions included in the Preferred Resource Plan, 3) ranges of the critical uncertain factors, 4) contingency options, and 5) monitoring and reporting processes of the critical uncertain factors. Pursuant to the requirements of the Commission's regulations, GMO will notify the Commission if GMO determines that circumstances have changed so that the Preferred Resource Plan identified in GMO's 2009 Integrated Resource Plan is no longer appropriate.

William H Downey

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