

## Mobile Substation Pool Offers Savings for Cooperatives

### Key Findings

- Mobile substations are expensive to buy and maintain, but a mobile pool can offer significant cost savings to cooperatives.
- The North Carolina Electric Membership Corporation (NCEMC) operates a mobile pool in which 15 member co-ops in North Carolina and one co-op in Virginia participate. The pool provides access to several mobile substations at a very affordable cost.
- Among the benefits that pool members receive are backup transformers, a minimum of two mobile substations available for most voltage classes, technical support, substation testing services, quarterly and annual maintenance, technical assistance and mobile component testing by field service technicians, as well as troubleshooting the test result interpretation.

### What has changed?

Electric cooperatives are using more mobile substations to give them the flexibility to respond to emergencies and carry out maintenance and new construction while enhancing service reliability.

### What is the impact on cooperatives?

Mobile units are expensive to buy and maintain, and age quickly from extreme weather exposure and bumpy rides. One primary challenge in using mobile substations is moving these large, complex installations to their destination without causing premature component wear and/or failure. Storage and maintenance of these units while not in service may also contribute to delays in installation or less than expected service life.

NRECA's Business & Technology Strategies released a three-part *Surveillance* series titled *A Summary of CEATI Station Equipment Program's Report: State-of-the-Art Review of Mobile Substations*. The series provided cooperative engineers with valuable information that will aid in the specification and purchase of new units as well as insights into storage, deployment and maintenance of units.

The full Surveillance series and individual articles can be found on cooperative.com via the following links:

- **Full Series:**  
<https://www.cooperative.com/topics/transmission-distribution/Pages/State-of-the-Art-Review-of-Mobile-Substations.aspx>

- **Article 1: Literature Search and Vendor Survey Results**  
<https://www.cooperative.com/programs-services/bts/Documents/Secure/TS/Surveillance-CEATI-Report-Summary-Mobile-Substations-Pt-1-July-2020.pdf>
- **Article 2: User Experience and Observations**  
<https://www.cooperative.com/programs-services/bts/Documents/Secure/TS/Surveillance-CEATI-Report-Summary-Mobile-Substations-Pt-2-July-2020.pdf>
- **Article 3: Technical Specification Guidelines**  
<https://www.cooperative.com/programs-services/bts/Documents/Secure/TS/Surveillance-CEATI-Report-Summary-Mobile-Substations-Pt-3-August-2020.pdf>

## What do cooperatives need to know or do about it?

One cost-effective option involves participation in a mobile pool, which provides access to several mobile substations at a very affordable cost. Since mobile units spend most of their time in storage, there are significant cost savings to be gained by participating in a mobile pool. This Advisory shares the North Carolina Electric Membership Corporation's (NCEMC's) mobile pool experience and covers some issues for cooperatives to consider when developing or joining a mobile pool.

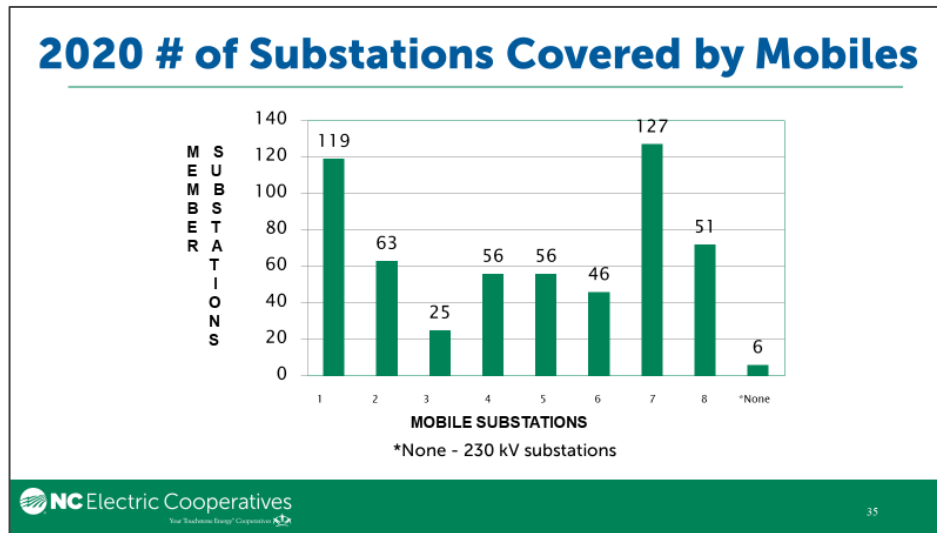
### NCEMC Case Study

NCEMC established a Mobile Substation Program in 1985 comprising eight mobile substations, three owned by cooperative members and five owned by NCEMC. These mobile units have ratings that range from 5 MVA to 30 MVA and voltages from 13.2 kV to 120 kV, and serve 269 substations with 354 transformers. The mobile substations provide emergency and non-emergency backup power at the lowest possible cost to electric cooperative members. Mobile units are used for maintenance, testing and construction, as well as for assistance during emergencies. The mobile pool currently includes 15 of the 26 cooperatives in North Carolina and one cooperative from Virginia.

The following figures show an example of a mobile substation and the number of substations covered by mobile units in 2020.



**Figure 1: Example of a Mobile Substation** (Courtesy of NCEMC)



**Figure 2: Number of Substations Covered by Mobile Units**  
(Courtesy of NCEMC)

## NCEMC’s Pool Organization

### *Management, Oversight and Fees*

NCEMC’s Board of Directors asks participating members to provide a representative to serve on a Mobile Pool Committee, which oversees operations of the fleet. NCEMC provides an administrator to manage the program and two field service technicians to handle maintenance and minor repairs. The administrator creates an annual budget that is approved and funded by pool members. An annual meeting is also held with the pool members (facilitated by NCEMC) to review mobile substation performance and testing, identify and discuss any program issues, present maintenance results, and perform spill prevention, control and countermeasure (SPCC) training for the members.

Under the fee structure, pool membership gives all of North Carolina’s electric cooperatives access to the program. Non-pool members are charged on a fee-for-service basis. Pool members are the first in line to use the mobile resources and receive several complimentary tests per year with costs revised annually based on transformer kVA requirements. All revenue from fee-for-service testing and usage is credited to offset annual mobile pool budget expenses. Major repair costs are capitalized in order to stabilize year-to-year rates for the members.

### *Mobile Pool Member Benefits*

Mobile pool member benefits include access to backup transformers with capacity up to 120 kV and 30 MVA. A minimum of two mobile substations are available for most voltage classes. Technical support is provided by NCEMC and DOBLE Engineering, and substation testing services are provided by NCEMC. A mobile pool online calendar has been developed, so that members can easily reserve a mobile unit.

Field service technicians (FSTs) perform quarterly and annual maintenance and handle minor repairs. Major repairs are performed by vendors, but are managed by the FSTs. The FSTs provide technical assistance in the

operation of the mobile units and testing of the mobile components. The FSTs coordinate and schedule the planned use of each mobile substation. They also provide training for NCEMC and member personnel in the operation of the mobile units and associated testing and oil containment equipment.

Testing of transformers and associated components is provided as part of the mobile pool program. Pool members are offered testing service provided by the FSTs at no additional cost to the members. These tests include power factor, excitation, winding resistance, transformer turns ratio, sweep frequency response analysis and demagnetization. Some of the test equipment is leased through DOBLE Engineering, and some of it is purchased through other vendors. As part of the leasing costs, DOBLE provides consultation and assists NCEMC in troubleshooting and interpreting test results for the mobile units and member substation equipment. This has proven a very valuable tool to members.

EMC Members of the mobile pool have the option to serve as a mobile substation contractor, responsible for storing mobile units at its facilities, performing routine and day-to-day maintenance of mobile units, and transporting the mobile substation to and from a service location. As contractors, they are reimbursed by the mobile pool for their maintenance costs. The contractors are responsible for mobilization, installation and removal of the mobile substations. All associated costs are paid by the user directly to the contractor.

## **Conclusion**

The goal of the NCEMC Board of Directors was to provide a dependable backup system at the lowest possible cost to all NCEMC members. This Mobile Pool Program has widespread support and helps keep the electric cooperative systems reliable and affordable. NCEMC would welcome the opportunity to assist other cooperatives in developing a Mobile Pool program or in answering any questions.

## **Contacts for Questions**

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