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Collinsville Area 34 kV Subtransmission Study

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Contents

Executive Summary ..... **iii**

Section 1: Introduction **1-1**

1.1 Purpose of Study 1-1

1.2 Scope of Study 1-1

Section 2: Study Assumptions and Inputs **2-1**

2.1 Assumptions 2-1

2.2 Initial Conditions 2-3

2.3 Special Existing Conditions 2-4

Section 3: System Analysis and Results **3-1**

3.1 Plans Considered and Options Evaluated 3-1

3.2 Steady-State Load Flow Methodology and Results 3-1

3.3 Providing Reserve for Line 3314 3-4

Section 4: Discussion and Recommendations **4-1**

4.1 Discussion 4-1

4.2 Horizon Strategies 4-2

4.3 Recommended Plan 4-2

4.4 Special Switching 4-2

Appendix A: Recommended Projects Summary **A-1**

Appendix B: Maps and Diagrams **B-1**

B.1 Study Area B-2

B.2 General Location B-3

B.3 Initial Conditions Diagram B-4

B.4 Capital Additions Diagram (2011 - 2016) B-5

B.5 Capital Additions Diagram (2017 - 2021) B-6

B.6 Line 3314 Configuration in 2016 ..... B-7

B.7 Substation One-Line Diagram - Interstate Substation B-8

PUBLIC VERSION

Appendix C: Load Area Forecast C-1

C.1 Discussion C-1

C.2 Tabulation of Projected Loads C-2

C.3 Projection Graph C-10

Appendix D: Data Summaries D-1

D.1 Transformer Loading Summary D-2

D.2 Line Terminal Loading Summary D-5

D.3 Transformer Fixed Tap Settings Summary D-8

D.4 Contingency Outage Deck Summary D-10

Appendix E: Planning Criteria E-1

E.1 Subtransmission Voltage Criteria E-1

E.2 Subtransmission Contingency Outage Planning Criteria E-1

Appendix F: Cost Analysis F-1

F.1 Cost Analysis of Plans F-1

PUBLIC VERSION

Executive Summary

This study examined the 34 kV system in the Collinsville and Edwardsville areas to determine if any system changes would be required to ensure reliable operation during normal and contingency conditions. The scope of the study was limited to the following items:

- A five year system study for the years 2011 through 2016.
- A horizon study for the years 2017 through 2021.

The analysis showed the following major existing problems for the area:

- Multiple 34 kV lines are heavily loaded in the Area
- Low voltage in the Cloverleaf and Marine Area during single contingencies
- After 5+ years there is a large requirement for area VAR support
- We currently cannot reserve Cloverleaf thru Troy or reserve Line 3348 from Line 3314

A summary of the options evaluated and estimated total cost of the plans for the years 2012 through 2021) is shown below.

Plan A	No new bulk supplies Reconductor existing Lines & Upgrade Transformers Add Capacitors	$25,056,000
Plan B	New Interstate Bulk Substation New line from Wanda to REA Reconductor Edwardsville Area	$24,428,000
Plan C	New Interstate Bulk Substation Reconductor Line 3314 Reconductor Edwardsville Area	$22,268,000
Plan D	New 138 kV to REA Reconductor Collinsville Area	$30,530,000
Plan E	Reconductor Line 3314 Build new line from E Collinsville	$21,340,000

Plan C is the recommended plan due to cost and flexibility. Building a new substation central to the growth area and the flexibility to add a 138 kV or a 34 kV line to the Edwardsville Area to support voltages in the future support both the short and long term requirements of the area. In addition, Plan C will have the flexibility of adding a second 138/34 kV transformer in the future.

PUBLIC VERSION

Section
1

Introduction

1.1 Purpose of Study

The purpose of this study is to examine the Collinsville Area 34.5 kV subtransmission system using forecasted load data and to recommend changes as necessary to maintain acceptable service during normal and single contingency conditions for both near and long term horizons.

1.2 Scope of Study

The scope of this study includes the following:

- The study area as defined in Appendix B.1 (page B-2).
- Perform contingency analysis to identify potential limiting facilities for an increased level of load for each year during the time period of 2011 to 2021.
- Provide detailed recommendations for the development of the Collinsville and Edwardsville 34 kV system for both short and long time frames.
- Perform normal and single contingency evaluations for peak load conditions. This study will not evaluate the system using the new 80% and 65% peak load planning criteria.

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PUBLIC VERSION

Section
2

Study Assumptions and Inputs

2.1 Assumptions

Load Forecast

Load forecasts include both actual peak loads from the previous year and a future projected forecast. The predicted percent expected growth by substation or metering point is obtained from the coop for their loads. Distribution substation and coop loads are weather normalized to a one-in-ten peak demand load forecast.

Power Flow Cases

The 2007 summer NERC MMWG series case was used to build a model for expected years 2011, 2013, 2016 and 2021 summer conditions. Any scheduled and planned reinforcements of the transmission and distribution systems in Collinsville and nearby areas were included in the models. The load flow model is built using forecasted peak load for each delivery point connected to the system. Typically, all of the load points will not peak at the same time. For modeling purposes a coincidence factor is used to approximate the system peak at the bulk supply substation.

Power Technologies Inc.'s (PTI) Power system simulator for Engineering (PSS/E) program was used to simulate the transmission and Ameren Illinois subtransmission system. Steady state simulations were performed for the projected peak loading conditions. System operation was evaluated for normal and first contingency system configurations during 100% of peak load conditions.

Planning Criteria

Ameren Illinois utilizes both normal and emergency ratings for all transmission facilities, subtransmission facilities, and transformers. Recently changed criteria and ratings provide uniform criteria and ratings for Ameren Illinois. This Collinsville Area Study used the new Planning Criteria line rating criteria listed above but did not assess the subtransmission system using the new 80% and 65% peak load planning criteria (i.e. bus outage and double contingencies at reduced load levels).

Contingencies and Limits

The analysis for the study was performed using the Reliability Criteria as defined in the Ameren Illinois Subtransmission System Planning Criteria and Guidelines and as

PUBLIC VERSION

listed in Appendix E.2 (page E-1). Contingency definitions were established per Planning Criteria and are listed in Appendix D.4 (pages D-10 through D-14).

Line Ratings

Overhead subtransmission line conductor maximum ratings are based on a maximum conductor temperature and ambient conditions. Aluminum Conductor Steel Reinforced (ACSR) and All Aluminum Conductor (AAC) are the two types of conductors that are predominantly existing and standard for future subtransmission line installations. ACSR has a normal and emergency operating temperature limit of 93 C and 120 C, respectively. AAC has a normal and emergency operating temperature limit of 93 C and 100 C, respectively.

Bulk Supply Transformer Ratings

Planning ratings for bulk supply transformers differ from nameplate ratings, which are based on a constant load level, a constant ambient temperature of 30° C, and normal life expectation. Bulk supply transformer planning ratings are obtained by using the rating method set forth in IEEE Standard C57.91-1995(R2004) and the loading and temperature profile as defined in the Planning Criteria.

Substation Equipment Ratings

Equipment used at substations are given the following planning ratings.

Item of Equipment	Rating	
	Normal	Emergency
Breaker	100% Nameplate	100% Nameplate
Disconnect or AB Switch	100% Nameplate	100% Nameplate
Wave Traps	100% Nameplate	100% Nameplate
Current Transformers	100% Nameplate (1)	100% Nameplate (1)
Relay Load Limit Settings	RLL (2)	RLL (2)
Conductors	90°C (3)	100°C (3)

(1) – Current Transformer (CT): nameplate rating at the tap in use and includes any thermal rating factor given by the manufacturer. Example, a multiple ratio CT (1200-800-600/5) operating on the 600/5 tap and has a thermal rating factor of 1.5 would be given a planning rating of 900 amp (600*1.5).

(2) – The Relay Load Limit (RLL) is the calculated relay load current trip value. These values are calculated and provided by the T&D Design Engineering – System Protection group who calculate the RLL per Ameren Substation Design Guide #15G, "Design Guide for Transmission and Bulk Substation Relay and Control".

PUBLIC VERSION

(3) – The current carrying capability of various types of conductors used in Ameren Substations are provided in Ameren Substation Design Standard No. 8G, "Design Guide for Outdoor Substation Conductor Current Ratings".

Voltage Limits

The voltages at the low voltage bus of distribution substations and the point of delivery voltage at customer substations will be maintained per the planning criteria as shown in Appendix E.1 (page E-1).

2.2 Initial Conditions

- The study area consists of a portion of the Division V area (Collinsville and a portion of the Edwardsville subtransmission systems) served by the South 34 kV system. The general location of the study area is shown on a diagram in Attachment B.1 (page B-2).
- Bulk power for the study area is supplied by the following five 138/34 kV transformers:

Substation	Nameplate MVA Rating	Voltage (kV)
E. Collinsville #1	93.3	138 / 34
E. Collinsville #2	112	138 / 34
Stallings #5	112	138 / 34
Stallings #3	112	138 / 34
Wanda	56	138 / 34

- The Collinsville 34 kV system is supplied mostly from two 138/34 kV transformers at E. Collinsville substation. Some support is supplied from one 34 kV line out of the Stallings substation. Also, there is a 34 kV tie between E. Collinsville substation and Greenville McCord 138/34 kV substation in Hillsboro Service Area which is operated normally open east of Highland. Additionally, there is a 34 kV tie from the Collinsville substation to Porter Road substation in the Belleville Service Area.
- The Edwardsville portion of the study area is supplied from two 138/34 kV transformers at Stallings and one 138/34 kV transformer at Wanda.
- Stallings #3, Stallings #5 and Wanda transformers also supply the Granite City 34 kV system in addition to Collinsville and Edwardsville systems.
- There are several system capacitor banks in the study area as given below:

Location	Voltage (kV)	Connected kVAR
Collinsville	34	9000
E. Collinsville #1	34	14400
E. Collinsville #2	34	10800
East St. Jacob	34	2400
Edwardsville Schwartz	34	9000
Marine	34	7200

PUBLIC VERSION

SIU	34	10800
S. Edwardsville	34	2400
Troy Industrial Park	34	10800

2.3 Special Existing Conditions

Reserve between Line 3314 and Line 3348

Line 3314 is a 34 kV line which extends 40 miles from E. Collinsville substation in Maryville Service Area to Greenville McCord substation in Hillsboro Service Area. This line is operated normally open between Pierron and the Highland Municipal Substations. Currently when reserving the entire line from either E. Collinsville or Greenville McCord substations thermal limits are exceeded, low voltages occur as well as a problem with voltage stability.

Reserve between Line 3310 and Line 3314

Line 3310 is a 34 kV line that is normally fed out of the Collinsville Substation and has a tie with Line 3314 through a normally open ATO at Troy Industrial Park. Due to voltage restraints this ATO cannot be manually operated through at peak load conditions such that Line 3310 would pick up the entire load due to a loss of the Line 3314 breaker at East Collinsville.

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Section
3

System Analysis and Results

3.1 Plans Considered and Options Evaluated

A summary of the major components of the options evaluated is shown below.

Plan A	• Do not install any new bulk supplies to the area • Reconductor existing lines that are overloaded • Upgrade transformers as they overload • Install capacitors to support area voltage
Plan B	• Build new Interstate Bulk Substation • Build new 34 kV line from Wanda Substation to REA • Reconductor Edwardsville Area lines that are overloaded
Plan C	• Build new Interstate Bulk Substation • Reconductor Line 3314 tap to Marine • Reconductor Edwardsville Area lines that are overloaded
Plan D	• Build new 138 kV line to REA • Reconductor Collinsville Area lines that are overloaded
Plan E	• Reconductor Line 3314 tap to Marine • Build new 34 kV line from East Collinsville to Cloverleaf area

3.2 Steady-State Load Flow Methodology and Results

Methodology

Steady state simulations were performed for the projected 2011 through 2021 peak loading conditions. Planning Criteria, listed in Appendix E, were used to determine voltage problems and overloads. Each year modeled utilizes improvements that were recommended in previous years. Major projects resulting from the load flow results for the summer peak period during normal and contingency conditions are listed below for each of the Plans considered.

Results

	Plan A
2012	Close NO switch between Troy Triad HS and E St Jacob
2012	Add 10.8 MVAR capacitor bank at Goethe St Substation
2012	L3310a - Reconductor 1.0 mi of 795 AAC with 954 ACSR T2 + terminal
2012	L3310b - Reconductor 1.98 mi of 795 AAC with 954 ACSR T2
2012	L3313a - Reconductor 2.69 mi of 795 AAC with 954 ACSR T2

PUBLIC VERSION

2012	L3313e - Reconductor .99 mi of 795 AAC with 954 ACSR T2
2012	L3313f - Reconductor 1.16 mi of 795 AAC with 954 ACSR T2 + terminal
2012	L3314a - Reconductor 4.06 mi of 795 AAC with 954 ACSR T2 + terminal
2012	L3314j - Reconductor 5.3 mi of 4/0 ACSR with 556 AAC
2012	L3314o - Reconductor 2.2 mi of 795 AAC with 954 ACSR T2
2012	L3331a - Reconductor 3.3 mi of 477 AAC & ACSR with 954 ACSR
2012	L3425b - Reconductor 4.4 mi of 795 AAC with 954 ACSR T2
2012	L3459a - Reconductor 4.56 mi of 795 AAC with 954 ACSR T2 + terminal
2012	Upgrade capacitor bank at Schwartz St to 10.8 MVAR
2013	Add 14.4 MVAR capacitor bank at Cloverleaf
2013	L3308c - Reconductor .4 mi of 2-2/0 Cu with 954 ACSR T2
2014	Upgrade capacitor bank at Troy Industrial Park
2015	L3313d - Reconductor .7 mi of 2-2/0 Cu with 954 ACSR
2015	L3457a - Reconductor 1.0 mi of 795 AAC with 954 ACSR T2
2017	L3402 - Reconductor 2.3 mi of 1272 ACSR with 954 ACSR T2 + terminal
2017	Upgrade Wanda Transformer to 112 MVA
2018	L3308c - Reconductor 2.4 mi of 795 AAC with 954 ACSR T2
2018	Upgrade capacitor bank at Goethe St Substation
2018	Upgrade capacitor bank at SIU to 14.4 MVAR
2018	Add 14.4 MVAR capacitor bank at Stallings #3
2018	Add 14.4 MVAR capacitor bank at Stallings #5
2019	L3313d - Reconductor 1.25 mi of 795 AAC with 954 ACSR T2
2020	L3313b - Reconductor .3 mi of 795 AAC with 954 ACSR T2
2020	L3313c - Reconductor 2 mi of 795 AAC with 954 ACSR T2
2020	Upgrade E Collinsville Trf #1 to 112 MVA

Plan B

2012	Close NO switch between Troy Triad HS and E St Jacob
2012	Add 10.8 MVAR capacitor bank at Goethe St Substation
2012	L3331a - Reconductor 3.3 mi of 477 AAC & ACSR with 954 ACSR
2012	L3425b - Reconductor 4.4 mi of 795 AAC with 954 ACSR T2
2012	L3459a - Reconductor 4.56 mi of 795 AAC with 954 ACSR T2 + terminal
2012	Upgrade capacitor bank at Schwartz St to 10.8 MVAR
2013	L3308c - Reconductor .4 mi of 2-2/0 Cu with 954 ACSR T2
2013	Upgrade Wanda Transformer to 112 MVA
2013	Build a new line to Edwardsville REA from Wanda with 556 AAC
2014	Install new 138/34 kV substation at Troy / Cloverleaf
2014	Install new 138 kV ring bus
2015	Add new 34 kV line from Interstate Sub and Line 3313
2015	L3308c - Reconductor 2.4 mi of 795 AAC with 954 ACSR T2
2015	L3457a - Reconductor 1.0 mi of 795 AAC with 954 ACSR T2
2017	Add a second Transformer at Wanda
2017	Add 14.4 MVAR capacitor bank at Second St Substation

Plan C

2012	Close NO switch between Troy Triad HS and E St Jacob
2013	L3314j - Reconductor 5.3 mi of 4/0 ACSR with 556 AAC
2013	L3331a - Reconductor 3.3 mi of 477 AAC & ACSR with 954 ACSR
2013	Upgrade capacitor bank at Schwartz St to 10.8 MVAR
2013	L3308c - Reconductor .4 mi of 2-2/0 Cu with 954 ACSR T2

PUBLIC VERSION

2014	Install new 138/34 kV substation at Troy / Cloverleaf
2014	Install new 138 kV ring bus
2015	Add new 34 kV line from Interstate Sub and Line 3313
2015	L3308c - Reconductor 2.4 mi of 795 AAC with 954 ACSR T2
2015	L3457a - Reconductor 1.0 mi of 795 AAC with 954 ACSR T2
2016	L3425b - Reconductor 4.4 mi of 795 AAC with 954 ACSR T2
2017	L3459a - Reconductor 4.56 mi of 795 AAC with 954 ACSR T2 + terminal
2017	Upgrade Wanda Transformer to 112 MVA
2017	Add 14.4 MVAR capacitor bank at Second St Substation
2020	L3313a - Reconductor 2.69 mi of 795 AAC with 954 ACSR T2

Plan D

2012	Close NO switch between Troy Triad HS and E St Jacob
2012	Add 10.8 MVAR capacitor bank at Goethe St Substation
2012	L3310a - Reconductor 1.0 mi of 795 AAC with 954 ACSR T2 + terminal
2012	L3310b - Reconductor 1.98 mi of 795 AAC with 954 ACSR T2
2012	L3313a - Reconductor 2.69 mi of 795 AAC with 954 ACSR T2
2012	L3313e - Reconductor .99 mi of 795 AAC with 954 ACSR T2
2012	L3313f - Reconductor 1.16 mi of 795 AAC with 954 ACSR T2 + terminal
2012	L3314a - Reconductor 4.06 mi of 795 AAC with 954 ACSR T2 + terminal
2012	L3331a - Reconductor 3.3 mi of 477 AAC & ACSR with 954 ACSR
2013	L3308c - Reconductor .4 mi of 2-2/0 Cu with 954 ACSR T2
2014	Add 34 kV lines from New Edwardsville bulk to S Edwardsville
2014	Build new 138kv Line from new breaker station to new substation
2014	New 138/34 kV bulk substation at Edwardsville REA
2014	Install new 138 kV ring bus
2015	L3313d - Reconductor .7 mi of 2-2/0 Cu with 954 ACSR
2017	Add 14.4 MVAR capacitor bank at Cloverleaf
2018	L3308c - Reconductor 2.4 mi of 795 AAC with 954 ACSR T2
2019	L3402 - Reconductor 2.3 mi of 1272 ACSR with 954 ACSR T2 + terminal
2020	L3457h - Reconductor .5 mi of 795 AAC with 954 ACSR T2

Plan E

2012	Close NO switch between Troy Triad HS and E St Jacob
2012	Add 10.8 MVAR capacitor bank at Goethe St Substation
2012	L3313a - Reconductor 2.69 mi of 795 AAC with 954 ACSR T2
2012	L3313e - Reconductor .99 mi of 795 AAC with 954 ACSR T2
2012	L3313f - Reconductor 1.16 mi of 795 AAC with 954 ACSR T2 + terminal
2012	L3314j - Reconductor 5.3 mi of 4/0 ACSR with 556 AAC
2012	L3331a - Reconductor 3.3 mi of 477 AAC & ACSR with 954 ACSR
2012	L3425b - Reconductor 4.4 mi of 795 AAC with 954 ACSR T2
2012	L3459a - Reconductor 4.56 mi of 795 AAC with 954 ACSR T2 + terminal
2012	Upgrade capacitor bank at Schwartz St to 10.8 MVAR
2013	L3308c - Reconductor .4 mi of 2-2/0 Cu with 954 ACSR T2
2013	New 34 kV line out of East Collinsville to Troy / Cloverleaf (7 mi of 954 ACSR)
2013	New 34 kV breaker terminal at East Collinsville
2014	L3313d - Reconductor .7 mi of 2-2/0 Cu with 954 ACSR
2015	L3457a - Reconductor 1.0 mi of 795 AAC with 954 ACSR T2
2017	L3402 - Reconductor 2.3 mi of 1272 ACSR with 954 ACSR T2 + terminal
2017	Upgrade Wanda Transformer to 112 MVA

PUBLIC VERSION

2017	Add 14.4 MVAR capacitor bank at Second St Substation
2018	L3308c - Reconductor 2.4 mi of 795 AAC with 954 ACSR T2
2019	L3313d - Reconductor 1.25 mi of 795 AAC with 954 ACSR T2
2020	Upgrade E Collinsville Trf #1 to 112 MVA

3.3 Providing Reserve for Line 3314

Introduction

Line 3314 and Line 3348 are 34 kV lines which are tied together at the East Highland Switching Station extending 40 miles from E. Collinsville substation in Maryville Service Area to Greenville McCord substation in Hillsboro Service Area. Reference Appendix B.7 located on page B-8.

In addition, there are two spurs off the line: a) Line 3314A extends 4.9 miles to the Edwardsville REA delivery point (the REA owned line extends 5.2 miles from this location to their substation). The A tap continues north from the REA meter point .4 miles to Marine distribution substation. b) Line 3314C extends west to Line 3310 at Cloverleaf substation through a normally open Automatic Transfer Switch at Troy Industrial substation.

Voltage Instability in the Present Configuration

- [redacted]
- [redacted]

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- Loss of Large Load

Reserve between Line 3314 and Line 3348

Lines 3314 and 3348 are tied together with normally open switch 3201 between Pierron and the Highland Municipal Substations. Currently when reserving the entire line from either E. Collinsville or Greenville McCord thermal limits are exceeded and low voltages occur. After the new bulk at Troy/Cloverleaf is in service and L3314 is reconductored between E. Highland Switching Station and Pierron, Line 3314 can be manually reserved from either East Collinsville or the new bulk supply at Troy/Cloverleaf by operating thru the ATO at Troy Industrial Park. With the new bulk supply in service the entire line (Lines 3314 and 3348) can be reserved at peak conditions by using both the E. Collinsville and Troy/Cloverleaf sources. This can be accomplished by closing switch 3201 and closing thu the ATO at Troy Industrial Park (switches 3212 & 3213).

Reserve between Line 3310 and Line 3314

Line 3310 is a 34 kV line that is normally fed out of the Collinsville Substation and has a tie with Line 3314 through a normally open ATO at Troy Industrial Park. Presently, this ATO cannot be manually operated through at peak load conditions such

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that Line 3310 would pick up the entire load due to a loss of Line 3314 breaker at East Collinsville due to voltage restraints. In 2014, when the new bulk supply is installed in the Troy/Cloverleaf area the configuration will be such that Line 3314 at East Collinsville will be reserved from the new bulk supply.

PUBLIC VERSION

Section
4

Discussion and Recommendations

4.1 Discussion

Load flow analysis for the study area showed that there are multiple 34 kV lines that are heavily loaded in the area. One area concern is the low voltages in the Cloverleaf and Marine area during single contingency conditions. In addition after five years there is a large requirement for area VAR support. An additional area concern is that we currently cannot reserve Cloverleaf thru Troy or reserve Line 3348 from Line 3314.

While performing this analysis various configurations were considered. Different connecting sources, number of lines and tap points as well as switchyard bus configuration are some of the variations that were considered. Configurations were judged on cost, reliability and flexibility. The different options evaluated and estimated cost is summarized below.

Plan A	• Does not meet Planning Criteria • Large number of additional capacitor banks without new lines or transformers will cause voltage instability in the area • Approximately 41 miles of 34 kV line to be reconductored	$25,056,000
Plan B	• Edwardsville Area can not support additional REA load during contingencies - need second Wanda Transformer • Need to upgrade existing Wanda Transformer 4 years earlier than other options • Potential Right of Way issues with new 34 kV line from Wanda to REA • Approximately 16 miles of 34 kV line to be reconductored (12 mi 795 AAC) • Will have ability to reserve L3348 from Greenville McCord with L3314 using operating guide	$24,428,000
Plan C	• Flexibility to add 138 kV line or 34 kV line to Edwardsville Area to support voltage in 2021+ • Flexibility to add second 138/34 kV transformer in the future • New substation central to growth area	$22,268,000

PUBLIC VERSION

	• Approximately 21 miles of 34 kV line to be reconductored (12 mi 795 AAC) • Will have ability to reserve L3348 from Greenville McCord with L3314 using operating guide as specified under Special Switching	
Plan D	• Does not address the Collinsville Area and Cloverleaf Area voltage deficiencies • Lead time to build 138 kV line will likely require additional projects to be constructed • Approximately 22 miles of 34 kV line to be reconductored (15 mi 795 AAC)	$30,530,000
Plan E	• Need additional Bulk supply to area in 2021+ • New line does not help Collinsville Area or Edwardsville Area • Approximately 30 miles of 34 kV line to be reconductored (18 mi 795 AAC)	$21,340,000

4.2 Horizon Strategies

While the state of the study area in the five year horizon period of 2017 through 2021 will likely differ from the current forecast, this study was extended to include those years in order to make note of possible conditions which could have a significant effect on the system or require sizeable investment of resources. In the horizon years of 2017 through 2021 the Edwardsville area will need to be reinforced with the upgrade of the Wanda transformer and the addition of a capacitor bank at Second Street substation. In future years, if load in the Edwardsville area grows at a greater rate than forecasted it will be possible to add a 138 kV or 34 kV line into the area from the new Interstate substation.

4.3 Recommended Plan

Plan C is the recommended plan due to cost and flexibility. Building a new substation central to the growth area and the flexibility to add a 138 kV or a 34 kV line to the Edwardsville Area to support voltages in the future support both the short and long term requirements of the area. In addition, Plan C will have the flexibility of adding a second 138/34 kV transformer in the future.

4.4 Special Switching

Due to voltage instability and thermal line loadings, Line 3314 is currently operated as two radial lines with a normally open switch in the middle. This switch cannot be closed to reserve either end. This configuration will continue until 2016 when with the new bulk Interstate substation in-service and a portion of Line3314 reconductored this line can be manually reserved using the following operating guide.

Line 3314 and 3348 operating guide:
For the loss of Greenville McCord – close thru the ATO at Troy Industrial Park (switches 3212 & 3213) then close switch 3201.

PUBLIC VERSION

Appendix A

The following are the projects associated with the recommended plan.

A.1 Recommended Projects Summary

Project #	Description	Justification	Estimated Cost
	2012		
1201	L3457 - Upgrade line ct rating at Edwardsville SIU Substation from 800 amp to 1200 amp	In 2012, the load on Line 3457 terminal at Edwardsville SIU Substation will exceed the ct rating. This does not meet our Planning Criteria. Terminal emergency rating (ct) = 47.8 MVA 2012 Load during contingency conditions = 51.0 MVA	<$100,000
1202	Line 3313 - Upgrade line terminal (Relay Load Limit) at Stallings Substation to at least 1200 amps	In 2012, the load on Line 3313 terminal at Stallings Substation will exceed the Relay Load Limit. Terminal Normal Rating = 38.1 MVA Terminal Emergency Rating = 38.1 MVA 2012 Load during contingency = 66.5 MVA	<$100,000
1203	Close NO switch between Troy Triad HS and E St Jacob	Help maintain voltage at Marine during normal and contingency conditions	$0
	2013		
1301	L3314j - Reconductor 5.3 mi of 4/0 ACSR with 556 AAC	In 2013 the normal voltage at Marine is .942 which is below Planning Criteria. In addition, load on this section of Line 3314 will reach its emergency rating during normal peak conditions. Normal Rating = 21.1 MVA Emergency Rating = 21.1 MVA 2013 Load during normal conditions = 20.7 MVA 2013 Load during contingencies (2) = 23.9 MVA Marine Sub - .942 normal & .815 contingency REA Marine - .925 normal & .810 contingency	$2,999,800
1302	L3331a - Reconductor 3.3 mi of 477 AAC & ACSR with 954 ACSR	In 2013, this section of line loads to 111% of its emergency rating during normal conditions. This is in violation of the National Electric Safety Code and does not meet our Planning Criteria. Normal Line Rating = 37.6 MVA Emergency Line Rating = 37.6 MVA 2013 Load during normal conditions = 41.6 MVA	$1,300,200

PUBLIC VERSION

Project #	Description	Justification	Estimated Cost
1303	Upgrade capacitor bank at Schwartz St to 10.8 MVAR	Power flow simulation results of 2013 summer forecast peak conditions show that Area voltages around Schwartz Street to be below .96 pu during contingency conditions. This is in violation of our Planning Criteria	$250,000
1304	L3308c - Reconductor .4 mi of 2-2/0 Cu with 954 ACSR T2	In 2013, the load on this section of line will exceed its emergency rating with the loss of the Porter Road bulk supply transformer. This is in violation of the National Electric Safety Code and does not meet our Planning Criteria. Line Normal Rating = 42.6 MVA Line Emergency Rating = 42.6 MVA 2011 Load during contingency = 41.3 MVA 2013 Load during contingency = 45.0 MVA	$157,600
1305	Stallings Trf #3 Substation terminal - Upgrade 2 1/2" bus between transformer breaker and 3" bus	In 2013, the load on this substation bus will exceed its emergency rating with the loss of the Stallings #5 138/34 KV transformer. This does not meet our Planning Criteria Normal Rating = 105.8 MVA Emergency Rating = 122.8 MVA 2013 Load during contingency = 125.9 MVA	<$100,000
1306	L3459 @ Wanda – Upgrade substation line terminal (from line to disconnect switch 591) to a minimum of 1200 amps	In 2013, the load on Line 3459 terminal at Wanda Substation will exceed the line terminal rating with the loss of Line 3425 between Stallings and SIU. Terminal Normal Rating = 52.9 MVA Terminal Emergency Rating = 58.1 MVA 2013 Load during contingency = 63.2 MVA	<$100,000
	2014		
1401	Install new 138/34 kV substation at Troy / Cloverleaf	Low voltages in the Troy and Cloverleaf area and the need to reconductor numerous 34 kV lines in the area. Required to meet Planning Criteria.	$3,623,000
1402	Install new 138 kV ring bus	Low voltages in the Troy and Cloverleaf area and the need to reconductor numerous 34 kV lines in the area. Required to meet Planning Criteria.	$4,200,000
	2015		
1501	Add new 34 kV line from Interstate Sub and Line 3313	Eliminates need to reconductor 6.8 miles of Line 3313. Provides voltage support to various substations around Collinsville Goethe St. during contingency conditions thus eliminating the need for additional capacitors in the area.	$1,507,800
1502	L3308c - Reconductor 2.4 mi of 795 AAC with 954 ACSR T2	In 2015, the load on this section of line will exceed its emergency rating with the loss of the Porter Road bulk supply transformer. This is in violation of the National Electric Safety Code and does not meet our Planning Criteria. Line Emergency Rating = 51.8 MVA 2015 Load during contingency = 54.2 MVA	$945,600

PUBLIC VERSION

Project #	Description	Justification	Estimated Cost
1503	L3457a - Reconductor 1.0 mi of 795 AAC with 954 ACSR T2	In 2015, the load on this section of line will exceed its emergency rating with the loss of Line 1456 (Cottage Hills to Stallings). This is in violation of the National Electric Safety Code and does not meet our Planning Criteria. Line Emergency Rating = 51.8 MVA 2015 Load during contingency = 55.8 MVA	$394,000
1504	Wanda Substation – Upgrade transformer terminal equipment	In 2015, the load on Wanda transformer terminal will exceed its emergency rating with the loss of Line 3425 (Stallings to SIU). This is in violation of the National Electric Safety Code and does not meet our Planning Criteria. Terminal Emergency Rating = 70.3 MVA 2015 Load during contingency = 70.5 MVA	<$100,000
	2016		
1601	L3425b - Reconductor 4.4 mi of 795 AAC with 954 ACSR T2	In 2016, the load on this section of line will exceed its emergency rating with the loss of Line 1456 (Cottage Hills to Stallings). This is in violation of the National Electric Safety Code and does not meet our Planning Criteria. Line Emergency Rating = 57.1 MVA 2016 Load during contingency = 69.2 MVA	$1,733,600
	2017		
1701	L3459a - Reconductor 4.56 mi of 795 AAC with 954 ACSR T2 + terminal	In 2017, the load on this section of line will exceed its emergency rating with the loss of Line L3425 (Stallings to SIU). This is in violation of the National Electric Safety Code and does not meet our Planning Criteria. Line Emergency Rating = 57.1 MVA 2017 Load during contingency = 70.5 MVA	$2,046,640
1702	Upgrade Wanda Transformer to 112 MVA	In 2017 the Wanda transformer will load to 98% of its emergency rating with the loss of Line 3425 between Stallings and SIU.	$1,500,000
1703	Add 14.4 MVAR capacitor bank at Second St Substation	Voltages at Second St., Schwarz St., South Edwardsville are below Planning Criteria during single contingency conditions.	$550,000
	2020		
2001	L3313a - Reconductor 2.69 mi of 795 AAC with 954 ACSR T2	In 2020, the load on this section of line will exceed its emergency rating with the loss of the new Interstate Bulk Supply Transformer. This is in violation of the National Electric Safety Code and does not meet our Planning Criteria. Line Emergency Rating = 57.1 MVA 2017 Load during contingency = 57.8 MVA	$1,059,860