ARMER System

(Allied Radio Matrix for Emergency Response)

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Allied Radio Matrix
for Emergency Response

Biennial Report to the Legislature

December 2010

Prepared by
Minnesota Department of Public Safety
Emergency Communication Networks Division

2010 ARMER Biennial Report

Executive Summary

Established in 2004, the Allied Radio Matrix for Emergency Response (ARMER) Program, administered in coordination with the Statewide Radio Board, manages the implementation of the 700/800 megahertz (MHz) shared digital trunked radio communication system.

The ARMER backbone, which is owned and operated by the Minnesota Department of Transportation (MnDOT), is a robust, scalable, state-of-the-art system that is capable of servicing the radio communications needs of every city, county, state agency, tribal government and non-government public safety entity in the state. The ARMER system is the fundamental infrastructure necessary for emergency responders to achieve seamless interoperable communications.

The system was planned and designed for implementation in six phases. Phases 1 and 2 of the ARMER implementation were in the nine-county Minneapolis-St. Paul metropolitan area. Phase 3 provided coverage in 23 additional counties in central and southeastern Minnesota; tower construction was completed in 2010. With the passage of full funding to complete the ARMER system by the 2007 Legislature, the state Departments of Public Safety and Transportation, with approval from the Statewide Radio Board, plan to complete the construction of the system in the remaining 55 counties as one project — Phase 456.

The basic backbone of the ARMER Program, with 75 percent statewide coverage, will be in place across the state by the end of 2010. The Statewide Radio Board has set an operating standard for the ARMER system to provide 95 percent mobile coverage in each county of the state by the end of 2012, prior to the Federal Communications Commission (FCC)-mandated narrowbanding deadline.

Statutory Requirement

Minnesota Statutes 403.36, Subdivision 4, requires the Statewide Radio Board to submit a biennial status report to the governor, the chairs and ranking minority members of the House of Representatives and Senate committees with jurisdiction over capital investment, and criminal justice funding and policy.

The report must include a substantive assessment and evaluation of each significant part of the implementation of the statewide public safety radio plan with (1) to the extent possible, an update on risks and mitigation strategies; and (2) quantitative information on the status, progress, costs, benefits and effects of those efforts.

Background

Planning for a Twin Cities metropolitan area interoperable radio communication system started in the 1980s. In 1993 a request for proposal was developed through the Metropolitan Council for the construction of a regionwide shared radio system in the metropolitan area.

In 2001, a plan was developed to extend the metro system into a statewide system. The original plan called for six phases. Phase 1 was the initial metro-area backbone; Phase 2 was local enhancements to the metro-area backbone; and Phases 3 through 6 provided for the extension of the backbone into Greater Minnesota. Use of the metro system began in 2002 when the City of Minneapolis, Hennepin County, metro operations of the State Patrol and Department of Transportation (MnDOT), Metro Transit, Carver County and several suburban agencies in Hennepin County transitioned on the shared communication system.

There are a number of important factors driving a national effort to coordinate public safety interoperability. Foremost is the inability of emergency responders to communicate with each other at emergency events. Additionally, the FCC narrowbanding mandate will require substantial replacement of legacy communication systems, currently being operated by most local governments and state agencies, prior to 2013.

To address the narrowband requirement, Phase 3 was funded by the Minnesota Legislature in 2005. In 2007, the Legislature provided funding for the completion of the ARMER backbone in the remaining 55 counties in Greater Minnesota. The operating and maintenance costs, and the debt service on the 911 revenue bonds issued to construct the system, are paid for out of the 911 special revenue account. To-date, 58 percent of the 328 towers being built statewide are on the air, and 71 of 87 counties have passed resolutions to migrate to the ARMER system.

Costs

Phase 1

The planning and development of Phase 1 began in 1995 with the formation of the Metropolitan Radio Board (MRB). The statute creating the MRB provided that MnDOT would own, operate and maintain the shared trunked radio system. The initial backbone, which included basic communication and interoperability infrastructure, cost approximately $36 million. It was funded by the state and through revenue bonds supported by a dedicated portion of the 911 fees. Phase 1 improvements, which included coverage, capacity, mobile and portable radios, in Carver and Hennepin counties and Minneapolis cost approximately $32 million. This was paid for by the local entities.

Phase 2

Phase 2 implementation was aided by the allocation of $7.5 million from 2003 federal Homeland Security funds, which purchased public safety portable and mobile radios for local communities. Additional funds from the Minnesota Department of Public Safety (DPS) Division of Homeland Security and Emergency Management (HSEM) were allocated to cover a portion of local costs for developing the interoperable radio system.

Phase 3

In 2005, the Legislature appropriated $45 million for Phase 3 construction. Another $9.5 million was made available to local governments for local enhancements in Phase 3. The same funding package also contained $8 million in local enhancement grants for Phase 2 enhancements for Chisago, Isanti, Scott and Washington counties in the metro area.

Currently, 58 of 59 tower sites in Phase 3 are on the air. There are an additional eight sites in Phase 3 to bring the mobile coverage reliability to 95 percent county-by-county. Currently, four of the sites are started and four have yet to be started.

Phase 456

The state has authorized $186 million for the completion of the Phase 456 backbone with an additional $3.75 million appropriated for advanced Phase 456 site work. The total available funding for the Phase 456 is $189.75 million.

System design criteria will increase mobile coverage reliability to 95 percent county-by-county, resulting in an additional 40 towers in Phase 456 and approximately 10 additional towers in Phases 1 and 3.

Construction Budget Status as of September 13, 2010

Project Funding	Original Budget	Spent to Date	Balance Remaining	Encumbered	Available Balance
Phase 3*	$45,000,000	$41,005,531	$3,994,469	$886,615	$3,107,854
SRB Funds (FY 09)	$1,902,831	$1,760,532	$142,899	$0	$142,899
Phase 456 (FY 09)	$62,000,000	$48,142,684	$13,857,316	$13,856,686	$630
Phase 456 (FY 10)	$62,000,000	$3,408,460	$58,591,540	$18,350,179	$40,241,361
Phase 456 (FY 11)	$62,000,000	$0	$62,000,000	$0	$62,000,000
Total	**$232,902,831**	**$94,317,207**	**$138,586,224**	**$33,093,480**	**$105,492,744**
Contingency as of July 2010					**$20,771,880**

* Phase 3 funds must be encumbered by December 31, 2010.

Bonds Sold in 2008

In 2008, the state of Minnesota issued and sold 911 revenue bonds for the ARMER system totaling $42,205,000. The bonds, which received a high 3-A rating from all bond-rating agencies, are backed with a dedicated funding source in the 911 Special Revenue account. The rating and sustainable funding contributed to the sale of all the bonds even in the current challenging economic period.

Bond Sale for 2009

In 2009, the state of Minnesota issued and sold additional 911 revenue bonds for the ARMER system totaling $60,510,000. These bonds are also backed with the dedicated funding source of the 911 Special Revenue account.

Bond Sale for 2011

MnDOT, which is building the system, and DPS have determined that another bond sale of approximately $46 million will be needed in 2011. MnDOT and DPS are working with Minnesota Management and Budget (MMB) to arrange a bond sale in early 2011.

911 Fees

The 2007 legislation permitted DPS to raise the 911 fee 10 cents on July 1, 2008, 2009 and 2010. After July 1, 2010, it can be raised but not to exceed 95 cents per 2007 Minnesota Session Law, Chapter 54. DPS chose not to raise the fee in 2008 because there was no need at that time to generate revenue for debt service on bonds. In 2009, the fee was increased from 65 cents to 75 cents. On August 1, 2010, the 911 fee was increased to 80 cents. It is anticipated that the fee will be increased on July 1, 2011 to 90 cents and then to 95 cents in July 2012.

Status and Progress

In 2005, the Minnesota Legislature provided funding for the continued implementation of the ARMER backbone in 23 counties of central and southeastern Minnesota. Implementation is underway and will be substantially complete in 2010. Implementation in the remaining 55 counties of the state was authorized in 2007; MnDOT has completed the detail design and began initial implementation in July 2008.

All metro-area cities and counties are now operating on the ARMER system. In Phase 3, Olmsted and Stearns counties, including the cities of Rochester and St. Cloud, are operating on the ARMER system. In southeast Minnesota, the counties of Freeborn, Goodhue, Wabasha, and Winona are in the process of migrating to the ARMER system. In central Minnesota, Benton, Douglas, Grant and Otter Tail counties are in the process of transitioning to ARMER; Kandiyohi, Sherburne and Wright counties have completed the process. The balance of the counties in the Southeast and Central Regions, except Mower and Waseca counties, are in the process of completing their participation plans and will migrate to the ARMER system.

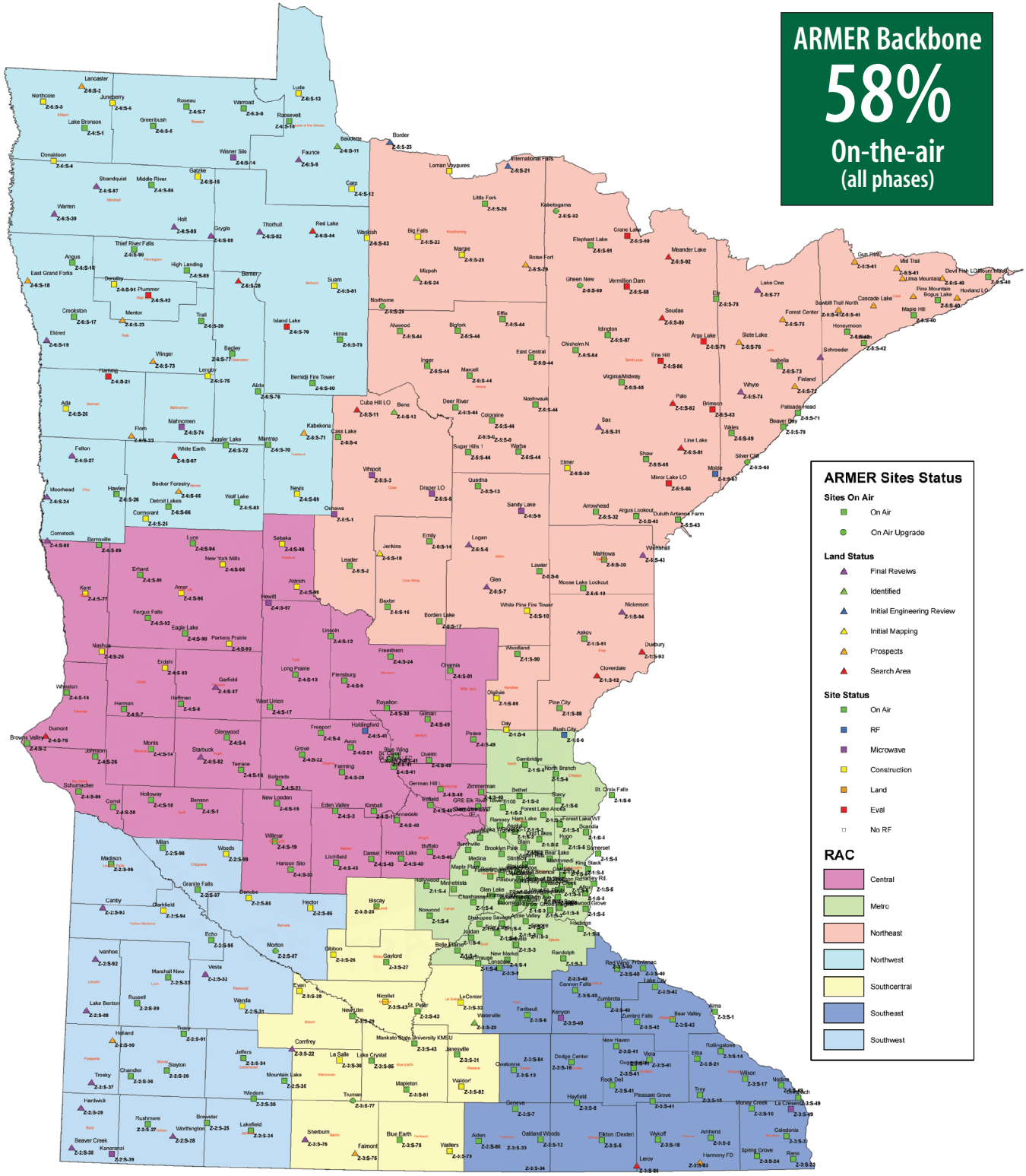
With the authorization and funding to complete the statewide implementation provided by the Legislature in 2007, and the ARMER Program having completed the studies required by that legislation, Phases 4, 5 and 6 were rolled in to a single phase referred to as “Phase 456.” In that phase, Itasca County built a compatible infrastructure that has been integrated into the system.

The remaining counties in Phases 456 have partnered with the ARMER Program to complete county-specific assessments of their communications systems. The assessments assisted county boards and emergency responders to make informed business decisions related to updating their radio communications systems prior to the FCC-mandated narrowbanding deadline of January 1, 2013. To date, 71 of 87 counties have decided to migrate to the ARMER system.

The map on page 4 shows the planned location of the more than 300 towers that will comprise the backbone of the ARMER system once implementation is complete. As owner and operator, MnDOT is at various stages in the site development process throughout Phase 3 and Phase 456. The process includes land acquisition, construction of towers, and equipping the towers with microwave and radio frequency equipment. Approximately one year to 20 months is required to construct an operable tower and bring it online.

With towers in northeast Minnesota coming on the air in December 2010, the basic backbone of the ARMER Program has reached 75 percent statewide coverage. The goal of the ARMER Program is to provide 95 percent mobile coverage in each county of the state by the end of 2012, prior to the FCC-mandated narrowbanding deadline

ARMER Tower Sites



Scheduled Milestones/Deliverables

Status Updated November 3, 2010

Milestone	Total Sites	Sites Not Started	Sites In Progress	Sites Complete	Completion Target
Phase 3 ARMER Backbone Construction					
Original Phase 3 Sites	59	0	1	58 On the Air	59
Added Sites for 95% Coverage (Dumont is a microwave only site)					
Tower Site Acquisition	9	0	4	5	
Tower Construction and Site Development Work	9	4	1	4	
Microwave Connectivity and RF Deployment	9	5	1	3 On the Air	
Phase 456 ARMER Backbone Construction	225 Sites*				By July 2011
Tower Site Acquisition	225	0	79	146	
Tower Construction and Site Development Work	225	79	37	109	
Microwave Connectivity and RF Deployment	225	116	11	98 On the Air	150

* Sites have been tentatively added and deleted in Cook County. A plan change is in progress.

Phase 1 add-on site at Rush City (Chisago County) is waiting for microwave connectivity and Day (Isanti County) is in construction status.

Some towers are on the air, but on the old towers. They are counted as on the air, but still require construction and/or installation at the new tower sites before they are complete.

Completion Targets

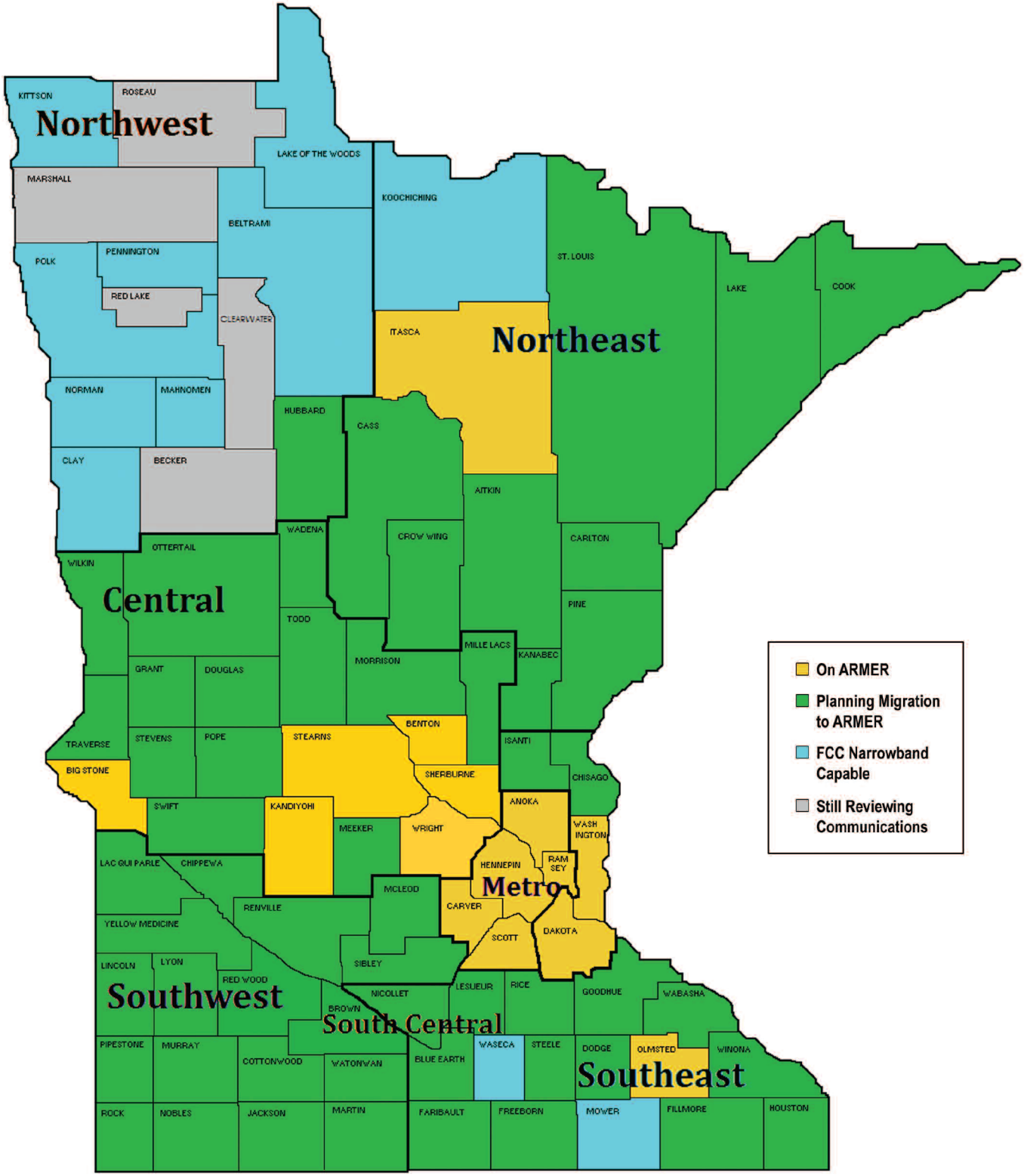
Phase 3

- 100% site acquisition completed by September 1, 2008 (100% complete January 2009)
- 100% tower site work completed by January 1, 2009 (100% complete March 2010)
- 100% microwave and RF deployment by April 1, 2009 (98% complete November 2010)

Phase 456

- 50 towers complete by July 1, 2009 (FY 09) (18 completed July 2009)
- 100 towers complete by July 1, 2010 (FY 10) (74 completed July 2010)
- 150 towers complete by July 1, 2011 (FY 11) (98 complete November 2010)
- 200 towers complete by July 1, 2012 (FY 12)
- 225 (100%) complete by July 1, 2013 (FY 13)

ARMER Participation Status



Risks and Mitigation Strategies

A number of potential factors represent risk, which if realized, could jeopardize the completion of the ARMER project.

One serious risk is increasing costs, such as for steel, land, and other system components. With the passage of the funding package for Phase 456, the Legislature required DPS to validate MnDOT's cost estimates, to ensure the final phases could be completed for the $186 million authorized in the bill.

DPS hired L. Robert Kimball & Associates in 2008 to perform an independent cost audit for Phase 456. The cost audit was required before the 911 fee, which is the funding mechanism to pay the debt service on the bonds, could be raised.

Kimball developed a cost projection model based on these factors most likely to affect MnDOT's cost estimates.

- Motor gasoline
- Steel mill products
- Real estate costs
- Consumer price index
- Employment cost index
- Producer price indexes for ready-mix concrete, materials and components for construction, and long-distance freight.

Another risk is legislative utilization of funds from the 911 Special Revenue Account for purposes other than emergency networks. This action could result in the loss of the 3-A rating on the 911 revenue bonds issued to fund ARMER construction. Lower bond ratings could impede the sale of bonds in the current economic environment or could result in prohibitive interest rates which would lead to a lack of funding to cover the debt service on the bonds.

Other risks concern timely completion of the project. The narrowbanding deadline of December 31, 2012, is the date when the ARMER backbone must be sufficiently operational to allow all agencies wishing to migrate to the system to do so rather than narrowband their VHF equipment. The Phase 456 build-out of 225 sites is scheduled to be near completion by December 31, 2012. However, it is estimated that approximately 20 sites may not be completed by that date due to complications with acquiring land. Consequently, select site acquisition and equipment purchase will be delayed until imminent need is realized.

The DHS National Emergency Communications Plan defines further deadlines in a series of federal goals that establish a minimum level of interoperable communications. Lack of compliance with the goals and respective deadlines carries risk, primarily in federal support. The three strategic goals are:

- By 2010, 90 percent of all high-risk urban areas designated within the Urban Area Security Initiative (UASI) are able to demonstrate response-level emergency communications within one hour for routine events involving multiple jurisdictions and agencies.
- By 2011, 75 percent of non-UASI jurisdictions are able to demonstrate response-level emergency communications within one hour for routine events involving multiple jurisdictions and agencies.
- By 2013, 75 percent of all jurisdictions are able to demonstrate response-level emergency communications within three hours of a significant event as outlined in national planning scenarios.

The following events and actions have or will mitigate these risks.

- Economic conditions at the time of the cost estimate in 2008 raised fears of dramatic cost increases, especially in the price of steel. In the current economic climate, the price of key resources such as steel, fuel, and real estate have stabilized and that pattern is likely to continue for the near future.
- Most of the equipment purchases and many of the tower projects have already been completed, avoiding some of the risk of future cost increases.
- Several bond sales have now occurred, with one more significant bond sales remaining. The dedicated funding of the 911 fund has been a factor in obtaining favorable interest rates.
- Over 58 percent of the backbone towers are already on the air, providing sufficient coverage to migrate state agencies to ARMER well in advance of the 2012 narrowbanding deadline, and reducing the risk that the remaining towers needed by local agencies will not be completed by then also. The implementation schedule of ARMER has been sufficient to meet the DHS National Emergency Communications Plan goals.

Benefits

The ARMER Program will ultimately provide Minnesota with the infrastructure and resources to allow its emergency responders to communicate with each other at any time regardless of the nature or scope of an event.

The availability and efficiency of this specific communication structure — interoperability — is not only a safety issue for emergency responders, but it also can be a life-or-death issue for those requiring assistance.

Interoperability is also a force multiplier; it allows personnel that would otherwise be dedicated to communications to be used more effectively and efficiently in an event response.

Local and state government investment in the ARMER system has yielded a high return relating to performance at large-scale planned and unplanned events (see sidebar).

However, it is most critical to note that the system provides continual, day-to-day benefits to emergency responders on routine calls. While the benefit the firefighter gains by being able to communicate three floors below ground or the benefit the police officer has to instant communication with officers from another jurisdiction in a felony pursuit is not easily quantifiable, ARMER does result in enhanced public safety for emergency responders as well as the citizens they serve.

Performance Highlights

Flood Response Aided by ARMER, 800 mhz Radios

In anticipation of Red River Valley spring flooding, the Big Stone County Sheriff's Office went live with 800 megahertz radios at 8 a.m. on March 12, 2010. The 20 portable radios, supplied by DPS Emergency Communication Networks, were to be used by area law enforcement and ambulances.

At the height of the flooding, the county deployed 12 portables in addition to their own radios to support various sandbagging crews, debris removal teams and monitors. This resulted in approximately 25 to 30 radio-equipped personnel. As radios were needed, personnel were assigned and a crash course in usage was given. Plain speak was utilized for ease of communications for the layman.

"To say that the system worked flawlessly would be an understatement," says Big Stone County Sheriff John Haukos. "In previous floods, we had neither the equipment nor the capacity to provide this level of communications. County and state lines were immaterial during the operation, and coverage was excellent throughout the area, and on both sides of the lake."

There was one particularly demonstrative example of the benefit of the ARMER system. To remove debris from the bridge at the south end of the lake, joint resources utilized boats and large backhoes — and the scene-of-action channel to maintain communications for safety at the removal site and to coordinate backhoe activity to boat operators. This allowed responders to keep their regular radio channels clear.

Also, present during the entire event was County Commissioner Roger Sandberg who also serves on the Central Minnesota Regional Radio Board. He was able to see the system in action and hear comments from firefighters who utilized the system — and who now look forward to getting on the system.

ARMER Enables Kandiyohi's Response to Haz-Mat Crash

In December 2009, one day after Kandiyohi County went live on the ARMER system, a truck roll-over occurred in the county on State Highway 23. The truck was loaded with explosives – dynamite, blasting caps and more. The crash would shut down traffic on the road for several hours.

Multiple agencies were enlisted to assist, including a haz-mat team from St. Cloud in Stearns County. Fortunately, ARMER allows agencies and responders from different cities and counties to communicate with each other. Regional "talk groups," which restrict communication to a targeted audience, allowed for clear and direct communication with the haz-mat teams as soon as they received the call in St. Cloud.

Additionally, Kandiyohi Sheriff's Office was able to spread multiple tasks over multiple talk groups to better control the radio traffic and avoid confusion.

Conclusion

Then and Now

Thirty months ago, Minnesota had two regional radio boards: the Metropolitan Emergency Services Board and the Central Minnesota Regional Radio Board.

Also only 30 months ago, only five counties were operating on the ARMER system. Today, 71 counties are either on the ARMER system or have committed through county board resolution to join. The level of local participation puts Minnesota in the top five states in the country in terms of local and state collaboration.

Today, all 87 counties and a number of cities are participating in regional governance structures. These legally recognized joint powers boards are made up of elected county commissioners and city council members. The boards' mission is to fill the interoperability gaps on a regional level and manage local migration to the ARMER system. The Regional Advisory Committees and Regional Radio Boards are the core of Minnesota's governance structure.

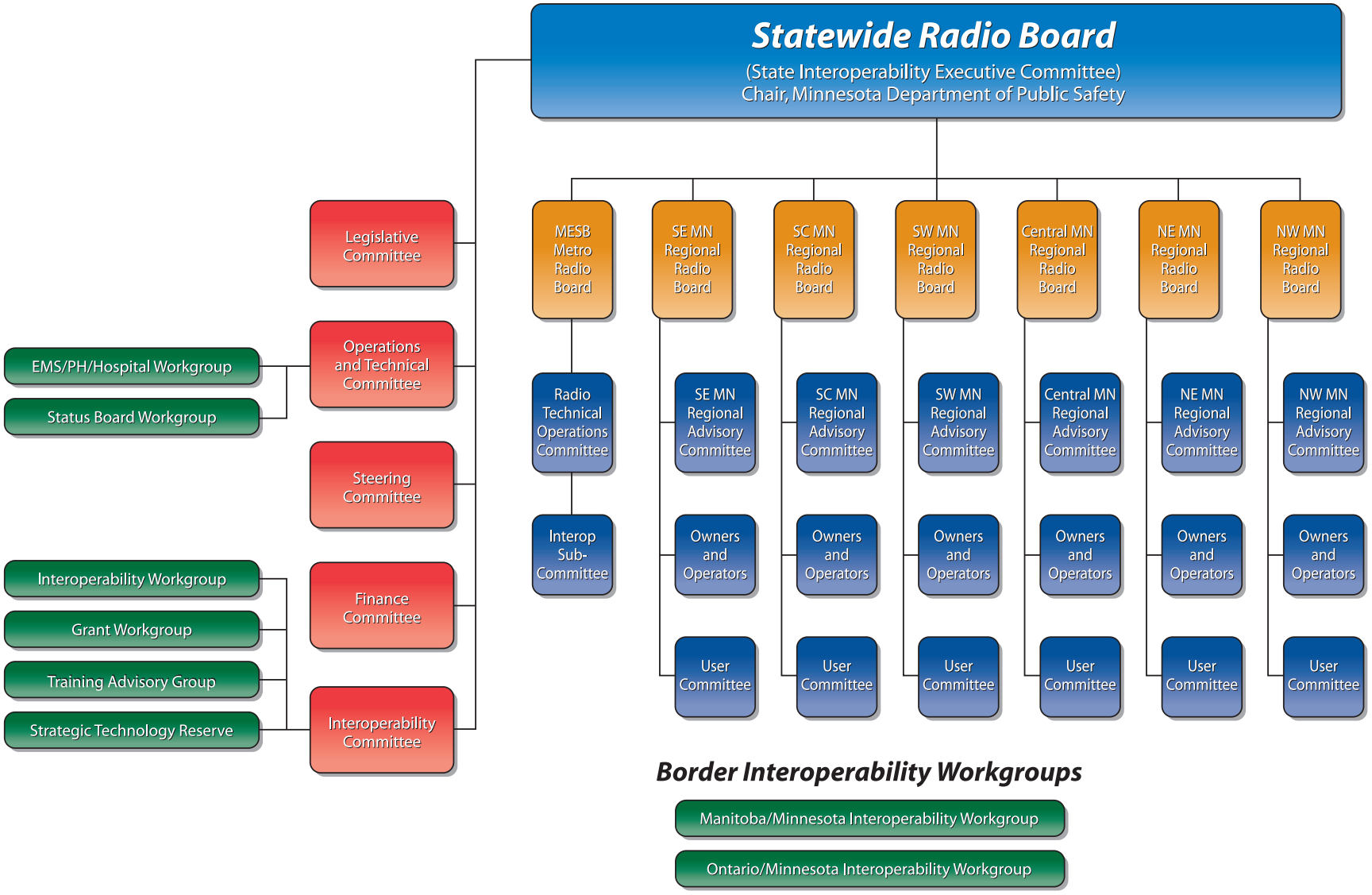
Local officials across our state readily recognize that a lack of communications interoperability is a significant public safety issue for their citizens and emergency responders. As a result, many elected officials have willingly embraced participation on joint powers boards, and joint powers agreements that have been reached among many county and city attorneys — clear testament to the value and importance of the ARMER system and the goal of achieving seamless statewide interoperability.

In its continually forward-moving progress of communications interoperability as evidenced by the ARMER system, the state of Minnesota is a nationally acknowledged leader. ECN has assisted states such as Iowa and Missouri as they attempt to model their governance and radio systems on Minnesota's success. Additionally, ECN staff has addressed inquiries about the ARMER system and governance from the states of Arizona, Arkansas, Idaho, Montana, Nebraska, Oregon and Virginia.

It is of particular financial note that in the worst lending marketplace in decades, the ARMER system has been able to keep moving forward because the debt service for its bonds is backed by the 911 funds, a dedicated source of funding.

Most other states and entities trying to replicate ARMER's functionality have relied heavily on federal influence and funding to move their processes along. In Minnesota, the implementation was initiated long before the well-documented communications problems of September 11 in New York City, with no federal directive or funding. The availability of federal funding incentives has allowed the state and local agencies to accelerate the already envisioned implementation and growth of ARMER.

Resolving communications interoperability gaps is fundamentally changing how emergency services are delivered across Minnesota — and the success to-date as well as future success is only possible with the continued support of Minnesota's state and local elected officials.



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