



East Kentucky Power Cooperative

# **System Impact Study**

## **Final Report**

OASIS Request NO: 76371132

Prepared for:

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## 1. EXECUTIVE SUMMARY

LG&E/KU has requested Network Integration Transmission Service (NITS) for an additional 4 MW's of new load in the Horse Cave area. EKPC has performed a study to determine the expected system impacts. This report identifies the expected impacts to the system, if any, along with the requirements and planning estimates to remedy any limitations.

The study has determined that the requested service can be granted with no additional transmission-system reinforcements necessary other than those already planned for the area.

## 2. Study Method

The study was performed on the latest available 2012-2021 summer and winter peak seasonal models using General Electric International, Inc. PSLF – V17.0\_05\_80K.

### 2.1 Base Case Modifications

Modifications to the base cases were made to reflect the latest information available. Changes that were made include the following:

- All future EKPC transmission projects that are currently in the engineering or construction phases for the Horse Cave area were included in the cases; all others were excluded.
- All capacitor banks in the Horse Cave area were fixed on in the cases to provide a better solution, which captures the direct effect, if any, of the 4 MW load addition on voltages in the area.

### 2.2 Long Term Firm Transactions

All long term firm transactions contained in the 2010 series of NERC MMWG models were included in the models. No other long term firm transactions were identified for inclusion in this study.



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## 2.3 Study Criteria

An analysis was performed based on the following study criteria:

### 2.3.1 Study Scenarios

- Power flow simulations with base case generation with and without the 4 MW load addition at Horse Cave.
- Power flow simulations with EKPC Cooper 2 generator out with imports from American Electric Power (AEP), with and without the 4 MW load addition at Horse Cave.
- Power flow simulations with LG&E/KU Mill Creek 4 generator out with imports from Tennessee Valley Authority (TVA) with and without the 4 MW load addition at Horse Cave.

### 2.3.2 Identification of System Impacts on EKPC Facilities

- If the flow on a monitored facility exceeds 100% of its emergency rating under single-contingency conditions with the 4 MW load addition at Horse Cave, the flow will be compared with the flow prior to the 4 MW load addition. If the 4 MW load addition causes an increase in flow of 2% or more and accelerates the timing of an overload by at least one year, the acceleration of the required improvements is attributable to the load addition.
- If the voltage level on a monitored facility violates EKPC voltage criteria under normal or single-contingency conditions with the 4 MW load addition at Horse Cave, the voltage will be compared with the voltage levels prior to the load addition. If the 4 MW load addition causes a decrease in voltage levels of 0.5% or more, and accelerates the timing of a voltage violation by at least one year, the acceleration of the required improvements is attributable to the load addition.



### 3. Study Results

The results of the study are detailed below.

#### 3.1 Voltage Violations

One bus voltage falls below EKPC’s planning criteria of 0.925 P.U. during single-contingency conditions, and is impacted by the 4 MW load addition at Horse Cave. The affected bus and the worst offending single contingency are provided in Table 1 below.

**Table 1 – Voltage Violations**

<b>Affected Bus</b>	<b>Contingency</b>	<b>Worst case Dispatch</b>	<b>Bus Voltage (P.U.) With Load</b>	<b>Violation Year With Load</b>	<b>Violation Year Without Load</b>
Cave City 12.47 KV	Barren County 161/69 transformer	Mill Creek 4	0.9135	2012 summer	2013 Summer

#### 3.2 Flow Violations

There were no monitored facilities that exceed 100% of emergency ratings under single contingency conditions with a resulting flow increase of 2 % or more with the 4 MW load addition at Horse Cave in place.

### 4. Conclusion

During the contingency of the Barren County 161/69 KV transformer, low voltage is expected to occur at EKPC’s Cave City 12.47 KV distribution substation bus. This problem is accelerated due to the 4 MW load addition at Horse Cave (by one year). EKPC currently has plans for a capacitor bank addition in the area to address the voltage problem. OASIS request # 76371132 can therefore be granted with no additional transmission-system reinforcements.

The results are based upon the most recent information available at the time of the study. Values obtained in the study are for EKPC’s transmission system and are subject to change as a result of any modifications to the assumptions utilized in the study.