COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF CUMBERLAND VALLEY ELECTRIC, INC. FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY TO CONSTRUCT FACILITIES ACCORDING TO THE APPLICANT'S 01/01/2012 ~ 12/31/2015 CONSTRUCTION WORK PLAN	))))))	**CASE NO. 2011-00442**

RESPONSE OF:

CUMBERLAND VALLEY ELECTRIC, INC. ("CVE") TO THE

"COMMISSION STAFF'S FIRST REQUEST FOR INFORMATION TO CVE"

FOR COMMISSION'S ORDER 2011-00442

REQUEST DATED FEBRUARY 17, 2012

FILED: MARCH 01, 2012

The Witnesses for All Response Contained Hereinafter:

Mark Abner ~ CVE

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VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF KNOXX)

The undersigned, **Mark Abner**, being duly sworn, deposes and says the Engineering Manager for Cumberland valley Electric, and that he has personal knowledge of the matters set forth in the response for which she is identified as the witness, and the answers contained therein are true and correct to the best of his information, knowledge and belief.

Mark Abner
Mark Abner

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 28TH day of February 2012.

(SEAL)

Randall Campbell
Notary Public

My Commission Expires:
ID # 429293
October 5th 2014

CUMBERLAND VALLEY ELECTRIC, INC.

CASE NO. 2011-00442

Response to Commission Staff's First Request for Information
Dated February 17, 2012

Question No. 1

Witness: Mark Abner

Q1. Refer to paragraphs 10 and 11 of the Application and Section E of the Executive Summary in the Application. Provide a breakdown of the costs by year that reflect the exclusions contained in Section E, paragraph 11.

A1.

	2012	2013	2014	2015	ALL YEARS
740c – 615	**$200k**	**$200k**	**$0**	**$0**	**$400k**
740c – 1501	**$0**	**$330k**	**$300k**	**$300k**	**$990k**
Yearly Tot.	**$200k**	**$530k**	**$300k**	**$300k**	**$1,330k**

CUMBERLAND VALLEY ELECTRIC, INC.

CASE NO. 2011-00442

Response to Commission Staff's First Request for Information
Dated February 17, 2012

Question No. 2

Witness: Mark Abner

Q2. Refer to Item C.3. of the "Basis of Study and Proposed Construction." The 2010 Operations and Maintenance Survey listed two items that required corrective action. Explain what procedures have been put in place to address those problems.

A2. **Item 1: Telephone poles left standing close to the electric pole should be removed.**

This is in regard to CVE poles that have been replaced having one or more third party attachments still in place. The upper portion of such poles is usually removed above the highest third party attachment. The CVE Engineering Department is collecting third party pole numbers from such structures and is forwarding same to attachment owners with requests for attachment transfer to the new pole. It is usual for the last attachment owner, which is typically the telephone provider, to remove the pole stub after their attachment has been transferred. CVE is identifying such structures by way of its pole inspection program and annual facilities inspections, as well as at the beginning of any planned pole replacements project.

Item 2: Cable TV attachments require constant monitoring and follow-up to ensure code requirements are met.

This is in regard to possible NESC violations of cable TV attachments. Many such code violations result from CATV placement of attachments without adequate pole space being present, hence the need for monitoring. The CVE Engineering Department is advising cable TV companies operating in its territory and upon its poles of the requirements of CVE's established Cable Television Attachment Tariff. That tariff provides procedures for proper administration of CATV attachments within the frame work of the NESC. CVE intends to proactively engage these companies in this regard to ensure their compliance with NESC requirements.

CUMBERLAND VALLEY ELECTRIC, INC.

CASE NO. 2011-00442

Response to Commission Staff's First Request for Information
Dated February 17, 2012

Question No. 3

Witness: Mark Abner

Q3. Refer to Exhibit C of the Application. Explain why three of the projects contained in the prior Construction Work Plan were cancelled.

A3. Item No. 308.01 was cancelled because little, if any, additional load was added to the subject conductor above the base model loading. Therefore, this project was deemed unnecessary.

Item No. 310.01 was cancelled because the exact location for the new Girdler Substation was not known at the time the work plan was completed. After the new sub was built, an alternate route for the distribution exit circuits was selected leaving the existing 1/0 ACSR line in place.

Item No. 315.01 was cancelled because actual loading of the existing 4/0 ACSR DC line did not warrant conductor replacement.

CUMBERLAND VALLEY ELECTRIC, INC.

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Dated February 17, 2012

Question No. 4

Witness: Mark Abner

Q4. Refer to page 10 of the CWP document prepared by consultant Patterson & Dewar Engineers, Inc. Under Section I, the replacement of the CVE radio system is noted.

a. The above replacement is supported by a study "by a reputable engineering firm with experience in radio communications . . . ." Provide the study and the name of the engineering firm.

b. The statement, "[t]he many benefits of an accurate and modern AM/FM/GIS system are well documented in the industry . . . ." Provide that documentation or the sources of such.

A4. a. Power Systems Engineering of Madison, Wisconsin, conducted the study. Said study is attached hereto as Appendix A.

b. ESRI is a company that produces software which many utilities use in mapping and GIS applications. The AM/FM/GIS system proposed by Cumberland Valley Electric is based on producing data in ESRI format and using ESRI software. The ESRI web-site provides a page that contains case studies of various utility projects. Within these case studies are statements from several utility leaders on how these projects have benefited their companies. The case study page can be found at the following link:

http://www.esri.com/showcase/case-studies/index.html#utilities_and_communication_panel

Many of these case studies are for electric utilities. Although Cumberland Valley Electric would not plan to implement every single aspect of GIS and mapping shown in all of these case studies, these reports and statements from utility employees help to give an overview of some of the benefits that can be achieved from implementing such technologies.

An "Outline of Information to Support GIS Financing" for Inclusion in 2012-2015 Construction Work Plan is included as APPENDIX B.

CUMBERLAND VALLEY ELECTRIC, INC.

CASE NO. 2011-00442

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Dated February 17, 2012

Question No. 5

Witness: Mark Abner

Q5. Refer to Exhibit B, page 1. Explain the item "Transformers for voltage conversion on Jellico Creek Substation in Year 3." Give the voltages involved and the reasons for the change.

A5. The Jellico Creek Substation and the distribution system it serves is currently operates at 7.62/13.2 kV. The proposed voltage conversion project would increase the station voltage and all distribution system voltage to 14.4/25 kV. The annual losses associated with this system typically run at approximately 7 to 8 percent of energy purchased at the sub. This project will reduce losses by about 50%.

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Dated February 17, 2012

Question No. 6

Witness: Mark Abner

Q6. Refer to the O&M Survey completed by the Rural Utilities Service ("RUS") Field Representative where foreign structures and attachments are noted as needing attention for improvement. Explain what plans are being made to specifically address those situations.

A6. These are the same situations addressed by Question 2 above. Please see CVE response A2.

CUMBERLAND VALLEY ELECTRIC, INC.

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Dated February 17, 2012

Question No. 7

Witness: Mark Abner

Q7. It was noted in Exhibit L that primary conductors are considered for replacement when loaded to 65 percent of the thermal rating. In Exhibit R, several accounts are indicated to be loaded to over 65 percent. Are these large power loads addressed the same as primary conductors and are they being considered for replacement? Explain.

A7. The large power loads listed by Exhibit R are served by primary conductors, but are not primary conductors themselves. The load factor associated with each account represents the percentage of time that their measured peak load is present on the system. This load factor, when in excess of 65 percent, does not equate to primary lines being loaded in excess of 65 percent of thermal loading. There are no primary conductor upgrades planned for any of the accounts depicted by Exhibit R.

CUMBERLAND VALLEY ELECTRIC, INC.

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Response to Commission Staff's First Request for Information
Dated February 17, 2012

Question No. 8

Witness: Mark Abner

Q8. Refer to Exhibit E, page 2, with regard to RUS Form 740c and Accounting Code 601.

a. There is a cost detail for new meters and new replacement meters. Describe the type of meters that Cumberland Valley Electric proposes to install in these two categories, giving the functions and capabilities of such meters in relation to existing meters being used.

b. Are these new meters an upgrade to more advanced AMR/AMI - capable meters?

A8. **a. Specifically, the term "New Meters" refers to meters that CVE expects to place on newly constructed premises as required by connecting new members. The term "New Replacement Meters" refers to meters that are intended to replace existing meters at existing member's premises. Generally speaking, the type of meter to be used for both categories is the same. CVE has been using, and expects to continue to use, Landis + Gyr's Focus AL form 2S meters for all single phase accounts. This meter will be used for both new premises and meter replacements. CVE has a significant number of legacy electro-mechanical meters fitted with Hunt Technologies TS2 endpoints. These will be gradually replaced with the Focus AL digital meters in conjunction with CVE's meter testing program. The Focus AL meter has the capability of measuring kilowatt-hours and line**

voltage and delivering same to the cooperative via Hunt Technologies TS2 system. Electro-mechanical meters can only measure kilowatt-hours.

b. The Focus AL digital meter is considered to be a more advanced AMR/AMI capable meter, namely in that it can measure line voltage.

APPENDIX A

Cumberland Valley Electric

Communication Assessment Report

the power to help you succeed.

Cumberland Valley Electric, Inc.
A Touchstone Energy® Cooperative

Communications Assessment Report

November 8, 2010

Contact: Charles Plummer
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Power System Engineering, Inc.

Madison, WI · Minneapolis, MN · Marietta, OH · Indianapolis, IN

PSE

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1 Project Overview and Goals

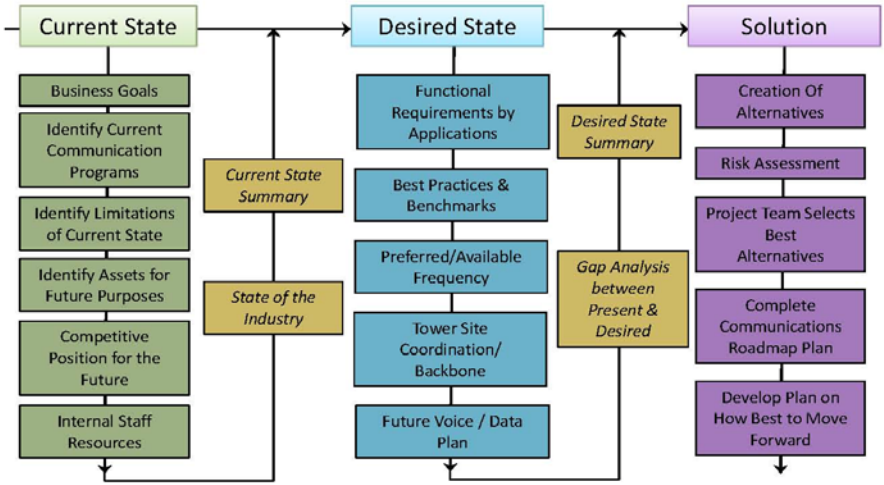
Cumberland Valley Electric's (CVE) present low band mobile radio system is dated, replacement parts are becoming difficult to find, and there are fairly large coverage gaps exist with cellular. A reliable, private mobile voice communication system replacement is imperative to provide high quality electric service. Also of utmost importance is interoperability with Eastern Kentucky Power Cooperative's radio system.

Cumberland Valley hired Power System Engineering, Inc. (PSE) to lead the effort and provide resources to evaluate Land Mobile Radio (LMR) technologies. Figure 1 below illustrates our approach for the project.

The goals of the project were to determine:

1. What mobile radio technology is the best fit: Trunked, Conventional, Analog, Digital
2. Preferred radio frequency: 150 MHz, 220 MHz, 450 MHz
3. Possible mobile data to be placed on the radio system: AVL, Service Orders, other
4. If new tower sites and a backbone/backhaul communications network are a requirement for moving forward.
5. Budgetary Business Case for chosen technology before 2011 budget deadline

Figure 1 Project Approach



2 Cumberland Valley Electric Current State

2.1 CVE Overview

2.1.1 General Information on CVE

Cumberland Valley Electric, Inc. (CVE) is an electrical distribution cooperative located in South Eastern Kentucky. The cooperative was formed by local business and community leaders in 1942 to bring electricity to the more rural areas of eastern Kentucky. Today, CVE serves over 24,000 members in Bell, Harlan, Knox, Laurel, Leslie, Letcher, McCreary, and Whitley counties in Kentucky as well as some members in Claiborne County, Tennessee. There are over 50 employees working at CVE to provide the electrical service for the cooperative. The headquarters for CVE is in Grays, Kentucky.

CVE is one of the 16 distribution member systems (cooperatives) that own and are served by Eastern Kentucky Power Company (EKPC). The member cooperatives set up EKPC as a not-for-profit generation and transmission utility with headquarters in Winchester, Kentucky. EKPC's purpose is to generate energy and ship it to co-ops that distribute it to retail customers. Today, EKPC provides wholesale energy and services to 16 distribution cooperatives through power plants, peaking units, hydro power and more than 2,800 miles of transmission lines. Together, EKPC and member cooperatives are known as Kentucky's Touchstone Energy Cooperatives. The distribution cooperatives supply energy to 519,000 Kentucky homes, farms, businesses and industries across 87 counties.

The service territory is illustrated in Figure 1 below.

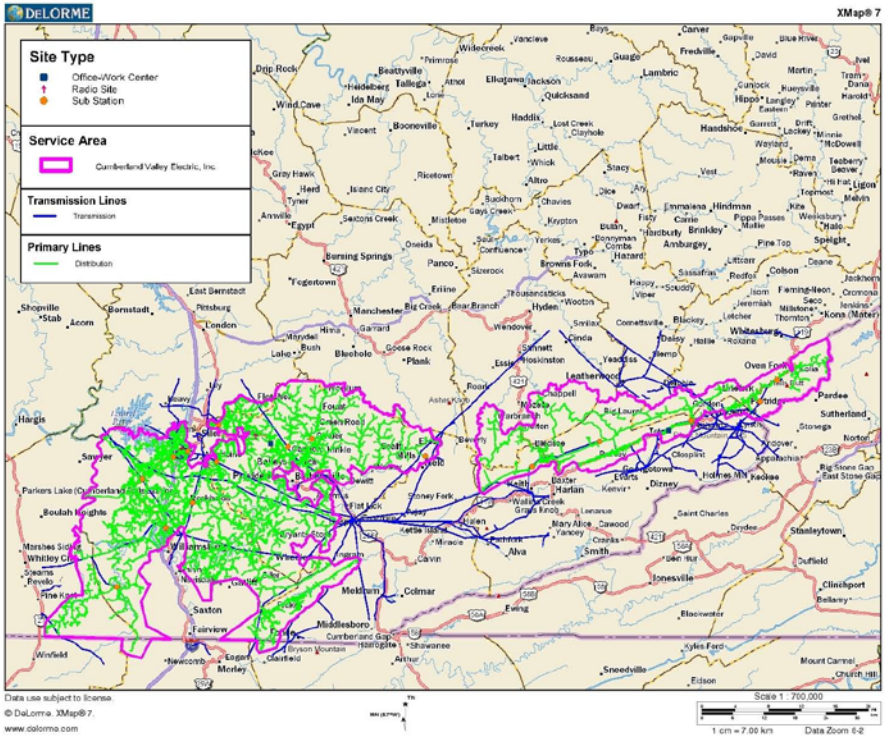


Figure 2 CVE Service Territory

2.1.2 CVE Corporate Culture

CVE tends to have a "wait and see" approach to adopting new technologies and concepts; a safe, conservative approach. With CVE's type of corporate culture, there is not an emphasis on programs often seen with early adopters (those quick to implement cutting edge or bleeding edge technologies):

- Targeted reliability improvements
- Broadband Internet for members
- Partnering with other entities (other than EKPC) for backbone build outs
- Major push for mobile data private infrastructure

Therefore, the solution options for the new mobile voice system that PSE focused on were not for the latest in cutting edge technologies. Instead, the technology choices presented for the mobile voice system were with well-established products and proven technologies. The

backbone suggestions were limited to only encompass the requirements for the new radio system, and not for future programs in progress at CVE.

2.2 Current CVE Communications Assets

2.2.1 Current Mobile Voice System

CVE currently is using an antiquated, simplex, conventional low-band mobile voice system that is owned and operated by EKPC. There are two tower remote base sites that CVE communicates to:

1. Johnson Hollow (Gilliam Knob), near Gray, KY HQ office

2. Joe Knob, near Cumberland, KY district office

Both tower sites are licensed by CVE on call sign KIA297 for one frequency, 37.54 MHz. The license is up for renewal on January 30, 2011. Some of the characteristics of the system are as follows:

- EKPC and CVE have their own receivers to hear mobiles calling.
- When either EKPC or CVE is transmitting, the other cannot receive calls.
- EKPC dispatch has access to CVE channel.
- Links from the CVE and EKPC dispatch offices to remote base sites is via a DS0 over microwave.
- The shared transmitters provide some degree of interoperability between CVE and EKPC since EKPC can select CVE's transmitter and vice versa via the dispatch centers.
- CVE has approximately 60 mobiles and 10 portables in use today.
- Current mobile voice system has some coverage gaps per the onsite PSE meeting in July 2010. Also, the mobile voice coverage gaps tend to be in the same place that cellular coverage is poor.

During a conversation with Terry Estes at EKPC, the following should be noted about the Johnson Hollow and Joe Knob tower sites:

1. The SCADA master radio and the current EKPC low band VHF two-way equipment are housed inside the respective EKPC shelters at each site.

2. Both shelters are undersized for the equipment they currently hold.

3. EKPC is installing a Motorola 150 MHz PassPort mobile voice radio system at both sites. The new EKPC radio equipment (two 24"x24" cabinets) just about fills the floor space in the shelters. Motorola installed the cabinets, leaving no room for another radio system. Therefore, if CVE would put in their own independent system, they would need to provide a

shelter or outdoor environmentally controlled cabinet at the site or locate the new system at towers other than Joe Knob and Johnson Hollow.

4. Microwave transceivers at the sites are:
   - Manufacturer: Western Multiplex Lynx HD4xT1
   - Model: 31350-10A1 (4 T1 capacity)
   - Frequency: 2.4 GHz Unlicensed to make use of the existing dishes

EKPC maintains the site remote base station equipment and Cornett Electronics maintains the radios in the CVE trucks. The service provided by Cornett Electronics is described as satisfactory. There is not currently a service level agreement (SLA) contract in place between Cornett Electronics and CVE.

Figure 2 below is a prediction model of the low band coverage across the CVE territory. The white areas within the territory map are uncovered areas based on propagation characteristics. There may be further open areas based on noise issues, which are common in low-band systems and difficult to model.

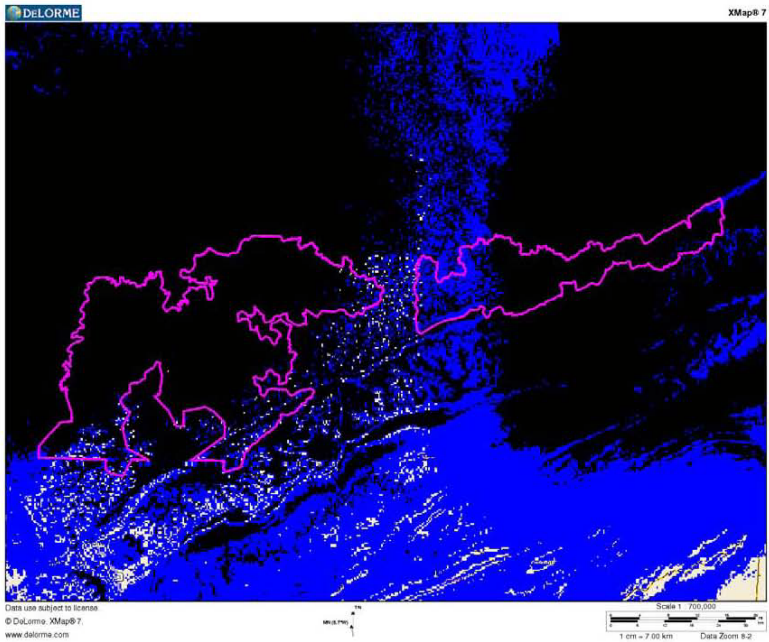


Figure 3 CVE Prediction Model of Low Band Coverage

2.2.2 Current Microwave Backbone System

There is a microwave system that interconnects the two CVE offices and mobile voice remote base stations on Johnson Hollow and Joe Knob via three links (See Figure 3 below). The microwave system is capable of four T-1s. The end links between the towers and the offices are 2.4 GHz unlicensed links owned by CVE. The licensed microwave link between tower sites is a four T-1 space diversity Alcatel MDR8000 system that is owned and operated by EKPC. Two of the four T-1s are currently in use by CVE:

- One T-1 channel bank is used for CVE telephones and mobile voice radio system. This channelized T-1 from the CVE channel banks is routed through an EKPC-owned RFL Mini-DACS, located at Johnson Hollow, for DS0 grooming and routing.
- One T-1 is used for WAN IP connectivity between the CVE offices that is routed directly across the EKPC link.

The microwave is terminated at both offices into Telect TeleMix 4000 modular DSX jack fields. If CVE were to need an increase in bandwidth, a full bandwidth versus path reliability study would be required to verify that reliability would not be compromised.

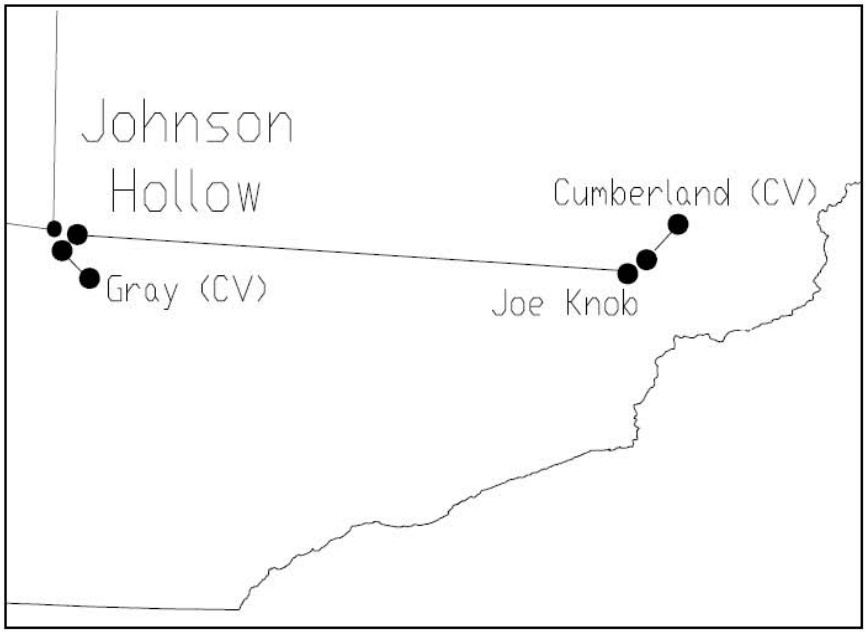


Figure 4 CVE Microwave System

2.2.3 Current CVE Operational Data Systems

CVE has eighteen substations throughout the territory. Below is a list of the current substations and the communications medium in place.

Substations		Latitude	Longitude	Media in Place
1	Emanuel	36° 55' 33.68" N	83° 53' 57.37 W	POTS/DSL/4W DATA
2	Hinkle	36° 52' 55.84" N	83° 49' 47.38" W	POTS/DSL/4W DATA
3	Alex Creek	36° 54' 34.90" N	83° 36' 06.58" W	POTS/CATV MOD./4W DATA
4	Girdler	36° 56' 24.25" N	83° 50' 49.70" W	POTS/DSL/4W DATA
5	North Corbin	36° 57' 50.79 N	84° 03' 01.42 W	POTS/DSL/4W DATA
6	Liberty Church	36° 54' 00.83" N	84° 03' 16.08" W	CATV MOD./EKP SCADA RADIO
7	Bacon Creek	36° 55' 04.26" N	84° 07' 04.29" W	POTS(CATV MOD & DSL AVAIL.)
8	South Corbin	36° 54' 29.14" N	84° 08' 57.29 W	POTS/DSL
9	Cumberland Falls	36° 52' 13.33" N	84° 13' 01.27" W	POTS/4W DATA
10	Goldbug	36° 47' 06.07" N	84° 09' 55.12" W	POTS/CATV MODEM
11	Rockhold	36° 49' 42.91" N	84° 06' 24.93 W	POTS/4W DATA
12	Jellico Creek	36° 40' 55.17" N	84° 16' 18.11" W	POTS
13	Carpenter	36° 43' 35.02" N	84° 58' 34.11" W	POTS/4W DATA
14	Bledsoe	36° 53' 29.18 N	83° 22' 07.25" W	POTS/DSL/4W DATA
15	Pine Mountain	36° 56'07.12" N	83° 13' 17.19" W	POTS/4W DATA
16	Chad	36° 58' 16.58" N	83° 01' 23.02" W	POTS/DSL/4W DATA
17	Oven Fork	37° 02' 32.08" N	82° 50' 10.21" W	POTS/4W DATA
18	Ark Land	37° 00' 16.32 N	82° 52' 23.05" W	POTS

CVE uses Futura GIS Systems and ESRI ArcMap mapping tools for their GIS needs. CVE personnel have laptops with GIS map viewer software. Many of the substations have Wi-Fi mobile hotspots that allow them to download data.

Garmin NUVI GPS navigation units are also in the trucks loaded with the CVE maps. However, during the visit in July, it was determined that most of the line personnel do not use the Garmin GPS data since they have local knowledge of the CVE electrical system and geography.

3 Future Mobile Voice System Needs

3.1.1 Mobile Voice State of the Industry Presentation

PSE provided a mobile voice state of the industry presentation to CVE personnel in July 2010. During that visit we discussed several types of mobile voice systems, including:

- Conventional simplex radio systems - like CVE's present system.
- Conventional single channel repeater radio systems.
- Conventional multiple channel repeater radio systems.
- Voted and simulcast multiple site conventional radio systems.
- Analog trunked radio systems.
- Digital trunked radio systems.

We also discussed different conventional and trunked technologies, including:

- PassPort and MPT analog trunked systems.
- Motorola MOTOTRBO Conventional (including the IP Connect) digital TDMA system.
- DMR III (MOTOTRBO Connect Plus, Tait, Team Simoco, Fylde) digital TDMA trunked systems.
- Kenwood NEXEDGE digital FMDA trunked system.
- P25 Phase 2 public safety designed trunked systems.
- TETRA digital trunked systems.

During the presentation, we discussed propagation characteristics of radio frequency waves and other RF concepts. Additionally, we went through several mobile data concepts to better understand the mobile data needs at CVE.

3.1.2 CVE Future Mobile Voice Needs

During the visit in July, we determined the following critical mobile voice needs based on the presentation feedback and interviews from key personnel who use the system:

1. The CVE territory is broken up into two distinctive territories that tend to work autonomously. The operational hierarchy is based almost completely on a district by district basis. The current simplex conventional system does not allow for radio communications across the whole territory since the Joe Knob radio site covers the Eastern territory and the Johnson Hollow radio site covers the Western territory. The only link between the two sites via the radio system is through the dispatcher in the Gray, KY Headquarters. The new radio system is required to provide calling capability across both CVE territories without the need for dispatcher intervention.

2. During EKPC switching operations, the EKPC dispatcher communicates with CVE line personnel to coordinate the switching in a safe manner through the present low band radio system. However, there was not a need for the CVE dispatcher to communicate to the EKPC line personnel. For safe automated switching, the new radio system is required to provide the capability for the EKPC dispatcher to communicate with the CVE trucks.

3. The current radio system has distinctive holes in the coverage that mirrors holes with the current cellular coverage. There are areas where line personnel cannot communicate with the dispatcher. The new radio system is required to provide at least 95% coverage with 95% reliability of calls completed in the first attempt throughout the entire CVE territory.

4. CVE does not have a communications department with trained technicians to maintain the radio system. They currently rely heavily on EKC and Cornett Electronics to maintain the current system. The new radio system is required to include a maintenance support agreement with a third party.

5. During the State of the Industry meeting, CVE personnel did not have a preference for a specific mobile voice technology. However, it was stated that it would be nice to be able to communicate directly to the EKPC line personnel during joint projects. They also did not fully consider if group calls, person-to-person calls, or radio to PBX telephone exchange calls are desirable. Therefore, there are no specific feature sets of the different radio technologies as "must haves", but all features available would be considered "nice to have", if affordable.

3.1.3 CVE Future Mobile Data Needs

During the visit in July we went through many possible mobile data requirements with CVE. They are summarized in the following table;

Service	CVE Opinion	Communications Medium
Text Messaging	*Little Interest*	**Typically offered in all trunked mobile voice technologies**
Automatic Vehicle Location	*Very Interested*	**Mobile Voice**
Mobile GIS Viewing	*Already Using*	Garmin GPS Loaded with CVE Maps
Service/Outage Orders	*Interested*	**Mobile Voice (if field data only, not downloading forms)**
Work Scheduling	*Not Interested*	Not Applicable
Time Sheets	*Not Interested*	Not Applicable
Field Inspections	*Interested*	Via Laptops – Downloaded at Hotspot or office
Staking	*Interested*	Via Laptops – Downloaded at Hotspot or office
Tree Trimming Data	*Not Interested*	Not Applicable

Automatic Vehicle Location (AVL) and service/outage orders could be transmitted to the vehicles via the mobile voice system. Conventional technologies have limited data capabilities and can affect the voice capacity. However, trunked radio technologies can provide controlled data at rates of approximately 2400 bps. Trunked technologies that incorporate a control channel can send the AVL data (and text messaging, either free form or canned messages) on the control channel without affecting the radio voice capacity.

Service and outage orders would use a voice channel operating at 2400 bps. Care is needed in choosing the mobile service/outage order software suite to limit the size of the transmissions.

4 Possible Solutions Development

4.1 Solution Criteria Overview

Once the CVE current state and desired future state were discovered and documented, PSE determined a list of possible mobile voice solutions that best served CVE while taking into account the current assets and future needs. The chosen possible solutions took into account the following:

1. Topology of the terrain in South Eastern Kentucky and CVE's territory. We focused on frequencies at, or below, 450 MHz since higher frequencies would require unrealistic quantities of towers to meet the 95% coverage and 95% reliability requirement of calls placed on the first attempt.

2. Although low band (LB) VHF systems provide great propagation characteristics, we did not consider an LB solution for number of reasons. These include:

   - LB is highly susceptible to computer generated noise.
   - LB equipment requires a large amount of tower and shelter real estate, which could make leasing very expensive.
   - Mobile voice radio equipment suppliers are moving away from LB solutions.

3. Current communications assets in place. We focused on towers that have microwave communications to them already or could accommodate added communication dishes.

4. The requirement for interoperability between the EKPC dispatcher and the CVE line personnel in the trucks. All chosen technologies include an interoperability solution with the EKPC dispatchers.

5. Trunked solutions to take into account CVE's need for seamless calling across the whole territory and not continue to have separated radio communications. Voted, or simulcast conventional systems could provide this same calling feature, but they do not handle mobile data as well as trunked technologies and can be more complicated to maintain.

6. Lowest cost of ownership for CVE, including maintenance over the next 15 years. Our budgeting numbers focus on analog trunked systems since the affordable digital trunked systems are still in the early stages of deployment and do not meet the CVE culture of "wait and see" approach to adopting technology. (If CVE were to deploy a digital trunked system, they would be considered an "early adopter".)

4.2 Technology Solution Focus

PSE did in-depth coverage predictions, features solutions, and budgetary numbers for the following three mobile voice solution alternatives:

1. Join the upcoming EKPC 150 MHz Motorola PassPort analog system that is replacing the current LB conventional system. The conceptual design includes adding an additional site at the Kentucky Utilities (KU) Pine Mountain site.

2. Installing a CVE-owned 220 MHz analog trunked radio system at third party tower sites.

3. Installing a CVE-owned 450 MHz analog trunked radio system at third party tower sites

4.3 Coverage and Towers

4.3.1 Coverage Prediction Model Assumptions

1. For 95% coverage and 95% call reliability, mobile coverage was predicted using a 3 dB gain mobile antenna (2.5 dB gain including losses) at 2 meters AGL for VHF and a 5 dB gain antenna (4 dB gain including losses) for UHF.

2. Signal strength modeling was set to a -103 dBm signal level to provide the 95% successful call reliability.

3. Mobile power was set to 45 watts and base stations were set to 100 watts before combining. Combiner loses were assumed to be 4.0 dB, which is common for a 4-channel site. Cable losses were set by the length of transmitter cable.

4. Omni directional antennas at the tower site were used for the modeling.

    - 6 dB gain for VHF

    - 9 dB gain for UHF

5. Portable coverage was not considered for this modeling.

6. The prediction models were performed using the CommStudy 2.2 software suite using the Okumura prediction model. The prediction model adjusts for terrain and urban versus rural environments.

Please note, the prediction models used in this feasibility study should only be used for budgetary and comparison purposes only. All final coverage prediction models would need to take into account actual equipment and frequency channels used, obtainable locations on towers available, intermodulation study results and using all detailed design parameters inputted into the model.

4.3.2 Review of Joining the EKPC 150 MHz Planned PassPort System

EKPC is in the process of installing a statewide 150 MHz trunked system to manage their day-to-day operations. This system has been contracted to Motorola and will be a PassPort system. There are three planned towers in this system that will provide coverage within the CVE territory:

1. Johnson Hollow
2. Joe Knob
3. McCreary County Switch Yard

Terry Estes, from EKPC, provided the following coverage map generated by Motorola using their proprietary propagation modeling tool. A careful look at the green coverage plot reveals that there will be significantly less than 95% coverage within the CVE territory.

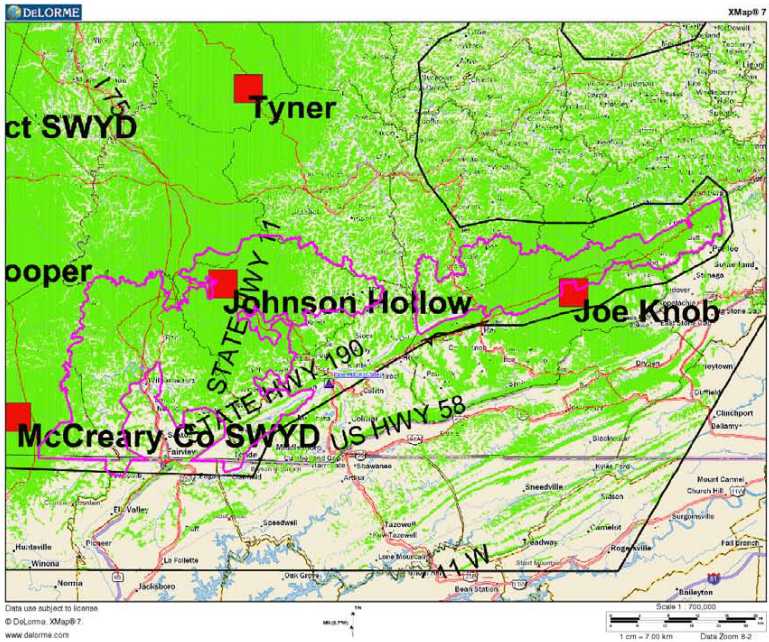


Figure 5 EKPC Motorola Coverage Map

PSE re-plotted the three tower sites from the Motorola system mentioned above and looked for a fill-in site to provide the required 95% coverage of the CVE territory. The site recommended by CVE was the Kentucky Utilities (KU) Pine Mountain site. A composite coverage prediction model is in the figure below that includes the added KU site using our prediction modeling software.

Call Sign	Longitude	Latitude	AGL (m)	Freq
MCCREARY CO. SWYD.	84-29-03.0 W	36-40-21.0 N	50	150
Pine Mountain (KU)	83-42-13.6 W	36-45-15.2 N	30	150
Joe Knob	83-05-35.0 W	36-55-39.4 N	30	150
Johnson Hollow	83-58-09.7 W	36-56-41.3 N	30	150

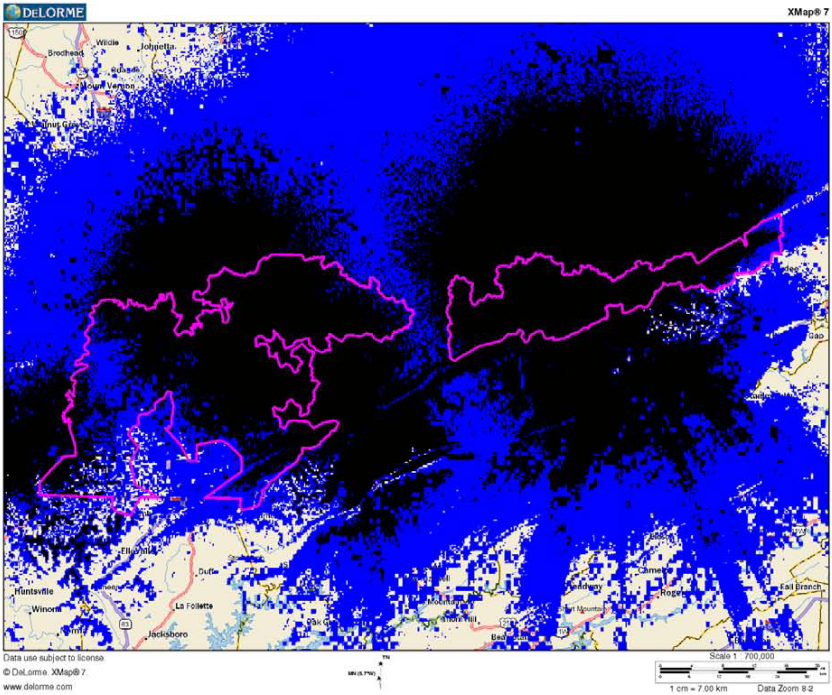


Figure 6 Coverage Prediction Using Pine Mountain

The KU site was chosen for a number of reasons:

- It provided the needed coverage in the middle part of the CVE territory.
- Per CVE, it has a microwave link that can be routed to the CVE Gray Office.
- KU has a good working relationship with CVE.
- With the added site, there is approximately 95% coverage across the CVE territory.

There are several items to note about the EKPC system:

1. It is almost completely statewide, so traveling CVE personnel could be in communications with CVE personnel throughout the state.

2. EKPC is willing to provide the capital investment for the infrastructure, which includes the tower infrastructure. CVE would provide the capital investment for the added fill-in tower site equipment, the needed subscriber units (mobiles and portables), the office dispatch centers, and any other in-office communications equipment.

3. EKPC is prepared to provide all tower equipment maintenance operational costs. CVE would pay for the maintenance contract for the subscriber units and equipment within the CVE offices. It is assumed that CVE would need to pay operational costs for the fill-in tower site lease (if applicable), but this was not confirmed with EKPC.

4. Motorola PassPort technology does not use a control channel approach to trunked communications. Therefore, any mobile data (AVL included) would require a dedicated voice channel for data. The EKPC PassPort system planning does not include accommodations for AVL or other mobile data communications; it is strictly a mobile voice system. If AVL or any other mobile data communications is a strong requirement for CVE on the new mobile voice system, the EKPC system will not accomplish that goal.

5. If CVE were to join the new system, it would allow for excellent interoperability with EKPC personnel, including dispatcher-to-truck calls in either direction, truck-to-truck calls between utilities, and dispatcher-to-dispatcher calls.

6. EKPC is in the final channel licensing process this year and hopes to have the new system fully installed in 2011. CVE would be able to be added to the system in late 2011 or early 2012. Coordination for the fill-in site communications would need to start very soon.

7. PSE did not look into the availability of 150 MHz channels for the fill-in site, or the availability of the KU-owned Pine Mountain tower site as part of this study. Both of these points would need to be addressed before a final design is prepared.

4.3.3 Review of a 220 MHz (AMTS Spectrum) System

PSE performed analysis on a CVE owned and operated autonomous 220 MHz system. We provided this option since, although the EKPC PassPort system would provide most of the requirements determined in the future state assessment, it would fall short in providing data communications to the mobiles for AVL and service/outage orders.

We determined that four tower sites, chosen based on towers in the area, would adequately provide radio coverage to the CVE territory. Joe Knob and Johnson Hollow were not included as possible sites due to the lack of shelter space. We did not contact any of the tower owners to determine if there was space on the towers for mobile voice antennas and 5.8 GHz microwave links. However, it should be noted that there were many options for towers in the vicinity of the CVE territory. A list of towers from our search is included in the appendices.

Call Sign	Longitude	Latitude	AGL (m)	Freq
1038395	84-18-07.9 W	36-25-39.3 N	86.9	217
Pine Mountain (KU)	83-42-13.6 W	36-45-15.2 N	30	217
Bold Knob	84-05-35.0 W	36-50-58.0 N	30	217
Black Mountain	82-53-39.0 W	36-54-53.0 N	43	217

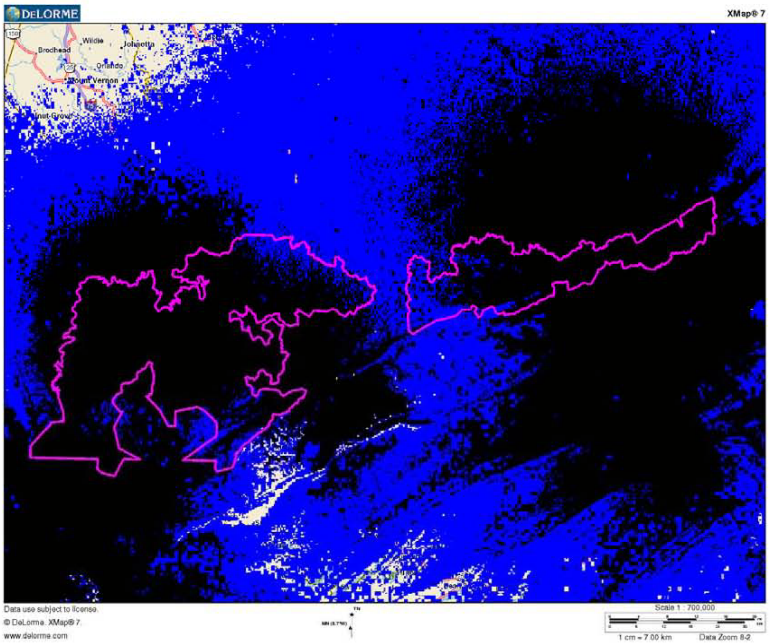


Figure 7 CVE Four Site 220 MHz System Coverage

Our prediction is that this system would actually provide better coverage to the CVE area than the 150 MHz EKPC system that includes the added fill-in site on the KU Pine Mountain tower. The design was focused on an analog MPT radio solution that would include accommodate AVL and mobile data at rates of 2400 bps.

If CVE were to move in this direction, frequency and tower site arrangements would be the next step in the process. MCLM is the owner of the AMTS spectrum in the CVE area. The contact for a quote is John Reardon (CEO) at 703-778-6555.

4.3.4 Review 450 MHz Licensed MPT System

PSE performed analysis on a CVE owned and operated autonomous 450 MHz system. We provided this option since, although the EKPC PassPort system would provide most of the requirements determined in the future state assessment, it would fall short in providing data communications to the mobiles for AVL and service/outage orders. We also included this as a baseline for the difference between the costs for 220 MHz frequency. The 450 MHz frequency, although less expensive than 220 MHz frequency, is becoming increasingly difficult to license through the FCC.

We determined that eight tower sites, chosen based on towers in the area, would adequately provide radio coverage to the CVE territory. Joe Knob and Johnson Hollow were not included as possible sites due to the lack of shelter space. We did not contact any of the tower owners to determine if there was space on the towers for mobile voice antennas and 5.8 GHz microwave links. A list of towers from our search is included in the appendices.

Please note that 450 MHz systems are probably not appropriate for the terrain in eastern Kentucky due to the propagation issues that arise with the higher frequencies in mountainous areas. This is why it would require eight sites to cover the CVE territory versus four for the 220 and 150 MHz systems.
The table below comprises the eight sites used in the feasibility study for 450 MHz.

Call Sign	Longitude	Latitude	AGL (m)	Freq
1038395	84-18-07.9 W	36-25-39.3 N	86.9	450
1056643	83-46-24.9 W	36-38-29.0 N	64.9	450
1215974	83-40-28.9 W	36-45-42.1 N	129.5	450
Bold Knob	84-05-35.0 W	36-50-58.0 N	30	450
Pine Mountain - Harlan	83-17-41.7 W	36-54-13.7 N	37	450
Black Mountain	82-53-39.0 W	36-54-53.0 N	43	450
1000715	83-24-16.9 W	37-01-25.6 N	92	450
Pine Mountain - Whitesburg	82-48-28.6 W	37-04-38.4 N	30	450

The predicted coverage of the CVE territory using a 450 MHz system is plotted below.

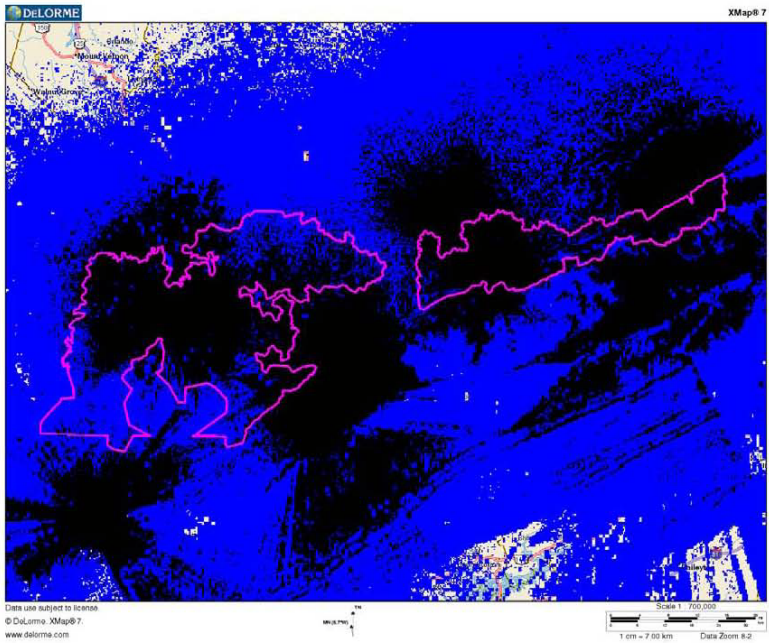


Figure 8 CVE 8 Site Coverage at 450 MHz

Our prediction is that this system would actually provide better coverage to the CVE area than the 150 MHz EKPC system that includes the added fill-in site on the KU Pine Mountain tower. The design was focused on an analog MPT radio solution that would include accommodate AVL and mobile data at rates of 2400 bps.

5 Budgetary Pricing

5.1.1 Budgetary Numbers for 150 MHz PassPort (EKPC)

CVE Trunked Radio System
Assumptions
1. Technology Assumption: Analog Trunked PassPort on 150 MHz
2. Assume that CVE only needs to pay for the added site at Pine Mountain (KU Site) and that shelter space is available
3. No AVL pricing since EKPC is not getting this on the system. Could be added later if the system moves to MOTOTRBO Connect Plus Digital
4. Assumes that 150 MHz channels can be added to the KU fill-in site for $2500 each un-paired channel
5. Assumes that all sites have sufficient microwave bandwidth and KU site connects to EKPC system per CVE comments.

Non-Recurring Capital Costs			
	Quantity	Unit Cost	Extended Cost
KU Owned Pine Mountain Tower Site Costs	**PassPort - Using MOTOTRBO Product**		
Two Base Station Antennas per site, connectors, jumpers, lightning protection	1	$ 1,500	$ 1,500
1 and 5/8 inch Low-loss cable (250 feet per site)	250	$ 15	$ 3,750
77" locked indoor cabinet for base station equipment	1	$ 6,000	$ 6,000
Receiver Multicoupler 3-channel (1 Per Tower Site)	1	$ 3,500	$ 3,500
Transmit Combiner 3-channel (1 Per Tower Site)	1	$ 8,500	$ 8,500
2200 W UPS Battery Backup System - One Hour	1	$ 5,000	$ 5,000
Extended Run Time Battery for UPS	1	$ 5,000	$ 5,000
Backhaul T1/Switches/ Controllers/Mux's Etc	1	$ 5,500	$ 5,500
Radio Transceivers/Power Amps (3 Channels)	3	$ 7,500	$ 22,500
Miscellaneous Equipment and Hardware (Power supplies/etc)	1	$ 3,000	$ 3,000
As Built Documentation & Manuals	1	$ 2,000	$ 2,000
Antenna and Other Tower Equipment Installation	1	$ 7,500	$ 7,500
Installation and Programming of the Radio Cabinet and Equipment At Site	1	$ 5,500	$ 5,500
Site Grounding Review and Augmentation	1	$ 2,500	$ 2,500
Frequency Channel Acquisition (6 unpaired 12.5 kHz Channels per Site)	6	$ 2,500	$ 15,000
Total Tower Site Costs			**$ 96,750**

	Quantity	Unit Cost	Extended Cost
Dispatch Center Costs			
AVTEC Dispatch Console/ Required UPS - (Gray and Cumberland Offices)	2	$ 18,000	$ 36,000
Fixed Mobile Back-ups at Each Office	2	$ 3,000	$ 6,000
Digital Desk Sets/Digital Junction/Mobile Unit	10	$ 4,500	$ 45,000
Installation and Programming of Dispatch Equipment (Each Office)	2	$ 7,500	$ 15,000
Total Dispatch Center Costs			**$ 102,000**
	Quantity	**Unit Cost**	**Extended Cost**
Subscriber Units - Mobiles and Portables Costs			
25 Watt Mobile with Digital Display, Antenna and Cable (3 Year Warranty)	60	$ 1,500	$ 90,000
Mobile Installation and Programming	60	$ 250	$ 15,000
5 Watt Portable with Digital Display, case and individual battery charger)	10	$ 1,050	$ 10,500
Programming of Portables	10	$ 50	$ 500
Portable Accessories (Gang Chargers at each office)	2	$ 550	$ 1,100
Programming Cables	4	$ 150	$ 600
Total Mobiles and Portables Costs (Including AVL)			**$ 117,700**
	Quantity	**Unit Cost**	**Extended Cost**
Headquarters Central Equipment Costs			
System Spares for Subscribers (EKPC would have infrastructure spares)	1	$ 8,000	$ 8,000
Total HQ Central Equipment Costs			**$ 8,000**
	Quantity	**Unit Cost**	**Extended Cost**
Services and Fees			
On Site Project Management	1	$ 15,000	$ 15,000
System Engineering and Configuration	1	$ 5,000	$ 5,000
System Acceptance Testing (SAT) - Only at one tower site and offices	1	$ 20,000	$ 20,000
System Training for CVE Personnel	1	$ 7,500	$ 7,500
Total HQ Central Control Equipment Costs			**$ 47,500**
System Grand Total Costs			**$ 371,950**

5.1.2 Budgetary Numbers for 220 MHz MPT System

CVE Trunked Radio System
Assumptions
1. Technology Assumption: Analog Trunked at 220 MHz
2. For pricing purposes, we assumed Central Switch MPT or Distributed MPT because of 220 product availability and the need for AVL (Over the Control Channel)
3. Assume 220 low band 217/219 MHz (reduces Stability Requirement and improves performance due to 2 MHz offset)

Non-Recurring Capital Costs

	Quantity	Unit Cost	Extended Cost
4 Tower Site Costs		**MPT**	
Two Base Station Antennas per site, connectors, jumpers, lightning protection	4	$ 1,500	$ 6,000
1 and 5/8 inch Low-loss cable (250 feet per site)	1000	$ 15	$ 15,000
77" locked indoor cabinet for base station equipment	4	$ 6,000	$ 24,000
Receiver Multi-coupler 3-channel (1 Per Tower Site)	4	$ 3,500	$ 14,000
Transmit Combiner 3-channel (1 Per Tower Site)	4	$ 14,500	$ 58,000
2200 W UPS Battery Backup System - One Hour	4	$ 4,500	$ 18,000
Extended Run Time Battery for UPS	4	$ 4,500	$ 18,000
Backhaul Routers/Switches/ Controllers/Mux's Etc (Different per vendor)	4	$ 5,500	$ 22,000
Radio Transceivers/Power Amps (3 Channels Per Tower Site)	12	$ 10,000	$ 120,000
Miscellaneous Equipment and Hardware (Power supplies/etc)	4	$ 5,000	$ 20,000
As Built Documentation & Manuals	4	$ 2,000	$ 8,000
Antenna and Other Tower Equipment Installation	4	$ 7,500	$ 30,000
Installation and Programming of the Radio Cabinet and Equipment At Site	4	$ 5,500	$ 22,000
Site Grounding Review and Augmentation	4	$ 2,500	$ 10,000
Microwave Costs Per Link to Connect to existing EKPC system	4	$ 40,000	$ 160,000
Frequency Channel Acquisition (3 AMTS Paired 12.5 kHz Channels per Site)	12	$ 20,000	$ 240,000
Total Tower Site Costs			**$ 785,000**
	Quantity	**Unit Cost**	**Extended Cost**
Dispatch Center Costs			
Dispatch Console/ Required UPS - (Gray and Cumberland Offices)	2	$ 14,000	$ 28,000
Fixed Mobile Back-ups at Each Office	2	$ 3,000	$ 6,000
Desk Top Remotes	10	$ 1,500	$ 15,000
PBX Telephone Inter-connection	1	$ 6,500	$ 6,500
Installation and Programming of Dispatch Equipment (Each Office)	2	$ 7,500	$ 15,000
Total Dispatch Center Costs			**$ 70,500**

	Quantity	Unit Cost	Extended Cost
Subscriber Units - Mobiles and Portables Costs			
25 Watt Conventional Mobile with Digital Display, Antenna and Cable	60	$ 1,500	$ 90,000
Mobile Installation and Programming	60	$ 250	$ 15,000
AVL GPS Receiver, Antenna and modem	60	$ 700	$ 42,000
AVL Programming and Configuration	60	$ 75	$ 4,500
5 Watt Portable with Digital Display, case and individual battery charger)	10	$ 1,050	$ 10,500
Portable Accessories (Gang Chargers at each office)	2	$ 550	$ 1,100
Programming Cables	4	$ 150	$ 600
Programming of Portables	10	$ 50	$ 500
Total Mobiles and Portables Costs (Including AVL)			**$ 164,200**
	Quantity	**Unit Cost**	**Extended Cost**
Headquarters Central Control Equipment Costs			
Maintenance Computer and Software	1	$ 3,500	$ 3,500
AVL Gateway Controller Server/Switches and Software	1	$ 65,000	$ 65,000
AVL Interfacing to CVE GIS	1	$ 25,000	$ 25,000
Central Switch and Controller (Not needed for all vendors)	1	$ 75,000	$ 75,000
2200 W UPS Battery Backup System - One Hour	1	$ 5,000	$ 5,000
System Spares for all Sites/Subscribers	1	$ 35,000	$ 35,000
Total HQ Central Control Equipment Costs			**$ 208,500**
	Quantity	**Unit Cost**	**Extended Cost**
Other Services and Fees			
RFP Level Design (Consultant) and Procurement Costs	1	$ 50,000	$ 50,000
On Site Project Management	1	$ 35,000	$ 35,000
System Engineering and Configuration	1	$ 50,000	$ 50,000
Factory Acceptance Test (FAT)	1	$ 10,000	$ 10,000
System Acceptance Testing (SAT)	1	$ 35,000	$ 35,000
System Training for CVE Personnel	1	$ 7,500	$ 7,500
Total HQ Central Control Equipment Costs			**$ 187,500**
System Grand Total Costs			**$ 1,415,700**

5.1.3 Budgetary Numbers for 450 MHz MPT System

CVE Trunked Radio System
Assumptions
1. Technology Assumption: Analog Trunked at 450 MHz
2. For pricing purposes, we assumed Central Switch MPT or Distributed MPT due to the need for AVL (Over the Control Channel)
3. Assume 450 MHz Channels are available at $2500 each through FCC or broker

Non-Recurring Capital Costs			
	Quantity	Unit Cost	Extended Cost
8 Tower Site Costs		**MPT**	
Two Base Station Antennas per site, connectors, jumpers, lightning protection	8	$ 1,500	$ 12,000
1 and 5/8 inch Low-loss cable (250 feet per site)	2000	$ 15	$ 30,000
77" locked indoor cabinet for base station equipment	8	$ 6,000	$ 48,000
Receiver Multi-coupler 3-channel (1 Per Tower Site)	8	$ 3,500	$ 28,000
Transmit Combiner 3-channel (1 Per Tower Site)	8	$ 12,000	$ 96,000
2200 W UPS Battery Backup System - One Hour	8	$ 4,500	$ 36,000
Extended Run Time Battery for UPS	8	$ 4,500	$ 36,000
Backhaul Routers/Switches/ Controllers/Mux's Etc (Different per vendor)	8	$ 5,500	$ 44,000
Radio Transceivers/Power Amps (3 Channels Per Tower Site)	24	$ 10,000	$ 240,000
Miscellaneous Equipment and Hardware (Power supplies/etc)	8	$ 5,000	$ 40,000
As Built Documentation & Manuals	8	$ 2,000	$ 16,000
Antenna and Other Tower Equipment Installation	8	$ 7,500	$ 60,000
Installation and Programming of the Radio Cabinet and Equipment At Site	8	$ 5,500	$ 44,000
Site Grounding Review and Augmentation	8	$ 2,500	$ 20,000
Microwave Costs Per Link to Connect to existing EKPC system	8	$ 40,000	$ 320,000
Frequency Channel Acquisition (3 Paired 12.5 kHz Channels per Site)	24	$ 2,500	$ 60,000
Total Tower Site Costs			**$ 1,130,000**

	Quantity	Unit Cost	Extended Cost
Dispatch Center Costs			
Dispatch Console/ Required UPS - (Gray and Cumberland Offices)	2	$ 14,000	$ 28,000
Fixed Mobile Back-ups at Each Office	2	$ 3,000	$ 6,000
Desk Top Remotes	10	$ 1,500	$ 15,000
PBX Telephone Inter-Connection	1	$ 6,500	$ 6,500
Installation & Programming of Dispatch Equipment (Ea Office)	2	$ 7,500	$ 15,000
Total Dispatch Center Costs			**$ 70,500**
	Quantity	**Unit Cost**	**Extended Cost**
Subscriber Units - Mobiles and Portables Costs			
25 Watt Conventional Mobile w Digital Display, Antenna, Cable	60	$ 1,500	$ 90,000
Mobile Installation and Programming	60	$ 250	$ 15,000
AVL GPS Receiver, Antenna and modem	60	$ 1,050	$ 63,000
AVL Programming and Configuration	60	$ 75	$ 4,500
5 Watt Portable with Digital Display, case and individual battery charger	10	$ 800	$ 8,000
Portable Accessories (Gang Chargers at each office)	2	$ 550	$ 1,100
Programming Cables	4	$ 150	$ 600
Programming of Portables	10	$ 50	$ 500
Total Mobiles and Portables Costs (Including AVL)			**$ 182,700**
	Quantity	**Unit Cost**	**Extended Cost**
Headquarters Central Control Equipment Costs			
Maintenance Computer and Software	1	$ 3,500	$ 3,500
AVL Gateway Controller Server/Switches and Software	1	$ 65,000	$ 65,000
AVL Interfacing to CVE GIS	1	$ 25,000	$ 25,000
Central Switch and Controller (Not needed for all vendors)	1	$ 75,000	$ 75,000
2200 W UPS Battery Backup System - One Hour	1	$ 5,000	$ 5,000
System Spares for all Sites/Subscribers	1	$ 55,000	$ 55,000
Total HQ Central Control Equipment Costs			**$ 228,500**
	Quantity	**Unit Cost**	**Extended Cost**
Other Services and Fees			
RFP Level Design (Consultant) and Procurement Costs	1	$ 60,000	$ 60,000
On Site Project Management	1	$ 55,000	$ 55,000
System Engineering and Configuration	1	$ 60,000	$ 60,000
Factory Acceptance Test (FAT)	1	$ 15,000	$ 15,000
System Acceptance Testing (SAT)	1	$ 60,000	$ 60,000
System Training for CVE Personnel	1	$ 7,500	$ 7,500
Total HQ Central Control Equipment Costs			**$ 257,500**
System Grand Total Costs			**$ 1,869,200**

6 Recommendations and Next Steps

6.1.1 Comparison of CVE Future Needs for the Three Possible Solutions

The table below summarizes how well the three possible radio solutions meet the determined requirements for the new radio system.

Requirement	150 MHz Joint System	220 MHz System	450 MHz System
1. The new radio system is required to provide calling capability across both CVE territories without the need for dispatcher intervention.	Yes	Yes	Yes
2. For safe automated switching, the new radio system is required to provide the capability for the EKPC dispatcher to communicate with the CVE trucks.	Yes – Directly from the dispatcher to the trucks on the radio system.	Yes-Through a Gateway mobile converter at Gray or through the PBX interconnect	Yes-Through a Gateway mobile converter at Gray or through the PBX interconnect
3. The new radio system is required to provide at least 95% coverage with 95% reliability of calls completed in the first attempt to the whole CVE territory.	Yes – using three planned EKPC site and one new fill-in site	Yes – Using four new tower sites that need to be determined if available.	Yes – Using eight new tower sites that need to be determined if available
4. The new radio system is required to include a maintenance support agreement with a third party.	Affordable, through a local shop. Only need to maintain the subscriber units.	Expensive through the radio manufacturer and probably a new local shop	Expensive through the radio manufacturer and probably a new local shop
5. None of the feature sets of the different radio technologies are required, but all features available would be nice, if affordable.	Affordable	High Cost	Extremely High Cost
6. AVL and 2400 bps data communications	No	Yes	Yes
7. Cost Affordable	Yes	No	No

6.1.2 PSE System Recommendations

The easiest interoperability solution for CVE is to join the EKPC system. This solution allows for communications between trucks, trucks to dispatch, and dispatch to dispatch in the simplest manner. Also, both cooperatives will always be using their standard operating procedures and would not have to change them dramatically during the high stress work periods that can occur during service outages.

The budgetary costs for CVE to add to the planned EKPC system are significantly lower than the CVE owned and operated systems. The costs are summarized in the below table:

PSE Recommendations	First Choice	Second Choice	Third Choice
System Costs	**150 MHz System**	**220 MHz System**	**450 MHz System**
Tower Infrastructure	$96,750	$785,000	$1,130,000
Dispatch Centers	$102,000	$70,500	$70,500
Subscriber Units	$117,700	$164,200	$182,700
HQ Central Equipment	$8,000	208,500	$228,500
Services and Fees	$47,500	187,500	$257,500
Total Radio Capital	$371,950	$1,415,700	$1,869,200
Tower Site Improvements	$10,000	$40,000	$80,000
Total Capital Costs	**$381,950**	**$1,455,700**	**$1,949,200**
Annual Tower Lease Estimates	$14,400	$57,600	$115,200
Annual System Maintenance	$10,000	$60,000	$125,000
Annual Operational Costs	**$24,400**	**$117,600**	**$240,200**

From a cost basis alone, the first choice for CVE is joining the EKPC system. However, there are several things to note about the EKPC system that CVE needs to consider before moving forward:

1. Even though the PassPort technology is feature rich compared to the current LB system, it is an older trunking technology that PSE does not consider to be best in class for trunking functionality. However, the features of PassPort should be adequate for CVE's mobile voice needs.

2. The planned EKPC system does not include any current or future plans for adding AVL or low speed data capability to the radio system. If CVE requires this functionality, then it is recommended to use a different communications medium than the mobile radio system. One option would be to provide cellular data cards for all of the laptop computers used in the trucks. These cellular cards could provide the needed AVL and mobile workforce management (MWM) application communications in areas that the coverage is good or via the substation Wi-Fi hotspots.

3. EKPC does not have a migration plan for the new system to a MOTOTRBO Connect Plus digital trunked time division multiple access (TDMA) system. However, due to frequency acquisition issues, the system may need to be converted at some time in the future. CVE may consider getting a quote for Motorola brand MOTOTRBO-capable mobiles and portables that have the PassPort functionality built-in, instead of the PassPort-only capable mobiles that EKPC has contracted for with Motorola.

6.1.3 Next Steps for CVE

EKPC is moving forward with their new system with many of the tower sites already deployed. However, there have been a few issues with getting the frequency licenses completed. If CVE decides to move forward with joining the EKPC system, the following are the next steps in the project.

1. Create a service level agreement with EKPC for the future radio system. It should include:

    - The deployment schedule in detail.

    - An outline of the responsibility matrix for each utility including the procurement process, the deployment process, the maintenance agreement for the infrastructure, subscribers, and dispatch centers, and which utility pays for the fill-in tower lease.

    - Details of the technology choices for the CVE-owned equipment.

2. Contact Kentucky Utilities to determine if there is space on the Pine Mountain tower and what microwave medium is available for backhaul of the mobile voice system. If the site is not available, determine what site would be available. Start the leasing and site make-ready work at the chosen tower.

3. Work with EKPC and Motorola to determine the antenna gain and pattern needed at the fill-in site that best covers the CVE territory. Review the antenna radiation patterns at Joe Knob, Johnson Hollow and the MacCreary County Switch Yard to see if some minor modifications could help provide the maximum coverage across the CVE territory without sacrificing the current covered territory.

4. Search for - and acquire - frequency channels that meet the chosen radiation pattern at the new fill-in site.

7 Appendix – Tower Sites Reviewed

243 sites were obtained from the FCC ASR database. Sites with less than 100' Height Above Average Terrain (HAAT) were filtered out and excluded from further analysis

FCC ASR #	Latitude	Longitude	AGL (m)	HAAT (m)
1268850	36-53-52.0 N	82-37-13.8 W	76.2	547.55
1204728	36-53-51.3 N	82-37-20.6 W	45.7	516.68
1024403	36-53-53.1 N	82-37-21.0 W	61.8	511.74
1017591	36-53-49.1 N	82-37-19.5 W	48.8	510.73
1203562	36-48-00.3 N	83-22-35.7 W	149.7	507.4
1243489	36-22-52.3 N	83-10-48.7 W	164.6	504.35
1017850	36-53-52.0 N	82-37-13.8 W	61	477.32
1026414	36-53-57.1 N	82-37-19.2 W	56	472.01
1043117	36-22-51.9 N	83-10-48.0 W	125	442
1056643	36-38-29.0 N	83-46-24.9 W	64.9	410.37
1237127	36-50-22.9 N	82-44-17.1 W	129	409.95
1041881	36-37-05.5 N	83-51-06.1 W	62.7	396.19
1022062	37-06-38.8 N	82-44-18.9 W	39.6	378.98
1255203	36-38-30.8 N	83-46-22.4 W	45.7	362.84
1219833	36-38-29.4 N	83-46-24.6 W	30.5	361.84
1250266	36-35-42.0 N	83-47-49.9 W	21.3	358.14
1025605	36-22-50.8 N	83-10-46.9 W	22.8	348.12
1007945	36-52-13.8 N	83-24-54.0 W	76.2	310.86
1267784	36-54-01.4 N	83-18-16.5 W	91.4	310.73
1061533	37-04-39.7 N	82-48-27.7 W	93	309.83
1200836	36-54-09.0 N	83-18-05.0 W	85.3	297.84
1215974	36-45-42.1 N	83-40-28.9 W	129.5	284.06
1042430	37-04-38.2 N	82-48-29.5 W	54.9	277.37
1268131	36-37-44.0 N	83-05-16.8 W	54.8	274.17
1043632	36-53-54.2 N	83-18-36.7 W	61	258.86
1247669	36-46-53.0 N	82-50-38.7 W	76.5	241.45
1065267	37-04-27.1 N	82-48-43.9 W	43	234.06
1044514	37-00-29.8 N	84-34-40.0 W	140.2	231.97
1042647	36-54-09.0 N	83-18-01.0 W	28	227.43
1037083	36-26-16.4 N	83-30-15.8 W	54.8	215.79
1243963	36-42-30.9 N	82-52-54.1 W	76.2	209.88
1038395	36-25-39.3 N	84-18-07.9 W	86.9	201.08
1202030	36-23-03.4 N	84-14-36.9 W	83.8	198.9

FCC ASR #	Latitude	Longitude	AGL (m)	HAAT (m)
1037081	36-33-35.2 N	84-07-25.6 W	86.1	198.18
1263059	37-03-41.0 N	83-51-28.4 W	73.1	187.34
1043979	37-06-11.8 N	84-35-43.0 W	137.2	186.68
1202016	36-27-37.8 N	84-15-21.9 W	83.8	180.71
1043528	36-57-15.1 N	83-58-41.8 W	131	180.24
1044807	36-59-43.0 N	83-35-42.0 W	79.9	177.53
1265463	36-23-03.8 N	84-14-34.4 W	51.8	176.62
1044808	36-56-41.2 N	83-58-10.1 W	79.2	170.28
1238463	36-32-50.2 N	83-13-42.2 W	86.9	168.84
1043677	36-57-38.1 N	84-34-06.9 W	128.9	165.51
1225328	36-36-36.3 N	83-40-00.8 W	10.7	165.33
1043633	36-45-17.2 N	84-08-30.8 W	36.6	163.33
1044814	36-59-56.0 N	83-25-20.2 W	86	157.4
1053918	36-25-28.2 N	84-29-12.8 W	138.1	150.94
1246017	37-03-29.8 N	83-48-59.7 W	91.4	149.83
1043634	36-53-51.0 N	83-54-19.0 W	76.2	149.75
1246043	36-51-46.8 N	83-47-01.6 W	91.7	147.15
1043977	37-01-05.1 N	84-34-54.1 W	91.4	146.97
1043635	36-53-49.9 N	84-07-53.0 W	61	146.42
1232817	37-07-19.5 N	83-53-49.5 W	100.5	146.04
1051877	37-07-51.9 N	84-33-15.1 W	79.3	145
1272080	37-07-52.6 N	83-43-03.3 W	91.4	144.29
1059319	36-29-49.9 N	84-12-25.2 W	88.4	143.87
1043630	36-38-53.1 N	83-41-25.0 W	45.7	142.29
1231917	36-56-40.5 N	83-58-08.7 W	58.5	141.82
1027929	36-50-33.0 N	82-47-24.0 W	54.9	138.2
1256124	36-56-42.0 N	83-58-10.9 W	41.1	137.52
1234225	37-01-12.7 N	84-34-43.6 W	76.5	137.11
1043806	36-54-29.1 N	84-08-04.5 W	79.6	136.53
1247918	37-07-24.6 N	84-33-06.1 W	91.7	135.71
1041616	36-27-45.0 N	83-36-00.0 W	73.2	134.99
1059320	36-32-21.1 N	84-09-33.1 W	88.4	133.91
1246954	37-07-05.1 N	83-53-52.0 W	91.4	129.99
1230623	37-07-33.2 N	83-45-45.3 W	109.7	129.23
1052499	36-57-14.7 N	83-57-04.3 W	89.6	129.01
1044797	37-01-13.4 N	84-23-42.7 W	79.9	123.03
1000715	37-01-25.6 N	83-24-16.9 W	92	120.37
1233359	36-50-27.2 N	84-28-44.0 W	76.2	120.01
1232713	36-52-21.7 N	83-49-19.2 W	103.6	119.14

FCC ASR #	Latitude	Longitude	AGL (m)	HAAT (m)
1037115	36-24-52.5 N	83-00-44.6 W	36.6	118.46
1234183	36-28-12.0 N	83-34-56.6 W	91.7	118
1043625	37-06-10.0 N	84-35-44.8 W	88.4	115.48
1269040	36-44-47.7 N	84-08-43.8 W	79.5	111.94
1010610	36-58-45.8 N	83-01-30.0 W	76.2	109.57
1260689	36-53-58.5 N	84-30-50.0 W	103.6	108.86
1244654	36-55-00.4 N	84-03-55.4 W	94.5	108.7
1043681	37-01-32.1 N	83-23-57.8 W	61	106.33
1043812	36-44-50.6 N	84-08-43.8 W	58.5	104.62
1204258	36-50-41.2 N	84-09-27.7 W	91.4	104.21
1232668	36-48-20.5 N	84-29-21.1 W	91.4	102.49
1237188	36-44-47.7 N	84-08-45.9 W	59.4	101.32
1233331	36-51-15.8 N	84-13-22.0 W	103.6	100.62
1258597	36-47-19.6 N	84-28-51.9 W	73.2	100.61

5 Sites owned by Cornett Electronics and available for lease were considered for coverage.

Site	Latitude	Longitude	Owner	Elevation (Ft)	Tower AGL (Ft)	Type
Pine Mt-Harlan	36-54-13.8 N	83-17-41.7 W	Cornett Electronics	2753	120	Self Support
Black Mt - Lynch	36-54-53.0 N	82-53-39.0 W	Cornett Electronics	4101	140	Self Support
Pine Mt-Whitesburg	37-04-38.4 N	82-48-28.6 W	Cornett Electronics	2753	100	Guyed
Bold Knob-Rockholds	36-50-58.0 N	84-05-35.0 W	Cornett Electronics	1840	100	Guyed
Pine Mt-Cumberland	36-58-47.3 N	83-01-07.6 W	Cornett Electronics	2181	80	Guyed

4 Sites are owned by other utilities and were considered for coverage. Lease possibilities are not known.

Site	Latitude	Longitude	Tower AGL (Ft)
MCCREARY CO. SWYD.	36-40-21.0 N	84-29-03.0 W	160
Pine Mountain (KU)	36-45-15.2 N	83-42-13.6 W	100
Joe Knob	36-55-39.4 N	83-05-35.0 W	100
Gilliam Knob	36-56-41.3 N	83-58-09.7 W	100

APPENDIX B

Cumberland Valley Electric

GIS Overview

Cumberland Valley Electric

KY57 Bell

November 8, 2011

Outline of Information to Support GIS Financing for Inclusion in 2012-2015 Construction Work Plan or CWP Amendments

1) Describe the planning process that was utilized in determining to proceed with a GIS implementation, including use of any pilot program, investigation of process used by other utilities, studies issued by CRN or others, use of consultants, etc.

   CVE has an existing GIS database that is a personal geo-database that resides on a single work station. CVE's plan is to upgrade this system to a server based GIS system. Other cooperatives have been contacted and it was found that most have implemented such systems.

2) List of GIS applications intended to be implemented, broken into the following general categories: traditional mapping, engineering, operations, planning and environmental, business and marketing, management, and shared services. This list will assist in understanding system priorities, by identifying when the individual applications will be implemented (i.e. immediate, near-term, or long-term).
   - Traditional mapping (immediate)
   - Staking (near term)
   - Engineering analysis models (near term)
   - R/W maintenance
   - Operations – future Outage Management support (long term)

3) Describe the data design standards and metadata that will ensure interoperability of GIS data with other borrower systems and systems of other parties (power supplier, transmission provider, government entities or PUC) with which the borrower may be required to share data.

   Data is expected to be formatted for ESRI version 9.3 based GIS products. Most other cooperatives use these products, therefore interoperability should be assured. CVE's power and transmission provider, East Kentucky Power Cooperative, as well as the Kentucky Public Service Commission and the US Forest Service are capable of using data produced by these software products.

4) List of both tangible and intangible benefits expected to be generated through GIS implementation.
   - Maps will be maintained daily instead of monthly to quarterly, thereby providing up-to-date maps.

- Implementation GIS system and a software staking solution based on GIS data will streamline staking and work order processes, thereby saving time and money.
- GIS data can be used by service personnel for damage assessment and regulatory inspections.
- Server based GIS system will integrate with and support CIS, ABS, EA, OMS
- GIS along with field collection of GPS and inventory data will provide for enhanced facilities management and correct plant asset records, thereby possibly saving property tax.

5) Details concerning the following GIS component elements requested for financing:
   a) Hardware: desk top or hand held computers, GPS units, etc, including the number of units to be procured which will be devoted to GIS use.
      - Three handheld GPS receivers to be used for staking and facility locating.
      - Three tablet or laptop machines for staking.

   b) Software: automated mapping/facilities management (AM/FM) software, geographic information system software (GIS), data viewer software, computer aided drafting software, business geographic software, including the specific software packages being utilized, if possible, as well as the number of software licenses being procured.
      - Server based GIS system – Futura Map
      - Staking software – Futura Stake
      - Map viewing software – Futura Viewer
      - 3 ESRI ArcView 9.3 License
      - 1 ESRI ArcEditor 9.3 License
      - 1 ESRI ArcServer 9.3 License

   c) Field Inventory: list of specific information that will be gathered and resources used to do so.
      - GPS coordinates of substations, poles, meters, pad transformers, pedestals and junction boxes
      - Pole size, class and year along with inspection dates
      - Attachments to poles and anchors of third parties
      - Primary, secondary and service wire sizes
      - Conductor phasing
      - Pole top assembly units

- Equipment types and sizes – transformers, reclosers, sectionalizers, regulators, capacitors, fuses and security lights

A contractor such as Davey Resources or Patterson-Dewar Engineers will be used to perform field inventory functions.

6) Budgeted costs for each GIS component. Due to the importance of this information, provide specific elements of cost within the categories of hardware, software, field inventory, conversion of existing data, training, etc. Indicate whether a GIS consultant was utilized in developing this information.

- Hardware $27,300
- Software $0

  (No up front money required for GIS mapping and staking software. Software is supported through monthly support fee based on number of consumers. Approximate monthly support fee is $1,650.)
- Field Inventory $875,100
- Data Conversion $0
- Software Implementation and Training $12,000
- ESRI Licensing $15,600

7) Time-lines for GIS implementation including the extent to which GIS costs have been included in the current year's budget as well as costs to be incurred in coming years. If a portion of the GIS implementation has been completed in prior years, list what activities and their associated costs have already been performed and over what time period.

   GIS system implementation and training is expected to take place during the first quarter of 2012. 2012 is the budget year for all cost items listed above except that the field inventory portion is expected to take longer than one year to complete. ESRI licensing and software support fees will recur yearly and monthly, respectively.

   A field inventory pilot project started on Monday, October 31, 2011, and should be completed by the first of December, 2011. This pilot project includes all facilities and consumers served by CVE's Pine Mountain Substation. The cost is expected to be approximately $14,000.

8) Staff and outside resources to be utilized in establishing the GIS system as well as for on-going maintenance of data collection and entry. Indicate the number and position of new employees required, whether existing employees will be utilized on a part-time basis, as well as any consulting assistance or contractors to be utilized in the process.

CVE's engineering manager will oversee implementation of GIS system and training of engineering department employees in its use, operation and maintenance. The software vendor will be responsible for software implementation and training. The department's three current staking technicians will maintain the GIS database through use of the software staking solution. It is expected that editing, data collection and system maintenance will be performed by one new full time GIS administrator/technician. It is likely that outside resources may be required for system support and maintenance until the new GIS administrator/technician is employed and properly trained.

9) Training that will be provided to ensure a successful deployment, including specifics of training being provided and by what parties, number of employees to be trained, and over what time period this training will be offered.

Training will be provided for CVE's engineering manager, its three current staking technicians and new GIS administrator/technician. Training will take place immediately after software is successfully implemented and tested. The software vendor, Futura GIS Systems, estimates 15 days will be required for implementation and training. The exact date of software implementation is not yet known, but is expected to be during the first quarter of 2012.

Training specifics include:

- Map Viewing
- Map editing
- Use of staking software and field equipment
- Data collection and revision

10) Describe the processes to be used for collecting field data as well as the conversion of existing mapping data, to ensure a successful integration into the overall GIS system. What external GIS data sets are planned to be used.

Field inventory data collection will be performed by a third party provider. They typically use two person teams consisting of a driver/map operator and an equipment operator that physically visits each asset feature being inventoried. The data compiled is formatted for the particular GIS system platform with which it will be used.

CVE staking technicians will collect GPS coordinates and field data using hand held receivers during their field visits for new construction or retirement activities. Once data is collected, the technician will import collected data into staking solution for production of work orders.

External data sets that may be used include, but not necessarily limited to:

- Google Earth imagery or Department of Agriculture imagery
- County property tax office parcel records
- Kentucky Public Service Commission territorial boundary data

- G&T transmission line and switch location data
- Publicly available land base data such as county, hydrology, highway, rail line, incorporated city, school tax and fire department data
- FEMA flood map data

11) Extent to which the mapping system will be integrated with other computerized applications, including engineering analysis, customer information system, work order tracking and outage analysis.

Immediately after implementation, integration will be in place between GIS system and CVE's CIS and accounting/work order systems. The new GIS system will provide work order tracking inherently. It will also immediately support engineering analysis but may not be fully integrated with it. CVE does not currently own or operate software driven outage management system, nor does it plan to in the near future. Should CVE plan for OMS implementation, a software module can be added to the GIS package to provide this functionality, or a third party solution may be used that GIS system will integrate with and support.

12) Board action to authorize the overall plan for implementing the GIS system including recognition of the time-lines, costs, and overall resources to be utilized. Include the board resolution as well as the information that was provided to them for their review.

The Cumberland Valley Electric board of directors was presented with a proposed 2012-2015 work plan on October 13, 2011. This GIS project was included in the proposed plan. A copy of their resolution to adopt the work plan is attached hereto.

CUMBERLAND VALLEY ELECTRIC

GIS COST SUMMARY

	Item Total	RUS Financing	
Field Inventory Estimate	$875,100	(75%)	$656,325
Hardware	$27,300	(100%)	$27,300
Software Implementation & Training	$12,000	(100%)	$12,000
Licensing	$15,600	(100%)	$15,600
TOTAL PROJECT	**$930,000**		**$711,225**