



Narrowband Mandate and State Agency Communications Systems

ISSUE

The federal government mandated that all non-federal public safety license holders on frequencies ranging from 150-512 MHz reduce their operating bandwidth from 25 kHz to 12.5 kHz narrowband channels and update their operating licenses by January 1, 2013. Failure to do so will result in the loss of communication capabilities and fines. This **Issue Review** analyzes the impact to State agencies of the federal mandate requiring all two-way radio systems and some paging networks, including those used by public safety agencies, to meet the new narrowband requirements by January 1, 2013. This **Issue Review** does not address the impact to local communications systems. Narrowbanding analog channels to comply with the FY 2013 federal mandate may result in gaps in tower coverage due to the reduction of bandwidth and may need to be addressed. Narrowbanding channels is an issue separate from the issue of upgrading to P-25 (digital) radios. (NOTE: A definition of key concepts and acronyms is included at the end of this document.)

AFFECTED AGENCIES

Departments of Public Safety, Transportation, Natural Resources, Public Health, and Corrections; Homeland Security and Emergency Management Division; educational institutions; and local public safety and public works entities

CODE AUTHORITY

Chapters 80 and 693

BACKGROUND

Blocks of radio spectrum are called channels or talk groups. In Iowa, there are an estimated 26,000 users of public safety communication channels or talk groups including fire, law enforcement, emergency management, medical services, and communications agencies. Per the federal mandate, by January 1, 2013, all two-way radio system licenses in the VHF band (150-174 MHz) and the UHF band (421-512 MHz) must be modified to narrowband emissions and all two-way radios must cease operating in the wide-band mode and only operate in the narrowband mode. Radios that operate in the 700 and 800 band are not affected by this federal mandate. Narrowbanding channels from 25.0 kHz (wideband mode) to 12.5 kHz (narrowband mode) allow additional channels to exist within the same limited radio spectrum. By January 1, 2017, the federal government is mandating that public safety agencies using 700 MHz systems must be operating with 6.25 KHz emissions/equivalency.

Currently, most public safety radio systems in Iowa use 25.0 kHz channels and 85.0% of the systems are a combination of VHF (75.0%) and UHF (10.0%) frequencies. Depending on the age of the radio equipment, radio users can remain on their current frequencies and continue to operate in analog as long as they comply with the federal mandate to reduce channel bandwidth

and update their operating license. It is this group of radio users that are impacted by the narrowbanding mandate.

State and local agencies need to assess their current radio equipment to determine if it is narrowband-capable (usually only newer equipment) or if it needs to be replaced (older, nonconvertible equipment). Agencies that do not migrate to narrowband 12.5 kHz channels by January 1, 2013, face the loss of communications capabilities, cancellation of their Federal Communications Commission (FCC) communication license, and a possible federal fine. This will impact radios used in State government including the Departments of Public Safety, Transportation, Natural Resources, Public Health, and Corrections.

Reducing the bandwidth from 25.0 kHz to 12.5 kHz will reduce radio and pager coverage. Agencies that narrowband in analog will have further reductions in coverage. However, agencies may use this opportunity to upgrade to digital technology. Narrowbanding the current DPS analog system may result in approximately one-fourth of the State being without radio coverage unless some corrective steps are taken to ensure continued coverage such as converting all DPS tower sites to digital. Federal Engineering, the consultant retained through a competitive bid process, developed a master communications plan for the state of Iowa. The plan includes building a statewide, 700 MHz, P-25 (digital) system that will provide 95.0% coverage on a county by county basis. The 700 MHz system calls for a total of 265 tower sites. It is estimated that 35 additional/new tower sites would need to be added to the existing 230 State, local, and private tower sites.

Narrowbanding may also affect two-tone paging systems and monitoring by scanners. Agencies need to assess their current tone paging and scanner equipment to determine if it is capable of receiving narrowband communications. This will primarily affect local agencies and volunteer fire departments.

Digital radios can be dual mode capable allowing for operation in wideband analog as well as narrowband analog and digital. Dual band radios can operate on both the 700 MHz/800 MHz frequencies. Digital is also more immune to adjacent channel interference than analog. Both digital and analog systems are capable of providing enhanced features such as emergency alert, caller ID, and short data messaging.

Frequency Bands

The most common system frequency band currently used by State and local agencies is VHF (high-band). This band has a limited number of channels available compared to the 700 or 800 MHz band and is also subject to more atmospheric interference. This frequency band carries the statewide mutual aid channels and is commonly known as the Sheriff's channel. This band is also used by volunteer fire departments for day-to-day operations and many agencies reserve use of this frequency as a backup mechanism.

Ambulances, hospitals, and some law enforcement and emergency services providers tend to use the UHF band.

Iowa Statewide Interoperable Communications System Board (ISICSB)

The ISICSB, created by the General Assembly in 2007, has developed a statewide communications Master Plan to increase interoperability among public safety agencies

throughout Iowa.¹ This Plan provides for a migration to or interconnection with the 700 MHz band and is not affected by the federal narrowbanding mandate. The Master Plan also focuses on a migration towards P-25 (digital) equipment.

P-25 Requirements

The majority of radios in State government can be reprogrammed to operate in narrowband. However, the majority of radios in State government are not P-25 (digital) radios. The P-25 suite of standards for digital radio communications provides an open interface to the radio frequency and allows the interlinking of different systems enabling communication with other agencies and mutual aid response teams in emergencies. The P-25 standard is a common platform that allows greater interoperability regardless of the manufacturer of the equipment. For example, radios from one manufacturer that are not P-25 compliant may not be able to communicate with another manufacturer's non-P-25 radio.

The ISICSB's Master Plan recommends P-25 (digital) equipment. Although the equipment may cost more, it has more capabilities. Public safety agencies wishing to purchase P-25 equipment may use the State contract for purchasing found on the Department of Administrative Services (DAS) website.

Interconnect Systems

An interconnect system allows radios to communicate even if they are on different frequencies or have the same frequency band but operate under different protocols. This equipment can link older radio systems with officers using new technology or radios from a different vendor. Gateway is one type of interconnect system that can serve as a link between disparate or legacy systems (VHF, UHF, 700 MHz, and 800 MHz). Gateways transmit and receive audio through multiple externally connected communication devices. There are several manufacturers who provide these types of services.

States Surrounding Iowa

Federal Engineering reviewed the communication systems in states surrounding Iowa as a part of the process when developing the Iowa Statewide Interoperable Communications System Master Plan. The results are summarized below.

- **Illinois** – The State of Illinois operates a 700/800 MHz statewide P-25 (digital) trunked system called STARCOM21 allowing for interoperability among State agencies, counties, and cities that have joined the System. Three essential VHF mutual aid channels are used for interoperability throughout the State. Interoperability on the UHF frequency is implemented at the local and regional level. There is currently no FCC-approved 700 MHz channel plan. There are also five channels on the 800 MHz frequency used for interoperability.
- **Minnesota** – The Statewide Radio Board (SRB) was created by the Minnesota General Assembly in 2004 to implement a statewide interoperable public safety radio and communication system plan. The plan evolved out of the implementation of a regional interoperable radio system in the Minneapolis/St. Paul metropolitan area in 2001. The statewide public safety radio system commonly referred to as ARMER (Allied Radio Matrix for Emergency Response) is an 800 MHz digital trunked system that allows frequencies to

¹ Full text of the Master Plan is available at: http://isicsb.iowa.gov/documents/federal-reports/11-08-2009_ISICS%20Master%20Plan_V1.pdf

be pooled and shared. Interoperability on the VHF and UHF frequencies is currently implemented at the local and regional levels. The 700 MHz system is currently in the planning stages and five channels are being utilized on the 800 MHz frequency.

- **Missouri** – The State has both VHF and UHF public safety radio bands including six channels on VHF and five channels on UHF. In the 700 MHz frequency, 34 specific channels have been identified and five channels in the 800 MHz frequency. Missouri has a State Interoperability Executive Committee and requires a Memorandum of Understanding (MOU) to use channels designated for public safety purposes.
- **Nebraska** – The Nebraska State Interoperability Executive Committee was created on November 26, 2001, by the Governor with the intent to administer the interoperability spectrum. Nebraska operates on five VHF channels and five UHF channels. The 700 MHz system is currently in the planning phases and no interoperability channels are in use on the frequency to date. There are also five channels on the 800 MHz frequency. In addition, mutual aid frequency assignments are shared by State and local jurisdictions.
- **South Dakota** – The State operates a 54-site digital trunked VHF statewide radio system which provides statewide interoperability. The system links State and county agencies, and municipalities, with the exception of some campus facilities, with other agencies in South Dakota. Interoperability is provided statewide on the VHF frequency and through four channels on the UHF frequency. There are no interoperability channels on the 700 MHz or 800 MHz frequencies.
- **Wisconsin** – The State of Wisconsin does not have an interoperable statewide communications system. There are three mutual aid channels in Wisconsin. Interoperability on the VHF and UHF frequencies is currently implemented at the local and regional levels. One of Wisconsin's regions has submitted and gained approval to operate on the 700 MHz system frequency and there are five channels being utilized on the 800 MHz frequency.

CURRENT SITUATION

700 MHz Frequency

As part of the Master Plan, the ISICSB petitioned the Federal Communications Commission (FCC) for permission to use the 700 MHz broadband spectrum for wireless data communications to compliment its 700 MHz voice channels authority. On May 12, 2010, Iowa was one of 21 city, county, and State governments granted a conditional waiver by the FCC to use the 700 MHz frequency in the D-block for data channels. Data channels include text messaging, electronic mail (e-mail), computer-aided dispatching, latitude/longitude mapping, global positioning (GPS), and video and database transfer. Other States that received the waiver include Alabama, Hawaii, Mississippi, New Jersey, New Mexico, New York, and Oregon as well as the District of Columbia. The 700 MHz channels are a key component in a national master plan that have been dedicated by the FCC for the nationwide use of public safety users allowing interoperability between disparate systems using a common frequency band that will reduce channel interference from commercial and nonpublic safety entities. The FCC is requiring the 21 entities to build broadband networks that operate under a common interoperability framework ensuring they are technically compatible and fully interoperable on a national level. An additional 25 entities have applied for the same waiver including four other States: Maryland, Florida, Oklahoma, and Texas. Iowa applied for federal funding through the Broadband Technology Opportunities Program (BTOP) but no funding was awarded.

Current Radio Equipment Needs:**Department of Public Safety (DPS)**

The DPS consists of the following divisions: Administrative Services; Criminal Investigation; Narcotics Enforcement; State Fire Marshal; and the State Patrol.

The Department is divided into six communication regions using 28 tower sites across the State. There are approximately 1,400 DPS radios including 600 portable (hand-held) and 800 mobile (vehicle-mounted) devices. In addition, there are approximately 400 vehicle repeaters used in the State Patrol vehicles. The vehicle repeaters serve as a link between the Trooper's hand-held portable device and the mobile radio mounted in the car to allow communications to be broadcast out to others when an officer is away from the vehicle.

In April 2011, the Department will begin the process of narrowbanding the DPS operations channel commonly known as BASE including programming the radios and site equipment. The plan is to begin in the northwest corner of the State and proceed clockwise east and south finishing up in the northwest corner. The estimated completion of this update is August 2011. In addition to DPS, the BASE channel is utilized by the Departments of Natural Resources and Transportation as well as federal agencies.

In April 2012, the Department will begin narrowbanding the LEA channel. The LEA channel has a large user base including local law enforcement. The goal is to have this process completed by September of 2012. This includes Mutual Aid, Point-to-Point, the I.O.W.A. Channel, LINC in Polk County, and Area 11 in Linn County. The same implementation plan will be used for this process beginning in the northwest corner of the State continuing clockwise around the State.

Department of Natural Resources (DNR)

The DNR recently completed an inventory of all its radio equipment across the State. The majority of radios in use by the DNR are contained within the State Parks Bureau and the Law Enforcement Bureau. The DNR radios need to be narrowbanded by April 2011. The DNR uses VHF equipment and operates on the DPS infrastructure for dispatching purposes. In the Parks Bureau, there are 83 mobile and 141 portable radios (224 total). Of these radios, 24 cannot be narrowbanded (nine mobile and 15 portables). In the Law Enforcement Bureau, there are 109 mobile radios and 105 portable, handheld radios. Of these radios, approximately 87 mobiles cannot be reprogrammed to narrowband.

Department of Agriculture and Land Stewardship (DALSS)

The Department uses a limited number of radios. Communications are provided by RACOM, a commercial service provider operating on the 800 MHz frequency band. There are 24 800 MHz portable radios and six mobile radios (800 MHz) installed in the veterinarian trucks for contact with local jurisdictions, as well as the DPS, through the LEA channel on the DPS network. There are also two VHF mobile radios installed and four radios awaiting installation in the veterinarian trucks. All the VHF mobile radios are narrowband compliant. None of the radios in the Department of Agriculture meet the P-25 requirements.

Department of Transportation (DOT)

The Iowa DOT has two divisions that utilize radio communications: the Motor Vehicle Enforcement and Highway Support (maintenance workers) Divisions. The Information Technology Division purchases all radios for the DOT. The Iowa DOT uses 175 tower sites throughout the State. The DOT owns approximately 1,450 radios includes 1,250 mobile (vehicle-mounted) and 200 portable (hand-held) devices. In addition, there are approximately 125 vehicle repeaters to allow portable radios to communicate via mobile radio broadcasting to

other officers. All of these radios can be reprogrammed to narrowband. The DOT radio equipment is purchased with Road Use Tax Funds.

The DOT is in year two of an eight-year project to upgrade all the radios. Approximately 400 radios have been replaced so far. These radios are capable of operating in VHF, the 700 MHz and 800 MHz frequencies, and are P-25 capable. In April 2011, the DOT will begin the process of narrowbanding tower sites. The plan is to coordinate efforts with the DPS and follow their implementation plan. As the DPS tower sites are upgraded, the DOT sites and radios will be upgraded at the same time.

Department of Public Health (DPH)

The Iowa DPH coordinates emergency medical services across the State. Public Health has 66 VHF radios and 389 RACOM radios (commercial service provider network in the 800 MHz band) of which 55 are in the actual Department. The RACOM radios are also in hospitals, local public health agencies, community health centers, and other partner agencies. Each of the 117 hospitals is equipped with VHF and RACOM radio equipment. All of the VHF radios can be reprogrammed to narrowband. None of the DPH radios meet the P-25 requirements.

Homeland Security and Emergency Management Division (HSEMD)

The Division uses a limited amount of radio equipment since primary communications are handled through the DPS and the Iowa National Guard. The Division has approximately 11 radios operating on a radio lease agreement through RACOM. This includes eight portable and three mobile encryption-capable radios operating on the 800 MHz band. All the current radios in the Homeland Security Division have been reprogrammed to narrowband and are interoperable-capable.

Iowa National Guard

The Iowa National Guard is interconnected by high frequency radios throughout the State at approximately 42 armories and three Air Units. The Iowa Air National Guard has 300 radios that are P-25 and narrowband compliant. In FY 2007, the Air National Guard purchased 56 VHF radios totaling \$130,000, completing the P-25 upgrade.

The Iowa Army National Guard has approximately 500 Combat Land Mobile Radios (CLMR) and 920 Land Mobile Radios (LMR) provided by the federal government since 2006 and valued at approximately \$3.0 million. The LMR is a non-tactical, hand-held radio that meets narrowband and P-25 requirements that can be used for Homeland Security and to support civilian agencies. Joint Forces Headquarters also has 61 VHF radios and 12 RACOM radios available.

Department of Corrections (DOC)

The DOC has nine institutions and eight Community-Based Corrections Districts with 20 locations for residential facilities across the State of Iowa. Inmate transportation between facilities and to work sites requires the use of radios. The Department does not have its own wide area radio system, but uses a combination of mutual-aid frequencies and commercial services. Vehicles equipped with VHF (high-band) radios operating on the LEA channel support the inmate transport process.

The DOC has 2,146 radios and approximately 923 (43.0%) are noncompliant and cannot be reprogrammed to narrowband. The number of radios (2,146) may or may not include the eight CBC District Departments. Approximately 85.0% of the DOC radios are 10 to 30 years old and

in need of replacement. The Fort Dodge Correctional Facility and Mitchellville are both on an 800 MHz system (RACOM) and are not affected by the FCC narrowband mandate since they are on a higher frequency than the 150 to 512 MHz range (VHF) affected by the mandate.

BUDGET IMPACT

All State agencies are being encouraged to inventory their radio equipment. With tight budgets, funding for radios and overtime is scarce and agencies are being encouraged to set up schedules to program all public safety VHF/UHF mobiles and control stations to narrow BASE and narrow LEA+ channels using current staff and resources. The cost of a P-25 (digital) radio is approximately \$5,000 compared to the cost of a standard radio at approximately \$1,500. Per the FCC Narrowband Mandate, by January 1, 2011, all new radios sold in the United States must be narrowband capable.

The total cost for State agency compliance in FY 2013 is approximately \$8.2 million to meet the narrowband mandate. Of the \$8.2 million, \$810,000 is being funded from the Road Use Tax Fund (RUTF). The remaining \$7.4 million would need to come from another funding source.

The overall radio cost, including the narrowband mandate and the P-25 (digital) radios, is estimated to be \$40.5 million at today's cost. Of the \$40.5 million total, \$10.5 million is being funded from RUTF dollars. The remaining \$30.0 million would need to come from another funding source .

The table below is based on current radio cost estimates as of October 2010. Costs will vary depending on the radio manufacturer and what options and accessories are chosen. Prices may change due to inflation (potential increased cost), bulk purchasing (potential decreased cost), or any change in the number of radios purchased by the various State agencies (potential increased or decreased cost if agencies reduce or add radios to the number currently provided to the LSA).

State Agency Radio Communications Estimate

Department	Cost Estimate for FY 2012 to comply with the FY 2013 Narrowband Mandate	Total Cost Estimate Including P-25 Radios
Public Safety	\$ 5,400,000	\$ 15,800,000
Natural Resources	154,000	900,000
Public Health	0	2,275,000
Agriculture	0	180,000
Corrections	1,800,000	10,790,000
Transportation	* 810,000 *	* 10,530,000 *
	\$ 8,164,000	\$ 40,475,000
Homeland Security and Emergency Management Division		Complete
National Guard		Complete

Notes:
 * Already has an indetified funding source - Road Use Tax Fund (RUTF)
 The total cost column includes the FY 2013 column figures.
 The radios in Public Health and Agriculture are already operating on an 800 MHz frequency.

- **Department of Public Safety**

The UHF Crossband Vehicular Repeaters in the State Highway Patrol cars are not narrowband capable and will need to be replaced by FY 2013 to be in compliance with the federal mandate. In addition, the mobile radio that communicates through the vehicular repeaters needs to be replaced. The Department of Public Safety is proposing purchase of dual band radios that are P-25 compliant. The estimated cost to replace 419 vehicle repeaters and 419 mobile radios is \$5.4 million, an average of \$6,400 per unit.

The Department does not have an equipment line-item budget for radios. In the past, the Department has used Asset Forfeiture Funds and grants to purchase radio equipment on an as-needed basis. The most recent purchase was made in FY 2010 for 390 portable handheld radios for the Patrol totaling \$390,000. Of this amount, \$15,000 was received from a federal Weapons of Mass Destruction grant and the remainder (\$375,000) was funded from Asset Forfeiture Funds. The Department of Public Safety estimates the total cost to replace all their current radios with P-25 (digital) radios to be \$16.0 million, which includes vehicle repeaters, tower changes, remote site repeater upgrades, mobile radios for all Public Safety staff, and additional portable handheld radios for all DPS staff, except the Patrol which already received new portable radios in FY 2010.

- **Department of Natural Resources**

The DPS plans to begin narrowbanding the BASE channel in April of 2011. Since DNR operates off the same channel, the radios in DNR will need to be narrowbanded before that time.

The estimated total cost to purchase replacement radios that can be narrowbanded for the Parks Bureau is \$23,000. The Parks Bureau is funded from the General Fund and does have an equipment line item in the budget; however, radio replacement/reprogramming costs have not been included in the FY 2011 budget.

The Law Enforcement Bureau is funded from the Fish and Wildlife Trust Fund. Radio replacement/reprogramming costs were not included in the FY 2011 budget. The estimated cost to purchase replacement radios that can be narrowbanded for the Law Enforcement Bureau is \$131,000. The DNR estimates the cost to replace all their radios with P-25 (digital) radios to be approximately \$900,000.

- **Department of Corrections**

The DOC indicates as of October 2010, 835 portable radios, 52 mobile radios, 24 base stations, and 12 vehicle repeaters cannot be reprogrammed to narrowband. The estimated cost to replace this equipment with equipment that can be narrowbanded is approximately \$1.8 million; however, these radios would not be P-25 compliant.

- **Department of Transportation**

In FY 2010, the Department purchased 203 radios totaling \$805,000 funded from the Road Use Tax Fund (RUTF). In FY 2011, 233 radios were purchased for approximately \$810,000. The Department has established an eight-year radio replacement plan to replace all radios with P-25 (digital) radios in the DOT radio fleet. The radios the DOT is purchasing can broadcast in VHF and are dual band radios that can operate on the 700 MHz and 800 MHz frequencies. If the price of radios comes down, the period of time to purchase the radios will be reduced.

ALTERNATIVES

Purchasing New Radios – Division VII of SF 2088 (Government Reorganization and Efficiency Act) requires agencies to purchase goods and services as negotiated in a master contract through the Department of Administrative Services. Since the majority of radios within State government are not P-25 compatible and a large quantity of radios need to be purchased, the State may save money by purchasing all radios, for all State agencies, at the same time through one master contract.

Leasing New Radios – Leasing new radios may result in a lower cost and allow the equipment to be replaced on a more frequent basis to keep up with changing technology. Since July 1, 2005, the Kansas Department of Transportation (KDOT) has accepted applications allowing their public agencies to lease new, multifrequency 800 MHz radios and equipment as well as tower sites.² However, the Kansas lease program was initiated as a method to upgrade communication technology rather than a cost-saving measure.

RELATED WEBSITES

Issue Review: [Narrowband Mandate and Statewide Interoperability](#)

<http://isicsb.iowa.gov/narrow-banding.html>

<http://isicsb.iowa.gov/documents/education/ECommsInteroperabilityTechnology101Slides.pdf>

<http://wirelessradio.net/>

KEY CONCEPTS

Narrowbanding – To decrease the radio frequency bandwidth from 25 kHz to 12.5 kHz.

APCO – The Association of Public Safety Communication Officials (APCO) developed the P-25 standard.

P-25 – An FCC accepted digital format used for both voice and data two-way wireless communication devices providing an open standard available to all vendors.

UHF/VHF – The group of frequencies used by most public safety radio systems in Iowa. This is the group of frequencies required to meet the federal narrowbanding requirements.

700/800 MHz - The group of frequencies that will be utilized for radio interoperability.

Dual-Band Radio – A radio that operates on both the VHF frequency and the 700/800 frequency and will operate under the interoperability plan.

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² See information regarding the Kansas Communication System Revolving Fund: <http://www.ksdot.org/burConsMain/Connections/Radio/default.asp> and Kansas Statutes 75-5073 through 75-5077: <http://www.kslegislature.org/legsrv-statutes/getStatuteInfo.do.jsessionid=79855DC23A6867342A5576583F2D130B>