



State of New Hampshire

**Department of Safety
Division of State Police
Office of Interoperability
P25 Public Safety Radio System
RFP DOS 2017-06**

RFP ISSUED.....11/04/2016

VENDOR CONFERENCE.....11/10/2016 (1:00 PM)

**AT: NH Department of Safety
Division of State Police
Office of Interoperability
33 Hazen Drive
Concord, NH 03305**

**STATE POINT of CONTACT..... Kevin Connor
Kevin Connor@dos.nh.gov
(603) 223-4300**

**CONTRACT TYPE.....Firm Fixed Price
PROPOSALS DUE.....02/13/2017 (2:00 PM)**

**MAILING ADDRESS:
NH Department of Safety
Division of State Police
Attn: Kevin Connor
33 Hazen Drive
Concord, NH 03305**

STATE OF NEW HAMPSHIRE
DEPARTMENT OF SAFETY
P25 PUBLIC SAFETY RADIO SYSTEM
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1.0 PURPOSE:

The State of New Hampshire, acting through the Department of Safety, is releasing this Request for Proposal (RFP) to procure equipment and services to construct a Project (P25) Public Safety Radio System throughout the State for the Division of State Police in accordance with the requirements of this Proposal invitation and any resulting contract.

The New Hampshire State Police (NHSP) Communication Maintenance Section is responsible for the installation, programming, and servicing of two-way voice and data communications equipment owned or operated by all Divisions within the New Hampshire Department of Safety. Additionally, the section provides installation, programming, and servicing of communications equipment for New Hampshire Department of Resources and Economic Development, New Hampshire Department of Fish and Game, and other state and local public safety entities. Today's New Hampshire Communications Network (NHCommNet) radio system consists of a Motorola P25 digital conventional Land Mobile Radio (LMR) system with a legacy (non-IP) dispatch console system that both require a technology refresh and expanded radio coverage.

The NHSP currently operates in the very-high frequency (VHF) band with a blended conventional standalone transmit site and simulcast design. All Troop patrol areas also have multiple receive-only sites. Each of the Troop areas identified as A, B, C, D and E have one radio system zone design, with Troop F having several zones due to its large geographic area. Meanwhile, Troop G and Marine Patrol have responsibilities over the entire state utilizing the radio channels operated by the other Troops' local systems.

The State has identified five key deficiencies, as follows:

1. Significant coverage gap areas exist across the state that create radio system reliability and officer safety concerns.
2. The current system requires significant radio user involvement to make the system meet their needs, which makes the system somewhat user unfriendly.
3. Key infrastructure elements have reached end-of-life (EOL) for product support.
4. A current gap exists in terms of moving to key Internet Protocol (IP)-based system components; this has hindered interoperability with county and local law enforcement agencies across the state.
5. The current system lacks reliable alternative channels to mitigate system congestion issues.

The State invites Vendors to submit a proposal to furnish and install equipment for the replacement of various communications subsystems operated by the State, in order to update the NHCommNet. Proposals are requested for the following:

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1. A new simulcast very high frequency (VHF) Project 25 (P25) Phase I digital conventional land mobile radio (LMR) system to replace the State's existing conventional digital system
2. New Internet protocol (IP)-based microwave hops leveraging the existing Ceragon Networks and Cambium Networks microwave backbone to connect to new transmit and receive sites.
3. A new IP-based radio dispatch console system to replace the existing Motorola Gold Elite consoles.
4. Civil work to support upgrades to existing State and local County tower sites to support the aforementioned communications subsystems. The intent is to utilize the preferred tower sites that include primarily existing government owned properties and no Greenfield sites.

The State has provided their comprehensive list of requirements (Attachment A) for the new Public Safety Radio System to enhance coverage for the first responders, provide a technology refresh of legacy equipment, and improve dispatch communications throughout the State. A list of all attachments provided to assist the preparation of the Vendor's proposal include:

1. Attachment A: Scope of Work
2. Attachment B: Proposal Pricing Forms
3. Attachment C: Candidate Site List
4. Attachment D: Compliance Matrix
5. Attachment E: Troop Patrol Areas and Coverage Focus
6. Attachment F: Existing Microwave Backhaul
7. Attachment G: Terms and Conditions
8. Attachment H: Proposal Submission Documents
9. Attachment I: Proposal Transmission Letter

2.0. INSTRUCTIONS TO VENDOR:

Read the entire RFP invitation prior to filling it out. Complete all required submission sections as outlined in Section 2.1 "Proposal Submittal" utilizing the applicable forms and Proposal Submission Documents in Attachment H and submit the complete package to the State of New Hampshire in accordance with the instructions.

2.1. PROPOSAL SUBMITTAL:

All proposals must be submitted in whole, must be typed or clearly printed in ink, and must be received on or before the date and time specified on page 1 of this RFP Under "Proposals Due". Interested parties may submit a Proposal to the State of New Hampshire by mail to the address listed under the cover. All Proposals must be clearly marked with RFP number, date due and purchasing agent's name.

Proposals must follow the following format:

1. Proposal must be provided in a three-ring binder;

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2. A Proposal must be printed on white paper with dimensions of 8.5 inches by 11 inches with right and left margins of one (1) inch;
3. Each page of a Proposal must include a page number and the number of total pages and identification of the Vendor in the page footer; and
4. Tabs must separate each Section of the Proposal.
5. Total of (5) Proposals must be submitted.

Vendors shall adhere to the proposal format provided below, organized by section:

1. Section 1: Proposal Transmittal Letter
2. Section 2: Cover Letter
3. Section 3: Table of Contents
4. Section 4: Executive Summary
5. Section 5: Qualifications
 - a. Descriptions of Vendor's qualifications and radio communication systems experience. A thorough understanding of the business functions associated with a public safety fully integrated dispatch enterprise IP-based radio communication system including but not limited to: tower infrastructure sites, microwave backhaul requirements, LMR requirements, frequency coordination, site permitting, quality audits, site integration coordination, and end user equipment operation. Experience with VHF digital narrowband communication systems will be considered a significant benefit.
 - b. Resumes of key personnel - For the Project Manager and Project Engineer and other key personnel, include the employee's name and, through a resume or similar document, the Project personnel's education and experience in the role they will serve on this project. Indicate the responsibilities each individual will have in this Project and how long each has been with your company, and similar experience with the aspects of this project (VHF simulcast, consoles, microwave backhaul, etc.). Identify by name any subcontractors you intend to use and the services they will perform.
 - c. Supplementary information
6. Section 6: Description of the System
 - a. Radio communications system
 - b. Connectivity to microwave backhaul links
 - c. Radio dispatch consoles
 - d. Site infrastructure
 - e. Additional subsystems
 - f. RF coverage predictions
 - g. Detailed equipment specification sheets for all proposed equipment
 - h. System design information shall include a complete detailed description, system-level and block diagrams, equipment layouts, and equipment lists necessary to provide a complete and comprehensive description
7. Section 7: Preliminary project schedule with detailed Gantt chart

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8. Section 8: Training programs and additional information that is not covered in other sections
9. Section 9: Point-by-point compliance
 - i. Vendors shall provide compliance statements for each outline level of this document. Vendors shall complete the compliance matrix provided in Attachment D: Compliance Matrix and include the specific paragraph reference. Compliance statements are limited to the following three choices:
 - i. COMPLY – The proposal meets or exceeds the specified requirement.
 - ii. COMPLY WITH CLARIFICATION – The proposal does not meet the exact stated requirement; however, it meets a substantial portion of, or meets the intent of, the requirement. Vendors must provide a detailed explanation when using this statement.
 - iii. EXCEPTION – The proposal does not meet the specified requirements. Vendors must provide a detailed explanation when using this statement.
10. Section 10: System, subsystem and subscriber warranty information.
11. Section 11: Total proposal cost and detailed pricing breakdown.
 - a. Vendors shall provide total proposal cost and itemized pricing for both equipment and services. Each line item shall indicate the Vendor’s list cost and discount offered. Costs for OPTIONAL items also shall be provided.
 - b. The Price Proposal (Attachment B) must be submitted in a SEPERATELY SEALED ENVELOPE labeled “Price Proposal”.

2.2. TIMELINE:

The timeline below is provided as a general guideline and is subject to change. Unless stated otherwise, consider the dates below a “on or about ” date.

EVENT DESCRIPTION	DATE	TIME
RFP Released (On or About)	11/04/2016	n/a
Bidders Conference	11/10/2016	10:00 AM
Site Location Survey Visits	11/14/2016 to 12/22/2016	
Questions Due	12/23/2016	2:00 PM
Response to Questions Sent	01/06/2017	2:00 PM
Bid Opening Date (Due Date)	02/13/2017	2:00 PM
Notification of Intent to Award	03/13/2017	2:00 PM
Governor & Council Meeting/Approval	05/09/2017	n/a
Notice to Precede (On or About)	05/10/2017	n/a
Kick Off Meeting	05/18/2017	n/a
Agency Acceptance & Close-Out	03/15/2019	n/a

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Prospective vendors are strongly encouraged to participate in the site survey visits related to this proposal. The State Project Manager or designee will assist with site visits for prospective bidders as necessary during the dates listed above. Prospective bidders are requested to contact both Tom Bardwell (thomas.bardwell@dos.nh.gov) & Jim Kowalik (James.Kowalik@dos.nh.gov) for site visit details at the NH Department of Safety, State Police Headquarters, 33 Hazen Drive, Concord, NH.

See Attachment C for site visitation schedule. The site visits will begin at the base of each mountaintop location. Attendees must bring a 4WD vehicle in order to be allowed to travel to the summit locations. In the event of the access road being closed to traffic or impassable, attendees may be allowed to travel to the summit by ATV, Snowmobile, or by foot if so desired. The visits are expected to take approximately 2 hours each.

2.3. SPECIFICATIONS:

Complete specifications required are detailed in Attachment A “Scope of Services” in this proposal. In responding to the proposal, the vendor shall address all requirements for information as outlined.

2.4. REQUEST FOR CHANGES AND/OR CLARIFICATION:

Any questions must be submitted by an individual authorized to commit their organization to the Terms and Conditions of this RFP. Submissions must clearly identify the RFP Number, the Vendor’s name and address and the name of the person submitting the question. Any requested changes, clarifications, and questions to this RFP invitation by the Vendor must be received in writing at the Division of State Police no later than 2:00 PM on 12/23/16.

Questions must be submitted by E-mail to Kevin Connor at the following address:
kevin.connor@dos.nh.gov.

2.5. TERMS OF SUBMISSION:

All material received in response to this proposal shall become the property of State and will not be returned to the Vendor. Regardless of the Vendors selected, State reserves the right to use any information presented in a Proposal response.

Complete proposals shall be filled out on original Proposal format. Vendors may submit additional paperwork with pricing, but all pricing shall be on Proposal and in the State’s format.

2.6. LIABILITY:

The State shall not be held liable for any costs incurred by the vendor in the preparation of their proposal or for work performed prior to contract issuance.

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2.7. CERTIFICATE OF INSURANCE:

The form contract P-37 in Attachment G “Terms and Conditions” shall be part of this proposal and the basis for the contract. The successful Vendor and the State, following notification, shall promptly execute this form of contract, which is to be completed by incorporating the service requirements and price conditions established by the vendor’s offer.

2.8. CONTRACT TERMS AND CONDITIONS:

The vendor’s signature on a proposal submitted in response to this RFP guarantees that all of the State of New Hampshire’s Terms and Conditions are accepted by the Vendor

The form contract P-37 in Attachment G “Terms and Conditions” shall be part of this proposal and the basis for the contract. The successful Vendor and the State, following notification, shall promptly execute this form of contract, which is to be completed by incorporating the service requirements and price conditions established by the vendor’s offer.

The term of the contract shall be from May 9, 2017 or the date of approval by the Governor and Executive Council, whichever is later, through March 19, 2019 a period of approximately two (2) years. The contract may be extended for up to an additional (1) year thereafter under the same terms, conditions and pricing structure upon the mutual agreement between the successful Vendor and the State with the approval of the Commissioner of the Department of Safety. The maximum term of the contract (including all extensions) shall not exceed three (3) years.

2.9. PUBLIC DISCLOSURE OF PROPOSAL SUBMISSIONS:

Generally, all proposals (including all materials submitted in connection with them, such as attachments, exhibits and addenda) become public information upon the effective date of a resulting contract or purchase order. However, to the extent consistent with applicable state and federal laws and regulations, as determined by the State, including, but not limited to, RSA Chapter 91-A (the “Right-to-Know” Law), the State will attempt to maintain the confidentiality of portions of a proposal that are clearly and properly marked by a Vendor as confidential. Any and all information contained in or connected to a proposal that a Vendor considers confidential must be clearly designated in a manner that draws attention to the designation. The State shall have no obligation to maintain the confidentiality of any portion of a proposal or related material, which is not so marked. Marking an entire proposal, attachment or sections thereof confidential without taking into consideration the public’s right to know will neither be accepted nor honored by the State. Notwithstanding any provision of this RFP to the contrary, pricing will be subject to public disclosure upon the effective date of all resulting contracts or purchase orders, regardless of whether or not marked as confidential. If a proposal results in a purchase order or contract, whether or not subject to approval by the Governor and Executive Council, all material contained in, made part of, or submitted with the contract or purchase order shall be subject to public disclosure.

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If a request is made to the State by any person or entity to view or receive copies of any portion of a proposal and if disclosure is not prohibited under RSA 21-G: 37, Vendors acknowledge and agree that the State may disclose any and all portions of the proposal or related materials which is not marked as confidential. In the case of proposals or related materials that contain portions marked confidential, the State will assess what information it believes is subject to release; notify the Vendor that the request has been made; indicate what, if any, portions of the proposal or related material will not be released; and notify the Vendor of the date it plans to release the materials. The State is not obligated to comply with a Vendor's designation regarding confidentiality.

By submitting a proposal, the Vendor agrees that unless it obtains and provides to the State, prior to the date specified in the notice described in the paragraph above, a court order valid and enforceable in the State of New Hampshire, at its sole expense, enjoining the release of the requested information, the State may release the information on the date specified in the notice without any liability to the Vendor.

A Proposal must remain confidential until the Effective Date of any resulting Contract as a result of this RFP. A Vendor's disclosure or distribution of Proposals other than to the State will be grounds for disqualification.

The State of New Hampshire reserves the right to cancel or amend this RFP at any time and for any reason.

2.10. TERMINATION:

The State of New Hampshire shall have the right to terminate the contract at any time by giving the successful Vendor a thirty (30) day written notice.

2.11. VENDOR CERTIFICATIONS:

ALL Vendors **SHALL** be duly registered as a Vendor authorized to conduct business in the State of New Hampshire. Vendors shall comply with the certifications below at the time of submission and through the term of any contract which results from said proposal. Failure to comply shall be grounds for disqualification of proposal and/or the termination of any resultant contract:

- **STATE OF NEW HAMPSHIRE VENDOR APPLICATION:** Vendor **SHALL** have a completed Vendor Application and Alternate W-9 Form which **SHALL** be on file with the NH Division of State Police. See the following website for information on obtaining and filing the required forms (no fee): <http://das.nh.gov/purchasing>.
- **NEW HAMPSHIRE SECRETARY OF STATE REGISTRATION:** A proposal award, in the form of a contract, will **ONLY** be awarded to a Vendor who is registered to do business **AND** in good standing with the State of New Hampshire. Please visit the

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following website to find out more about the requirements for registration with the NH Secretary of State: <http://www.sos.nh.gov/corporate>.

- **CONFIDENTIALITY & CRIMINAL RECORD:** If applicable, by the using agency, the Vendor will have signed by each of its employees or its approved sub-contractor(s), if any, working in the office or externally with the State of New Hampshire records a Confidentiality form and Criminal Record Authorization Form. These forms shall be returned to the individual using agency prior to the start of any work. The State reserves the right to prohibit any individuals from working on this project based on Criminal Record search results.

2.12. INVOICING:

Invoices shall be submitted as per the deliverables listed in Attachment B – Pricing Proposal. After completion and acceptance of the Deliverable by the State, the vendor shall invoice the state. Payment shall be paid in full within thirty (30) days after receipt of invoice and acceptance of the work to the State's satisfaction.

2.13. PROPOSAL INQUIRIES:

All inquiries concerning this RFP, including but not limited to, requests for clarifications, questions, and any changes to the RFP, shall be emailed, citing the RFP title, RFP number, page, section, and paragraph and submitted to the RFP point of contact:

NH Department of Safety
Division of State Police
Attn: Kevin Connor
33 Hazen Drive
Concord, NH 03305
Email: kevin.connor@dos.nh.gov

All requests shall be submitted five business days prior to proposal opening date.

Vendor shall include complete contact information including the vendor's name, telephone number and fax number and e-mail address. Vendors are encouraged to submit questions via email; however, the State assumes no liability for assuring accurate/complete email transmission/receipt and is not responsible to acknowledge receipt.

The State intends to issue official responses to properly submitted inquiries, however, the date may be subject to change at the State's discretion. The State may consolidate and/or paraphrase questions for sufficiency and clarity. The State may, at its discretion, amend this RFP on its own initiative or in response to issues raised by inquiries, as it deems appropriate. Oral statements, representations, clarifications, or modifications concerning the RFP shall not be binding upon the State. Official responses will be made in writing and posted on the NH

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Department of Administrative Services website (<http://das.nh.gov/Purchasing>) and an Amendment to the RFP.

2.14. PRE-PROPOSAL CONFERENCE:

A Vendor Pre-Proposal Conference will be held as identified in Section 3.2: Timeline at the location under the cover letter.

All Vendors are strongly encouraged to attend the Vendor Conference either in person or via Conference Call. Vendors are requested to RSVP via email to kevin.connor@dos.nh.gov, indicating the number of individuals who will attend the Vendor Conference and to receive call-in instructions.

Vendors will have an opportunity to ask questions about the RFP and the State shall make a reasonable attempt to answer questions it deems appropriate. Questions may include, without limitation, a request for clarification of the RFP; a request for changes to the RFP; suggestions or changes to the RFP that could improve the RFP competition or lower the offered price; and to review any applicable documentation.

Vendors are encouraged to email inquiries at least twenty-four (24) hours prior to the Pre-Proposal Conference. No responses will be given prior to the Pre-Proposal Conference. Oral answers shall not be binding on the State. The State's final response to Vendor inquiries and any requested changes to terms and conditions raised during the Vendor Inquiry Period will be posted to the website. Vendors are responsible for any and all costs associated with attending the Vendor Conference Call.

Vendor(s) may also make site visits to any location they chose to proposal on if applicable. Vendor(s) are responsible for having ascertained pertinent local conditions, such as equipment conditions, locations, accessibility and general character of the sites knowledge of conditions affecting delivery performance. The act of submitting a proposal is to be considered in full acknowledgment that the Vendor(s) is familiar with the conditions and requirements of these specifications.

2.15. VENDOR'S RESPONSIBILITY:

Read the entire proposal invitation prior to filling it out. Complete the detailed pricing forms in Attachment B. Also complete the "Vendor Contact Information" section and sign and have notarized the front page of this proposal.

All State of New Hampshire proposal invitations and addenda to these proposal invitations are advertised on our website at: <http://das.nh.gov/Purchasing>. *Any alteration to this RFP or any file associated with this RFP is prohibited. Any such changes may result in a Proposal being rejected.*

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It is a prospective Vendor's responsibility to access our website to determine any proposal invitation under which they wish to participate. It is also the Vendor(s)'s responsibility to access our website for any posted addendum.

The website is update several times per day; it is the responsibility of the prospective Vendor(s) to access the website frequently to ensure no proposal opportunity or addenda are overlooked.

It is the prospective Vendor's responsibility to forward a signed copy (if the form has a signature block) of any addenda to the Division of State Police with the proposal response.

The successful Vendor shall be solely responsible for meeting all terms and conditions specified in the proposal, and any resulting contract. The Vendor's signature on a Proposal submitted in response to this RFP guarantees that the prices, terms and conditions, and Services quoted have been established without collusion with other Vendors and without effort to preclude the State from obtaining the best possible competitive Proposal.

2.16. PAYMENT:

Payments shall be made via ACH. Use the following link to enroll with the State Treasury:
<http://www.nh.gov/treasury/Divisions/DocsForms/Tforms.htm?inc=P>

2.17. INSTRUCTIONS TO VENDOR(S):

Read the entire proposal invitation prior to filling it out. In the preparation of your proposal response you shall:

- Complete the pricing information in Attachment B.
- Complete all other required information on your officer Attachment I
- Complete the "Vendor(s) Contact Information" section Attachment I
- Complete the company information on the front page, and sign the proposal in the space provided on that page. The signature page must be notarized to be an official submission. Attachment I

The State requires proposals addressing all components identified in this solicitation to provide "turnkey" solutions.

Proposal Options: Requirements described as an "OPTION" or "OPTIONAL" refer to features or equipment that may or may not be purchased by the State, or items whose quantities are not determined yet. It is not the Vendor's option to respond to these requirements; therefore, the Vendor is required to respond to all OPTIONAL requirements to the greatest extent possible.

Alternate Proposals:

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1. In the event that the Vendor has a technological solution that does not meet the exact requirements in this specifications document, the Vendor may offer more than one proposal, as long as each proposal fully addresses the intent of the requirements set forth in this document.
2. Alternate proposals shall be submitted separately under a different cover from the base proposal and clearly marked "ALTERNATE PROPOSAL."

IF AWARDED A CONTRACT, The Vendor must complete the following sections of the attached agreement State of New Hampshire Form #P-37 in Attachment G;

Section 1.3 Contractor(s) Name

Section 1.4 Contractor(s) Address

Section 1.11 Contractor(s) Signature

Section 1.12 Name & Title of Contractor(s) Signor

Section 1.13 Acknowledgement

Section 1.13.1 Signature of Notary Public or Justice of the Peace

Section 1.13.2 Name & Title of Notary or Justice of the Peace

- Provide certificate of insurance with the minimum limits required, with State of NH as the certificate holder.
- Provide certificate of workers' compensation, with State of NH as the certificate holder.
- Provide a certificate of good standing from the NH Secretary of State or proof of your completion of and payment for the start of the registration process.
- Provide a Certificate of Vote.

2.18. PROPOSAL PRICES:

Proposal prices must be in US dollars and must include delivery and all other costs required by this RFP invitation. Special charges, surcharges, processing charges, delivery charges, or fuel charges of any kind (by whatever name) may not be added on at any time (to include writing them separately in Attachment B). Any and all charges **must be built into your Proposal price** at the time of the Proposal.

Per Administrative Rule 606.01(e) "if there is a discrepancy between the unit price and the extension price in a response to an RFP, RFB or RFQ, the unit price shall be binding upon the RFP".

2.19. PROPOSAL DUE DATE:

All proposal submissions shall be received at the Division of State Police no later than the date and time shown on transmittal letter of this Proposal. Submissions received after the date and time specified will be marked as "Late" and will not be considered in the evaluation process.

All offers shall remain valid for a period of two hundred and forty (240) days from the proposal due date. A vendor's disclosure or distribution of proposals other than to Division of State Police may be grounds for disqualification.

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2.20. PROPOSAL SUBMISSION:

Late submissions will not be accepted and will remain unopened. Delivery of the Proposals shall be at the Vendor's expense. The time of receipt shall be considered when a Proposal has been officially documented by the Department of Safety, in accordance with its established policies, as having been received at the location designated above. The Department of Safety accepts no responsibility for mislabeled mail. Any and all damage that may occur due to shipping shall be the Vendor's responsibility. State reserves the right to require that the proposal, in parts or in whole be submitted in native document format(s).

Vendors shall submit one bound original and five bound copies of the proposal to the State. Each package shall include a copy of the proposal in electronic format (e.g., PDF) on USB flash drive. Vendor shall submit their signed proposal to the State before the date and time above in "Proposal Submission".

Submission of proposal in its entirety via mail to:

NH Department of Safety
Division of State Police
Attn: Kevin Connor
33 Hazen Drive
Concord, NH 03305

Proposal responses shall be marked as:

State of New Hampshire Proposal RFP DOS 2017-06
Due Date: 02/13/2017 @ 2:00 PM
P25 Radio System

The original and all copies shall be bound separately, delivered in sealed containers, and permanently marked as indicated above. The Proposal Pricing Form (Attachment B) shall be SEPERATELY SEALED, labeled "Price Proposal", and included in the proposal submission. A Vendor's disclosure or distribution of its Proposal other than to the State will be grounds for disqualification.

2.21. ORAL PRESENTATIONS/INTERVIEWS AND DISCUSSIONS:

The State reserves the right to require Vendors to make oral presentations/interviews. Any and all costs associated with oral presentations/interviews shall be borne entirely by the Vendor.

2.22. AWARD:

The State intends to evaluate responses determined to be in the best interest of the State, and award a contract for each system component. However, the State specifically reserves the

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following rights, consistent with procuring a system that best meets the needs of the State and system users:

1. The State reserves the right to accept or reject any or all proposals, or any portion thereof.
2. The State reserves the right to accept all or part of any proposal depending solely upon the requirements and needs of the State.
3. The State reserves the right to seek clarifications of any proposal submitted, or specific aspects of any proposal, prior to the award of the contract. After seeking such clarification, the State will allow the Vendor an opportunity to provide the requested clarification.
4. The State reserves the right to adjust item quantities and/or reconfigure the communications system in the best interest of the State subsequent to award of the contract.

2.22.1 Scoring Proposals

Each Proposal shall be evaluated and considered with regard to the Services proposed, qualifications of the Vendor and any Subcontractors, experience and qualifications of proposed Candidates and cost.

The State shall issue an Intent to Award notice to a Vendor based on these evaluations. Should the State be unable to reach an Agreement with the Vendor during Contract discussions, the State may then undertake Contract discussions with the second preferred Vendor and so on. Such discussions may continue at the sole option of the State, until an Agreement is reached, or all Proposals are rejected.

The State shall use a scoring scale of 100 points, which shall be applied to the Solution as a whole. A maximum of 60 points will be awarded for the Technical Proposal and a maximum of 40 points will be awarded for the Price Proposal. Points will be distributed among multiple factors:

1. Vendor experience
 - a. Experience with type of requested services and demonstrated history of providing similar services to comparable entities
 - b. Candidate's qualifications (including any Subcontractor)
 - c. Quality of work as verified by references
2. Capability, features and functionality
3. Warranty, maintenance and support
4. Base Contract Costs

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TECHNICAL PROPOSAL	POINTS
<i>Vendor Experience</i>	10
<i>Capability, features and functionality</i>	40
<i>Warranty, maintenance and support</i>	10
Maximum Technical Proposal Point	60

PRICE PROPOSAL	POINTS
<i>Base Contract Costs</i>	40
Maximum Price Proposal Points	40

TOTAL MAXIMUM PROPOSAL	POINTS
Maximum Technical + Maximum Price Points	100

Proposers are advised that this is not a low bid award and that the scoring of the price proposal will be combined with the scoring of the technical proposal to determine the overall highest scoring proposal.

The following formula will be used to assign points for cost:

Proposer's Price Score = (Lowest Proposed Price/Proposer's Proposed Price) x 40 (Maximum Number of Points for Price Proposal)

1. The State reserves the right to:

1. Consider any source of information in evaluating Proposals;
2. Omit any planned evaluation step if, in the State's view, the step is not needed;
3. At its sole discretion, reject any and all Proposals at any time; and
4. Open Contract discussions with the second highest scoring Vendor, if the State is unable to reach an Agreement on Contract terms with the highest scoring Vendor.

2. The State plans to use the following process:

1. Initial Screening;
 - a. The State shall conduct an initial screening step to verify Vendor compliance with submission requirements and to confirm that the Proposal satisfies the following:
 - i. The Proposal is date and time stamped before the deadline;
 - ii. The Vendor has sent the proper number of copies;
 - iii. The original version of the Proposal is marked "ORIGINAL" and the copies are marked "COPY" and;
 - iv. The original Proposal includes a signed Transmittal Letter

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- b. A Proposal that fails to satisfy either submission requirements or minimum standards may be rejected without further consideration.
2. Preliminary Scoring of the Proposals and Reference Checks;
 - a. The State shall establish an evaluation team to initially score Proposals and conduct reference checks.
3. Oral presentations;
 - a. Preliminary scores from the initial evaluation of the Proposals shall be used to select Vendors to invite to oral presentations.
 - b. The purpose of oral presentations is to clarify and expound upon information provided in the written Proposals. For each invited Vendor, the oral presentation shall be no longer than two (2) hours in length. A highly structured agenda shall be used for oral presentations to ensure standard coverage of each invited Vendor. Information gained from oral presentations shall be used to refine scores assigned from the initial review of the Proposals.
4. Best and Final Offer (BAFO), if appropriate; and
 - a. The State may, at its sole option, either accept a Vendors initial Proposal by award of a Contract, or enter into discussions with Vendors whose Proposals are deemed best qualified to be considered for an award. After discussions are concluded a Vendor may be allowed to submit a "Best and Final Offer" for consideration.
5. Final Evaluation.
 - a. The State shall conduct final evaluations as a culmination of the entire process of reviewing Vendor Proposals and information gathering.

2.23. NOTIFICATION AND AWARD OF CONTRACT:

If a Vendor is selected, the State will notify the selected Vendor in writing of their selection and the State's desire to enter into contract discussions. Until the State successfully completes discussions with the selected Vendor, all submitted Proposals remain eligible for selection by the State. In the event contract discussions are unsuccessful with the selected Vendor, the evaluation team may recommend another Vendor.

In accordance with New Hampshire Statutes Chapter 21-G:37, no information shall be available to the public, the members of the general court or its staff, notwithstanding the provisions of RSA 91-A:4, concerning specific responses to this RFP, from the time the RFP is made public until the closing date for responses, in order to protect the integrity of the bidding process. On the closing date for responses, the State will post the number of responses received on the following website: <http://www.nh.gov/safety/commissioner/procurement/index.html>. Notwithstanding the provisions of RSA 91-A:4, no other information shall be available to the public or to the members of the general court or its staff concerning this RFP from the closing date for responses until the contract is approved by the governor and executive council, except that the State shall, at least 5 business days prior to submitting the proposed contract to the Department of Administrative Services, post the rank or score for each responding vendor on the following website: <http://www.nh.gov/safety/commissioner/procurement/index.html>.

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Proposal results may also be viewed on our website at:

<http://das.nh.gov/Purchasing/vendorresources.asp>.

2.24. SCOPE OF SERVICES:

The purpose of this proposal is to provide all labor, tools, transportation, materials, equipment and permits as necessary to provide the required level of services as described herein. The scope of work is detailed in Attachment A.

The proposed VHF communications system will provide an Association of Public-Safety Communications Officials (APCO) International P25 interoperable radio communications system to support mission-critical communications within the State.

Vendors must respond to all components of the solicitation. The State anticipates awarding a contract to a single Vendor.

Vendor may also request site visits to locations other than the Preferred Site listed in Attachment C. The act of submitting a proposal shall be considered in full acknowledgment that the vendor is familiar with or had the opportunity to become familiar with, the conditions and requirements of these specifications with ascertained pertinent local conditions, such as equipment conditions, locations, accessibility and general character of the sites relating to this proposal.

The Vendor agrees that any damage or injury to buildings, materials, equipment or to other property during the performance of this service will be repaired at their own expense.

The State shall require correction of defective work or damages to any part of the building or its appurtenances when caused by the Vendor's employees, equipment or supplies. The Vendor shall place in satisfactory condition all defective work and damages rendered thereby or any other damages incurred. Upon failure of the Vendor to proceed promptly with the necessary corrections, the State may withhold any amount necessary to correct all defective work or damages from payments to the Vendor.

The work staff shall consist of qualified persons completely familiar with the products and equipment they shall use. The Contracting Officer may require the Vendor to dismiss from the work such employees as deems incompetent, careless, insubordinate, or otherwise objectionable, or whose continued employment on the work deemed by him to be contrary to the public interest or inconsistent with the best interest of security. The State must ensure that appropriate levels of security are implemented and maintained in order to protect the integrity and reliability of its Information Technology resources, information, and Services.

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The Vendor or their personnel shall not represent themselves as employees or agents of the State.

All personnel shall observe all regulations or special restrictions in effect at the State Agency.

If **subcontractors** are to be utilized, please include information regarding the proposed subcontractors including the name of the company, their address, contact person and three references for clients they are currently servicing.

2.25. WARRANTY REQUIREMENTS:

The successful Vendor(s) shall be required to warranty all of the equipment awarded to him for a period of three (3) years. The warranty shall cover 100% of all parts, shipping, labor, travel, lodging and expenses. The warranty shall become effective on the date of Final Acceptance (State of New Hampshire accepts all equipment, products and work).

2.26. OBLIGATIONS AND LIABILITY OF THE VENDOR:

The Vendor shall do all the work and furnish all the materials, tools, equipment and safety devices necessary to perform in the manner and within the time hereinafter specified. Vendor shall complete the entire work to the satisfaction of the State and in accordance with the specifications herein mentioned, at the price herein agreed upon and fixed therefore. All the work, labor and equipment to be done and furnished under this contract, shall be done and furnished strictly pursuant to, and in conformity with the specifications described herein, and the directions of the State representatives as given from time to time during the progress of the work, under the terms of this contract and also in accordance with contract drawings.

The Vendor shall take all responsibility for the work under this contract; for the protection of the work; and for preventing injuries to persons and damage to property and utilities on or about the work. He shall in no way be relieved of his responsibility by any right of the State to give permission or issue orders relating to any part of the work; or by any such permission given on orders issued or by failure of the State to give such permission or issue such orders. The Vendor shall bear all losses resulting to him or to the Owner on account of the amount or character of the work, or because of the nature of the area in or on which the work is done is differed from what was estimated or expected, or account of the weather, elements or other causes.

The Vendor agrees that any damage or injury to buildings, materials, and equipment or to other property during the performance of this service will be repaired at their own expense.

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2.27. PERFORMING SERVICES:

The Vendor will perform all services according to the requirements and specifications of this proposal.

2.28. OFFER:

The State of New Hampshire intends to use, wherever possible, existing statewide software and hardware Contracts to acquire supporting software and hardware, if required during the period of staff augmentation.

2.29. STATE CONTRACTS:

The State of New Hampshire intends to use, wherever possible, existing statewide software and hardware Contracts to acquire supporting software and hardware, if required during the period of staff augmentation.

2.30. SHIPPING AND DELIVERY FEE EXEMPTION:

The State will not pay for any shipping or delivery fees unless specifically itemized in the Contract.

2.31. ACCESS/COOPERATION:

As applicable, and reasonably necessary, and subject to the applicable State and federal laws and regulations and restrictions imposed by third parties upon the State, the State will provide the Vendor with access to all program files, libraries, personal computer- based Systems, Software packages, network Systems, security Systems, and hardware as required to complete the Contracted Services.

The State of New Hampshire intends to use, wherever possible, existing statewide software and hardware Contracts to acquire supporting software and hardware, if required during the period of staff augmentation.

2.32. REGULATORY/GOVERNMENTAL APPROVALS:

Any Contract awarded under the RFP shall be contingent upon the Vendor obtaining all necessary and applicable regulatory or other governmental approvals.

2.33. FORCE MAJEURE:

Neither Vendor nor the State shall be responsible for delays or failures in performance resulting from events beyond the control of such party and without fault or negligence of such party. Such events shall include, but not be limited to, acts of God, strikes, block outs, riots, and acts of War, epidemics, acts of Government, fire, power failures, nuclear accidents, earthquakes, and unusually severe weather. Except in the event of the foregoing, Force Majeure events shall not include Vendor's inability to hire or provide personnel needed for the Vendor's performance under the Contract.

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2.34. CHANGE OF OWNERSHIP:

In the event that the Vendor should change ownership for any reason whatsoever, the State shall have the option of continuing under the Contract with the Vendor, its successors or assigns for the full remaining term of the Contract; continuing under the Contract with the Vendor, its successors or assigns for such period of time as determined necessary by the State; or immediately terminate the Contract without liability to the Vendor, its successors or assigns.

2.35. RETENTION AND ACCESS REQUIREMENTS:

The Vendor shall agree to the conditions of all applicable State laws and regulations, which are incorporated herein by this reference, regarding retention and access requirements, including without limitation, retention policies consistent with the Federal Acquisition Regulations (FAR) Subpart 4.7 Contractor Records Retention.

The Vendor and its Subcontractors shall maintain books, records, documents, and other evidence of accounting procedures and practices, which properly and sufficiently reflect all direct and indirect costs, invoiced in the performance of their respective obligations under the Contract. The Vendor and its Subcontractors shall retain all such records for three (3) years following termination of the Contract, including any extensions. Records relating to any litigation matters regarding the Contract shall be kept for one (1) year following the termination of all litigation, including the termination of all appeals or the expiration of the appeals period.

Upon prior notice and subject to reasonable time frames, all such records shall be subject to inspection, examination, audit and copying by personnel so authorized by the State and federal officials so authorized by law, rule, regulation or Contract, as applicable. During the Term of this Contract, access to these items shall be provided within Merrimack County of the State of New Hampshire, unless otherwise agreed by the State. Delivery of and access to such records shall be at no cost to the State during the three (3) year period following termination of the Contract and one (1) year term following litigation relating to the Contract, including all appeals or the expiration of the appeal period. The Vendor shall include the record retention and review requirements of this section in any of its subcontracts.

The State agrees that books, records, documents, and other evidence of accounting procedures and practices related to the Vendor's cost structure and profit factors shall be excluded from the State's review unless the cost or any other Services or Deliverables provided under the Contract is calculated or derived from the cost structure or profit factors.

2.36. ACCOUNTING REQUIREMENTS:

The Vendor shall maintain an accounting system in accordance with generally accepted accounting principles. The costs applicable to the Contract shall be ascertainable from the accounting system.

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2.37. DISPUTE RESOLUTION:

Prior to the filing of any formal proceedings with respect to a dispute (other than an action seeking injunctive relief with respect to intellectual property rights), the party believing itself aggrieved (the "Invoking Party") shall call for progressive management involvement in the dispute negotiation by written notice to the other party. Such notice shall be without prejudice to the Invoking Party's right to any other remedy permitted by this Agreement.

The parties shall use all reasonable efforts to arrange personal meetings and/or telephone conferences as needed, at mutually convenient times and places, between negotiators for the parties at the following successive management levels, each of which shall have a period of allotted time as specified below in which to attempt to resolve the dispute:

Dispute Resolution Responsibility and Schedule Table

	VENDOR	THE STATE	CUMULATIVE ALLOTTED TIME
Primary	TBD	Kevin Connor, Project Manager	5 Business Days
First	TBD	Christopher Wagner, Director, NHSP	10 Business Days
Second	TBD	Robert Quinn, Assistant Commissioner	20 Business Days

The allotted time for the first level negotiations shall begin on the date the Invoking Party's notice is received by the other party. Subsequent allotted time is days from the date that the original Invoking Party's notice is received by the other party.

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RADIO COMMUNICATIONS SYSTEM REQUIREMENTS

3.1. OVERVIEW

- A. Vendors shall propose complete P25 VHF conventional digital radio communications systems as described below. Requirements are described herein and are delineated throughout the specifications document according to system requirements.
 - 1. **Primary Conventional System:** P25 Phase I — The system shall be a single-channel system operating on a different frequency in each Troop area. The system should utilize the preferred candidate radio sites detailed in Attachment C to the greatest extent possible. The system must seamlessly integrate all sites within each Troop simulcast system such that end users can have coverage within their Troop service area without interruption of service or the need to manually select sites. The system must meet the prioritized coverage gap requirements and overall coverage requirement for each Troop. The system must be expandable to allow for additional capacity and features. The State desires designs that utilize a single simulcast cell to cover any given Troop geographic area. Multiple simulcast cells will be acceptable in Troop F (based on licensing availability and guarantee of coverage; reducing below four existing zones in Troop F is acceptable).
- B. This system shall provide mobile radio coverage throughout the State and each Troop patrol area as described in Section 6.5 below.

3.2. INTEROPERABILITY/ P25 STATEMENT OF REQUIREMENTS

- A. At minimum, the proposed radio system shall comply with the latest applicable P25 suite of standards adopted as TIA, ANSI and/or EIA documents at the time of proposal submission, as listed in Table 1 below. The standards establish technical parameters that allow compatibility and interoperability of digital radio equipment from different manufacturers.
- B. Vendors are encouraged to propose solutions that would enhance interoperability communication for the State and its local and county partners.
- C. By stating compliance with a level-two heading in the Statement of Requirements (SoR), the Vendor claims compliance with all applicable level-three requirements in the SoR. If the Vendor is not compliant with a requirement, the Vendor shall identify the requirement by number and name, and provide a detailed explanation of why the proposed system does not meet the requirement.

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3.2.1. VHF P25 Conventional System

- A. Table 1 below contains a list and brief description of the elements contained in the APCO P25 SoR. Vendors are expected to verify compliance with items in the table. In order to confirm compliance with the P25 standards, Vendors shall provide point-by-point compliance statements for each of the requirements in Table 1 for Phase I, 12.5 kilohertz (kHz) systems.
- B. It is acknowledged that the SoR might not reflect all of the current requirements for the State system or the current P25 specifications, as the specification is a “living document” and a certain specification may not be final or does not yet exist (e.g., over-the-air programming, or OTAP). In the absence of a specification, the State requests a reply regarding how the Vendor may or may not address the requirement.

Table 1 – APCO P25 SoR Mandatory and Standard Options

Requirement Description	Requirement No.	Service, Feature or Capability from the P25 SoR
P25 Overview	1.2.1	Bandwidth Compliance
	1.3.2	ANSI/TIA/EIA
	1.3.3	Subscriber Unit MIL-SPEC Requirements
Detailed Standards Suite Proposed	2.1.1	P25 Common Air Interface (CAI)
	2.1.2	P25 Standard Service Set
	2.2.1	P25 Mobile Data Interface
	2.2.2	P25 Fixed Host Data Interface
	2.3	P25 Telephone Interconnect Interface
	2.4	P25 Inter-RF Subsystem Interface (ISSI)
	2.4.1	Multiple P25 RF Subsystem Connectivity
	2.4.2	Operational Modes
	2.4.3	Networking Configurations
	2.4.4	Bearer Media for Interconnection
	2.4.5	Services to be Supported
	2.4.6	Interface Requirements
	2.4.7	Control Element
	2.4.8	Traffic Element
	2.4.10	Roaming Subscriber Management
	2.5	P25 Network Management Interface (NMI)
	2.5.1	Network Management
2.5.2	Element Management	
2.6.1	Console Subsystem Interface (CSSI) Applicability	

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Requirement Description	Requirement No.	Service, Feature or Capability from the P25 SoR
	2.6.2	General CSSI Requirements
	2.6.3	CSSI Requirements for Conventional Services
	2.6.4	CSSI Requirements for Trunked Services
	2.6.5	CSSI Requirements for Mixed Mode Services
	2.6.6	CSSI Requirements Applicable to both Trunking and Conventional
	2.6.7	Miscellaneous CSSI Requirements
	2.7	P25 Fixed/Base Station Subsystem Interface (FSSI)
	2.7.2	Conventional Digital Fixed Station Interface (CDFSi)
	2.7.3	Trunked FSSI
P25 System Overview	3.1.1	Spectral Efficiency
	3.1.2	Channelization
	3.1.3	Roaming Functions of Portables and Mobiles Within and Among P25 Systems
	3.2.1	System Architectures
	3.2.2	System Connectivity
	3.2.3	Identification (ID) Structures
	3.2.4	Throughput Delay
	3.2.5	Direct Modes of Communications
	3.2.6	Use of Standard Signaling
	3.2.7	Over-The-Air-Programming (OTAP)
	3.3	Support Audible Signaling
	3.3.1	General
	3.3.2	Operational or Systemic
	3.3.3	Operational Signals (Personality Programmed)
	3.3.4	Service and Bearer Channel Interface/Service Set
	3.3.5	Other System Functionalities
3.3.6	Location Services via Global Positioning Satellite (GPS)	
Encryption	4.1.1	Type 3 Encryption Requirements
	4.1.2	Adopt for Type 1 Encryption
	4.1.3	Key Fill
	4.1.4	Four Levels of Encryption
	4.1.5	Key Management
Subscriber Equipment	5.1.1	General Requirements
	5.1.2	Phase I – Specific Requirements
	5.1.3	Phase II – Specific Requirements
	5.1.4	Other General Requirements
	5.2.1	General VR Capabilities
	5.3.2	Phase II Subscriber Units

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Requirement Description	Requirement No.	Service, Feature or Capability from the P25 SoR
Interoperability	6.1	Infrastructure
	6.2	Subscriber Units
Migration	7.1.1	General Migration Requirements
	7.3.1	Phase I Conventional to Phase II Migration Requirements
	7.3.2	Phase I Trunked to Phase II Migration Requirements

3.3. SYSTEM CONFIGURATION

3.3.1. Redundancy and Survivability

- A. The proposed radio communications systems are intended to support mission-critical operations; therefore, a high degree of redundancy and survivability is required. A network topology utilizing fault tolerance shall be incorporated to the greatest extent possible through a distributed and/or redundant architecture.

- B. Redundancy is required for all system elements in which failure would result in a major failure of the system; single points of failure are not acceptable. Such elements include, but are not limited to, the following:
 - 1. System controllers and fixed site equipment
 - 2. Simulcast controllers and voting equipment
 - 3. Backhaul network
 - 4. Power systems
 - 5. NMS

- C. The conventional system shall include several modes of degraded operation, known as failure modes. The system shall be capable of automatic activation of failure modes in the event of a system failure. Additionally, the system shall switch to a failure mode gracefully. Vendors shall provide a description of each failure mode and describe how communications are affected by the failure. Failure modes shall include the following scenarios, at a minimum:
 - 1. Loss of single site
 - 2. Loss of multiple sites
 - 3. Loss of simulcast controller
 - 4. Loss of voter
 - 5. Loss of a repeater station due to an equipment failure

3.3.2. Expansion

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- A. The systems shall be expandable by adding additional hardware and/or software to increase coverage, capacity, or features. Vendors shall describe the expansion capabilities of which the proposed system is equipped capable, with future costs.

3.4. SITE SELECTION

- A. Vendors shall utilize the preferred candidate sites identified in Attachment C to the greatest extent possible.
- B. Vendor can request permission to perform site visits on existing locations prior to submitting its proposal, to ensure a full understanding of each site's condition. The site visits would be arranged starting the day of the pre-proposal conference and completed that week. The visits must be requested one week prior to the pre-proposal conference.
- C. General assumptions on the preferred candidate sites include:
 - 1. Antenna height is available
 - 2. ERP is available
 - 3. Space is available but may require some equipment relocation within existing shelters

3.5. COVERAGE

- A. The radio systems shall be designed to serve within the geographical boundaries of the State and the Troop areas of A, B, C, D, E and F.
- B. Coverage design, implementation, and testing for the system shall adhere to the TIA Telecommunications Systems Bulletin (TSB) #88-D or latest version.
- C. Channel Performance Criteria (CPC): RF coverage is defined as the digital Bit Error Rate (BER) that provides an audio signal that delivers a minimum Delivered Audio Quality (DAQ) score of 3.4, for both outbound (talk-out) and inbound (talk-in) communications.
 - 1. TIA defines DAQ 3.4 as "speech understandable with repetition only rarely required," which is the minimum acceptable level for public safety communications.
- D. The State envisions the radio system to provide coverage as described below:
 - 1. The primary system shall be designed for focused coverage to the areas identified in Attachment E. The priority areas in each Troop patrol area are the primary focus areas. The secondary areas are not required as part of this RFP. However, evaluation criteria does consider the optimal design to cover additional areas.
 - 2. The primary system shall provide 95 percent coverage for a mobile radio outdoors, with 95 percent reliability.

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- A. Vendors shall utilize the following assumptions for subscriber radio performance in order to meet stated coverage requirements:
 - 1. Vehicle-mounted 100-watt (W) mobile radios – Trunk-mount, with unity gain antenna mounted on the trunk
 - 2. Portable radios – Standard portable radio outdoors or indoors (reference only):
 - b. Talk-out to a portable radio on hip with a swivel belt clip
 - c. Talk-in from a portable radio at hip using a remote speaker microphone
 - d. Hip level shall be assumed as a height above ground at 3 feet

3.5.1. Coverage Maps

- A. Vendors shall include a detailed description of the propagation models used and the assumptions made in preparation of the maps. A brief description of the methodology the software used to calculate coverage also shall be included in the proposal narrative.
- B. Vendors shall submit both talk-out and talk-in system composite coverage maps for all proposed design configurations. The maps shall be clearly labeled and shall show link budget calculations for each of the following:
 - 1. Mobile radios – Trunk-mount, with antenna mounted on the trunk
 - 2. Portable radios (reference purposes only) – Standard portable radio outdoors:
 - a. Talk-out to a portable radio on hip with a swivel belt clip
 - b. Talk-in from a portable radio at hip level with a swivel belt clip
- C. All maps must clearly delineate the difference between areas with coverage predicted to be equal to or greater than DAQ 3.4 and areas that do not meet this coverage requirement. Coverage maps shall consider any anticipated degradation resulting from simulcast interference.
- D. Coverage maps shall be provided in the proposal in two formats:
 - 1. 11-inch x 17-inch, full-color, hardcopy format
 - 2. In PDF file format on USB flash drive
- E. Coverage maps must include sufficient detail to allow another party to duplicate the predicted coverage utilizing propagation software.
- F. Coverage maps shall display coverage extending beyond the State and Troop borders.

3.5.2. Map Criteria

- A. All maps shall include a background layer suitable for State reference (e.g., topographic map, roads, rivers, etc.). Link budgets shall be provided that clearly define the following

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minimum information for both the radio and paging systems, related to each map and each site:

1. Base station/repeater RF power output
 2. Antenna gain/transmission line size
 3. Antenna down tilt (if applicable)
 4. Transmit ERP
 5. Receiver sensitivity
 6. Combiner/duplexer loss and multicoupler gain
 7. Mobile and portable antenna height for talk-out and talk-in
 8. Mobile and portable RF output power
 9. Simulcast timing parameters (if applicable)
- B. Thirty-meter U.S. Geological Survey (USGS), North American Datum (NAD)-83 terrain elevation data shall be used for coverage simulations. Alternatively, 3-arc-second data may be used where 30-meter data is not available.

3.5.3. Coverage Model

- A. Vendors shall employ a suitable coverage prediction model using appropriate terrain and land cover data for the State environment. Vendors shall describe the coverage model used to predict their maps.

3.5.4. TIA TSB-88 – User Choices

- A. TIA TSB-88 User Choices provides numerous guidelines and choices for system design and validation. The user choices for the proposed State system are provided below:
- B. User Choices:
1. VHF Conventional System
 2. P25 Phase I compliance
- C. Service Area:
1. The service area is the defined geographical area of the state
 2. The target device, usage, and location are:
 - a. Mobile radios – Standard dash- or trunk-mount, with antenna mounted in the center of the trunk
 - b. Portable radios (reference only) – Standard portable radio on hip with a swivel belt clip:
 - i) Outbound (talk-out) from the transmitter to a portable radio on hip
 - ii) Inbound (talk-in) to the transmitter from a portable radio at hip level

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- c. Basic network coverage for mobile radios shall be designed to accommodate vehicles traveling at speeds up to 75 miles per hour

- D. CPC: Minimum CPC – BER that provides a minimum DAQ 3.4. As an option, Vendors may provide an alternate coverage design for DAQ 3.0 as a value added design consideration to meet overall coverage objectives and remove a site(s) with low added coverage value.

- E. Reliability Design Target: The CPC reliability design target is a service area probability of 97 percent

- F. Terrain Profile Extraction Method: Snap-to-grid method

- G. Interference Calculation Method: Monte Carlo Simulation method

- H. Metaphors to Describe the Plane of the Service Area: Tiled method

- I. Required Service Area Reliability: 95 Percent. Vendors shall provide their guaranteed service area reliability for each Troop.

- J. Willingness to Accept a Lower Area Reliability in Order to Obtain a Frequency: The State is not willing to accept lower area reliability in order to obtain a frequency.

- K. Adjacent Channel Drift Confidence Factor: Confidence that combined drift due to desired and adjacent channel stations will not cause degradation: 95 percent

- L. Conformance Test Confidence Level: 99 percent

- M. Sampling Error Allowance:
 - 1. True value error: ± 1 percent
 - 2. Number of subsamples: 50

- N. Pass/Fail Criterion: "Greater Than" test

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- O. Treatment of Inaccessible Grids: All inaccessible grids will be eliminated from the calculation.

3.6. SITE EQUIPMENT

3.6.1 Overview

All site equipment supplied shall be new, of high quality, and designed to provide high reliability to support mission-critical communications. The site equipment, or RF infrastructure, consists of the following components:

- A. System and site control equipment
- B. Simulcast equipment
- C. Receiver voting
- D. Transmitters
- E. Receivers
- F. Duplexers (combiners/multicouplers as necessary)
- G. Antenna systems

3.6.2. System and Site Control Equipment

- A. The site control equipment shall be capable of controlling all voice channels in the proposed system to and from the dispatch console systems.
- B. The control equipment shall fully support APCO P25 functional requirements, features, and performance objectives as outlined in Section 6.2.1 above, including the CAI and CSSI.

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- C. Vendor shall fully describe the manner in which the proposed system and site controllers function and operate (if used).

- D. Vendors shall provide and describe in their proposals how their system can connect the radio dispatch console system to local county dispatch centers. This will allow IP connectivity between dispatch centers in order for them to access available channels. Connectivity currently exists on the State's microwave network to all of the county dispatch centers.

3.6.3. Simulcast Equipment

- A. The successful Vendor shall provide all necessary simulcast components and signal-processing elements that are required to optimize voice quality in coverage overlap areas.

- B. Non-captured overlap areas with delay spreads in excess of those required to meet the DAQ objective shall be minimized inside the service area.

- C. Simulcast systems shall operate without the need for frequent manual optimization and system/subsystem alignment. All alignments and adjustments shall be automated where possible.

3.6.4. Receiver Voting

- A. Receiver voting equipment shall monitor all receivers in the simulcast system and select the best signal for processing and rebroadcasting throughout the network.

3.6.5. Base Station Equipment

- A. General
 1. Base station equipment shall be solid state in design and function with standard site conditions for temperature, altitude, and humidity.
 2. Equipment shall have alarm contact interfaces to provide status to a separate alarm system.
 3. The units shall be as compact as possible, with mounting configurations for standard relay racks or cabinets.

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- B. Base station equipment shall comply with Part 90 of the FCC Rules and Regulations, as well as appropriate EIA and similar agency standards, and be an FCC-type accepted for use in the VHF frequency band.
- C. Prior to implementation, the successful Vendor shall perform the following studies at each site:
 - 1. Intermodulation analysis – Vendor shall consider equipment from all tenants located at the proposed site, per FCC license information.
 - 2. Maximum Permissible Exposure (MPE) study (per latest revision of the *FCC Office of Engineering and Technology [OET] Bulletin 65*) – Vendor shall consider equipment from all tenants located at the proposed site, per FCC license information.
- D. Vendors shall include detailed specification sheets for all proposed equipment.

3.6.6. Antenna Systems

- A. Vendors shall propose all antenna system equipment necessary for a complete design.
- B. Antennas shall be appropriate to provide the required coverage and meet applicable FCC rules and regulations.
- C. Transmission line type and length shall be constructed of copper and appropriate to provide the required coverage.
- D. Duplexers are expected to minimize tower real estate. Transmit combiner/receiver multicouplers can be proposed for sites with multiple transmitters.
- E. Vendors shall include detailed specification sheets for all proposed equipment, including, but not limited to, base stations, antennas and filters.

3.7. ADDITIONAL EQUIPMENT

- A. As an option, the vendor shall propose additional unit pricing for additional equipment that the State may select depending on budget availability. The specifications in this section shall be the baseline requirements for each of the following:

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1. Fully equipped and installed standalone VHF single channel conventional site with antenna, 200-foot transmission line, all connectors, and simulcast capability to add an additional site into any of the proposed simulcast systems.
2. Fully equipped and installed standalone 700/800 MHz single channel conventional site with antenna, 200-foot transmission line, and all connectors to add 700 MHz coverage to any site.
 - a. Software or additional equipment necessary to simulcast and trunk if adding to a trunking site.
3. Fully equipped and installed 700 MHz simulcast overlay network utilizing the same VHF sites proposed in the VHF conventional base proposal. The overlay shall require similar requirements laid out in this document with the expectation of reduced coverage footprint compared to VHF. Each site shall provide the antenna, connectors, simulcast, and same antenna heights proposed in the base proposal. This option shall be considered as a route to design a 700 MHz system overlay. Vendors shall be prepared for a design review to augment the coverage design if the option is elected.
4. Fully equipped VHF digital vehicular repeater system (DVRS) connected to VHF mobiles in all vehicles. The VHF system is used to communicate with dispatch. Users continue to carry VHF portables, so all communications are VHF with the DVRS linking to the statewide network and dispatch enhancing portable coverage.
5. Provide a communications interoperability and broadband push-to-talk (PTT) solution that delivers real-time voice and data securely over any network using any device (i.e. application on a smartphone device). From two-way radios to smartphones, laptops to landlines, tablets to rugged handhelds, users can use the devices they already have and the networks they already subscribe to and PTT with other agencies using the VHF simulcast radio system.
 - a. The solution shall provide both the management server and gateway connection into all Troop patrol areas. Pricing shall detail initial equipment costs and individual subscriber fees.
6. Fully equipped and installed microwave hop, 200-foot waveguide, dehydrator and all connectors to add an additional microwave hop.

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BACKHAUL NETWORK

4.1. OVERVIEW

- A. Vendors shall propose a detailed plan to expand the existing microwave backhaul network located in Attachment F to any new transmit and/or receive sites. The new paths must be integrated into the existing backhaul system to provide seamless statewide IP connectivity. At a minimum, a new microwave path is required to connect into the Milan site if proposed in the new radio system. The plan shall include, at a minimum, path-loss calculations and annual availability for each path, as well as an overall network topology.

4.2. DIGITAL MICROWAVE NETWORK

- A. The digital microwave network shall consist of the following components:
1. Point-to-point digital microwave radios
 2. Microwave antennas
 3. Antenna systems
 4. Multiplex equipment

4.2.1. Requirements

- A. The digital microwave backhaul network shall consist of monitored hot standby (MHSB) or ring-protected, point-to-point licensed microwave hops equivalent to Ceragon Networks' IP-10 or Cambium Networks' PTP-800 radios (or latest versions).
- B. Microwave terminal equipment shall include transmitter, receiver, modem, power supply, automatic switching device, multiplexer, service channel(s), and all associated interconnections to provide a complete and functional system.
- C. The radio shall deliver two-frequency, full-duplex operation. Space diversity configurations are acceptable, if necessary, to meet reliability requirements.
- D. The network shall support MPLS routing to support seamless integration and ad-hoc routing with landline-based Ethernet connections.
- E. Capacity:
1. Each hop shall be equipped for the proposed radio network requirements and existing legacy radio system channels as applicable.
- F. Performance Objectives:

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1. Each microwave hop shall be designed to meet or exceed a one-way, end-to-end annual reliability (BER = 10^{-3}) of 99.995 percent at the required capacity.
2. Each microwave hop shall be designed to meet or exceed a one-way, end-to-end annual quality performance (BER = 10^{-6}) of 99.999 percent at the required capacity.
3. The mean time between failures (MTBF) for the proposed MHSB transceiver equipment shall exceed 25 years.

G. Frequency:

1. The successful Vendor shall be responsible for all microwave frequency research, prior coordination and preparation of all associated FCC license applications, and submittals on behalf of the State.
2. The State shall be responsible for coordination fees and licensing fees, if any, and signatures, if applicable.
3. The Vendor shall propose the most appropriate licensed frequency band for each hop based on the requirements and FCC Part 101 regulations.

H. Transmitter:

1. Vendor shall provide transmit output power referenced to the antenna port.
2. Transmit output power shall be software adjustable.
3. Automatic Transmit Power Control (ATPC) shall be available.
4. A switch from the main transmitter to the standby transmitter shall not result in a system outage. Vendor shall describe expected switchover time.
5. Radios shall be equipped with redundant power amplifiers. Switching between power amplifiers shall not result in a system outage.

I. Receiver:

1. Vendor shall provide a guaranteed receiver threshold.
2. Vendor shall provide performance criteria of the proposed radios for the following:
 - a. Co-channel interference
 - b. Adjacent-channel interference
 - c. Dispersive fade margin
3. The receiver shall be designed so as to ensure that the receiver with the better performance is operational at any given moment. Vendor shall equip radios with a 10:1 split to prevent frequent switching.
4. Transfer to the backup receiver shall not result in a system outage.

J. Antenna System:

1. Microwave antennas shall be compatible with the radio frequency bands and conform to applicable FCC requirements. Solid parabolic type, Category A antennas shall be used in accordance with FCC Part 101.115 for use in public safety-grade communications systems. Vendors shall propose the smallest dish sizes possible that will satisfy the link reliability requirements.

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2. A pressurized elliptical waveguide shall be used. Connectors shall be standard, premium type, and compatible with the antenna and EIA radio interfaces.
3. All mounting brackets, connectors, and other hardware shall be supplied as necessary for a complete installation.
4. An automatic dehydrator/pressurization system shall be provided to maintain at least five pounds per square inch gauge (psig) positive pressure of conditioned air in the elliptical waveguide and antenna feed unit. Individual pressure gauges on a distribution manifold shall be provided for each line.
5. All installed antenna/transmission lines shall be purged, pressure tested, and tested for low voltage standing wave ratio (VSWR) using return loss measurements.
6. All RF paths shall be tested to demonstrate proper antenna alignment by measuring the net path loss between sites as measured at the equipment rack interface.

K. Multiplex Equipment:

1. The successful Vendor shall provide switching equipment to connect into the IP microwave network.
 - a. All multiplex equipment shall be equipped with standby switching and alarms.

4.2.2. Microwave Engineering

- A. Vendors shall conduct physical path surveys to verify that all proposed paths meet proper clearance criteria.
- B. Vendors also shall conduct mandatory site visits at all sites and notify the Owner as well as State representatives of any site modifications necessary for the microwave hop.
- C. Vendors shall provide antenna centerline mounting height recommendations, based upon the information gathered during the physical path surveys and site visits.
- D. Vendors shall include fade margin calculations with the proposal, showing the preliminary antenna sizes, system gains, and system losses.
- E. Radomes shall be provided for each microwave antenna.
- F. The equipment shall be type accepted for licensing under Part 101 of the FCC Rules and Regulations.

4.3. ADDITIONAL EQUIPMENT

- A. As an option, the vendor shall propose additional unit pricing for additional equipment that the State may select depending on budget availability. The specifications in this section shall be the baseline requirements for each of the following: Fully equipped and

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installed microwave hop including radios, network equipment, 200-foot waveguide and six-foot dish on each end, dehydrators and all connectors to add an additional microwave hop.

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DISPATCH CONSOLE

5.1. GENERAL REQUIREMENTS AND FEATURES

- A. Vendors shall provide pricing for replacement of all existing Motorola Gold Elite consoles with state-of-the-art, IP-controlled consoles.
- B. Vendors shall provide and install 24 dispatch consoles (two for each of the six Troop regions and 12 additional at the IPOC).
- C. The dispatch console is a critical link for public safety personnel. It is here that the dispatch operator must relay critical information from the public to public safety personnel in the field. At times, the dispatcher may be in stressful conditions with lives at risk. It is imperative that the dispatch console be laid out in a manner that results in the operation of such consoles being second nature to the dispatching personnel. The dispatching console shall provide the operator with as much information as necessary without the screen being cluttered, and shall be easily navigated to perform necessary functions. Features of the console shall include, but not be limited to:
 - 1. Dispatch console equipment (operator positions) shall be designed to be placed on existing furniture and provide operators with an ergonomic design that permits ease of operation over extended periods, typically 8-12 hours for each operator.
 - 2. Console positions shall be able to acoustically cross-mute channels in order to eliminate acoustic feedback between operators.
 - 3. The screen display shall be designed so that all dispatching functions shall be operable from one display.
 - 4. The screen display shall be very flexible, enabling authorized personnel to determine which functions are available at each operator position.
 - 5. New features and screen configurations shall be supported through software programming and not reconfiguration of hardware.
 - 6. Capability to program, store, retrieve, and edit multiple custom operator screens and configurations for each operator position shall be provided.
 - 7. Operator screen configurations and alias database shall be stored locally or on a centrally located server.
 - 8. The dispatch console shall display an alias name on screen when a unit with a radio identification (ID) stored in the alias database is transmitting.
 - 9. Operator positions shall have the ability to decrypt and encrypt secure voice communications. Channels shall have a distinctive icon if encryption is being used for that channel. All consoles shall be configured to provide end-to-end Advanced Encryption Standard (AES) encryption to personnel in the field.
 - 10. Upon activation of an emergency alarm by field units, dispatch positions shall provide an audible alert, display calling unit ID, and provide a visual alert of an emergency activation.

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11. Operators shall have the ability to utilize a headset, foot pedal, or stationary gooseneck-type microphone for transmitting audio.
12. The capability to converse on the telephone utilizing the same operator headset that is used for radio conversations shall be provided.
13. Instant recall shall be provided allowing the operator to review and verify his or her recent traffic. Playback shall be available at the operator position.

D. The dispatch console system must be able to integrate with all County dispatch centers in the State using IP connectivity to each center. The system must be able to integrate all resources between the counties and State. The Vendor shall provide a description of how this can be accomplished in order to view unit ID on the system during an emergency, and to achieve console-to-console intercom, at a minimum. At minimum, the proposed solution shall comply with the latest P25 suite of standards. Vendors are encouraged to propose solutions that would enhance interoperability of communications for the State and its local and county partners.

County	Console
Belknap	Motorola MCC5500, 2 positions, CES
Carroll	Motorola MCC7500, 4 positions, K2 Core
Cheshire	Motorola MCC7500, 4 positions, K2 Core
Coos	Current: Motorola Centracom 2 Gold Elite, 2 positions, CEB Future install: Motorola MCC7500, 2 positions, K Core
Grafton	Motorola MCC7500, 6 positions, K2 Core
Hillsborough	Motorola MIP5000, 3 positions, IP/CEB
Merrimack	Current: Motorola Centracom 2 Gold Elite, 7 positions, CEB Future install : Motorola MCC7500, 7 positions, K2 Core
Rockingham	Motorola MCC7500, 5 positions, K2 Core
Strafford	Motorola MCC 7500, 4 positions, K2 Core
Sullivan	Motorola Centracom 2 Gold Elite, 2 positions, CEB

5.2. CONVENTIONAL RADIO SYSTEM REQUIREMENTS

- A. Dispatch equipment shall include an instant transmit switch for each conventional repeater channel and/or base station.
- B. On conventional resources capable of operating on multiple frequencies/modes, a control/indicator shall be provided to select the desired transmit frequency/mode (select channel). The select-channel function shall cause the associated channel to switch

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frequencies/modes. Once a channel has been selected, the operator shall be able to transmit on this channel by pressing the footswitch or transmit button.

- C. A transmit audio level meter shall be provided that indicates the level of transmitted voice. This meter also shall indicate the level of receive audio present on the selected channel.
- D. Operator positions shall have the ability to independently set each channel's volume level. Minimum audio levels shall be capable of being set to avoid missed calls.
- E. A control/indicator shall be provided to allow the operator to mute or unmute audio from unselected channels. Selected audio and unselected audio shall be audible from separate speakers.
- F. A control/indicator shall be provided that enables the operator to select multiple channels, which in turn gives the dispatcher the ability to broadcast to several channels at once.
- G. Operators shall have the ability to patch two or more conventional repeaters and/or base stations together so that users may communicate directly. Operator positions shall be equipped such that a minimum of eight simultaneous patches shall be available.

5.3. OPERATOR POSITION EQUIPMENT

- A. All equipment supplied for use by the dispatch operators shall be capable of withstanding the 24 hours a day, 7 days a week (24 x 7) environment of today's dispatch centers.
- B. All equipment supplied for use by the dispatch operators shall be integrated into the existing furniture at the dispatch locations.
- C. Operator position display monitors will be, at a minimum, 19-inch liquid crystal display (LCD) or light-emitting diode (LED) touchscreens, with resolution of 1920 x 1080 or better.
- D. Keyboards shall be a standard 101-key keyboard.
- E. Operator functions shall be executed by positioning a screen pointer (cursor) over the appropriate icon and pressing the mouse button, or by touching the monitor screen.
- F. A high-quality gooseneck microphone shall be provided for each operator position.

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- G. Headset jacks shall be provided that enable the operator to hear select audio via a headset and allow the operator to respond via a microphone attached to the headset. The headset plug inserted into the jack shall automatically disconnect the console's microphone and mute the select speakers.
- H. Optional pricing for wireless headsets shall be provided by the Vendors.
- I. A heavy-duty footswitch shall be provided to allow the operator to key the selected channel hands-free.
- J. If personal computers (PCs) are supplied, they shall be capable of providing a graphic user interface (GUI) using the current Microsoft® Windows operating system, be capable of local-area network (LAN) client-server architecture for network access, and be capable of supporting multiple Microsoft® Windows compliant applications.
- K. PCs supplied shall be based on present state-of-the-art PC technology.

5.4. COMMON ELECTRONICS EQUIPMENT (SYSTEM CONTROL)

- A. The common electronics equipment shall replace the existing Embassy Switch in place and contain all equipment necessary to route audio and control signals between the dispatch operator positions and the proposed P25 conventional system. The system control equipment shall be capable of controlling all channels in the proposed system. The control equipment may use a distributed or centralized architecture.
- B. Vendors shall fully describe the manner in which the proposed system controllers function and operate.
- C. Because the system equipment are critical to the network, placement of the equipment at a secure, highly stable location is of the utmost importance. The State's IPOC is preferred and should be suitable for the placement of the equipment. Respondents shall inform the State of any deficiencies or upgrades needed at this location. This site was chosen due to its central location, proximity to maintenance personnel, and condition of facilities.
- D. The common electronics equipment shall not have a single point of failure. Redundant servers, cards and power supplies shall be used when feasible. AS AN OPTION, the Vendor shall provide a fully redundant and geo-diverse system core to be located in Troop F that includes redundant servers, cards, power supplies. In addition to the fully redundant and geo-diverse option, vendors can provide an option for geo-diverse system control providing the basic redundancies in two different locations.

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- E. The common electronics equipment shall be equipped of controlling the proposed P25 conventional system and capable to expand in use of a trunking system.
- F. The common electronics equipment shall be equipped of controlling the channels, sites and dispatch positions proposed and capable to expand to minimum 10 channels at a minimum 75 sites each plus a minimum 50 console positions.
- G. The common electronics equipment shall be connected to the conventional radio system and accessing available resources from other county dispatch centers.
- H. The common electronics equipment shall be equipped of receiving alarm information from distant communications sites and displaying this information on the dispatch screen.
- I. The common electronics equipment shall allow for a remote dispatch position. This remote dispatch position shall be connected via a LAN/wide area network (WAN) connection.

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FACILITIES AND INFRASTRUCTURE DEVELOPMENT

6.1. GENERAL

- A. Because the final design will depend on the concurrent procurement of radio equipment, Vendors shall provide itemized pricing to allow the State to easily determine pricing based on updated design parameters.
- B. Site survey information may be dated; therefore, Vendors shall perform due diligence in verifying all proposed site data for inclusion in the proposed radio system.
- C. Vendors shall provide itemized pricing for services that may be required throughout the implementation of the project including, but not limited to:
 - 1. Towers
 - 2. Shelters
 - 3. Backup power
 - 4. Site preparation
- D. Code Compliance:
 - 1. Installation of all electrical equipment, power distribution, lighting assemblies, and associated wiring shall comply with the most recent edition of the National Electrical Code (NEC), d Occupational Safety and Health Administration (OSHA) regulations, and/or other codes and regulations as they may apply.
All electrical equipment shall be listed or approved by UL.
- E. Concrete:
 - 1. For all foundations and concrete work, the Vendor or its subcontractor(s) shall provide to the vendor's Project Engineer a test sample of each mix of concrete demonstrating that it has been tested for compliance with the foundation specifications set forth by the requisite site engineer. Written reports certifying the strength of the concrete shall accompany each test cylinder.
 - 2. If any concrete used in the foundation does not meet specifications, the Vendor or its subcontractor(s) shall remove the foundation and pour a new foundation using compliant materials, at no expense to the Owner.

6.2. TOWERS

- A. General:
 - 1. If the Vendor determines that additional towers are required, or existing towers must be replaced or modified, the Vendor shall provide unit pricing to furnish and install a 180-foot self-supporting tower.

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2. Any tower manufacturer supplying a tower(s) for this system shall guarantee structural integrity of the tower for a period of not less than 20 years from the date of acceptance.

B. Tower Loading:

1. The tower and foundation shall be designed for all proposed equipment, legacy equipment, appurtenances, ancillary equipment, and initial antenna loading plus 50 percent future antenna system growth, without addition to or modification of the finished tower or foundation.
2. The proposed tower structure shall be designed and installed in accordance with latest revision of the ANSI/EIA-222 standard.

C. Proposed towers shall include the following:

1. Ice Bridge – A 24-inch, open mesh-type horizontal transmission line ice bridge, extending from the tower cable ladder to the equipment building, including 24 four-inch-diameter line entry ports shall be provided.
2. Transmission Line Support – A vertical transmission line support system shall be provided to securely attach the antenna transmission lines. Holes shall be provided in the tower support members, tower hanger adapter plates, or separate ladder structures to allow installation of snap-in cable hangers and bolt-in cable hangers at maximum three-foot intervals. The mounting holes shall be precision punched or drilled and sufficiently separated to accommodate the snap-in or bolt-in hangers.
3. Climbing Access – A ladder, beginning at a point at least ten feet off the ground, shall be provided as an integral part of the tower to permit access by authorized personnel. The tower shall be equipped with an OSHA-approved anti-fall safety device in accordance with ANSI/EIA-222. This device must not interfere with the climber's ease of reach by hand or foot from one rung of the ladder to the next, either going up or coming down. Two safety climbing belts shall be supplied with each new tower.
4. A lightning ground rod shall be installed at the very top of the tower to extend at least 2 feet above the top of the tower or lighting fixture.
5. Labeling shall be clearly provided near the base of all new towers for the following:
 - a. Make
 - b. Model
 - c. Serial number
 - d. Tower height
 - e. Latitude and longitude
 - f. FAA and FCC identification numbers (if applicable)

D. Construction:

1. All welding must be done in the factory prior to the galvanizing process. Field welding is not acceptable.

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2. The tower shall be constructed of high-strength steel. All components and hardware shall be hot-dip galvanized with a zinc coating after fabrication, per EIA standards. A zinc coating shall be permanently fused to the steel, both inside and outside, so that all surfaces are protected and no painting is required for rust protection.
 3. Prior to galvanization, each piece of steel and every weld must be deburred and smooth-finished.
- E. Final Testing and Acceptance – Upon completion of the work, documentation detailing final inspection and testing shall be submitted, documenting the following:
1. Steel structure:
 - a. Vertical alignment and plumbness
 - b. All bolts tight and torqued to specification
 - c. No damaged or missing structural members
 - d. All surface scratches and damage to the galvanization repaired
 - e. No signs of stress or vibration
 - f. All climbing ladders and other devices installed correctly
 - g. Labels and tags
 2. Foundation:
 - a. Concrete finish should exhibit no cracks or blemishes
 - b. Grouting, if used, shall have drain holes if the tower uses hollow leg construction or monopole design
 - c. Backfilling and grading shall be conducted
 3. Grounding – Shall meet applicable standards such as Motorola R56; items include, but are not limited to:
 - a. Verify lugs and exothermic welds
 - b. Test and record ground resistance
 - c. Install lightning ground rod at top of tower
 4. Ice Bridge – Install per tower manufacturer specifications
 5. Lighting and controls:
 - a. Inspect conduit and wiring installation
 - b. Verify proper lamp operation
 - c. Verify alarm contact operation
 - d. Verify labeling
 6. Photographs (digital):
 - a. Overall structure from north, east, south, and west
 - b. Footers
 - c. Grounding

6.3. SHELTERS

- A. General:

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1. Vendors shall provide unit pricing for two types of a new equipment shelter at new site locations and where existing shelters are deemed inadequate.
2. The shelter shall be prefabricated and preassembled. The shelter can be constructed from concrete, fiberglass, and/or aggregate materials.

B. Size:

1. Minimum shelter size shall be 12 feet x 20 feet, with a minimum interior height of 9 feet. The shelter shall be divided in such manner to house equipment on one side and a separate room for a generator on the other side.
2. Minimum shelter size shall be 12 feet x 12 feet, with a minimum interior height of 9 feet, but with no generator room.

- C. Foundation – The foundation for the shelter shall consist of concrete piers or a poured concrete slab constructed by the Vendor or its subcontractor(s) that will properly support and secure the shelter. Foundation drawings recommended by the shelter manufacturer shall be the criteria by which the foundation is constructed.

D. Flooring:

1. Vendors are to propose a structure where the floor or solid foundation features a minimum uniform load rating of 200 pounds per square foot with no more than 3,000 pounds over any 4-square-foot area. This rating shall be increased in sections as necessary to support heavyweight equipment including a generator. If the shelter is delivered with the floor already assembled, the floor shall exhibit a minimum 90-pounds-per-square-foot, uniform live-load capacity while the building is being lifted.
2. Floors shall be insulated to a minimum R-11 rating. Insulation shall be secured in place to prevent shifting during construction and transportation.
3. Exterior covering of the floor shall be included to prevent rodent infestation.
4. The floor shall be covered by a high-quality, industrial- or commercial-grade asphalt or vinyl tile. All edges shall be covered by wall molding.

E. Walls:

1. Walls shall be constructed to a minimum 120-mile-per-hour (MPH) wind-load rating, including overturning moments.
2. Bullet Proof – Walls shall withstand the effects of bullets or other projectiles equivalent to a .30-06 high-power rifle ¹ load fired from a distance of 50 feet with no penetration to the inner cavity of the wall. No interior damage shall be sustained including insulation, interior walls, etc.
3. The outside walls shall be finished with concrete or an aggregate composition.

¹ UL Level 4 or greater

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4. A wall feed-through bushing with 24 four-inch-diameter openings shall be provided on the tower side of the building to accommodate elliptical waveguide and coaxial transmission lines. The openings shall be properly booted to provide a good weather seal. The wall feed-through bushing shall be bonded to the site ground system per guidelines specified in Section 5.6.1, Standards and Guidelines.
5. The inside walls shall be finished with minimum 5/8-inch plywood (or equivalent) to allow mounting of panels, blocks, etc., and shall be trimmed with coordinated molding.
6. High-performance insulation shall provide a minimum insulation factor of R-11.

F. Roof:

1. The shelter roof shall support a minimum 100-pounds-per-square-foot uniform live load.
2. The roof shall be pitched to facilitate run-off of water.
3. The roof shall withstand the impact of ice falling from the adjacent tower without suffering any damage, or shall otherwise be protected from such damage. The Vendors shall describe in their proposals how this requirement will be met.
4. High-performance insulation shall provide a minimum insulation factor of R-19.

G. Door:

1. The shelter shall have one 42-inch x 84-inch insulated door per room, with three stainless-steel, tamper-proof hinges, passage-style lever handle, deadbolt lockset, and fiberglass weather hood or awning. The door shall be equipped with a hydraulic door closer.
2. The exterior door shall be of aluminum or steel (stainless or galvanized) construction with a finish to match the building finish.
3. The door shall withstand the effects of bullets or other projectiles equivalent to a .30-06 high-power rifle ² load fired from a distance of 50 feet with no penetration to the inner cavity of the door. No interior damage shall be sustained, including insulation, interior walls, etc.
4. The door sill shall be of stepped construction so as to prevent rain water from entering the shelter at the bottom of the door or from around the door frame. The door frame shall have a weather seal around the door to limit air and water intrusion.

H. Finishing:

1. The interior and exterior finishes shall be described by the Vendor. Color and finishes shall be selected by the State from samples provided by the Vendor or its subcontractor(s).
2. All joints shall be sealed with a compressible, resilient sealant.

² UL Level 4 or greater

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- I. Alternating Current (AC) Power System:
1. The successful Vendor shall deliver the building complete with a 200-ampere-capacity, 240-volt, single-phase electrical panel box with a ground bar.
 2. This panel shall be equipped with a 200-ampere-capacity main circuit breaker used to supply power for all electrical functions related to the site.
 3. Overall panel size shall be determined by the need to provide the number of individual breakers required, plus a reserve of at least six 240-volt slots.
 4. Breakers for shelter air-conditioning shall be of the bolt-down, not snap-in, type.
 5. Receptacles:
 - a. Each radio equipment unit (or rack) shall be supplied with two 20-ampere circuits. Receptacles shall be mounted to the side of the overhead cable tray.
 - b. Service receptacles shall be mounted on the walls at 6-foot intervals or less.
 - c. One weatherproof ground fault interrupter (GFI) exterior power receptacle shall be provided with each shelter, to be mounted near air-conditioning units.
 - d. Each receptacle shall be fed from an individual breaker. The feeding breaker shall be identified at the receptacle and the receptacle shall be identified at the breaker. All breakers or circuits shall be 20-ampere, unless otherwise noted.
- J. Power Line Surge Suppression:
1. AC surge protection shall be provided and installed inside the shelter.
 2. An acceptable unit shall be an in-line type such as the AC Data Systems "integrated load center." An alternate unit must meet or exceed all of the capabilities of this model unit.
 3. Minimum surge protector requirements:
 - a. Built-in redundancy of dual stages per phase with filtering
 - b. Surge energy shunted to ground, not to neutral
 - c. Front panel indicator lamps
 - d. Remote/local status contacts
 - e. Fusible link protected so as not to interrupt power
 - f. Field replacement protection blocks and fuses, if needed
 - g. UL-Listed components
 - h. 45 kiloamperes (kA) per phase, ANSI C62.1 8/20 waveform
 - i. Electromagnetic interference/radio frequency interference (EMI/RFI) filtering per MIL-STD-220
 - j. Capable of handling the full 240-volt, 200-ampere capacity of the electrical system
- K. Wiring Methods:
1. Shall meet all applicable standards.
 2. All wiring noted on the site drawings or otherwise included by the successful Vendor shall be installed in conduit or ductwork. Where no protection method is specified, conduit shall be used.

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3. All conduits and ducts shall be securely surface-mounted and supported by approved clamps, brackets, or straps as applicable, and held in place with properly selected screws. No wiring shall be imbedded inside any walls, floors or ceilings. Entrance power, outside light, air-conditioning outlet, and telecommunications company (telco) are the only wiring that may penetrate shelter walls or floor.
4. All wire raceways, conduits, etc., shall be mechanically joined and secured.
5. Flexible steel conduit or armored cable shall protect wiring connected to motors, fans, etc., and other short runs where rigid conduit is not practical.
6. Unless otherwise specified, all power wiring shall be minimum 12 American wire gauge (AWG) size, solid copper conductors with insulation rated for 600 volts AC.

L. Light Fixtures:

1. Ceiling-mounted, 4-foot fluorescent light fixtures (two 40-watt bulbs per fixture) with RFI ballasts shall be supplied for the equipment shelters. A sufficient quantity of light fixtures shall be supplied to provide a uniform light level throughout the building of 150 foot candles at four feet above the floor.
2. Light fixtures shall be fed as a gang from a common breaker and controlled by an on/off switch near the door.

M. Outdoor Lighting:

1. An exterior 100-watt, wall-mounted light shall be mounted on the front entrance of the shelter.
2. The exterior lighting system shall be fed from a separate, appropriately rated breaker and controlled by an on/off switch mounted near the door.

N. Heating, Ventilation and Air-Conditioning (HVAC):

1. Vendors shall provide an HVAC system for each shelter proposed. Vendors shall propose dual AC units with a lead-lag controller. Each AC unit shall be sized for 100 percent of the building's required cooling capacity, as determined by the British thermal unit (BTU) analysis.
2. Vendors shall perform a BTU analysis (heat-load calculations) for all shelter equipment during preliminary design to verify HVAC system size. All calculations shall include a 50-percent expansion factor, and all assumptions regarding power consumption, duty factor, and heat loading shall be thoroughly explained.
3. Each unit shall be capable of maintaining an inside ambient temperature range between 65 and 85 degrees Fahrenheit (F). Each unit shall be sized to maintain temperatures inside the shelter at 70 degrees F.
4. The HVAC system shall be controlled by a wall-mounted thermostat. The thermostat shall turn the heater on when the temperature inside the shelter drops to 65 degrees F and off when it rises to 68 degrees F. It shall turn on the air-conditioner when the interior temperature reaches 78 degrees F and off when the temperature drops

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below 75 degrees F. Thermostat control shall be adjustable within the range of 45 to 85 degrees F.

- O. Antenna Cable Conduit Entry – A bulkhead panel shall be supplied to accommodate coaxial transmission lines between 1/2-inch and 1 5/8-inch diameter elliptical waveguides. A minimum of 12 transmission lines shall be accommodated with 4-inch openings. The building manufacturer shall seal the conduits into the wall to verify that they are watertight.
- P. Cable Tray – All new shelters shall be equipped with the cable trays. The successful Vendor shall install a minimum 18-inch-wide cable tray system above the equipment.
- Q. Shelters shall be supplied with at least one 10-pound carbon dioxide (CO₂) fire extinguisher, an approved eyewash station, and a first-aid kit.

6.4. GENERATOR AND AUTOMATIC TRANSFER SWITCH (ATS)

- A. Vendor shall provide unit pricing for a 20-kilovolt amperes (kVA) emergency generator system at each new radio communications site for backup power.
- B. This section provides specifications and requirements for standby power systems to supply electrical power in the event that the normal supply fails. Standby power systems shall consist of a liquid-cooled engine, an AC alternator and system controls with all necessary accessories for a complete operating system, including but not limited to the items as specified.
 - 1. For the purpose of the proposal, the Vendor shall assume the following:
 - a. 20 kilowatts (kW)
 - b. Single phase
 - c. 60 Hz operating frequency
 - d. 0.8 power factor
 - e. Propane fuel
 - f. Minimum 72-hour runtime
- C. In the event of a commercial power outage, the emergency generator shall provide power to the entire shelter without a system outage.
- D. Quality Assurance – The system shall be supplied by a manufacturer that has been regularly engaged in the production of engine-alternator sets, ATS, and associated controls for a minimum of ten years, thereby identifying one source of supply and responsibility.

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- E. The generator system and all accessories and ancillary equipment shall comply with the following standards:
1. NFPA 37, Flammable and Combustible Liquids Code
 2. NFPA 55, Standard for the Storage and Handling of Compressed Gases
 3. NFPA 70, National Electrical Code, with particular attention to Article 700, "Emergency Systems"
 4. NFPA 110, Requirements for Level 1 Emergency Power Supply System
 5. NFPA 101, Code for Safety to Life from Fire in Buildings and Structures
 6. ANSI/NEMA MG 1, Motor and Generators
 7. ANSI/NEMA AB 1, Molded Case Circuit Breakers
 8. ANSI/NEMA 250, Enclosures for Electrical Equipment (1,000 Volts Maximum)
- F. Labeling and Identification – All wiring harnesses and connectors shall be clearly identified by number and function according to the associated schematic diagrams and documentation provided by the Vendor.
- G. Factory Testing:
1. Before shipment of the equipment, the generator set shall be tested under rated load for performance and proper functioning of control and interfacing circuits. Tests shall include:
 - a. Verification that all safety shutdowns are functioning properly
 - b. Verification of single-step load pick-up per NFPA 110-1996, paragraph 5-13.2.6
 - c. Verification of transient and voltage-dip responses and steady-state voltage and speed (frequency) checks
 - d. Full load test for a minimum of one hour
 2. Vendor shall provide complete report(s) of all testing performed.
- H. Startup and Checkout:
1. The supplier of the electricity-generating plant and associated items covered herein shall provide factory-trained technicians to check the completed installation and to perform an initial startup inspection to include:
 - a. Ensuring that the engine starts (both hot and cold) within the specified timeframe.
 - b. Verifying that engine parameters are within specification.
 - c. Verification of no-load frequency and voltage adjustment, if required.
 - d. Testing of all generator automatic shutdowns.
 - e. Performing a simulation of power failure to test generator startup and the ability of the ATS to pick up building load correctly.
 - f. Returning to commercial power and testing the generator and ATS to demonstrate correct cycling to normal commercial power.
 - g. Performing a load test of the generator, to ensure full-load frequency and voltage is within specification when using building load. This test shall be run for a minimum of one hour.

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- h. Testing and verifying all remote indicators and controls.
- 2. Vendor shall provide complete report(s) of all testing performed.

6.4.1. Propane Generator

- A. The prime mover shall be a liquid-cooled, propane and/or natural gas fueled, naturally aspirated engine of four-cycle design.
- B. The engine shall have sufficient horse power rating to drive the generator to full output power without a gear box between the engine and generator.
- C. The engine shall have a battery charging direct current (DC) alternator with a solid state voltage regulator.
- D. The engine shall have a unit-mounted, thermostatically-controlled water jacket heater to aid in quick starting. The wattage shall be as recommended by the manufacturer. A proper electrical branch circuit feed from a normal 120-volt utility power source shall be provided.
- E. The generator shall meet temperature rise standards for Class "H" insulation, operating within Class "F" standards for extended life.
- F. The alternator shall be protected by internal thermal overload protection and an automatic reset field circuit breaker.
- G. One step load acceptance shall be 100 percent of generator set nameplate rating and meet the requirements of NFPA 110 paragraph 5-13.2.6.
- H. The electric plant shall be mounted with vibration isolators on a welded steel base that shall permit suitable mounting to any level surface.
- I. A main line output circuit breaker carrying the UL mark shall be factory installed.
 - 1. Form C auxiliary contacts rated at 250 VAC/10 amperes shall be provided to allow remote sensing of breaker status.
 - 2. A system utilizing manual reset field circuit breakers and current transformers is unacceptable.
- J. An alternator strip heater shall be installed to prevent moisture condensation from forming on the alternator windings.
- K. Controls:

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1. All engine alternator controls and instrumentation shall be designed, built, wired, tested and shock-mounted in a NEMA 1 enclosure mounted to the generator set by the manufacturer. It shall contain panel lighting, a fused DC circuit to protect the controls and a +/- 5 percent voltage adjusting control.
2. The generator set shall contain a complete two-wire automatic engine start-stop control that starts the engine on closing contacts and stops the engine on opening contacts.
3. A programmable cyclic cranking limiter shall be provided to open the starting circuit after four attempts if the engine has not started within that time. Engine control modules must be solid state plug-in type for high reliability and easy service.
4. The panel shall include:
 - a) Analog meters to monitor:
 - i. AC voltage
 - ii. AC current
 - iii. AC frequency
 - b) Phase selector switch
 - c) Emergency stop switch
 - d) Audible alarm
 - e) Battery charger fuse
 - f) Programmable engine control
 - g) Monitoring module
5. The programmable module shall include:
 - a) Manual OFF/AUTO switch
 - b) Four LEDs to indicate
 - i. Not In Auto
 - ii. Alarm Active
 - iii. Generator Running
 - iv. Generator Ready
6. The module shall display all pertinent unit parameters including:
 - a) Generator Status – ON/OFF/AUTO
 - b) Instrumentation – Real-time readouts of the following engine and alternator analog values:
 - i. Oil pressure
 - ii. Coolant temperature
 - iii. Fuel level (where applicable)
 - iv. DC battery voltage
 - v. Run time hours
 - c) Alarm Status – Current alarm(s) condition of:
 - i. High or low AC voltage
 - ii. High or low battery voltage
 - iii. High or low frequency

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- iv. Low or pre-low oil pressure
- v. Low water level
- vi. Low water temperature
- vii. High and pre-high engine temperature
- viii. High, low and critical low fuel levels (where applicable)
- ix. Over crank
- x. Over speed
- xi. Unit not in "Automatic Mode"

L. Unit Accessories:

1. Weather protective enclosure:

- a) The generator set shall be factory enclosed in a heavy gauge steel enclosure constructed with 12-gauge corner posts, uprights and headers.
- b) The enclosure shall be coated with electrostatically applied powder paint, baked and finished to manufacturer's specifications.
- c) The enclosure is to have large, hinged doors to allow access to the engine, alternator and control panel.

2. The exhaust silencer(s) shall be provided of the size recommended by the manufacturer and shall be of critical grade.

3. The generator set shall include an automatic dual rate battery charger manufactured by the generator set supplier. The battery charger is to be factory installed on the generator set. Due to line voltage drop concerns, a battery charger mounted in the transfer switch will be unacceptable.

M. A heavy-duty, lead-acid 12-volts DC (VDC) battery shall be provided by the generator set manufacturer. The generator set shall have a frame suitable for mounting the battery and include all connecting battery cables.

6.4.2. Automatic Transfer Switch

A. The ATS shall be compatible with the generator set so as to maintain system compatibility and local service responsibility for the complete emergency power system.

B. Representative production samples of the ATS supplied shall have demonstrated through tests the ability to withstand at least 10,000 mechanical operation cycles. One operation cycle is defined as the electrically operated transfer from normal to emergency and back to normal.

C. Wiring must comply with NEC table 373-6(b). The manufacturer shall furnish schematic and wiring diagrams for the particular ATS proposed and a typical wiring diagram for the entire system.

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D. Ratings and Performance:

1. The ATS shall be adequately sized to match the generator and shelter electrical systems.
2. The ATS shall be a 2-pole design rated for 600-volt AC, 200-amperes continuous operation in ambient temperatures of -20 degrees F (-29 degrees Celsius) to +140 degrees F (+60 degrees Celsius).
3. The operating mechanism shall be a single operating coil design, electrically operated and mechanically held in position.
4. A provision shall be supplied to be able to manually operate the switch in the event of logic or electrical coil failure.

E. Controls:

1. A solid-state under-voltage sensor shall monitor all phases of the normal source and provide adjustable ranges for field adjustments for specific application needs.
 - a. Pick-up and drop-out settings shall be adjustable from a minimum of 70 percent to a maximum of 95 percent of nominal voltage.
 - b. A utility-sensing interface shall be used, stepping down system voltage of 120/240-volt AC 1 phase to 24-volt AC, helping to protect the printed circuit board from voltage spikes and increasing personnel safety when troubleshooting.
2. Controls shall signal the generator set to start in the event of a power interruption.
 - a. A solid-state time delay start, adjustable from 0.1 to 10 seconds, shall delay this signal to avoid nuisance start-ups on momentary voltage dips or power outages.
3. Controls shall transfer the load to the generator set after it reaches proper voltage.
 - a. Adjustable from 70–90 percent of system voltage.
 - b. Adjustable from 80–90 percent of system frequency.
 - c. A solid-state time delay, adjustable from 5 seconds to 3 minutes, shall delay this transfer to allow the generator to warm up before application of load.
 - d. There shall be a switch to bypass this warm-up timer when immediate transfer is required.
4. Controls shall retransfer the load to the line after normal power restoration.
 - a. A return-to-utility timer, adjustable from 1 to 30 minutes, shall delay this transfer to avoid short-term normal power restoration.
5. The operating power for transfer and retransfer shall be obtained from the source to which the load is being transferred.
6. Controls shall signal the generator to stop after the load retransfers to normal.
 - a. A solid-state engine cool-down timer, adjustable from 1 to 30 minutes, shall permit the engine to run unloaded to cool down before shutdown.
 - b. Should the utility power fail during this time, the switch shall immediately transfer back to the generator.
7. The transfer switch shall have a time-delay-neutral feature to provide a time delay, adjustable from 0.1 to 10 seconds, during the transfer in either direction, during

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which time the load is isolated from both power sources. This allows residual voltage components of motors or other inductive loads (such as transformers) to decay before completing the switching cycle.

8. A switch shall be provided to bypass all transition features when immediate transfer is required.
9. The transfer switch shall have an in-phase monitor, which allows the switch to transfer between live sources if their voltage waveforms become synchronous within 20 electrical degrees within 10 seconds of the transfer-initiation signal.
 - a. If the in-phase monitor will not allow such a transfer, the control must default to time-delay-neutral operation.
10. Front-mounted controls shall include a selector switch to provide for a NORMAL TEST mode with full use of time delays; FAST TEST mode that bypasses all time delays to allow for testing the entire system in less than one minute; or AUTOMATIC mode to set the system for normal operation.
 - a. The controls shall provide bright lamps to indicate the transfer switch position in either UTILITY (white) or EMERGENCY (red). A third lamp is needed to indicate STANDBY OPERATING (amber). These lights must be energized from the utility source or the generator set.
 - b. The controls shall provide a manually operated handle to allow for manual transfer. This handle must be mounted inside the lockable enclosure and accessible only by authorized personnel.
 - c. The controls shall provide a safety disconnect switch to prevent load transfer and automatic engine start while performing maintenance. This switch also shall be used for manual transfer switch operation.
 - d. The controls shall provide LED status lights to give a visual readout of the operating sequence including:
 - i) Utility on
 - ii) Engine warm-up
 - iii) Standby ready
 - iv) Transfer to standby
 - v) In-phase monitor
 - vi) Time delay neutral
 - vii) Return to utility
 - viii) Engine cool down
 - ix) Engine minimum run

6.4.3. Propane Fuel System

- A. Vendor shall provide a complete fuel system including tank(s) and all associated piping, valves, controls, etc.

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- B. Tank and fuel system components shall be sized to provide a minimum of 72 hours of run time at full load.

- C. Clear access shall be provided for refueling.

- D. Tanks:
 - 1. Steel and polyurethane construction.
 - 2. UL labeled in accordance with UL 644 and stamped in accordance with American Society of Mechanical Engineers (ASME) Section VIII Division 1.
 - 3. Rated for a minimum of 250 psig.
 - 4. All tanks to be secured to an adequately sized concrete foundation.

- E. Fuel System Construction:
 - 1. No copper pipe will be allowed for any part of the underground fuel-line system.
 - 2. No bare black iron pipe will be used for any part of the fuel system.
 - 3. Any underground steel pipe will be epoxy-coated and all joints wrapped to prevent corrosion.
 - 4. All underground pipes will be at least 18 inches below the surface.
 - 5. Fuel lines will be protected with a concrete-filled sleeve both entering and leaving the ground for at least 12 inches into the ground and 6 inches above the ground.
 - 6. Fuel lines crossing a driveway will be protected from damage by being installed in a larger pipe sleeve or covered with a concrete barrier of sufficient strength.
 - 7. All above-ground pipe will be supported at least every 36 inches.

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NETWORK MANAGEMENT SYSTEM (NMS)

- A. This section provides specifications and requirements for an integrated monitoring-and-control system for local and remote site facilities and equipment. The system is used to provide remote indication of status, alarms, and analog values, and to provide remote-control relay operations. Vendor shall provide a description of the NMS, including capabilities and available options.

- B. System Alarms: The system shall acquire, process and display information in an integrated and uniform fashion for a variety of critical systems including:
 - 1. Conventional radio systems
 - 2. Local and remote site facilities
 - 3. Primary and backup power systems
 - 4. Microwave, leased line and data networks

- C. Site Alarms: Any change in the state of site equipment shall induce an alarmed state. Equipment monitored shall include, but not be limited to, the following:
 - 1. Surge arrestors
 - 2. Transfer switch (normal or bypass state)
 - 3. Power fail
 - 4. HVAC
 - 5. Smoke detector
 - 6. Intrusion detection
 - 7. High temperature
 - 8. Low temperature
 - 9. High humidity
 - 10. UPS/DC power fail
 - 11. UPS/DC power state (normal or bypass)
 - 12. Generator (including generator run, low fuel, high temperature, fail, etc.)
 - 13. Generator not in automatic mode
 - 14. In an effort to reduce false alarms, all alarm contacts normally shall be closed when no alarm is present.

- D. NMS components include:
 - 1. Network management terminals (NMTs)
 - 2. Remote terminal units (RTUs)

7.1. NETWORK MANAGEMENT TERMINALS (NMT)

- A. NMTs shall provide primary processing, display and control of information to and from a variety of RTU locations. System status and alarm conditions shall be displayed. The

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system shall provide the ability to remotely access the system to check the operational status of the system and to view alarms.

- B. NMTs shall be installed at three locations to be determined. It should be assumed that these locations may not be located at positions with access to the radio backhaul network, and may therefore require virtual private network (VPN) access.

- C. NMTs shall meet the following general requirements:
 - 1. Expandable software and hardware architecture shall be easily updated by adding software modules and hardware boards.
 - 2. Hardware and software platform shall be PC-based using current versions of hardware and software.
 - 3. Both graphic and tabular displays shall provide instantaneous and comprehensive network status information.
 - 4. NMTs shall provide full archiving and control functions.
 - 5. Multiple alarm protocols for higher-level network management systems shall be mediated by the NMTs.
 - 6. NMTs shall be designed to monitor a large cross section of equipment so that they can consolidate multiple alarm systems, rather than just poll alarms from RTU locations.
 - 7. NMTs must perform full management functions with a local terminal.
 - 8. NMTs shall provide email notification of alarms.
 - 9. NMTs shall provide alarm filtration and consolidation.
 - 10. Web-browser interface shall be provided for common management functions.
 - 11. Secure Web-browser interface shall be provided to monitor alarms and perform control and management functions via Intranet or Internet.

- D. NMTs/RTUs Communications Protocol(s) supported:
 - 1. Vendors shall fully describe all protocols used or supported.
 - 2. Vendors shall identify which of the following protocols are supported, either standard or as an OPTION:
 - a. American Standard Code for Information Interchange (ASCII)
 - b. Simple Network Management Protocol (SNMP)
 - 3. Proprietary protocols may be acceptable, as long as all requirements are met.

- E. Standard Features:
 - 1. Vendor shall provide programmable display screens including the following:
 - a. System Summary – High-level screen summary window with links to other screens
 - b. Change of State – Summary of points that have changed state from alarm to normal or normal to alarm
 - c. Standing Alarms – Summary of all points in alarm condition

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- d. Programmable Alarm Windows – Allowing logical grouping of alarms, such as by type or site
- 2. Shall provide for the graphic depiction of the network allowing annunciation and point selection via icons:
 - a. Nested-tree depiction of the network with drill-down capability
 - b. Capability to drive external display devices
- 3. Programmable console environment, including:
 - a. Database definition
 - b. Screen colors
 - c. Alarm summary formats
 - d. Blink attributes
 - e. Pager alarm formats
 - f. Audible alert formats
- 4. Status Points – The following status types shall be supported:
 - a. Simple status – Contact open or closed
 - b. Change detect – Simple status plus change detect since last scan
- 5. Control Points – The following relay control types shall be supported:
 - a. Direct control
 - b. Select before operate
 - c. Batch – Control multiple relays with a single operation
- 6. Analog points – Display the value of a monitored quantity such as temperature, fuel level, VSWR, etc.
- 7. Time stamp indicating date and time of message within 0.5 seconds
- 8. Conditional assignable text messages (minimum 256 characters) for each point to be issued on a change of state or alarm
- 9. Alarm qualification – On a point basis, programmable delay before alarm is issued
- 10. Alarm deactivation – On a point basis, the ability for the operator to deactivate an alarm to inhibit additional annunciation
- 11. Alarm history:
 - a. Logging of all alarms to disk and printer (selectable)
 - b. Minimum history log of 500,000 entries
- 12. Email support – Text message of alarm sent to email lists
- 13. Ping interrogator – To confirm that servers, routers and IP-based equipment are physically present on the network
- 14. Editor – Providing point configuration utilities to create and edit point databases
- 15. Security – Multiple levels of user name and password protection to all for flexible system management
- 16. Reports – Vendor shall define reports available. Vendor shall describe how trend analysis is supported and how current system status is reported. System shall be able to provide comprehensive planning and analysis, and shall have a flexible user interface.

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7.2. REMOTE TERMINAL UNITS (RTUS)

- A. RTUs shall be provided in sufficient quantities to monitor the entire network, including:
 - 1. Conventional radio network components
 - 2. Site facilities including shelter, tower, lighting, power and generator
 - 3. Data network equipment, including routers, switches, etc.
 - 4. Other miscellaneous equipment
- B. RTUs shall be fully compatible with NMTs supplied and provide complementary functionality wherever necessary to provide a complete working system.
- C. RTUs shall support the following points:
 - 1. Status/alarms – 48 minimum, expandable to 256
 - 2. Control outputs – 8 minimum, expandable to 32
 - 3. Analog inputs – 8 minimum, expandable to 16
- D. RTUs shall support time stamp and system time synchronization.
- E. Terminations for all points shall be provided on suitable terminal blocks providing ease of installation, testing and maintenance.

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TRAINING

8.1. GENERAL

- A. The successful Vendor shall provide:
1. Operator training:
 - a. Vendor shall provide complete and comprehensive operational training that covers the features, operation and special care associated with the equipment supplied. Operator training shall include six classes with a maximum of ten people per class in the following categories:
 - i) Dispatch console operation
 2. Technical/system management training:
 - a. Vendor shall identify and provide complete and comprehensive technical training in the theory, maintenance and repair of each type of equipment and system provided for the project. This training shall include, at a minimum, one class with a maximum of ten people on system theory, troubleshooting, repair and servicing techniques as applicable to the selected system. Technical training shall include the following categories:
 - i) Infrastructure maintenance and troubleshooting
 3. Vendor shall identify and provide complete and comprehensive technical training for ten State technical staff charged with managing the system. This training shall include, but is not limited to: planning and setting up the system and network; performing database-management functions; monitoring and managing the system's performance; and writing and printing system reports.
- B. Vendor shall fully describe all proposed training programs detailing how Vendor intends to provide training. The training description shall include the following:
1. A list of all subjects with a description of each
 2. Class material to be provided by Vendor³
 3. Number of classes
 4. Class duration
 5. Need for recurring training
 6. Class size
- C. Vendor shall coordinate with the State regarding the number of attendees and schedule.
- D. Classes shall be scheduled as near to system cutover as possible. Vendor shall work with the State to develop the schedule.

³ To be provided in both hard and softcopies. Softcopies shall be in native document format

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- E. Vendor shall train State employees or designated individuals. Vendor shall provide all instructional materials, including printed manuals, audio, video, interactive self-paced personal computer programs, and complete equipment operating instructions for all technical and operational training classes. Actual and/or exact model and series of equipment being delivered shall be made available for hands-on use and operation during training. All instructional materials shall be subject to the approval of the State and shall become property of the State.

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WARRANTY, MAINTENANCE AND SUPPORT

9.1. WARRANTY AND MAINTENANCE

- A. The proposed communications systems shall have a minimum warranty period of three (3) years. The warranty period shall commence upon final acceptance of the system.
- B. The maintenance period will begin upon the expiration of the warranty period. Vendor should provide optional maintenance pricing for years two through five following system acceptance.
- C. Vendor shall provide a Technical HelpDesk with a single toll-free telephone number that answers 24 hours a day, 7 days a week, 365 days a year (24 x 7 x 365), for all service requests and warranty claims.
- D. Vendor shall state in the proposal the name, address, and capabilities of the service station(s) providing on-site warranty service.
- E. Vendor shall maintain and repair all systems, equipment, hardware and software throughout the implementation, migration and warranty periods. The State reserves the right to have technical staff onsite to witness, and if desired, assist in the maintenance and troubleshooting procedures. This does not relieve the Vendor from its warranty and maintenance responsibilities as defined in this specifications document.
- F. The following procedures shall be followed during the warranty period:
 - 1. Warranty maintenance shall be performed 24 hours a day with no additional charges for work on critical infrastructure outside of normal 8:15 a.m. to 4:15 p.m. business hours.
 - 2. The service facility shall provide prompt repair service, with service personnel arriving onsite within two hours after a service request by the State or dispatching entity, and returning the system to service within four hours after a service request by the State or dispatching entity.
 - 3. The State shall be provided with written documentation indicating the cause of the service outage, the resolution and all post-repair testing procedures to ensure proper operation. In the event State-owned spares are used to complete the repair, the model and serial number of both the defective unit and the spare shall be noted in the documentation.
 - 4. For all equipment needing factory or depot repairs, a comprehensive tracking system shall be put in place by the Vendor to track units to and from the factory/depot.

9.1.1. Warranty and Maintenance Standards

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- A. Replacement parts used in repairs shall be equal in quality and ratings to the original parts.
- B. Equipment shall be maintained in a clean condition. Oil, dust and other foreign substances shall be removed on a routine basis.
- C. Equipment and system performance shall be maintained at the level initially described in these equipment and systems specifications. The service organization shall maintain records to confirm this has been done at intervals defined by the State.
- D. Vendor shall provide only factory-trained and –authorized maintenance personnel.
- E. If fixed equipment or a fixed equipment module fails more than twice during the acceptance test or twice during the first year, the Vendor shall meet with the State to discuss and explain such failures. If, in the opinion of both parties, these failures indicate that the equipment is potentially prone to continuing failures, the Vendor shall replace it at no cost to the State.

9.1.2. Extended Warranty

- A. As an option, Respondents shall propose an extended warranty for years four (4) through five (5), renewable on an annual basis.
- B. Respondents shall fully describe the terms and conditions of the extended warranty in their proposals.
- C. The approach to maintenance of this system shall be one of preventive maintenance.
- D. Comprehensive maintenance services shall be proposed for option years.
- E. Respondent shall provide a list of maintenance plans available. Plans should be based on the quantities of equipment included in the proposed system. These plans shall include:
 - a. Fixed equipment onsite service
 - i. 2-hour response time
 - ii. 4-hour response time
 - iii. 8-hour response time
 - iv. Next-day response time
 - b. Fixed equipment mail-in board repair
 - i. Normal response – 7 days
 - ii. Emergency response – Next day

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- F. All fixed equipment maintenance plans shall provide 24-hour system support so that users can dial one toll-free number to report problems and/or receive technical support.
- G. Additionally, for fixed onsite maintenance, Vendor's staff will dispatch the proper technician in the prescribed response time to resolve the problem, if Vendor is unable to resolve the problem through telephone consultation.
- H. Maintenance plans shall include a yearly retune of all components. The yearly retune should restore components to the manufacturer specifications.

9.2. PARTS AVAILABILITY

- A. From the date of final acceptance to the seventh anniversary of the date of final acceptance, the Vendor shall maintain replacement parts for all delivered equipment.
- B. In the event that the Vendor plans to discontinue stocking any part required for maintenance after the seventh anniversary of acceptance, the Vendor shall send written notice to the State 24 months prior to the date of discontinuance, to allow for last-time buys and replenishment.
- C. All parts ordered on a priority basis shall be delivered within 24 hours after placing an order. Vendor shall provide year round, 24-hour ordering facilities via telephone, Internet, email and fax service.

9.3. SPARE EQUIPMENT [ATTIC STOCK]

- A. Vendor shall propose to the State recommended spare parts for the system, subsystems and individual equipment.
- B. The list of spare parts shall include, but is not limited to:
 - 1. Any Vendors-identified field-replaceable units (FRUs).
 - 2. Any infrastructure component that does not have FRUs that can cause a critical system failure if it were to fail. Examples could include base station antennas and other non-modular components.
 - 3. Power supplies.
 - 4. Spares for less-critical items.
- C. The list shall include items that will rapidly and completely restore all critical system functionality with the least amount of effort, e.g., board replacement instead of troubleshooting to the component level when a critical unit has failed.

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- D. The quantities of spares in the list shall be appropriately sized to accommodate equipment quantities in the system.
- E. Spares shall be included in any system update to keep them current.

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SYSTEM IMPLEMENTATION, TEST AND ACCEPTANCE

10.1. GENERAL

- A. The successful Vendor shall attend biweekly project and construction conference calls as deemed necessary by the State prior to and during installation. Additional meetings may be scheduled at the discretion of the State.
- B. If any changes in the overall timeline occur, the Vendor shall update the project schedule for discussion during these project meetings.
- C. Vendor shall provide written minutes of all meetings no later than five business days after the meeting.

10.2. CUTOVER PLAN

- A. The successful Vendor shall be responsible for planning and coordinating the implementation of all equipment, subsystems and the overall system.
- B. Execution of the cutover plan shall ensure that the upgraded systems are brought online with minimum interruption to all existing systems and communications.
- C. During final design, Vendor shall deliver a preliminary cutover plan describing how the radio system will be phased into a fully operational system.
 - 1. Vendor shall successfully complete all tests and training prior to the actual cutover of systems.
 - 2. Vendor shall provide the necessary labor to cutover from existing systems to the proposed systems.
 - 3. The plan shall include contingencies and back-out plans.
 - 4. The State reserves the right to approve and change the cutover plan as it relates to any or all system components.

10.3. STAGING

- A. Each individual assembly or equipment unit shall undergo factory testing prior to shipment.
- B. Standard factory test documentation that indicates the tests performed and the successful completion of testing, shall be submitted to the State.

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C. System Staging:

1. The complete system shall be staged and tested at the factory, in the United States, to the greatest extent practical. The intent of the staging tests is to demonstrate to the State that the system is ready for shipment and installation. The selected Respondent shall provide travel expense coverage for three State personnel to participate in the Staging Acceptance Test Plan (SATP).
2. The successful Vendor shall provide all necessary technical personnel and test equipment to conduct staging tests. All deviations, anomalies and test failures shall be resolved at the Vendor's expense.
3. Vendor shall use an approved SATP. It is expected that the SATP has been performed and all tests have been successful before the State witnesses the official SATP. The SATP shall be signed and dated by Vendor and State representatives following completion of all tests. All tests in the SATP shall be marked as either pass, fail, or pass qualify.
4. Failed tests shall be documented, corrected and retested. All defective components shall be replaced and retested. Defective components that cannot be corrected shall be replaced at the expense of the Vendor.
5. Retest of individual failed SATP tests or the entire plan shall be at the State's discretion.
6. The fully executed and completed SATP document shall be provided to the State.

10.4. SYSTEM INSTALLATION

- A. Installation shall include a complete, tested system to include placement of associated cabling, appropriate system layout, and terminal connections. Vendor shall provide associated power supplies and any other hardware, adapters and/or connections to deliver a complete operable system to the State at the time of acceptance.
- B. All installations shall be performed by factory-authorized or Vendor-affiliated service shops. Other shops or installers may be used upon mutual agreement between the State and Vendor. Qualified, adequately trained personnel familiar with this type of work shall perform all installations. Vendor shall provide the names of the service shops, their qualifications, a description of their certified training on the proposed system, a summary of their experience and a list of five references (minimum) for each proposed shop.
- C. Prior to the start of the system installation, the Vendor shall participate in a mandatory project site survey with the State or State's representative to confirm actual equipment location within each space. At that time, the exact equipment locations shall be determined and documented by the Vendor.

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- D. Vendor shall coordinate with others, as appropriate, to confirm that any preparation work that affects the installation of the base station equipment, such as tower work, coring, bracing, conduit, electrical, etc., is complete before final inspection.
- E. Vendor shall provide and pay for all materials necessary for the execution and completion of all work. Unless otherwise specified, all materials incorporated into the permanent work shall be new and shall meet the requirements of this specifications document. All materials furnished and work completed shall be subject to inspection by the State or the State's representative.
- F. Equipment supplied as spare equipment shall not be used for installation of the proposed system. All spare equipment shall be supplied in an unused condition.
- G. All equipment and devices shall be cleaned internally and externally, and all damaged finishes shall be repaired.
- H. Worksites shall be left neat and broom swept upon completion of work each day. All shelter floors will be thoroughly cleaned and all scuff marks and abrasions shall be removed prior to acceptance. All trash shall be removed weekly.
- I. Inspection:
 - 1. The State shall conduct an inspection of the installations upon substantial completion. Any deficiencies shall be documented on a single punch list and provided to the Vendor for resolution.
 - 2. Final acceptance testing shall not commence until all punch-list items are resolved.

10.5. COVERAGE TESTING

- A. The successful Vendor shall submit a preliminary CATP with the proposal. The final CATP shall be submitted during the final design stage of the project.
- B. CATP:
 - 1. The CATP shall be consistent with the procedures and guidelines outlined in TIA TSB-88, latest revision.
 - 2. Coverage testing shall commence only after the radio systems are fully tested and aligned. Significant changes to the system shall require retesting of coverage at the State's discretion.
 - a. Automated objective mobile drive testing
 - b. Non-automated subjective DAQ testing (intelligibility testing)
 - 3. Test Configurations:
 - a. Automated Objective Mobile Drive Testing:

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- i) Vendor shall test both the signal level and BER, as applicable, at a statistically significant number of test locations throughout the State utilizing automated test equipment.
 - ii) Vendor or its subcontractor(s) may subdivide grids if necessary to ensure statistical significance after inaccessible grids have been excluded.
 - iii) Inaccessible grids shall not count as either a pass or fail in the statistical analysis.
 - iv) Any failed grids may be changed to “pass” if the underlying issue is corrected and the grid is retested.
- b. Configurations for the non-automated subjective DAQ testing shall represent typical operating configurations to the greatest extent possible, using mobile radio equipment to be used with the system.
- c. Non-Automated Subjective DAQ Testing:
- i) Non-automated subjective DAQ coverage testing shall be conducted using typical mobile radios supplied with the system.
 - ii) Talk-out and talk-in performance shall be documented.
 - iii) Vendor shall provide a standardized test form for testing.
- d. Vendor shall coordinate with the State to establish pass/fail criteria.
- e. Vendor shall guarantee coverage for both automated and non-automated subjective DAQ testing.

10.6. 30-DAY OPERATIONAL TEST

- A. Vendor shall perform a 30-calendar day operational test of the system to ensure that all hardware and software defects have been corrected prior to entering final proof-of-performance testing. The fully integrated operation of the system, including all individual subsystems, shall be demonstrated during these tests. The tests shall be designed to demonstrate the reliability, long-term stability and maintainability of the systems. A failure of any critical component of the system during this test will cause the test to restart after the repair is completed. Vendor and the State shall agree on what constitutes a critical failure prior to commencing this test.
- B. Vendor shall provide a 30-day operational test plan during the preliminary design phase.

10.7. FINAL ACCEPTANCE TESTING

- A. Prior to final acceptance testing, the successful Vendor shall verify and document that all equipment, hardware and software are upgraded to the latest factory revision. Multiple revision levels among similar equipment are not acceptable. The State shall be given two weeks written notice that the system is ready for final acceptance testing.

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B. FATP:

1. Vendor shall use the completed and approved FATP. It is expected that the FATP has been performed and all tests have been successful before the State witnesses the official FATP. The FATP shall be signed and dated by Vendor and State representatives following completion of all tests. All tests in the FATP shall be marked as either pass, fail, or pass qualify.
2. Vendor shall provide all necessary technical personnel and test equipment to conduct FATP tests. All deviations, anomalies, and test failures shall be resolved at the Vendor's expense.
3. Failed tests shall be documented, corrected and retested. All defective components shall be replaced and retested. Defective components that cannot be corrected shall be replaced at the Vendor's expense.
4. Retest of individual failed FATP tests or the entire plan shall be at the State's discretion.
5. The fully executed and completed FATP document shall be provided to the State.

10.8. AS-BUILT DOCUMENTATION

- A. At the completion of the installation phase, Vendor shall provide complete as-built documentation as outlined below. As-built documentation shall be provided in both hardcopy and softcopy formats:
1. Equipment provided
 2. Plan and elevation drawings of all equipment, including antennas on towers
 3. Cabling and terminations
 4. Block and system-level diagrams
 5. Fleet mapping and programming
 6. Setup and alignment information
 7. Successfully completed, signed and dated SATP

10.9. SYSTEM ACCEPTANCE

- A. The State shall deem the system ready for final acceptance following successful completion and approval of the following:
1. Final design submittals
 2. SATP
 3. System installation
 4. Final inspection and punch-list resolution
 5. As-built documentation
 6. FATP, including CATP
 7. 30-day operational test completion
 8. Training