VOLUME 6:

INTEGRATED ANALYSIS

KCP&L

INTEGRATED RESOURCE PLAN

4 CSR 240-22.060

** PUBLIC **

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Appendix 6.A.2 Integrated Analysis Technology Cost Development Background Data

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VOLUME 6: INTEGRATED ANALYSIS

SECTION 1: BACKGROUND

Under Integrated Analysis (IA), utilities are to design alternative resource plans that satisfy the requirements of 4 CSR 22.010 (2). This rule requires plans to "provide the public with energy services that are safe, reliable and efficient, at just and reasonable rates, and in a manner that serves the public interest." The objectives include:

- Consider demand-side efficiency and energy management on an equivalent basis with supply alternatives,
- Use minimization of present worth of long-run utility costs as the primary selection criterion, and
- Specifically identify other considerations which are critical to meeting the fundamental objective of the resource planning process, but which may limit the minimization of the present worth of expected utility costs.

To address the third item listed above, utilities are to document the process and rationale used by decision makers to assess the tradeoffs and determine the appropriate balance between cost minimization and the other considerations in selecting a preferred resource strategy and developing contingency plans. Consideration shall include at least the following items:

- Risks associated with critical uncertainties
- Risk associated with new or more stringent environmental laws
- Rate increases associated with alternative resource plans.

As required by 4 CSR 22.060 (2), the measures used to assess performance of alternative resource plans include the five measures listed below:

1. Present worth of utility revenue requirements
2. Present worth of probable environmental costs
3. Present worth of out-of-pocket costs to participants of demand-side programs
4. Levelized annual average rates
5. Maximum single-year increase in annual average rates

In addition to the above selection criteria, the utility is also required to evaluate the following measures of the utility's financial condition for each year of the planning horizon:

- Pretax interest coverage
- Ratio of total debt to total capital
- Ratio of net cash flow to capital expenditures

1.1 KCP&L MODELING BACKGROUND

KCP&L utilizes the MIDAS™ model, which is similar to other fundamental price forecasting models commonly used in the industry. MIDAS™ is provided by Ventyx (formerly Global Energy Decisions). A detailed description of MIDAS™ is included in Volume 7, Risk Analysis and Strategy Selection, Section 11.1. As required by 22.060 (4) (B), the model assumed that rates were adjusted annually. The model provides the opportunity to compare the cost impacts of various alternative resource plans under a range of future uncertainties. Available comparisons include the 5 selection criteria noted above.

MIDAS™ also provides a Capacity Expansion Module © (CEM). The CEM function allows the model to select economic resource additions under various future scenarios. This capability allows the CEM to serve as an additional screening tool by identifying the preferred technology selections and installation timing under specified scenarios of future uncertainties. For example, one scenario might include "base" forecasts for the cost of fuel and projected load, but show high costs for emission allowances. The CEM results would select the combination and timing of resource additions that provides the lowest Present Value Revenue Requirement (PVRR) under this defined scenario.

As discussed in Volume 4, Supply-Side Resource Analysis, Ventyx was retained to perform modeling utilizing the CEM functionality of MIDAS™ (See Section 3 of Volume 4 for details of this modeling). Ventyx was provided a set of 10 future scenarios, similar to the example given above. Results of the Ventyx modeling served as an additional level of screening by identifying the preferred selection of resource additions under each of the 10 future scenarios. The alternative resource selections available to Ventyx included supply-side resource additions as well as new Demand Side Management (DSM) and Energy Efficiency (EE) programs. The CEM treats supply-side, DSM, and EE alternatives on an equal basis as required by the IRP rules.

1.2 KEY UNCERTAIN FACTORS IMPACTING RESOURCE PLANNING

Pursuant to 22.060 (4) KCP&L identified five (5) uncertainties that were judged to have significant impacts on the selection of a preferred resource plan. The process of forecasting the range of fuel and emission costs over the 20-year planning horizon was discussed in detail in Volume 4, Supply-Side Analysis of this report. The uncertainty of future system loads was discussed in detail in Volume 3, Load Analysis and Forecasting. The forecasting process identified the most likely, or expected value, for the five (5) uncertainties as well as providing the statistical basis for providing the range of expected results under the performance measures required by Rule 22.060 (2). The key uncertainties identified were:

1. Price and availability of natural gas,
2. Emission allowance price forecasts,
3. System load,
4. Price of coal, and
5. Cost of Probable Environmental regulations (primarily the potential for CO_2 emission restrictions, but also including other probable restrictions).

SECTION 2: DEVELOPMENT OF ALTERNATIVE RESOURCE PLANS

DSM and EE alternatives were primarily screened using the Integral Analytics DSMore model as described in Volume 5 , Demand-Side Resource Analysis. Pursant to rule 22.050 (7) (F), nearly all DSM and EE programs evaluated were carried into Integrated Analysis. End-use measures not included in Integrated Analysis are described in Section 3.3.1 of Volume 5 and include:

- Upgrading residential air conditioners from 13 SEER to 14, 15 or 16 SEER
- Adding 2-inches or more of residential attic insulation
- Adding residential floor insulation
- Insulating residential hot water pipes
- Installing Energy Star® dishwashers/clothes dryers
- All end-use renewable generation evaluated by The Energy Savings Store.

For supply-side alternatives, KCP&L included two levels of pre-screening. The first level involved meeting the IRP requirements under 4 CSR 22.040, Supply-Side Analysis. The second level included an evaluation performed by Ventyx using the CEM capabilitiy of MIDAS™ as described above in Section 1.1. Based on the results of the first level of pre-screening, the technologies shown in Table 1 below were passed to Ventyx for resource plan optimization modeling.

Table 1: Technologies Included in Ventyx CEM Modeling

Combined Cycle	Supercritical Pulverized Coal with and without Carbon Capture and Sequestration (CCS)	Circulating Fluidized Bed Combustion
Integrated Gasification Combined Cycle (IGCC) with and without Carbon Capture and Sequestration (CCS)	Combustion Turbines (CT's)	Nuclear
Wind	Compressed Air Energy Storage (CAES)	Molten Carbonate Fuel Cells
Solar Parabolic Trough	Photovoltaic Flat Plate	Microturbines
Biomass Alternatives	DSM Programs	Energy Efficiency Programs

2.1 VENTYX OPTIMIZATION ANALYSIS

Cost and performance data for the technologies shown above in Table 1 were provided to Ventyx for optimization modeling using the MIDAS™ CEM© functionality. Details of the cost and performance data utilized by Ventyx are shown in Appendix 4.A.7 under Volume 4, Supply-Side Analysis. In addition, coal retirements were also available for selection by the MIDAS™ CEM© model.

The first step of the CEM evaluations is to establish scenarios by specifying combinations of values for future uncertainties. A decision tree representation of the scenarios modeled by Ventyx is shown in Table 2, below. For each scenario established, the CEM performs multiple evaluations with each available alternative technology and ultimately selects the preferred combination and timing of resource additions for each scenario. The result is the selection of alternative technologies that provide the lowest present value of revenue requirements (PVRR) under each scenario.

This process served as an additional screen to reduce the number of candidate technologies used in developing alternative resource plans. Combined, the initial pre-screening and the Ventyx optimization modeling address the requirements of 22.060 (3), which requires the inclusion of appropriate combinations of resources in alternative resource plans.

It should be noted that the cost and performance data for some of the technologies evaluated by Ventyx were updated from values utilized in the first level Supply-Side pre-screening. As discussed in Volume 4 of this report, the first level pre-screening evaluations were based on EPRI TAG ® data to ensure that consistent assumptions were utilized for the initial screening of technologies. For the second level of pre-screening, the decision was made to utilize the latest available cost data to provide a more current comparison of technologies. The basis and development of these technology cost updates are shown in Appendix 4.A.8.

2.1.1 SCENARIOS EVALUATED BY VENTYX

Based on the five (5) uncertainties identified above in Section 1.2, Ventyx was provided a list of 10 alternative futures. The assumed value of each uncertainty for the 10 scenarios is shown in Table 2 below.

Table 2: Ventyx Future Scenarios

Ventyx Capital Expansion Model (CEM) Futures					
Natural Gas Prices	Enviromental Allowance Prices	Load Growth	Coal Prices	CO2 Allowance Prices	Plan Number
				High	Plan V-7
High	High	High	High	None	Plan V-2
	High	Base	Base	None	Plan V-3
				High	Plan V-8
				Base	Plan V-6
Base	Base	Base	Base		
				Low	Plan V-9
				None	Plan V-1
	Low	Base	Base	None	Plan V-4
Low	Low	Low	Low	Low	Plan V-10
				None	Plan V-5

2.1.2 VENTYX TECHNOLOGY SELECTION AND TIMING

Using the CEM capability of MIDAS, Ventyx provided one optimized resource plan for each of the 10 scenarios. The resulting 10 resource plans are shown in Table 3 and Table 4 below.

Table 3: Optimal Resource Plans from CEM Modeling ** Proprietary **

	Plan V-1	Plan V-2	Plan V-3	Plan V-4	Plan V-5

Table 4: Optimal Resource Plans from CEM Modeling ** Proprietary **

	Plan V-6	Plan V-7	Plan V-8	Plan V-9	Plan V-10

2.1.3 SUMMARY OF VENTYX FINDINGS

Optimization modeling did not select the technologies listed below, and therefore, these technologies were not carried forward to Integrated Analysis:

- Fluidized Bed Combustion
- Fuel Cells
- Small Scale generation (microturbines)
- Compressed Air Energy Storage (CAES)

- Solar (Note that PV was included in one alternative resource plan designed to meet the terms of a renewable energy ballot initiative in Missouri)

Explanations for exclusions of these technologies are found in Volume, 4, Supply-Side Analysis, Section 3.2.4.

2.2 KCP&L INTEGRATED ANALYSIS

Technologies moved to Integrated Analysis are shown in Table 5 below.

Table 5: Technologies Evaluated in Integrated Analysis

Combined Cycle	Supercritical Pulverized Coal with and without Carbon Capture and Sequestration (CCS)	Nuclear
Integrated Gasification Combined Cycle (IGCC) with and without Carbon Capture and Sequestration (CCS)	Combustion Turbines (CT's)	Energy Efficiency Programs
Wind	Photovoltaic Flat Plate	Biomass Alternatives
CCS on Existing Coal Units	DSM Programs	

Details of the cost and performance data utilized to model these technologies in Integrated Analysis are attached in Appendix 6.A.1. It should be noted that the capital costs for SCPC and nuclear generation technologies were once again updated prior to evaluation under Integrated Analysis. The costs were updated from the costs modeled by Ventyx. The capital cost of SCPC generation was updated based on Iatan-2 cost data presented to the Joint Owners Meeting, May, 2008. The cost of additional transmission investment was added to the updated cost and a 15% contingency was added to reflect potential cost increases associated with a future SCPC alternative. The capital cost of nuclear generation was based on an average of capital cost estimates cited in a May 12, 2008 article from the Wall Street Journal.

Details of the SCPC and nuclear capital cost estimates are attached in Appendix 6.A. 1 and 6.A.2.

2.2.1 ALTERNATIVE RESOURCE PLANS

KCP&L evaluated 26 alternative resource plans that included various combinations of technologies listed in Table 5. Timings of installations were also varied. The 26 alternative resource Plans are shown in Table 6 through Table 9 below including identification of the technology selection, size and timing of installation. These tables meet the requirements of 22.060 (1), 22.060 (3), and 22.060 (6) (A).

Table 6: Alternative Resource Plans 1-7

	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7
EE N= Normal C&I A = Aggressive C&I R= Residential	N + R (2010)	N + R (2010)	A + R (2012)	A + R (2012)	A + R (2012)	A + R (2012)	A + R (2012)
DSM (CEP-1, Growth, Curtail)	CEP-1	CEP-1	CEP-1	CEP-1	CEP-1	CEP-1	CEP-1
Wind			400 MW (2009-2012)		400 MW (2009-2012)	400 MW (2009-2012)	400 MW (2009-2012)
PTC	N.A.	N.A.	No	N.A.	No	No	No
SCPC	300 MW (2022)					300 MW (2025 & 2030) With CCS	LaCygne-2, latan-1 and latan-2 convert to CCS
Combustion Turbines		154 MW (2027 & 2030)	154 MW (2016, 2019, 2024)	154 MW (2016, 2018, 2022)	154 MW (2016, 2019, 2024)	154 MW (2016, 2019, 2024)	154 MW (2022, 2023, 2025, 2028, 2032)
Combined Cycle	273 MW (2031)						
Nuclear			300 MW (2025, 2030)	300 MW (2025, 2030)	300 MW (2025 & 2030) With CCS		
IGCC							
Coal Retirement			510 MW (2016)	510 MW (2016)	510 MW (2016)	510 MW (2016)	CCS Retrofits

Table 7: Alternative Resource Plans 8-14

	Plan 8	Plan 9	Plan 10	Plan 11	Plan 12	Plan 13	Plan 14
EE N= Normal C&I A = Aggressive C&I R= Residential	A + R (2012)	A + R (2012)	A + R (2010)	A + R (2012)	R (2010)	N (2010)	A (2010)
DSM (CEP-1, Growth, Curtail)	CEP-1	CEP-1	CEP-1	CEP-1	CEP-1	CEP-1	CEP-1
Wind	400 MW (2012-2015)	200 MW (2012 & 2013)	400 MW (2009-2012)	400 MW (2009-2012)			
PTC	No	No	No	Yes	N.A.	N.A.	N.A.
SCPC							
Combustion Turbines	154 MW (2016, 2019, 2024)	154 MW (2016, 2019, 2023)	154 MW (2016, 2019, 2024)	154 MW (2016, 2017, 2021)	154 MW (2026 & 2030)	154 MW (2026 & 2029)	154 MW (2026 & 2030)
Combined Cycle							
Nuclear	300 MW (2025, 2030)	300 MW (2025, 2030)	300 MW (2025, 2030)	300 MW (2025, 2030)			
IGCC							
Coal Retirement	510 MW (2016)	510 MW (2016)	510 MW (2016)	510 MW (2016)			

Table 8: Alternative Resource Plans 15-21

	Plan 15	Plan 16	Plan 17	Plan 18	Plan 19	Plan 20	Plan 21
EE N= Normal C&I A = Aggressive C&I R= Residential	A + R (2010)	N (2010)			A + R (2010)	A + R (2010)	A + R (2010)
DSM (CEP-1, Growth, Curtail)	CEP-1	CEP-1	Growth	Curtail	CEP-1	Growth	Growth
Wind		2014, 2018, 2121, 2023			400 MW (2009-2012)		400 MW (2009-2012)
PTC	N.A.	Yes	N.A.	N.A.	Yes	N.A.	Yes
Solar		2011, 2014, 2018, 2021					
SCPC							
Combustion Turbines	154 MW (2027 & 2031)	154 MW (2028 & 2032)	154 MW (2026 & 2029)	154 MW (2023, 2027, 2031)	154 MW (2029)	154 MW (2028 & 2032)	154 MW (2029)
Combined Cycle							
Nuclear							
IGCC							
Coal Retirement							

Table 9: Alternative Resource Plans 22-26

	Plan 22	Plan 23	Plan 24	Plan 25	Plan 26
EE N= Normal C&I A = Aggressive C&I R= Residential	A + R (2010)	A + R (2010)	A + R (2010)	A + R (2010)	A + R (2010)
DSM (CEP-1, Growth, Curtail)	Growth	CEP-1	Curtail	CEP-1	CEP-1
Wind	400 MW (2009-2012)	400 MW (2009-2012)	400 MW (2009-2012)	400 MW (2009-2012)	400 MW (2012-2015)
PTC	No	No	Yes	Yes	Yes
SCPC					
Combustion Turbines		154 MW (2029)	154 MW (2027 & 2031)	154 MW (2029)	154 MW (2029)
Combined Cycle					
Nuclear					
IGCC					
Coal Retirement					

SECTION 3: LOAD-BUILDING PROGRAMS

In response to 22.060 (5), KCP&L did not evaluate load building programs in the IRP and none are included in the preferred resource plan.

SECTION 4: REPORT REQUIREMENTS

This Section provides reporting requirements shown in 22.060 (6).

Table 6 through Table 9 shown above in Section 2.2.1 meet the requirements of 22.060 (6) (A), which calls for a description of each resource plan.

As required by Rule 22.060 (6) (B), the summary of the performance of the alternative resource plans as measured by each required measure in Rule 22.060 (2) is supplied in Table 10 below. It should be noted that the Maximum Rate Increase occurs in the 2012 timeframe when a CO_2 market is assumed to commence.

Table 10: Performance Measures

Plan	NPVRR ($MM)	Probable Environmental Costs ($MM)	DSM Costs ($MM)	Levelized Annual Rates ($/kw-hr)	Maximum Rate Increase
Plan 1	21,240	3,502	46.06	0.1259	29.74%
Plan 2	21,137	3,358	46.06	0.1251	29.74%
Plan 3	21,554	2,345	50.02	0.1265	27.18%
Plan 4	21,360	2,623	50.02	0.1271	30.04%
Plan 5	22,022	2,505	50.02	0.1313	27.17%
Plan 6	21,722	2,395	50.02	0.1280	27.17%
Plan 7	22,089	1,288	50.02	0.1275	25.32%
Plan 8	21,525	2,390	50.02	0.1271	32.17%
Plan 9	21,442	2,487	50.02	0.1270	32.17%
Plan 10	21,539	2,339	50.02	0.1266	27.24%
Plan 11	21,271	2,345	50.02	0.1252	27.04%
Plan 12	21,239	3,387	34.09	0.1251	29.79%
Plan 13	21,221	3,387	11.97	0.1249	29.85%
Plan 14	21,168	3,370	23.93	0.1250	29.83%
Plan 15	21,071	3,340	58.02	0.1250	29.71%
Plan 16	21,244	1,401	11.97	0.1254	29.74%
Plan 17	21,334	3,416	-	0.1250	29.93%
Plan 18	21,340	3,416	-	0.1251	29.90%
Plan 19	21,019	3,050	58.02	0.1232	27.01%
Plan 20	21,072	3,340	58.02	0.1250	29.71%
Plan 21	21,021	3,050	58.02	0.1232	27.01%
Plan 22	21,289	3,047	58.02	0.1245	27.21%
Plan 23	21,290	3,050	58.02	0.1245	27.21%
Plan 24	21,126	3,124	58.02	0.1231	26.97%
Plan 25	21,215	3,050	58.02	0.1241	26.04%
Plan 26	21,006	3,093	58.02	0.1236	31.70%

Rule 22.060 (6) (C) 1. requires a plot of the combined impact of all DSM resources on the base case winter and summer peak demands. Because KCP&L modeled two levels of C&I Energy Efficiency programs, a normal and aggressive C&I EE

penetration, there are two sets of graphs provided. Figure 1 and Figure 2 show the winter and summer peak impacts associated with the normal C&I penetrations. Figure 3 and Figure 4 show the same impacts for the aggressive C&I penetrations. The data shown in Figure 1 through Figure 4 includes the impact of projected residential EE programs that were included along with the C&I projections in all 6 resource plans with the lowest NPVRR results. These figures also show the impacts of new DSM/EE programs but do not include the impacts on on-going or existing programs. For example, the projected 66 MW's provided by the installed Dynamic Voltage Control (DVC) is not included.

Figure 1: Winter Peak Impact: Residential and Normal C&I EE

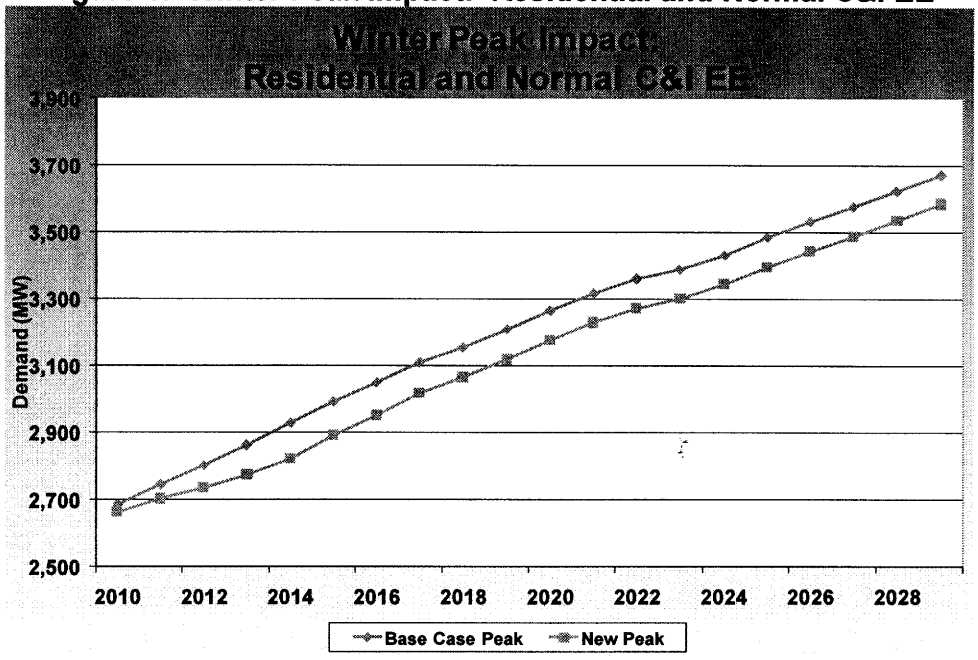


Figure 2: Summer Peak Impact: Residential and Normal C&I EE

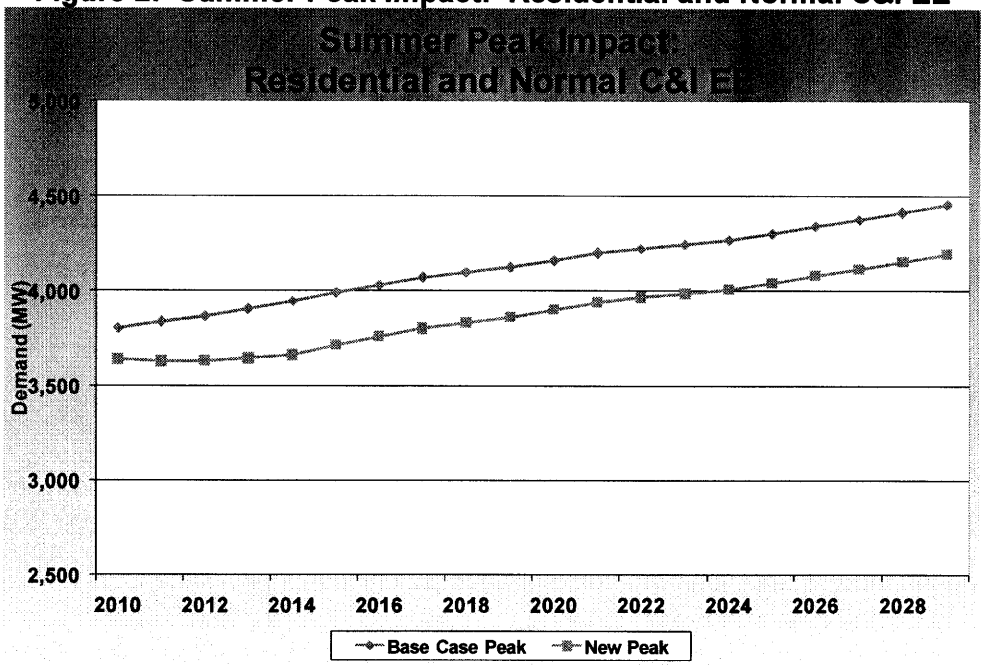


Figure 3: Winter Peak Impact: Residential and Aggressive C&I EE

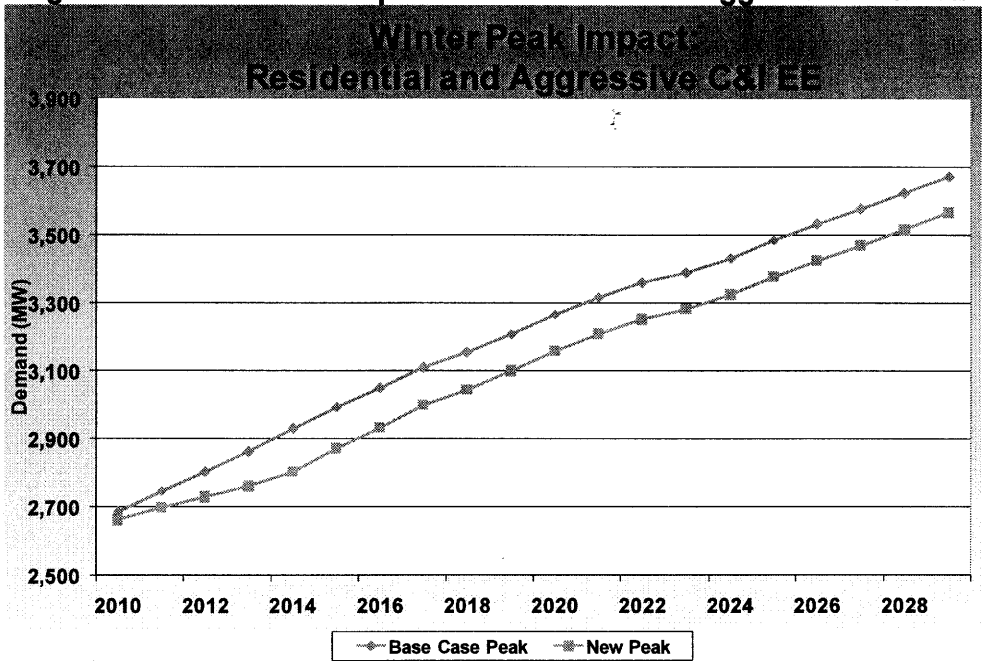
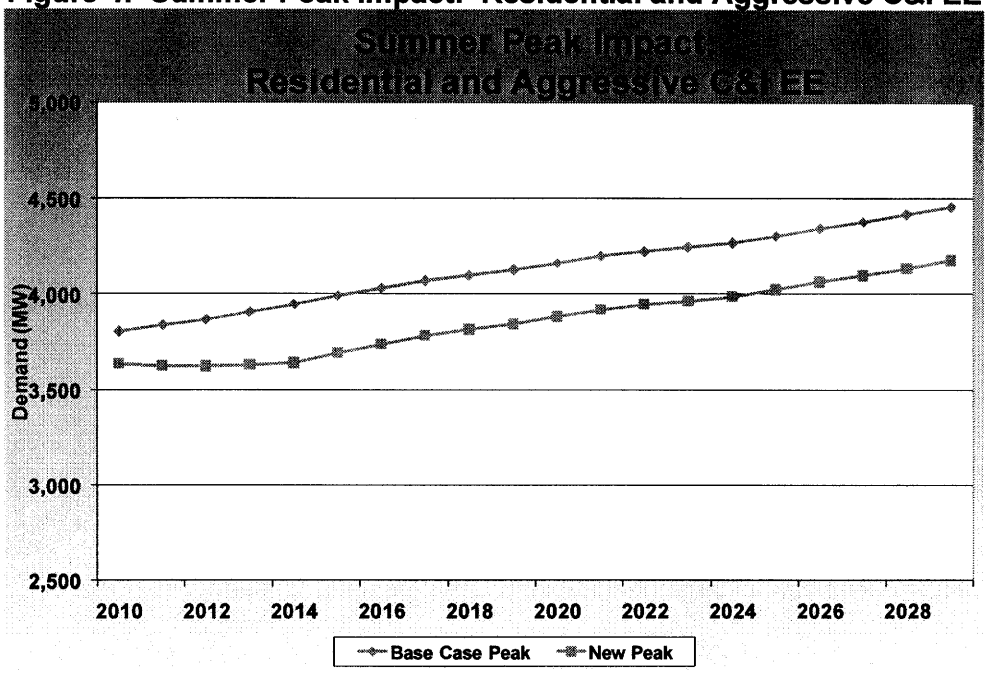


Figure 4: Summer Peak Impact: Residential and Aggressive C&I EE



Rule 22.060 (6) (C) 2 requires a plot of the capacity provided by each demand side resource. KCP&L modeled Residential EE, Normal C&I EE, and Aggressive C&I EE. Also, there are existing Comprehensive Energy Plan (CEP) EE and DSM programs approved under KCP&L's CEP. CEP programs were approved in Missouri case number EO-2005-0329. The capacity provided by each of these programs is shown in Figure 5 through Figure 9 to meet the requirements of Rule 22.060 (6) (C) 2..

Figure 5: Residential EE Demand By Program

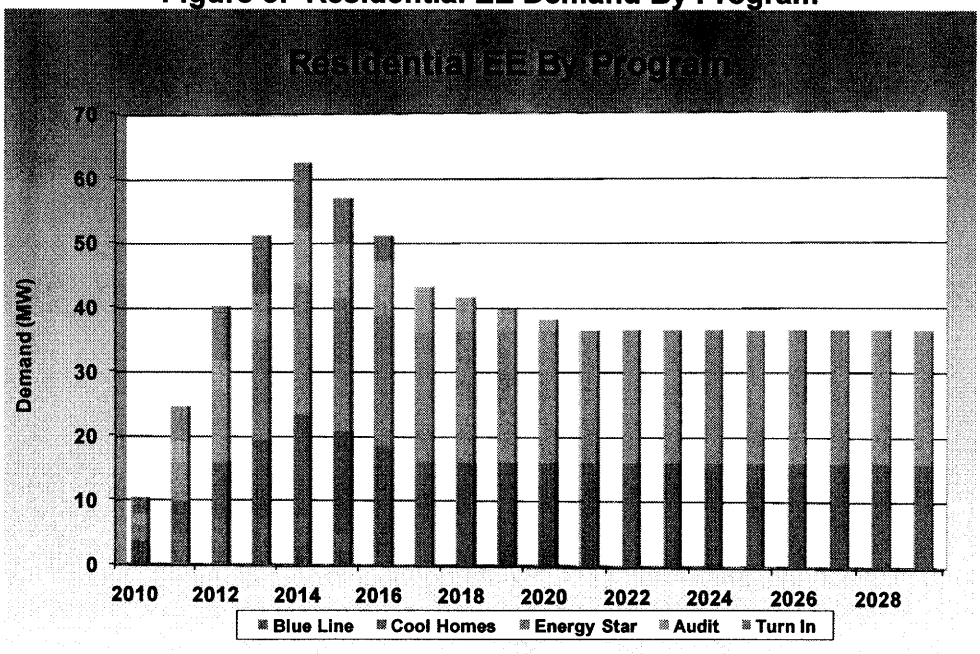


Figure 6: Normal C&I EE Demand By Program

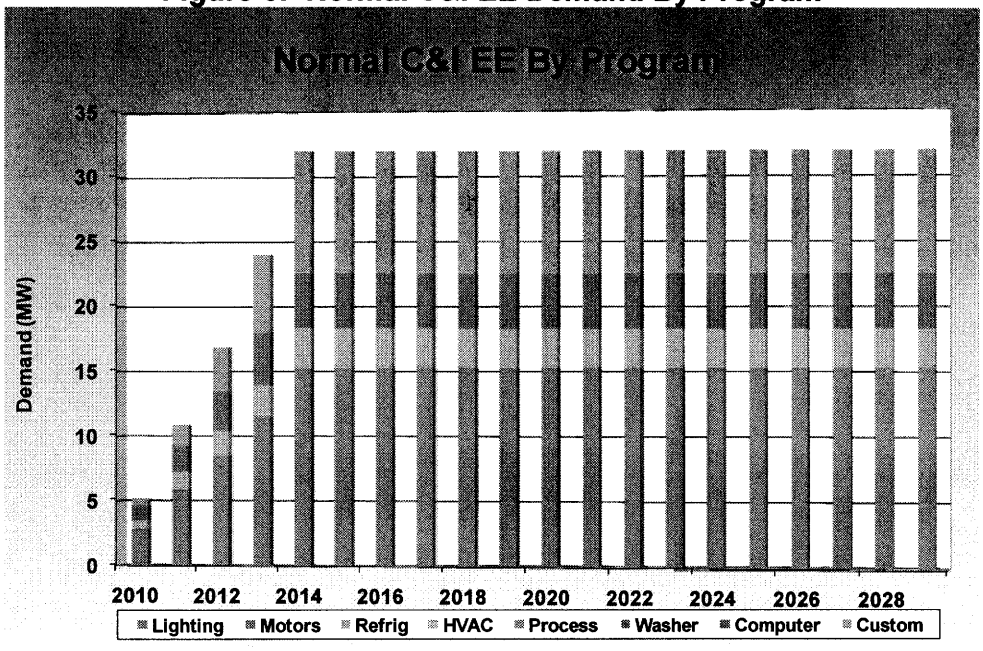


Figure 7: Aggressive C&I EE Demand By Program

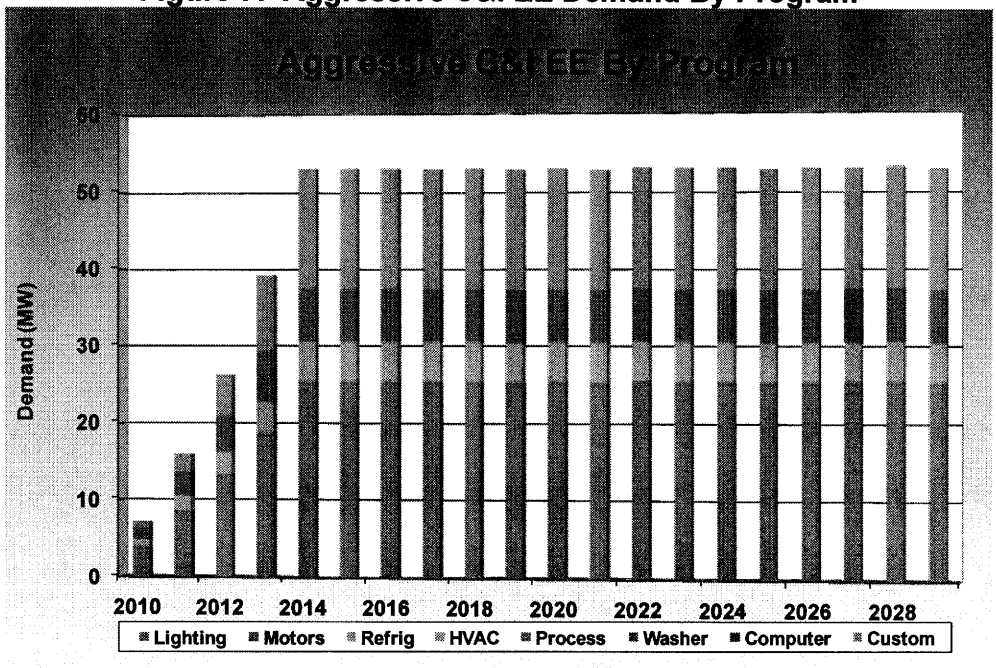


Figure 8: CEP EE Demand By Program

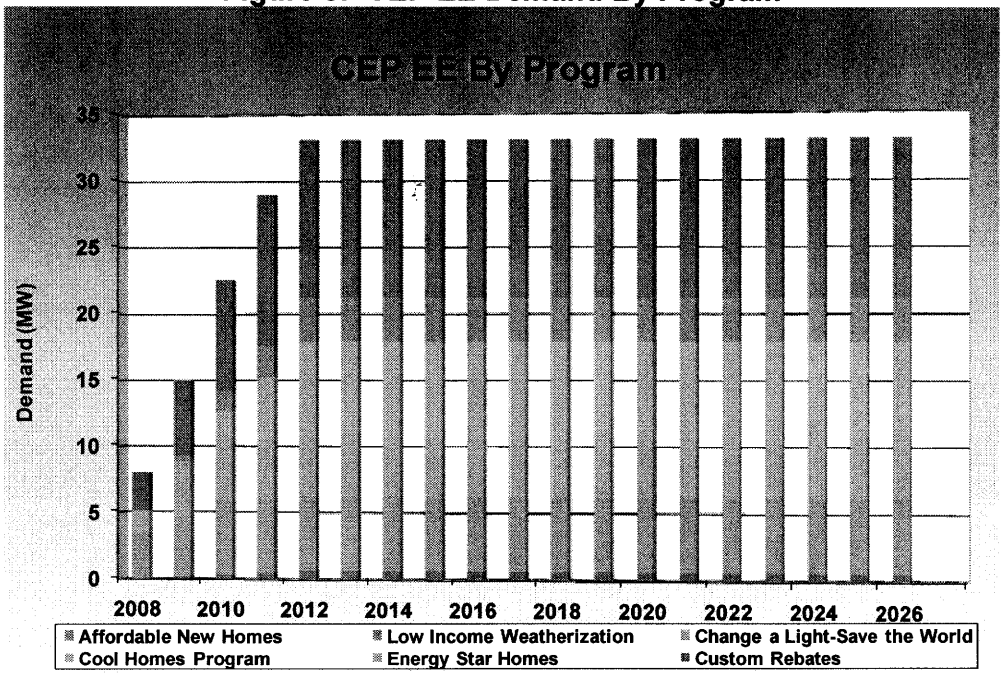
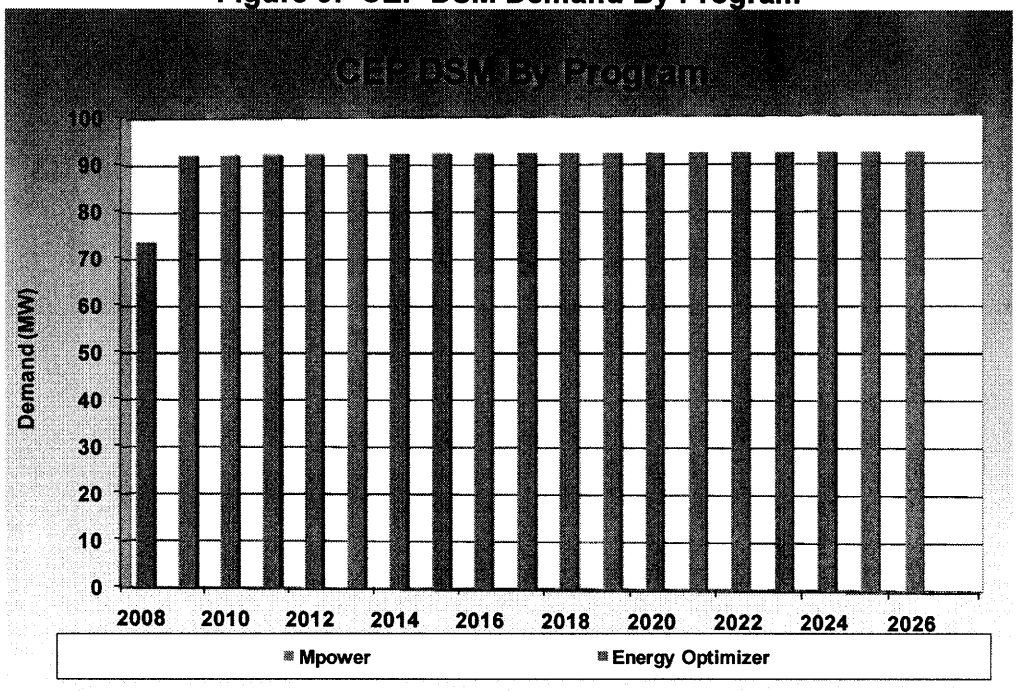
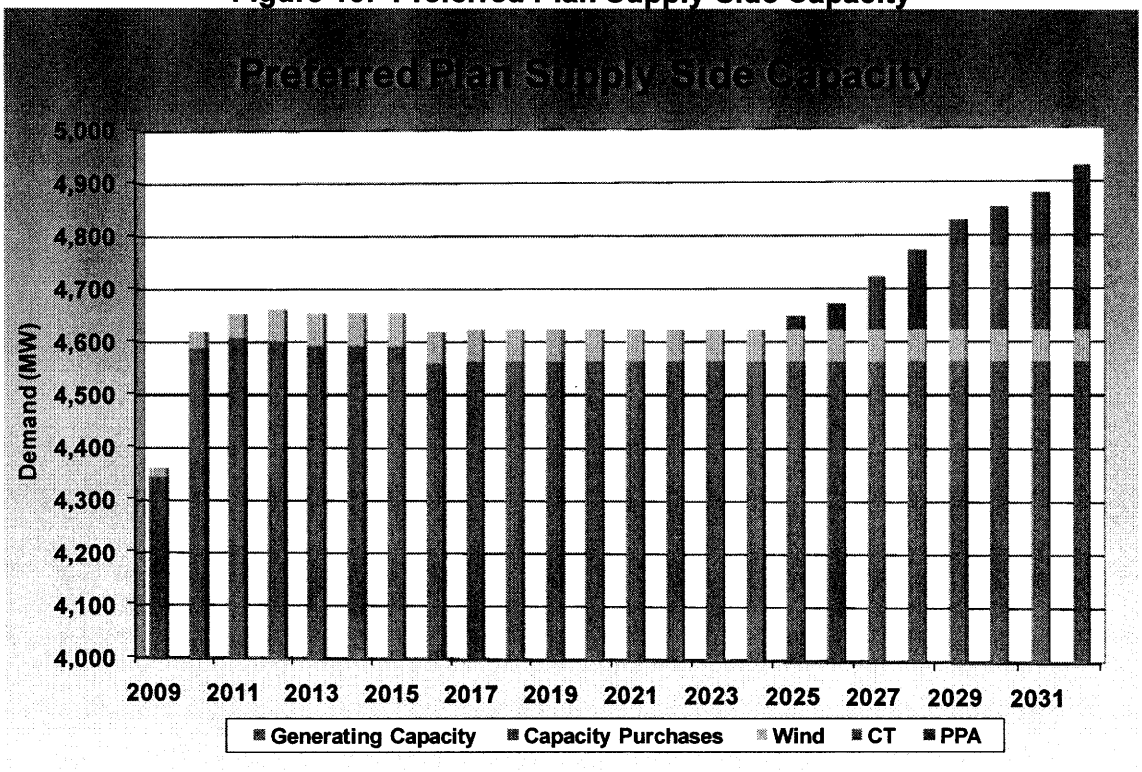


Figure 9: CEP DSM Demand By Program



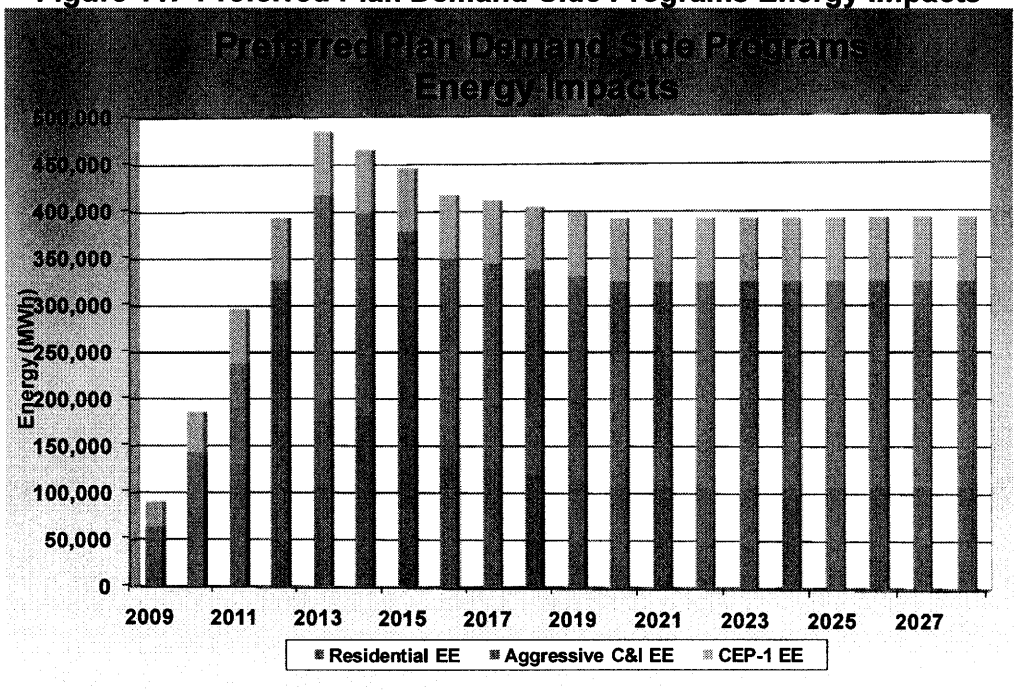
Rule 22.060 (6) (C) 3. requires a graph of the composition of capacity provided by supply resources. Figure 10 meets this requirement.

Figure 10: Preferred Plan Supply-Side Capacity



Rule 22.060 (6) (C) 4 requires a plot of the combined impact of all demand side resources on the base case forecast of annual energy requirements. Figure 11 meets the requirement of Rule 22.060 (6) (C) 4.

Figure 11: Preferred Plan Demand-Side Programs Energy Impacts



Rule 22.060 (6) (C) 5. requires a plot of the energy provided by each demand side resource. Figure 12 through Figure 15 meet this requirement.

Figure 12: Residential EE - Energy By Program

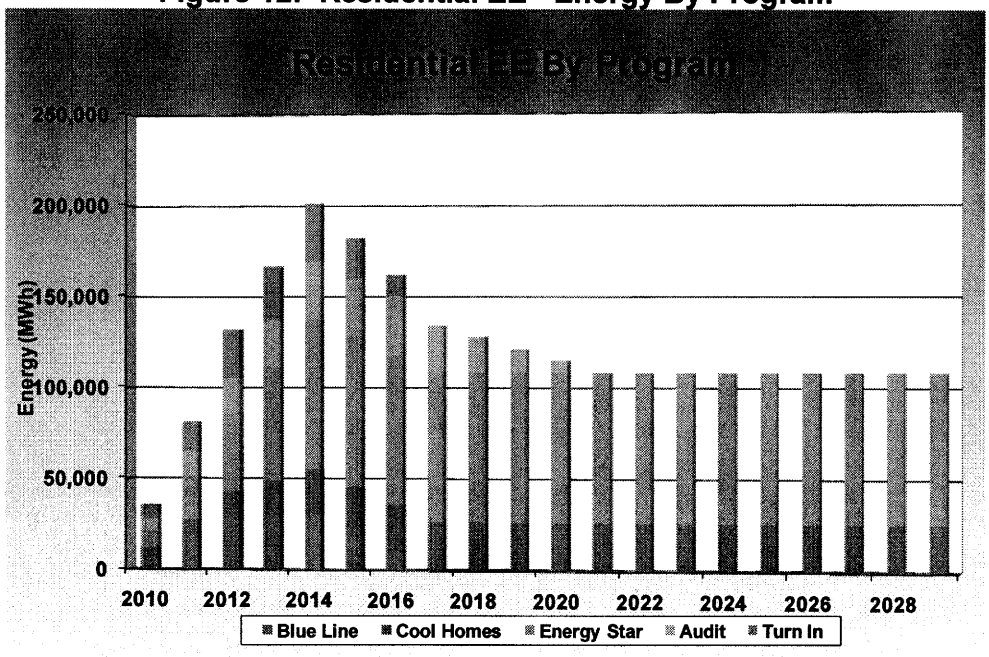


Figure 13: Normal C&I EE Energy By Program

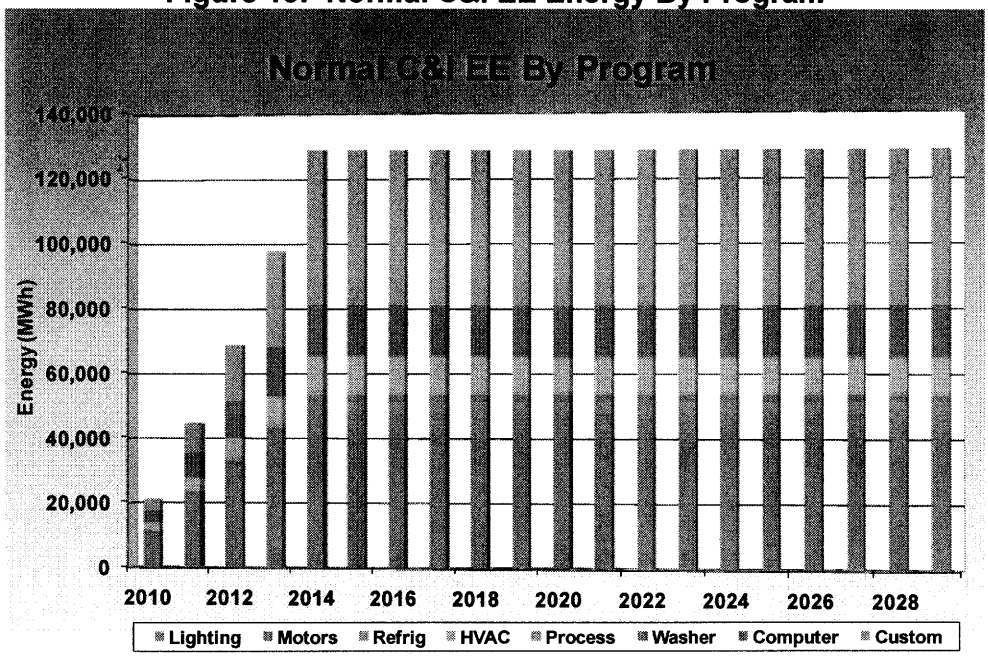


Figure 14: Aggressive C&I EE Energy By Program

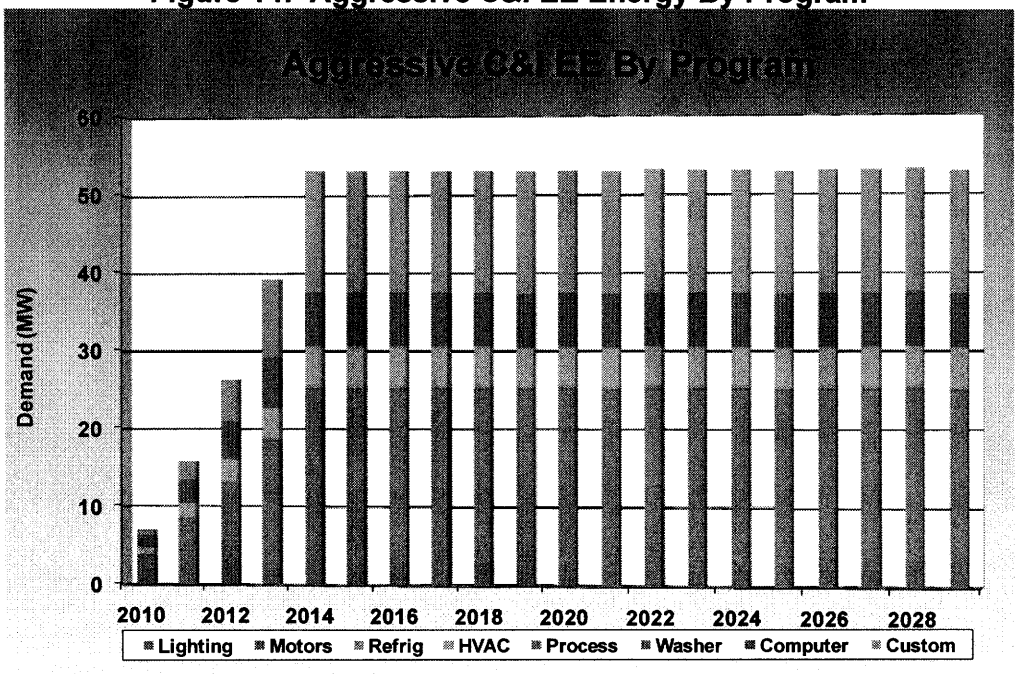
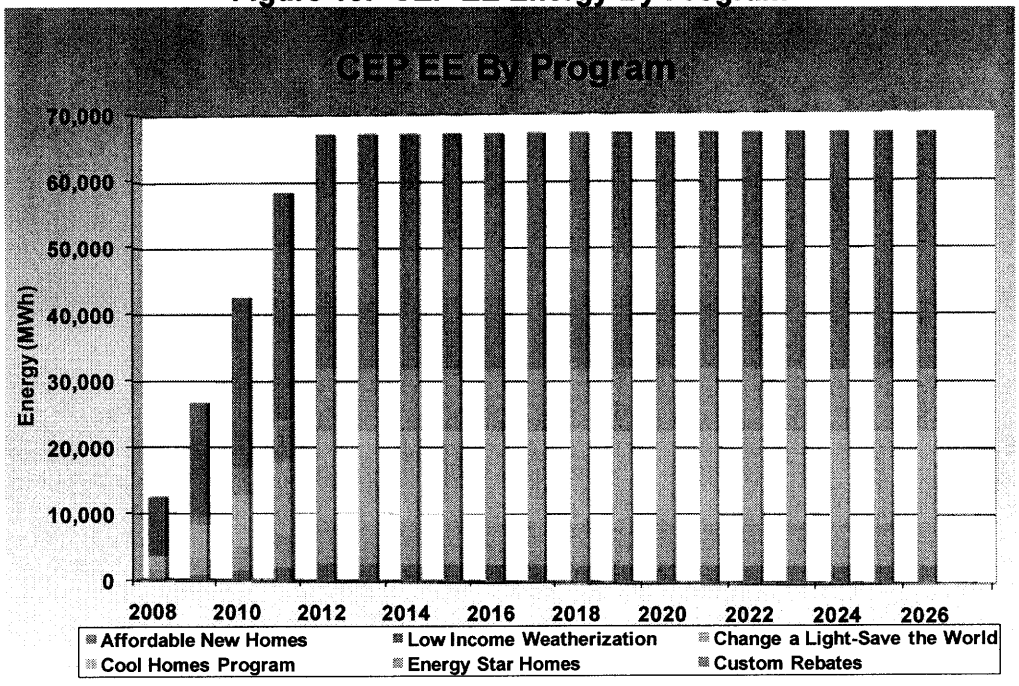


Figure 15: CEP EE Energy By Program



Funding levels for the proposed Residential, Normal C&I EE, and Aggressive C&I EE programs are shown in Table 11 and Table 12 below.

Table 11: Residential and Normal C&I EE Projected Spending Levels ** Highly Confidential **

Projected Spending Levels

Table 12: Residential and Aggressive C&I EE Projected Spending Levels ** Highly Confidential **

Projected Spending Levels

Note that these spending level projections are only for the proposed Residential and C&I EE programs that were modeled in MIDAS^{TM}. The funding for the DSM and EE programs approved as part of the CEP are included in MIDAS^{TM}.

Rule 22.060 (6) (C) 6 requires a graph of annual energy provided by supply-side resources. Existing resources can be shown as a single resource. To comply with this rule, the expected value of energy generated by unit was tabulated and graphed. All existing units, including the recently added wind generation at Spearville, were included in the existing unit compilation. Iatan-2 was listed separately from the detail of existing units, but was included in all alternative plans.

Figure 16 details the energy by source for the preferred plan. Figure 17 through Figure 41 detail all other plans. All energy totals shown on the Y-axis are in GWh's. Note that the energy supplied by new CT's in the preferred resource plan is included in the Figure 16; however, the level of energy provided is too low to view in the graph.

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Figure 16: Preferred Plan – Plan 19 - Energy by Source

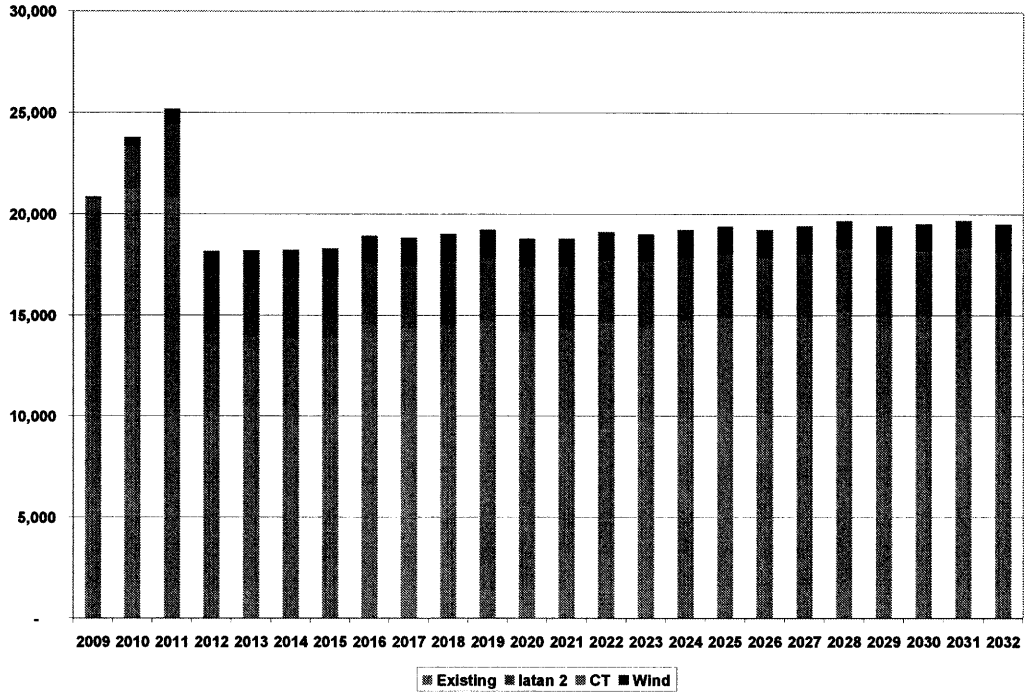


Figure 17: Plan 1 - Energy by Source

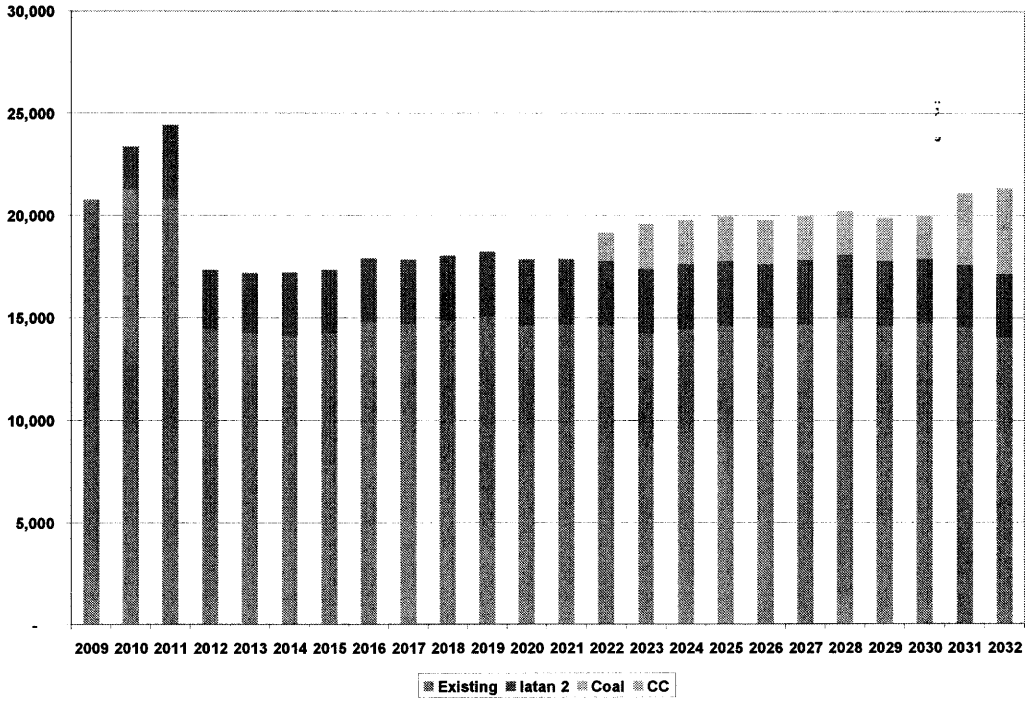


Figure 18: Plan 2 - Energy by Source

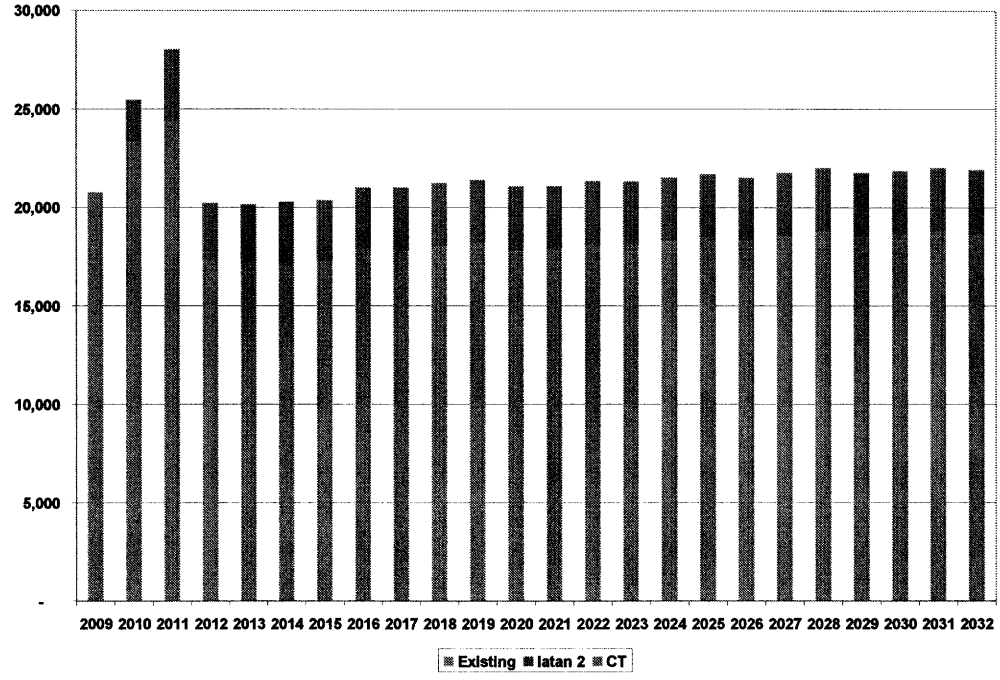


Figure 19: Plan 3 - Energy by Source

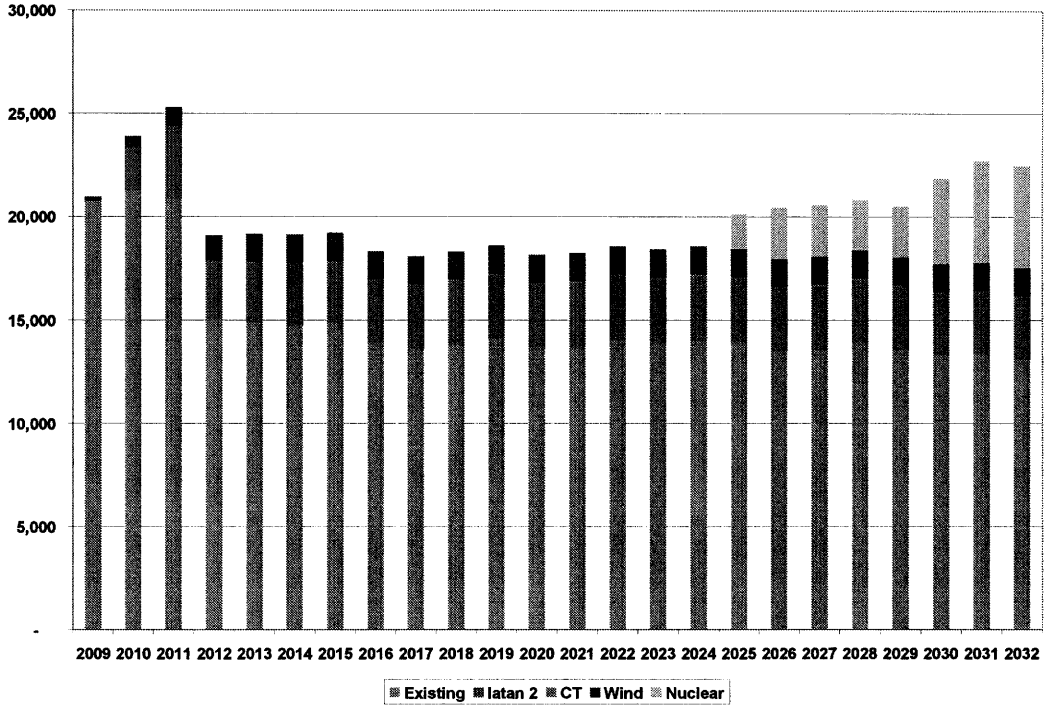


Figure 20: Plan 4 - Energy by Source

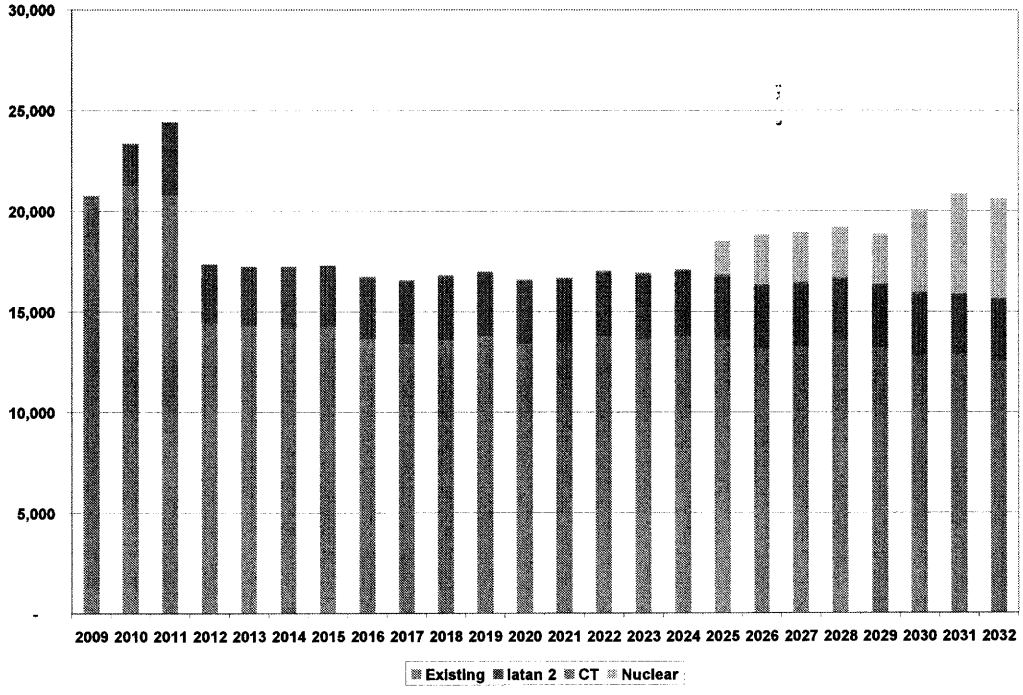


Figure 21: Plan 5 - Energy by Source

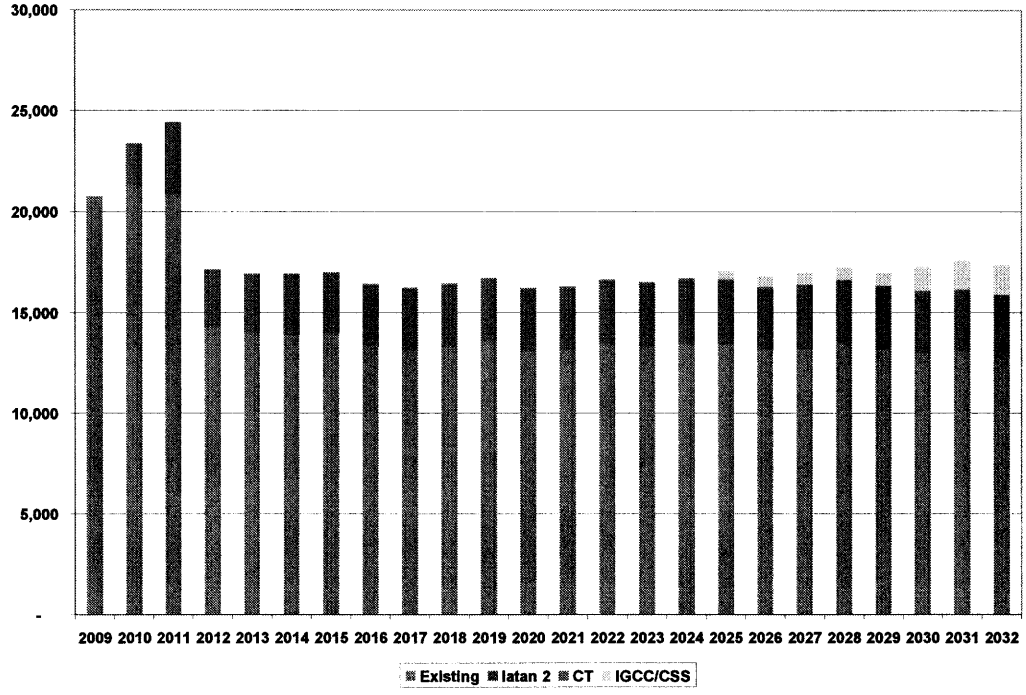


Figure 22: Plan 6 - Energy by Source

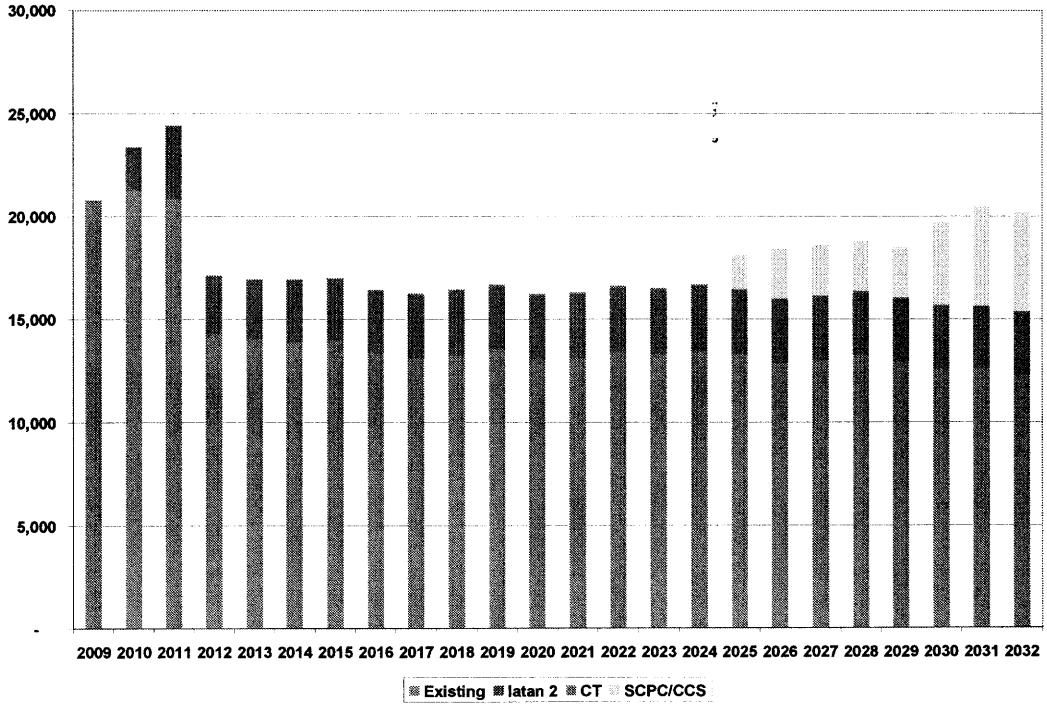


Figure 23: Plan 7 - Energy by Source

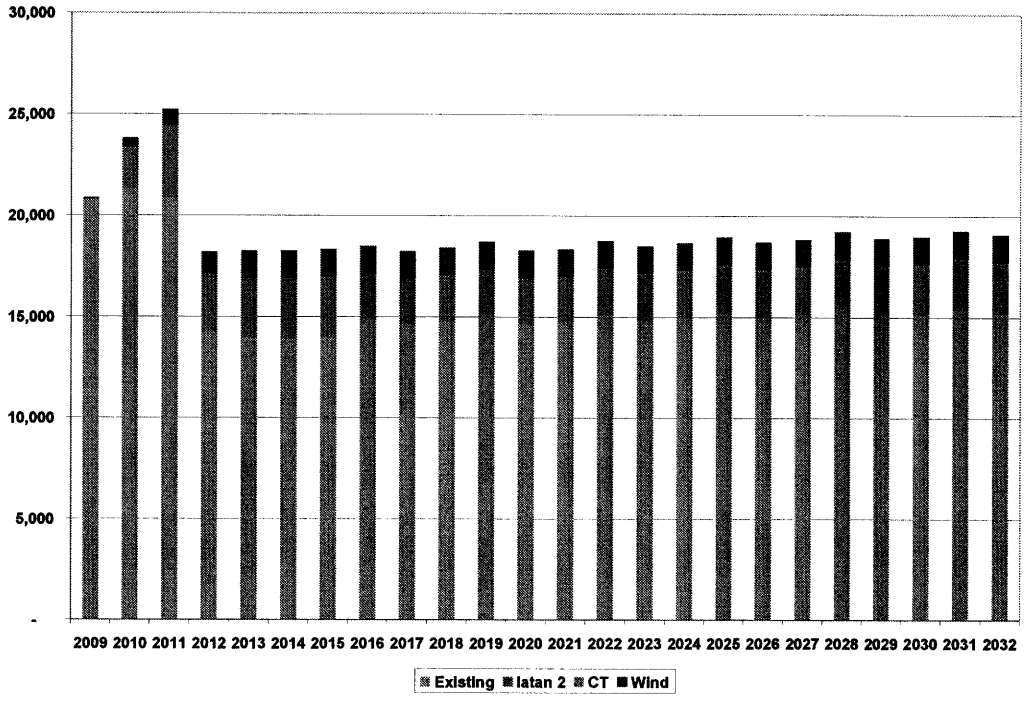


Figure 24: Plan 8 - Energy by Source

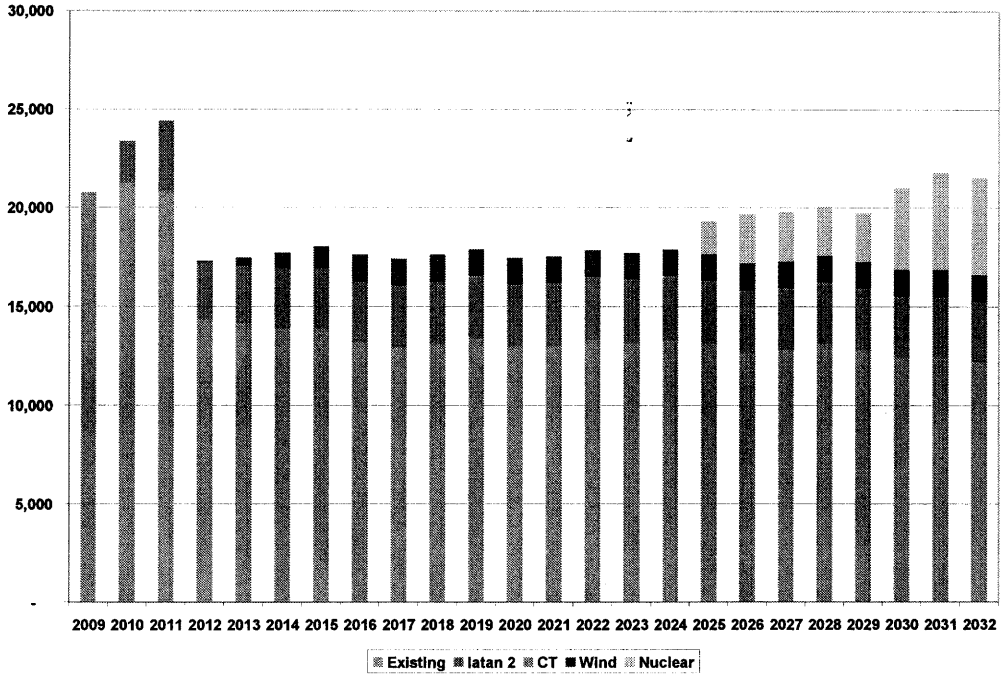


Figure 25: Plan 9 - Energy by Source

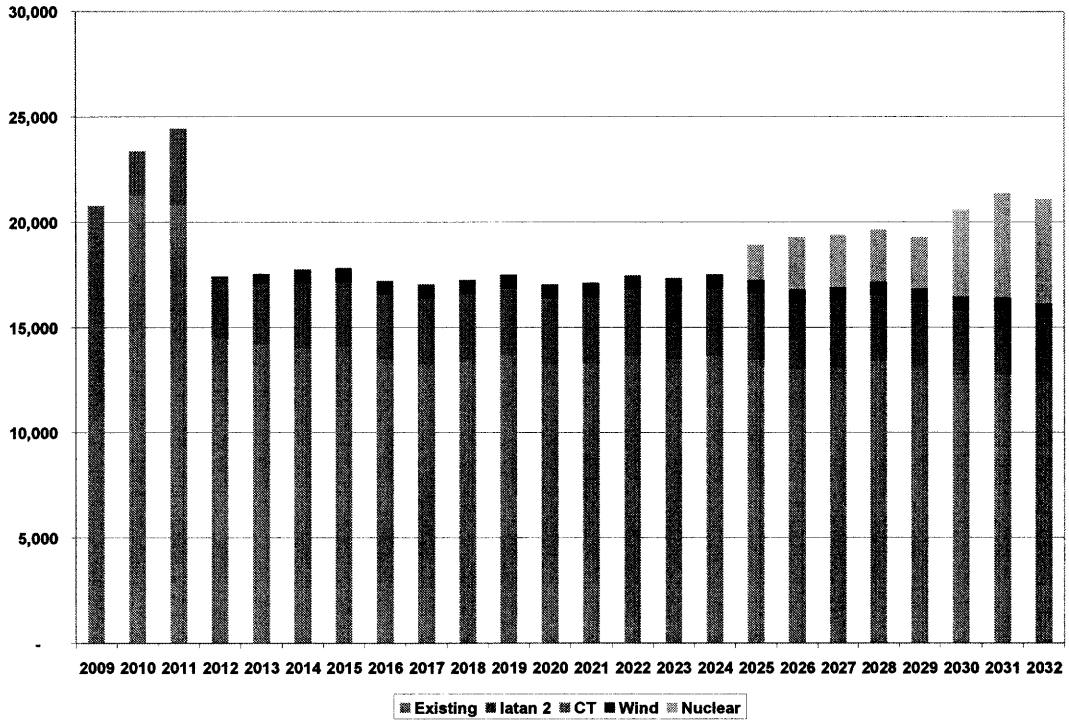


Figure 26: Plan 10 - Energy by Source

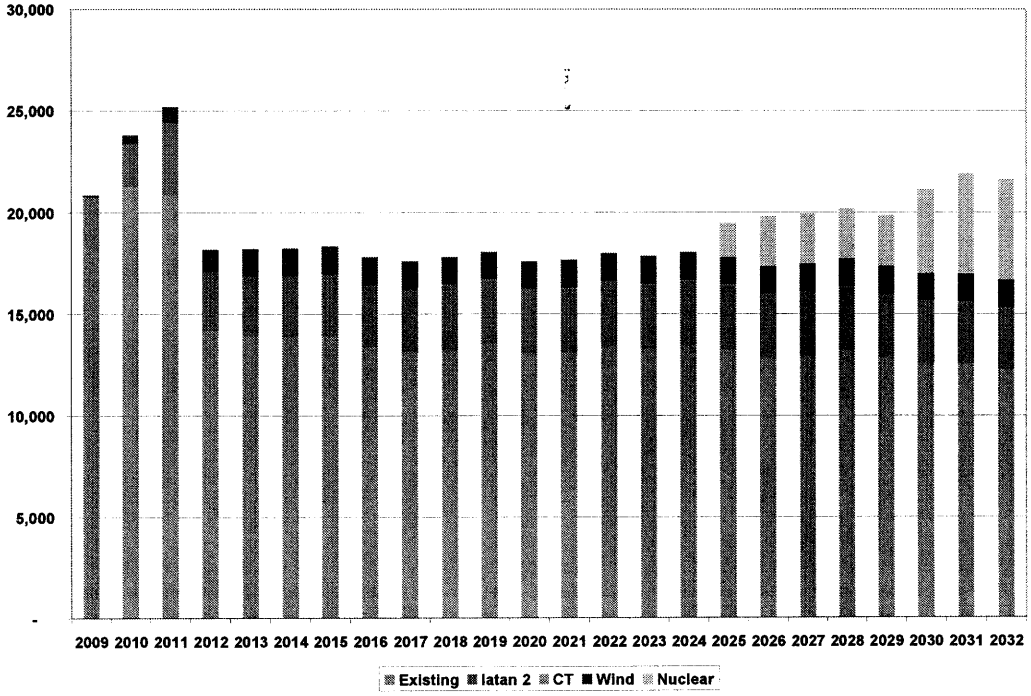


Figure 27: Plan 11 - Energy by Source

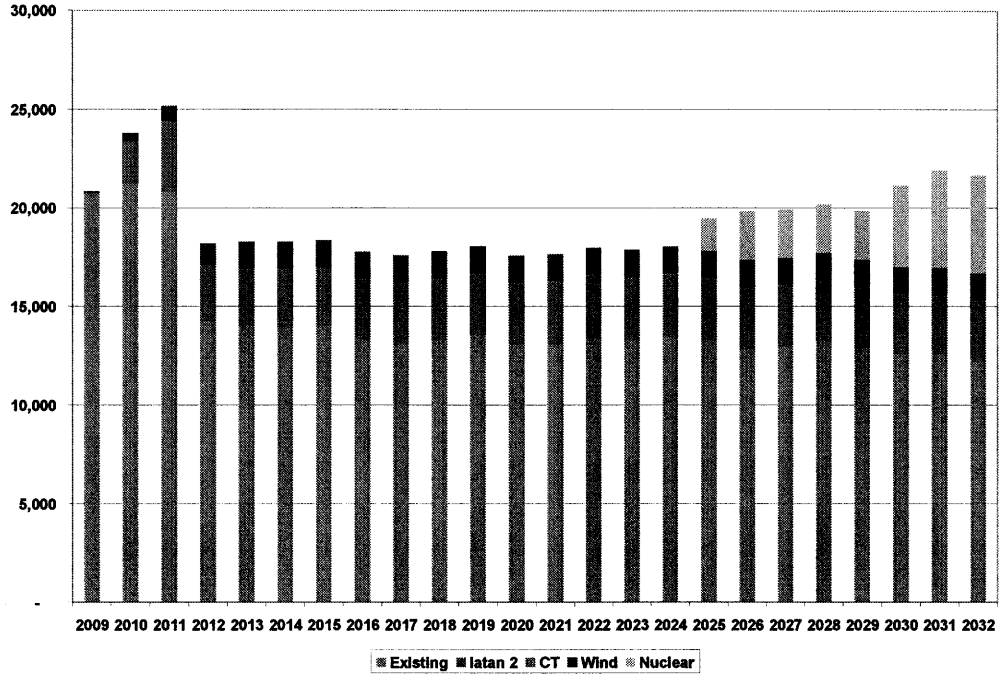


Figure 28: Plan 12 - Energy by Source

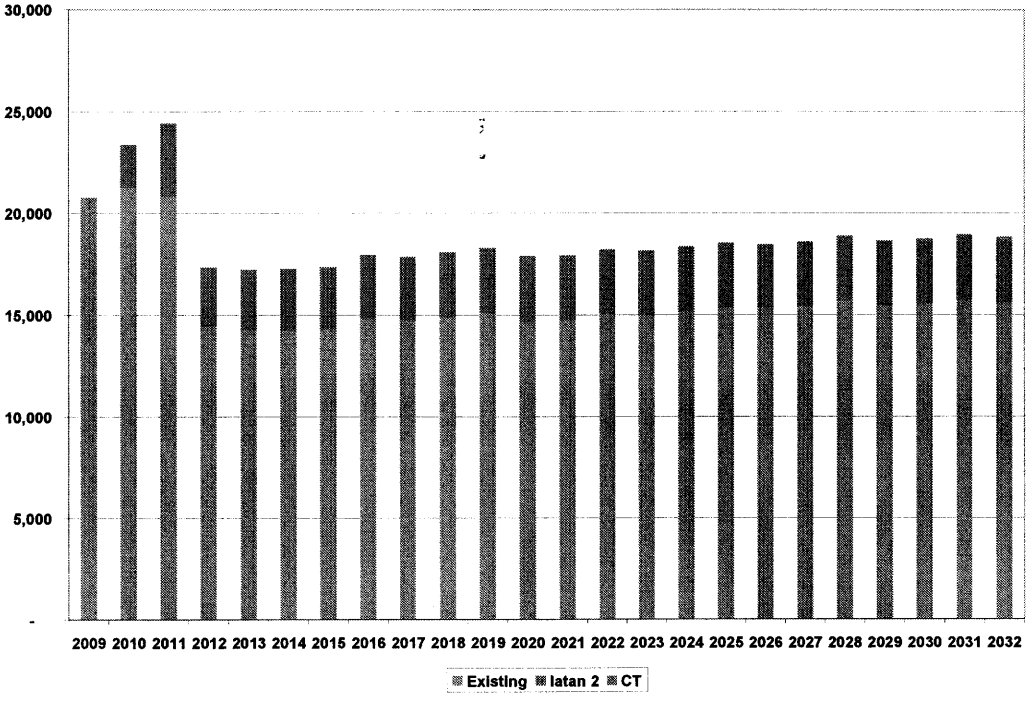


Figure 29: Plan 13 - Energy by Source

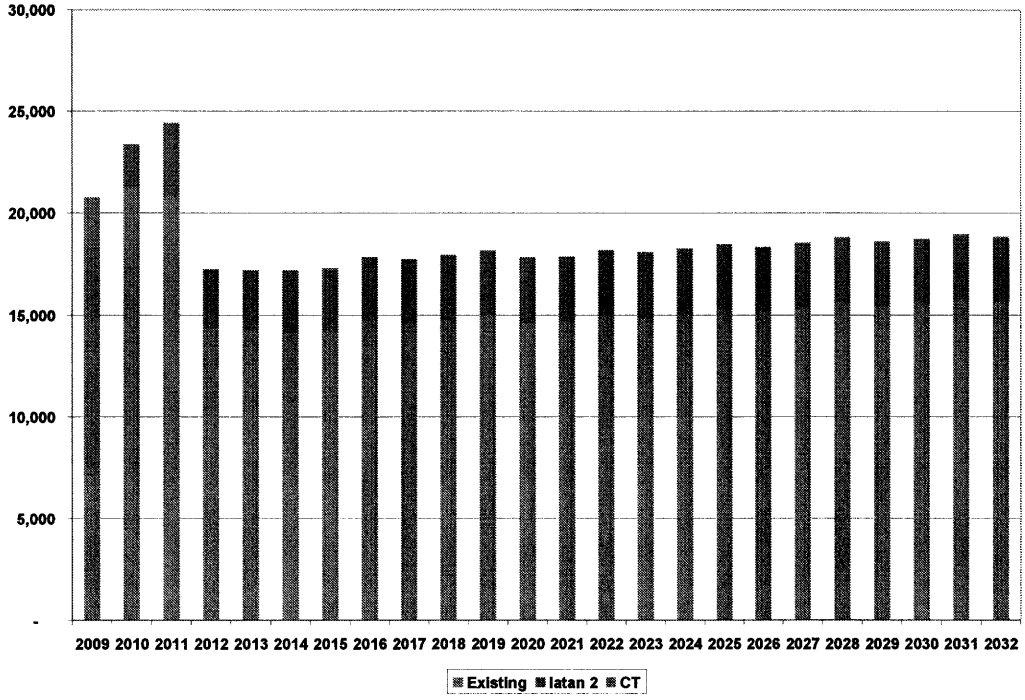


Figure 30: Plan 14 - Energy by Source

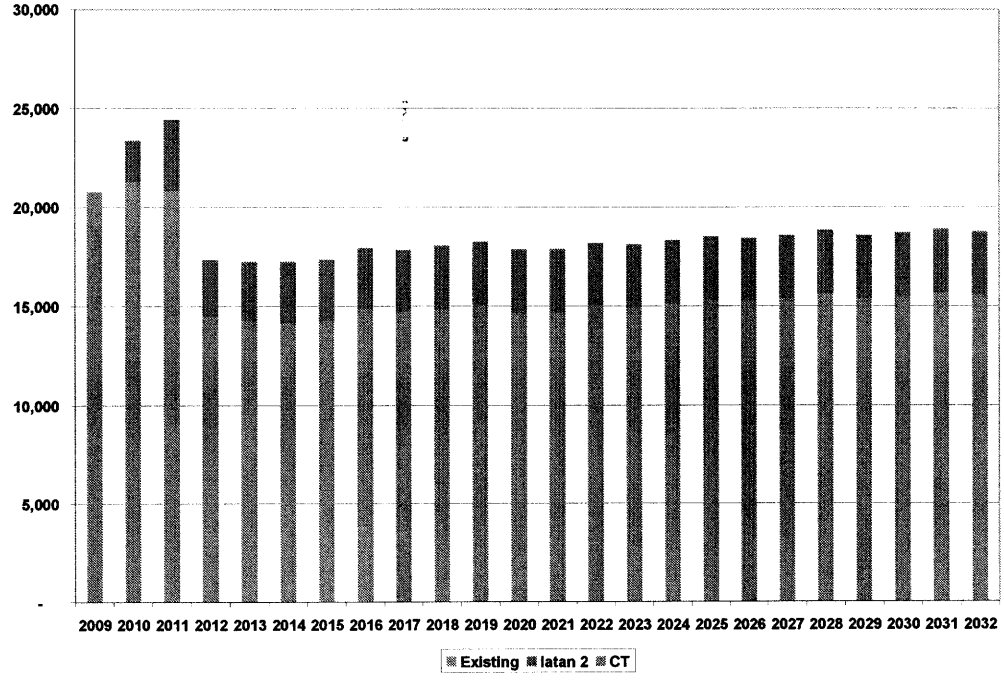


Figure 31: Plan 15 - Energy by Source

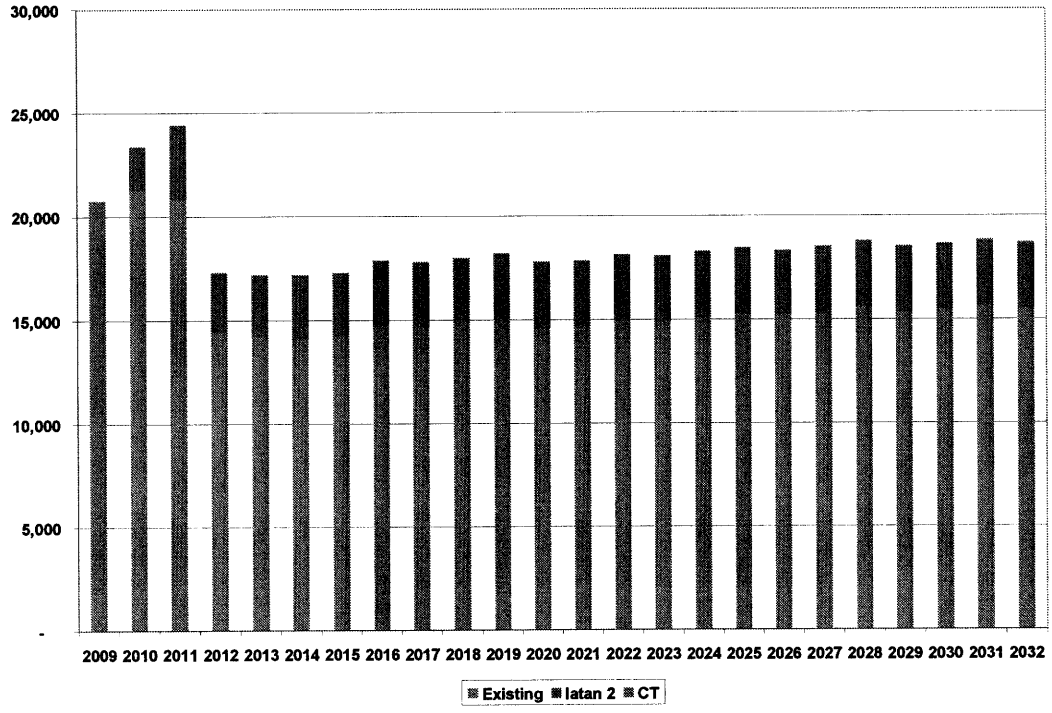


Figure 32: Plan 16 - Energy by Source

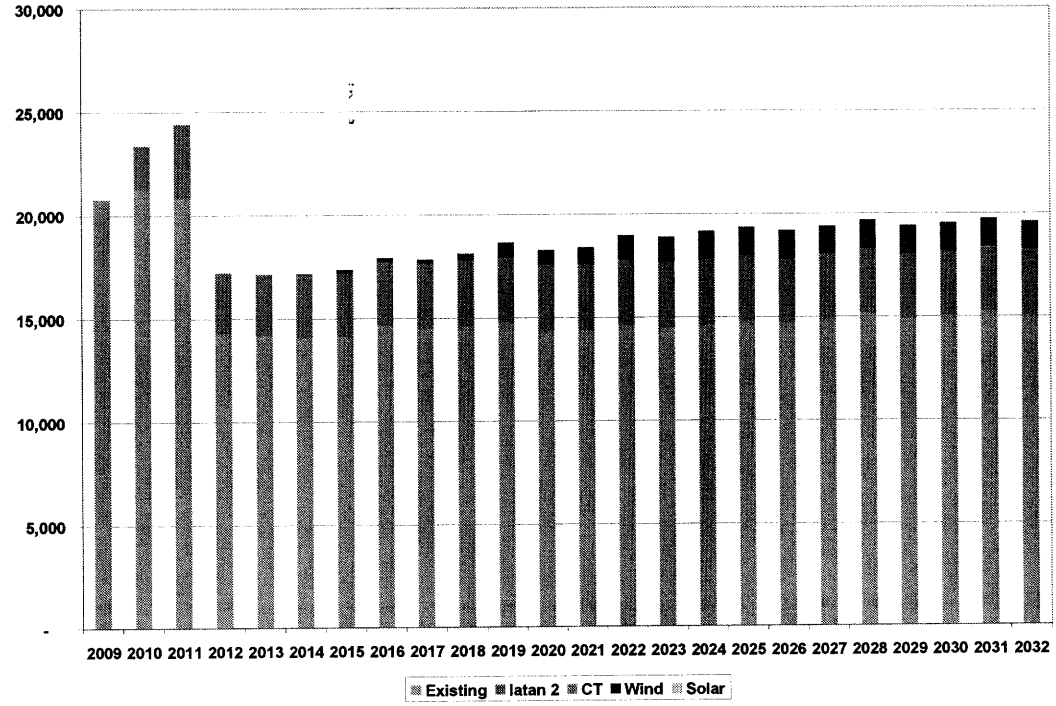


Figure 33: Plan 17 - Energy by Source

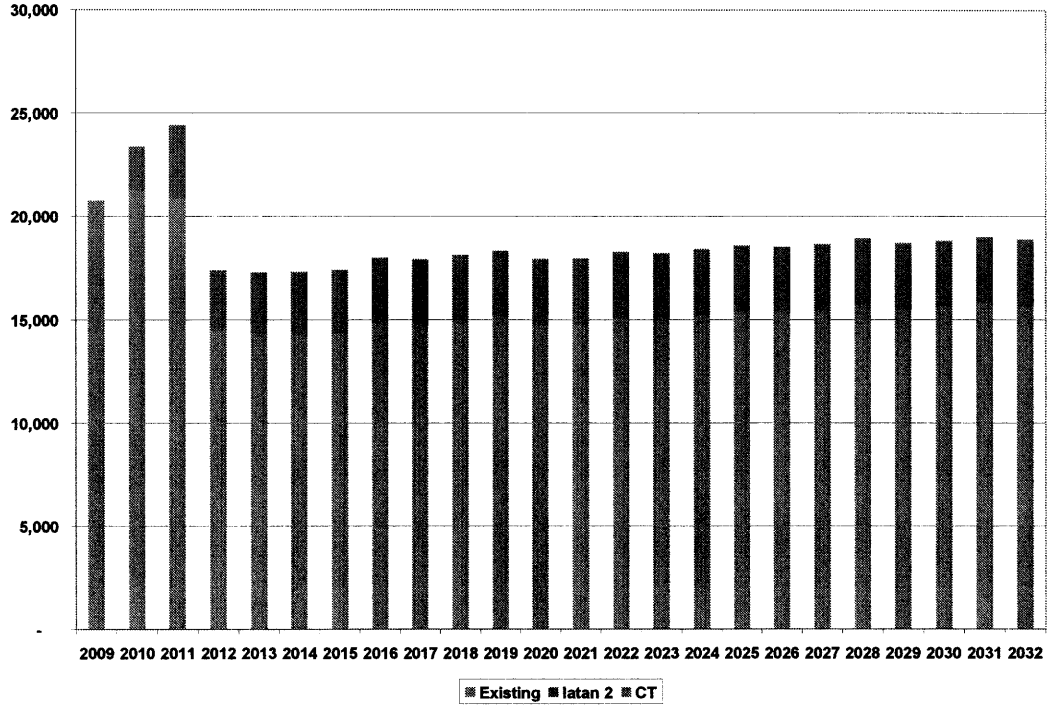


Figure 34: Plan 18 - Energy by Source

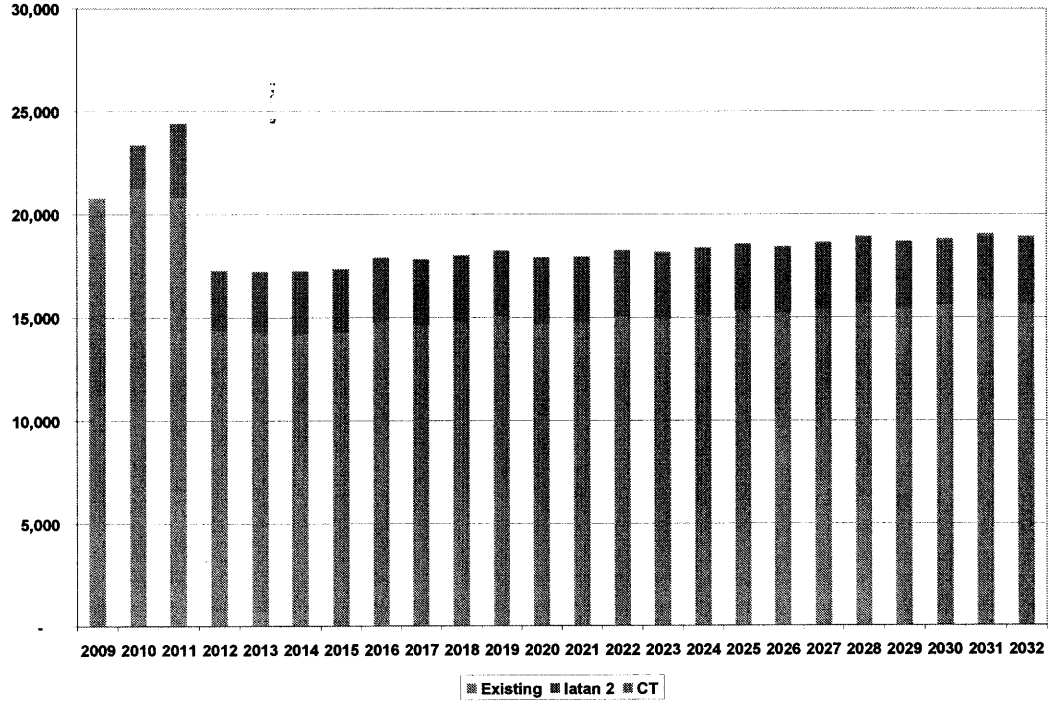


Figure 35: Plan 20 - Energy by Source

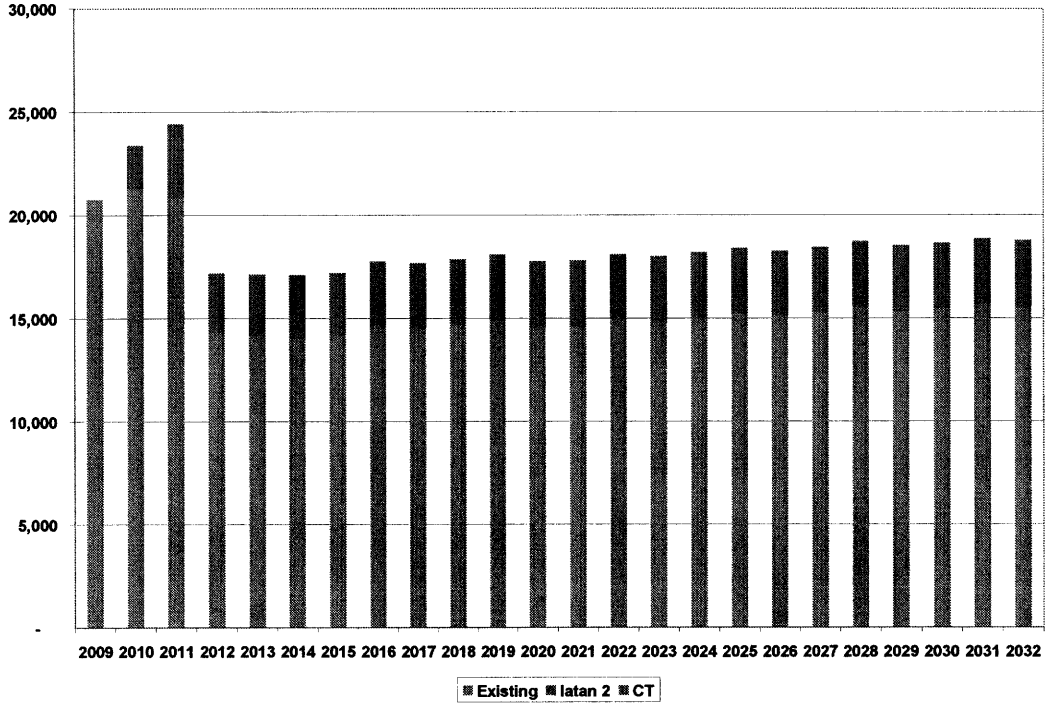


Figure 36: Plan 21 - Energy by Source

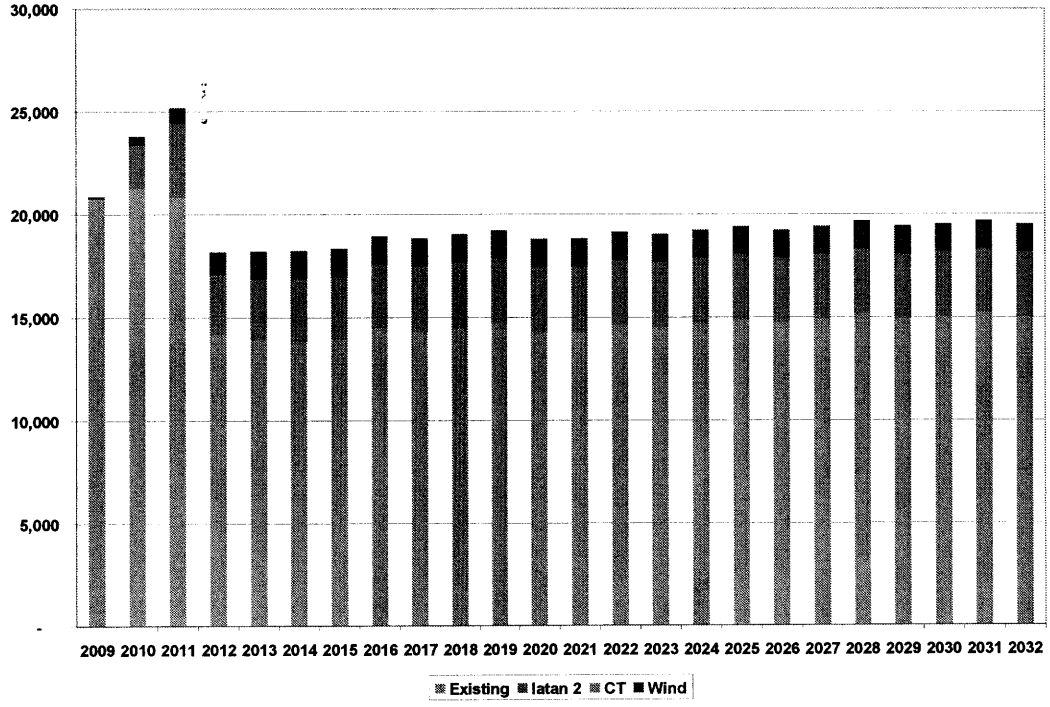


Figure 37: Plan 22 - Energy by Source

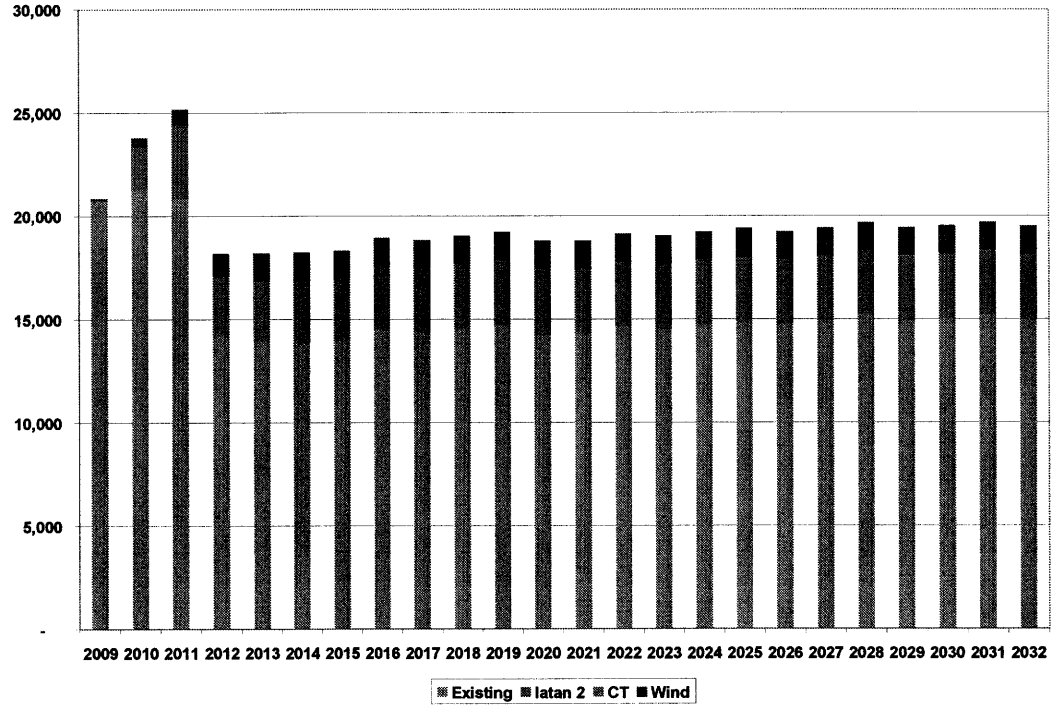


Figure 38: Plan 23 - Energy by Source

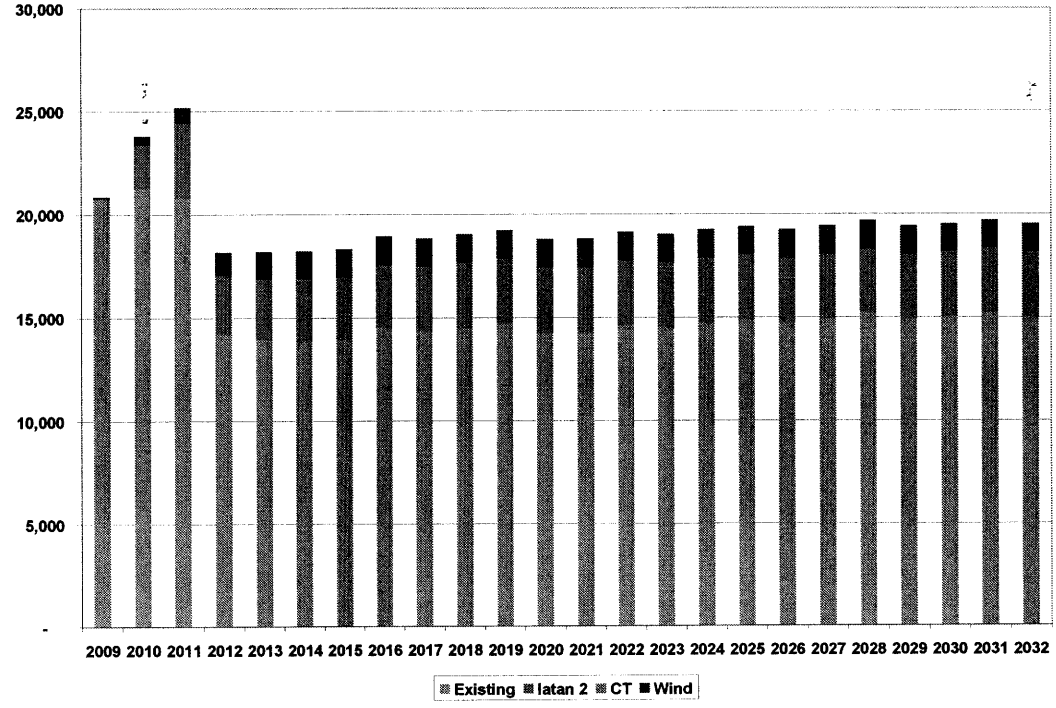


Figure 39: Plan 24 - Energy by Source

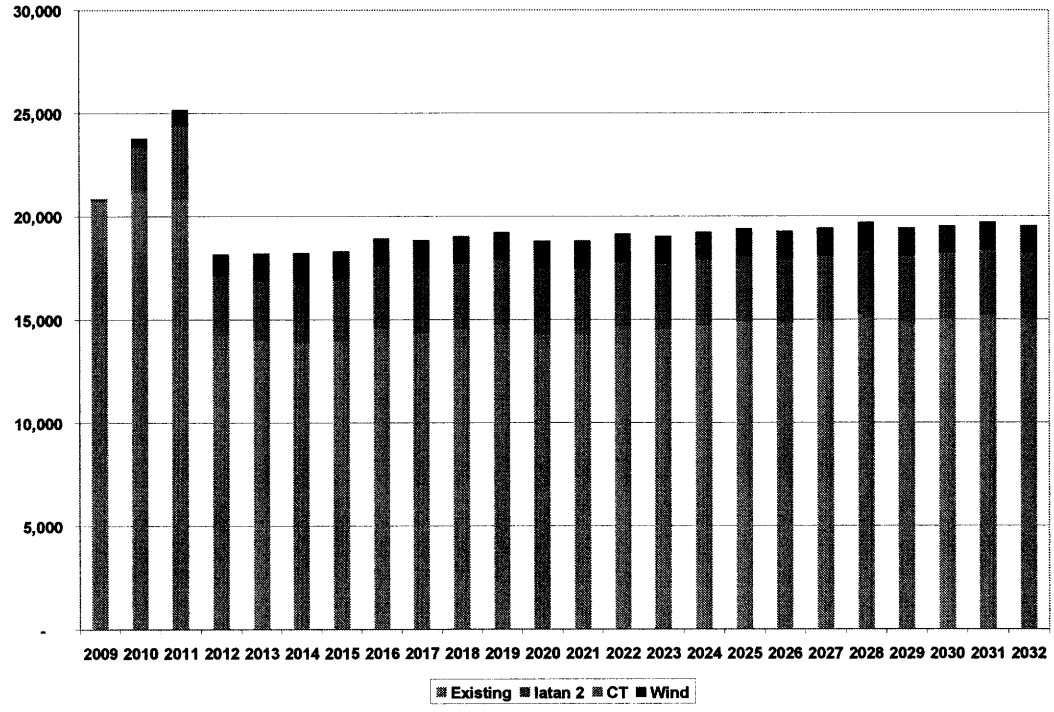


Figure 40: Plan 25 - Energy by Source

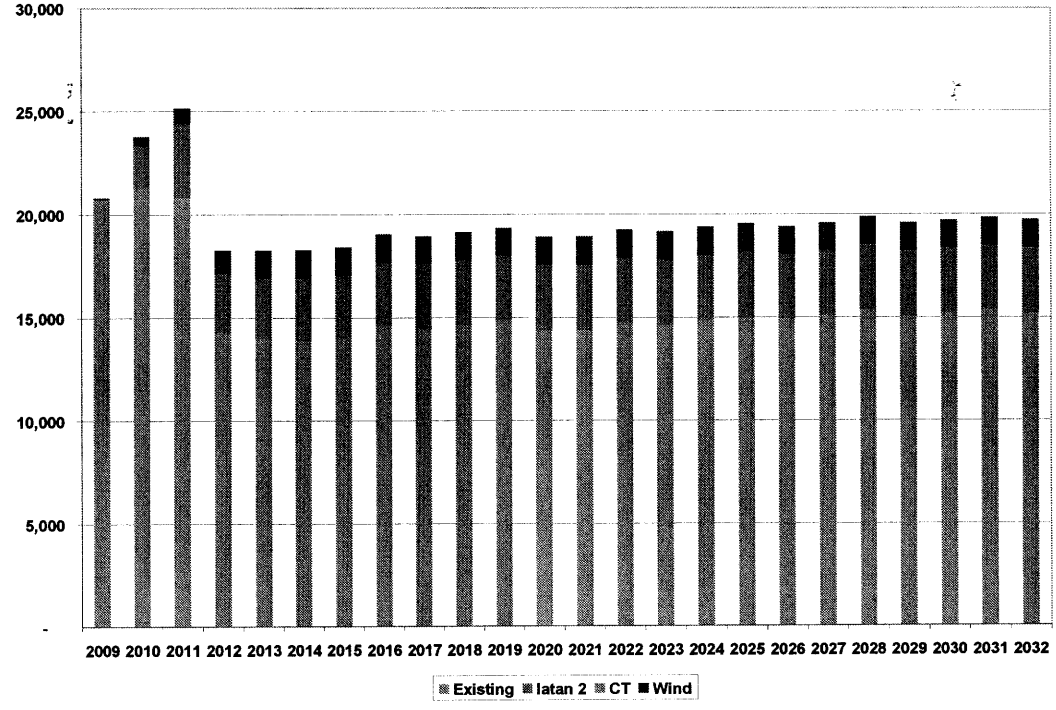
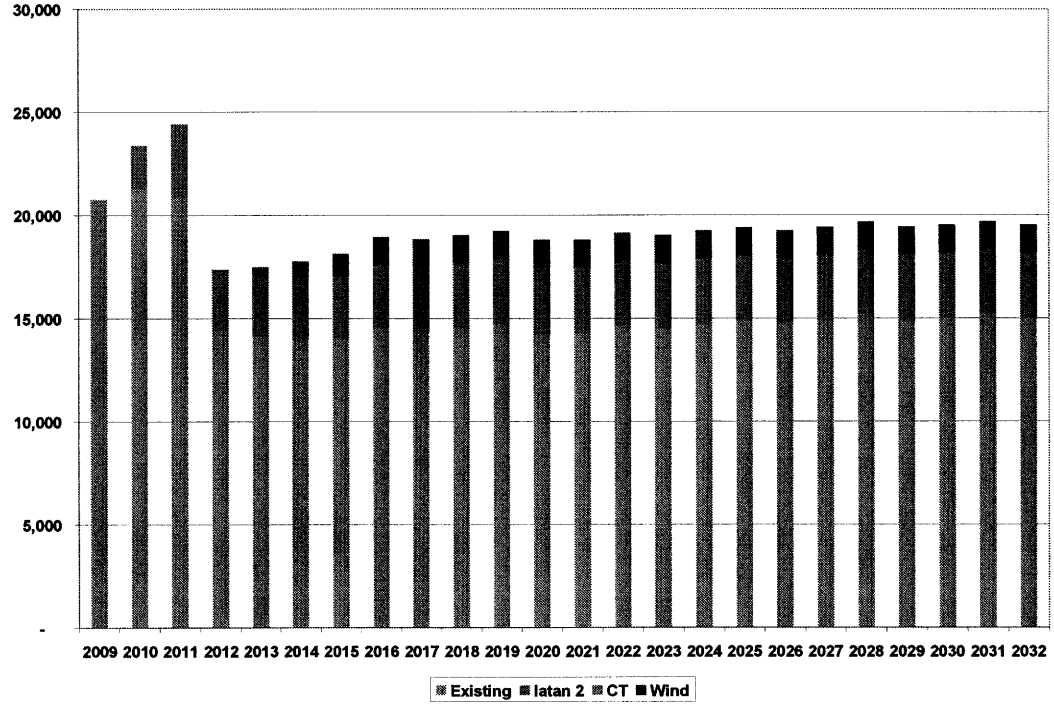


Figure 41: Plan 26 - Energy by Source



Rule 22.060 (6) (C) 7 requires a graph of the values of the 3 measures of financial condition including pre-tax interest coverage, total debt to total capital and the ratio of net cash flow to capital expenditures. This data is detailed in Figure 42, Figure 43 and Figure 44. It should be noted that the MIDAS™ model does not assume stock buy-backs so plans with low capital expenditures will show a decreasing debt to total capital ratio that will actually occur.

Figure 42: Pretax Interest Coverage ** Highly Confidential **

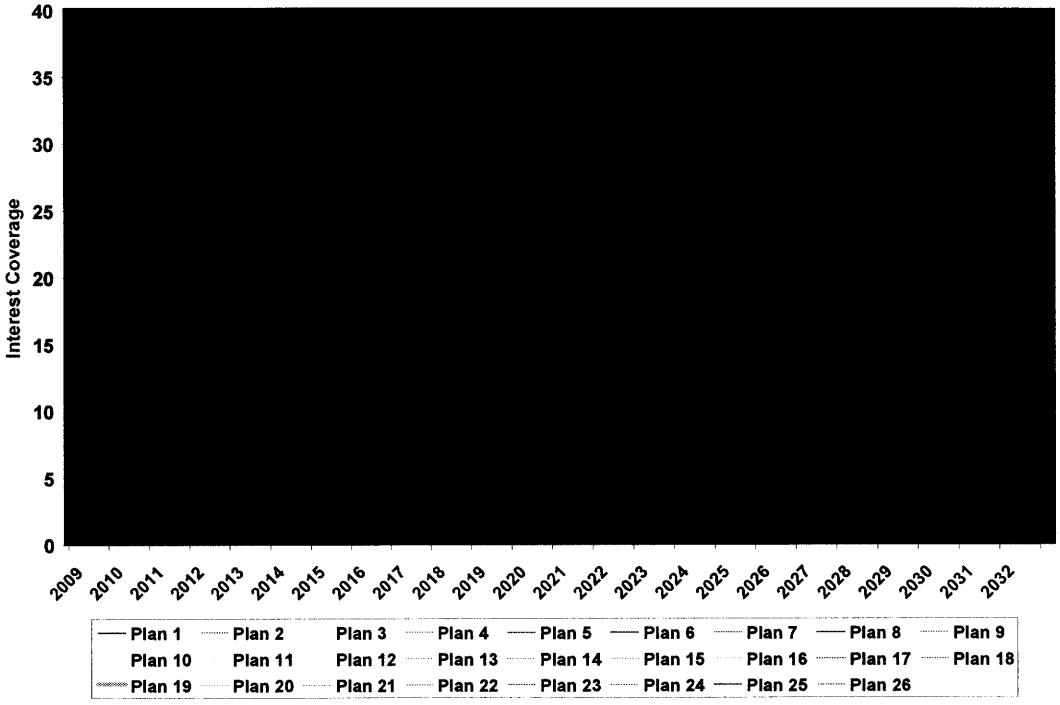


Figure 43: Ratio of Total Debt to Total Capital ** Highly Confidential **

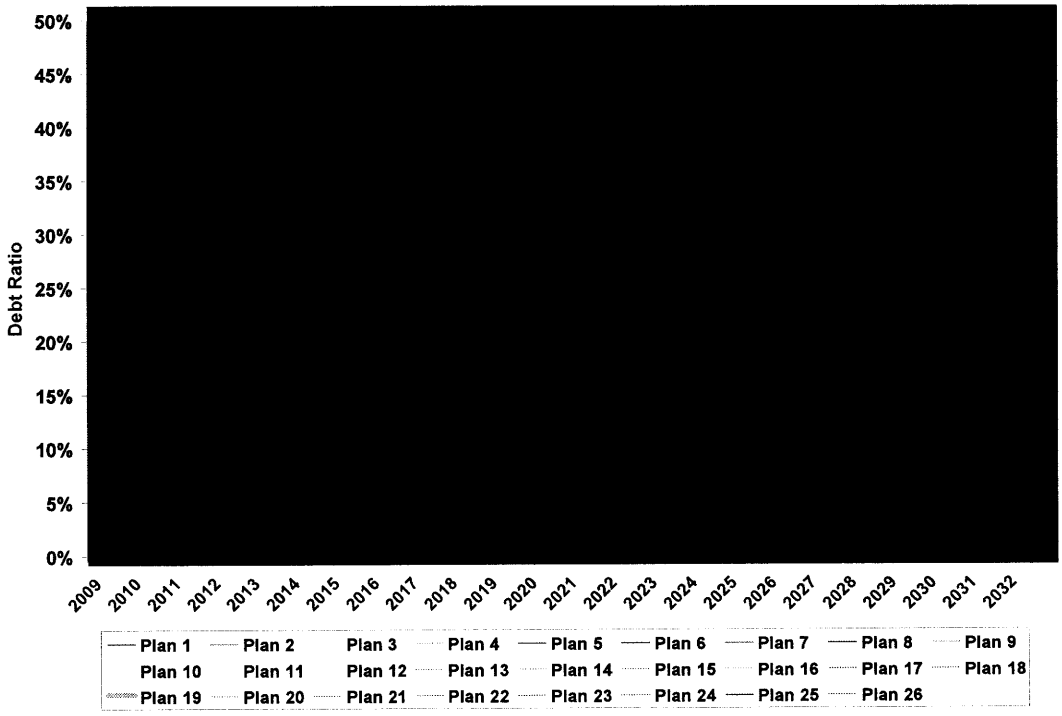


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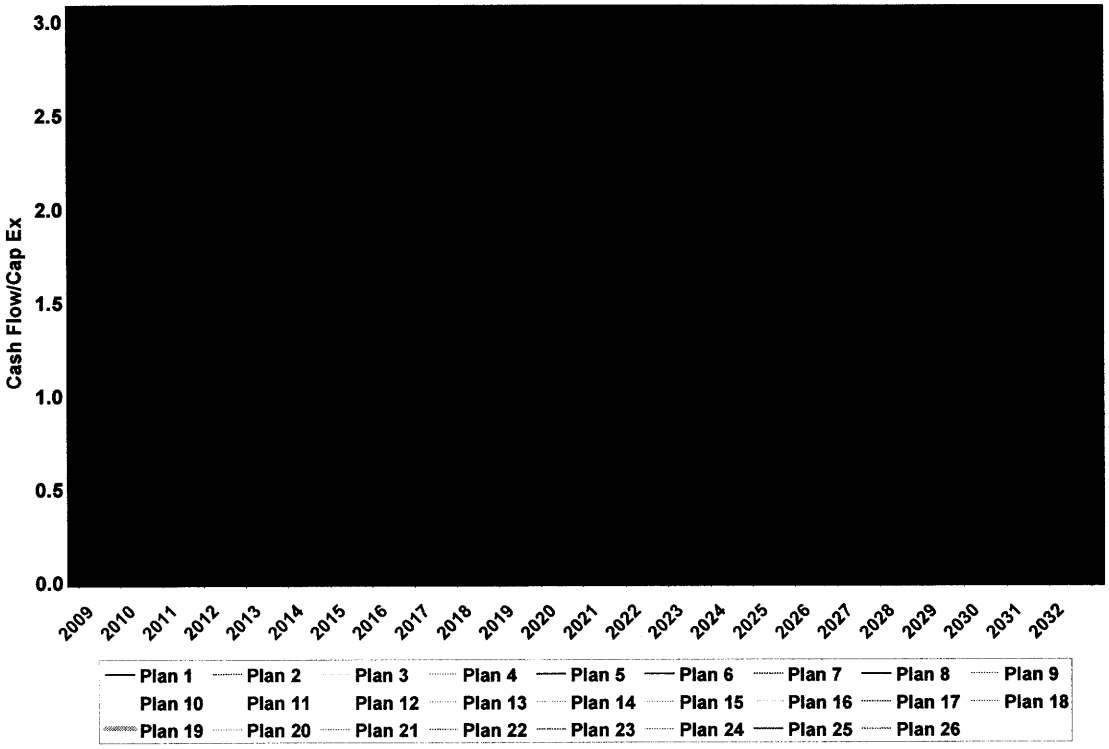
Figure 44: Ratio of Net Cash Flow to Capital Expenditures ** Highly Confidential **



Rule 22.060 (6) (C) 8 requires a graph of annual average rates. Average rates are calculated using the resultant annual revenue requirement spread over the net system input measured in megawatt-hours. The expected value of the annual average rate for each plan is detailed in Figure 45.

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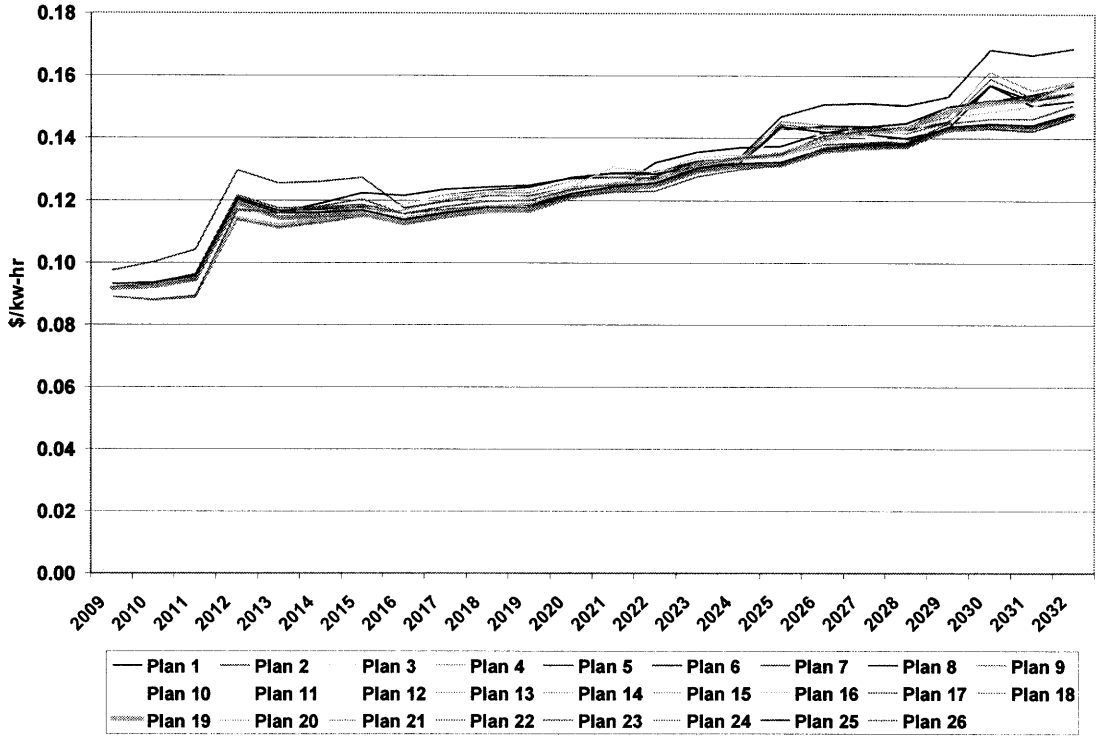
Figure 45: Annual Average Rate - Expected Value by Plan



Rule 22.060 (6) (C) 9 requires a plot of annual emissions of each pollutant identified within the Probable Environmental Cost assumptions. For this IRP, the company identified four pollutants with current or possible cost impacts over the study horizon. These pollutants are SO_2, NO_x, CO_2 and Mercury.

Figure 46: Annual SO_2 Emissions

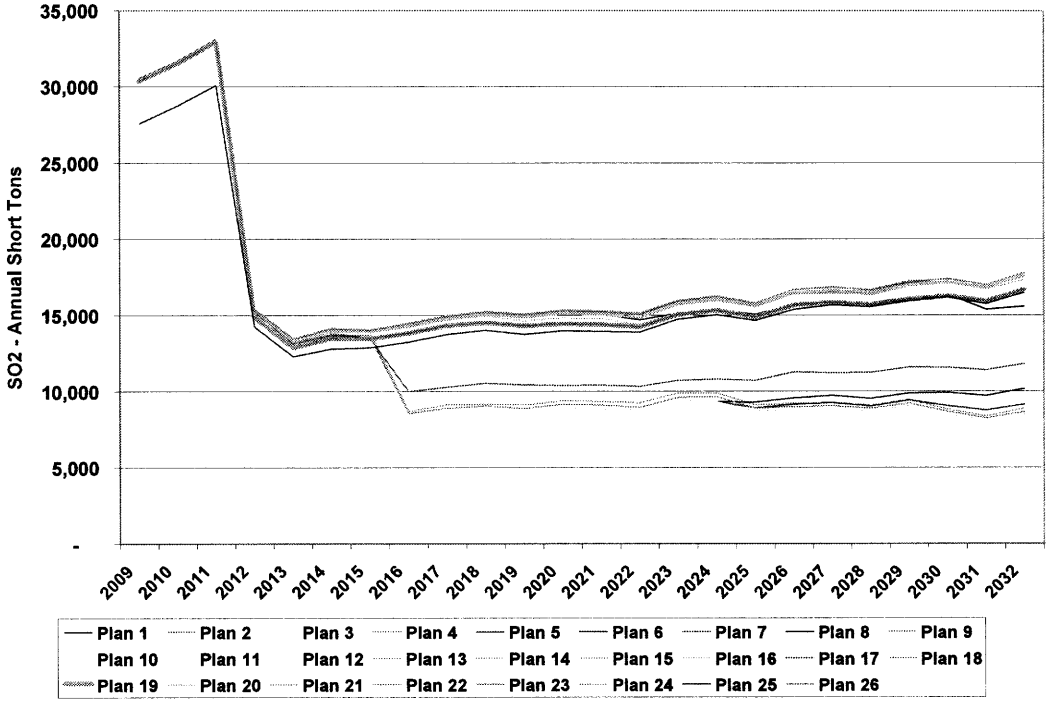


Figure 47: Annual NO_x Emissions

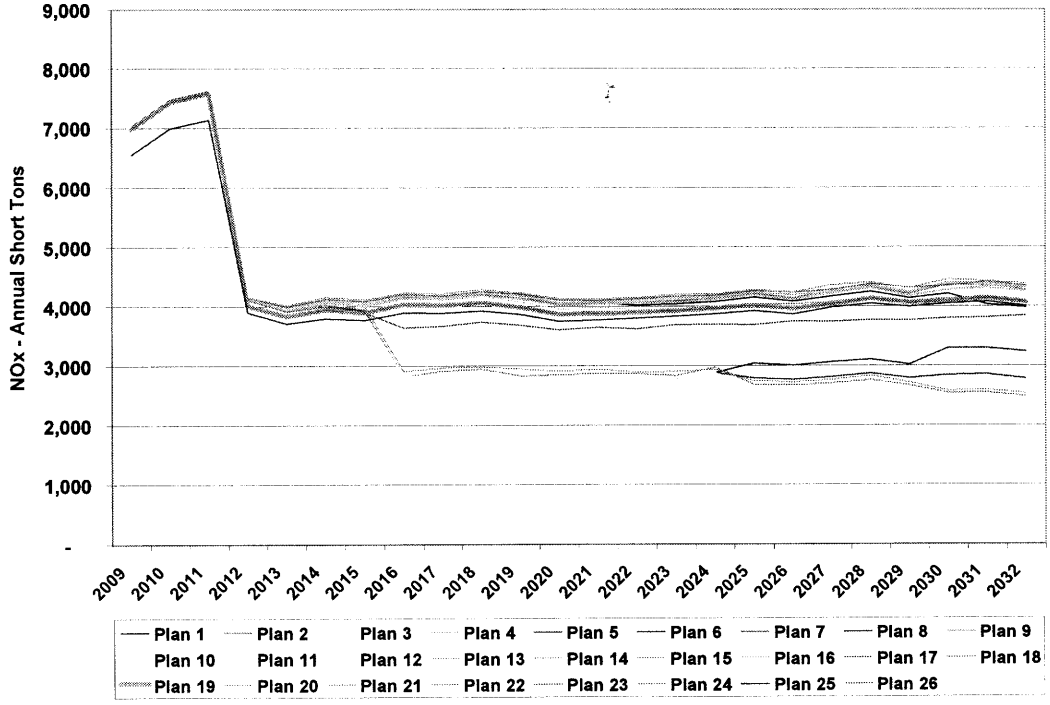


Figure 48: Annual CO_2 Emissions

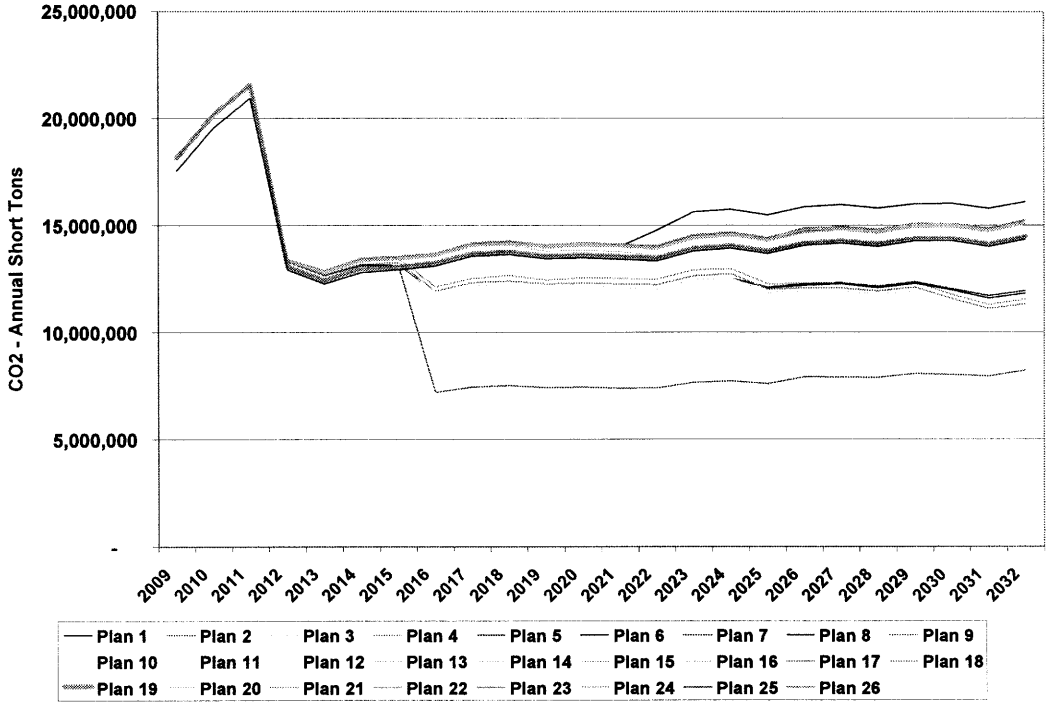
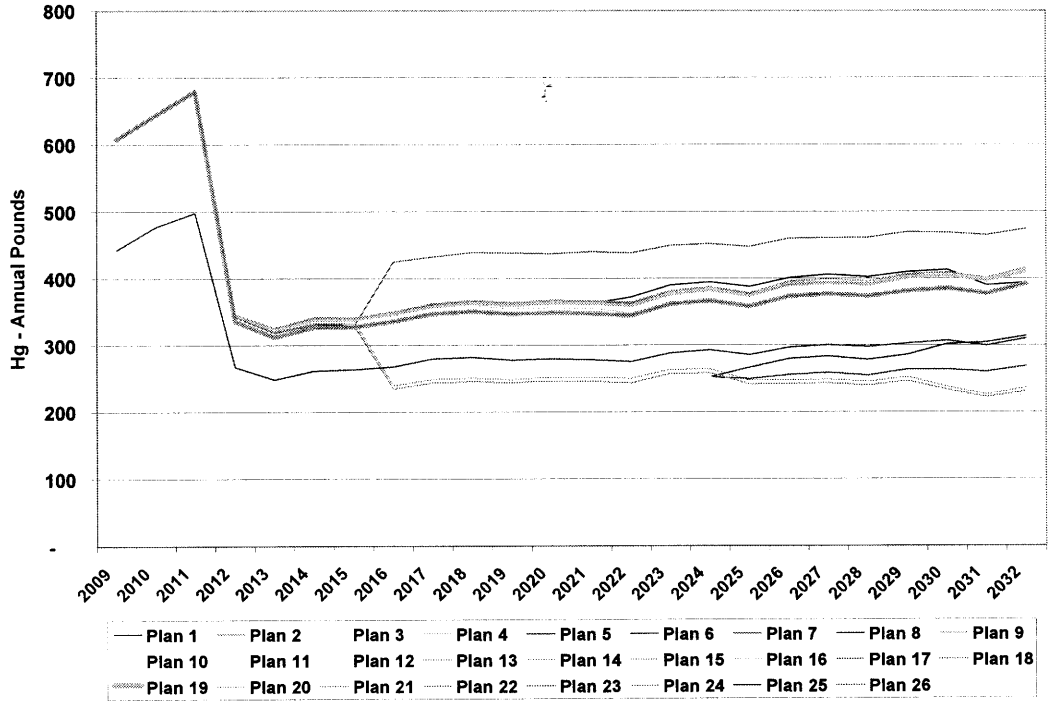
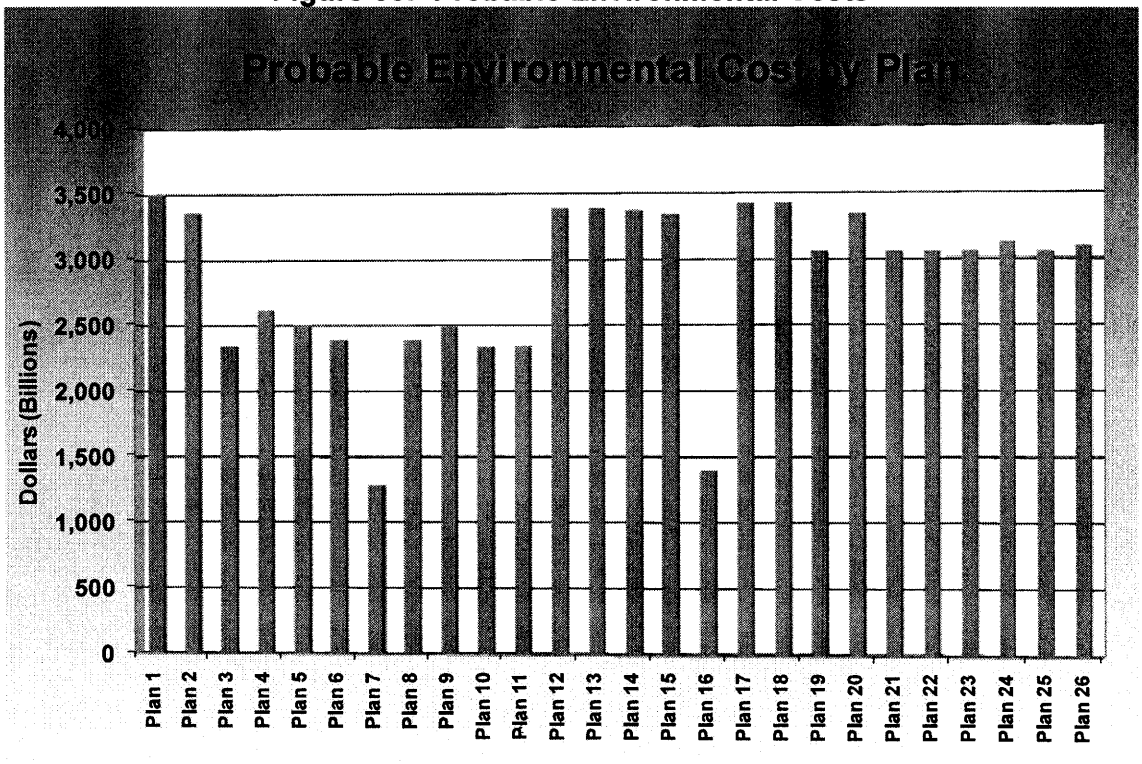


Figure 49: Annual Mercury Emissions



Rule 22.060 (6) (C) 10. requires a plot of Probable Environmental Costs. These costs are over the 25-year analysis timeframe.

Figure 50: Probable Environmental Costs



Rule 22.060 (6) (D), requires that the impact of rate increases be built into the Load Forecast model. Electric rates were assumed to grow at the rate of inflation through 2012. After 2012, MIDAS was utilized to calculate annual rate increases based on the projected capital spending and total rate base that was available at the time the load forecast was developed. The Load Forecast model includes consideration for price elasticity. The factor included in the model is -0.18 (where a 10% increase in energy price results in a 1.8% reduction in energy usage). Additional discussion of price elasticity is in Volume 3, Load Analysis and Forecasting beginning on Page 88.

Pursuant to Rule 22.060 (6) (E) a description of the model used to evaluate alternative resource plans is included in Volume 7, Risk Analysis and Strategy Selection, Section 7.1.

In response to Rule 22.060 (6) (F), KCP&L did not include load building programs.