Appendix C:

ENVIRONMENTAL COMPLIANCE PLANNING

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ENVIRONMENTAL COMPLIANCE PLANNING

1.0 INTRODUCTION

Planning and developing the preferred strategy for environmental compliance requires consideration of numerous and complex environmental regulations. Sensitivities must also be evaluated to address significant uncertainties associated with the final form(s) of currently proposed emission regulation and potential forms of future regulations. There is a high level of probability that regulations requiring reductions in permissible air emissions will be implemented and will require environmental retrofits on existing coal fired units within the planning horizon of KCP&L's strategic Initiative (2005-2015). At a minimum, reductions in allowable emissions of NOx, SO2 and mercury are expected by 2010. The final forms of regulation and the potential for additional future, more restrictive regulation are current unknowns.

To assess the various alternative compliance strategies, KCP&L first developed a base case identifying the expected regulations. In early 2003, it appeared that President Bush's Clear Skies legislation would be a major focus of the administration and passage of this legislation was expected. By mid to late 2003, the probability of the passage of the Clear Skies legislation grew less likely. In December 2003, the EPA issued proposed rulemaking, which essentially duplicated the impacts of the Clear Skies legislation. The proposed rulemaking includes the Clean Air Interstate Rule (CAIR), which calls for significant reductions in SO2 and NOx emissions, and the Mercury Rule which includes two proposed structures, one around the maximum achievable control technology (MACT), the second around a cap and trade structure. KCP&L expects that the proposed CAIR will be promulgated with no major revisions to the proposed rule. KCP&L expects that there is still much uncertainty around the final promulgation of the Mercury Rule. For the purpose of the base case assumptions for this analysis, KCP&L selected the proposed CAIR and the proposed cap and trade Mercury Rule as the expected or base case for evaluating the required environmental retrofits on KCP&L coal fired generators.

The expected case includes the following emission limitations:

- SO_2, phase I reductions of 50% in 2010 and phase II reductions of 70% in 2015
- NO_x, phase I reductions of 50% in 2010, and phase II reductions of 65% in 2015
- Mercury, phase I reductions of 50% in 2010 and phase II reductions of 70% in 2015.

The primary uncertainty in the base case is the level and form of the final mercury regulations. The EPA proposed two forms of regulation; one including a cap and trade market and one without the cap and trade. Also, there is a growing interest from environmental groups to set final mercury reduction requirements to meet a 90% removal rate instead of the 70% removal rate contained in the proposed regulations. Beyond the uncertainties regarding mercury, there is always the potential for future reductions to be more stringent than those currently expected. Another uncertainty is the potential for concerns over global warming leading to limitations on CO_2 emissions. A final uncertainty is the potential for passage of Renewable Portfolio Standards (RPS).

KCP&L's environmental compliance strategy, as recommended in the Comprehensive Plan addresses the expected regulations and provides flexibility to meet the uncertainties of future regulatory rulings or new legislation. Flexibility in the compliance strategy takes several forms:

- Initial retrofits are completed on the newest, most economically viable units. These units would be the last to be exposed to stranded environmental investment.
- The risk of potential CO_2 limits is also mitigated by compliance on our most economic units first. These units would be expected to continue to operate under proposed forms of CO_2 legislation.

- Spreading the construction schedule over several years is expected to result in cost savings for several reasons. Regional demand for qualified labor will peak as firm compliance dates are known. Limited manufacturing capabilities will require a schedule premium for those who delay action. A compressed schedule would drive up the cost of engineering and design. Qualified internal manpower for project management would have to be expanded from current levels for an "all at once" approach to equipment installations.
- The use of wet scrubber technology instead of dry scrubber technology is expected to meet or exceed the proposed 70% mercury removal rates without the addition of high cost and relatively unproven sorbent injection technology. The wet scrubber technology provides the flexibility to meet the potential requirement for 90% mercury removal at significantly lower cost than dry scrubber technology.
- The comprehensive plan addresses the potential for Renewable Portfolio Standards (RPS) through the inclusion of renewable wind generation.
- Future, more stringent reductions of allowable emissions are addressed with the improved SO2 removal of wet scrubbers as well as the flexibility to increase catalyst density in the SCR's.
- Potential risks associated with ozone non-attainment in the Kansas City maintenance plan area are reduced by early installation of an SCR on the LaCygne unit 1 generating unit as requested by KDHE, local EPA and the Mid America Regional Council (MARC).

2.0 SUMMARY OF ENVIRONMENTAL REGULATIONS

In addition to the expectation of CAIR and the Mercury Rule, KCP&L must also consider the possible impacts of the following existing regulations and potential new regulations:

- Best Available Retrofit Technology (BART)
- New Source Review (NSR), based on potential enforcement under Section 114 of the Clean Air Act
- PM 2.5 ambient air standard
- 8-Hour Ozone ambient air standard
- Potential mercury removal of 90% Vs 70%, no cap and trade allowance market
- Potential CO2 limitations
- Potential Renewable Portfolio Standards (RPS)
- Potential for future reductions beyond CAIR

Both the potential for CO2 limitations and RPS would require legislative actions. The other regulations shown above are reflective of potential rulemaking by the EPA, which could impact the economics of planned environmental compliance strategies. As the permissible emission rates decrease, both the capital and operating costs of compliance increase. By retrofitting existing units to meet CAIR and the Mercury Rule, it is expected that the probability of future enforcement actions under NSR and BART will be reduced. A comparison of the average allowable emissions rates for KCP&L units under CAIR, NSR, and BART are shown in table below.

Table 2.0 Comparison of Allowable Emissions

	Lbs/mmbtu			
Comparison of EPA Regulations	SO2 Phase I	SO2 Phase II	NOx Phase I	NOx Phase II
CAIR	0.25	0.125	0.144	0.12
BART & NSR (BACT)		0.1		0.07

A review of the above listed regulations is discussed below.

Additional Issues Surrounding CAIR and The Mercury Rule

As currently proposed, CAIR includes both Kansas and Missouri units. In the final ruling, expected in Mid December 2004, there is a chance that Kansas units will be excluded, although that is not expected. The comment period for both the Supplemental Mercury Proposal and the proposed Utility Mercury Reductions Rule closed June 29, 2004. EPA is currently reviewing comments in preparation for issuing a final rule in March 2005. Under CAIR and the mercury Rule, emissions will be limited as discussed below.

SO2. Allowance allocations have been specifically granted to generating units under the existing Clean Air Act (CAA). CAIR will reduce those allocations by 50% in 2010 and by 70% in 2015. The allowable emissions are clearly established and known based on the CAA; however, individual states will prepare State Implementation Plans (SIP), which may reduce the SO2 allowances granted to utilities. This potential reduction in allowances was not modeled in the evaluations of compliance plans.

NOx. Determination of allowable NOx emissions is based on historic unit heat inputs. The average of the three highest annual heat inputs between 1999-2002 will establish the baseline for calculating NOx allowances. In 2010, units will be allocated allowances based on 0.15 lbs/mmbtu of NOx times the baseline heat input calculated above. In 2015, the allowable rate will drop from 0.15 to 0.125 lbs/mmbtu. The calculation of the baseline heat input is proposed to be a rolling average, e.g., the 4-year window utilized to establish the baseline will change every year. In 2010, heat inputs from 1999-2002 will be utilized. In 2011, heat inputs from 2000-2003 will establish the baseline and so on. As with SO2, states may reduce the allowances of NOx granted to utilities. This potential reduction was not modeled in the evaluation of compliance plans.

Mercury. There remains much uncertainty regarding implementation of the mercury rule. The expected case is that a cap and trade program will be established for mercury with required reductions of 50% in 2010 and 70% in 2015. Although the mercury rule calls for earlier compliance dates, litigation of the final rule is expected to delay implementation until the 2010 and 2015 timeframes. The allowable emissions are shown in the Tuesday March 16, 2004 Federal Registry, Part II, Environmental Protection Agency, 40 CFR Parts 60, 72, and 75 (Volume 69, NO. 51). This publication specifies the allowances available for phase II of the mercury rule set at a 70% reduction. The allowances to be granted under the proposed 70% reduction are clearly established and known from this publication. Individual state action could reduce the allowable mercury emissions to levels below the EPA emission reductions. This potential reduction was not modeled in evaluating the compliance plan.

The uncertainties with mercury include the potential for "command and control" limits without the availability of a cap and trade market. In addition, the reduction target may be set at 90% instead of the expected 70%.

For all of the above emissions, the addition of new generating resources does NOT increase the allowances provided.

BART

Under existing sections of the CAA, the EPA is required to evaluate all generating units larger the 250 MW, which were brought on line or were under construction between 1962 and 1977. This requirement covers both of the LaCygne units. In the event that Kansas is excluded from CAIR, the Kansas units would be evaluated under BART, which requires compliance in the 2014 to 2018 timeframe. The BART evaluation will determine the impact of individual units on visibility in the nearest class I area. If the impact is determined to be "significant", the unit will be subjected to BART requirements, which are the same as the BACT requirements discussed below. If a BART evaluation is required in Kansas, the primary concerns for KCP&L are NOx from LaCygne unit 1 and both SO2 and NOx from LaCygne unit 2.

NSR Section 114

Section 114 of the CAA allows the EPA to require New Source Review for companies that have made major modifications on existing units. What constitutes a major modification has been highly debated and has been the subject of much litigation since the EPA's increased enforcement of the rule during the Clinton administration. The risk to KCP&L for maintenance performed on its existing units is unknown. Based on actions taken on other companies, the EPA could issue a notice of enforcement for some or all of KCP&L units under Section 114 of the CAA. Such action could result in fines and that would be retroactive to the date of the modification that would continue until the unit was brought into compliance. It is expected that the promulgation of CAIR and Mercury Rule will replace the issuance of Section 114 notices. In the event that these rules are not promulgated or are ineffective toward moving the industry to employ the latest compliance technologies, the likelihood of continued Section 114 enforcement is high.

The table below shows the result of past enforcement by the EPA under Section C and D of the CAA, New Source Review provisions.

EPA Clean Air Act Settlements				
Company Name	**Settlement Fine**	**Near Term Upgrade Costs**	**Long Term Upgrade Costs**	**Original Fine Potential**
Tampa Electric Company	$ 3,500,000	$ 10,000,000		$ 385,425,000
Cinergy	$ 8,500,000	$ 21,500,000	$ 1,400,000,000	$ 1,101,525,000
Virginia Electric Power Company	$ 5,300,000	$ 13,900,000	$ 1,200,000,000	$ 1,554,900,000
Southern Indiana Gas & Electric	$ 600,000	$ 30,000,000		$ 227,857,500
Source: EPA Website and Press Releases				
http://cfpub.epa.gov/compliance/resources/decrees/civil/				
Original Fine Potential	Pre-January 1, 1997		$25,000/day/plant	
	Post-January 1, 1997		$27,500/day/plant	

8-Hour Ozone

The EPA has the authority under the Clean Air Act to ensure that ambient air quality standards are maintained above the minimum standards. The metropolitan Kansas City area was expected to exceed the ambient air quality standard for ozone during the summer of 2004. Emissions of nitrogen oxides and volatile organic compounds from automobiles and trucks, industrial activity and electric generators combined with sunlight and temperature are the precursors for ozone formation. Due to cool summer conditions in 2004, the Kansas City area was in compliance with the 8-hour ozone ambient air standard during the ozone season. It is anticipated that the Kansas City metropolitan region will exceed the 8 hour ozone ambient air standard during the next "normal" summer.

Once these ambient air standards are exceeded, the region will be designated non-attainment by the EPA for ozone compliance. Regional planners, under the coordination of the Mid-American Regional Council (MARC) will be required to submit detailed plans to the EPA outlining the steps that will need to be taken to return the region to a compliant status. Historically these plans have included vapor recovery nozzles for filling automobile gas tanks, car-pool incentives, and emissions testing of vehicles as well as additional efficiency improvements and emissions controls for industry. The most significant economic impacts for the region involve the offset provisions included under Least Achievable Emissions Reduction (LAER), another enforcement authority granted to the EPA. LAER applies to all new sources of emissions within a non-attainment area. Under LAER, new sources must install equipment to meet significantly more stringent emissions limitations and they must obtain offsets for each unit of emissions they produce. These offsets are reductions from existing emission sources located within the non-attainment area. The need to obtain these offsets applies to any new regional business that emits contributors to ozone formation. This requirement places the metropolitan region at a significant disadvantage for attracting new business and growing the economy.

MARC's modeling of the transport characteristics of the ozone precursors of nitrogen oxides and volatile organic compounds has indicated that NOx emissions from the Lacygne Station have a detrimental impact on the formation of ozone in the metropolitan region. LaCygne unit 1, which utilizes cyclone burner technology emits over 3 times as much NOx as emitted by LaCygne unit 2 on a Lbs/MMbtu basis. Based on these facts, MARC and local EPA officials have identified LaCygne unit 1 as a major contributor to ozone formation in the metropolitan area and have specifically requested action by KCPL to reduce the NOx impact from this unit. The Comprehensive Plan includes early installation of an SCR on LaCygne unit 1 to address this specific request.

PM 2.5

Emissions of fine particulates are being reviewed by the EPA and others to determine the impact on human health. The combustion process in many power plants contributes to emissions of fine particulates primarily through gaseous emissions of (1) sulfur oxides from coal and oil, which can transform into sulfates; and (2) nitrogen oxides from all fossil fuels, which can transform into nitrates. The existing stack particulate emission standard is PM 10. As more information is developed on the relationship between ambient air standards and stack emission rates, there is a strong possibility that the current PM 10 stack emission rates will be modified to include PM 2.5 and require the addition of baghouses on existing coal fired generating units since they are more effective in removing fine particulates than electrostatic precipitators. PM 2.5 has two primary impacts beyond the requirement for baghouses. First, regions can be declared non-attainment for PM 2.5 standards. This would result in the application of Least Achievable Emissions Reductions (LAER) regulations as required under ozone non-attainment. The second impact involves KCP&L's planned use of wet scrubbers. PM 2.5 includes "condensables" in measuring emissions of fine particulates. Wet scrubbers are expected to produce measurable particulates at a rate of 0.025 lbs/MMbtu. Under PM 2.5, the EPA has been requiring particulate emission rates of 0.018 lbs/MMbtu. KCP&L anticipates that the added environmental benefits of wet scrubbers (increased SO_2 and mercury removal) will result in agreement from the EPA to allow the 0.025 Lb/MMbtu emission rate for PM 2.5. Because the Kansas City metropolitan area is not believed to face non-attainment status under PM 2.5, the use of wet scrubbers is not expected to become an issue.

CO_2 Limitations

Concern over global warming is a growing issue receiving significant coverage in the press. Russia recently ratified the Kyoto protocol, as have many of the industrialized nations in Europe. Some environmentalists continue to push for control of CO_2. Reacting to this growing concern, several proposals have been introduced in Congress to limit the volumes of CO_2 emitted into the atmosphere. In the event that Congress moves to reduce CO_2 emissions, the two proposals viewed as the most likely forms of CO_2 control include Senator Carper's proposal and the McCain-Lieberman proposal. These two proposals were included as CO_2 sensitivity evaluations in developing KCP&L's Comprehensive Plan. Also, see the Supplemental Attachment on CO_2 issues attached at the end of this Appendix.

The Carper bill specifically targets CO_2 emissions from fossil fueled electricity generators and sets the annual CO_2 cap at year 2006 levels beginning six years after enactment. In year 10 through 20, the cap is set at 2001 levels. For sensitivity modeling, it is assumed similar legislation is passed in late 2005, with enforcement effective January 1, 2012.

The McCain-Lieberman proposal would cap CO_2 emissions at 2000 levels. In October 2003, this proposal was rejected in the Senate by a 55-43 vote, with a number of Republican Senators voting in favor. For modeling sensitivity to this form of CO_2 control, it is assumed that similar legislation is passed as early as 2005, with a six-year window before enforcement. Therefore it is assumed that CO_2 will be capped at year 2000 levels beginning January 1, 2012.

RPS

A Renewable Portfolio Standard (RPS) has been established in 27 states. These standards require various percentages of annual energy generation to be supplied from renewable resources. On the federal level, RPS legislation has been introduced in several forms as additions to Clear Skies and other legislative proposals. The potential for Federally mandated RPS is considered fairly high since more than half of the states have already implemented their own RPS requirements. The inclusion of wind generation in KCP&L's Comprehensive Plan is expected to reduce the risk exposure to future RPS requirements.

3.0 PROPOSED ENVIRONMENTAL COMPLIANCE

KCP&L's environmental compliance plan is a significant portion of the overall Comprehensive Plan and was developed to address the expectation of passage of the CAIR and the Utility Mercury Reduction Rule. As discussed in the introduction, the compliance plan also provides significant flexibility to react to potential changes in the final form of environmental regulation. The processes included in developing the compliance plan are discussed below.

Technology Selection

KCP&L has considered only proven forms of emission control technology which include wet or dry scrubbers for SO2, SCR's for NOx, and baghouses or electrostatic precipitators (ESP's) for particulates. For mercury, co-benefits are expected to achieve a significant reduction in emissions. The use of sorbent injection is an emerging technology for higher levels of mercury removal, however, much is unknown regarding this technology.

KCP&L's proposed environmental compliance plan includes the use of wet scrubbers. This technology is expected to remove 95%-98% of SO2 from stack emission. Dry scrubbers are expected to remove 90-93% of the SO2. When combined with an SCR and baghouse, the selection of scrubber technology is expected to have a significant impact on the removal of mercury. Although much is unknown regarding the actual levels of mercury reduction, preliminary testing supports the claim that the wet scrubbers provide superior mercury removal. In the Iatan unit 2 Project Definition Report, Burns and McDonnell evaluated and compared wet and dry scrubber technology. On a stand-alone basis for meeting CAIR requirements for SO2 removal, the dry scrubber was expected to result in busbar costs $0.81/MWh lower than the wet scrubber. However, under sensitivity evaluations, Burns and McDonnell recommended the wet scrubber as the most economical technology.

The sensitivity evaluation included the following findings:

- Mercury control costs. The dry scrubber would require the addition of halogenated activated carbon at a cost of $0.48/MWh to meet a mercury removal target of 70%. The sorbent injection is not expected to be required for the wet scrubber to meet the mercury MACT 70% removal target. Although sorbent injection would be required for a wet scrubber to achieve 90% mercury removal, however, a dry scrubber would require significantly higher rates of sorbent usage to meet this target.

- Combustion by-product sales. Wet scrubbers are expected to produce marketable gypsum as a by-product. Dry scrubbers will require landfill of all by-products, adding $0.40/MWh to the cost of a dry scrubber
- Emissions allowance prices. The superior SO2 removal of wet scrubbers is expected to result in reduced emissions valued at $0.33/MWh compared to the dry scrubber technology
- Dry scrubbers offer superior removal of sulfuric acid mist and the condensable portion of PM. In addition, dry scrubbers require less auxiliary power and provide improved heat rates, which help to lower emissions. However, these emissions benefits are far outweighed by the SO2 and mercury control benefits of a wet scrubber
- Modern wet scrubbers have demonstrated availabilities above 99%, while dry scrubbers have availabilities in the low to mid 90%'s.

The Burns and McDonnell final recommendation regarding the selection of wet instead of dry scrubbers included the following statements.

> "The overriding issue that results in our recommendation to install a wet FGD system for Iatan unit 2 is the emission control benefits for SO2 and mercury. A wet FGD system will provide a higher level of SO2 control. A wet FGD system inherently has better mercury control capabilities. Supplemental mercury controls may not be needed to meet MACT regulations if a wet FGD in installed. Several mercury control techniques (such as sorbent injection) that are currently under development are more suitable for installation on a wet FGD installation."

For particulate removal, baghouses offer the most economic and reliable technology. ESP's require large amounts of auxiliary load and are not proven to economically meet the fine particulate removal requirements of the CAIR or PM 2.5.

For NOx reductions, SCR's are the only known technology proven on the required commercial scale.

Construction Schedule

Burns and McDonnell engineering completed constructability studies to ensure that adequate space is available for the installation of the required scrubbers, baghouses and SCR's. The findings indicate that all KCP&L sites can accommodate the environmental retrofit equipment. The proposed schedules include completion of construction with the units on line. During earlier planned outages, blanking plates will be installed in existing ductwork. After equipment construction is complete, the blanking plates would be reversed to complete the installation of new environmental equipment. Burns and McDonnell indicates that reversing the blanking plates to tie in the new equipment can be accomplished during a 3-4 week outage. Therefore extended unit outages are not anticipated as a consequence of the scheduled environmental retrofits.

To complete the Comprehensive Plan, the 5-year planned outage schedule was projected beyond 2009. The results and subsequent retrofit completion schedule are shown in the table below. The yellow highlighted outages indicate the schedule as recommended in the Comprehensive Plan. The brown highlighted outages for latan and the LaCygne units indicate the delayed compliance dates evaluated in MIDAS. Under the delayed compliance scenarios, the Montrose units are scheduled after 2015.

Table 3.0 Environmental Compliance Schedules													
			BUDGETED OUTAGES					PROJECTED OUTAGES					
STATION	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Iatan													
Date Complete		16-Mar	27-Mar	12-Mar	4-Mar	23-Nov							
Duration		9	30	9	58	30						58	
Equip						SCR, BH, FGD							
L-1													
Date Complete		9-Apr	10-Apr	1-May	29-Apr	24-Feb	3-May	Spring	Spring	Fall	Spring	Fall	Fall
Duration		27	86	30	30	30	30	30	30	30	58	30	30
Equip					SCR		BH, FGD						
L-2													
Date Complete		7-Oct		26-Feb	25-Nov		8-Feb	Fall		Spring	Fall		Fall
Duration		56		30	30		30	30		56	30		30
Equip											SCR, BH, FGD		
H-5													
Date Complete		5-May	30-Oct	26-Mar	8-Apr	9-Mar	5-Apr						
Duration		11	30	9	30	9	58						
Equip													
M-1													
Date Complete		10-Sep	24-Apr	20-Apr	7-Oct	13-Mar		Spring	Fall	Spring	Fall	Spring	Fall
Duration		56	4-Jan	4	30	4		56	30	4	4	30	4
Equip								LNB's				SCR, BH, FGD	
M-2													
Date Complete			1-May	26-Nov	8-Apr	19-Mar	13-Dec	Fall	Fall	Spring	Fall	Spring	Spring
Duration			4	30	4	4	58	4	30	4	30	4	4
Equip							LNB's				SCR, BH, FGD		
M-3													
Date Complete		22-Jan		26-Mar		9-Nov		Spring	Fall	Fall	Spring	Fall	Spring
Duration		56		30		58		30	4	30	4	4	30
Equip						LNB's				SCR, BH, FGD			

Proposed Schedule Highlights

The recommended schedule begins environmental retrofits prior to the expected implementation dates of CAIR and the mercury rule. This is recommended for several reasons:

- Demand for equipment and qualified construction labor is expected to peak as the implementation dates approach, driving up the cost of compliance. Starting early and spreading construction over 10 years is expected to help avoid premium payments for constrained schedules. Obtaining early slots in the manufacturing queue is expected to reduce costs.
- The construction period for completion of retrofits is 4 years. Work must start prior to the implementation dates to reduce the cost of allowance purchases during the first years of implementation
- The availability of qualified vendors and manufacturing capacity will be limited. Spreading the construction schedule over 10 years will help to ensure adequate design expertise and help avoid premium payments associated with schedule constraints.
- Internal project management resources are limited and best suited for spreading the construction work.
- The proposed schedule represents a compromise between early capital spending and allowance purchase costs.

As recommended, the initial environmental plan proposes the installation of an SCR on LaCygne unit 1 prior to the 2007 ozone season. The decision to complete this work in the 2007 timeframe was reached in cooperation with the KDHE, Mid America Regional Council (MARC) and local EPA officials Where the primary driver for early NOx compliance on LaCygne unit 1 is to address the issue of ozone non-attainment in the metropolitan Kansas City area.

The proposed schedule for environmental retrofits at Iatan unit 1 would have equipment in service in late December 2008, just 1 year prior to the start of Phase 1 requirements of the CAIR. As the lowest cost coal fired generator in our fleet, Iatan unit 1 will be a required generating resource for years to come under the most restrictive foreseeable environmental restrictions. Local concern regarding increased site emissions associated with the proposed addition of Iatan unit 2, and the Iatan site is also driving the need to plan Iatan 1 environmental retrofits early in the compliance plan. It is also expected that the procurement and construction of retrofits on Iatan 1 can be coordinated with the procurement and construction schedule of Iatan 2 to derive economies of scale and timing in the costs of both projects. Finally, once the proposed SCR has been added to LaCygne unit 1, Iatan will be the highest emitter of SO2 and NOx in the KCP&L fleet. The investment in the Iatan unit 1 environmental retrofit will provide the greatest reduction in the required purchase of allowances.

LaCygne unit 1 retrofits addressing SO2 and particulate are the next proposed projects. As proposed, LaCygne unit 1 will complete a rebuild of the existing wet scrubber and the installation of a baghouse during the May 2009 planned outage. This is the last planned outage prior to the expected implementation of reductions in allowable emissions of SO2, NOx and mercury. This schedule will mitigate exposure to high allowance prices by helping to reduce overall KCP&L fleet emissions in time to meet the expected Phase 1 compliance dates.

LaCygne 2 is scheduled to complete environmental retrofits in the fall of 2013. This schedule is intended to minimize allowance purchases under Phase I of the CAIR and mercury rule while also ensuring compliance prior to the expected enforcement of Phase II reductions in 2015.

The Montrose units complete the remainder of the scheduled environmental retrofits. Delaying retrofits on the Montrose units provides flexibility for further evaluation of the economics surrounding environmental retrofits at Montrose.

4.0 ECONOMIC EVALUATION

Base Case

Implementation of the EPA's proposed CAIR and Utility Mercury Reduction Rule form the basis of the expected emissions reductions utilized as the Base Case for evaluations. As indicated in Section 3.0 above, it is impractical to develop a "just in time" compliance plan due to the extensive unit outage time required, limited availability of a qualified workforce, and design engineering limitations. The primary cost adders for compressing the compliance schedule are expected to be increased costs for equipment, materials and labor. Delaying all compliance until after the Phase I implementation date would expose KCP&L ratepayers to allowance price uncertainty.

The recommended or base case environmental compliance schedule is actually a combination of early and delayed compliance. As proposed, the schedule limits early capital spending and also mitigates some of the exposure to high allowance prices. Although the reasons for the proposed schedule are numerous and appear to be logical, the ultimate test of the proposed schedule will be the economic comparison between alternative plans. Several compliance schedules were modeled in MIDAS to test the economics of altering the proposed schedule. These scenarios and the resulting economic evaluations are discussed below.

Alternative Plans

At the end of 2004, KCP&L is expected to have a bank of SO2 allowances equaling approximately 190,000 tons of SO2 emissions. Two alternative strategies have been proposed for the beneficial use of the SO2 allowances. First, KCP&L could delay the installation of scrubbers by utilizing the existing bank to allow unit operations without SO2 penalties. Second, KCP&L could sell these allowances to offset the cost of compliance and cash flow requirements under the proposed regulatory plan. These alternatives are included in the five MIDAS scenarios described below. In all scenarios, resource additions match the Comprehensive Plan with 500 MW of Iatan 2, and 100 MW of wind in both 2006 and 2008.

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2. Scenario #2: No compliance

3. Scenario #3: Delayed compliance. Unit compliance schedules were delayed to match the schedule shown below. No SO2 sales were included in this scenario.
   - LC-2: Fall 2015
   - Iatan-1: Spring 2016
   - LC-1: Spring 2013
   - M-3: Fall 2016
   - M-2: Spring 2017
   - M-1: Fall 2017

4. Scenario #4: Delayed scrubber installations. The Comprehensive Plan with delayed scrubber installations. Under this scenario, SCR and baghouse installations are completed as shown in Table 3 above. The installation of Wet Scrubbers is delayed to match the schedule shown below. The cost of

annual emissions of SO2 are paid out of the existing bank of SO2 allowances as available.

a. LC-1: Spring 2013
b. Iatan: Spring 2014
c. LC-2: Spring 2017
d. Montrose 2&3: Spring 2019
e. Montrose 1: Fall 2019

These four scenarios provide comparison of the Base Case to alternatives for delayed compliance. The scenarios also demonstrate the most economic use of the existing bank of SO2 allowances; either allowing delays in the installation of scrubbers or selling the allowances to generate cash flow. These scenarios do not show the potential impact of NSR section 114 enforcement, which could result from delaying the installation of environmental controls. As indicated previously, such enforcement could add substantially to the cost of compliance by imposing significant fine and requiring equipment installations and allowable emissions rates set at BACT limits rather than limits based on CAIR and the mercury rule.

4.1 SENSITIVITIES

The following uncertainties were modeled under a range of expected outcomes:

- Emissions allowance price
- Construction cost for environmental retrofits

Emission Allowance Price Sensitivity

In the initial evaluations to develop the environmental compliance plan, the following sources for emissions allowance price forecasts were utilized:

- Energy VenturesAnalysis, Inc. Fuelcast, Long Term Outlook, August 2003

- DOE Website, March 2004
- EEI Emissions Forecast (assuming Interstate Air Quality Rule, now called the Clean Air Interstate Rule, and Mercury Cap-and-Trade as proposed by the EPA in December 2003), February 2004
- J. D. Energy Emissions Price Forecast April 16, 2004
- EPA source, Roman Kramarchuk, Emissions Price Forecast (assuming Clear Skies as originally proposed), May 3, 2004
- "Roll the Dice Again: Economic Models of Global Warming:" William D. Nordhaus and Joseph Boyer, Yale University, October 25, 1999.
- Tom Wilson, Green House Gas Project Manager for EPRI's Global Climate Council
- "The Marginal Cost of CO2 Emissions: An Assessment of the Uncertainties" Richard S. J. Tol, April 10, 2003

In the final evaluation, updated forecasts for NOx, SO2 and mercury allowance prices were included from Energy Ventures (August 2004 Forecasts) and J D Energy (October 2004 SO2 forecast). Ranges utilized in developing scenarios in MIDAS included Expected, High and Low price forecasts. Details of these prices are shown below in section 4.3, Assumptions. The expected range of CO2 allowance pricing under Greenhouse Gas (GHG) limitations are shown in the supplemental attachment at the end of this report.

Construction Cost Sensitivity

Construction costs were modeled based on inputs from Burns and McDonnell engineering who indicated the expected costs could range from a low of –10% to a high of + 30%. Additional details regarding the development of these cost estimates is included in the following section.

4.3 ASSUMPTIONS

Base Case for Environmental Compliance

Under the expectation of CAIR and the Utility Mercury Reduction Rule, KCP&L expects to be provided annual allowances for emitting SO2, NOx and Mercury. Emissions above the level of allowances provided will require purchasing emissions allowances under the proposed cap and trade programs for each pollutant. The expected levels of KCP&L's share of annual emissions are shown in the table below.

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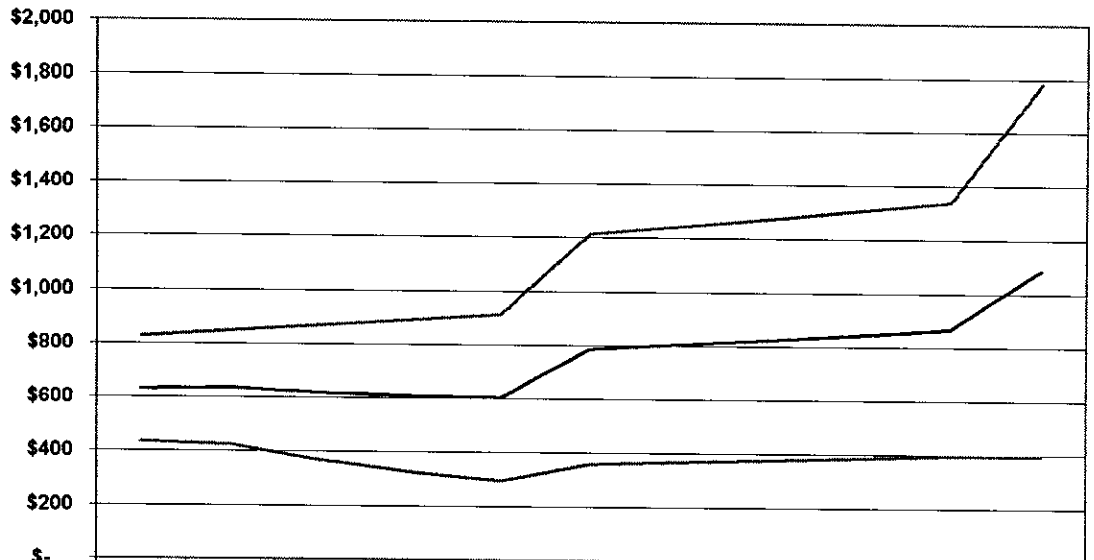
Emission Allowance Price Forecasts

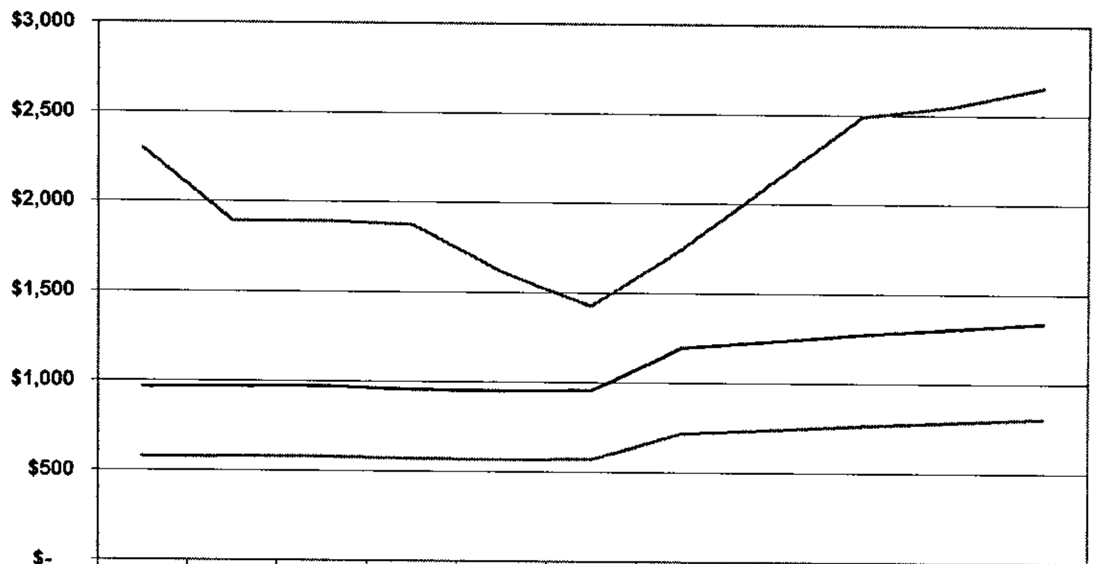
Based on the sources described in Section 4.1, the following tables document the range of emissions allowance prices utilized in the environmental compliance evaluations.

SO2 Allowance Price Forecast



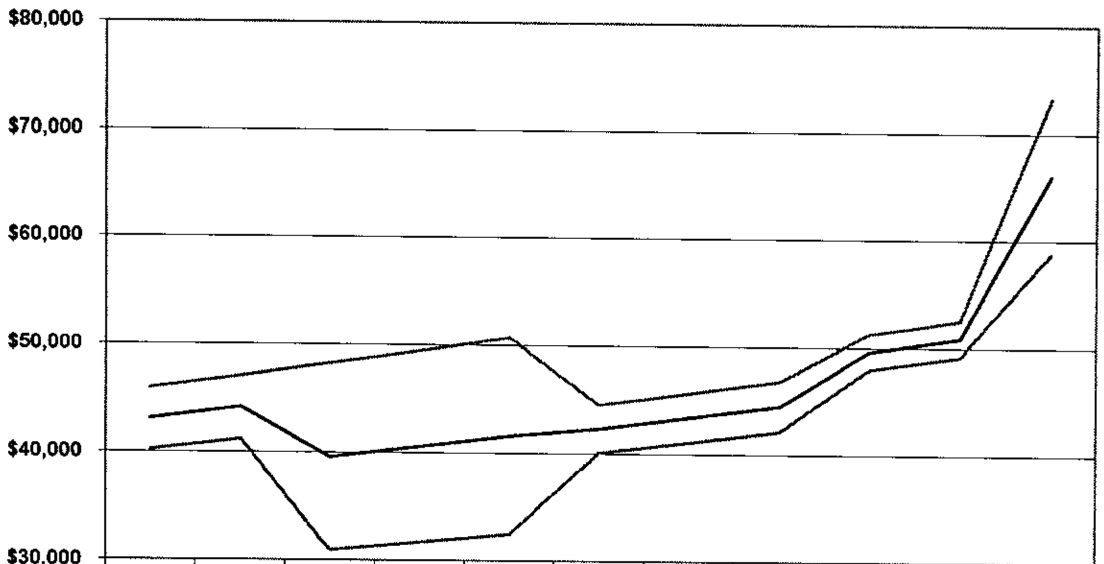
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Expected	$631	$635	$618	$608	$603	$786	$805	$825	$846	$867	$1,088
High	$827	$847	$868	$890	$912	$1,213	$1,243	$1,274	$1,306	$1,339	$1,780
Low	$435	$424	$368	$326	$294	$358	$367	$376	$386	$395	$395

NOx Allowance Price Forecast



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Expected	$965	$968	$971	$952	$948	$953	$1,191	$1,230	$1,271	$1,303	$1,336
High	$2,297	$1,892	$1,894	$1,877	$1,610	$1,425	$1,742	$2,116	$2,491	$2,549	$2,653
Low	$579	$581	$583	$571	$569	$572	$715	$738	$763	$782	$802

Mercury Allowance Price Forecast ($/Lb)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Expected	$43,067	$44,143	$39,587	$40,576	$41,591	$42,317	$43,375	$44,460	$49,606	$50,846	$66,006
High	$45,923	$47,071	$48,248	$49,454	$50,690	$44,535	$45,649	$46,790	$51,253	$52,534	$73,226
Low	$40,210	$41,215	$30,926	$31,699	$32,491	$40,099	$41,102	$42,130	$47,960	$49,158	$58,785

Environmental Compliance Cost Assumptions

The table below details the expected cost of environmental compliance based on cost estimates provided by Burns & McDonnell Engineering. As indicated previously, the range of expected costs are 10% below and 30% above the costs shown below.

Burns & McDonnell developed cost estimates for the environmental retrofits utilizing the CUE-Cost program developed by the EPA. This is an estimating program based on an integrated Excel spreadsheet model. Burns and McDonnell have made proprietary changes to the basic CUE-Cost program to provide estimates more closely matching their experience in completing environmental retrofit projects. Detailed results from Burns and McDonnell's KCP&L-specific estimates will be supplied and forwarded in the near future.

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4.4 INTEGRATED RESOURCE PLANNING EVALUATION RESULTS

Expectations From Scenarios modeled

The four scenarios described earlier test the timing of environmental compliance as well as the beneficial use of KCP&L's bank of excess SO2 credits.

- Scenario #1: Base Case. The Comprehensive Plan (Regulatory Plan) with sales of available SO2 credits between 2005-2009 to reduce the rate impacts of construction expenditures
- Scenario #2. No environmental compliance. Bank of SO2 credits is utilized to offset the cost of purchasing SO2 allowances
- Scenario #3. Delayed Environmental Compliance.
- Scenario #4. Delayed installation of scrubbers. All other compliance equipment is installed according to the Comprehensive Plan. SO2 credits are sold to avoid purchase of allowances during delay of scrubber installations.

Simply delaying or eliminating environmental compliance, as modeled in the above scenarios, is expected to produce a lower Net Present Value Revenue Requirements (PVRR). However, there are significant risks associated with delaying action past the expected Phase I implementation of CAIR and the mercury rule. These risks are not included in the above modeling. ,

Delaying compliance would increase the probability for enforcement under New Source Review and/or BART. Ozone non-attainment in the Kansas City area becomes more probable and carries the potential for future generating resource additions to be regulated under LAER limitations. Compliance under any of these conditions may lead to constrained construction schedules and an associated increase in costs to fast-track equipment deliveries, construction labor forces, and design engineering. The ability to take advantage of planned outages for equipment installations may be compromised. The no-compliance scenario is most likely an unrealistic scenario as it is expected that revisions to clean air legislation will eventually require the addition of similar technology as that proposed in KCP&L's comprehensive plan.

The proposed plan leverages the timing of compliance initiatives off of KCP&L's existing planned unit outage schedules to minimize unit down time. This plan allows for paced engineering, procurement, construction, and project management for improved cost control.

Results

The tables below show the PVRR results of each scenario with sensitivities for allowance pricing and construction cost.

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Results for the proposed regulatory plan show that Allowance Prices can move PVRR over $200 million. This is significant due to the risk mitigation provided by early compliance.

Results comparing the delay scenarios to the regulatory plan are not surprising. As expected, the capital intensive environmental retrofits are a primary driver of PVRR. The no compliance scenario carries a high probability of enforcement action by the EPA under NSR. As shown previously, fines under NSR enforcement can easily reach the $200 million figure with eventual compliance at a higher cost than initially complying with CAIR and the Mercury Rule. The significant finding is that under high allowance price scenarios, the delay alternatives reduce PVRR by a maximum of $36 million. This is well within the expected range of construction cost uncertainty and potentially exposes the public to much more costly compliance.

5.0 RECOMMENDATIONS

Compliance with proposed and existing environmental regulations presents specific challenges for KCP&L for continuing to meet the needs if its customers in the most reliable and cost effective manor while maintaining a responsibility to the environment and the community. In developing KCP&L's environmental strategy, a number of factors were considered when selecting the alternatives to achieve the balanced set of initiatives that are included in the Company's Comprehensive Plan.

First, under the Clean Air Act, there are a multiple number of existing rules that regulate the emissions of SO2, NOx, particulate and mercury, and there is the potential for more restrictive legislation to be passed in the future. No one rule or proposed legislation can be assumed to define the compliance requirements in the strategy.

The installation of compliance retrofits on some or all of KCP&L's fleet cannot all be done at the same time to meet a specific compliance rule start date. One of the attributes to Cap and Trade rules is that the structure allows companies more flexibility for managing the timing of scheduled compliance. Spreading out the timing of retrofits to where outages can be minimized and projects can be managed effectively reduces the concern for increased costs and reduced system reliability.

Rules designed around a Cap and Trade model also allow for the design of compliance strategies that can be balanced to be more robust against an uncertain future. In KCP&L's 10 year planning horizon, the long term viability of some of KCP&L's units such as the Montrose units is unknown. Deferring compliance decisions allows for a better understanding of future environmental requirements as well as future technologies that may be available at the time a compliance decision is made.

There is risk in an over-reliance in the purchase of allowances to meet compliance requirements. Allowance markets are expected to be volatile with a number of companies weighing the decision to delay compliance on older less viable units.

It was in consideration of these and other drivers that the initiatives for environmental compliance were selected for KCP&L's Comprehensive Plan. The initiatives provide a balanced and robust set of alternatives that meet the requirements of a number of uncertain future scenarios. The recommended initiatives are as follows:

LaCygne 1 SCR – Scheduled in-service in May of 2007, 3 ½ years prior to Phase 1 compliance under the CAIR and Mercury Rule. The proactive date of this compliance initiative is driven by Kansas City metropolitan region's projections for when the region will be in non-compliance with the 8-hour Ozone standard. Modeling done by MARC on ozone precursors in the metropolitan area has indicated that NOx emitted from LaCygne 1 contributes to the ozone problem in the region. Compliance with SCR on LaCygne 1 will help the region maintain its compliance with the 8-hour ozone standard as well as reduce the Company's reliance on NOx allowances following the start of Phase 1 of the CAIR in 2010.

Iatan 1 SCR, Scrubber and Baghouse – Scheduled to be in-service by December of 2008, 1 year prior to Phase 1 compliance under the CAIR and Mercury rules. The proactive date of the Iatan 1 compliance initiative is intended to take advantage of economies by coordinating procurement and construction schedules with the Iatan 2 project. The schedule will also allow for compliance of Iatan 1 to be completed prior to the in-service date of Iatan 2 which will result in site emissions with both units operating that are about half of the emission levels of Iatan 1 today.

LaCygne 1 Scrubber Replacement and Baghouse – Scheduled to be in-service by May 2009, 6 months prior to Phase 1 of the CAIR and Mercury Rule. Will take advantage of timing of a scheduled major boiler/turbine outage.

LaCygne 2 SCR Scrubber and Baghouse- Scheduled to be in-service by Fall 2013, 3 years after the start of Phase 1 and 2 years before Phase 2 of the CAIR and Mercury Rule. The date of the LaCygne 2 compliance initiative will take advantage of a major boiler/turbine outage and rely of the purchase of allowances during the initial Phase 1 period.

SUPPLEMENTAL ATTACHMENT: KCP&L CO2 ASSUMPTIONS

Overview

To model the sensitivity of the Comprehensive Plan to CO_2 limitations, KCP&L compared two cases:

- Voluntary CO_2 reductions per our memo of understanding with EEI
- Federal legislation limiting CO_2 emissions to the following

2012-2016	15.4 million tons per year
2017-2026	12.2 million tons per year

By comparison, AEP in their August 31, 2004 report titled "an Assessment of AEP's Actions to Mitigate the Economic Impacts of Emissions Policies", utilized three possible CO_2 reduction policies:

1. Continuation of current US climate change policy, which does not include a federally mandated regulatory approach. Some states are enacting their own GHG regulatory programs, however, such action is not anticipated in either Kansas or Missouri. Voluntary reductions of CO_2 intensity, in line with EEI's Memo of Understanding with the DOE, are expected to be the primary form of CO_2 controls.

2. Legislation similar to the proposed Carper bill is enacted. The Carper bill specifically targets CO_2 emissions from fossil fueled electricity generators and sets the annual CO_2 cap at year 2006 levels beginning six years after enactment. In year 10 through 20, the cap is set at 2001 levels. For modeling, it is assume similar legislation is passed in late 2005, with enforcement effective January 1, 2012.

3. Legislation similar to the proposed McCain-Lieberman bill is enacted. As proposed, this legislation would cap CO2 emissions at year 2000 levels in 2010. In October 2003, this proposal was rejected in the Senate by a 55-43 vote, with a number of Republican Senators voting in favor. For modeling, it is assume that similar legislation is passed as early as 2005, with a six-year window before enforcement. Therefore it is assumed that CO2 will be capped at year 2000 levels beginning January 1, 2012.

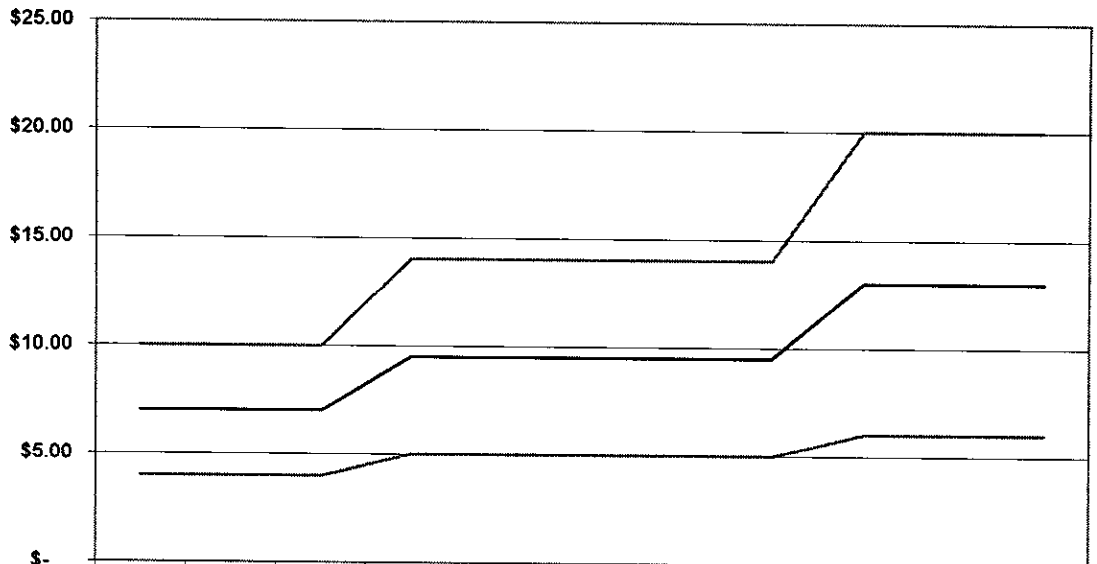
For the Carper bill, KCP&L's projected 2006 CO2 emissions total 16.920 million tons. In 2001, KCP&L emitted 13.765 million tons of CO2. However, the Carper bill requires a reserve of allowances to be set-aside for new units. This reserve is assumed to be 10% of total allowances. Therefore KCP&L's allowable CO2 emissions are expected to be:

2012-2016	15.228 million tons per year
2017-2026	12.388 million tons per year

KCP&L's year 2000 CO2 emissions were 12.392 million tons. Under McCain-Lieberman, this is the expected allowance cap beginning in 2012.

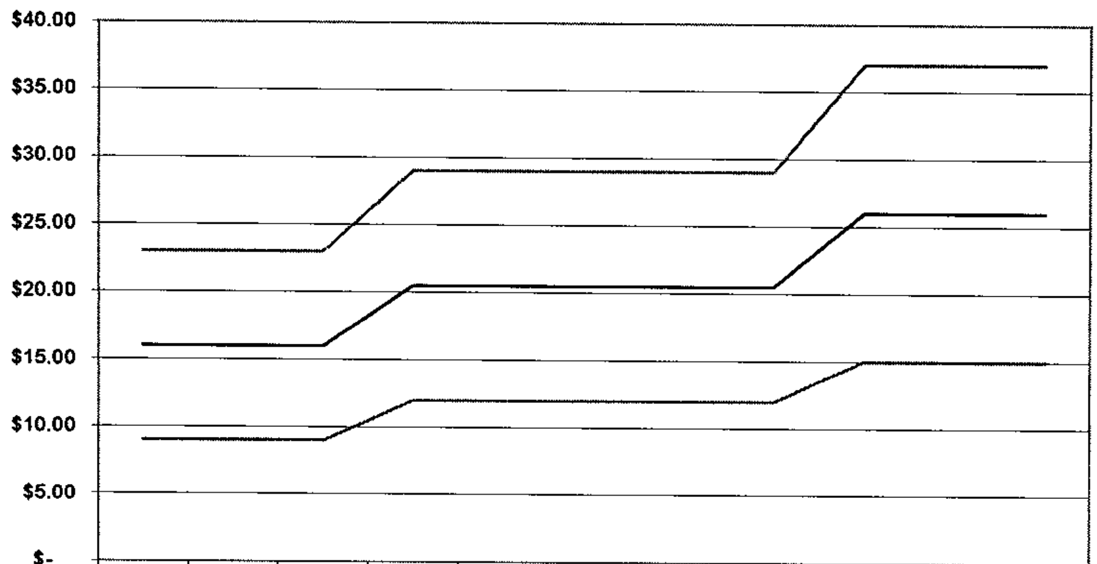
CO2 Allowance Price Graphs

AEP CO2 Allowance Price Forecast Under Carper



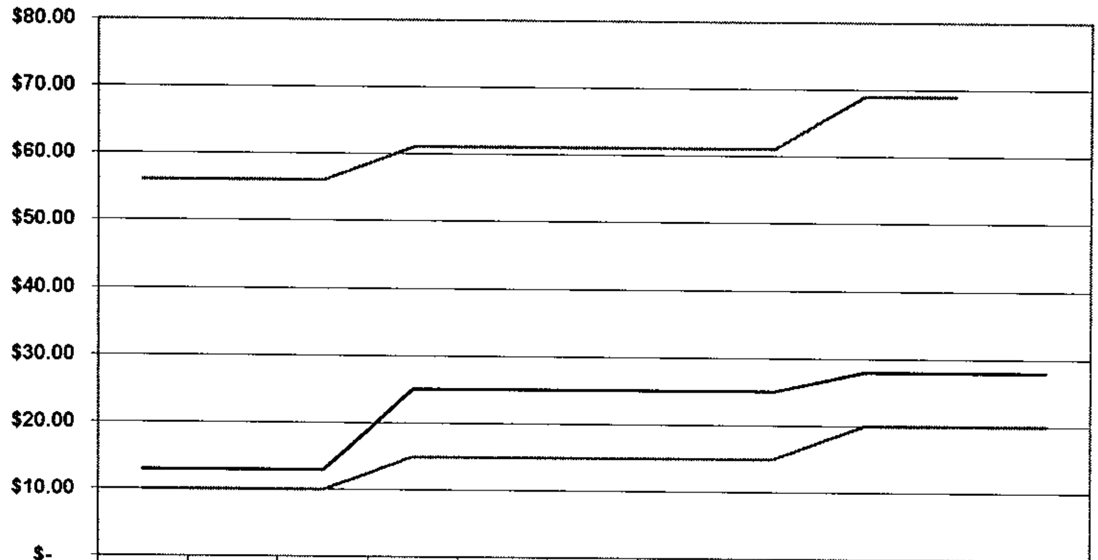
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Expected	$7.00	$7.00	$7.00	$9.50	$9.50	$9.50	$9.50	$9.50	$13.00	$13.00	$13.00
High	$10.00	$10.00	$10.00	$14.00	$14.00	$14.00	$14.00	$14.00	$20.00	$20.00	$20.00
Low	$4.00	$4.00	$4.00	$5.00	$5.00	$5.00	$5.00	$5.00	$6.00	$6.00	$6.00

AEP CO2 Allowance Price Forecast Under McCain-Lieberman



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
—Expected	$16.00	$16.00	$16.00	$20.50	$20.50	$20.50	$20.50	$20.50	$26.00	$26.00	$26.00
—High	$23.00	$23.00	$23.00	$29.00	$29.00	$29.00	$29.00	$29.00	$37.00	$37.00	$37.00
—Low	$9.00	$9.00	$9.00	$12.00	$12.00	$12.00	$12.00	$12.00	$15.00	$15.00	$15.00

CO2 Emission Prices Modeled in MIDAS



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Expected	$13.00	$13.00	$13.00	$25.00	$25.00	$25.00	$25.00	$25.00	$28.00	$28.00	$28.00
High	$56.00	$56.00	$56.00	$61.00	$61.00	$61.00	$61.00	$61.00	$69.00	$69.00	
Low	$10.00	$10.00	$10.00	$15.00	$15.00	$15.00	$15.00	$15.00	$20.00	$20.00	$20.00

Additional Assumptions Regarding CO2 Allowance Price Forecast
Preliminary evaluation by KCP&L indicated the following values for CO2 allowances:

	LOW	EXPECTED	HIGH
2010	$10	$13	$56
2015	$19	$25	$61
2020	$21	$28	$69

These expected prices were based on findings from numerous sources highlighted in the table below.

CO2 $/Ton					
Source	**1995**	**2004**	**2005**	**2015**	**2025**
Nordhause & Boyer: "Warming the World Economic Models of Global Warming". MIT Press, 2000			**Nordhouse & Boyer in 2004 $'s**		
Modeled Policy					
Optimal	$ 6.84		$ 13.55	$ 24.15	$ 40.67
10-Yr Delay	$ -		$ 13.58	$ 24.19	$ 40.70
1990 Levels	$ -		$ 77.91	$ 170.44	$ 311.44
Concentration	$ 2.49		$ 5.66	$ 11.93	$ 24.28
Temperature	$ 7.80		$ 17.50	$ 36.49	$ 73.63
Richard Tol, Review of 22 CO2 Studies			**Nominal $'s**		
Mean CO2 Value			$ 11.56	$ 14.79	$ 18.94
95% Confidence Value			$ 38.87	$ 49.76	$ 63.70
Tom Wilson, GHG Proj Mgr for EPRI Global Climate Council			**$'s as Shown in Left Column**		
Current Euro Mrkt		$ 15.00	$ -	$ -	$ -
Near Term Expectation (2003 $'s)		$3 to $5	$ 10.00	$ -	$ 20.00
2004 $'s Projection		$ 4.00	$ 10.00	$ 15.00	$ 20.00
Nominal $'s		$ 4.00	$ 11.60	$ 19.68	$ 29.69

By Comparison, in August 2004, AEP issued an Emissions Policy study indicating the following CO2 allowance prices:

	McCain-Lieberman		Carper	
	LOW	HIGH	LOW	HIGH
2010	$9	$23	$4	$10
2015	$12	$29	$5	$14
2020	$15	$37	$6	$20

Factors that could limit the upper range of CO2 pricing include renewables, fuel switching (if natural gas were economically available in adequate volumes), sequestration and off-system reductions in GHG emissions. Tom Wilson, GHG Project Manager for EPRI indicated that fuel switching and sequestration projects begin to become justified in the \$20/ton cost range. The impact of a 1\$/ton CO2 cost are shown below:

Coal with a 10,000 Btu/kWh heat rate	= \$1.00/MWh
Combined Cycle with a 7,200 heat rate	= \$0.43/MWh
Combustion Turbine with a 12,000 heat rate	=\$0.71/MWh

If fuel switching were an available alternative, Combined Cycle would become competitive with Coal fired generation with CO2 values of \$30/ton (assuming gas at \$5.50/mmbtu). Large scale fuel switching is expected to drive up the cost of natural gas, which would push the breakeven point for CO2 costs even higher. At \$8.00 gas, fuel switching becomes economical at CO2 values above \$50/ton. Shrinking gas supplies are expected to limit the capability of fuel switching to alleviate CO2 emissions.

An additional factor, which could limit the value of CO2 allowances, is the ability to sequester CO2 from stack emissions. This is a high cost and unproven alternative. Nonetheless, economics could drive this technology to serve as a brake on the value of CO2 allowances. Carbon sequestration from PC generating units is expected to have the following cost impacts:

Capital Cost	+50%	(\$600-\$800/kW)
Fixed O&M	+30%	(\$6/kW-Yr)
Variable O&M	+ 200%	(\$6-\$8/MWh)
Heat Rate	+ 40%	(+3,000 to 4,000 Btu/kWh)

The all-in cost adder for these additions at an 85% capacity factor is roughly \$25/MWh.

In addition to these alternatives for reducing CO_2 emissions, there are numerous "off-system" alternatives. AEP indicates these may provide the most cost-effective control of GHG and CO_2.

AEP assumptions for CO_2 allowance pricing are lower than those utilized by KCP&L. AEP's evaluation tests sensitivities to the form of potential CO_2 legislation. Rather than consider that sensitivity, KCP&L modeled a wider range of potential CO_2 allowance prices.