EAST KENTUCKY POWER COOPERATIVE

December 13, 2002

Dwight Lockwood
Global Energy, Inc.
312 Walnut Street – Suite 2000
Cincinnati, OH 45202

Dear Mr. Lockwood,

Included on the enclosed CD are the documents offered in response to your request for transmission impact data regarding the KPE generation project at East Kentucky Power's J.K. Smith site.

Document #1

Study of Future J.K. Smith Transmission, March 31, 2000 – Excerpts as shown below

Section 1	Executive Summary
Section 2	Study Assumptions and Criteria
Section 3	Study Progression
Section 4	Development of Transmission Exit Combinations
Section 5	Final Study Alternatives, Comparison of Alternatives, Selection of Proposed Alternatives
Section 6	Reconciliation of Proposed Alternative with Most Current EKPC Generation Expansion Plan

Document #2

Transmission Planning Conclusions and Recommendation for Future J.K. Smith Generation, June 7, 2000 – Combustion Turbine Units 4 and 5 Kentucky Pioneer Energy Unit

Document #3

Kentucky Public Service Commission Submittal – Development of Transmission Outlet Plan – E.A. Gilbert Unit No. 3 Located at Spurlock Generating Station, Maysville, Kentucky February 2001

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These documents comprise the transmission studies performed to date by EKPC with respect to future generation additions interconnecting with EKPC's transmission system, and have been provided to the Kentucky Public Service Commission in various proceedings regarding the potential addition of the generation projects identified. The studies were performed to determine the recommended transmission expansion within the area's transmission grid necessary to support the output of the respective projects. Based on these studies, EKPC believes that with the appropriate improvements, the reliability of the transmission grid in Kentucky will not be compromised by the interconnection of the KPE facility.

Sincerely,

Mary Jane Warner

Mary Jane Warner, P.E.
Manager, Power Delivery Expansion
East Kentucky Power Cooperative, Inc.

MJW:jkr

(M:\MJKPEproject)

STUDY OF FUTURE
JK SMITH TRANSMISSION

March 31, 2000

PREFACE

East Kentucky Power Cooperative, Inc. (EKPC) previously submitted to the Public Service Commission (PSC) a request for a Certificate of Public Convenience and Necessity to construct a 138 kV line, approximately 11.5 miles in length, from the J.K. Smith Generating Facility Site in Clark County, Kentucky, to the KU Lake Reba Tap Substation in Madison County, Kentucky. The request for this certificate was part of EKPC's filing for a fourth combustion turbine at the J.K. Smith Generating Facility site(PSC Case No. 98-544).

Within the filing referenced above, as part of its prepared testimony, EKPC stated that a joint study with KU was being conducted to determine the best transmission proposal for the needed generation outlet capability at the J.K. Smith site. EKPC later requested to separate the certificate filing for the J.K. Smith transmission facility requirements from Combustion Turbine #4, and this request was granted. EKPC agreed to address the transmission facility requirements for J.K. Smith generation in a later filing.

In its June 9, 1999 order, EKPC was granted a certificate for the construction of Combustion Turbine #4, and, as part of this order, the PSC directed EKPC to file every 60 days a status report of its study with KU on alternative transmission facilities for J.K. Smith. EKPC has since provided the PSC with two(2) 60 day status reports to date. As part of its first status report (dated August 11, 1999), EKPC provided the PSC with a general progression for the J.K. Smith Transmission study.

This report serves to document the results of the joint study of alternative transmission facilities for future generation additions at the J.K. Smith generation site. The report generally follows the progression provided by EKPC in its status report dated August 11, 1999 as referenced above.

STUDY OF FUTURE
JK SMITH TRANSMISSION

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Section 1

Executive Summary

This report documents the results of a coordinated study recently performed by East Kentucky Power Cooperative, Inc. (EKPC) and Kentucky Utilities Company (KU) to determine the best option to accommodate future generation additions at EKPC's J. K. Smith Facility Generating Site in Clark County, Kentucky. The maximum design generation for the J.K. Smith site assumed in this study, is 1155 and 1674 MW for projected summer and winter peak load conditions, respectively (See Table 1, Plan A). The maximum design generation corresponds with that which was modeled in the 2007 Summer and 2007/08 Winter Peak load flow cases used in this study.

Based on the results of this study, a total of 4 detailed study alternatives were developed, any of which would provide the required transmission necessary to accommodate the design generation outlined in Table 1. However, one of the alternatives was selected as the proposed alternative because it offers one or more key advantages over the others. In addition, the proposed alternative is expected to cost about 5 million present worth dollars less than any of the other alternatives. The total present worth cost estimate for each of the 4 study alternatives is shown as Exhibits I-IV.

The proposed transmission alternative needed due to projected future J.K Smith follows:

Facility	Proposed In-Service Date	New Generation Addition(s)
J. K. Smith-Lake Reba Tap 138 kV Line (12 Miles 954 MCM ACSR)	2001	CT's #4,5
J. K. Smith-Spencer Road 138 kV Line (17 Miles 954 MCM ACSR)	2002	Global
J. K. Smith-Avon 345 kV Line (17 Miles 2-954 MCM ACSR)	2003	C.T # 6,7
J. K. Smith 345/138 kV Substation (270/360/450 MVA)	2003	C.T. # 6,7
J. K. Smith-Tyner 345 kV Line (43 Miles 2-954 MCM ACSR); Tyner 345/161 kV Substation(450 MVA)	2006	C.T.# 8,9
J. K. Smith 345/138 kV Substation (Add 2nd 270/360/450 MVA Transformer)	2006	C.T. # 8,9

The facilities listed above are major additions which will require the most significant expenditures including new right-of-way acquisition. The proposed plan also includes terminal facilities for the new transmission lines, as well as other system improvements needed to accommodate future generation including reconductoring to upgrade transmission line capacity, and transformer change-outs to upgrade transformer capacity. The complete list of facilities for the proposed alternative is shown as Exhibit I. Exhibit I also shows the total estimated present worth cost for the proposed plan.

The proposed alternative offers additional transmission system support benefits to the joint EKPC-KU system, other than simply providing the necessary outlet capability for J. K. Smith generation, as outlined below:

- The proposed alternative adds significant voltage support for the EKPC-KU system extending from Tyner to London. One other study alternative does not contain a line built from J.K. Smith to Tyner, and this alternative provides significantly less voltage support to the Tyner-London system. Two other study alternatives include the J.K.

J.K. Smith to Tyner Line built at 161 kV as opposed to 345 kV. These alternatives provide less voltage support than the proposed alternative.

- The proposed alternative provides a strong EHV link between EKPC's Spurlock and J.K. Smith generating plants. Provides additional voltage support at the Spurlock Substation and vicinity, when both Spurlock generating units are off-line. Two other study alternatives include the J.K Smith-Avon Line built and operated at 138 kV as opposed to 345 kV. These alternatives provide noticeably less voltage support than the proposed alternative, when both Spurlock generating units are off-line.

- The proposed alternative provides additional voltage support to the KU system extending between the Clark County and Rodburn Substations, and also to the EKPC-KU system in the Rodburn-Rowan County Substation vicinity.

EKPC's generation expansion scenario for J.K. Smith has changed from what was expected when the majority of the transmission analysis associated with this report was performed. Table 1 shows EKPC's original (Plan A) and most current (Plan B) generation expansion scenarios. The alternatives in this study were all developed under the original scenario (Plan A). Following a review of the new generation scenario (Plan B), it was judged that the alternatives were still the best ones available under the new scenario or any other possible scenarios involving the addition of like generation at J.K. Smith. The new scenario changes the substation configuration at the J. K. Smith Site, and slightly increases the cost for facility upgrades. The net result of these changes is an increase in the present worth cost of facilities, as compared to the original scenario. Exhibit V shows the present worth cost estimate of facilities for the new scenario. By comparing Exhibits I and V, it can be seen that the new scenario increases the present worth cost of facilities by approximately 4.2 million dollars.

Section 2

Study Assumptions and Criteria

Planning Criteria

The KU-EKPC Minimum Acceptable Transmission Planning Criteria was used in this study, which is shown in Appendix D.

Future Generation Additions

EKPC Generation Additions

The assumed future generation expansion scenario in this study for EKPC's J.K. Smith generating site is shown as Table 1, Plan A. Table 1, Plan B also shows EKPC's most current generating expansion scenario for the J.K. Smith site. The maximum winter generation for both scenarios is nearly the same, however, the maximum summer generation for the most current scenario, Plan B is about 155 MW more than the original scenario, Plan A.

LGEE Generation Additions

The future generation expansion scenario for the joint KU-LG&E (LGEE) system has some effects on flows in the J.K. Smith transmission study. Table 2 shows the assumed future generation additions on the LGEE system in this study.

Power Flow Base Cases

The 1998 series KU-EKPC joint load flow base cases were used in this study for the J.K. Smith transmission analysis. These cases were developed in early 1998. The time frame for the cases is given below:

Summer Cases	Winter Cases
1999 Summer	1999-00 Winter
2002 Summer	2002-03 Winter
2007 Summer	2007-08 Winter

Table 1: EKPC Generation Resource Plans

Plan A Assumed JK Smith Generation Additions in Transmission Study Based on 1996 Power Requirements Study (PRS) Update[1]					
		Generation (MW)			
		Incremental		Total	
Unit	In-Service Date	Summer	Winter	Summer	Winter
CT #1-3	Existing	330	447	330	447
CT #4	May-2001[2]	80	108	410	555
CT #5	May-2001	80	108	490	664
CT #6	May-2001	80	108	570	772
CC #1	May-2002	225	347	795	1119
CC #2	May-2003	120	185	915	1304
CC #3	May-2004	120	185	1035	1489
CC #4	May-2006	120	185	1155	1674
Plan B Current JK Smith Generation Expansion Scenario Preliminary 2000 Integrated Resource Plan (IRP)[3]					
		Generation (MW)			
		Incremental		Total	
Unit	In-Service Date	Summer	Winter	Summer	Winter
CT #1-3	Existing	330	447	330	447
CT #4	Dec-2001	80	108	330	555
CT #5	May-2002	80	108	490	664
CC #1	Dec-2002	500	570	490	1234
CT #6	May-2004	80	108	1070	1342
CT #7	May-2005	80	108	1150	1450
CT #8	May-2006	80	108	1230	1559
CT #9	May-2007	80	108	1310	1667

[1] Reference: Attachment 12 of Exhibit II, PSC Case No. 98-544.
[2] In-Service date originally listed as May 2000 in Exhibit II, PSC Case No. 98-544
[3] Reference: Attachment to Exhibit III, PSC Case No. 2000-056.

Table 2
LGEE Generation Additions

	Assumed Maximum Generation(MW) Combustion Turbine Plus Combined Cycle Generation	
Case	Brown 138 kV Bus	Trimble County 345 kV Bus
1999 Summer	440	0
2002 Summer	800	0
2007 Summer	880	600
1999-00 Winter	510	0
2002-03 Winter	927	0
2007-08 Winter	1020	695

Load Forecast

The EKPC 1996 Power Requirements Study (PRS) Forecast was used in this study. The EKPC forecasted load from the 1996 PRS was modeled in the power flow cases used in this study, which were identified in the previous section above. This forecast (1996 PRS) was the most recent one available when the power flow base cases for this study were developed. The LGEE load forecast of early 1998 was modeled in the power flow cases used in this study

The forecasted EKPC and LGEE load which was modeled in the power flow study cases is given below:

Power Flow Case	EKPC Load (MW)	LGEE Load (MW)
1999 Summer	1724	6224
1999-00 Winter	2164	5406
2002 Summer	1982	6592
2002-03 Winter	2472	5712
2007 Summer	2244	7191
2007-08 Winter	2865	6134

Section 3

Study Progression

Initial Progression

The initial progression of this study was agreed upon by EKPC and KU in early 1999. EKPC supplied this progression as part of a 60 day status report. The initial progression is shown below:

- Develop list of contingencies.
- Develop alternative dispatch conditions.
- Load flow screening of potential problems with projected future J.K. Smith generation, for 1999S, 2002S, 1999/00W, 2002/03W cases. Construct spreadsheet summaries of overloads found for outage-dispatch conditions.
- Develop study plots.
- Prepare load flow plots of selected cases with projected future J.K. Smith generation, using 1999S, 2002S, 1999/00W, 2002/03W cases.
- Develop alternatives to support projected future J.K. Smith generation corresponding with the KU-EKPC 2007S and 2007-08W cases. Construct, test, modify, and re-test each alternative as necessary to meet the KU-EKPC Minimum Acceptable Planning Criteria.
- Develop initial cost estimates for each alternative. (Initial estimates should exclude costs for high temperature and terminal facility upgrades.)
- Compare alternatives on the basis of cost.
- Select alternatives for detailed analysis.
- Prepare detailed cost estimates for the final alternatives, including all costs.
- Prepare present worth cost estimates of the final alternatives, including estimates of avoided energy and capacity losses.
- Select the final plan.

Revised Progression

It was decided that some revisions were needed to the study progression previously outlined above, from observations made during the study analysis, and also due to the relative relationship of the facility costs in the study alternatives. It was judged that the cost estimates of certain transmission facility upgrades including higher temperature line upgrades, bus upgrades, and change-outs of circuit breakers, disconnects, line tuners and traps should not be included in the alternatives. The reason for excluding these facilities is that the associated costs are minimal when compared to new transmission facilities(lines and substations). For example, the cost to change out an existing 138 or 161 kV circuit breaker with a higher capacity breaker typically costs $80,000-$90,000. This is only a fraction of the cost of one mile of new 138 or 161 kV transmission line, which typically costs $240,000-$250,000.

Even though lower cost terminal facilities were excluded, as outlined above, it was decided that estimates for higher cost facility upgrades, i.e. transmission line reconductoring and increases in transformer capacity, should be included in each of the alternatives. For example, the cost to change out an existing 60/80/100 MVA 138-69 kV transformer with a larger 80/107/133 MVA transformer could exceed $600,000. Finally, a typical cost estimate to re-conductor an existing 10 mile 138 or 161 kV transmission line using large conductor (typically 954 MCM ACSR) is about $600,000.

It was necessary to make some other minor adjustments to the initial study progression, which focused on the mechanics of the analysis. After making these adjustments, and including the assumptions as outlined above, a revised study progression was formed which is given below:

- Develop a list of contingencies and a list of alternative dispatch conditions.
- Perform load flow screening of potential problems with projected future J.K. Smith generation, for all load flow study base cases (1999S, 2002S, 2007S, 1999/00W, 2002/03W, 2007/08W). Construct spreadsheets of overload summaries for the alternative outage-dispatch conditions.

- Develop load flow study plots to examine the impact of future J.K. Smith generation (See Table 1), using all load flow study base cases (1999S, 2002S, 2007S, 1999/00W, 2002/03W, 2007/08W).
- Develop alternative combinations of exit facilities to support projected future J.K. Smith generation corresponding with the KU-EKPC 2007S and 2007-08W cases. Construct, test, modify, and re-test the combinations as necessary, to provide the foundations of acceptable study alternatives.
- Using the foundation combinations developed above as a base, develop final study alternatives to support projected future J.K. Smith generation which will fully meet the KU-EKPC minimum acceptable Planning Criteria.
- Determine the approximate timing of facility additions for each alternative, using the load flow study base cases as needed.
- Develop cost estimates for each alternative.
- Prepare present worth cost estimates of the alternatives, including estimates of avoided energy and capacity losses.
- Compare alternatives on the basis of cost and unique benefits.
- Select the final plan.

Section 4

Development of Exit Combinations

Introduction

Using the study progression previously discussed in Section 3, a general method was used to construct and develop a total of 4 exit combinations for future J. K. Smith generation. These combinations were used as the foundation of 4 study alternatives, each of which would provide acceptable generation exit capability for the J. K Smith generation through the 2007-08 Winter season. The steps used in this method and explanation of each is step is given below

Base Case Overloads and Flow Trends

The first step of the analysis was to examine the base case flows with future J.K. Smith generation for the study base cases. As expected, in the 2002 and 2007 year cases, numerous overloads are present. These overloads can all be seen in the overload summaries of Appendix A. The base case overloads for the 1999 year cases can also be found in the overload summaries of Appendix A. Appendix A also contains load flow figures which show the base case flows on the EKPC-KU transmission system for the cases referred to above.

The power flow base cases referred to above were studied to determine the flow trends of increased J.K. Smith generation. Table 3 shows the estimated increase in flow into portions of the EKPC-KU system in the vicinity of J.K. Smith Generating Site. The increase was calculated by dividing the increase in flow (1999-00 to 2007-08 Winter) by the total increase in J.K. Smith generation (MW) from 1999-00 to 2007-08 Winter.

From Table 3, it can be seen that the largest portion of additional J. K. Smith generation flows into EKPC's Avon 138 kV bus from the Dale Station. This can be attributed largely to an increase in flow over the Avon-Loudon 138 kV Line, and also from new flow through the Bourbon County 138-69 kV EKPC-KU substation which is currently planned for 2001 Summer. It should be noted that the Bourbon County substation is not in service in the 1999-00 Winter case.

Next from Table 3, it can be seen that a large portion of additional J. K. Smith generation flows into EKPC and KU 161-69 and 138-69 kV injection points. This increase can be attributed in part to load growth (1999-00 to 2007-08 Winter). The remaining increase can be attributed to generation passing through portions of the KU and EKPC 69 kV systems.

Finally, from Table 3, it can be seen that a large portion of additional J. K. Smith generation flows into KU's Brown South 138 kV bus from the Fawkes Substation. This increase in flow can be attributed largely to the electrical connection to the KU 345 kV system at Brown. Nearly all of the additional flow into the Brown South 138 kV bus from Fawkes flows into the KU 345 kV system through the 138-345 kV transformer at Brown North.

Table 3
J.K. Smith Generation Flow Trends
1999/00 to 2007/08 Winter

System	Increase in Flow (Percent of Added J.K. Smith Generation)
Avon 138 kV (from Dale)	29
EKPC-KU 161-69 kV and 138-69 kV injections	25
Brown South 138 kV(from Fawkes)	17
Transmission Losses	11
Tyner 161 kV (from Delvinta)	9
Clark County 138 kV (from Fawkes)	7
Delvinta to Arnold 161 kV	2

Overloads for Single Contingency Outage Conditions

A list of selected single contingency outage conditions was developed, along with a list of alternative dispatch conditions to be analyzed for each single contingency. The list of single contingency outage conditions can be found in the overload summary Appendix A. The list of alternative dispatch conditions analyzed in this study can also be found in Appendix A.

The selected contingencies referred to above were modeled for each dispatch condition and in all of the power flow study base cases. Numerous overloads were found, especially in the 2002 and 2007 year cases. The overload summaries for each case can be found in Appendix A. It should be noted that in Appendix A, the overload summaries are shown in two different formats, a "detailed" format and a "summarized"format. The detailed format also shows the overloads which are present for the base case dispatch condition, and the overloads which resulted for every outage dispatch condition. The summarized format shows only the worst case overload condition which was found for a particular facility.

It should be noted that for the 2007-08 Winter case, several outage-dispatch conditions were found to result in non-convergent load flow cases, which was expected. The non-convergent cases are noted in Appendix A.

2007 Year Exit Combinations

Starting Points

From the analysis of the base and contingency power flow case described above, a starting point in alternative development was chosen for the 2007 year cases. It was judged that two(2) new transmission outlets from J. K. Smith should be added initially in these cases, and the cases should then be tested for base case and single contingency overloads. It was judged that the location of the new outlets should be:

- Avon Substation
- Stanford Substation (Tapping KU's Brown-Pineville 345 kV circuit)
- Tyner Substation

The above locations were chosen because, excluding the KU-EKPC 69 kV system, they exhibited the largest increases in flow from new J.K. Smith generation. This was discussed earlier in the previous subsection entitled, "Base Case Overloads".

Using the starting point locations referred to above, the following exit combinations were used:

Combination 1

- J. K. Smith-Avon 345 kV Line (17 miles 2-954 MCM)
- J. K. Smith 345/138 kV Substation (450 MVA)
- J. K. Smith-Tyner 345 kV Line (43 miles 2-954 MCM)
- Tyner 345/161 kV Substation (450 MVA)
  - J. K. Smith 138 kV summer/winter bus generation 465/672 MW (New)
  - J. K. Smith 345 kV summer/winter bus generation 360/555 MW (New)

Combination 2 (Same as Combination 1 except as shown below)

- J. K. Smith-Stanford 345 kV Line(40 miles 2-954 MCM ACSR) (Replaces J. K. Smith-Tyner 345 kV Line in Combination 1)
- Stanford 345 kV Switching Substation (Replaces Tyner 345-161 kV Substation in Combination 1) (Substation taps KU Brown North-Pineville 345 kV Line)

Combination 3

- J. K. Smith-Avon 138 kV Line (17 miles 954 MCM)
- J. K. Smith 161-138 kV Substation (2-150 MVA Transformers) (Remove Powell County 161-138 kV Substation)
- J. K. Smith-Tyner 161 kV Line (43 miles 954 MCM)
- Convert J. K. Smith-Powell County 138 kV Line to 161 kV
- Powell County 161-69 kV 150 MVA Substation (Converted from 138-69 kV)
  - J. K. Smith 138 kV summer/winter bus generation 465/672 MW (New)
  - J. K. Smith 161 kV summer/winter bus generation 360/555 MW (New)

The above combinations were modeled and tested under base case conditions and also under the outage-dispatch conditions which were previously discussed. The results of the testing can be seen in Appendix A.

Not surprisingly, it was found that the newly added facilities (referenced above) had a significant impact on reducing flows for normal and contingency conditions, and EKPC-KU transmission system losses were significantly reduced. However, none of the combinations provided a complete solution to problems because some overloads were still present for contingencies. Therefore, it was judged that one or more additional generation outlets from J.K. Smith were needed.

From observations of flows during normal and contingency conditions, and due to the relatively close physical proximity of several existing transmission substations to J.K. Smith, the following locations were chosen as candidates for additional J.K. Smith outlets:

- Lake Reba Tap 138-161 kV Substation
- Clark County 138-69 kV Substation
- Spencer Road 138-69 kV Substation
- Brown North 138 kV Substation
- Maggard and Maytown 138-69 kV Substations
  Powell County to Maytown to Maggard 138 kV Line (954 MCM)
  Convert Skaggs to Maggard 69 kV Line to 138 kV

Final Exit Combinations

Introduction

Several combinations of outlets were developed and tested during normal and single contingency outage conditions. Each combination contains the starting point facilities outlined earlier, along with 1 or 2 more additional generation outlets from J.K. Smith, extending to the candidate locations referred to above. The list of tested combinations can be seen in Appendix A, along with the testing results and the EKPC-KU joint transmission system losses which resulted for each combination under projected 2007-08 Winter peak load conditions.

Eliminated Exit Locations

- Brown North 138 kV Substation
- Maggard and Maytown 138-69 kV Substations
  Powell County to Maytown to Maggard 138 kV Line (954 MCM)
  Convert Skaggs to Maggard 69 kV Line to 138 kV

From the results of the testing described above, it was judged that the above locations should be eliminated as potential J. K Smith exit points for two reasons. First, their exhibited performance as plant outlets appeared to be less than the others. Finally, the physical distance to these locations is significantly greater than the other tested locations, and the associated cost for transmission line will also be significantly greater. The greater physical distance resulted in lower performance as plant outlets, because of higher transmission impedances from J. K. Smith to these locations.

Eliminated Exit Locations

- Clark County 138-69 kV Substation

From the results of the testing as described above, it was judged that an exit to the Clark County Substation should be eliminated in favor of an exit to the Spencer Road Substation. This judgement was made for several reasons. First, a significant amount of the flow on the J.K. Smith-Clark County 138 kV line flows east to the Spencer Road Substation. Second, the location of the Spencer Road Substation is situated more favorably in terms of providing voltage support to the Fawkes-Rodburn System; In fact, it is electrically situated near the middle of the Fawkes-Rodburn System. Third, the routing of the J. K. Smith-Spencer Road Line should pass very close to EKPC's Mt. Sterling Substation, and the routing should be relatively close to EKPC's 69 kV system extending between the Powell County and Goddard Substations. EKPC's Mt. Sterling and Reid Village distribution substations are currently served radially on a 69 kV line which extends to EKPC's Sideview Distribution Substation. Fourth, and finally, it was found that the J.K. Smith-Clark County Line addition results in a significant increase in flow on the Clark County 138-69 kV transformer, and the 69 kV system radiating from the Clark County Substation, especially during contingencies. In order to correct these problems, the existing 83 MVA transformer at Clark County would have to be replaced by a larger 133 MVA transformer. In addition, the 2/0 CU portion of the Clark County-Mt. Sterling 69 kV Line (12.2miles) would have to be re-conductored with 397.5 MCM to eliminate a potential overload, for an outage of the Clark County-Spencer 138 kV Line (See Appendix A). By replacing the J. K. Smith-Clark County Line with the J. K. Smith-Spencer Road Line, it was found the overloads referenced are eliminated.

Final Exit Combinations

With the Brown North, Maggard-Maytown, and Clark County locations eliminated as exit locations, a total of 4 combinations were chosen as final J. K. Smith exit combinations for the year 2007. These combinations are shown as Table 4 on the next page. All of the exit combinations included 4 new generation outlets from J. K. Smith.

Under Combinations 1 and 2, it was judged that a total of 4 new outlets are preferred for two reasons. First, it was found that at least 3 outlets (2-345 kV and 1-138 kV) are needed to provide acceptable generation outlet capability during normal and single contingency outage conditions (See Appendix A). However, it was later found that a fourth outlet built at 138 kV provides a significant reduction in transmission system losses (See Appendix A), while further reducing normal and contingency outage flows on other facilities, most significantly, the other generation outlets extending from J. K. Smith.

Under Combinations 3 and 4, it was judged that 4 new outlets are required in order to provide acceptable generation outlet capability during both normal and single contingency outage conditions. Under these two combinations, 345 kV is not employed as an exit voltage for J. K. Smith. Without the use of 345 kV as an exit voltage, it was found that combinations involving only 3 new generation outlets will not provide acceptable generation outlet capability due to overloads. This can be observed in the overload summaries (Appendix A). The addition of a 4th outlet also provides significant reduction in transmission losses.

Table 4

Final J. K. Smith Exit Combinations

Combination 1

- J. K. Smith-Lake Reba Tap 138 kV Line (12 miles 954 MCM ACSR)
- J. K. Smith-Spencer Road 138 kV Line (17 miles 954 MCM ACSR)
- J. K. Smith-Avon 345 kV Line (17 miles 2-954 MCM ACSR)
- J. K. Smith 345/138 kV Substation (450 MVA)
- J. K. Smith-Tyner 345 kV Line (43 miles 2-954 MCM ACSR)
- Tyner 345-161 kV Substation (450 MVA)
  - J. K. Smith 138 kV summer/winter bus generation 465/672 MW (New)
  - J. K. Smith 345 kV summer/winter bus generation 360/555 MW (New)

Combination 2 (Same as Combination 1 except as shown below)

- J. K. Smith-Stanford 345 kV Line (40 miles 2-954 MCM ACSR)
  (Replaces J. K. Smith-Tyner 345 kV Line in Combination 1)
- Stanford 345 kV Switching Substation
  (Replaces Tyner 345-161 kV Substation in Combination 1)
  (Taps KU Brown North-Pineville 345 kV Line)

Combination 3

- J. K. Smith-Lake Reba Tap 138 kV Line (12 miles 954 MCM ACSR)
- J. K. Smith-Spencer Road 138 kV Line (17 miles 954 MCM ACSR)
- J. K. Smith-Avon 138 kV Line (17 miles 954 MCM ACSR)
- J. K. Smith 161-138 kV Substation (2-150 MVA Transformers)
  (Remove Powell County 161-138 kV Substation)
- Convert J. K. Smith-Powell County 138 kV Line to 161 kV
- Powell County 161-69 kV 150 MVA Substation (Converted from 138-69 kV)
- J. K. Smith-Tyner 161 kV Line(43 miles 954 MCM ACSR)
  - J. K. Smith 138 kV summer/winter bus generation 465/672 MW (New)
  - J. K. Smith 161 kV summer/winter bus generation 360/555 MW (New)

Table 4(Continued)
Final J. K. Smith Exit Combinations

Combination 4(Same as Combination 3 except as shown below)

- J. K. Smith-Lake Reba Tap 161 kV Line (12 miles 954 MCM ACSR)
  (Replaces 138 kV Line in Combination 3 above)
  - J. K. Smith 138 kV summer/winter bus generation 585/902 MW (New)
  - J. K. Smith 161 kV summer/winter bus generation 240/325 MW (New)

2002 Year Exit Combinations

Introduction

Several exit combinations were tested using projected 2002 Summer and 2002-03 Winter load flow cases. These cases contained projected EKPC generation at J. K. Smith corresponding with the 2002 Summer and 2002-03 Winter seasons (See Table 1, Plan A). The testing was performed the same way as in the 2007 year exit combinations previously discussed.

Exit Locations Considered

In order to provide acceptable generation outlet capability for the 2002 year cases, at least 1 additional generation outlet from J. K. Smith is required. The 2002 year cases were tested first with one additional outlet built to one of several possible locations. Using the results of the 2007 year testing, the following exit locations below were considered as candidates in the 2002 year testing:

- Lake Reba Tap 138-161 kV Substation
- Spencer Road 138-69 kV Substation
- Avon 138 kV Substation
- Tyner 161 kV Substation

The results of the testing described above can be seen in Appendix A, along with the reduction of KU-EKPC system losses for each situation. In addition, the KU-EKPC joint system losses for each scenario can be seen in Appendix A.

Exit Locations Eliminated

From the results of the testing as described above, it was judged that Tyner should be eliminated as a location for an exit in the 2002 year cases, because it did not perform as well as the other outlets in terms of generation outlet capability. In addition, a J.K. Smith to Tyner Line (estimated 43 miles) would be over twice as long as a line built from J. K. Smith to any of the other potential locations, which would result in significantly higher construction cost.

Final Exit Combination

From the results of the testing described above, it was judged that 2 generation outlets are required to support the 2002 year generation for both normal and single contingency outage conditions. Three combinations of outlets involving two new outlets (built to the locations described above) were tested for overloads during normal and single contingency outage conditions. The tested combinations and the results of the testing can be seen in Appendix A.

From the results of the testing, the following combination listed below was selected as the final combination for supporting the 2002 year generation:

- J. K. Smith-Lake Reba Tap 138 kV Line (12 Miles 954 MCM ACSR)
- J. K. Smith-Spencer Road 138 kV Line (17 Miles 954 MCM ACSR)

The above combination was selected versus the other 2 for several reasons. First, its performance was judged to be equal to or better than the other 2 combinations. Second, the chosen exit combination exhibited a significant reduction in transmission system losses versus the other 2 combinations, each of which included a 138 kV line built from J. K. Smith to Avon. Finally, the total miles of new transmission line required in the selected combination is less than or equal to the total miles of transmission line required in each of the other combinations.

Section 5

Final Study Alternatives
Comparison of Alternatives
Selection of Proposed Alternative

Foundation Exit Combinations

In the previous Section 4, a total of four exit combinations were developed to provide the foundation of study alternatives, each of which would provide acceptable generation exit capability for the J. K Smith generation through the 2007-08 Winter season. Also in Section 4, an exit combination was developed which would provide the foundation of the study alternatives through the 2002-03 Winter season.

Facility Timings

Using the exit combinations developed in Section 4, a total of 4 final study alternatives were developed. In each alternative, the timings of all facility additions were determined for the new transmission facilities and for any major transmission facility upgrades (re-conductoring and transformer capacities). The timing of facilities was accomplished using power flows modeling critical contingencies during alternative time periods. Spreadsheets were used to model critical flows (obtained from power flow runs) for different time periods which resulted during most critical contingencies. These spreadsheets were used to determine the approximate generation level at J. K. Smith at the threshold of facility overloading. The timing of facility additions was then determined by coordinating the threshold generation levels with the projected EKPC generation additions (See Table). The spreadsheets and the associated power flows can all be found in Appendix B entitled, "Key Load Flow Diagrams and Flow Calculations".

Final Study Alternatives

The final study alternatives which were developed, as outlined and described above, are given in Table 5 beginning on the next page.

Table 5

Final Study Alternatives

Alternative 1 (See Exhibit I for Detailed Cost Estimate)		
Facility	**Proposed In-Service Date**	**Present Worth Cost In Millions of Dollars**
J. K. Smith-Lake Reba Tap 138 kV Line (12 Miles 954 MCM ACSR); Line Terminal Facilities (J. K. Smith, Lake Reba Tap)	2001	5.5
J. K. Smith-Spencer Road 138 kV Line (17 Miles 954 MCM ACSR); Line Terminal Facilities (J. K. Smith, Spencer Road)	2002	7.3
J. K. Smith 345/138 kV Substation (270/360/450 MVA)	2003	4.8
J. K. Smith-Avon 345 kV Line (17 Miles 2-954 MCM ACSR); Line Terminal Facilities (Avon)	2003	10.6
J. K. Smith-Tyner 345 kV Line (43 Miles 2-954 MCM ACSR); Line Terminal Facilities (J. K. Smith); Tyner 345/161 kV Substation (270/360/450 MVA)	2006	24.9
Transmission Facility Upgrades (Through 2008)		4.9
Other Facilities (GSU/Terminal Facilities, Substation Reconfiguration, Capacitor Bank)		16.3
Total Cost:		74.3

Table 5(Continued)
Final Study Alternatives

Alternative 2 (See Exhibit II for Detailed Cost Estimate)		
Facility	**Proposed In-Service Date**	**Present Worth Cost In Millions of Dollars**
J. K. Smith-Lake Reba Tap 138 kV Line (12 Miles 954 MCM ACSR); Line Terminal Facilities (J. K. Smith, Lake Reba Tap)	2001	5.5
J. K. Smith-Spencer Road 138 kV Line (17 Miles 954 MCM ACSR); Line Terminal Facilities (J. K. Smith, Spencer Road)	2002	7.3
J. K. Smith 345/138 kV Substation (270/360/450 MVA)	2003	4.8
J. K. Smith-Avon 345 kV Line (17 Miles 2-954 MCM ACSR); Line Terminal Facilities (Avon)	2003	10.6
J. K. Smith-Stanford 345 kV Line (40 Miles 2-954 MCM ACSR); Line Terminal Facilities (J. K. Smith); Stanford 345 kV Switching Substation (Tapping KU Brown-Pineville 345 kV)	2006	22.2
Laurel County Tap 161 kV Line(4 Miles 954 MCM) (Tapping KU Alcalde-Farley 161 kV) Line Terminal Facilities (Laurel County, KU Tap Point)	2011	1.2
Tyner-Delvinta #2 161 kV Line(14 Miles 954 MCM) Line Terminal Facilities (Tyner, Delvinta)	2013	3.0
Transmission Facility Upgrades		4.2
Other Facilities (GSU/Terminal Facilities, Substation Reconfiguration, Capacitor Bank)		16.3
Transmission System Losses (Versus Alternative 1)		32.0
Total Cost:		107.1

Table 5(Continued)
Final Study Alternatives

Alternative 3 (See Exhibit III for Detailed Cost Estimate)		
Facility	**Proposed In-Service Date**	**Present Worth Cost In Millions of Dollars**
J. K. Smith-Lake Reba Tap 138 kV Line (12 Miles 954 MCM ACSR); Line Terminal Facilities (J. K. Smith, Lake Reba Tap)	2001	5.5
J. K. Smith-Spencer Road 138 kV Line (17 Miles 954 MCM ACSR); Line Terminal Facilities (J. K. Smith, Spencer Road)	2002	7.3
J. K. Smith-Avon 138 kV Line (17 Miles 954 MCM ACSR); Line Terminal Facilities (J. K. Smith, Avon)	2003	6.5
J. K. Smith 161/138 kV Substation (2-150 MVA) Convert J. K. Smith-Powell Co 138 kV to 161 kV; Powell County 161-69 kV Substation (150 MVA)	2003	4.7
J. K. Smith-Tyner 161 kV Line (43 Miles 2-954 MCM ACSR); Line Terminal Facilities (J. K. Smith, Tyner)	2006	13.5
Laurel County Tap 161 kV Line(4 Miles 954 MCM) (Tapping KU Alcalde-Farley 161 kV) Line Terminal Facilities (Laurel County, KU Tap Point)	2014	0.9
Transmission Facility Upgrades		7.1
Other Facilities (GSU/Terminal Facilities, Substation Reconfiguration, Capacitor Bank)		15.0
Transmission System Losses (Versus Alternative 1)		20.0
Total Cost:		80.5

Table 5(Continued)

Final Study Alternatives

Alternative 4 (See Exhibit IV for Detailed Cost Estimate)		
Facility	**Proposed In-Service Date**	**Present Worth Cost In Millions of Dollars**
J. K. Smith 161/138 kV Substation (2-150 MVA); Convert J. K. Smith-Powell Co 138 kV to 161 kV; Powell County 161-69 kV Substation (150 MVA)	2001	5.2
J. K. Smith-Lake Reba Tap 161 kV Line (12 Miles 954 MCM ACSR); Line Terminal Facilities (J. K. Smith, Lake Reba Tap)	2001	5.7
J. K. Smith-Spencer Road 138 kV Line (17 Miles 954 MCM ACSR); Line Terminal Facilities (J. K. Smith, Spencer Road)	2002	7.0
J. K. Smith-Avon 138 kV Line (17 Miles 954 MCM ACSR); Line Terminal Facilities (J. K. Smith, Avon)	2003	6.8
J. K. Smith-Tyner 161 kV Line (43 Miles 2-954 MCM ACSR); Line Terminal Facilities (J. K. Smith, Tyner)	2004	15.3
Laurel County Tap 161 kV Line(4 Miles 954 MCM) (Tapping KU Alcalde-Farley 161 kV) Line Terminal Facilities (Laurel County, KU Tap Point)	2014	0.9
Transmission Facility Upgrades		5.2
Other Facilities (GSU/Terminal Facilities, Substation Reconfiguration, Capacitor Bank)		15.3
Transmission System Losses (Versus Alternative 1)		17.6
Total Cost:		79.0

Alternatives Eliminated

Three of the four final study alternatives were found to be comparable in cost. Alternative 2 was found to cost considerably more due to higher system losses. In addition, it was found that Alternative 2 provides significantly less voltage support to the transmission system in the Tyner-London vicinity, due to the absence of an exit built from J. K. Smith into this area. For these reasons, Alternative 2 was eliminated from further consideration.

Advantages of Alternative 1

All of the remaining Alternatives (1, 3, and 4) were found to be comparable in total cost. However, Alternative 1, which employs 345 kV and 138 kV as exit voltages offer several advantages versus the others in terms of additional system support. The unique advantages of Alternative 1 are discussed below:

Additional Voltage Support

Tyner-London Vicinity

All of the remaining alternatives (1,3, and 4) result in significant additional voltage support for the EKPC-KU system extending from Tyner to London. However, because of the use of 345 kV, Alternative 1 provides better voltage support to the subject vicninity than the other alternatives. This additional voltage support is the direct result of reduced voltage drop between the J. K. Smith Plant and the Tyner Substation.

The additional voltage support in Alternative 1 eliminates the need for additional transmission facilities in the Laurel County Substation vicinity for an outage of the Laurel County to Laurel Dam 161 kV Line. The economic benefits of the additional support in this case have been quantified in the present worth cost analysis.

Spurlock Generating Plant Vicinity

Alternative 1 provides a strong EHV link between EKPC's Spurlock and J.K. Smith generating plants. It also provides additional voltage support at the Spurlock Switchyard when both Spurlock units are off-line, which is beneficial.

Under projected 2007 Summer peak load conditions, for Alternatives 1 and 3, load flow plots showing an outage of both Spurlock Units can be seen in Appendix B (Tab 21). Since Alternative 4 is very similar electrically to Alternative 3 for this case, plots of Alternative 4 are not shown. By comparing the voltage at the Spurlock Switchyard under

Alternative 1 versus 3, it can be seen that the per unit voltage at the Spurlock 345 and 138 kV busses is over 2 percent higher under Alternative 1.

Fawkes to Rodburn Transmission System

All of the final study alternatives include the addition of a 17 mile 138 kV line (954 MCM) built from J. K. Smith to KU's Spencer Road 138-69 kV Substation. This line provides significant voltage support to the transmission system extending from the KU Fawkes and Rodburn Substations. Without this line addition, there is a total of approximately 63 miles of 138 kV line extending between the Fawkes and Rodburn substations. The conductor size over the entire length of this line is 556.5 MCM ACSR. This figure does not include the Farmers Substation 138 kV tap line.

The addition of the J. K. Smith-Spencer Road 138 kV line splits the Fawkes-Rodburn 138 kV system almost 50-50%. There is approximately 34 miles of line extending between Fawkes and Spencer Road, and approximately 29 miles of line extending between Rodburn and Spencer Road. Since the power flow bias is always from J. K. Smith to Spencer Road, the splitting of the Fawkes-Rodburn System by the new line is obviously beneficial from a standpoint of electrical support.

The additional voltage support provided to the Fawkes-Rodburn system from the J. K. Smith-Spencer Road Line addition can be observed in the load flow plots of Appendix B. The referenced plots assume Alternative 1 is in effect. To determine the effect(s) of the J. K. Smith-Spencer Road 138 kV Line addition, load flow base cases modeling projected 2007 Summer Peak Load Conditions were run under Alternative 1, both with and without the subject line in service (See Appendix B, Tabs 17 and 22). The resulting comparison of the two cases is given below:

Projected 2007 Summer Peak Increase in voltage from J. K. Smith to Spencer Road 138 kV Line	
Substation Bus(138 kV)	Percent Increase in Voltage
Spencer Road	4.9
Farmers Tap	3.0
Clark County	2.7
Rodburn	2.3

<u>Reduced Transmission System Losses</u>

Alternative 1 utilizes 345 and 138 kV as exit voltage levels for J.K. Smith, while Alternatives 3 and 4 utilize 161 and 138 kV as exit voltage. The use of 345 kV in Alternative 1 results in a significant reduction of transmission losses for the EKPC-KU joint system. This reduction in losses has been quantified in the present worth analysis of alternatives.

Present Worth Cost

Exhibits I-IV show the present worth cost estimates for the 4 final study alternatives. These estimates include the estimated cost of additional EKPC-KU transmission system losses under Alternatives 2, 3, and 4 versus Alternative 1. As mentioned above, the EKPC-KU combined transmission system losses were found to be significantly lower under Alternative 1 versus the other alternatives.

In comparing the present worth cost of alternatives, it was found that Alternative 1 costs about 4.7 million dollars less than Alternative 4, 6.3 million dollars less than Alternative 3, and 32.8 million dollars less than Alternative 2. This benefit adds to the system support benefits outlined above

<u>Selection of Proposed Alternative</u>

From the above discussion, Alternative 1 was selected as the proposed alternative. Alternative 1 provides additional transmission system support and results in significantly reduced losses on the EKPC-KU joint transmission system. Finally, Alternative 1 costs at least 4.7 million present worth dollars less than any of the other alternatives.

Section 6

Reconciliation of Proposed Alternative with Most Current EKPC Generation Expansion Plan

As mentioned in the Executive Summary, EKPC's generation expansion scenario for J.K. Smith has changed from what was assumed in the analysis performed in this report. Table 1 shows EKPC's original (Plan A) and most current (Plan B) generation expansion scenarios.

Following a review of the new generation scenario, it was judged that the alternatives developed under the original scenario are still the best ones available under the new scenario or any other possible scenarios involving the addition of like generation at J.K. Smith. However, the timing of the transmission facility additions could shift slightly as a result of the new scenario. Also, the substation configuration and layout at the J. K. Smith Site will change as a result of the new scenario.

Using the study power flow cases (previously discussed), the proposed Alternative 1 facilities were re-timed and the substation configuration at the J. K. Smith Site was re-configured to coordinate with EKPC's most current generation expansion scenario. Exhibit V shows the facilities, the timing of these facilities, and the estimated present worth cost of these facilities under new generation scenario. The present worth cost of facilities for the original generation scenario is shown as Exhibit I. By comparing Exhibits I and V, it can be seen that the present worth facility cost for the new generation scenario is about 4.2 million dollars higher than the original scenario.

As in the original generation scenario, spreadsheet summaries used in the facility re-timings for the new scenario, which are shown in Appendix B. As mentioned earlier, these spreadsheets were used to determine the approximate generation levels at the threshold of facility overloads. The timing of facility additions were then determined by coordinating the threshold generation levels with the projected EKPC generation additions for the new scenario.

TRANSMISSION PLANNING CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE JK SMITH GENERATION

COMBUSTION TURBINE UNITS 4 AND 5
KENTUCKY PIONEER ENERGY UNIT

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Section 1
Executive Summary

From the results of load flow studies and economic analysis, an optimum transmission plan was formulated to support future generation additions at the J. K. Smith generating site. The plan was developed in two parts or "Phases". In Phase 1, the optimum transmission plan was formulated to support the addition of two additional combustion turbine units (C.T.'s) added at the J. K. Smith site, with assumed summer and winter capacities of 80/108 MW. In Phase 2, the optimum transmission plan was formulated to support the addition of the proposed Kentucky Pioneer Energy (KPE) unit, with assumed summer/winter capacities of 500/570 MW. The Phase 2 plan assumes that the Phase 1 plan is already in place.

The proposed Phase 1 and 2 transmission plans referred to above were developed, using as a basis, some of the facilities projected in a future "horizon" generating addition study at the J. K. Smith site. The description and background discussion of this future study can be found in Section 2.

The proposed Phase 1 and 2 transmission plans are given below:

Phase 1
Combustion Turbine #4 and #5 Facilities

Facility	Proposed In-Service Date
Add 2nd Fawkes EKPC-KU 138 kV tie.	2000
J. K. Smith-Lake Reba Tap 138 kV Line(12 Miles 954 MCM ACSR) J. K. Smith, Lake Reba Tap Terminal Facilities	2001
Replace the 60/100 MVA 161-138 kV transformer at KU's Lake Reba Tap Substation with a 120/200 MVA unit.	2001
Re-conductor EKPC's Dale-Boonesboro Tap 138 kV Line (2.75 miles 556.5 MCM ACSR) using bundled 477 MCM ACSR.	2002

Phase 2
Kentucky Pioneer Energy Facilities

Facility	Proposed In-Service Date
KPE 345-138 kV Switching Substation Addition (New substation at new site on J. K. Smith property)	2003
KPE-J. K. Smith 138 kV Circuits #1, 2 (1.6 miles total, 2-954 MCM ACSR) J. K. Smith Terminal Facility Additions	2003
J. K. Smith-Spencer Road 138 kV Line(17 Miles 954 MCM ACSR) J. K. Smith, Spencer Road Terminal Facilities	2003
KPE-Avon 345 kV Line (17 Miles 2-954 MCM ACSR) Avon 345 kV Terminal Facilities	2003
Upgrade the terminal facilities at EKPC's Dale Substation (J. K. Smith Line) to 2000 Ampere capability.	2003
Replace the 30/50 MVA 138-69 kV transformer at KU's Spencer Road Substation with a 50/83 MVA unit moved from KU's Boonesboro North Substation.	2003
Replace the 30/40 MVA 138-69 kV transformer at KU's Farmers Substation with a 30/50 MVA unit moved from KU's Spencer Road Substation.	2003
Re-conductor KU's Clark Co.-Parker Seal 69 kV Line (0.77 miles 397.5 MCM ACSR) using 795 MCM ACSR.	2003

The proposed Phase 2 plan above contains 345 kV facilities. An alternative was developed which would defer these facilities beyond the KPE unit, or until additional generation beyond the KPE unit is installed. However, the 345 kV facilities are proposed because of several advantages, which are listed on the next page:

Phase 2 Plan

Advantages of 345 kV facilities

- Provides additional loadability margin for the heaviest loaded facility during the most critical contingency.
- Elimination and/or deferral of several transmission facility upgrades.
- Provides significant additional voltage support for a loss of both Spurlock units.
- Provides significant reduction in transmission losses.
- It is estimated that the present worth savings of avoided EKPC-KU system losses and avoided transmission facility upgrades will more than pay for the additional cost of installing the 345 kV facilities to support the KPE unit. The net present worth cost savings of installing the 345 kV facilities is estimated at 1.2 million dollars.

Additional details concerning the advantages of installing the 345 kV facilities can be found in Section 5.

Section 2
Introduction

East Kentucky Power Cooperative, Inc. (EKPC) recently completed a report of the proposed transmission required to support future generation additions at the J. K. Smith site. EKPC submitted this report to the Kentucky Public Service Commission (PSC), and supplied it to the Office of the Kentucky Attorney General (OAG) and also to the Rural Utilities Services (RUS). This report documented the proposed transmission necessary to support a total of 1310/1667 MW of summer/winter generation at the J. K. Smith site. Since there is currently 330/447 MW of summer/winter generation at the J. K. Smith site, the report addressed the proposed transmission necessary to support an additional 980/1220 MW of future generation.

The proposed transmission described above includes two new 345 kV transmission lines, two new 138 kV transmission lines, a 345-138 kV substation addition and a 345-161 kV substation addition. It also includes upgrades on the EKPC-KU interconnected transmission system which are associated with future generation additions at J. K. Smith. The proposed transmission supports a total of 6 new combustion turbine (CT) additions at J. K. Smith, with assumed summer/winter capacities of 80/108 MW, along with a generating unit addition proposed by Kentucky Pioneer Energy (KPE). The assumed summer/winter capacity of the KPE unit is 500/570 MW. Table 1 shows the assumed generation additions in the J. K. Smith future study for the generation scenario described above. Table 1 also shows EKPC's most current schedule for generation additions at the J. K. Smith site.

EKPC currently expects to have two new 80/108 MW CT's available at the J. K. Smith site between late 2001 and mid 2002. The KPE unit is assumed to be available by mid 2004. The proposed transmission facilities necessary to support the KPE unit are assumed to be in service by 2003 Summer, to allow for testing of the unit. The purpose of this document is to identify the proposed facilities, outlined in the study referred to above, which are necessary due to the following generation additions

- CT's #4 and #5
- KPE (assuming transmission for CT's #4 and #5 is installed)

TABLES

Table 1: EKPC Generation Resource Plans

J. K. Smith Future Generation Study--Plan B JK Smith Generation Expansion Scenario Preliminary 2000 Integrated Resource Plan (IRP)[1]					
		Generation (MW)			
		Incremental		Total	
Unit	In-Service Date	Summer	Winter	Summer	Winter
CT #1-3	Existing	330	447	330	447
CT #4	Dec-2001	80	108	330	555
CT #5	May-2002	80	108	490	664
KPE	Dec-2002	500	570	490	1234
CT #6	May-2004	80	108	1070	1342
CT #7	May-2005	80	108	1150	1450
CT #8	May-2006	80	108	1230	1559
CT #9	May-2007	80	108	1310	1667

Generation Expansion Scenario at JK Smith Site 2000 Integrated Resource Plan					
		Generation (MW)			
		Incremental		Total	
Unit	In-Service Date	Summer	Winter	Summer	Winter
CT #1-3	Existing	330	447	330	447
CT #4	Dec-2001	80	108	330	555
CT #5	May-2002	80	108	490	664
KPE	May-2004	500	570	990	1234
CT #6	May-2006	80	108	1070	1342
CT #7	May-2007	80	108	1150	1450
CT #8	May-2008	80	108	1230	1559
CT #9	May-2009	80	108	1310	1667

[1] Reference: Attachment to Exhibit III, PSC Case No. 2000-056.

Section 3
Transmission System Testing

Overview and General Description

Using load flow analysis, the EKPC-KU interconnected system was tested for potential problems during projected 1999 Summer, 1999-00 Winter, 2002 Summer, and 2002-03 Winter Peak load conditions. The 1999 series cases contained only the existing generation at J. K. Smith, while the 2002 series cases contained the existing generation at J. K. Smith along with two additional C.T.'s and the KPE unit. The ratings of these new generating units was previously described above. The testing was done for single contingency outages under 5 different dispatch conditions. Table 2 on the next page shows the different dispatch conditions which were analyzed for each power flow seasonal case. Table 2 also shows the dispatch conditions for the 2007 year cases which were used in the J. K. Smith future study previously discussed.

Table 2: Alternative Dispatch Conditions
J. K. Smith Future Generation Study

	Dispatch		Imports	
Case	Number	Condition	Utility	MW
1999 Summer	1	Cooper #2 off	KU/TVA	200/25
	2	Cooper #2 off	CIN	225
	3	KU Brown #3 off	CIN	441
	4	Spurlock #2 off	KU/TVA	200/340
	5	Spurlock #2 off	TVA	540
2002 Summer	1	Cooper #2 off	--	--
	3	KU Brown #3 off	CIN	441
	4	Spurlock #2 off	KU	125
	5	Spurlock #2 off	TVA	125
2007 Summer	1	Cooper #2 off	--	--
	3	KU Brown #3 off	CIN	441
	4	Spurlock #2 off	KU	100
	5	Spurlock #2 off	TVA	100
1999/00 Winter	1	Cooper #2 off	KU	225
	2	Cooper #2 off	CIN	225
	3	KU Brown #3 off	CIN	441
	4	Spurlock #2 off	KU	540
	5	Spurlock #2 off	TVA	540
2002/03 Winter	1	Cooper #2 off	KU	60
	2	Cooper #2 off	CIN	60
	3	KU Brown #3 off	CIN	441
	4	Spurlock #2 off	KU	350
	5	Spurlock #2 off	TVA	350
2007/08 Winter	1	Cooper #2 off	KU	60
	2	Cooper #2 off	CIN	60
	3	KU Brown #3 off	CIN	441
	4	Spurlock #2 off	KU	350
	5	Spurlock #2 off	TVA	345

Summary

Figure 3 shows the results of the testing described above. In Figure 3, the generation level at which overloads will occur is calculated, using flows obtained from the 1999 and 2002 series cases. The threshold of overload is also shown. From Figure 3, it is obvious that numerous overloads are present. Figure 3 indicates that, even with maximum conductor ratings for two of the most critical facilities, the addition of two 80/108 MW C.T.'s at J. K. Smith will result in thermal overloads which will need to be corrected by adding a new 138 kV outlet from the generating site. The two critical facilities are existing generating outlets, and a new outlet will be required to reduce flows on these facilities below maximum conductor thermal ratings or existing circuit ratings.

Section 4
Proposed Phase 1 Transmission Facilities
Combustion Turbine #4 and #5 80/108 MW Units

Proposed Facilities

The proposed transmission facilities to support Combustion Turbine (CT) Units #4 and #5 are outlined below. The planning justification for each facility follows:

Facility	Proposed In-Service Date
Add 2nd Fawkes EKPC-KU 138 kV tie.	2000
J. K. Smith-Lake Reba Tap 138 kV Line(12 Miles 954 MCM ACSR) J. K. Smith, Lake Reba Tap Terminal Facilities	2001
Replace the 60/100 MVA 161-138 kV transformer at KU's Lake Reba Tap Substation with a 120/200 MVA unit.	2001
Re-conductor EKPC's Dale-Boonesboro Tap 138 kV Line (2.75 miles 556.5 MCM ACSR) using bundled 477 MCM ACSR.	2002

Facility Justification

Add 2nd Fawkes EKPC-KU 138 kV Tie

Under projected 1999-00 Winter peak load conditions and worst case dispatch, an outage of EKPC's J. K. Smith-Powell County 138 kV line results in a flow of 353 MVA on the Fawkes EKPC-KU 138 kV tie. This flow significantly exceeds the 287 MVA rating of the tie, and occurs without the addition of any future generation at J. K. Smith. Figure 3 shows the flow on the Fawkes EKPC-KU 138 kV tie under projected 1999-00 and 2002-03 Winter peak load conditions, respectively, under worst case dispatch.

During the course of the J. K. Smith future generation study (referred to in the Introduction) , EKPC and KU discussed potential solutions to the problem referenced above. Within the study, it was concluded that the most practical way to solve it would be to re-terminate EKPC's J. K. Smith-Fawkes 138 kV line at KU's adjacent Fawkes Substation. This would re-direct flow into KU's Fawkes 138 kV bus directly from the

J. K. Smith line and divert some of it off the existing Fawkes EKPC-KU tie.

Upon further inspection of the tie configuration at Fawkes, instead of re-terminating EKPC's line at Fawkes Substation, as discussed above, EKPC and KU now expect to build a 2nd 138 kV tie between the EKPC and KU Fawkes Substations. This would be accomplished by adding a 138 kV breaker at EKPC's Fawkes Substation and a building a very short 138 kV line from EKPC's Fawkes substation, which would tap KU's Fawkes-Lake Reba Tap line outside of KU's Fawkes 138 kV bus. A second 138 kV breaker would be added at EKPC's Fawkes Substation which would act as a transfer breaker for any of the 4 existing line breakers. EKPC's cost estimate for modifications at Fawkes is $427,000. EKPC's current schedule for the Fawkes Substation additions is Fall, 2000.

Figure 4 shows the results of load flow testing assuming that the J. K. Smith-Fawkes EKPC line is re-terminated at KU's Fawkes Substation. The load flow testing methodology is described in the previous Section 2.

<u>J. K. Smith-Lake Reba Tap 138 kV Line (12 miles 954 MCM ACSR) and associated terminal facilities; Replace the 60/100 MVA 161-138 kV transformer at KU's Lake Reba Tap Substation with a 120/200 MVA unit.</u>

With the J. K. Smith-Fawkes line re-terminated at KU's Fawkes Substation, as described above, load flow testing was again performed on the joint EKPC-KU system as outlined in the previous Section 2. Figure 4 shows the results of the testing. Figure 4 indicates that, even with maximum conductor ratings applied to the two most critical facilities, the addition of two 80/108 MW C.T.'s at J. K. Smith will result in a thermal overloads which will need to be corrected by adding a new 138 kV outlet from the generating site. The two most critical facilities are existing outlets for J. K. Smith, extending to the Dale and Fawkes Substations, respectively. A new outlet will be required to reduce flows on both of the critical outlet facilities below the maximum conductor thermal rating.

A new outlet for J. K. Smith was selected from the 4 potential outlets which were proposed in the future J. K. Smith generation study (See Introduction). The selected outlet was a 12 mile 138 kV line extending from J. K. Smith to KU's existing Lake Reba Tap 138 kV substation. This outlet was selected from a standpoint of increased system performance and economic considerations. It is the shortest line of the 4 potential outlets, and it is a 138 kV outlet which is considerably less expensive than 345 kV.

With the J. K. Smith-Lake Reba Tap Line installed, it is assumed that the existing 161-138 kV 60/100 MVA transformer at the Lake Reba Tap Substation is changed out with a 120/200 MVA transformer. This change out was required in the future generation study.

Re-conductor EKPC's Dale-Boonesboro Tap 138 kV Line
(2.75 miles 556.5 MCM ACSR) using bundled 477 MCM ACSR.

Assuming that all of the facilities described above are in service, the joint EKPC-KU transmission system was re-tested using the methodology previously described. The results, which are shown in Figure 5, indicate that only one potential problem remains with CT's #4 and #5 added, which is a potential overload of the Dale-Boonesboro Tap 138 kV line. It was calculated in Figure 5 that this overload will not occur until CT #5 is installed.

The proposed solution to the above problem is to re-conductor the Dale-Boonesboro Tap 138 kV line using bundled 477 MCM conductor. This conductor selection will provide sufficient capacity for future increases in loading, a trend which was found in the future J. K. Smith generation study previously discussed.

Section 5
Proposed Phase 2 Transmission Facilities
Kentucky Pioneer Energy 500/570 MW Unit

Assumed Initial Facilities

In this section of the justification, it is assumed that the proposed transmission facilities necessary to support Combustion Turbine (CT) Units #4 and #5 are in service. The justification for these previous facilities is outlined in Section 3 above.

Potential Alternatives

Three potential alternatives were analyzed to provide the transmission support for the KPE unit. One of these alternatives was selected as the proposed solution. Each of the 3 potential alternatives analyzed is discussed in detail below, and the planning justification for each facility is also discussed

Alternative 1

The assumed facility additions and upgrades for this alternative are given below, and the justification for each facility follows:

Alternative 1 Facility	Proposed In-Service Date
KPE 138 kV Switching Substation Addition (New substation at new site on J. K. Smith property)	2003
KPE-J. K. Smith 138 kV Circuits #1, 2 (1.6 miles total, 2-954 MCM ACSR) J. K. Smith Terminal Facility Additions	2003
J. K. Smith-Spencer Road 138 kV Line(17 Miles 954 MCM ACSR) J. K. Smith, Spencer Road Terminal Facilities	2003
Re-conductor the Boonesboro Tap-Avon 138 kV Line (8.82 miles 556.5 MCM ACSR) using 954 MCM ACSR.	2003
Upgrade the terminal facilities at EKPC's Dale Substation (J. K. Smith Line) to 2000 Ampere capability.	2003

Alternative 1(Continued) Facility	Proposed In-Service Date
Replace the 30/50 MVA 138-69 kV transformer at KU's Spencer Road Substation with a 50/83 MVA unit moved from KU's Boonesboro North Substation.	2003
Replace the 30/40 MVA 138-69 kV transformer at KU's Farmers Substation with a 30/50 MVA unit moved from KU's Spencer Road Substation.	2003
Re-conductor KU's Clark Co.-Winchester 69 kV Line (1.69 miles 397.5 MCM ACSR) using 795 MCM ACSR.	2003
Replace the 50/83 MVA 138-69 kV transformer at KU's Clark Co. Substation with a 80/133 MVA transformer.	2003

KPE 138 kV Switching Substation Addition; KPE-J. K. Smith 138 kV Circuits #1, 2 and associated terminal facilities at J. K. Smith Substation

To connect the KPE unit to EKPC's system, it was assumed that a new 138 kV switching substation is constructed and located approximately 0.8 miles from the existing J. K. Smith 138 kV switchyard. It was assumed that the KPE substation would be connected through two separate 138 kV circuits, each approximately 0.8 miles in length, and that the conductor size of each circuit would consist of bundled 954 MCM ACSR conductor.

It was assumed that the KPE unit would supply power to the transmission through a Generator Step Up transformer with a 138 kV primary winding. It was assumed that the GSU transformer would contain a 345 kV winding to allow it to be converted to generate into the 345 kV system in the future.

J. K. Smith-Spencer Road 138 kV Line (17 miles 954 MCM ACSR) and associated terminal facilities

The transmission system was tested for potential problems, assuming that the KPE unit connected to the EKPC system as described above, and that the proposed transmission facilities for C.T.'s #4 and #5 are in service. The results of the testing is shown in Table Figure 5. The results of the testing indicate that the C.T. #4 and #5 facilities will not provide acceptable generation outlet capability for the KPE unit, because numerous overloads are present. These overloads include those of three of 4 direct generation outlets from J. K. Smith, assuming maximum conductor ratings are in effect. This can be observed at the bottom of each page of Figure 5.

Transmission Facility Upgrades

It was found that the addition of a 138 kV line between J. K. Smith and KU's Spencer Road Substation will alleviate most of the previous overloads referred to above. With this line installed, all of the remaining overloads could be corrected inexpensively with re-conductoring and transformer change-outs, all of which were identified in the future J. K. Smith transmission study. Of the remaining facilities in the J. K. Smith future study, the J. K. Smith-Spencer 138 kV line is the least expensive remaining facility which could be added to eliminate overloads.

Alternative 2(Proposed)

This potential alternative contains the J. K. Smith-Spencer Road 138 kV line, which was assumed in Alternative 1 above. However, it also assumes the addition of another generation outlet for J. K. Smith, a 17 mile 345 kV line extending from KPE to Avon together with a 345-138 kV substation addition at KPE.

The complete list of assumed facility additions and transmission upgrades for this alternative are given below, and the discussion and justification follows:

Alternative 2(Proposed) **Facility**	**Proposed In-Service Date**
KPE 345-138 kV Switching Substation Addition (New substation at new site on J. K. Smith property)	2003
KPE-J. K. Smith 138 kV Circuits #1, 2 (1.6 miles total, 2-954 MCM ACSR) J. K. Smith Terminal Facility Additions	2003
J. K. Smith-Spencer Road 138 kV Line(17 Miles 954 MCM ACSR) J. K. Smith, Spencer Road Terminal Facilities	2003
KPE-Avon 345 kV Line (17 Miles 2-954 MCM ACSR) Avon 345 kV Terminal Facilities	2003

Alternative 2(Continued) Facility	Proposed In-Service Date
Upgrade the terminal facilities at EKPC's Dale Substation (J. K. Smith Line) to 2000 Ampere capability.	2003
Replace the 30/50 MVA 138-69 kV transformer at KU's Spencer Road Substation with a 50/83 MVA unit moved from KU's Boonesboro North Substation.	2003
Replace the 30/40 MVA 138-69 kV transformer at KU's Farmers Substation with a 30/50 MVA unit moved from KU's Spencer Road Substation.	2003
Re-conductor KU's Clark Co.-Parker Seal 69 kV Line (0.77 miles 397.5 MCM ACSR) using 795 MCM ACSR.	2003

KPE 345/138 kV Substation Addition (270/450 MVA);
KPE-Avon 345 kV Line (17 Miles 2-954 MCM ACSR); Avon Terminal Facilities

Under Alternative 1, as discussed above, it was observed that very little margin exists on the heaviest loaded facility during single contingency outage conditions. From Figure 6, during winter peak load conditions (2002/03), only 3 MVA of additional margin exists on the heaviest loaded facility and during summer peak load conditions (2002), only 5 MVA of additional margin exists. Taking into consideration load flow and modeling accuracy, actual flows during critial single contingencies could be higher than those observed in the model. Even if the load flow model is completely accurate, minimal outlet capability exists to support any future generation additions.

Using least cost remaining facilities from the J. K. Smith Future Study, it was found that a 345-138 kV substation addition at the KPE site, together with a 17 mile KPE to Avon 345 kV line, significantly increases the loading margin on the heaviest loaded exit facility from J. K. Smith. For winter peak load conditions, this margin is increased by 98 MVA, and for summer peak load conditions, this margin is increased by 75 MVA.

Other Advantages of 345 kV Facility Additions

A. Avoided Transmission Facility Upgrades

It was found that the addition of 345 kV facilities will eliminate or defer some transmission facility upgrades required in Alternative 1, until future generating units materialize. For the support of the KPE and CT #4 and #5 units exclusively, the addition of 345 kV in this alternative will eliminate the following transmission facility upgrades:

Alternative 2

Eliminated Facility Upgrades versus Alternative 1

- Re-conductor EKPC's Boonesboro Tap-Avon 138 kV Line with 954 MCM ACSR
- Re-conductor KU Parker Seal-Winchester 69 kV Line with 795 MCM ACSR.
- Replace KU Clark County 50/83 MVA 138-69 kV transformer with 80/133 MVA transformer.
- Replace KU Lake Reba 50/83 MVA 138-69 kV transformer with 60/100 MVA transformer.

B. Voltage Support for loss of Both Spurlock Units

For an outage of both Spurlock units, the 345 kV facilities provide additional voltage support at the Spurlock generating plant (See Load Flow Plots 1 and 2). Plot 1 shows an outage of both Spurlock units without the 345 kV additions (Alternative 1), and Plot 2 shows the same outage with the 345 kV facilities added (Alternative 2). From the plots, the 345 kV facilities increase the voltage level by 2.5 % at the Spurlock 345 kV bus.

C. Avoided Transmission System Losses

It was found that the 345 kV additions in this alternative provides a significant reduction in EKPC-KU transmission system losses.

D. Summary

It was found that present worth cost savings from reduced losses, combined with the savings from eliminated or deferred facility upgrades, will pay for the additional costs of installing the 345 kV additions to support the KPE unit. This is discussed in further detail in the following subsection below entitled, "Comparison of Alternatives and Selection of Proposed Alternative".

Alternative 3

A third alternative was analyzed to support the KPE generation unit addition. The assumed facility additions and upgrades for this alternative are given on the next page, and the justification for each facility follows:

Alternative 3 Facility	Proposed In-Service Date
KPE 345-138 kV Substation Addition (New substation at new site on J. K. Smith property)	2003
KPE-J. K. Smith 138 kV Circuits #1, 2 (1.6 miles total, 2-954 MCM ACSR) J. K. Smith Terminal Facility Additions	2003
KPE-Avon 345 kV Line (17 Miles 2-954 MCM ACSR) Avon 345 kV Terminal Facilities	2003
Re-conductor EKPC's Avon-Boonesboro Tap 138 kV Line (2.75 miles 556.5 MCM ACSR) using 954 MCM ACSR.	2003
Upgrade the terminal facilities at EKPC's Dale Substation (J. K. Smith Line) to 2000 Amp	2003
Re-conductor the 2/0 CU section of KU's Clark County-Mt. Sterling 69 kV Line (2.75 miles) using 397.5 MCM ACSR.	2003
Replace the 60/100 MVA 138-69 kV transformer at KU's Boonesboro North Substation with an 80/133 MVA unit.	2003

The above scenario was tested for potential overloads using the same methodology previously discussed in other parts of this document. The results of the testing is shown in Figure 8.

As in Alternative 1 above, it was found that this alternative provides small margin on the heaviest loaded facility during the most critical contingency. From Figure 8, it provides only 7 MVA of margin for summer peak load conditions, and 10 MVA for winter peak load conditions. In addition to the small loadability margins outlined above, this alternative would require implementing some facility upgrades which were not required in the future J. K. Smith transmission study.

It was found that this combination results in significantly higher transmission losses as compared to Alternatives 1 and 2 above. Also, the present worth cost of this alternative will be increased versus Alternative 1 because of the use of higher cost 345 kV exit facilities in place of 138 kV facilities.

Summary

For the reasons outlined above, it was decided that this alternative should be eliminated in favor of Alternative 1. The present worth cost of this alternative will be significantly more than Alternative 1 because of the use of 345 kV as opposed to 138 kV, and also because of increased transmission system losses. Finally, like Alternative 1, this alternative provides a small loadability margin on the heaviest loaded facility during the most critical contingency.

Comparison of Alternatives and Selection of Proposed Alternative

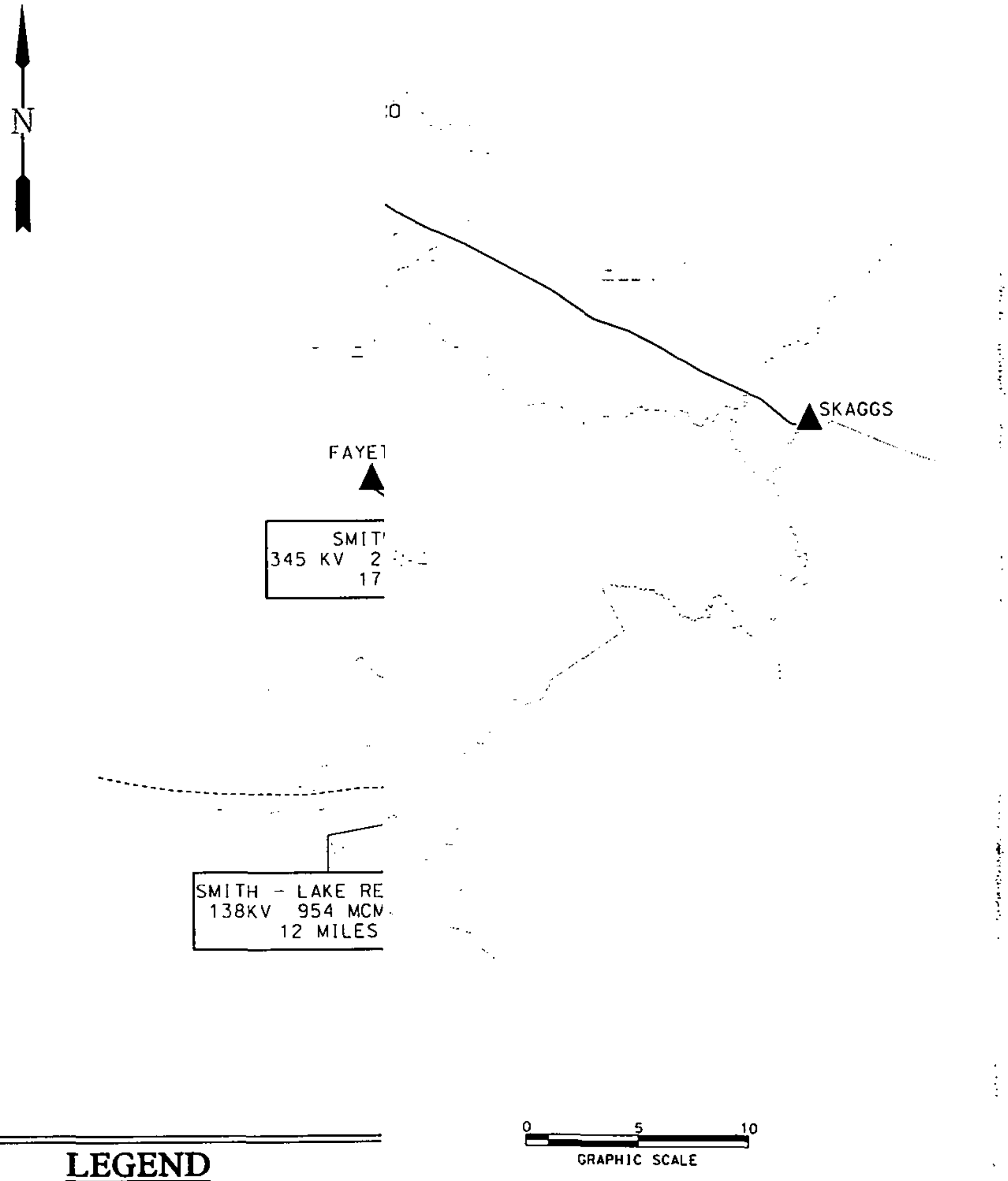
With Alternative 3 eliminated as discussed above, present worth cost estimates were performed on Alternatives 1 and 2,which are shown as Exhibits I and II. In these estimates, the estimated cost of joint EKPC-KU transmission system losses are included. It should be noted that the facilities included in the above estimates support the addition of two additional 80/108 MW C.T.'s at J. K. Smith, which are projected to be installed after the KPE unit (See Table 1).

By comparing Exhibits I and II, it can be seen that Alternatives 1 and 2 cost approximately the same in present worth dollars. Even though the more expensive 345 kV facilities are installed 2 years earlier under Alternative 2, the additional present worth costs are offset by the savings resulting from eliminated transmission facility upgrades and avoided transmission system losses. Therefore, it is concluded that Alternative 2 is justified because of the additional benefits it provides, which were discussed earlier and are summarized on the next page:

Advantages of 345 kV Facilities (Alternative 2)

- Provides additional loadability margin for the heaviest loaded facility during the most critical contingency.
- Elimination and/or deferral of several transmission facility upgrades(described earlier)
- Provides significant additional voltage support for a loss of both Spurlock units.
- Provides significant reduction in transmission losses.
- It is estimated that the present worth savings of avoided EKPC-KU system losses and avoided transmission facility upgrades will more than pay for the additional cost of installing the 345 kV facilities to support the KPE unit. The net present worth cost savings of installing the 345 kV facilities is estimated at 1.2 million dollars.

FIGURES

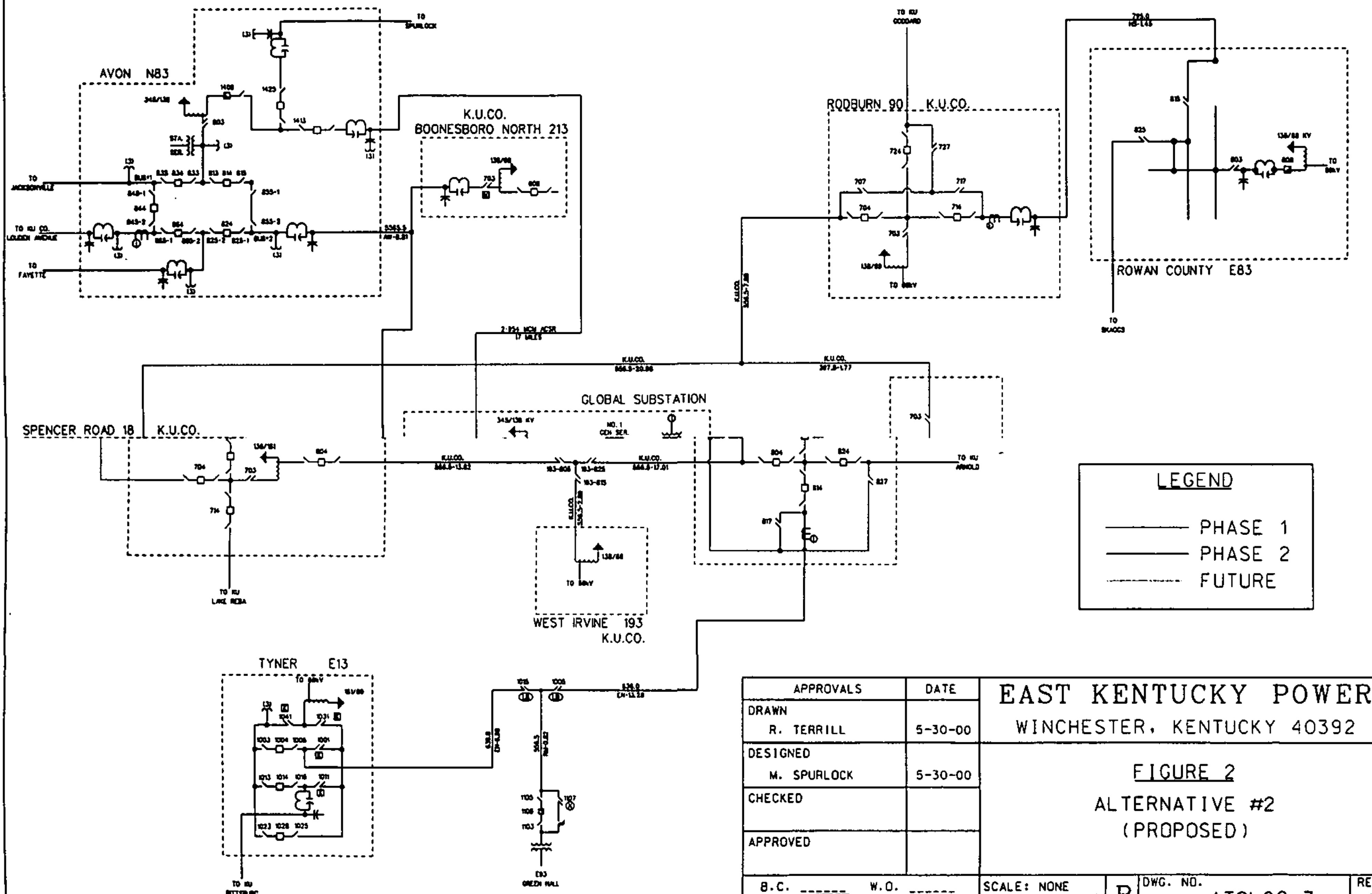


LEGEND

- EKPC GENERATION
- EKPC SUBSTATION
- KU SUBSTATION
- EKPC 138 KV TRANSMISSION
- EKPC 161 KV TRANSMISSION
- EKPC 345 KV TRANSMISSION
- KU 138 & 161 KV TRANSMISSION
- PHASE 1
- PHASE 2

DATE	EAST KENTUCKY POWER WINCHESTER, KENTUCKY 40392
5-31-00	FIGURE 1 PROPOSED ALTERNATIVE #2 VICINITY MAP

SCALE: SHOWN	B	DWG. NO. PL00-04	REV 0
SHEET 1 OF 1			



APPROVALS	DATE
DRAWN R. TERRILL	5-30-00
DESIGNED M. SPURLOCK	5-30-00
CHECKED	
APPROVED	

B.C. ______ W.O. ______

AS BUILT

EAST KENTUCKY POWER

WINCHESTER, KENTUCKY 40392

FIGURE 2

ALTERNATIVE #2

(PROPOSED)

SCALE: NONE

SHEET 1 OF 1

B

DWG. NO. ATOL00-7

REV. 0

FIGURE 3
CALCULATION OF OVERLOADS BY JK SMITH GENERATION

BASE WITHOUT NEW FACILITIES

SUMMER PEAK LOAD CONDITIONS
JKSMITH 138 KV MAXIMUM BUS GENERATION: 330 MW-1999S ; 990 MW-2002S

OUTAGED FACILITY FROM BUS	TO BUS	KV	MONITORED FACILITY FROM BUS	TO BUS	KV	RATING MVA	FLOW MVA 1999S GEN	FLOW MVA 2002S GEN	GEN FACTOR	TOTAL JKSMITH GEN AT RATING	THRESHOLD OF FACILITY OVERLOAD	DISPATCH CONDITION
JKSMITH	FAWKESEK	138	DALE	THREEFKJ	138	222	226	287	0.2429	315		3
FAWKESEK	FAWKS KU	138	DALE	BOONESTP	138	222	219	562	0.5191	336	CT#4 ADDED	5
JKSMITH	FAWKESEK	138	THREEFKJ	FAWKESEK	138	222	214	272	0.2306	363		3
JKSMITH	FAWKESEK	138	JKSMITH	DALE	138	295	199	693	0.7477	458	CT#5 ADDED	5
FAWKESEK	FAWKS KU	138	BOONES N	BOONES N	138-69	123	113	133	0.0774	458		3
JKSMITH	DALE	138	JKSMITH	FAWKS KU	138	295	196	653	0.6924	473		5
FAWKESEK	FAWKS KU	138	BOONESTP	AVON	138	222	119	407	0.4358	565	KPE ADDED	5
CLARK CO	SPENC RD	138	CLARK CO	MTSTERKU	69	54	44	63	0.0276	682		4

WINTER PEAK LOAD CONDITIONS
JKSMITH 138 KV MAXIMUM BUS GENERATION: 447 MW-1999W ; 1234 MW-2002W

OUTAGED FACILITY FROM BUS	TO BUS	KV	MONITORED FACILITY FROM BUS	TO BUS	KV	RATING MVA	FLOW MVA 1999W GEN	FLOW MVA 2002W GEN	GEN FACTOR	TOTAL JKSMITH GEN AT RATING	THRESHOLD OF FACILITY OVERLOAD	DISPATCH CONDITION
JKSMITH	POWELLCO	138	FAWKESEK	FAWKS KU	138	287	353	627	0.4322	295		3
JKSMITH	POWELLCO	138	LK REB T	LK REB T	161-138	140	142	200	0.0741	427		1
JKSMITH	FAWKESEK	138	DALE	THREEFKJ	138	287	289	452	0.2552	438		3
JKSMITH	FAWKESEK	138	JKSMITH	DALE	138	295	265	867	0.7659	487	CT#4 ADDED	5
JKSMITH	DALE	138	JKSMITH	FAWKESEK	138	295	261	834	0.7274	493		5
JKSMITH	FAWKESEK	138	THREEFKJ	FAWKESEK	138	287	273	426	0.2407	504		3
FAWKESEK	FAWKS KU	138	DALE	BOONESTP	138	278	221	638	0.5301	555		5
FAWKESEK	FAWKS KU	138	BOONES N	BOONES N	138-69	140	123	171	0.0752	672	KPE ADDED	3
POWELLCO	DELVINTA	161	POWELLCO	BOWEN	69	68	57	82	0.0314	804		1
FAWKESEK	FAWKS KU	138	BOONESTP	AVON	138	278	113	463	0.4457	818		5
JKSMITH	DALE	138	POWELLCO	POWELLCO	161-138	220	133	265	0.1673	965		1
POWELLCO	DELVINTA	161	POWELLCO	POWELLCO	138-69	147	93	169	0.0974	1005		1
JKSMITH	DALE	138	JKSMITH	POWELLCO	138	400	207	469	0.3325	1026		1
LAURELCO	LAURELCO	161-69	PITTSBRG	PITTSBRG	161-69	140	88	138	0.0637	1262		1

FIGURE 4
CALCULATION OF OVERLOADS BY JK SMITH GENERATION

JKSMITH-FAWKES EKPC RETERMINATED AT FAWKES KU
SUMMER PEAK LOAD CONDITIONS
JKSMITH 138 KV MAXIMUM BUS GENERATION: 330 MW-1999S ; 990 MW-2002S

OUTAGED FACILITY			MONITORED FACILITY				FLOW MVA			TOTAL		
FROM BUS	TO BUS	KV	FROM BUS	TO BUS	KV	RATING MVA	1999S GEN	2002S GEN	GEN FACTOR	JKSMITH GEN AT RATING	THRESHOLD OF FACILITY OVERLOAD	DISPATCH CONDITION
JKSMITH	FAWKS KU	138	DALE	THREEFKJ	138	222	226	287	0.2429	315		3
JKSMITH	FAWKS KU	138	THREEFKJ	FAWKESEK	138	222	214	272	0.2306	363	CT#4 ADDED	3
FAWKS KU	CLARK CO	138	DALE	BOONESTP	138	222	192	421	0.3476	417	CT#5 ADDED	5
JKSMITH	FAWKS KU	138	JKSMITH	DALE	138	295	199	693	0.7477	458		5
JKSMITH	DALE	138	JKSMITH	FAWKS KU	138	295	196	653	0.6924	473		5
FAWKES	CLARK CO	138	BOONES N	BOONES N	138-69	123	111	147	0.0536	546	KPE ADDED	5
CLARK CO	SPENC RD	138	CLARK CO	MTSTERKU	69	54	44	63	0.0276	682		4
DALE	FAWKESEK	138	BOONESTP	AVON	138	222	95	303	0.3153	733		5

ADDITIONAL FACILITY UPGRADES
TERMINAL FACILITY UPGRADE AT DALE SUBSTATION(JK SMITH LINE)
TERMINAL FACILITY UPGRADE AT FAWKES KU SUBSTATION(JK SMITH LINE)

OUTAGED FACILITY			MONITORED FACILITY				FLOW MVA			TOTAL		
FROM BUS	TO BUS	KV	FROM BUS	TO BUS	KV	RATING MVA	1999S GEN	2002S GEN	GEN FACTOR	JKSMITH GEN AT RATING	THRESHOLD OF FACILITY OVERLOAD	DISPATCH CONDITION
JKSMITH	FAWKS KU	138	JKSMITH	DALE	138	320	199	693	0.7477	492	KPE ADDED	5
JKSMITH	DALE	138	JKSMITH	FAWKS KU	138	320	196	653	0.6924	509		5

FIGURE 4

CALCULATION OF OVERLOADS BY JK SMITH GENERATION

JKSMITH-FAWKES EKPC RETERMINATED AT FAWKES KU
WINTER PEAK LOAD CONDITIONS
JKSMITH 138 KV MAXIMUM BUS GENERATION: 447 MW-1999W ; 1234 MW-2002W

OUTAGED FACILITY FROM BUS	OUTAGED FACILITY TO BUS	KV	MONITORED FACILITY FROM BUS	MONITORED FACILITY TO BUS	KV	RATING MVA	FLOW MVA 1999W GEN	FLOW MVA 2002W GEN	GEN FACTOR	TOTAL JKSMITH GEN AT RATING	THRESHOLD OF FACILITY OVERLOAD	DISPATCH CONDITION
JKSMITH	POWELLCO	138	LK REB T	LK REB T	161-138	140	142	200	0.0741	427		1
JKSMITH	FAWKS KU	138	DALE	THREEFKJ	138	287	289	452	0.2552	438		3
JKSMITH	FAWKS KU	138	JKSMITH	DALE	138	295	265	867	0.7659	487	CT#4 ADDED	5
JKSMITH	DALE	138	JKSMITH	FAWKS KU	138	295	261	834	0.7274	493		5
JKSMITH	FAWKS KU	138	THREEFKJ	FAWKS KU	138	287	273	426	0.2407	504		3
DALE	FAWKS KU	138	DALE	BOONESTP	138	278	176	459	0.3601	730	KPE ADDED	5
JKSMITH	FAWKS KU	138	FAWKS KU	FAWKS KU	138	287	212	357	0.2283	777		3
POWELLCO	DELVINTA	161	POWELLCO	BOWEN	69	68	57	82	0.0314	804		1
JKSMITH	DALE	138	POWELLCO	POWELLCO	161-138	220	133	265	0.1673	965		1
POWELLCO	DELVINTA	161	POWELLCO	POWELLCO	138-69	147	93	169	0.0974	1005		1
FAWKESEK	CLARK CO	138	BOONES N	BOONES N	138-69	140	111	152	0.0529	1005		4
JKSMITH	DALE	138	JKSMITH	POWELLCO	138	400	207	469	0.3325	1026		1
DALE	FAWKS KU	138	BOONESTP	AVON	138	278	81	335	0.3228	1057		5
LAURELCO	LAURELCO	161-69	PITTSBRG	PITTSBRG	161-69	140	88	138	0.0637	1262		1

ADDITIONAL FACILITY UPGRADES
TERMINAL FACILITY UPGRADE AT DALE SUBSTATION(JK SMITH LINE)
TERMINAL FACILITY UPGRADE AT FAWKES KU SUBSTATION(JK SMITH LINE)

OUTAGED FACILITY FROM BUS	OUTAGED FACILITY TO BUS	KV	MONITORED FACILITY FROM BUS	MONITORED FACILITY TO BUS	KV	RATING MVA	FLOW MVA 1999W GEN	FLOW MVA 2002W GEN	GEN FACTOR	TOTAL JKSMITH GEN AT RATING	THRESHOLD OF FACILITY OVERLOAD	DISPATCH CONDITION
JKSMITH	FAWKESEK	138	JKSMITH	DALE	138	400	265	867	0.7659	624	CT#5 ADDED	5
JKSMITH	DALE	138	JKSMITH	FAWKESEK	138	400	261	834	0.7274	638		5

FIGURE 5
CALCULATION OF OVERLOADS BY JK SMITH GENERATION

JKSMITH-FAWKES EKPC RETERMINATED AT FAWKES KU
JKSMITH-LAKE REBA TAP 138 KV ADDED(954 MCM)
LAKE REBA TAP 161-138 KV XFMR CHGOUT(120/200 MVA)

SUMMER PEAK LOAD CONDITIONS
JKSMITH 138 KV MAXIMUM BUS GENERATION: 330 MW-1999S ; 990 MW-2002S

OUTAGED FACILITY			MONITORED FACILITY							TOTAL		
							FLOW MVA			JKSMITH	THRESHOLD	
FROM	TO		FROM	TO	RATING		1999S	2002S	GEN	GEN AT	OF FACILITY	DISPATCH
BUS	BUS	KV	BUS	BUS	KV	MVA	GEN	GEN	FACTOR	RATING	OVERLOAD	CONDITION
FAWKS KU	CLARK CO	138	DALE	BOONESTP	69	222	186	403	0.3288	440	CT #5 ADDED	5
FAWKS KU	CLARK CO	138	BOONES N	BOONES N	138-69	123	111	145	0.0521	566	KPE ADDED	5
CLARK CO	SPENC RD	138	CLARK CO	MTSTERKU	69	54	43	64	0.0306	680		4
JKSMITH	LK REB T	138	JKSMITH	DALE	138	295	114	425	0.4723	714		5
JKSMITH	DALE	138	JKSMITH	LK REB T	138	320	137	395	0.3912	799		5
AVON	DALE	138	DALE	THREEFKJ	138	222	139	254	0.1738	806		5
BOONES N	BOONES N	138-69	BOONESTP	AVON	69	222	89	273	0.2789	808		5
AVON	DALE	138	CLARK CO	CLARK CO	138-69	102	80	110	0.0459	820		5
AVON	DALE	138	CLARK CO	SYLVANIA	69	90	70	95	0.0380	851		5
AVON	DALE	138	FAWKS KU	CLARK CO	138	222	149	239	0.1358	866		5
AVON	DALE	138	FAWKES	THREEFKJ	138	222	131	240	0.1661	880		5
JKSMITH	DALE	138	JKSMITH	FAWKS KU	138	320	102	359	0.3889	890		5
AVON	DALE	138	SYLVANIA	PRKRSEAL	69	90	68	93	0.0376	913		5

ADDITIONAL FACILITY UPGRADES
TERMINAL FACILITY UPGRADE AT DALE SUBSTATION(JK SMITH LINE)

OUTAGED FACILITY			MONITORED FACILITY							TOTAL		
							FLOW MVA			JKSMITH	THRESHOLD	
FROM	TO		FROM	TO	RATING		1999S	2002S	GEN	GEN AT	OF FACILITY	DISPATCH
BUS	BUS	KV	BUS	BUS	KV	MVA	GEN	GEN	FACTOR	RATING	OVERLOAD	CONDITION
JKSMITH	LK REB T	138	JKSMITH	DALE	138	320	114	425	0.4723	767	KPE ADDED	5
JKSMITH	DALE	138	JKSMITH	LK REB T	138	320	137	395	0.3912	799		5
JKSMITH	DALE	138	JKSMITH	FAWKS KU	138	320	102	359	0.3889	890		5

FIGURE 5
CALCULATION OF OVERLOADS BY JK SMITH GENERATION

JKSMITH-FAWKES EKPC RETERMINATED AT FAWKES KU
JKSMITH-LAKE REBA TAP 138 KV ADDED(954 MCM)
LAKE REBA TAP 161-138 KV XFMR CHGOUT(120/200 MVA)

WINTER PEAK LOAD CONDITIONS
JKSMITH 138 KV MAXIMUM BUS GENERATION: 447 MW-1999W ; 1234 MW-2002W

OUTAGED FACILITY			MONITORED FACILITY							TOTAL JKSMITH GEN AT RATING	THRESHOLD OF FACILITY OVERLOAD	DISPATCH CONDITION
FROM BUS	TO BUS	KV	FROM BUS	TO BUS	RATING KV	RATING MVA	FLOW MVA 1999W GEN	FLOW MVA 2002W GEN	GEN FACTOR			
JKSMITH	LK REB T	138	JKSMITH	DALE	138	295	147	524	0.4797	755	KPE ADDED	5
FAWKS KU	CLARK CO	138	DALE	BOONESTP	138	278	160	423	0.3342	801		4
LK REB T	LK REB T	161-138	LK REBA	LK REBA	138-69	116	104	125	0.0261	904		1
JKSMITH	DALE	138	JKSMITH	LK REB T	138	400	180	495	0.4002	996		2
FAWKS KU	CLARK CO	138	BOONES N	BOONES N	138-69	140	109	150	0.0528	1044		4
FAWKS KU	LK REB T	138-161	POWELLCO	POWELLCO	161-138	220	150	237	0.1111	1081		1
JKSMITH	DALE	138	JKSMITH	FAWKS KU	138	400	134	448	0.3993	1114		5
CLARK CO	SPENC RD	138	CLARK CO	MTSTERKU	69	66	45	69	0.0304	1135		4
AVON	DALE	138	DALE	THREEFKJ	138	278	150	290	0.1782	1166		5
FAWKS KU	LK REB T	138-161	BOONESTP	AVON	138	278	57	291	0.2982	1189		4
LAURELCO	LAURELCO	161-69	PITTSBRG	PITTSBRG	161-69	140	91	143	0.0664	1190		1

ADDITIONAL FACILITY UPGRADES
TERMINAL FACILITY UPGRADE AT DALE SUBSTATION(JK SMITH LINE)

OUTAGED FACILITY			MONITORED FACILITY							TOTAL JKSMITH GEN AT RATING	THRESHOLD OF FACILITY OVERLOAD	DISPATCH CONDITION
FROM BUS	TO BUS	KV	FROM BUS	TO BUS	RATING KV	RATING MVA	FLOW MVA 1999W GEN	FLOW MVA 2002W GEN	GEN FACTOR			
JKSMITH	LK REB T	138	JKSMITH	DALE	138	400	147	524	0.4797	974	KPE ADDED	5
JKSMITH	DALE	138	JKSMITH	LK REB T	138	400	180	495	0.4002	996		2
JKSMITH	DALE	138	JKSMITH	FAWKS KU	138	400	134	448	0.3993	1114		5

REMOVE FACILITY UPGRADES
JKSMITH-FAWKES EKPC RETERMINATED AT FAWKES KU

OUTAGED FACILITY			MONITORED FACILITY							TOTAL JKSMITH GEN AT RATING	THRESHOLD OF FACILITY OVERLOAD	DISPATCH CONDITION
FROM BUS	TO BUS	KV	FROM BUS	TO BUS	RATING KV	RATING MVA	FLOW MVA 1999W GEN	FLOW MVA 2002W GEN	GEN FACTOR			
JKSMITH	LK REB T	138	FAWKESEK	FAWKS KU	138	287	280	504	0.3525	467	CT #4 ADDED	3

FIGURE 6
CALCULATION OF OVERLOADS BY JK SMITH GENERATION

JKSMITH-FAWKES EKPC RETERMINATED AT FAWKES KU
JKSMITH-LAKE REBA TAP 138 KV ADDED(954 MCM)
LAKE REBA TAP 161-138 KV XFMR CHANGE OUT(120/200 MVA)
DALE-BOONESBORO TAP RECONDUCTORED(2-477 MCM)
JKSMITH-SPENCER ROAD 138 KV ADDED(954 MCM)

SUMMER PEAK LOAD CONDITIONS
JKSMITH 138 KV MAXIMUM BUS GENERATION: 330 MW-1999S ; 990 MW-2002S

OUTAGED FACILITY			MONITORED FACILITY							TOTAL		
							FLOW MVA			JKSMITH	THRESHOLD	
FROM	TO		FROM	TO		RATING	1999S	2002S	GEN	GEN AT	OF FACILITY	DISPATCH
BUS	BUS	KV	BUS	BUS	KV	MVA	GEN	GEN	FACTOR	RATING	OVERLOAD	CONDITION
RODBURN	SPENC RD	138	SPENC RD	SPENC RD	138-69	62	66	95	0.0435	229		4
AVON	DALE	138	CLARK CO	SYLVANIA	69	90	83	120	0.0562	462	CT #5 ADDED	5
AVON	DALE	138	SYLVANIA	PRKRSEAL	69	90	80	117	0.0558	504	KPE ADDED	5
SPENC RD	SPENC RD	138-69	FARMERS	FARMERS	138-69	46	42	49	0.0136	594		1
AVON	DALE	138	CLARK CO	CLARK CO	138-69	102	81	114	0.0500	748		5
AVON	DALE	138	PRKRSEAL	WINCHSTR	69	90	63	99	0.0538	825		5
RODBURN	SPENC RD	138	BOONESTP	AVON	69	222	61	241	0.2721	922		5
JKSMITH	LK REB T	138	JKSMITH	DALE	138	295	62	315	0.3832	938		5
JKSMITH	SPENC RD	138	JKSMITH	DALE	138	295	70	313	0.3674	941		5

ADDITIONAL FACILITY UPGRADES
SPENCER ROAD 138-69 KV TRANSFORMER CHANGE OUT(50/83 MVA)
CLARK CO-SYLVANIA-PARKER SEAL-WINCHESTER LINE RECONDUCTORED(795 MCM)
FARMERS 138-69 KV TRANSFORMER CHANGE OUT(30/50 MVA)
CLARK CO 138-69 KV TRANSFORMER CHANGE OUT(80/133 MVA)
BOONESBORO TAP-AVON RECONDUCTORED(954 MCM)
TERMINAL FACILITY UPGRADE AT DALE SUBSTATION(JK SMITH LINE)

OUTAGED FACILITY			MONITORED FACILITY							TOTAL		
							FLOW MVA			JKSMITH	THRESHOLD	
FROM	TO		FROM	TO		RATING	1999S	2002S	GEN	GEN AT	OF FACILITY	DISPATCH
BUS	BUS	KV	BUS	BUS	KV	MVA	GEN	GEN	FACTOR	RATING	OVERLOAD	CONDITION
JKSMITH	LK REB T	138	JKSMITH	DALE	138	320	62	315	0.3832	1003	KPE + 13 MW	5
JKSMITH	SPENC RD	138	JKSMITH	DALE	138	320	70	313	0.3674	1009	KPE + 19 MW	5

FIGURE 6

CALCULATION OF OVERLOADS BY JK SMITH GENERATION

JKSMITH-FAWKES EKPC RETERMINATED AT FAWKES KU
JKSMITH-LAKE REBA TAP 138 KV ADDED(954 MCM)
LAKE REBA TAP 161-138 KV XFMR CHANGE OUT(120/200 MVA)
DALE-BOONESBORO TAP RECONDUCTORED(2-477 MCM)
JKSMITH-SPENCER ROAD 138 KV ADDED(954 MCM)

WINTER PEAK LOAD CONDITIONS
JKSMITH 138 KV MAXIMUM BUS GENERATION: 447 MW-1999W ; 1234 MW-2002W

OUTAGED FACILITY			MONITORED FACILITY							TOTAL		
							FLOW MVA			JKSMITH	THRESHOLD	
FROM	TO		FROM	TO		RATING	1999W	2002W	GEN	GEN AT	OF FACILITY	DISPATCH
BUS	BUS	KV	BUS	BUS	KV	MVA	GEN	GEN	FACTOR	RATING	OVERLOAD	CONDITION
JKSMITH	LK REB T	138	JKSMITH	DALE	138	295	93	397	0.3870	970	KPE ADDED	5
JKSMITH	SPENC RD	138	JKSMITH	DALE	138	295	88	382	0.3741	1000		5
LK REB T	LK REB T	161-138	LK REBA	LK REBA	138-69	116	102	119	0.0220	1093		1
LAURELCO	LAURELCO	161-69	PITTSBRG	PITTSBRG	161-69	140	90	141	0.0648	1221		1

ADDITIONAL FACILITY UPGRADES
LAKE REBA 138-69 KV TRANSFORMER CHANGE OUT(60/100 MVA)
TERMINAL FACILITY UPGRADE AT DALE SUBSTATION(JK SMITH LINE)

OUTAGED FACILITY			MONITORED FACILITY							TOTAL		
							FLOW MVA			JKSMITH	THRESHOLD	
FROM	TO		FROM	TO		RATING	1999W	2002W	GEN	GEN AT	OF FACILITY	DISPATCH
BUS	BUS	KV	BUS	BUS	KV	MVA	GEN	GEN	FACTOR	RATING	OVERLOAD	CONDITION
JKSMITH	LK REB T	138	JKSMITH	DALE	138	400	93	397	0.3870	1241	KPE + 7 MW	5
JKSMITH	SPENC RD	138	JKSMITH	DALE	138	400	88	382	0.3741	1281	KPE + 47 MW	5

FIGURE 7

CALCULATION OF OVERLOADS BY JK SMITH GENERATION

JKSMITH-FAWKES EKPC RETERMINATED AT FAWKES KU
JKSMITH-LAKE REBA TAP 138 KV ADDED(954 MCM)
LAKE REBA TAP 161-138 KV XFMR CHANGE OUT(120/200 MVA)
DALE-BOONESBORO TAP RECONDUCTORED(2-477 MCM)
JKSMITH-SPENCER ROAD 138 KV ADDED(954 MCM)
JKSMITH-AVON 345 KV ADDED(2-954 MCM);JKSMITH 345-138 KV ADDED(450 MVA)

SUMMER PEAK LOAD CONDITIONS
JKSMITH 138 KV MAXIMUM BUS GENERATION: 330 MW-1999S ; 990 MW-2002S

OUTAGED FACILITY			MONITORED FACILITY							TOTAL		
							FLOW MVA			JKSMITH	THRESHOLD	
FROM	TO		FROM	TO		RATING	1999S	2002S	GEN	GEN AT	OF FACILITY	DISPATCH
BUS	BUS	KV	BUS	BUS	KV	MVA	GEN	GEN	FACTOR	RATING	OVERLOAD	CONDITION
RODBURN	SPENC RD	138	SPENC RD	SPENC RD	138-69	62	65	84	0.0292	238		4
SPENC RD	SPENC RD	138-69	FARMERS	FARMERS	138-69	46	43	49	0.0106	576	KPE ADDED	1
AVON	DALE	138	CLARK CO	SYLVANIA	69	90	78	99	0.0314	703		5
AVON	DALE	138	SYLVANIA	PRKRSEAL	69	90	76	97	0.0309	780		5
JKSMITH	AVON	345	BOONESTP	AVON	69	222	46	208	0.2453	1048	KPE + 58 MW	5
JKSMITH	AVON	345	JKSMITH	DALE	138	295	34	240	0.3118	1168	KPE + 178 MW	5
AVON	DALE	138	CLARK CO	CLARK CO	138-69	102	77	96	0.0282	1210	KPE + 220 MW	5
AVON	DALE	138	PRKRSEAL	WINCHSTR	69	90	59	78	0.0286	1402	KPE + 412 MW	5

ADDITIONAL FACILITY UPGRADES
SPENCER ROAD 138-69 KV TRANSFORMER CHANGE OUT(50/83 MVA)
CLARK CO-SYLVANIA-PARKER SEAL LINE RECONDUCTORED(795 MCM)
FARMERS 138-69 KV TRANSFORMER CHANGE OUT(30/50 MVA)
TERMINAL FACILITY UPGRADE AT DALE SUBSTATION(JK SMITH LINE)

OUTAGED FACILITY			MONITORED FACILITY							TOTAL		
							FLOW MVA			JKSMITH	THRESHOLD	
FROM	TO		FROM	TO		RATING	1999S	2002S	GEN	GEN AT	OF FACILITY	DISPATCH
BUS	BUS	KV	BUS	BUS	KV	MVA	GEN	GEN	FACTOR	RATING	OVERLOAD	CONDITION
JKSMITH	AVON	345	BOONESTP	AVON	69	222	46	208	0.2453	1048	KPE + 58 MW	5
AVON	DALE	138	CLARK CO	CLARK CO	138-69	102	77	96	0.0282	1210	KPE + 220 MW	5
JKSMITH	AVON	345	JKSMITH	DALE	138	320	34	240	0.3118	1248	KPE + 258 MW	5
AVON	DALE	138	PRKRSEAL	WINCHSTR	69	90	59	78	0.0286	1402	KPE + 412 MW	5

FIGURE 7
CALCULATION OF OVERLOADS BY JK SMITH GENERATION

JKSMITH-FAWKES EKPC RETERMINATED AT FAWKES KU
JKSMITH-LAKE REBA TAP 138 KV ADDED(954 MCM)
LAKE REBA TAP 161-138 KV XFMR CHANGE OUT(120/200 MVA)
DALE-BOONESBORO TAP RECONDUCTORED(2-477 MCM)
JKSMITH-SPENCER ROAD 138 KV ADDED(954 MCM)
JKSMITH-AVON 345 KV ADDED(2-954 MCM);JKSMITH 345-138 KV ADDED(450 MVA)

WINTER PEAK LOAD CONDITIONS
JKSMITH 138 KV MAXIMUM BUS GENERATION: 447 MW-1999W ; 1234 MW-2002W

OUTAGED FACILITY			MONITORED FACILITY							TOTAL		
							FLOW MVA			JKSMITH	THRESHOLD	
FROM	TO		FROM	TO		RATING	1999W	2002W	GEN	GEN AT	OF FACILITY	DISPATCH
BUS	BUS	KV	BUS	BUS	KV	MVA	GEN	GEN	FACTOR	RATING	OVERLOAD	CONDITION
JKSMITH	AVON	345	JKSMITH	DALE	138	295	52	299	0.3147	1220	KPE ADDED	5
LAURELCO	LAURELCO	161-69	PITTSBRG	PITTSBRG	161-69	140	91	138	0.0597	1264	KPE + 30 MW	1
LK REB T	LK REB T	161-138	LK REBA	LK REBA	138-69	116	105	115	0.0125	1346	KPE + 112 MW	1

ADDITIONAL FACILITY UPGRADES
TERMINAL FACILITY UPGRADE AT DALE SUBSTATION(JK SMITH LINE)

OUTAGED FACILITY			MONITORED FACILITY							TOTAL		
							FLOW MVA			JKSMITH	THRESHOLD	
FROM	TO		FROM	TO		RATING	1999W	2002W	GEN	GEN AT	OF FACILITY	DISPATCH
BUS	BUS	KV	BUS	BUS	KV	MVA	GEN	GEN	FACTOR	RATING	OVERLOAD	CONDITION
LK REB T	LK REB T	161-138	LK REBA	LK REBA	138-69	116	105	115	0.0125	1346	KPE + 112 MW	1
JKSMITH	AVON	345	JKSMITH	DALE	138	400	52	299	0.3147	1554	KPE + 320 MW	5

FIGURE 8
CALCULATION OF OVERLOADS BY JK SMITH GENERATION

JKSMITH-LAKE REBA TAP 138 KV ADDED(954 MCM)
JKSMITH-AVON 345 KV ADDED(2-954 MCM);JKSMITH 345-138 KV ADDED(450 MVA)
DALE-BOONESBORO TAP RECONDUCTORED(2-477 MCM)
JKSMITH-FAWKES EKPC RETERMINATED AT FAWKES KU
LAKE REBA TAP 161-138 KV XFMR CHANGE OUT(120/200 MVA)

SUMMER PEAK LOAD CONDITIONS
JKSMITH 138 KV MAXIMUM BUS GENERATION: 330 MW-1999S ; 990 MW-2002S

OUTAGED FACILITY			MONITORED FACILITY							TOTAL JKSMITH		
							FLOW MVA					
FROM BUS	TO BUS	KV	FROM BUS	TO BUS	KV	RATING MVA	1999S GEN	2002S GEN	GEN FACTOR	GEN AT RATING	THRESHOLD OF FACILITY OVERLOAD	DISPATCH CONDITION
FAWKES	CLARK CO	138	BOONES N	BOONES N	138-69	123	108	135	0.0405	698	KPE ADDED	4
CLARK CO	SPENC RD	138	CLARK CO	MTSTERKU	69	54	43	56	0.0194	913		4
JKSMITH	AVON	345	BOONESTP	AVON	69	222	60	236	0.2670	938		5
JKSMITH	AVON	345	JKSMITH	DALE	138	295	70	313	0.3674	941		5

ADDITIONAL FACILITY UPGRADES
BOONESBORO NORTH 138-69 KV TRANSFORMER CHANGE OUT(80/133 MVA)
CLARK CO-MT.STERLING 2/0 CU SECTION RECONDUCTORED(397.5 MCM)
BOONESBORO TAP-AVON RECONDUCTORED(954 MCM)
TERMINAL FACILITY UPGRADE AT DALE SUBSTATION(JK SMITH LINE)

OUTAGED FACILITY			MONITORED FACILITY							TOTAL JKSMITH		
							FLOW MVA					
FROM BUS	TO BUS	KV	FROM BUS	TO BUS	KV	RATING MVA	1999S GEN	2002S GEN	GEN FACTOR	GEN AT RATING	THRESHOLD OF FACILITY OVERLOAD	DISPATCH CONDITION
JKSMITH	AVON	345	JKSMITH	DALE	138	320	70	313	0.3674	1009	KPE + 19 MW	5

FIGURE 8
CALCULATION OF OVERLOADS BY JK SMITH GENERATION

JKSMITH-LAKE REBA TAP 138 KV ADDED(954 MCM)
JKSMITH-AVON 345 KV ADDED(2-954 MCM);JKSMITH 345-138 KV ADDED(450 MVA)
DALE-BOONESBORO TAP RECONDUCTORED(2-477 MCM)
JKSMITH-FAWKES EKPC RETERMINATED AT FAWKES KU
LAKE REBA TAP 161-138 KV XFMR CHANGE OUT(120/200 MVA)

WINTER PEAK LOAD CONDITIONS
JKSMITH 138 KV MAXIMUM BUS GENERATION: 447 MW-1999W ; 1234 MW-2002W

OUTAGED FACILITY			MONITORED FACILITY				FLOW MVA			TOTAL		
FROM BUS	TO BUS	KV	FROM BUS	TO BUS	KV	RATING MVA	1999W GEN	2002W GEN	GEN FACTOR	JKSMITH GEN AT RATING	THRESHOLD OF FACILITY OVERLOAD	DISPATCH CONDITION
JKSMITH	AVON	345	JKSMITH	DALE	138	295	88	382	0.3741	1000	KPE ADDED	5
LK REB T	LK REB T	161-138	LK REBA	LK REBA	138-69	116	107	118	0.0145	1096		1
LAURELCO	LAURELCO	161-69	PITTSBRG	PITTSBRG	161-69	140	92	140	0.0609	1239	KPE + 5 MW	1
JKSMITH	FAWKS KU	138	JKSMITH	LK REB T	138	400	223	390	0.2125	1281	KPE + 47 MW	2

<u>ADDITIONAL FACILITY UPGRADES</u>
LAKE REBA 138-69 KV TRANSFORMER CHANGE OUT(60/100 MVA)
TERMINAL FACILITY UPGRADE AT DALE SUBSTATION(JK SMITH LINE)

OUTAGED FACILITY			MONITORED FACILITY				FLOW MVA			TOTAL		
FROM BUS	TO BUS	KV	FROM BUS	TO BUS	KV	RATING MVA	1999W GEN	2002W GEN	GEN FACTOR	JKSMITH GEN AT RATING	THRESHOLD OF FACILITY OVERLOAD	DISPATCH CONDITION
JKSMITH	AVON	345	JKSMITH	DALE	138	400	88	382	0.3741	1281	KPE + 47 MW	5
JKSMITH	FAWKS KU	138	JKSMITH	LK REB T	138	400	223	390	0.2125	1281	KPE + 47 MW	2

EXHIBITS

EXHIBIT I
EAST KENTUCKY POWER COOPERATIVE PRESENT WORTH CASH ANALYSIS

JK SMITH CT #4 AND #5 PLUS KPE GENERATING SCENARIO--ALTERNATIVE 1
JK SMITH-LAKE REBA TAP 138 KV(954 MCM) ADDED IN 2001;JK SMITH-SPENCER ROAD 138 KV(954 MCM) ADDED IN 2003
KPE 345-138 KV SUBSTATION(450 MVA) AND KPE-AVON 345 KV(2-954 MCM) ADDED IN 2006

Project Name	Estimated Cost	Effective Year of Cost	Inflated Cost + IDC	Install Date (Year)	Discount Rate	Escalation	IDC @ 5.0%	Compound Basis	Fixed Charge Rate	Annual Fixed Charges	# Yrs. Amort.	Present Worth Cash ($2000)
A. NEW FACILITIES												
Fawkes KU Substation Addition	427,000	2000	448,350	2000	7.30%	0.0%	21,350	Annually	12.57%	56,358	30	678,774
(Terminate J.K. Smith-Fawkes EKPC Line)												
JK Smith GSU Cost 138 kV	1,075,000	2000	1,157,415	2001	7.30%	2.5%	55,115	Annually	12.57%	145,487	30	1,616,665
(C.T. #4--80/108 MW Unit)												
JK Smith GSU Cost 138 kV	1,152,000	2000	1,240,318	2001	7.30%	2.5%	59,063	Annually	12.57%	155,908	30	1,732,464
(C.T. #5--80/108 MW Unit)												
J. K. Smith - Lake Reba Tap 138 kV Line	2,988,000	1999	3,292,322	2001	7.30%	4.9%	156,777	Annually	12.57%	413,845	30	4,598,683
(12 miles 954 MCM)												
J. K. Smith Substation Terminal Facilities	293,000	2000	315,463	2001	7.30%	2.5%	15,022	Annually	12.57%	39,654	30	440,635
Lake Reba Tap Substation Terminal Facilities	285,000	2000	306,849	2001	7.30%	2.5%	14,612	Annually	12.57%	38,571	30	428,604
KPE 138 kV Substation	4,141,000	2000	4,698,937	2003	7.30%	8.1%	223,759	Annually	12.57%	590,656	30	5,572,288
(C.C #1--500/570 MW Unit--138/345 kV)												
KPE - J. K. Smith 138 kV Circuits #1, 2	585,600	1999	680,043	2003	7.30%	10.6%	32,383	Annually	12.57%	85,481	30	806,437
(2-954 MCM, 1.6 miles total)												
J. K. Smith Substation Terminal Facilities	771,000	2000	874,881	2003	7.30%	8.1%	41,661	Annually	12.57%	109,972	30	1,037,487
J. K. Smith - Spencer Road 138 kV Line	4,233,000	1999	4,915,683	2003	7.30%	10.6%	234,080	Annually	12.57%	617,901	30	5,829,319
(17 miles 954 MCM)												
J. K. Smith Substation Terminal Facilities	478,000	2000	542,403	2003	7.30%	8.1%	25,829	Annually	12.57%	68,180	30	643,215
Spencer Road Substation Terminal Facilities	285,000	2000	323,399	2003	7.30%	8.1%	15,400	Annually	12.57%	40,651	30	383,507
JK Smith GSU Cost 138 kV	1,152,000	2000	1,418,140	2006	7.30%	17.2%	67,530	Annually	12.57%	178,260	30	1,305,104
(C.T. #6--80/108 MW Unit)												
KPE 345/138 kV Addition(270/450 MVA)	3,322,000	2000	4,089,463	2006	7.30%	17.2%	194,736	Annually	12.57%	514,045	30	3,763,504
KPE - Avon 345 kV Line	6,800,000	1999	8,566,763	2006	7.30%	20.0%	407,941	Annually	12.57%	1,076,842	30	7,883,933
(17 miles, 2-954 MCM)												
Avon Substation Terminal Facilities	883,000	2000	1,086,994	2006	7.30%	17.2%	51,762	Annually	12.57%	136,635	30	1,000,353
JK Smith GSU Cost 138 kV	1,152,000	2000	1,451,930	2007	7.30%	20.0%	69,140	Annually	12.57%	182,508	30	1,224,750
(C.T. #7--80/108 MW Unit)												
Total New Facilities Cost($1,000,000)	30.0		35.4									38.9
Upgraded Facilities Cost--Page 2($1,000,000)	4.7		5.3									5.2
Additional Losses Cost(Versus Alternative 2)												2.5
Grand Total Cost All Facilities($1,000,000)	34.7		40.7									46.7

EXHIBIT I
EAST KENTUCKY POWER COOPERATIVE PRESENT WORTH CASH ANALYSIS

JK SMITH CT #4 AND #5 PLUS KPE GENERATING SCENARIO--ALTERNATIVE 1
JK SMITH-LAKE REBA TAP 138 KV(954 MCM) ADDED IN 2001;JK SMITH-SPENCER ROAD 138 KV(954 MCM) ADDED IN 2003
KPE 345-138 KV SUBSTATION(450 MVA) AND KPE-AVON 345 KV(2-954 MCM) ADDED IN 2006

Project Name	Estimated Cost	Effective Year of Cost	Inflated Cost + IDC	Install Date (Year)	Discount Rate	Escalation	IDC @ 5.0%	Compound Basis	Fixed Charge Rate	Annual Fixed Charges	# Yrs. Amort.	Present Worth Cash ($2000)
B. UPGRADED FACILITIES												
Lake Reba Tap 161-138 kV Substation (Transformer Change Out--120/200 MVA)*	996,000	2000	1,072,358	2001	7.30%	2.5%	51,065	Annually	9.02%	96,727	30	1,074,836
Dale - Boonesboro Tap 138 kV Line (2.8 miles, 2-477 MCM, Reconductor)	252,000	1999	285,612	2002	7.30%	7.9%	13,601	Annually	9.02%	25,762	30	263,896
Dale Substation Upgrade(2000A)	186,000	1998	218,076	2003	7.30%	11.7%	10,385	Annually	9.02%	19,670	30	185,572
Spencer Road 138-69 kV Substation (Transformer Change Out--50/83 MVA) (Moved from Boonesboro North)	57,000	2000	64,680	2003	7.30%	8.1%	3,080	Annually	9.02%	5,834	30	55,039
Farmers 138-69 kV Substation (Transformer Change Out--30/50 MVA) (Moved from Spencer Road)	57,000	2000	64,680	2003	7.30%	8.1%	3,080	Annually	9.02%	5,834	30	55,039
Clark Co.-Winchester 69 kV Line (1.69 miles, 795 MCM, Rebuild)	251,810	1999	292,421	2003	7.30%	10.6%	13,925	Annually	9.02%	26,376	30	248,836
Avon - Boonesboro Tap 138 kV Line (8.8 miles, 954 MCM, Reconductor)	528,000	1999	613,154	2003	7.30%	10.6%	29,198	Annually	9.02%	55,306	30	521,765
Clark Co 138-69 kV Substation (Transformer Change Out--80/133 MVA)*	353,000	2000	400,561	2003	7.30%	8.1%	19,074	Annually	9.02%	36,131	30	340,859
Lake Reba 138-69 kV Substation (Transformer Change Out--60/100 MVA)	579,000	2000	657,011	2003	7.30%	8.1%	31,286	Annually	9.02%	59,262	30	559,085
Pittsburg 161-69 kV Substation (2nd 161-69 kV Transformer--60/100 MVA)	1,434,000	2000	1,627,210	2003	7.30%	8.1%	77,486	Annually	12.57%	204,540	30	1,929,645
Total Upgraded Facilities Cost($1,000,000)	4.7		5.3									5.2

* Salvage existing transformer

EXHIBIT I
EAST KENTUCKY POWER COOPERATIVE PRESENT WORTH CASH ANALYSIS

SYSTEM LOSS COST CALCULATION ALTERNATIVE 1

					TOTAL ENERGY AND CAPACITY COSTS							
		EKPC-KU SYSTEM			ENERGY COST			CAPACITY COST				PRESENT
YEAR	#YRS	LOSSES MW	LOAD FACTOR	LOSS FACTOR	LOSSES MW	COST $/MWH	TOTAL COST $	LOSSES MW	COST $/KW-YR	TOTAL COST $		WORTH 2000$
2000	1.00	253.28	0.500	0.290	253.28	23.40	15,057,838	0.000	500.00	0		15,057,838
2001	1.00	269.57	0.500	0.290	269.57	24.25	16,608,393	16.290	511.91	8,339,155		23,250,278
2002	1.00	260.16	0.500	0.290	260.16	25.13	16,611,040	0.000	524.10	0		14,427,709
2003	1.00	266.50	0.500	0.290	266.50	26.05	17,633,849	0.000	536.59	0		14,274,074
2004	1.00	263.63	0.500	0.290	263.63	26.99	18,077,489	0.000	549.37	0		13,637,640
2005	1.00	297.00	0.500	0.290	297.00	27.97	21,105,212	27.431	562.46	15,428,816		25,686,146
2006	1.00	306.26	0.500	0.290	306.26	28.99	22,553,271	9.254	575.85	5,329,223		18,269,779
2007	1.00	302.40	0.500	0.290	302.40	30.04	23,078,299	0.000	589.57	0		14,093,074
TOTALS:	8.00											138,696,539

Notes:

DISCOUNT RATE = 7.3%

EXHIBIT II
EAST KENTUCKY POWER COOPERATIVE PRESENT WORTH CASH ANALYSIS

JK SMITH CT #4 AND #5 PLUS KPE GENERATING SCENARIO--ALTERNATIVE 2
JK SMITH-LAKE REBA TAP 138 KV(954 MCM) ADDED IN 2001;JK SMITH-SPENCER ROAD 138 KV(954 MCM) ADDED IN 2003
KPE 345-138 KV SUBSTATION(450 MVA) AND KPE-AVON 345 KV(2-954 MCM) ADDED IN 2003

Project Name	Estimated Cost	Effective Year of Cost	Inflated Cost + IDC	Install Date (Year)	Discount Rate	Escalation	IDC @ 5.0%	Compound Basis	Fixed Charge Rate	Annual Fixed Charges	# Yrs. Amort.	Present Worth Cash ($2000)
A. NEW FACILITIES												
Fawkes KU Substation Addition *(Terminate J.K. Smith-Fawkes EKPC Line)*	427,000	2000	448,350	2000	7.30%	0.0%	21,350	Annually	12.57%	56,358	30	678,774
JK Smith GSU Cost 138 kV (C.T. #4--80/108 MW Unit)	1,075,000	2000	1,157,415	2001	7.30%	2.5%	55,115	Annually	12.57%	145,487	30	1,616,665
JK Smith GSU Cost 138 kV (C.T. #5--80/108 MW Unit)	1,152,000	2000	1,240,318	2001	7.30%	2.5%	59,063	Annually	12.57%	155,908	30	1,732,464
J. K. Smith - Lake Reba Tap 138 kV Line (12 miles 954 MCM)	2,988,000	1999	3,292,322	2001	7.30%	4.9%	156,777	Annually	12.57%	413,845	30	4,598,683
J. K. Smith Substation Terminal Facilities	293,000	2000	315,463	2001	7.30%	2.5%	15,022	Annually	12.57%	39,654	30	440,635
Lake Reba Tap Substation Terminal Facilities	285,000	2000	306,849	2001	7.30%	2.5%	14,612	Annually	12.57%	38,571	30	428,604
KPE 138 kV Substation (C.C #1--500/570 MW Unit--138/345 kV)	4,141,000	2000	4,698,937	2003	7.30%	8.1%	223,759	Annually	12.57%	590,656	30	5,572,288
KPE - J. K. Smith 138 kV Circuits #1, 2 (2-954 MCM, 1.6 miles total)	585,600	1999	680,043	2003	7.30%	10.6%	32,383	Annually	12.57%	85,481	30	806,437
J. K. Smith Substation Terminal Facilities	771,000	2000	874,881	2003	7.30%	8.1%	41,661	Annually	12.57%	109,972	30	1,037,487
J. K. Smith - Spencer Road 138 kV Line (17 miles 954 MCM)	4,233,000	1999	4,915,683	2003	7.30%	10.6%	234,080	Annually	12.57%	617,901	30	5,829,319
J. K. Smith Substation Terminal Facilities	478,000	2000	542,403	2003	7.30%	8.1%	25,829	Annually	12.57%	68,180	30	643,215
Spencer Road Substation Terminal Facilities	285,000	2000	323,399	2003	7.30%	8.1%	15,400	Annually	12.57%	40,651	30	383,507
KPE 345/138 kV Addition(270/450 MVA)	3,322,000	2000	3,769,589	2003	7.30%	8.1%	179,504	Annually	12.57%	473,837	30	4,470,210
KPE - Avon 345 kV Line (17 miles, 2-954 MCM)	6,800,000	1999	7,896,679	2003	7.30%	10.6%	376,032	Annually	12.57%	992,613	30	9,364,367
Avon Substation Terminal Facilities	883,000	2000	1,001,971	2003	7.30%	8.1%	47,713	Annually	12.57%	125,948	30	1,188,199
JK Smith GSU Cost 138 kV (C.T. #6--80/108 MW Unit)	1,152,000	2000	1,418,140	2006	7.30%	17.2%	67,530	Annually	12.57%	178,260	30	1,305,104
JK Smith GSU Cost 138 kV (C.T. #7--80/108 MW Unit)	1,152,000	2000	1,451,930	2007	7.30%	20.0%	69,140	Annually	12.57%	182,508	30	1,224,750
Total New Facilities Cost($1,000,000)	30.0		34.3									41.3
Upgraded Facilities Cost($1,000,000)--Page 2	4.2		5.0									4.2
Grand Total Cost($1,000,000)	34.2		39.4									45.5

EXHIBIT II
EAST KENTUCKY POWER COOPERATIVE PRESENT WORTH CASH ANALYSIS

JK SMITH CT #4 AND #5 PLUS KPE GENERATING SCENARIO--ALTERNATIVE 2
JK SMITH-LAKE REBA TAP 138 KV(954 MCM) ADDED IN 2001;JK SMITH-SPENCER ROAD 138 KV(954 MCM) ADDED IN 2003
KPE 345-138 KV SUBSTATION(450 MVA) AND KPE-AVON 345 KV(2-954 MCM) ADDED IN 2003

Project Name	Estimated Cost	Effective Year of Cost	Inflated Cost + IDC	Install Date (Year)	Discount Rate	Escalation	IDC @ 5.0%	Compound Basis	Fixed Charge Rate	Annual Fixed Charges	# Yrs. Amort.	Present Worth Cash ($2000)
B. UPGRADED FACILITIES												
Lake Reba Tap 161-138 kV Substation (*Transformer Change Out--120/200 MVA*)*	996,000	2000	1,072,358	2001	7.30%	2.5%	51,065	Annually	9.02%	96,727	30	1,074,836
Dale - Boonesboro Tap 138 kV Line (2.8 miles, 2-477 MCM, Reconductor)	252,000	1999	285,612	2002	7.30%	7.9%	13,601	Annually	9.02%	25,762	30	263,896
Dale Substation Upgrade(2000A)	186,000	1998	218,076	2003	7.30%	11.7%	10,385	Annually	9.02%	19,670	30	185,572
Spencer Road 138-69 kV Substation (*Transformer Change Out--50/83 MVA*) (Moved from Boonesboro North)	57,000	2000	64,680	2003	7.30%	8.1%	3,080	Annually	9.02%	5,834	30	55,039
Farmers 138-69 kV Substation (Transformer Change Out--30/50 MVA) (Moved from Spencer Road)	57,000	2000	64,680	2003	7.30%	8.1%	3,080	Annually	9.02%	5,834	30	55,039
Clark Co.-Parker Seal 69 kV Line (0.77 miles, 795 MCM, Rebuild)	114,730	1999	133,233	2003	7.30%	10.6%	6,344	Annually	9.02%	12,018	30	113,375
Avon - Boonesboro Tap 138 kV Line (8.8 miles, 954 MCM, Reconductor)	528,000	1999	665,184	2006	7.30%	20.0%	31,675	Annually	9.02%	60,000	30	439,278
Lake Reba 138-69 kV Substation (Transformer Change Out--60/100 MVA)	579,000	2000	712,763	2006	7.30%	17.2%	33,941	Annually	9.02%	64,291	30	470,698
Pittsburg 161-69 kV Substation (2nd 161-69 kV Transformer--60/100 MVA)	1,434,000	2000	1,807,350	2007	7.30%	20.0%	86,064	Annually	12.57%	227,184	30	1,524,559
Total Upgraded Facilities Cost($1,000,000)	4.2		5.0									4.2

* Salvage existing transformer

EXHIBIT II
EAST KENTUCKY POWER COOPERATIVE PRESENT WORTH CASH ANALYSIS

SYSTEM LOSS COST CALCULATION ALTERNATIVE 2

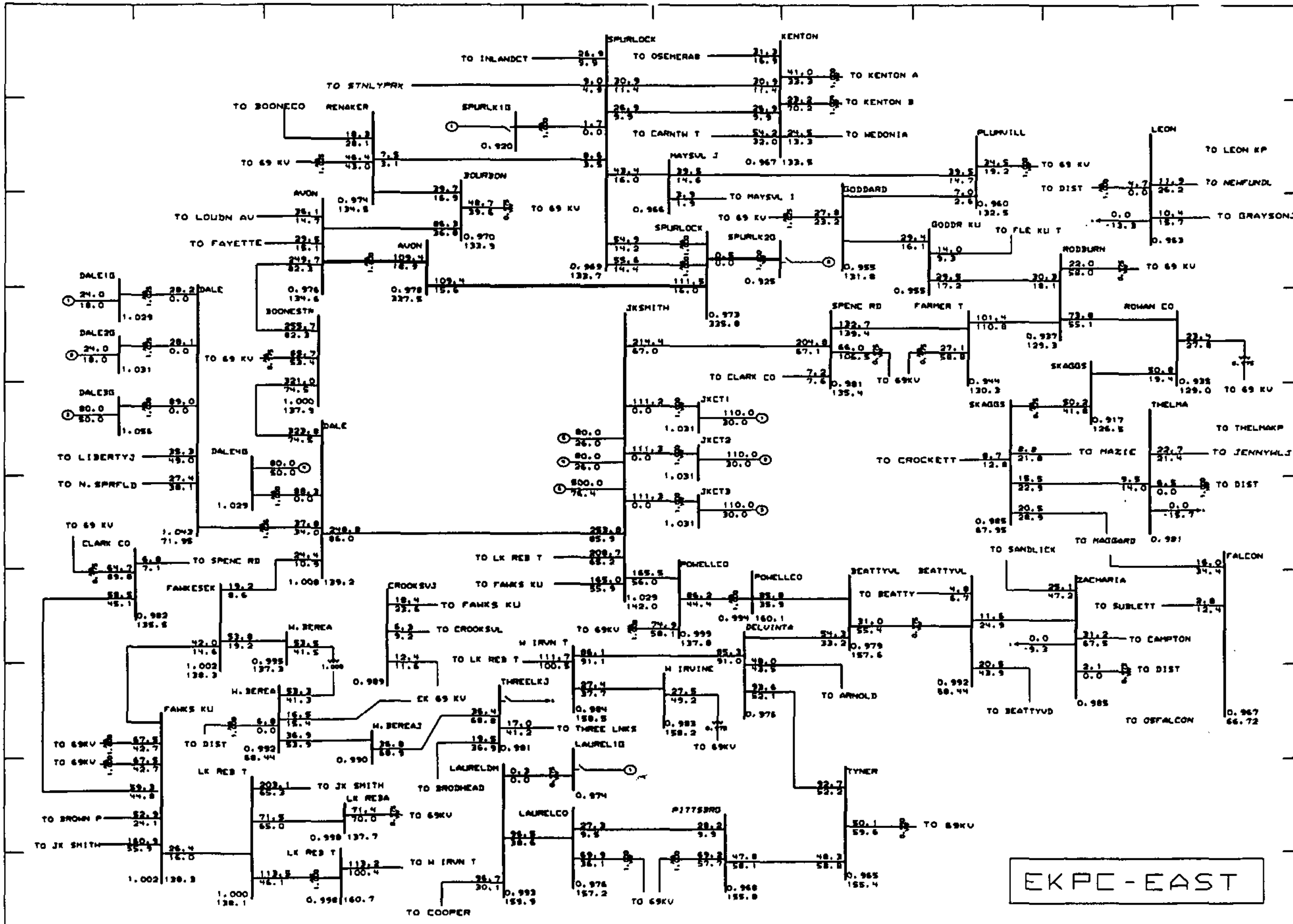
		EKPC-KU			TOTAL ENERGY AND CAPACITY COSTS						
		SYSTEM			ENERGY COST			CAPACITY COST			PRESENT
		LOSSES	LOAD	LOSS	LOSSES	COST	TOTAL	LOSSES	COST	TOTAL	WORTH
YEAR	#YRS	MW	FACTOR	FACTOR	MW	$/MWH	COST $	MW	$/KW-YR	COST $	2000$
2000	1.00	253.28	0.500	0.290	253.28	23.40	15,057,838	0.000	500.00	0	15,057,838
2001	1.00	269.57	0.500	0.290	269.57	24.25	16,608,393	16.290	511.91	8,339,155	23,250,278
2002	1.00	260.16	0.500	0.290	260.16	25.13	16,611,040	0.000	524.10	0	14,427,709
2003	1.00	266.50	0.500	0.290	266.50	26.05	17,633,849	0.000	536.59	0	14,274,074
2004	1.00	264.23	0.500	0.290	264.23	26.99	18,118,088	0.000	549.37	0	13,668,268
2005	1.00	288.90	0.500	0.290	288.90	27.97	20,529,351	19.327	562.46	10,870,810	22,076,654
2006	1.00	295.79	0.500	0.290	295.79	28.99	21,782,426	6.891	575.85	3,968,071	16,872,805
2007	1.00	302.58	0.500	0.290	302.58	30.04	23,091,663	6.789	589.57	4,002,481	16,545,404
TOTALS:	8.00										136,173,030

Notes:

DISCOUNT RATE = 7.3%

LOAD FLOW PLOTS

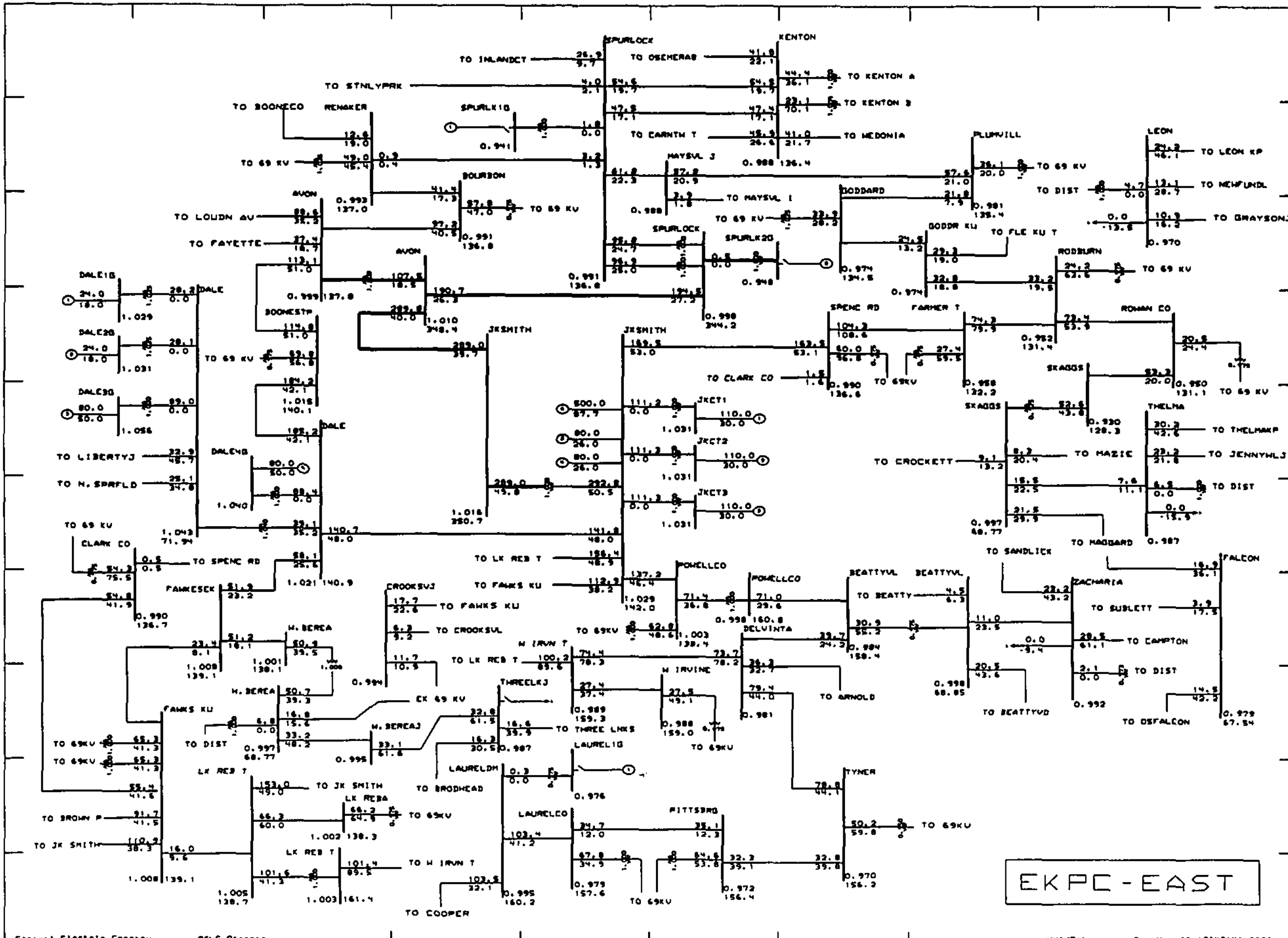
PLOT 1



General Electric Company PSLF Program MVA/Pct Tue May 23 12:41:20 2000

EAST KENTUCKY Power Cooperative	2002S KU-EKPC JOINT LF CASE 4/98;JKSMITH-FAWKES EK RETERM AT FAWKES KU JKSMITH GEN 990 MW(3-110,2-80,500) ;SPURLOCK #1+2 OFF;IMPORT 460 MW(TVA) JKSMITH-LAKE REBA TAP+SPENCER RD 138 KV ADDED(954 MCM)	JKSMITH 345-138KV ADD(450MVA);LKRBATP 161-138KV XFMR CHG(200MVA) RECONDUCTOR DALE-BOONESBORO TAP BUND 477 MCM-AVON 954 MCM	jk02e.drw 02ssplkoff.sav

PLOT 2



EAST KENTUCKY Power Cooperative

2002S KU-EKPC JOINT LF CASE 4/98;JKSMITH-FAWKES EK RETERM AT FAWKES KU
JKSMITH GEN 990 MW(3-110,2-80,500) ;SPURLOCK #1+2 OFF;IMPORT 445 MW(TVA)
JKSMITH-LAKEREBATAP+SPENCER RD 138KV(954MCM)+AVON-JKSMITH 345KV ADD(2-954MCM)

JKSMITH 345-138KV ADD(450MVA);LKRBATP 161-138KV XFMR CHG(200MVA)
RECONDUCTOR DALE-BOONESBORO TAP BUND 477 MCM

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KENTUCKY PUBLIC SERVICE COMMISSION SUBMITTAL

Development of Transmission Outlet Plan

E. A. Gilbert Unit No. 3 Located At Spurlock Generating Station, Maysville, Kentucky

February 2001

East Kentucky Power Cooperative Winchester, Kentucky

Stanley Consultants INC.

A Stanley Group Company
Engineering, Environmental and Construction Services - Worldwide

Executive Summary

This report presents the preliminary findings to date for the recommended transmission plan associated with the addition of the new E.A. Gilbert Unit 3 and a Future Generating Unit 4 to be located at East Kentucky Power Cooperative's (EKPC) existing Spurlock Generating Station. Both units are rated at 250 MW and scheduled for operation in November 2004 and May 2005. To coordinate the planning process such that construction for E.A. Gilbert 3 is part of an alternate plan, the transmission outlet planning addresses the full 500 MW additions at the Spurlock site. The recommended plan will identify those transmission facilities associated with E.A. Gilbert Unit No. 3.

This study forms the basis for EKPC's request for a Certificate of Public Convenience and Necessity from the Kentucky Public Services Commission (PSC). The current schedule plans for the PSC filing by EKPC to be in February 2001, with an amended filing in April 2001 for submittal of the final Transmission Outlet Plan.

Transmission power flow studies are currently being done to help determine the transmission requirements associated with the generation additions at the Spurlock site. The majority of these studies are being performed at the 2007 load level. EKPC's summer and winter native peak loads at this time are estimated to be 2,330 and 2,948 MW, respectively, based on information in its latest Power Requirements Study Forecast. In addition to the two new units at the Spurlock site, the study includes six new gas turbines at the J. K. Smith plant. Therefore, the total EKPC self-owned winter season generating capacity in 2007 will be 2,982 MW. The studies also include the J. K. Smith - Lake Reba Tap 138 kV line which is required with the addition of Units 4 and 5 at Smith.

Initially, seven different alternatives were developed along with their respective capital costs. Preliminary power flows were completed for these alternatives. A meeting between Stanley Consultants and EKPC's Transmission Expansion Committee (Committee) was held on January 5, 2001, to discuss the Initial Alternatives. The advantages and disadvantages of each

alternative were discussed with the Committee. The details of these discussions are included later in this report.

As a result of these discussions, two of the initial alternatives were eliminated with modifications made to some of the other alternatives. It was agreed that further analysis would be done for five Final Alternatives. These alternatives are defined below along with their preliminary capital costs:

Final Alternates

Alternate	Facility	Capital Costs
1A	Double Circuit 138 kV Line from Spurlock to interconnect with CINergy Foster/Stuart 138 kV line. Inland - Inland "T" 138 kV line. J.K. Smith- Spencer and Cranston -Rowan 138 kV lines.	
	Total Costs	**$14,581,000**
3	Double Circuit 345 kV Line from Spurlock to interconnect with CINergy Stuart - Zimmer 345 kV line.	
	Total Cost	**$17,178,000**
3A	Double Circuit 345 kV Line from Spurlock to interconnect with CINergy Stuart - Zimmer 345 kV line. Smith - Avon 345 kV and Smith 345/138 kV substation expansion. Smith - Spencer 138 kV line.	
	Total Cost	**$43,033,000**
4	Double Circuit 345 kV Line from Spurlock to interconnect with CINergy Stuart - Zimmer 345 kV line. Spurlock - Rowan 345 kV Line and Rowan 345/138 kV substation.	
	Total Cost	**$51,943,000**
4A	Double Circuit 345 kV line from Spurlock to interconnect with CINergy Stuart - Zimmer 345 kV line. Cranston - Rowan 138 kV line.	
	Total Cost	**$20,629,000**

All of the above interconnections with CINergy from the Spurlock site involve crossing the Ohio River.

The above costs are intended for comparative purposes only and are not totally refined. Transmission is exclusive of right-of-way costs, and no specific design was performed in making the estimates. All estimates are in 2000 dollars. A detailed breakdown of these costs, along with those of the Initial Alternatives, are included in Appendix B.

Power flow studies are currently in progress to determine if these Final Alternatives meet the area utility transmission planning criteria. Modifications may be made to these Alternatives as the study proceeds. Analysis descriptions along with the recommended alternative will be provided in a filing in April 2001.

Table of Contents

Section 1

Study Assumptions & Criteria

Introduction

East Kentucky Power Cooperative, Inc. (EKPC) has planned an expansion of the Spurlock Generating Station with the addition of two 250 MW generating units. These units are scheduled to be operational in November 2004 and May 2005. The existing three 138 kV and one 345 kV line exiting from this site are insufficient to supply reliable transmission capacity exits for the total peak output of the expanded plant. It is the purpose of this study to determine the recommended transmission expansion at this site and within the area's transmission grid to support the output of the expanded Spurlock plant. Transmission construction will closely parallel the timings of the unit expansions. Note that the exact transmission expansion(s) will be required prior to the unit in-service dates to accommodate generating unit testing.

This study concentrates on the ultimate development of the additional 500 MW as this identifies the full transmission requirements. The recommended transmission expansion alternative is then reviewed for the interim incremental addition required for the first 250 MW block of added capacity.

This study forms the basis for EKPC's request for a Certificate of Public Convenience and Necessity from the Kentucky Public Utility Commission to construct the required transmission system improvements.

Load Levels

Load flow studies (See Section 3) are being conducted to help determine the required new transmission facilities. The majority of the studies use the 2007 summer and 2007/08 winter load levels. However, the transmission system is also modeled at the 2002 summer and 2002/03 winter levels to run studies as may be required. The loads were based on EKPC's 1996 Power Requirements Study (PRS) Forecast which is the most recent forecast available. The total EKPC loads included in the study are shown below:

Table 1-1 EKPC Base Case Generation

Unit	Winter Capacity (MW)
J.K. Smith Generating Station	
Unit 1	141
Unit 2	141
Unit 3	141
Unit 4 (Under Construction)	108.3
Unit 5 (Under Construction)	108.3
Unit 6 (Future)	108.3
Unit 7 (Future)	108.3
Unit 8 (Future)	108.3
Unit 9 (Future)	108.3
Spurlock Generating Station	
Unit 1	325
Unit 2	535
Unit 3 - E. A. Gilbert 3	250
Unit 4 - Future 4	250
Total	2981.8

Planning Criteria

Planning criteria utilized for this expansion study is include in Appendix A and is identical to that utilized in the recent EKPC PUC submittal for transmission expansion at the J. K. Smith Generating Station. (Study of Future J. K. Smith Transmission, March 31, 2000). This criteria has been coordinated with Kentucky Utilities of LG&E Energy as part of the previous study. The criteria also conforms to the transmission planning requirements of the East Central Area Reliability Coordination Agreement (ECAR) and the North American Electric Reliability Council (NERC).

Alternative Descriptions

Each Initial Alternative was designed to provide insight into the ability of the existing transmission system plus additions to support the Spurlock generation additions.

- **Alternate 1** – Alternate 1 was designed to illustrate the ability of a single double - circuit 138 kV transmission line from Spurlock to the vicinity of CINergy's Stuart Generating Station across the Ohio River to provide adequate additional transmission capacity for the Spurlock additions. This new 2.9-mile double circuit line would cross the Ohio River just to the east of the Spurlock site and bisect the existing CINergy Foster - Stuart 138 kV line. The bisected Stuart - Foster line would form two circuits to Spurlock. A new steel lattice tap structure is assumed to be constructed "inline" with the existing line that will deadend the two Spurlock circuits along with the existing line. Lines are assumed constructed with single conductor 954 kcmil ACSR per phase and include optical ground wire (OPGW) for use in communications and relaying. Two new line terminals will be added to the existing Spurlock 138 kV Substation.

  This alternative emphasizes the use of the 138 kV system as the sole means of distributing additional capacity from Spurlock. The new 138 kV lines have sufficient thermal capacity to support the added generation. Note that the new Spurlock generation is assumed to be connected to the 345 kV bus as described in Section 1. Therefore, a new 345-138 kV bus tie transformer is added to the Spurlock Substations.

- **Alternate 1A** – Alternate 1A is intended to further study the 138 kV system's ability to be the only means of supporting added Spurlock capacity. As such, it builds on all the Alternate 1 transmission additions by including transmission local to Spurlock and inside the EKPC service area to service native load in the eastern portion of the state.

  A single circuit Cranston - Rowan 138 kV line is included to add capacity to relieve local KU overloads in this area and to serve EKPC loads more directly. The eastern Kentucky EKPC load service relies heavily on KU facilities. The study of this line addition will potentially support this local system and help to service this load area from Spurlock.

  In addition, a new J. K. Smith - Spencer Road single circuit 138 kV line is also included to support the Spencer - Rowan transmission area and provide added transmission capacity to EKPC loads.

  Lines are all assumed constructed with single conductor 954 kcmil ACSR per phase and include optical ground wire (OPGW) for use in communications and relaying. The 138 kV expansions will also require some SCADA expansion.

- **Alternate 2** – Alternate 2 is designed to illustrate the impacts of serving the eastern Kentucky EKPC loads directly from the 345 kV system as opposed to the 138 kV or a combined system. A new 45.9-mile 345 kV single circuit line is assumed to be constructed between the Spurlock Generating Station and the existing Rowan County Substation. A new 350/465/580 MVA 345-138 kV transformer will be added to the existing 138 kV substation at Rowan. Lines are assumed constructed on steel poles with two 954 kcmil ACSR conductors per phase and include optical groundwire (OPGW) for use in communications and relaying.

A new line terminal will be added to the existing Spurlock 345 kV breaker-and-a-half bus. The Rowan construction is assumed to have a 345 kV circuit switcher directly at the end of the line that serves the 345-138 kV transformer. This is similar to the existing facilities at EKPC's Avon Substation.

- **Alternate 3** – This alternative is designed to evaluate a similar arrangement to Alternate 1, but at 345 kV. This construction was originally evaluated as part of the Spurlock Unit 2 addition in the mid-1970s, but was not constructed at that time. A new 8.9-mile 345 kV single circuit line is assumed constructed from the Spurlock 345 kV substation across the Ohio River and terminate at the existing CINergy Stuart Generating Station 345 kV Substation. The line is assumed constructed on steel poles with two 954 kcmil ACSR conductors per phase and include optical ground wire (OPGW) for use in communications and relaying.

  A new line terminal will be added to the existing Spurlock 345 kV breaker-and-a-half bus in the existing spare position. The Stuart construction assumes a new two breaker 345 kV line terminal. No added changes at the Stuart facilities are included.

- **Alternate 3A** – This alternative is included to test the impacts of combining the 345 kV interconnection to Stuart in Alternate 3 with service to EKPC loads by adding a new 17.6-mile 345 kV single circuit line between the existing EKPC Avon Substation and a 345-138 kV step-down at the J. K. Smith Substation as included in the recent J. K. Smith transmission expansion study. Lines are assumed constructed on steel poles with two 954 kcmil ACSR conductors per phase and include optical ground wire (OPGW) for use in communications and relaying.

  The new line terminal at the existing Avon 345 kV Substation will convert the existing single line terminal into a three breaker ring bus with future conversion designed into for a breaker-and-a-half bus scheme.

  The J. K. Smith construction is assumed to be similar to the Rowan construction in Alternate 3.

- **Alternate 4** – Alternate 4 is included to review the impacts of the 345 kV interconnection in Alternate 3 combined with a high capacity 345 kV feed into EKPC's eastern Kentucky loads at Rowan. The Alternate 3 construction is combined with a new 45.9-mile 345 kV single circuit line from the Spurlock Generating Station to the existing Rowan County Substation. Two new line terminals are added to the existing Spurlock 345 kV breaker-and-a-half bus. A new 350/465/580 MVA 345-138 kV transformer will be added to the existing 138 kV substation at Rowan similar to that included in Alternate 2. Lines are assumed constructed on steel poles with two 954 kcmil ACSR conductors per phase and include optical ground wire (OPGW) for use in communications and relaying.

- **Alternate 4A** – Alternate 4A is a combined 138 kV and 345 kV alternative similar to Alternate 2. However, the interconnection to CINergy is at 345 kV. This alternative includes the Alternate 3 facilities plus a new 7.3-mile 138 kV single circuit line between the existing Cranston and Rowan Substations. Lines are assumed constructed with single conductor 954 kcmil ACSR per phase and include optical ground wire (OPGW) for use in communications and relaying.

  Two new line single breaker line terminals will be added to the existing Rowan County and Cranston 138 kV Substations.

Initial Alternative Cost Estimates

Estimated investment costs were developed for each of the Initial Alternatives. These capital estimates are designed to assist in the overall plan comparisons and are not totally refined. As the Spurlock site layout constrains the location of new generating facilities, all plans assume the new generation to be connected to the 345 kV Spurlock Substation. Therefore, all Initial Alternatives include the additional 345-138 kV bus tie transformers in each case to support system flows as required. As cost estimates are intended for comparison between plans, these facilities are not contained in the estimates.

Cost estimates were based on data developed for the recent Kentucky Public Service Commission filing associated with the Kentucky Pioneer Energy expansion at the J. K. Smith Generating Station. These costs were augmented by revised design costs available from Stanley Consultants. Specific right-of-way acquisition costs were not included. No specific design was performed to develop the capital cost estimates. All estimates are assumed to be in 2000 dollars.

Individual estimates were developed for each alternative and are summarized in Table 2-1. As seen by the Table, the estimates range from a low of approximately $3,100,000 for Alternate 1 to a high of $42,709,000 for Alternate 4. Details of these cost estimates are included in Appendix B.

Table 2-1 Estimated Alternative Transmission Costs

Alternate	Facility	Estimated Cost
1	Line Additions	
	Spurlock – Foster/Stuart 138 kV Double Circuit Line	$2,340,000
	Substation Additions	
	Spurlock Generating Station Substation	$714,000
	Stuart and Foster Relay Panels	$75,000
	Total Alternate 1	**$3,129,000**

Table 2-1 Estimated Alternative Transmission Costs

Alternate	Facility	Estimated Cost
1A	Line Additions	
	Spurlock – Foster/Stuart 138 kV Double Circuit Line	$2,340,000
	Inland – Inland "T" 138 kV Single Circuit Line	$416,000
	J. K. Smith – Spencer Road 138 kV Single Circuit Line	$6,312,000
	Cranston – Rowan 138 kV Single Circuit Line	$2,793,000
	Substation Additions	
	Spurlock Generating Station Substation	$714,000
	Stuart and Brown Relay Panels	$75,000
	Inland 138 kV Substation Expansion	$305,000
	Cranston 138 kV Breaker	$307,000
	Rowan 138 kV Breaker	$351,000
	J. K. Smith – 138 kV Substation Expansion	$545,000
	Spencer Road 138 kV Substation Expansion	$423,000
	Total Alternate 1A	**$14,581,000**
2	Line Additions	
	Spurlock – Rowan 345 kV Single Circuit Line	$28,160,000
	Substation Additions	
	Spurlock Generating Station Substation	$664,000
	Rowan 345-138 kV Substation Addition	$6,605,000
	Total Alternate 2	**$35,429,000**
3	Line Additions	
	Spurlock – Stuart 345 kV Single Circuit Line	$6,060,000
	Substation Additions	
	Spurlock Generating Station Substation	$664,000
	Stuart 345 kV Substation Addition	$1,220,000
	Total Alternate 3	**$7,944,000**
3A	Line Additions	
	Spurlock – Stuart 345 kV Single Circuit Line	$6,060,000
	J. K. Smith – Avon 345 kV Single Circuit Line	$10,798,000
	Substation Additions	
	Spurlock Generating Station Substation	$664,000
	Stuart 345 kV Substation Addition	$1,220,000
	J. K. Smith 345-138 kV Substation Expansion	$6,560,000
	Avon 345 kV Substation Expansion	$1,762,000
	Total Alternate 3A	**$27,064,000**

Table 2-1 Estimated Alternative Transmission Costs

Alternate	Facility	Estimated Cost
4	Line Additions	
	Spurlock – Stuart 345 kV Single Circuit Line	$6,060,000
	Spurlock – Rowan 345 kV Single Circuit Line	$28,160,000
	Substation Additions	
	Spurlock Generating Station Substation	$664,000
	Stuart 345 kV Substation Addition	$1,220,000
	Rowan 345-138 kV Substation Addition	$6,605,000
	Total Alternate 4	**$42,709,000**
4A	Line Additions	
	Spurlock – Stuart 345 kV Single Circuit Line	$6,060,000
	Cranston – Rowan 138 kV Single Circuit Line	$2,793,000
	Substation Additions	
	Spurlock Generating Station Substation	$664,000
	Stuart 345 kV Substation Addition	$1,220,000
	Cranston 138 kV Substation Expansion	$307,000
	Rowan 138 kV Substation Expansion	$351,000
	Total Alternate 4A	**$11,395,000**

Alternative Analysis & Discussion

Discussion of the results of load flow studies for the initial alternates are provided in Section 3.

Selected Alternatives

After review of the analysis of the Initial Alternatives, modifications were made to reflect the conditions observed and to provide increased overall network support. On January 5, 2001, EKPC's Transmission Expansion Committee and Stanley Consultants met to review the analysis to date of the Initial Alternatives. This committee is an internal review committee that has representation from the various entities within EKPC that are concerned with transmission including generation planning, transmission planning, system operations, system maintenance, and system design and protection.

After review of each alternative, the following concerns were identified:

- **Alternate 1** – The system overloads identified in the initial analysis indicates that the construction of only 138 kV circuits to the north will not provide adequate system capacity for Spurlock generation expansion without other system improvements. Therefore, Alternate 1 was eliminated from further consideration.
- **Alternate 2** – The construction of a 46-mile single circuit 345 kV line and associated substation does provide direct supply to EKPC loads. However, this alternative by itself is inadequate to solve system overloads. Consequently, Alternate 2 is eliminated.

- **345 kV Interconnections** –The construction of a transmission line across the Ohio River involves a significant financial commitment as well as the requirement to address the numerous associated environmental concerns. Furthermore, there have been operational issues associated with north/south system flow that may significantly overload 138 kV interconnections across the Ohio River. Based on this, it was judged that any circuits constructed across the river should be at 345 kV at a minimum. Further, a single 345 kV line would be susceptible to removing a significant portion of Spurlock transmission exit capacity if the circuit were outaged. A double circuit transmission line constructed across the river will not cost twice that of a single circuit and would add the advantage of potentially providing two exits for Spurlock, rather than one.

  There exists a single circuit 345 kV line just north of the Ohio River that connects to CINergy's Stuart and Zimmer Generating Stations. In addition to the generation present at these locations, both of plants have significant 345 kV transmission assets. Tapping into these strong systems would have the advantage of connecting Spurlock to two large facilities and their associated network connections.

  Therefore, all further investigation regarding a 345 kV line across the Ohio River to the CINergy system will include a double circuit 345 kV line. As the new lines will be utilizing the existing terminals at Stuart and Zimmer, there will also be less investment as no significant substation physical modifications will be required at either of the existing CINergy generating substations.

- **Alternate 3A** – The use of the Avon - J. K. Smith 345 kV line may not provide sufficient system support to relieve overloads in the Spencer - Cranston - Rowan 138 kV area. However, support to this area comes from the J. K. Smith 138 kV bus as identified in previous J. K. Smith expansion analysis. It is judged that the J. K. Smith - Spencer 138 kV line will provide this support.

A set of Final Alternatives that address the above, while preserving, to the extent possible, the concepts identified in the Initial Alternatives.

Final Alternative Descriptions

The following alternatives have been preserved for final analysis:

- **Alternate 1A** - This plan will be preserved to review the use of an "all 138 kV" plan for transmission expansion. Based on initial analysis, additional transmission modifications will be added to the plan as needed during the ongoing analysis.

- **Alternate 3** – Alternate 3 is modified to include a new assumed 8.9-mile double circuit 345 kV transmission line constructed across the Ohio River to bisect the existing CINergy Stuart - Zimmer 345 kV line. A new steel lattice tap structure is assumed to be constructed "inline" with the existing line that will deadend the two Spurlock circuits along with the existing line. Lines are assumed constructed with two 954 kcmil ACSR conductors per phase and include optical ground wire (OPGW) for use in communications and relaying. Two new line terminals will be added to the existing Spurlock 345 kV Substation.

- **Alternate 3A** – This alternative will utilize the revised Alternate 3 facilities, but will include the Smith - Spencer 138 kV line along with the Smith - Avon 345 kV line. The Avon, Smith, and Spencer substations will be modified by the addition of new line terminals at each location.

- **Alternate 4** – Alternate 4 is modified by the use of the double circuit 345 kV line to bisect the Stuart - Zimmer line and includes the Alternate 3 facilities. Combining this with the new 45.9-mile 345 kV single circuit line from the Spurlock Generating Station to the existing Rowan County Substation will further increase the most expensive plan's cost. Therefore, Alternate 4A will be analyzed first.

- **Alternate 4A** – The investigation will start with Alternate 3 and add the Cranston – Rowan 138 kV line. The Smith – Spencer 138 kV will be added if needed.

These alternates are shown on the EKPC system map at the end of this report.

Estimated Alternative Investments

Estimated investment costs were developed for each of the Final Alternatives using the same basis as those prepared for the Initial Alternatives. Individual estimates were developed for each alternative and are summarized in Table 2-2. As seen by the Table, the estimates range from a low of approximately $14,581,000 for Alternate 1 to a high of $51,943,000 for Alternate 4. Details of these cost estimates are included in Appendix B.

Table 2-2 Estimated Final Alternative Transmission Costs

Alternate	Facility	Estimated Cost
1A	Line Additions	
	Spurlock – Foster/Stuart 138 kV Double Circuit Line	$2,340,000
	Inland – Inland "T" 138 kV Single Circuit Line	$416,000
	J. K. Smith – Spencer Road 138 kV Single Circuit Line	$6,312,000
	Cranston – Rowan 138 kV Single Circuit Line	$2,793,000
	Substation Additions	
	Spurlock Generating Station Substation	$714,000
	Stuart and Brown Relay Panels	$75,000
	Inland 138 kV Substation Expansion	$305,000
	Cranston 138 kV Breaker	$307,000
	Rowan 138 kV Breaker	$351,000
	J. K. Smith – 138 kV Substation Expansion	$545,000
	Spencer Road 138 kV Substation Expansion	$423,000
	Total Alternate 1A	**$14,581,000**

Table 2-2 Estimated Final Alternative Transmission Costs

Alternate	Facility	Estimated Cost
3	Line Additions	
	Spurlock–Stuart and Spurlock–Zimmer 345 kV Double Circuit Line	$15,401,000
	Substation Additions	
	Spurlock Generating Station Substation	$1,612,000
	Modifications to Zimmer and Stuart Substations	$165,000
	Total Alternate 3	**$17,178,000**
3A	Line Additions	
	Spurlock–Stuart and Spurlock–Zimmer 345 kV Double Circuit Line	$15,401,000
	J. K. Smith – Spencer Road 138 kV Single Circuit Line	$6,312,000
	J. K. Smith – Avon 345 kV Single Circuit Line	$10,798,000
	Substation Additions	
	Spurlock Generating Station Substation	$1,612,000
	Modifications to Zimmer and Stuart Substations	$165,000
	J. K. Smith 345-138 kV Substation Expansion	$6,560,000
	Spencer Road 138 kV Substation Expansion	$423,000
	Avon 345 kV Substation Expansion	$1,762,000
	Total Alternate 3A	**$43,033,000**
4	Line Additions	
	Spurlock–Stuart and Spurlock–Zimmer 345 kV Double Circuit Line	$15,401,000
	Spurlock – Rowan 345 kV Single Circuit Line	$28,160,000
	Substation Additions	
	Spurlock Generating Station Substation	$1,612,000
	Modifications to Zimmer and Stuart Substations	$165,000
	Rowan 345-138 kV Substation Addition	$6,605,000
	Total Alternate 4	**$51,943,000**
4A	Line Additions	
	Spurlock–Stuart and Spurlock–Zimmer 345 kV Double Circuit Line	$15,401,000
	Cranston–Rowan 138 kV Single Circuit Line	$2,793,000
	Substation Additions	
	Spurlock Generating Station Substation	$1,612,000
	Modifications to Zimmer and Stuart Substations	$165,000
	Cranston 138 kV Substation Expansion	$307,000
	Rowan 138 kV Substation Expansion	$351,000
	Total Alternate 4A	**$20,629,000**

Section 3

Power Flow Evaluation

The Final Alternatives are now being analyzed. This Section summarizes results for the Initial Alternatives and provides the status of the analysis for the Final Alternatives. This section will be augmented as additional significant results become available.

Introduction

Load flow models were used to determine power flows and voltages on the EKPC interconnected transmission system. Initial load flow studies were completed for base case and contingency conditions for Alternates 1, 1A, and 2, for the 2007 summer and winter load levels. The contingency cases consisted primarily of combinations of different dispatch scenarios for generator outages at the Cooper and Spurlock plants and line outages. The following dispatch scenarios were used in the study:

Scenario No.	Descriptions
0	Normal conditions with generator units operated on an "economic dispatch" basis.
1	Cooper 2 (225 MW) off, import 210 MW from Kentucky Utilities in winter only. No summer imports due to increased J. K. Smith usage.
2	Cooper 2 (225 MW) off, import 205 MW from CINergy (used in winter only).
3	Kentucky Utilities Brown 3 off, import 441 MW from CINergy (summer and winter).
4	Spurlock 2 (535 MW) off, import 480 MW from Kentucky Utilities in winter and 170 MW in summer.
5	Spurlock 2 (535 MW) off, import 480 MW from TVA in winter and 165 MW in summer.

Scenario 4 was considered in initial studies and then eliminated. Individual generator outputs were modified in the EKPC, Kentucky Utilities, CINergy and TVA systems to obtain the desired increased imports. Generation capacity exceeding the normal rating was used for the J. K. Smith units when evaluating the contingencies.

The normal 2007 EKPC system dispatch schedule is shown in Table 3-1.

Initial Alternative Analysis & Discussion

Contingency studies have been completed only for Alternates 1, 1A, and 2. These studies indicated that certain contingencies resulted in severe overloads, particularly on the Kentucky Utilities' system. Table 3-2 was prepared which identifies the line overloads of greatest concern to EKPC resulting from various line outages and dispatch scenarios and indicates that these alternatives by themselves do not provide adequate system support.

Load flows to date have only been run for a normal system for Alternates 3, 3A, 4, and 4A, and only general observations can be made regarding the performance of these plans.

TABLE 3-1
2007 Normal System Generation Schedule for EKPC Control Area, MW

Generating Unit	Winter	Summer
Cooper 1	116.0	116.0
Cooper 2	225.0	225.0
Dale 1	24.0	24.0
Dale 2	24.0	24.0
Dale 3	80.0	80.0
Dale 4	80.0	80.0
Dale 69 kV (1)	(12.0)	(12.0)
JK CT 1	141.0	90.0
JK CT 2	141.0	90.0
JK CT 3	141.0	90.0
JK Smith 4	108.3	62.3
JK Smith 5	108.3	62.3
JK Smith 6	108.3	62.3
JK Smith 7	108.3	-
JK Smith 8	108.3	-
JK Smith 9	108.3	-
Spurlock 1	325.0	325.0
Sprulock 2	535.0	535.0
E. A. Gilbert 3	250.0	250.0
Future 4	250.0	250.0
Spurlock T9 13.8 (1)	(10.0)	(10.0)
Laurel 1 G 13.8 (2)	50.0	-
Love Hydro (3)	40.0	40.0
CMPV EK 12.5 (4)	2.0	2.0
TOTAL	3,051.8	2,385.9

(1) Reflects auxiliary loads.
(2) Owned by Southeastern Power Administration, output purchased by EKPC.
(3) Owned by City of Hamilton. In EKPC's control area and dispatched by EKPC.
(4) EKPC customer privately-owned cogeneration plant.

TA
Line Outages Resu

Line Outage	Base Summer	D	%	Base Winter	D	%	Alternate 1 Spurlock-Brown & Spurlock-Stuart 138 kV Lines Summer	D	%	
Brown N - Gent 345 kV	*Avon 138-Loudn Av 138*	3	106%	*Avon 138-Loudn Av 138*	3	125%				*Avon 138-*
	Dale 138-BooneStp 138	5	125%	Dale 138-BooneStp 138	5	110%	Dale 138-BooneStp 138	5	129%	Dale 138-
Fawkes KU - Clark Co 138 kV	Boonsb N 138-Boonsb N 69	4	118%	Boonsb N 138-Boonsb N 69	5	107%	Boonsb N 138-Boonsb N 69	4	119%	Boonsb N 13
	Goodr KU 138-Rodburn 138	3	134%							
	Kenton 138-05Emera8 138	1	122%							
	Murphysv 69-Sardis T 69	3	109%	Goodr KU 138-Rodburn 138	3	126%				
Avon - Spurlock 345 kV	Sardis T 69-Millrsbu 69	3	105%	Kenton 138-05Emera8 138	1	114%	Goddr KU 138-Rodburn 138	3	113%	Goddr KU 1
	Fawks KU 138-Clark Co 138	4	152%				Fawks KU 138-Clark Co 138	4	155%	
	Clark Co 138-Clark Co 69	5	135%				Clark Co 138-Clark Co 69	5	135%	
	Clark Co 69-Sylvania 69	5	130%				Clark Co 69-Sylvania 69	5	130%	
Avon - Dale 138 kV	Sylvania 69-Prkrseal 69	5	126%				Sylvania 69-Prkrseal 69	5	126%	
				Fayette 69-Davis 69	3	109%				
Avon - Loudon Av 138 kV				Paris 138-Paris 12 69	3	100%				Fayette
	Spurlock 138-Kenton 138 Ckt 1	1	163%	Spurlock 138-Kenton 138 Ckt 1	1	163%	Spurlock 138-Kenton 138 Ckt 1	1	131%	Spurlock 138-
Spurlock - Kenton 138 kV Circuits	Spurlock 138-Kenton 138 Ckt 2	1	159%	Spurlock 138-Kenton 138 Ckt 2	1	159%	Spurlock 138-Kenton 138 Ckt 2	1	128%	Spurlock 138-
	Fle KU T 138-Goddr KU 138	3	143%	Kenton 138-Wedonia 138	3	138%	Fle KU T 138-Goddr KU 138	3	133%	Kenton 13
	Kenton 138-Wedonia 138	3	142%	Fle KU T 138-Goddr KU 138	2	135%	Kenton 138-Wedonia 138	3	131%	Fle KU T 13
Plumvill - Spurlock 138 kV	Wedonia 138-Fle KU T 138	3	132%	Wedonia 138-Fle KU T 138	2	111%	Wedonia 138-Fle KU T 138	3	123%	Wedonia 1
				JKSmith 138-Dale 138	4	155%				
JK Smith - Lake Reba T 138 kV	JKSmith 138-Dale 138	5	113%	JKSmith 138-FawkesEK 138	2	137%	JKSmith 138-Dale 138	5	114%	JKSmith
Spencer Rd - Clark Co 138 kV							Clark Co 69-Mtster KU 69	4	105%	
Clark Co 138/69 kV										
Dale - JK Smith 138 kV	*JKSmith 138-Lk Reb T 138*	5	104%	*JKSmith 138-Lk Reb T 138*	2	113%	*JKSmith 138-Lk Reb T 138*	5	104%	*JKSmith 1*
Fawkes EK - Fawkes KU 138 kV										Fawkes T 13
Fawkes T - Lake Reba T 138 kV				Powell Co 138-Powell Co 161	1	101%				Fawkes EK 1
Fawkes T 138 kV - Lake Reba T 161 kV										
Spencer Rd 138/69 kV										
JK Smith - Spencer Road 138 kV										
Spencer Rd - Rodburn 138 kV										
Lake Reba T 161/138 kV										Lk Reba

'ABLE 3-2
ulting In Thermal Overloads

			Alternate 1a Alternate 1 plus Inland CT Modifications Smith-Spencer Road & Cranston-Rowan 138 kV Lines						Alternate 2 Spurlock-Rowan 345 kV Line Rowan 345/138 kV Substation				
Winter			Summer			Winter			Summer			Winter	
	D	%		D	%		D	%		D	%		D
-Loudn Av 138	3	120%				Avon 138-Loudn Av 138	3	118%					
-BooneStp 138	5	110%											
138-Boonsb N 69	5	107%							Dale 138-BooneStp 138	5	128%	Dale 138-BooneStp 138	4
									Skaggs 138-Skaggs 69	1	119%		
									Goddard 69-Hillsbor 69	3	109%		
138-Rodburn 138	3	108%							Kenton 138-05Emera8 138	1	107%	Skaggs 69-Skaggs 138	1
			Clark co 69-Sylvania 69	5	159%								
			Sylvania 69-Prkrseal 69	5	155%				Clark Co 69-Sylvania 69	5	146%		
			Clark Co 138-Clark Co 69	5	140%	Clark Co 69-Sylvania 69	4	138%	Slyvania 69-Prkreal 69	5	142%	Clark Co 69-Sylvania 69	[illegible]
			Prkreal 69-Winchstr 69	5	117%	Sylvania 69-Prkrseal 69	4	118%	Clark Co 138-Clark Co 69	5	140%	Sylvania 69-Prkrseal 69	[illegible]
e 69-Davis 69	3	100%											
8-Kenton 138 Ckt 1	2	139%							Spurlock 138-Kenton 138 Ckt 1	1	128%		
8-Kenton 138 Ckt 2	2	135%							Spurlock 138-Kenton 138 Ckt 2	1	125%	Spurlock 138-Kenton 138 Ckt 1	1
38-Wedonia 138	3	130%	Fle KU T 138-Goddr KU 138	3	133%								
138-Goddr KU 138	3	127%	Kenton 138-Wedonia 138	3	130%								
138-Fle KU T 138	3	105%	Wedonia 138-Fle KU T 138	3	122%	Kenton 138-Wedonia 138	3	122%					
h 138-Dale 138	4	155%							JKSmith 138-Dale 138	5	115%	JKSmith 138-Dale 138	[illegible]
									Spenc Rd 69-Sprenc Rd 138	1	106%		
138-Lk Reb T 138	2	113%							JKSmith 138-Lk Reb T 138	5	104f%	JKSmith 138-Lk Reb T 138	[illegible]
138-Fawkes KU 138	3	152%											
138-Fawks KU 138	3	117%											
												Powell Co 138-Powell Co 161	
			Farmers 138-Farmers 69	1	112%	Farmrs 138-Farmers 69	1	102%	Farmers 138-Farmers 69	1	125%	Farmers 138-Farmers 69	
			Dale 138-BooneStp 138	5	101%								
			Spencer Rd 138-Spencer Rd 69	4	142%	Spenc Rd 69-Sprenc Rd 138	5	129%	Rodburn 138-Rodburn 69	1	247%	Rodburn 138-Rodburn 69	
138-Lk Reba 69	1	108%				Lk Reba 138-Lk Reba 69	1	103%				Lk Reba 138-Lk Reba 69	

Table 3-3 shows the distribution of the generator output for the Smith and Spurlock plants for Alternates 3 through 4A and helps in understanding the impact to the transmission system resulting from the new facilities. The following observations can be made from a review of Table 3-3 regarding the Spurlock Plant power distribution:

1. With the exception of Alternate 4, when the Spurlock - Rowan 345 kV line is in service the power flow to CINergy over the new Spurlock - Stuart 345 kV line ranges from 140 to 184 MW. The impact of the new Rowan line and 345/138 kV substation is to reduce the flow to CINergy to 42 MW.

2. The new Rowan line and substation also reduce the flow from the Spurlock - Mayesville 138 kV line by about 60 MW, resulting in a flow to Mayesville of 131 MW. These new facilities also reduce the flow over the heavily loaded Kenton 138 kV lines by 70 MW.

3. The new Smith - Avon 345 kV line has minimal impact on the Spurlock Plant distribution with the flow over the Spurlock - Avon 345 kV line reduced by 38 MW and the flow over the 345 kV line in Case 3 increasing by 28 MW.

4. Alternates 3 and 3A result in minimum reactive flow over the Spurlock - Stuart 345 kV line with values of about 8 and 23 MVAR. However, for Alternates 4 and 4A when a new transmission source is brought to Rowan, the reactive power flow to Stuart increases substantially to values of 122 and 136 MVAR.

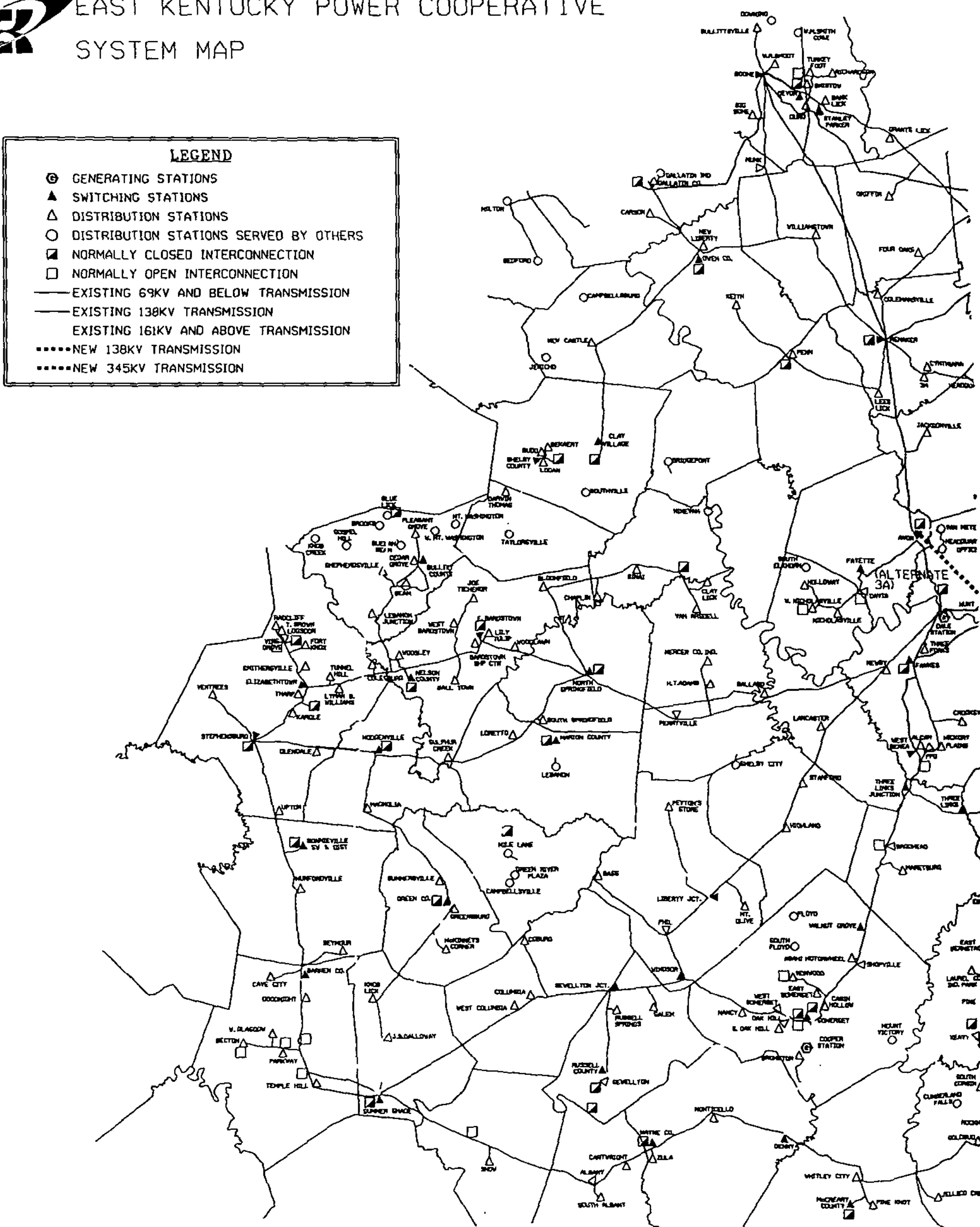
The new Smith - Avon 345 kV line results in a power flow to Avon from Smith of 102 MW. This new plant outlet results in a rather uniform decrease in power flows over the existing lines out of Smith.

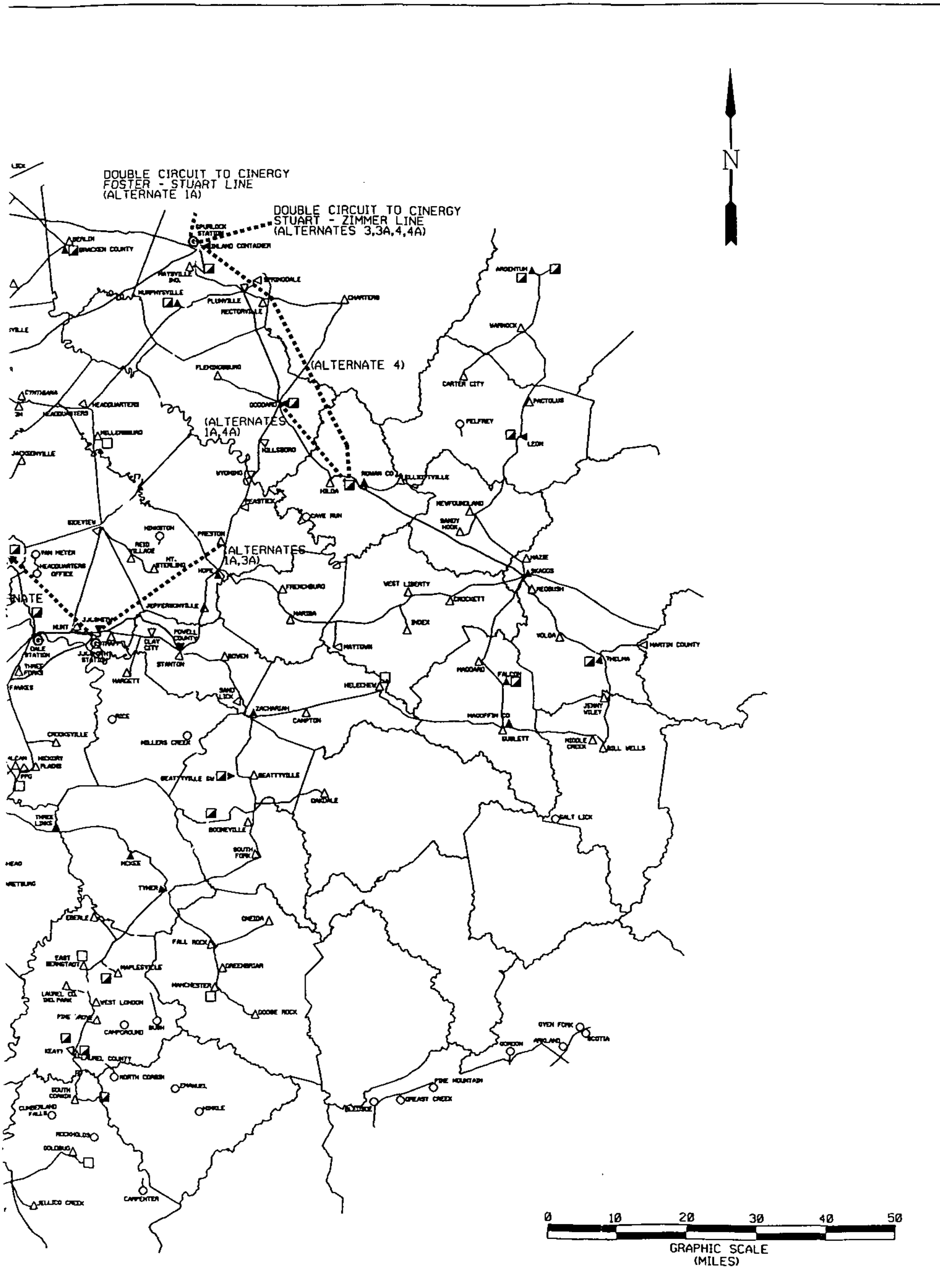
The above results were reviewed with the EKPC Transmission Expansion Committee on January 5, 2001, and were used in developing the Final Alternatives discussed in Section 2.

Final Alternative Analysis & Discussion

Currently the load flow models are being refined to include the modifications for the Final Alternatives. Consequently, no results are available at this time.

EAST KENTUCKY POWER COOPERATIVE
SYSTEM MAP




DOUBLE CIRCUIT TO CINERGY
FOSTER - STUART LINE
(ALTERNATE 1A)
DOUBLE CIRCUIT TO CINERGY
STUART - ZIMMER LINE
(ALTERNATES 3,3A,4,4A)
(ALTERNATE 4)
(ALTERNATES
1A,4A)
ALTERNATES
1A,3A)
N
0
10
20
30
40
50
GRAPHIC SCALE
(MILES)

Appendix

Planning Criteri

Appendix A contains the transmission planning criteria utilized for this study. As indicated in Section 1, the criteria is identical to that utilized in the recent EKPC PSC submittal for transmission expansion at the J. K. Smith Generating Station.

Section 3
EKPC Transmission System Planning Criteria

3.1 Overview

In general, EKPC's transmission system is planned to withstand forced outages of generators and transmission facilities, individually and combined. Table 1 describes the contingencies and measurements EKPC utilizes in testing and assessing the performance of its transmission system

For all testing conditions, stability of the network should be maintained, and cascading outages should not occur. Specific modeling considerations are considered as part of the testing conditions, which are discussed in Section 3.1.

Table 1: Transmission Planning Contingencies and Measurements

Contingencies[1]	Max. Facility Ratings	Min. Volt Level (P.U.)[2]	Max. Volt Level[3] (P.U.)	Curtail Demand and/or Transfers
None(Base Case)	Tables 2,3	0.955	1.050	no
Extreme load due to unusual weather.[4]	Tables 2,3	0.940	1.050	no
Outage of a generator, transmission circuit, or transformer.[5]	Tables 2,3	0.925	1.050	no
Outage of two(2) generators.	Tables 2.3	0.925	1.050	no
Outage of a bus section or a circuit breaker.[6]	Tables 2,3	0.925	1.050	yes
Outage of two(2) transmission circuits.	Tables 2,3	0.925	1.050	yes
Outage of a transmission circuit and a transformer.	Tables 2,3	0.925	1.050	yes
Outage of two(2) transformers.	Tables 2,3	0.925	1.050	yes
Outage of a double circuit tower line.[7]	Tables 2,3	0.925	1.050	yes
Outage of a generator, transmission circuit, transformer, or bus section.[8]	Tables 2,3	0.925	1.050	yes

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[1] All contingencies(except as noted) are single line to ground or 3-phase faults with normal clearing. For all testing conditions, network stability should be maintained and cascading should not occur.

[2] Measured at the unregulated low side distribution transformer bus.

[3] For peak load conditions. Maximum off-peak voltage level at unregulated low side distribution transformer bus = 1.085 P.U.

[4] Based on a 10% probability load forecast. Fault conditions do not apply.

[5] Includes outages which do not result from a fault.

[6] Single line to ground with normal clearing.

[7] Non 3-phase, with normal clearing.

[8] Single line to ground, with delayed clearing.

Table 2: EKPC Typical Line Ratings[9]
(Maximum Conductor Operating Temperatures)

Line Type	Thermal Capability(MVA) Normal / Contingency[10] 176 / 212°F Operation Winter	Summer
69 kV 1/0 ACSR6x1	37 / 40	27 / 32
69 kV 2/0 ACSR 6x1	43 / 46	31 / 37
69 kV 3/0 ACSR 6x1	54 / 59	39 / 47
69 kV 195.7 ACAR	58 / 64	42 / 51
69 kV 4/0 ACSR 6x1	62 / 68	45 / 55
69 kV 266.8 ACSR 26x7	78 / 87	57 / 69
69 kV 556.5 ACSR TW 26x7	121 / 135	88 / 108
69 kV 556.5 ACSR 26x7	125 / 139	90 / 111
69 kV 795 ACSR 26x7	157 / 175	113 / 140
138 kV 556.5 ACSR TW 26x7	242 / 270	176 / 216
138 kV 556.5 ACSR 26x7	250 / 278	181 / 222
138 kV 636 ACSR 26x7	273 / 303	197 / 242
138 kV 795 ACSR 26x7	315 / 351	227 / 280
138 kV 954 ACSR 54x7	349 / 389	251 / 311
161 kV 636 ACSR 26x7	318 / 354	230 / 283
161 kV 795 ACSR 26x7	367 / 409	265 / 327
161 kV 954 ACSR 54x7	407 / 454	293 / 363
345 kV 2-954 ACSR 54x7	1746 / 1947	1257 / 1554

[9] Line rating may be limited by terminal facilities or by maximum existing conductor operating temperature.

[10] Normal ratings apply only to base case conditions. Contingency ratings apply to contingency conditions.

Table 3: EKPC Transformer Ratings(Maximum)[11]

	Rated kV			MVA Rating[12]			
	High	Low	Rated	Summer(95F)		Winter(32F)	
	Side	Side	MVA	Norm	Emer	Norm	Emer
55C Rise							
OA	161	138	75	71	107	100	135
	161, 138	69	75	71	107	100	135
	161	69	60	57	86	80	108
	161, 138	69	50	47	71	67	90
	138	69	49.5	47	71	66	89
	138	69	45	43	64	60	81
	161	69	35	33	50	47	63
	161	69	26.8	25	38	36	48
	138	69	25.5	24	36	34	46
OA/FA/FA	138	69	82.5	78	111	107	136
OA/FOA/FOA							
65C Rise							
OA	345	138	270	257	367	340	475
	345	138	180	171	245	227	317
	161	138	90	86	122	113	158
	161, 138	69	90	86	122	113	158
	161, 138	69	60	57	82	76	106
OA/FA/FA	345	138	450	434	581	536	662
OA/FOA/FOA	345	138	300	290	387	357	441
	161	138	150	145	194	179	221
	161, 138	69	150	145	194	179	221
	161	138	140	135	181	167	206
	161, 138	69	140	135	181	167	206
	161, 138	69	100	97	129	119	147
	161, 138	69	93.3	90	120	111	137
	138	69	84	81	108	100	123
	161, 138	69	65.4	63	84	78	96
	138	69	65.3	63	84	77	96
	161	69	50	48	65	60	74
	138	69	47.6	46	61	57	70

[11] Transformer rating may be limited by terminal facilities.

[12] Normal ratings apply only to base case conditions. Contingency ratings apply to contingency conditions.

Table 4: TYPICAL RATINGS FOR EKPC DISTRIBUTION TRANSFORMERS

Transformers	KVA Rating*		
		Winter	
	Rated	32F	100F
OA--55C	450	670	400
OA--55C	750	1,120	660
OA--55C	2,500	3,740	2,210
OA/FA--65C	3,220	4,170	3,130
OA--55C	3,750	5,600	3,310
OA--65C	4,200	5,900	4,150
OA/FA--65C	4,830	6,260	4,700
OA--55C	5,000	7,470	4,410
OA--65C	5,000	7,020	4,950
OA--65C	5,600	7,860	5,540
OA/FA--65C	5,751	7,450	5,600
OA--55C	6,250	9,340	5,510
OA/FA--65C	6,440	8,350	6,270
OA--55C	7,500	11,210	6,620
OA/FA--65C	9,660	12,520	9,400
OA--65C	11,200	15,720	11,080
OA--65C	12,000	16,850	11,870
OA/FA--65C	14,000	18,140	13,620
OA--65C	15,000	21,060	14,840
OA/FA--65C	16,000	20,740	15,570
OA/FA--65C	20,000	25,920	19,460
OA/FA/FA--65C	20,000	24,840	19,200
OA/FA/FA--65C	25,000	31,050	24,000

* Load percentages multiplied by 0.90 to account for phase imbalance
Winter ratings limited on 32F ambient temperatures, to account for uncertainties in auxiliary equipment loading such as connectors and fittings.

3.1 Plant Voltage Schedules

For major power plants, the voltage level at the high side of the generator step up transformer(GSU) should be maintainable with normal generation and normal transmission system conditions as follows:

Plant Name	GSU High Side Bus Name and (kV)	Scheduled Voltage (kV)	Scheduled Voltage (Per Unit)
H. L. Spurlock	Spurlock 345	355	1.029
H. L. Spurlock	Spurlock 138	142	1.029
J. S. Cooper	Cooper 161	166	1.031
W. C. Dale	Dale 138	142	1.029
W. C. Dale	Dale 69	72	1.043
J. K. Smith	J. K. Smith 138	142	1.029

3.2 Modeling Considerations

Replacement generation required to offset generating unit outages should be simulated first from all available internal resources. If internal resources are not available or are exhausted, then replacement generation should be simulated from the most restrictive of interconnected companies(AEP, CINergy, LGEE, or TVA).

A single outage may include multiple transmission components in the common zone of relay protection.

Post-fault conditions and conditions after load restoration should be evaluated. Post-contingency operator initiated actions to restore load service must be simulated. Load that is off-line as a result of the contingency being evaluated may be switched to alternate sources during the restoration process, however, load should not be taken off-line to perform switching.

Transmission capacitor status (on/off) should be simulated consistent with existing automatic voltage control (on/off) settings and operating practice during normal transmission system conditions. Manual on-line switching of capacitors during normal conditions can be simulated provided it is consistent with existing operational practice, however, manual switching should not be simulated following a contingency to eliminate low voltage conditions.

The following operational procedures should be avoided:

1) Seasonal adjustment(s) of fixed taps on transmission transformers to control voltage(s) within acceptable ranges.
2) Switching HV and EHV system facilities out of service to reduce off-peak voltage(s).

3.3 Reliability Criteria

Customer Interruptions - Customer interruptions may occur due to an outage of a subtransmission circuit or a distribution substation transformer. To minimize the time and number of customers affected by a single contingency outage, the following criteria should be applied:

(a) Spare Distribution Transformer - To provide for the failure of the distribution substation transformer, a spare transformer should be maintained and available for installation at the affected substation within 10 hours.

(b) Distribution Substation Supply - Transmission radial supply to a distribution substation is acceptable provided that the tap "load-exposure" index, TE, does not exceed 100 MW-miles. When this index is exceeded, multiple source supply should be provided to reduce this index below 100 MW-miles.

(c) Subtransmission Circuit - The circuit "load-exposure" index, CE, should not exceed 2400 MW-miles.

3.4 Load Level

Future transmission facility requirements should be determined using power flow base cases which model coincident individual substation peak demands(summer and winter) forecasted on a normal weather basis.

Future transmission facility requirements should also be determined using summer and winter load flow base cases simulating a 10% probability severe weather load forecast. A severe weather load flow case will be considered in itself as an abnormal system planning condition. This criteria is new and used only for the distribution substation justifications in the November 1999 – October 2002 Work Plan.

Appendix B

Estimated Alternative Investment Details

Appendix B contains the details of the cost estimates summarized in Table 2-1 and Table 2-2. Each set of plans has separate estimated investment details.

Initial Alternates

Spurlock Generating Station 500 MW Expansion
Alternate Transmission Arrangements
Estimated Transmission Costs

Alternate	Facility	Estimated Cost
1	Line Additions	
	Spurlock - Foster/Stuart 138 kV Double Circuit Line	$2,340,000
	Substation Additions	
	Spurlock Generating Station Substation	$714,000
	Stuart and Foster Relay Panels	$75,000
	Total Alternate 1	$3,129,000
1A	Line Additions	
	Spurlock - Foster/Stuart 138 kV Double Circuit Line	$2,340,000
	Inland - Inland "T" 138 kV Single Circuit Line	$416,000
	J. K. Smith - Spencer Road 138 kV Single Circuit Line	$6,312,000
	Cranston - Rowan 138 kV Single Circuit Line	$2,793,000
	Substation Additions	
	Spurlock Generating Station Substation	$714,000
	Stuart and Brown Relay Panels	$75,000
	Inland 138 kV Substation Expansion	$305,000
	Cranston 138 kV Breaker	$307,000
	Rowan 138 kV Breaker	$351,000
	J.K. Smith 138 kV Substation Expansion	$545,000
	Spencer Road 138 kV Substation Expansion	$423,000
	Total Alternate 1A	$14,581,000
2	Line Additions	
	Spurlock - Rowan 345 kV Single Circuit Line	$28,160,000
	Substation Additions	
	Spurlock Generating Station Substation	$664,000
	Rowan 345-138kV Substation Addition	$6,605,000
	Total Alternate 2	$35,429,000
3	Line Additions	
	Spurlock - Stuart 345 kV Single Circuit Line	$6,060,000
	Substation Additions	
	Spurlock Generating Station Substation	$664,000
	Stuart 345 kV Substation Addition	$1,220,000
	Total Alternate 3	$7,944,000
3A	Line Additions	
	Spurlock - Stuart 345 kV Single Circuit Line	$6,060,000
	J.K Smith - Avon 345 kV Single Circuit Line	$10,798,000
	Substation Additions	
	Spurlock Generating Station Substation	$664,000
	Stuart 345 kV Substation Addition	$1,220,000
	J.K. Smith 345-138 kV Substation Expansion	$6,560,000
	Avon 345 kV Substation Expansion	$1,762,000
	Total Alternate 3A	$27,064,000
4	Line Additions	
	Spurlock - Stuart 345 kV Single Circuit Line	$6,060,000
	Spurlock - Rowan 345 kV Single Circuit Line	$28,160,000
	Substation Additions	
	Spurlock Generating Station Substation	$664,000
	Stuart 345 kV Substation Addition	$1,220,000
	Rowan 345-138kV Substation Addition	$6,605,000
	Total Alternate 4	$42,709,000
4A	Line Additions	
	Spurlock - Stuart 345 kV Single Circuit Line	$6,060,000
	Cranston - Rowan 138 kV Single Circuit Line	$2,793,000
	Substation Additions	
	Spurlock Generating Station Substation	$664,000
	Stuart 345 kV Substation Addition	$1,220,000
	Cranston 138 kV Substation Expansion	$307,000
	Rowan 138 kV Substation Expansion	$351,000
	Total Alternate 4A	$11,395,000

Alternate Transmission Case 1

COST ESTIMATE: Spurlock Generating Station Expansion

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV STEEL STRUCTURE, BUS WORK, SW'S & MAST	LOT	$120,000	$120,000
138 KV BREAKER	3	$70,000	$210,000
138 KV CVT	6	$6,000	$36,000
RELAY PANEL	2	$25,000	$50,000
CABLE TRENCH (ADDITION)	LOT	$10,000	$10,000
CABLE & CONDUITS	LOT	$10,000	$10,000
FOUNDATIONS	LOT	$10,000	$10,000
GROUNDING	LOT	$10,000	$10,000
MISCELLANEOUS ITEMS, GRAVEL	LOT	$20,000	$20,000
SUBTOTAL:			**$476,000**
UNDEVELOPED DESIGN DETAILS	20.0%		$95,200
ENGINEERING, LEGAL OVERHEAD	25.0%		$142,800
SUBTOTAL:			**$238,000**
GRAND TOTAL($1,000):			**$714,000**

USE $714,000

COST ESTIMATE: Foster and Stuart Substation Expansions

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
RELAY PANEL	2	$25,000	$50,000
SUBTOTAL:			**$50,000**
UNDEVELOPED DESIGN DETAILS	20.0%		$10,000
ENGINEERING, LEGAL OVERHEAD	25.0%		$15,000
SUBTOTAL:			**$25,000**
GRAND TOTAL($1,000):			**$75,000**

USE $75,000

COST ESTIMATE: Spurlock- Foster/Stuart Double Circuit 138 kV Line

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV SINGLE CIRCUIT 954 KCMIL ACSR STEEL POLE STRUCTURES	2.9	$255,000	$739,500
ADD SECOND CIRCUIT	2.9	$127,500	$369,750
RIVER CROSSING STRUCTURES	2	$150,000	$300,000
TAP STRUCTURE	1	$150,000	$150,000
SUBTOTAL:			**$1,559,250**
UNDEVELOPED DESIGN DETAILS	20.0%		$311,850
ENGINEERING, LEGAL OVERHEAD	25.0%		$467,775
SUBTOTAL:			**$779,625**
GRAND TOTAL($1,000):			**$2,338,875**

USE $2,340,000

Alternate Transmission Case 1A

COST ESTIMATE: Inland Substation Expansion

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV STEEL STRUCTURE, BUS WORK, SW'S & MAST	LOT	$60,000	$60,000
138 KV BREAKER	1	$70,000	$70,000
138 KV CCVT	3	$6,000	$18,000
RELAY PANEL	1	$25,000	$25,000
CABLE TRENCH (ADDITION)	LOT	$5,000	$5,000
CABLE & CONDUITS	LOT	$5,000	$5,000
FOUNDATIONS	LOT	$5,000	$5,000
GROUNDING	LOT	$5,000	$5,000
MISCELLANEOUS ITEMS, GRAVEL	LOT	$10,000	$10,000
SUBTOTAL:			**$203,000**
UNDEVELOPED DESIGN DETAILS	20.0%		$40,600
ENGINEERING, LEGAL OVERHEAD	25.0%		$60,900
SUBTOTAL:			**$101,500**
GRAND TOTAL:			**$304,500**
		USE $305000	

COST ESTIMATE: Spencer Road Substation Expansion with SCADA

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV STRUCTURE	1	$16,000	$16,000
138 KV DISC SWITCH	2	$10,000	$20,000
138 KV AIR BREAK SW	1	$10,000	$10,000
138 KV BREAKER	1	$70,000	$70,000
138 KV ARRESTORS	3	$1,500	$4,500
AC SYSTEM	LOT	$4,700	$4,700
DC SYSTEM	LOT	$11,800	$11,800
CONTROL BUILDING AND EQUIPMENT		$12,900	$12,900
RELAY PANEL		$25,000	$25,000
FOUNDATIONS		$10,000	$10,000
GROUND GRID ADDITION	LOT	$5,000	$5,000
SCADA (SMALL RTU)	LOT	$5,000	$5,000
CABLE, CONDUIT	LOT	$5,000	$5,000
ROCK, FENCE, ETC.	LOT	$9,000	$9,000
SUBSTATIONS SITE(3 ACRES)		$40,000	$40,000
METERING CT'S 138 KV	2	$8,000	$16,000
METERING (JEM2) WITH MODEM		$5,000	$5,000
CONTROL BUILDING MODIFICATION	LOT	$8,000	$8,000
CABLE, TRAY, & TRENCH	LOT	$4,000	$4,000
SUBTOTAL:			**$281,900**
UNDEVELOPED DESIGN DETAILS	20.0%		$56,380
ENGINEERING, LEGAL OVERHEAD	25.0%		$84,570
SUBTOTAL:			**$140,950**
GRAND TOTAL:			**$422,850**

USE $423,000

COST ESTIMATE: Inland - Inland "T" Single Circuit 138 kV Line

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV SINGLE CIRCUIT 954 KCMIL ACSR STEEL POLE STRUC	0.5	$255,000	$127,500
TAP STRUCTURE	1	$150,000	$150,000
SUBTOTAL:			**$277,500**
UNDEVELOPED DESIGN DETAILS	20.0%		$55,500
ENGINEERING, LEGAL OVERHEAD	25.0%		$83,250
SUBTOTAL:			**$138,750**
GRAND TOTAL($1,000):			**$416,250**

USE $416000

COST ESTIMATE:J.K. Smith - Spencer Road Single Circuit 138 kV Line

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV SINGLE CIRCUIT 954 KCMIL ACSR STEEL POLE STRUC	16.5	$255,000	$4,207,500
SUBTOTAL:			**$4,207,500**
UNDEVELOPED DESIGN DETAILS	20.0%		$841,500
ENGINEERING, LEGAL OVERHEAD	25.0%		$1,262,250
SUBTOTAL:			**$2,103,750**
GRAND TOTAL($1,000):			**$6,311,250**

USE $6,312,000

COST ESTIMATE: Cranston - Rowan Single Circuit 138 kV Line

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV SINGLE CIRCUIT 954 KCMIL ACSR STEEL POLE STRUC	7.3	$255,000	$1,861,500
SUBTOTAL:			**$1,861,500**
UNDEVELOPED DESIGN DETAILS	20.0%		$372,300
ENGINEERING, LEGAL OVERHEAD	25.0%		$558,450
SUBTOTAL:			**$930,750**
GRAND TOTAL($1,000):			**$2,792,250**
		USE $2,793,000	

COST ESTIMATE: Cranston 138 kV Breaker

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV STRUCTURE	1	$16,000	$16,000
138 KV DISC SWITCH	2	$10,000	$20,000
138 KV AIR BREAK SW	1	$10,000	$10,000
138 KV BREAKER	1	$70,000	$70,000
138 KV ARRESTORS	3	$1,500	$4,500
RELAY PANEL		$25,000	$25,000
FOUNDATIONS		$10,000	$10,000
GROUND GRID ADDITION	LOT	$5,000	$5,000
SCADA (SMALL RTU)	LOT	$5,000	$5,000
CABLE, CONDUIT	LOT	$5,000	$5,000
ROCK, FENCE, ETC.	LOT	$9,000	$9,000
METERING CTS 138 KV	2	$8,000	$16,000
METERING (JEM2) WITH MODEM		$5,000	$5,000
CABLE, TRAY, & TRENCH	LOT	$4,000	$4,000
SUBTOTAL:			**$204,500**
UNDEVELOPED DESIGN DETAILS	20.0%		$40,900
ENGINEERING, LEGAL OVERHEAD	25.0%		$61,350
SUBTOTAL:			**$102,250**
GRAND TOTAL:			**$306,750**

USE $307,000

COST ESTIMATE: Rowan 138 kV Breaker

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV STRUCTURE	1	$16,000	$16,000
138 KV DISC SWITCH	2	$10,000	$20,000
138 KV AIR BREAK SW	1	$10,000	$10,000
138 KV BREAKER	1	$70,000	$70,000
138 KV ARRESTORS	3	$1,500	$4,500
AC SYSTEM	LOT	$4,700	$4,700
DC SYSTEM	LOT	$11,800	$11,800
CONTROL BUILDING AND EQUIPMENT		$12,900	$12,900
RELAY PANEL		$25,000	$25,000
FOUNDATIONS		$10,000	$10,000
GROUND GRID ADDITION	LOT	$5,000	$5,000
SCADA (SMALL RTU)	LOT	$5,000	$5,000
CABLE, CONDUIT	LOT	$5,000	$5,000
ROCK, FENCE, ETC.	LOT	$9,000	$9,000
METERING CT'S 138 KV	2	$8,000	$16,000
METERING (JEM2) WITH MODEM		$5,000	$5,000
CABLE, TRAY, & TRENCH	LOT	$4,000	$4,000
SUBTOTAL:			**$233,900**
UNDEVELOPED DESIGN DETAILS	20.0%		$46,780
ENGINEERING, LEGAL OVERHEAD	25.0%		$70,170
SUBTOTAL:			**$116,950**
GRAND TOTAL:			**$350,850**

USE $351,000

COST ESTIMATE: J.K. Smith Addition

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV STEEL STRUCTURE, BUS WORK, SW'S & MAST	LOT	$120,000	$120,000
138 KV BREAKER	2	$70,000	$140,000
138 KV CVT	3	$6,000	$18,000
RELAY PANEL	1	$25,000	$25,000
CABLE TRENCH (ADDITION)	LOT	$10,000	$10,000
CABLE & CONDUITS	LOT	$10,000	$10,000
FOUNDATIONS	LOT	$10,000	$10,000
GROUNDING	LOT	$10,000	$10,000
MISCELLANEOUS ITEMS, GRAVEL	LOT	$20,000	$20,000
SUBTOTAL:			**$363,000**
UNDEVELOPED DESIGN DETAILS	20.0%		$72,600
ENGINEERING, LEGAL OVERHEAD	25.0%		$108,900
SUBTOTAL:			**$181,500**
GRAND TOTAL($1,000):			**$544,500**

USE $545,000

Alternate Transmission Case 2

COST ESTIMATE: Spurlock 345 kV Substation Expansion

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
345 KV STEEL STRUCTURE	1	$50,000	$50,000
345 KV BREAKER	1	$220,000	$220,000
345 KV CCVT	3	$15,000	$45,000
345 KV VERT. BK SWITCHES W/O INS.	2	$18,000	$36,000
LINE TRAPS, LTU, 2000A W/O INS.	1	$20,000	$20,000
345 KV SA'S	3	$3,800	$11,400
RELAY PANEL	1	$35,000	$35,000
CABLE TRENCH (ADDITION)	LOT	$5,000	$5,000
CABLE & CONDUITS	LOT	$5,000	$5,000
FOUNDATIONS	LOT	$5,000	$5,000
MISCELLANEOUS ITEMS, GRAVEL	LOT	$10,000	$10,000
SUBTOTAL:			**$442,400**
UNDEVELOPED DESIGN DETAILS	20.0%		$88,480
ENGINEERING, LEGAL OVERHEAD	25.0%		$132,720
SUBTOTAL:			**$221,200**
GRAND TOTAL:			**$663,600**

USE $664,000

COST ESTIMATE: Rowan 345-138 kV Substation Expansion

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV BUS WORK & MAST	LOT	$75,000	$75,000
138 KV BREAKER	1	$70,000	$70,000
138 KV CCVT	3	$6,000	$18,000
138 KV STRUCTURE	1	$16,000	$16,000
138 KV DISC SWITCH	2	$10,000	$20,000
138 KV AIR BREAK SW	1	$10,000	$10,000
138 KV BREAKER	1	$70,000	$70,000
138 KV ARRESTORS	3	$1,500	$4,500
RELAY PANEL	1	$25,000	$25,000
AC SYSTEM	LOT	$4,700	$4,700
DC SYSTEM	LOT	$11,800	$11,800
CONTROL BUILDING AND EQUIPMENT	1	$12,900	$12,900
345-138 kV 580 MVA AUTOTRANSFORMER	1	$4,000,000	$4,000,000
CABLE TRENCH (ADDITION)	LOT	$10,000	$10,000
CABLE & CONDUITS	LOT	$5,000	$5,000
FOUNDATIONS	LOT	$20,000	$20,000
GROUNDING	LOT	$10,000	$10,000
MISCELLANEOUS ITEMS, GRAVEL	LOT	$20,000	$20,000
SUBTOTAL:			**$4,402,900**
UNDEVELOPED DESIGN DETAILS	20.0%		$880,580
ENGINEERING, LEGAL OVERHEAD	25.0%		$1,320,870
SUBTOTAL:			**$2,201,450**
GRAND TOTAL:			**$6,604,350**

USE $6,605,000

COST ESTIMATE:Spurlock - Rowan Single Circuit 345 kV Line

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV SINGLE CIRCUIT 954 KCMIL ACSR STEEL POLE STRUCTURES	45.9	$409,000	$18,773,100
SUBTOTAL:			**$18,773,100**
UNDEVELOPED DESIGN DETAILS	20.0%		$3,754,620
ENGINEERING, LEGAL OVERHEAD	25.0%		$5,631,930
SUBTOTAL:			**$9,386,550**
GRAND TOTAL($1,000):			**$28,159,650**
		USE $28,160,000	

Alternate Transmission Case 3

COST ESTIMATE: Stuart 345kV Substation Expansion

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
345 KV STEEL STRUCTURE	1	$50,000	$50,000
345 KV BREAKER	2	$220,000	$440,000
345 KV BUSWORK, MAST, STRUCTURES	LOT	$150,000	$150,000
345 KV CCVT	3	$15,000	$45,000
345 KV VERT. BK SWITCHES W/O INS.	2	$18,000	$36,000
LINE TRAPS, LTU, 2000A W/O INS.	1	$20,000	$20,000
345 KV SA'S	3	$3,800	$11,400
RELAY PANEL	1	$35,000	$35,000
CABLE TRENCH (ADDITION)	LOT	$5,000	$5,000
CABLE & CONDUITS	LOT	$5,000	$5,000
FOUNDATIONS	LOT	$5,000	$5,000
MISCELLANEOUS ITEMS, GRAVEL	LOT	$10,000	$10,000
SUBTOTAL:			**$812,400**
UNDEVELOPED DESIGN DETAILS	20.0%		$162,480
ENGINEERING, LEGAL OVERHEAD	25.0%		$243,720
SUBTOTAL:			**$406,200**
GRAND TOTAL:			**$1,218,600**

USE $1,220,000

COST ESTIMATE:Spurlock - Stuart Single Circuit 345 kV Line

DESCRIPTION	QTY	MATERIAL UNIT COST	MATERIAL EXT'D COST
138 KV SINGLE CIRCUIT 954 KCMIL ACSR STEEL POLE STRUCTURES	8.9	$409,000	$3,640,100
RIVER CROSSING STRUCTURES	2	$200,000	$400,000
SUBTOTAL:			**$4,040,100**
UNDEVELOPED DESIGN DETAILS	20.0%		$808,020
ENGINEERING, LEGAL OVERHEAD	25.0%		$1,212,030
SUBTOTAL:			**$2,020,050**
GRAND TOTAL($1,000):			**$6,060,150**

USE $6,060,000

Alternate Transmission Case 3A

COST ESTIMATE: Avon 345 kV Substation Expansion

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
345 KV STEEL STRUCTURE	1	$50,000	$50,000
345 KV BREAKER	3	$220,000	$660,000
345 KV CCVT	3	$15,000	$45,000
345 KV VERT. BK SWITCHES W/O INS.	6	$18,000	$108,000
345 KV BUSWORK, MAST, STRUCTURES	LOT	$150,000	$150,000
345 KV SA'S	3	$3,800	$11,400
RELAY PANEL	2	$35,000	$70,000
CABLE TRENCH (ADDITION)	LOT	$15,000	$15,000
CABLE & CONDUITS	LOT	$15,000	$15,000
FOUNDATIONS	LOT	$20,000	$20,000
MISCELLANEOUS ITEMS, GRAVEL	LOT	$30,000	$30,000
SUBTOTAL:			$1,174,400
UNDEVELOPED DESIGN DETAILS	20.0%		$234,880
ENGINEERING, LEGAL OVERHEAD	25.0%		$352,320
SUBTOTAL:			$587,200
GRAND TOTAL:			$1,761,600

USE $1,762,000

COST ESTIMATE: Smith - Avon Single Circuit 345 kV Line

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV SINGLE CIRCUIT 954 KCMIL ACSR STEEL POLE STRUCTURES	17.6	$409,000	$7,198,400
SUBTOTAL:			**$7,198,400**
UNDEVELOPED DESIGN DETAILS	20.0%		$1,439,680
ENGINEERING, LEGAL OVERHEAD	25.0%		$2,159,520
SUBTOTAL:			**$3,599,200**
GRAND TOTAL($1,000):			**$10,797,600**

USE $10,798,000

COST ESTIMATE: Smith 345-138 kV Substation Expansion

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV BUS WORK & MAST	LOT	$75,000	$75,000
138 KV BREAKER	1	$70,000	$70,000
138 KV CCVT	3	$6,000	$18,000
138 KV STRUCTURE	1	$16,000	$16,000
138 KV DISC SWITCH	2	$10,000	$20,000
138 KV AIR BREAK SW	1	$10,000	$10,000
138 KV BREAKER	1	$70,000	$70,000
138 KV ARRESTORS	3	$1,500	$4,500
RELAY PANEL	1	$25,000	$25,000
345-138 kV 580 MVA AUTOTRANSFORMER	1	$4,000,000	$4,000,000
CABLE TRENCH (ADDITION)	LOT	$10,000	$10,000
CABLE & CONDUITS	LOT	$5,000	$5,000
FOUNDATIONS	LOT	$20,000	$20,000
GROUNDING	LOT	$10,000	$10,000
MISCELLANEOUS ITEMS, GRAVEL	LOT	$20,000	$20,000
SUBTOTAL:			**$4,373,500**
UNDEVELOPED DESIGN DETAILS	20.0%		$874,700
ENGINEERING, LEGAL OVERHEAD	25.0%		$1,312,050
SUBTOTAL:			**$2,186,750**
GRAND TOTAL:			**$6,560,250**

USE $6,560,000

Alternate Transmission Case 4

COST ESTIMATE: Rowan 345-138 kV Substation Expansion

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV BUS WORK & MAST	LOT	$75,000	$75,000
138 KV BREAKER	1	$70,000	$70,000
138 KV CCVT	3	$6,000	$18,000
138 KV STRUCTURE	1	$16,000	$16,000
138 KV DISC SWITCH	2	$10,000	$20,000
138 KV AIR BREAK SW	1	$10,000	$10,000
138 KV BREAKER	1	$70,000	$70,000
138 KV ARRESTORS	3	$1,500	$4,500
RELAY PANEL	1	$25,000	$25,000
AC SYSTEM	LOT	$4,700	$4,700
DC SYSTEM	LOT	$11,800	$11,800
CONTROL BUILDING AND EQUIPMENT	1	$12,900	$12,900
345-138 kV 580 MVA AUTOTRANSFORMER	1	$4,000,000	$4,000,000
CABLE TRENCH (ADDITION)	LOT	$10,000	$10,000
CABLE & CONDUITS	LOT	$5,000	$5,000
FOUNDATIONS	LOT	$20,000	$20,000
GROUNDING	LOT	$10,000	$10,000
MISCELLANEOUS ITEMS, GRAVEL	LOT	$20,000	$20,000
SUBTOTAL:			**$4,402,900**
UNDEVELOPED DESIGN DETAILS	20.0%		$880,580
ENGINEERING, LEGAL OVERHEAD	25.0%		$1,320,870
SUBTOTAL:			**$2,201,450**
GRAND TOTAL:			**$6,604,350**

USE $6,605,000

COST ESTIMATE:Spurlock - Rowan Single Circuit 345 kV Line

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV SINGLE CIRCUIT 954 KCMIL ACSR STEEL POLE STRUCTURES	45.9	$409,000	$18,773,100
SUBTOTAL:			**$18,773,100**
UNDEVELOPED DESIGN DETAILS	20.0%		$3,754,620
ENGINEERING, LEGAL OVERHEAD	25.0%		$5,631,930
SUBTOTAL:			**$9,386,550**
GRAND TOTAL($1,000):			**$28,159,650**

USE $28,160,000

Final Alternates

Spurlock Generating Station 500 MW Expansion
Final Alternate Transmission Arrangements
Estimated Transmission Costs

Alternate	Facility	Estimated Cost
1A	Line Additions	
	Spurlock - Foster/Stuart 138 kV Double Circuit Line	$2,340,000
	Inland - Inland "T" 138 kV Single Circuit Line	$416,000
	J. K. Smith - Spencer Road 138 kV Single Circuit Line	$6,312,000
	Cranston - Rowan 138 kV Single Circuit Line	$2,793,000
	Substation Additions	
	Spurlock Generating Station Substation	$714,000
	Stuart and Brown Relay Panels	$75,000
	Inland 138 kV Substation Expansion	$305,000
	Cranston 138 kV Breaker	$307,000
	Rowan 138 kV Breaker	$351,000
	J.K. Smith 138 kV Substation Expansion	$545,000
	Spencer Road 138 kV Substation Expansion	$423,000
	Total Alternate 1A	$14,581,000
3	Line Additions	
	Spurlock - Stuart and Spurlock - Zimmer 345 kV Double Circuit Line	$15,401,000
	Substation Additions	
	Spurlock Generating Station Substation	$1,612,000
	Modifications to Zimmer and Stuart Substations	$165,000
	Total Alternate 3	$17,178,000
3A	Line Additions	
	Spurlock - Stuart and Spurlock - Zimmer 345 kV Double Circuit Line	$15,401,000
	J. K. Smith - Spencer Road 138 kV Single Circuit Line	$6,312,000
	J.K. Smith - Avon 345 kV Single Circuit Line	$10,798,000
	Substation Additions	
	Spurlock Generating Station Substation	$1,612,000
	Modifications to Zimmer and Stuart Substations	$165,000
	J.K. Smith 345-138 kV Substation Expansion	$6,560,000
	Spencer Road 138 kV Substation Expansion	$423,000
	Avon 345 kV Substation Expansion	$1,762,000
	Total Alternate 3A	$43,033,000
4	Line Additions	
	Spurlock - Stuart and Spurlock - Zimmer 345 kV Double Circuit Line	$15,401,000
	Spurlock - Rowan 345 kV Single Circuit Line	$28,160,000
	Substation Additions	
	Spurlock Generating Station Substation	$1,612,000
	Modifications to Zimmer and Stuart Substations	$165,000
	Rowan 345-138kV Substation Addition	$6,605,000
	Total Alternate 4	$51,943,000
4A	Line Additions	
	Spurlock - Stuart and Spurlock - Zimmer 345 kV Double Circuit Line	$15,401,000
	Cranston - Rowan 138 kV Single Circuit Line	$2,793,000
	Substation Additions	
	Spurlock Generating Station Substation	$1,612,000
	Modifications to Zimmer and Stuart Substations	$165,000
	Cranston 138 kV Substation Expansion	$307,000
	Rowan 138 kV Substation Expansion	$351,000
	Total Alternate 4A	$20,629,000

Alternate Transmission Case 1A

COST ESTIMATE: Inland Substation Expansion

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV STEEL STRUCTURE, BUS WORK, SW'S & MAST	LOT	$60,000	$60,000
138 KV BREAKER	1	$70,000	$70,000
138 KV CCVT	3	$6,000	$18,000
RELAY PANEL	1	$25,000	$25,000
CABLE TRENCH (ADDITION)	LOT	$5,000	$5,000
CABLE & CONDUITS	LOT	$5,000	$5,000
FOUNDATIONS	LOT	$5,000	$5,000
GROUNDING	LOT	$5,000	$5,000
MISCELLANEOUS ITEMS, GRAVEL	LOT	$10,000	$10,000
SUBTOTAL:			**$203,000**
UNDEVELOPED DESIGN DETAILS	20.0%		$40,600
ENGINEERING, LEGAL OVERHEAD	25.0%		$60,900
SUBTOTAL:			**$101,500**
GRAND TOTAL:			**$304,500**

USE $305000

COST ESTIMATE: Spencer Road Substation Expansion with SCADA

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV STRUCTURE	1	$16,000	$16,000
138 KV DISC SWITCH	2	$10,000	$20,000
138 KV AIR BREAK SW	1	$10,000	$10,000
138 KV BREAKER	1	$70,000	$70,000
138 KV ARRESTORS	3	$1,500	$4,500
AC SYSTEM	LOT	$4,700	$4,700
DC SYSTEM	LOT	$11,800	$11,800
CONTROL BUILDING AND EQUIPMENT		$12,900	$12,900
RELAY PANEL		$25,000	$25,000
FOUNDATIONS		$10,000	$10,000
GROUND GRID ADDITION	LOT	$5,000	$5,000
SCADA (SMALL RTU)	LOT	$5,000	$5,000
CABLE, CONDUIT	LOT	$5,000	$5,000
ROCK, FENCE, ETC.	LOT	$9,000	$9,000
SUBSTATIONS SITE(3 ACRES)		$40,000	$40,000
METERING CT'S 138 KV	2	$8,000	$16,000
METERING (JEM2) WITH MODEM		$5,000	$5,000
CONTROL BUILDING MODIFICATION	LOT	$8,000	$8,000
CABLE, TRAY, & TRENCH	LOT	$4,000	$4,000
SUBTOTAL:			$281,900
UNDEVELOPED DESIGN DETAILS	20.0%		$56,380
ENGINEERING, LEGAL OVERHEAD	25.0%		$84,570
SUBTOTAL:			**$140,950**
GRAND TOTAL:			**$422,850**

USE $423,000

COST ESTIMATE: Inland - Inland "T" Single Circuit 138 kV Line

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV SINGLE CIRCUIT 954 KCMIL ACSR STEEL POLE STRUCTURES	0.5	$255,000	$127,500
TAP STRUCTURE	1	$150,000	$150,000
SUBTOTAL:			**$277,500**
UNDEVELOPED DESIGN DETAILS	20.0%		$55,500
ENGINEERING, LEGAL OVERHEAD	25.0%		$83,250
SUBTOTAL:			**$138,750**
GRAND TOTAL($1,000):			**$416,250**

USE $416000

COST ESTIMATE:J.K. Smith - Spencer Road Single Circuit 138 kV Line

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV SINGLE CIRCUIT 954 KCMIL ACSR STEEL POLE STRUCTURES	16.5	$255,000	$4,207,500
SUBTOTAL:			**$4,207,500**
UNDEVELOPED DESIGN DETAILS	20.0%		$841,500
ENGINEERING, LEGAL OVERHEAD	25.0%		$1,262,250
SUBTOTAL:			**$2,103,750**
GRAND TOTAL($1,000):			**$6,311,250**

USE $6,312,000

COST ESTIMATE:Cranston - Rowan Single Circuit 138 kV Line

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV SINGLE CIRCUIT 954 KCMIL ACSR STEEL POLE STRUCTURES	7.3	$255,000	$1,861,500
SUBTOTAL:			**$1,861,500**
UNDEVELOPED DESIGN DETAILS	20.0%		$372,300
ENGINEERING, LEGAL OVERHEAD	25.0%		$558,450
SUBTOTAL:			**$930,750**
GRAND TOTAL($1,000):			**$2,792,250**

USE $2,793,000

COST ESTIMATE:Cranston 138 kV Breaker

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV STRUCTURE	1	$16,000	$16,000
138 KV DISC SWITCH	2	$10,000	$20,000
138 KV AIR BREAK SW	1	$10,000	$10,000
138 KV BREAKER	1	$70,000	$70,000
138 KV ARRESTORS	3	$1,500	$4,500
RELAY PANEL		$25,000	$25,000
FOUNDATIONS		$10,000	$10,000
GROUND GRID ADDITION	LOT	$5,000	$5,000
SCADA (SMALL RTU)	LOT	$5,000	$5,000
CABLE, CONDUIT	LOT	$5,000	$5,000
ROCK, FENCE, ETC.	LOT	$9,000	$9,000
METERING CT'S 138 KV	2	$8,000	$16,000
METERING (JEM2) WITH MODEM		$5,000	$5,000
CABLE, TRAY, & TRENCH	LOT	$4,000	$4,000
SUBTOTAL:			**$204,500**
UNDEVELOPED DESIGN DETAILS	20.0%		$40,900
ENGINEERING, LEGAL OVERHEAD	25.0%		$61,350
SUBTOTAL:			**$102,250**
GRAND TOTAL:			**$306,750**
		USE $307,000	

COST ESTIMATE: Rowan 138 kV Breaker

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV STRUCTURE	1	$16,000	$16,000
138 KV DISC SWITCH	2	$10,000	$20,000
138 KV AIR BREAK SW	1	$10,000	$10,000
138 KV BREAKER	1	$70,000	$70,000
138 KV ARRESTORS	3	$1,500	$4,500
AC SYSTEM	LOT	$4,700	$4,700
DC SYSTEM	LOT	$11,800	$11,800
CONTROL BUILDING AND EQUIPMENT		$12,900	$12,900
RELAY PANEL		$25,000	$25,000
FOUNDATIONS		$10,000	$10,000
GROUND GRID ADDITION	LOT	$5,000	$5,000
SCADA (SMALL RTU)	LOT	$5,000	$5,000
CABLE, CONDUIT	LOT	$5,000	$5,000
ROCK, FENCE, ETC.	LOT	$9,000	$9,000
METERING CT'S 138 KV	2	$8,000	$16,000
METERING (JEM2) WITH MODEM		$5,000	$5,000
CABLE, TRAY, & TRENCH	LOT	$4,000	$4,000
SUBTOTAL:			**$233,900**
UNDEVELOPED DESIGN DETAILS	20.0%		$46,780
ENGINEERING, LEGAL OVERHEAD	25.0%		$70,170
SUBTOTAL:			**$116,950**
GRAND TOTAL:			**$350,850**

USE $351,000

COST ESTIMATE: J.K. Smith Addition

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV STEEL STRUCTURE, BUS WORK, SW'S & MAST	LOT	$120,000	$120,000
138 KV BREAKER	2	$70,000	$140,000
138 KV CVT	3	$6,000	$18,000
RELAY PANEL	1	$25,000	$25,000
CABLE TRENCH (ADDITION)	LOT	$10,000	$10,000
CABLE & CONDUITS	LOT	$10,000	$10,000
FOUNDATIONS	LOT	$10,000	$10,000
GROUNDING	LOT	$10,000	$10,000
MISCELLANEOUS ITEMS, GRAVEL	LOT	$20,000	$20,000
SUBTOTAL:			**$363,000**
UNDEVELOPED DESIGN DETAILS	20.0%		$72,600
ENGINEERING, LEGAL OVERHEAD	25.0%		$108,900
SUBTOTAL:			**$181,500**
GRAND TOTAL($1,000):			**$544,500**

USE $545,000

COST ESTIMATE: Spurlock Generating Station Expansion

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV STEEL STRUCTURE, BUS WORK, SW'S & MAST	LOT	$120,000	$120,000
138 KV BREAKER	3	$70,000	$210,000
138 KV CVT	6	$6,000	$36,000
RELAY PANEL	2	$25,000	$50,000
CABLE TRENCH (ADDITION)	LOT	$10,000	$10,000
CABLE & CONDUITS	LOT	$10,000	$10,000
FOUNDATIONS	LOT	$10,000	$10,000
GROUNDING	LOT	$10,000	$10,000
MISCELLANEOUS ITEMS, GRAVEL	LOT	$20,000	$20,000
SUBTOTAL:			**$476,000**
UNDEVELOPED DESIGN DETAILS	20.0%		$95,200
ENGINEERING, LEGAL OVERHEAD	25.0%		$142,800
SUBTOTAL:			**$238,000**
GRAND TOTAL($1,000):			**$714,000**

USE $714,000

COST ESTIMATE: Foster and Stuart Substation Expansions

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
RELAY PANEL	2	$25,000	$50,000
SUBTOTAL:			**$50,000**
UNDEVELOPED DESIGN DETAILS	20.0%		$10,000
ENGINEERING, LEGAL OVERHEAD	25.0%		$15,000
SUBTOTAL:			**$25,000**
GRAND TOTAL($1,000):			**$75,000**

USE $75,000

COST ESTIMATE: Spurlock- Foster/Stuart Double Circuit 138 kV Line

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV SINGLE CIRCUIT 954 KCMIL ACSR STEEL POLE STRUCTURES	2.9	$255,000	$739,500
ADD SECOND CIRCUIT	2.9	$127,500	$369,750
RIVER CROSSING STRUCTURES	2	$150,000	$300,000
TAP STRUCTURE	1	$150,000	$150,000
SUBTOTAL:			**$1,559,250**
UNDEVELOPED DESIGN DETAILS	20.0%		$311,850
ENGINEERING, LEGAL OVERHEAD	25.0%		$467,775
SUBTOTAL:			**$779,625**
GRAND TOTAL($1,000):			**$2,338,875**

USE $2,340,000

Alternate Transmission Case 3

COST ESTIMATE: Spurlock 345 kV Substation Expansion

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
345 KV STEEL STRUCTURE	2	$50,000	$100,000
345 KV BREAKER	2	$220,000	$440,000
345 KV CCVT	6	$15,000	$90,000
345 KV VERT. BK SWITCHES W/O INS.	4	$18,000	$72,000
LINE TRAPS, LTU, 2000A W/O INS.	2	$20,000	$40,000
345 KV SA'S	6	$3,800	$22,800
BUS STRUCTURES, ETC	1	$150,000	$150,000
RELAY PANEL	3	$35,000	$105,000
CABLE TRENCH (ADDITION)	LOT	$10,000	$10,000
CABLE & CONDUITS	LOT	$10,000	$10,000
FOUNDATIONS	LOT	$15,000	$15,000
MISCELLANEOUS ITEMS, GRAVEL	LOT	$20,000	$20,000
SUBTOTAL:			**$1,074,800**
UNDEVELOPED DESIGN DETAILS	20.0%		$214,960
ENGINEERING, LEGAL OVERHEAD	25.0%		$322,440
SUBTOTAL:			**$537,400**
GRAND TOTAL:			**$1,612,200**

USE $1,612,000

COST ESTIMATE: Zimmer & Stuart 345 kV Substation Expansions

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
ZIMMER RELAY PANEL	1	$35,000	$35,000
STUART RELAY PANEL	1	$35,000	$35,000
CABLE & CONDUITS	LOT	$20,000	$20,000
MISCELLANEOUS ITEMS	LOT	$20,000	$20,000
SUBTOTAL:			**$110,000**
UNDEVELOPED DESIGN DETAILS	20.0%		$22,000
ENGINEERING, LEGAL OVERHEAD	25.0%		$33,000
SUBTOTAL:			**$55,000**
GRAND TOTAL:			***$165,000***

USE $165,000

COST ESTIMATE:Spurlock - Stuart and Spurlock - Zimmer Double Circuit 345 kV Line

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
345 KV SINGLE CIRCUIT 954 KCMIL ACSR STEEL POLE STRUCTURES	8.9	$409,000	$3,640,100
SECOND 345KV STRUCTURE MODIFICATIONS & CONDUCTOR	8.9	$204,500	$1,820,050
RIVER CROSSING STRUCTURES	2	$350,000	$700,000
SUBTOTAL:			**$6,160,150**
UNDEVELOPED DESIGN DETAILS	20.0%		$1,232,030
ENGINEERING, LEGAL OVERHEAD	25.0%		$1,848,045
SUBTOTAL:			**$9,240,225**
GRAND TOTAL($1,000):			**$15,400,375**

USE $15,401,000

Alternate Transmission Case 3A

COST ESTIMATE: Avon 345 kV Substation Expansion

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
345 KV STEEL STRUCTURE	1	$50,000	$50,000
345 KV BREAKER	3	$220,000	$660,000
345 KV CCVT	3	$15,000	$45,000
345 KV VERT. BK SWITCHES W/O INS.	6	$18,000	$108,000
345 KV BUSWORK, MAST, STRUCTURES	LOT	$150,000	$150,000
345 KV SA'S	3	$3,800	$11,400
RELAY PANEL	2	$35,000	$70,000
CABLE TRENCH (ADDITION)	LOT	$15,000	$15,000
CABLE & CONDUITS	LOT	$15,000	$15,000
FOUNDATIONS	LOT	$20,000	$20,000
MISCELLANEOUS ITEMS, GRAVEL	LOT	$30,000	$30,000
SUBTOTAL:			**$1,174,400**
UNDEVELOPED DESIGN DETAILS	20.0%		$234,880
ENGINEERING, LEGAL OVERHEAD	25.0%		$352,320
SUBTOTAL:			**$587,200**
GRAND TOTAL:			**$1,761,600**

USE $1,762,000

COST ESTIMATE: Smith - Avon Single Circuit 345 kV Line

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV SINGLE CIRCUIT 954 KCMIL ACSR STEEL POLE STRUCTURES	17.6	$409,000	$7,198,400
SUBTOTAL:			**$7,198,400**
UNDEVELOPED DESIGN DETAILS	20.0%		$1,439,680
ENGINEERING, LEGAL OVERHEAD	25.0%		$2,159,520
SUBTOTAL:			**$3,599,200**
GRAND TOTAL($1,000):			**$10,797,600**

USE $10,798,000

COST ESTIMATE: Smith 345-138 kV Substation Expansion

DESCRIPTION	QTY	MATERIAL	
		UNIT COST	EXT'D COST
138 KV BUS WORK & MAST	LOT	$75,000	$75,000
138 KV BREAKER	1	$70,000	$70,000
138 KV CCVT	3	$6,000	$18,000
138 KV STRUCTURE	1	$16,000	$16,000
138 KV DISC SWITCH	2	$10,000	$20,000
138 KV AIR BREAK SW	1	$10,000	$10,000
138 KV BREAKER	1	$70,000	$70,000
138 KV ARRESTORS	3	$1,500	$4,500
RELAY PANEL	1	$25,000	$25,000
345-138 kV 580 MVA AUTOTRANSFORMER	1	$4,000,000	$4,000,000
CABLE TRENCH (ADDITION)	LOT	$10,000	$10,000
CABLE & CONDUITS	LOT	$5,000	$5,000
FOUNDATIONS	LOT	$20,000	$20,000
GROUNDING	LOT	$10,000	$10,000
MISCELLANEOUS ITEMS, GRAVEL	LOT	$20,000	$20,000
SUBTOTAL:			**$4,373,500**
UNDEVELOPED DESIGN DETAILS	20.0%		$874,700
ENGINEERING, LEGAL OVERHEAD	25.0%		$1,312,050
SUBTOTAL:			**$2,186,750**
GRAND TOTAL:			**$6,560,250**

USE $6,560,000