Entergy Arkansas, Inc.

## Proposed Transmission Reliability Projects

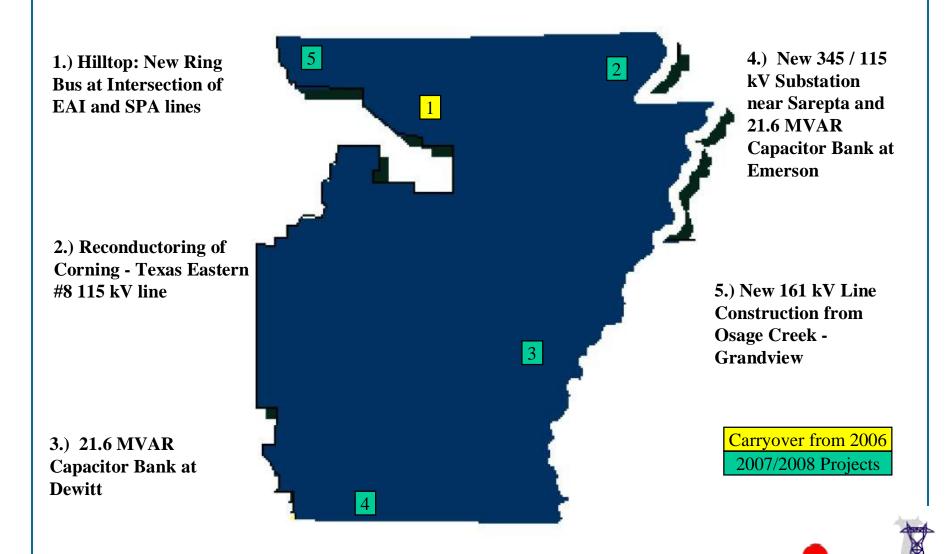
**Entergy Transmission Planning Summit** 

**New Orleans, LA** 

**July 13, 2006** 



## 2007 - 2008 EAI Transmission Reliability Projects

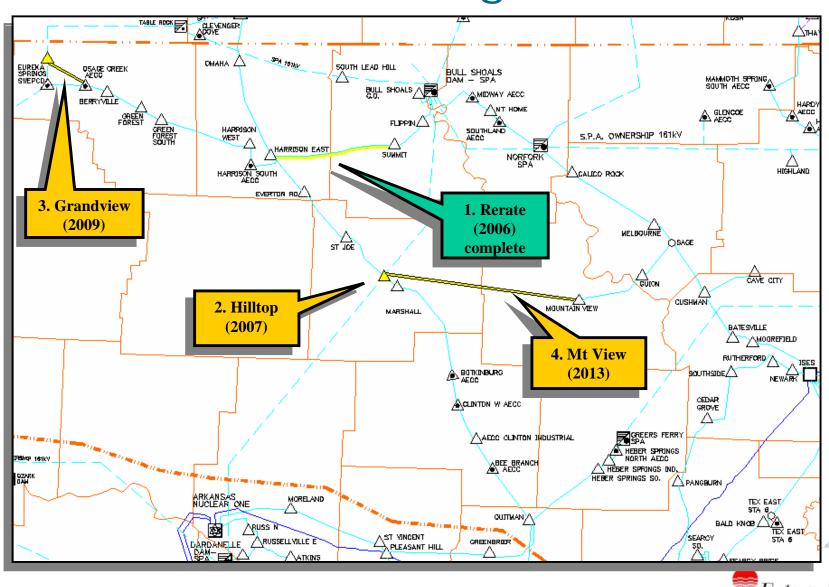


#### Transmission Business. Northwest Arkansas TABLE ROCK TO CLEVENGER KDSH SỐUTH LEAD HILL OSAGE CREEK AECC BERRYYOLLE BULL SHOALS DAM — SPA MAMMOTH SPECING NT HOME SOUTHLAND AECC FLPPIN HARROSON WEST \_\_ 5.P.A. OWNERSHIP 161kV HARRISON EAST SUMMET ∖сьшее воск EVERTON RO NELBOURNE ()SAGE CAVE CITY CULON . CUSHNAN MOUNTAÍN ÝÆW MARSHALL BATESVILLE △ MODRET FUTHERFORD \ <mark>В</mark>оотналье∆ AECC BOTKINBURG CEDAR GROVE ACLINTON W AECC AECC CLINTON INDUSTRIAL HEBER SPRINGS NORTH AECC HEBER SPRINGS SO. MORELAND TEX EAST STA 8 BALD KNOB OUTHAN ∕

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#### Transmission Business

## NW Arkansas Long Term Plan



2007

## Hilltop: 161 kV Ring Bus Between EAI and SPA Lines

#### **Scenario**:

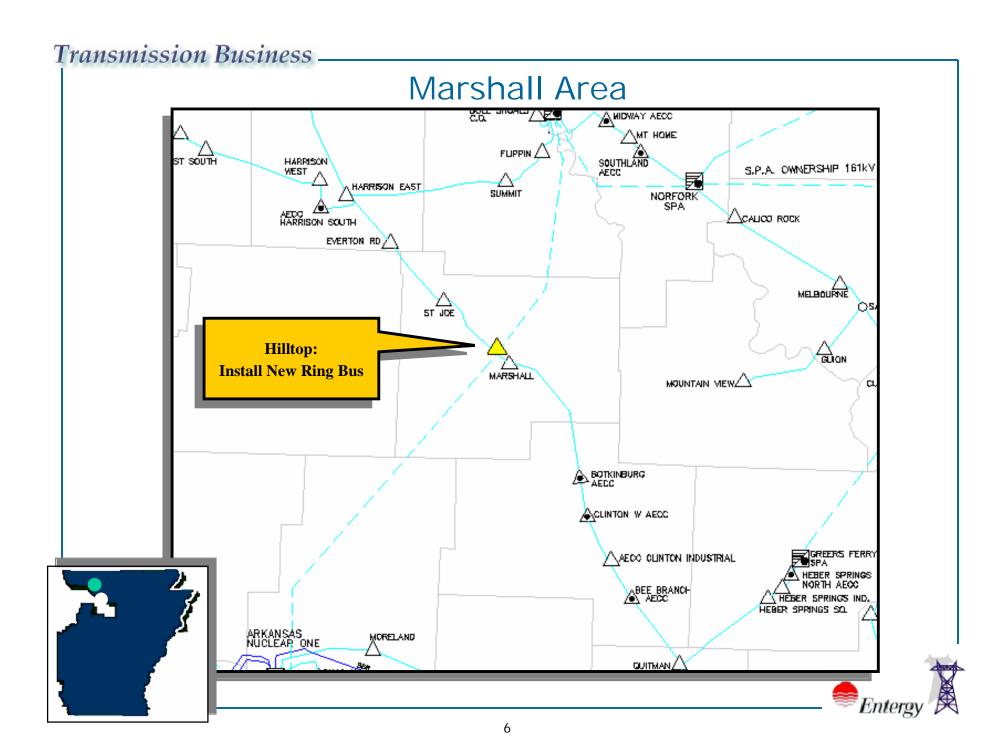
- The 161 kV transmission system in northwest Arkansas is generally served by generation located at Arkansas Nuclear One (ANO) and Independence SES (ISES).
- There are also units at Table Rock, Ozark Beach, Norfork and Bull Shoals Dam which provide some support during the summer peak, but availability of these resources is limited by the availability of water on their respective sources.
- Three major transmission lines which originate at Harrison East and cause undervoltages and thermal overloads:
  - Harrison East Eureka Springs 161 kV
  - Harrison East Bull Shoals Dam 161 kV
  - Harrison East Quitman 161 kV

#### **Proposed Solution**:

Build a four-breaker ring bus, Hilltop, where the SPA line from Dardanelle Bull Shoals crosses the APL line from Harrison East - Quitman.

Estimated Cost: \$8.5 MM





## Texas Eastern Station #8 – Corning 115kV Line Rebuild

#### Scenario:

- Previous construction has increased the conductor size on selected spans to 1,590 mcm and 666 mcm, but a majority of the line is 336 mcm or smaller (e.g., 4/0 copper), and substation equipment limits the ampacity of the line.
- Low voltage will occur at Corning under certain single contingency scenarios.
- Low voltage also causes greater current to flow and will cause an overload on the Corning to TE #8 line segment.

#### **Proposed Solution:**

 Rebuild the line segment from TE #8 to Corning with 666 mcm, to increase the line rating to 176 MVA.

Estimated Cost: \$8 MM



#### Transmission Business Datto - Jim Hill Area DONTRAIN AECI JIM HILL TEX EAST STAIB **GIBSON** CORNING N AECC CORNING DATTO RECTOR NORTH POCAHONTAS W Rebuild 115 kV: AECC POCAHONTAS Corning – TE #8 RECTOR WATER VALLEY EAST AECC WATER VALLEY SPA MARMADUKE A MARMADUKE RAIL BLACK A IMBODEN. AECC LIGHT CROWLEY RODGE HALLDAY AECC AECC AECC WALNUT RIDGE PARAGOULD GEN POWER DELL HOXIE SOUTH PARACOULD SO SEDGWICK. AECC DELL EAST ∕**₩**NAECC AECC JONESBORO SPA JÕNESBORD NORTH TEX EAST STA 7 MONETTE JCT / DELL SDDkV MANIEL A

## Dewitt: 21.6 MVAR Capacitor Bank

#### **Scenario**:

- Loss of the Helena Industrial Ritchie SES 115 kV line segment causes low voltages at various substations
- Loss of the Stuttgart Ricusky 230/115 kV autotransformer causes low voltages at various substations and overloads on the Woodward – Altheimer and the Altheimer – Wabbaseka 115 kV line segments

#### **Proposed Solution:**

- Install a 21.6 MVAr capacitor bank at Dewitt.
  - Correct Distribution power factor at Dewitt, Almyra, Marvell, Gillett, Helena Central, and Ulm substations.

Estimated Cost: \$700K



#### Transmission Business Stuttgart Area CITY WEST EL RIOSE \$0. BRINKLEY -EAST JACKSONVILLE NORTH BRINKLEY 4 WEST JACKSONVILLE SOUTH AEGC ^\_MORO DEVALLS BLUFF, VA<mark>CKS</mark>ONVILLE MARIANNA WEST LONGKE EAST AECC HAZEN/ REMINGTON AECC MARJANNA CARLISLE Ă CLARENDON KEO EHV KEO AECC HELENA ENGLAND AEOC BARTON' RIGHTSVILLE EFAV HELENA CENTRAL AULM MARVELL. STUTTGARTA NORTH HEL. IND. /XHELENA ASTUTTGART IND SOUTH STUTTGART RICUSKY WHITE BLUFF STUTTGART NORTH SS RITCHIE AECC HUMPHREY .∆ALMYRA SHERRILL PINE A BLUFF ARSENAL C WABBASEKA \ELAINE DEWITT **ALTHEIMER** VOODVARD The Deluce Aeco **Dewitt: 21.6 MVAR Capacitor Bank** GILLETT AECC HYDRO<u>ST</u>A #Z

## Sarepta: New 345/115 kV Auto and Capacitor Bank

#### Scenario:

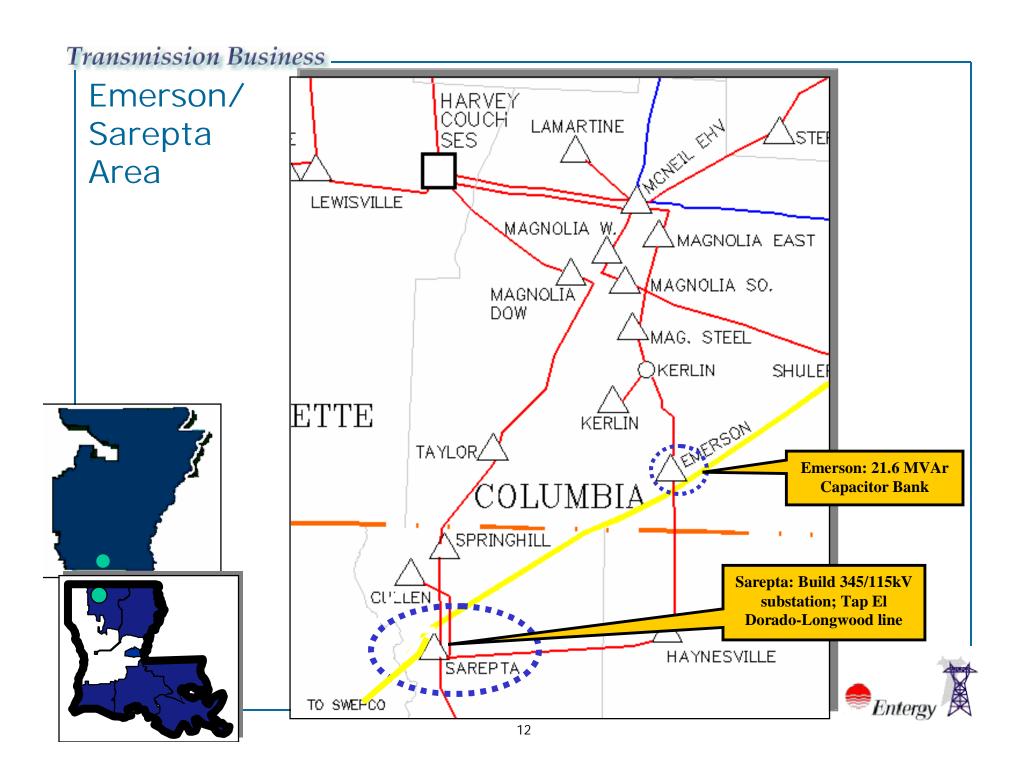
- The following single contingencies cause low voltage in the extreme southwestern corner of the EAI service territory:
  - Loss of the Magnolia East McNeil line segment
  - Loss of the Magnolia Steel Magnolia East line segment
  - Loss of the Magnolia Steel Kerlin S.S. line segment
- The low voltage concerns also propagate into north Louisiana (Lucky substation).
- Capacitor bank additions do not provide sufficient improvement to this region.
- The transmission grid performance can be improved by delivering a high voltage source into the Emerson area. Emerson resides very close to a 345 kV line from El Dorado to Longwood (AEP-West).

#### **Proposed Solution:**

- Build a new 345/115 kV tie at Sarepta 115 kV substation and install a 21.6 MVAR capacitor bank at Emerson.
- This project's alternative solution is to construct a new 345/115 kV substation, Mohawk, where the Emerson -Haynesville 115 kV crosses the Longwood El Dorado 345 kV line.
- Proposed In-Service Date: 2008

Estimated Cost: \$12.6 MM





## Osage Creek-Grandview

#### Scenario:

- By 2010, it is estimated that approximately 227 MW of load will be served between Harrison East and Eureka Springs.
- Nearly 110 MW of the load will be located at Osage Creek, at the extreme northwest end of the line.
- Loss of the Harrison East Harrison South transmission line segment causes thermal overloads on the Eureka Osage Creek (AECC) line segment.
- Loss of this line also causes low voltage on the Osage bus.

#### **Proposed Solution:**

 Construct a new switching station, Grandview, on the transmission line from Table Rock Dam – Eureka Springs. Build a new line between Grandview and Osage Creek.

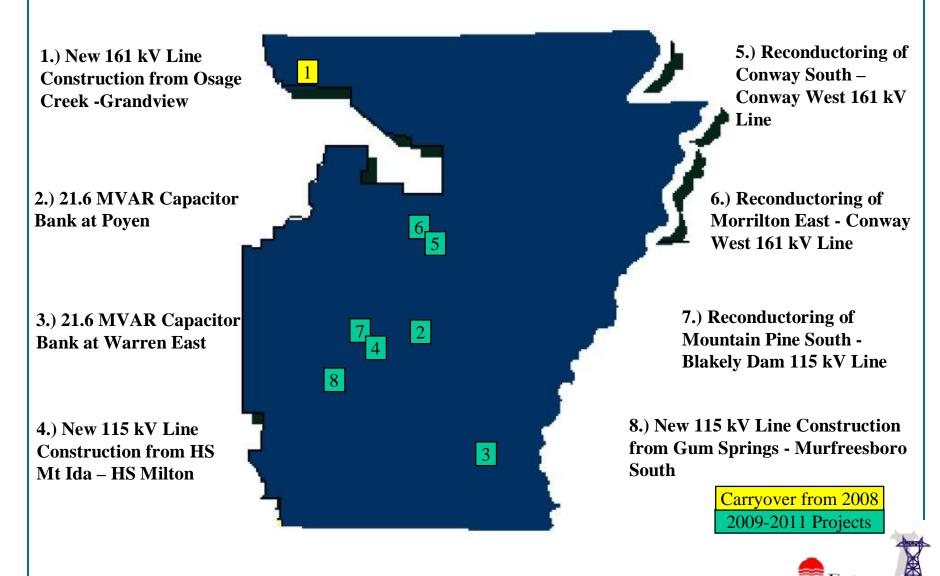
Estimated Cost: \$7.3 MM



#### Transmission Business Osage Creek-Grandview OZARK BEACH TABLE ROCK SPA 181AV омана Д SOUTH LEAD HILL OSAGE CREEK AECC EUROKA SPRINGS A SWEPCO Bill anovra \ BEFRYVILLE GREEN FOREST **₽**₽ FLIPPIN 🛆 GREEN FOREST SOUTH HARRISON WEST HARROSON EAST SUMMIT **Grandview:** AECC AECT SOUTH Install new 161 kV line and switching station EVERTON RD ST JOE

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## 2009-2011 EAI Transmission Expansion Projects



## Install 21.6 MVAR Capacitor Bank at Poyen

#### Scenario:

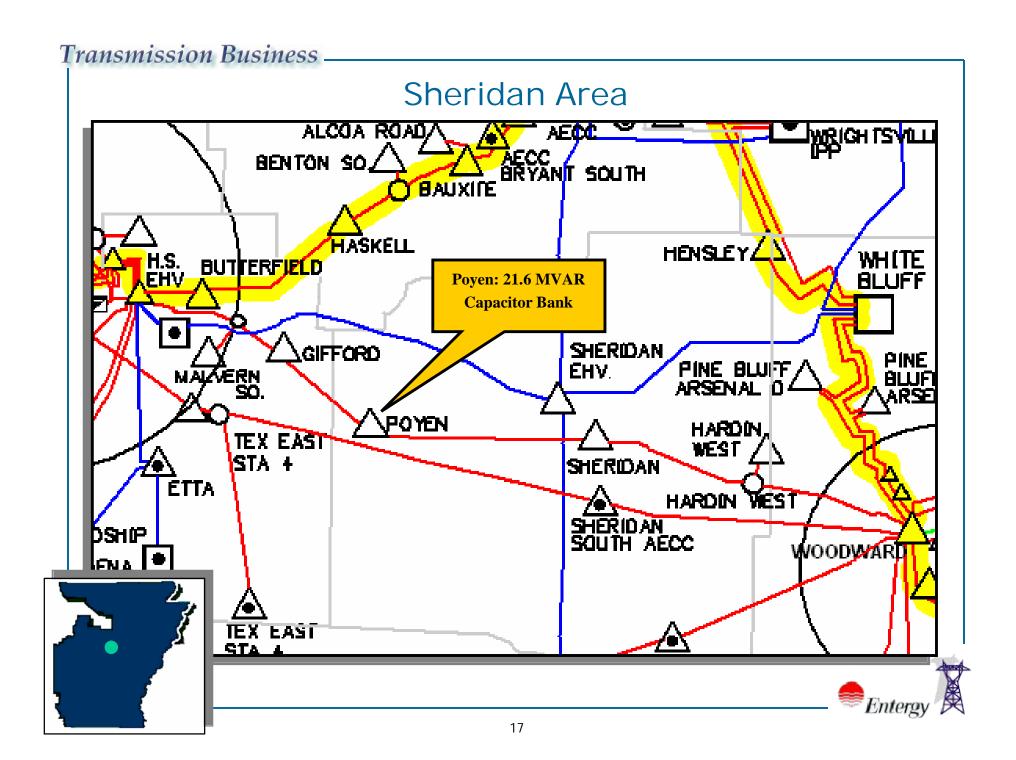
- The 115 kV line from HS EHV East Malvern N is 6.6 miles long.
- Loss of the Malvern North HS EHV East 115 kV line segment causes low voltages at various substations.
- Loss of the Gifford Malvern North 115 KV line segment causes low voltage at Poyen, and Gifford substations.

#### <u>Proposed Solution</u>:

Install a 21.6 MVAR Capacitor Bank at Poyen 115 kV substation.

Estimated Cost: \$660 K





## Install 21.6 MVAR Capacitor Bank at Warren East

#### Scenario:

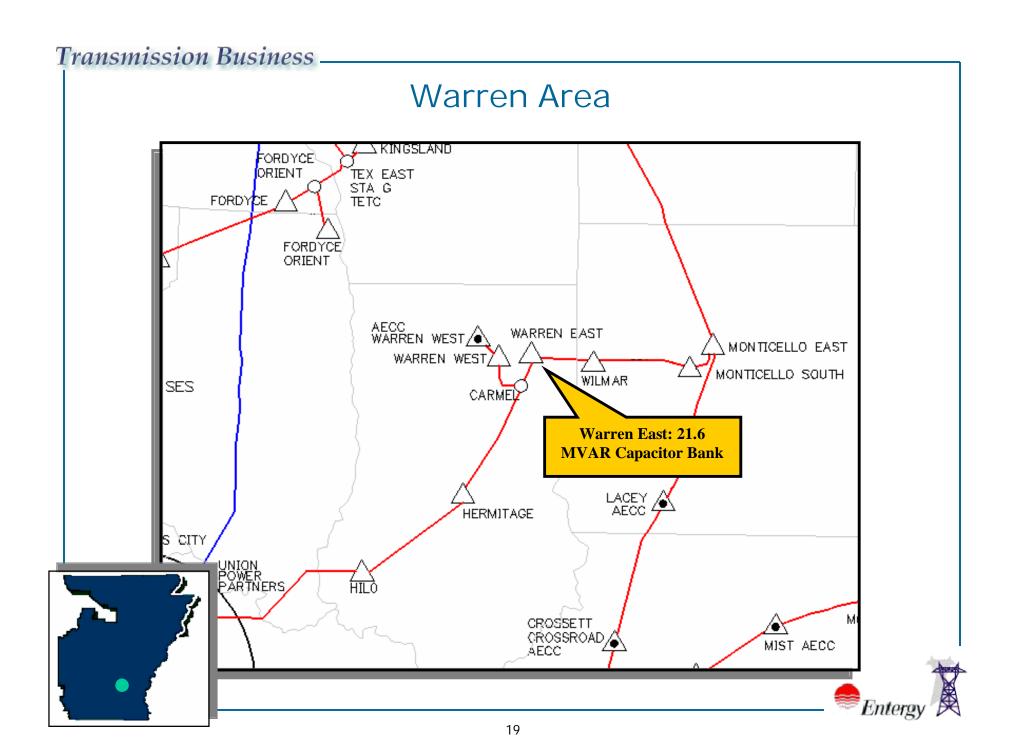
- The Warren East is a substation which is located in southeastern Arkansas, northeast of El Dorado.
- This is a long radial line fed from Monticello East and El Dorado EHV which is approximately 61 miles.
- Loss of any of the line segment along this line causes low voltages.
- Loss of the 500/115 kV at El Dorado EHV also causes low voltages.

#### **Proposed Solution:**

Install a 21.6 MVAR capacitor bank at the Warren East substation.

Estimated Cost: \$650 K





### New Hot Springs Mt Ida – Hot Springs Milton 115 kV Line

#### Scenario:

- Loss of the Mountain Pine South Blakely 115 kV line segment causes:
  - An overload on the HS South HS West 115 kV line segment
  - An overload on the Carpenter Dam HS South 115 kV line segment
- Loss of the Carpenter Dam

   HS South 115 kV line segment causes low voltages at various substations.
- Loss of Bismarck HS EHV West 115 kV line segment causes low voltages at various substations.

#### **Proposed Solution:**

 Build a new 115 kV line from HS Mt Ida - HS Milton with 1,272 ACSR or equivalent conductor, and upgrade switches to 1,200 Amp.

Estimated Cost: \$15 MM



#### Transmission Business Hot Springs Area HOT SPRII VILLAGE B HIS.V ALENTEJO New 115 kV Line: AECC CROV BLAKELY SPA Mt Ida – HS Milton MT PINE S HOT SPRINGS ROYAL MT IDA HOT SPRINGS MILTON GLENWOOD ALPINE **BISMARCK** AECC AMIT) ETTA DEGRAY SPA FRIEMDSHIP DENA DENA HOT SPRINGS AMITY TAP ARKADELPHIA NW ARKADELPHIA NORJA AECC SMURFREESBORO E ARKADELPHIA W MURFREESBORO S RICHWOODS N. SW. STA. DALARK 21

## Conway South - Conway West 161 kV Line Rebuild

#### Scenario:

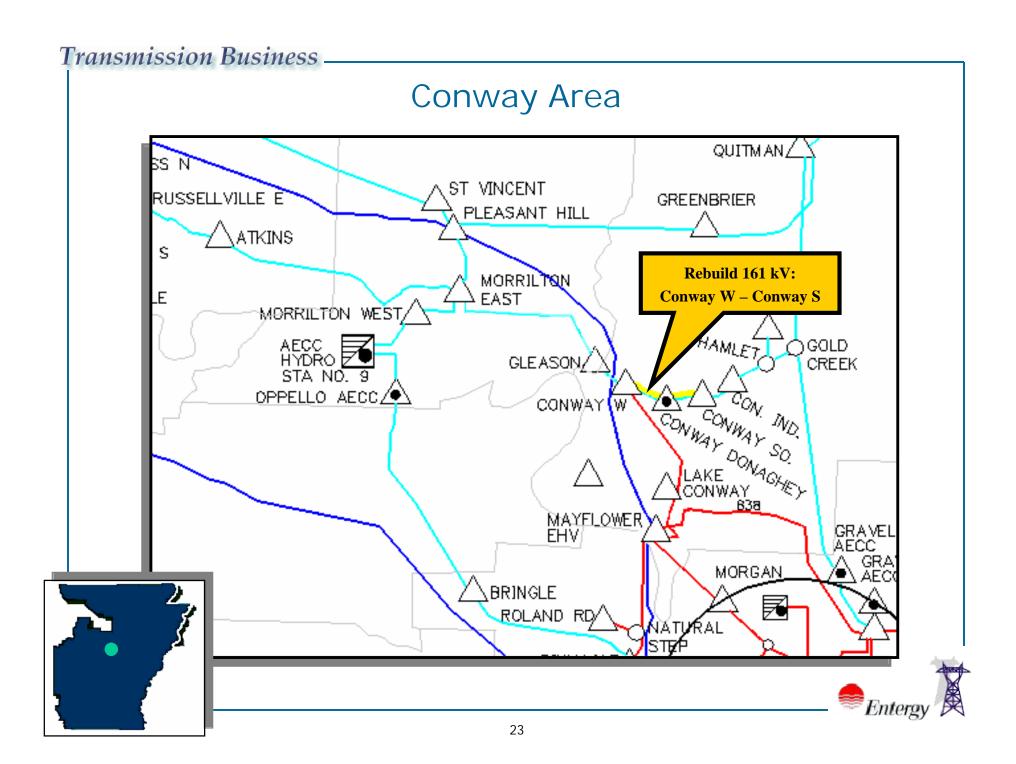
- The Conway West 161 kV line is 5 miles long and is constructed of 666 ACSR conductor.
- Loss of the Pleasant Hill-Greenbrier 115 kV line segment causes overloads on the Conway South-Conway West 115 kV line segment
- Loss of the Conway West Lake Conway 115 kV line segment causes overloads on the Gleason – Morrilton E 161 kV line segment.

#### **Proposed Solution:**

 Rebuild Conway South - Conway West 161 kV line segment using 1,272 ASCR or equivalent conductor.

Estimated Cost: \$4.5 MM





## Morrilton East - Conway West 161 kV Line Rebuild

#### Scenario:

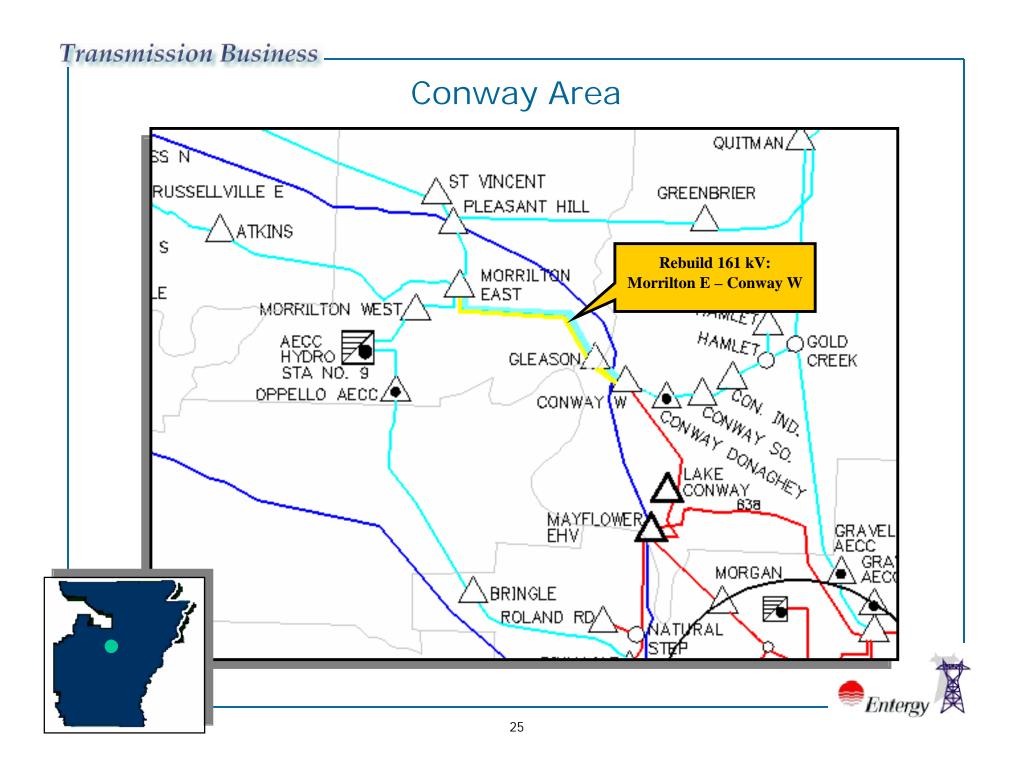
- The Morrilton East Conway West 161 kV line is 15.35 miles long and is constructed of 666 ACSR conductor
- Loss of the Lake Conway Mayflower 115 kV line segment causes overload to the Morrilton East - Gleason 161 kV line segment and the Gleason - Conway West 116 kV line segment
- Loss of the Conway West Lake Conway line segment and the Conway West
   161 / 115 kV line segment also causes overloads

#### **Proposed Solution:**

Rebuild the Morrilton East - Conway West 161 kV line segment using 1,272
 ASCR or equivalent conductor.

Estimated Cost: \$8.3 MM





### Blakely Dam - Mountain Pine South 115 kV Line Rebuild

#### Scenario:

- The Blakely Dam Mountain Pine South 115 kV line segment is 2.92 miles and consist of 666 ACSR conductor
- Loss of the Carpenter Dam Hot Springs South 115 kV Line segment causes:
  - an overload on the Mountain Pine Blakely Dam segment
  - low voltage at Hot Springs South
- Line switches at the Blakely Dam prevent any greater throughput through the SPA substation.

#### **Proposed Solution:**

 Upgrade the Blakely Dam – Mountain Pine South line segment to 1,272 ACSR or equivalent conductor and upgrade switches to 1,200 Amp.

Estimated Cost: \$2.4 MM



#### Transmission Business Mountain Pine Area HOT SPRINGS VILLAGE SOUTH AECC A AECC HOT SPRINGS VILLAGE, AECC HOT SPRINGS CHEETAH VILLAGE EAST ALENTEJO AECC CROWS BENTI BLAKELY Rebuild 115 kV: SPA ALC Blakely Dam - MT Pine S BENTON NINE S ADI TMZ H.S. 4 ROYAL HOT SPRINGS BUTTERFIE MILTON GJF GLENWOOD MAKVERN SO. TEX EAST ALPINE BISMARCK STA 4 AECC AMITY ETTA DEGRAYE SPA FRIEMDSHIP DENA 🕒 AMITY TAP HOT SPRINGS DIZABEL DUDA 27

2011-12

## New Switching Station (Gum Springs) and New 115 kV Line Construction

#### Scenario:

- The Woodward Degray 115 kV transmission line crosses the Friendship -Couch 115 kV transmission line near Curtis, between Arkadelphia and Richwoods.
- There are low voltages in the Murfreesboro South region under single contingency scenarios.

#### **Proposed Solution**:

 Build a switching station, Gum Springs, at the intersection of the Woodward-Degray line and the Friendship-Couch line. Construct a new 115 kV line from Gum Springs to Murfreesboro South using 1,272 ASCR or equivalent conductor.

Estimated Cost: \$12.5 MM



#### Transmission Business Curtis Area HOT SPRINGS ROYAL<sup>4</sup> AMT IDA HS EHV HOT SPRINGS MILTON **B**UTTERFIELD GIFFORD GLENWOOD VERN SO. TEX EAST ALPINE BISMARCK STA 4 AECC AMITY ETTA DEGRAY SPA FRIENDSHIP DENA DENA HOT SPRINGS AMITY TAP ARKADELPHIA NW AECC MURFREESBORO E ARKADELPHIA NORTA TEX EAST STA 4 ARKADELPHIA W MURFREESBORO S SW. STA. RICHWOODS N. AECC DALARK GURDON NORTH AECC **Gum Springs:** SMITHTON BEIRNE. **Install new 115 kV Line and** GURDON new Switching Station 29

# Transmission Business Transmission System Target Areas 2012 and Beyond 4.) Mt. View-Hill Top 1.) Little Rock Area 3.) Hot Springs 2.) Sheridan South