



MOTOROLA

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Radio Interoperability in Wisconsin: The VHF Narrowband Mandate

A presentation to the Wisconsin APCO/NENA conference 2006



*Celebrating 50 Years
1956 - 2006*

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Agenda

Interoperability

The VHF Narrowband Mandate

The Narrowband Conversion: The Wrong Way and the Right Way

Wisconsin Narrowband Migration in 2011

Mutual Aid Channels

Narrowband Notes and the SIEC Plan



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Interoperability

Technical Interoperability

- Ability for Radio-to-Radio Communications
 - > Frequency Band
 - > Technology – Conventional, Trunking, Analog, Digital
 - > Radio Programming
 - > Patching

Operational Interoperability

- Agreements on Use of Radio Channels
- Incident Command Assignment of Radio Channels
- Common Use of Channel Names



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FCC Mandates for Narrowband

VHF Band is Getting Full

- Difficult to get new Frequencies
- Technology for splitting channels – Narrowband – now cost effective
- Narrowband reduces channels from 25 KHz to 12.5 KHz
- VHF band can then handle twice as many channels

Narrowband DOES NOT MEAN DIGITAL (P25)

- Narrowband can be 12.5 KHz analog FM
- Most 2-way radios of recent vintage have narrowband capability
 - * Narrowband only requires re-programming in such cases

There is NO MANDATE to change to DIGITAL (P25)

- FCC mandate is narrowband – not TYPE of transmission

	25 kHz		25 kHz		25 kHz		25 kHz		25 kHz		25 kHz		25 kHz
12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
kHz	kHz	kHz	kHz	kHz	kHz	kHz	kHz	kHz	kHz	kHz	kHz	kHz	kHz

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FCC Mandates for Narrowband

January 1, 2011: All NEW Licenses Must be NARROWBAND

January 1, 2011: No MANUFACTURE of WIDEBAND Equipment

- All radios purchased 2011 or later will not have WIDEBAND
- Effectively forces a migration to NARROWBAND in 2011
- Once one new unit is purchased, ALL must switch to NARROWBAND

January 1, 2013: All Systems must be NARROWBAND

- All Public Safety wideband licenses converted to narrowband
- Fire/EMS Pagers Must Be Narrowband



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Statewide Move to Narrowband in 2011

FCC Mandate for No Wideband Radios Sales in 2011

- Departments needing new radios forced to narrowband
- Creates a Mutual Aid Problem
- Requires all user have narrowband radios

Statewide Confusion with Mutual Aid

- Some departments/counties switch, some do not
- Neighboring departments/counties may not have narrowband programmed

Statewide Plan Needed for Narrowband Migration

- Need for all mutual aid users to have narrowband capable radios
- Coordinated plan to move to narrowband in 2011
- Practical time period for re-programming of radios and systems



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Reprogramming Radios

- New 'Template' Created for each MODEL of Radio
- Programming Computer and Cable Connected to Radio
- New Programming Input into Radio
- Narrowband Channels Programmed on a PER CHANNEL Basis
- Requires Multiple Programming Computers of Different Vintages
- Typically Done on a Per-Brand Basis by a Radio Dealer
- Radio Shop Must Have All Vintage Programming Software and Programming Cables
- A Typical Wisconsin County Will Have 300 to 1500 Public Safety Radios Between Fire, EMS and Law Enforcement



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Conversion to Narrowband – the Wrong Way

- Individual Agencies Decide to Convert to Narrowband Before 2011
- Individual Counties or Cities Decide to Convert to Narrowband Before 2011
- A State Agency Converts to Narrowband Before 2011 (i.e. DNR)
- Mutual Aid Agencies Forced to Reprogram
- Agency or Department may not have all Narrowband Capable Radios
- Other Agencies/Departments Start to Convert to Narrowband
- More Reprogramming by Mutual Aid Agencies
- Process Repeats. Many Interoperability Problems.
- What a Mess



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Conversion to Narrowband – the Right Way

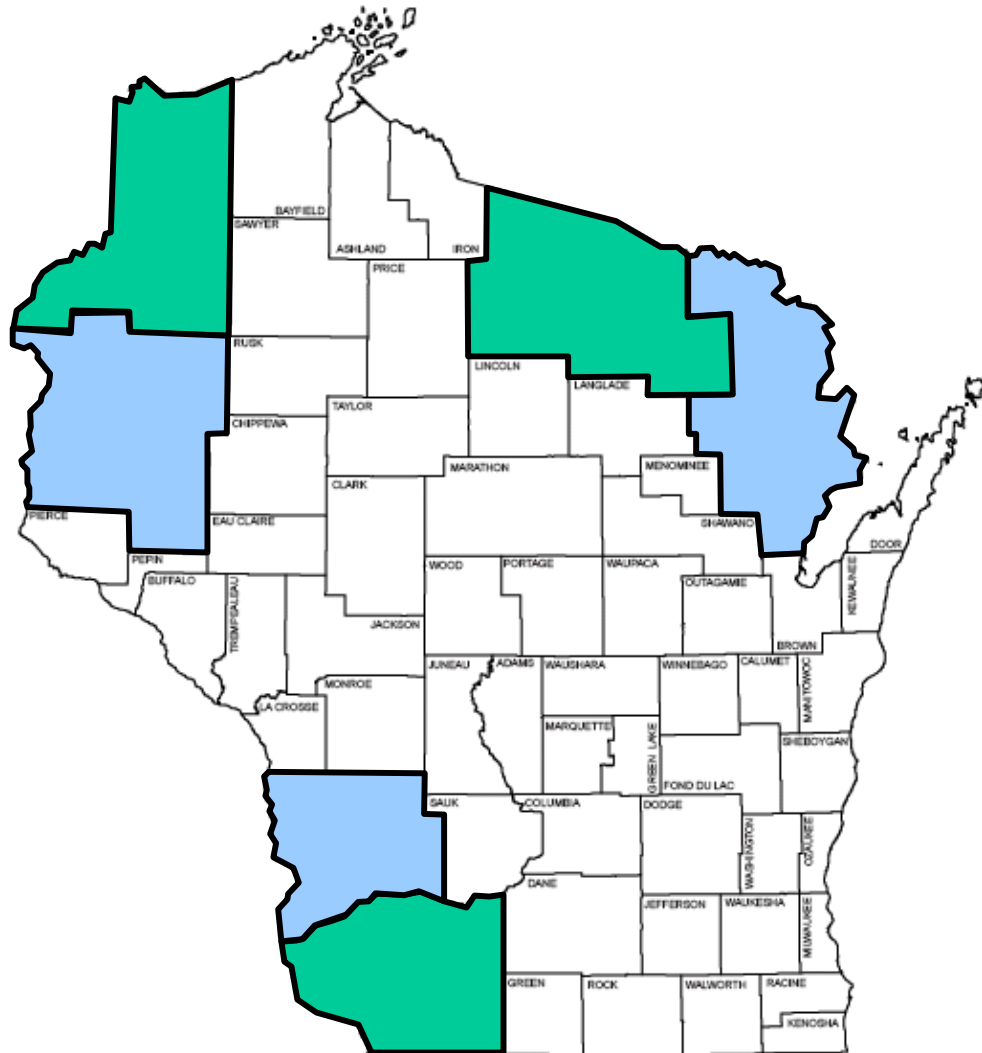
- Nobody Converts to Narrowband Before 2011
- Consultant or State Hired to Coordinate Narrowband Migration
 - > Mutual Aid channel plans locked in
 - > Audits done to confirm all users have narrowband capable radios
- Schedule Set to Convert One to Several Counties Simultaneously
 - > Likely to occur in mid-2011
 - > Logistics for realistic reprogramming timing
 - > Mutual aid interoperability problems minimized
- Likely time frame is April to October 2011
- Logical Migration of Several Counties at Once, Moving Across the State



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Migration in 2011



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Homeland Security Interoperability Grant - Reprogramming

- OJA Bulletin 06-07 of September 11, 2006: Second Round
 - > Application Deadline of November 16, 2006
 - > All requests to reprogram radios will be honored
- Radios with 16 Channels or Less
 - > Grant pays 75% up to \$20 per radio
 - > Must include 5 state mutual aid channels minimum
- Radios with MORE THAN 16 Channels
 - > Grant pays 75% up to \$35 per radio
 - > Must include 10 state mutual aid channels
- First Five (5) Mutual Aid Channels the Most Significant
 - > Defines channels common among all radios



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SEIC Recommended Priority for Mutual Aid Channels

PRIORITY	LAW ENFORCEMENT	FIRE	EMS	EMERGENCY MANAGEMENT	DPW/HWY
1	WISPERN	FG BLUE	EMS B	WEM CAR	WEM CAR
2	MARC1	MARC1	MARC1	MARC1	MARC1
3	MARC2	MARC2	MARC2	MARC2	MARC2
4	MARC3	MARC3	MARC3	MARC3	MARC3
5	MARC4	MARC4	MARC4	MARC4	MARC4
6	POINT	IFERN	IFERN	IFERN	IFERN
7	WEM CAR	FG RED	FG RED	FG RED	FG RED
8	FG BLUE	FG WHITE	FG WHITE	FG WHITE	FG WHITE
9	IFERN	WEM CAR	FG BLUE	FG BLUE	FG BLUE
10	EMS C	EMS C	EMS C	EMS C	EMS C
11	FG RED	WISPERN	WISPERN	WISPERN	WISPERN
12	FG WHITE	POINT	POINT	POINT	POINT
13	NATSAR	NATSAR	NATSAR	NATSAR	NATSAR
14	EMS B	EMS B	WEM CAR	EMS B	EMS B
15	EMS A	EMS A	EMS A	EMS A	EMS A
16	FG GOLD	FG GOLD	FG GOLD	FG GOLD	FG GOLD
17	FG BLACK	FG BLACK	FG BLACK	FG BLACK	FG BLACK
18	FG GRAY	FG GRAY	FG GRAY	FG GRAY	FG GRAY
19	IFERN2	IFERN2	IFERN2	IFERN2	IFERN2
20	VCALL	VCALL	VCALL	VCALL	VCALL
21	VTAC1	VTAC1	VTAC1	VTAC1	VTAC1
22	VTAC2	VTAC2	VTAC2	VTAC2	VTAC2
23	VTAC3	VTAC3	VTAC3	VTAC3	VTAC3
24	VTAC4	VTAC4	VTAC4	VTAC4	VTAC4

04/06

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Recommended Mutual Aid Channel Implementation

Radios with 16 Channels or Less

Grant pays 75% up to \$20 per radio

Must include 5 state mutual aid channels minimum

In radios with multiple zones (banks), program these channels in the first zone (bank)

FIRE AND EMS	LAW ENFORCEMENT
FG BLUE	WISPERN
MARC 1	MARC 1
MARC 2	MARC 2
MARC 3	MARC 3
STATE EMS B	POINT

Radios with MORE THAN 16 Channels

Grant pays 75% up to \$20 per radio

Must include 10 state mutual aid channels minimum

ADD the channels below to the list above (usually in the second zone/bank)

FIRE AND EMS	LAW ENFORCEMENT
MARC 4	MARC 4
FG WHITE	IFERN
FG RED	FG BLUE
IFERN	STATE EMS B
WEMCAR	WEM CAR

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Narrowband Audio Expansion

- Called 'Compadding' 'Expansion' 'X-Pand' or another trade name
- This is beyond standard FM emphasis/de-emphasis
- Designed to make audio sound like wideband
- Not a standard – manufacturer specific
- Programmed on a per-channel basis
- Not all radios have this feature
- Works good when all radios are from the same manufacturer and there is no mutual aid. Example: County Highway Department
- Not recommended for public safety, in order to maintain consistency



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SIEC Long Term Plan

- State Interoperability Executive Council
- Final Plan Released
- Hybrid VHF/700/800 MHz Trunking
- Standards Based (APCO-25 = P25)
- No major changes from original engineering study
- VHF Trunking Frequencies a Challenge Before 2013
- Designed to Work in Conjunction with Existing Systems
- Recommended that New Systems be standards (P25) Capable



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Recommendations

- Budget to Replace Radios without Narrowband Capability by 2010
- Budget to Replace Pagers with Narrowband by 2012
- Budget to Replace Base Stations without Narrowband Capability by 2010
- Budget for Reprogramming of Narrowband Capable Radios in 2011
- Do Not Convert to Narrowband Before 2011
- Use Current Grant to Reprogram Radios with Mutual Aid Channels
- Consultant or Otherwise Coordinate Narrowband Migration in 2011
- Do not use Narrowband Audio Companding or Similar Options



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APCO 25

APCO: Association of Public Safety Communications Officials

- Non-profit organization
- Dispatch and Communications System Staff

APCO 25: Standard #25 for Public Safety Radio

- An Analog FM AND Digital System
- Conventional and Trunking
- Digital part can be encrypted
- Uses Narrowband Channel Bandwidth (is already 12.5 KHz)
- Open Standard; Multiple Manufacturers for Radios

Most Federal Grant Money Requires APCO 25 Compatibility

Fire/EMS in many cases can remain Analog FM

- Keeping Fire/EMS as analog-FM-only is cost effective
- Fire/EMS still need to migrate to NARROWBAND analog FM
- APCO 25 should be a serious consideration for a Sheriff or Police channel
- Some ambulance communications may consider APCO 25 for privacy

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