

Columbia 9-1-1 Communications District



Columbia 9-1-1 District Board
Review of Alternatives
February 1, 2022

Federal Engineering, Inc.
"Unleashing the Power of Technology"



Current VHF Situation



- VHF prone to interference (including with existing systems)
- Unstructured band (transmit and receive channels can be adjacent to one another)
- It is a congested band, translating to a high noise floor (lower performance of radios)
- Difficult to obtain new frequencies (congestion)
- Several neighboring jurisdictions have chosen 700/800 MHz networks; Interoperability difficult without multi-band radios



Benefits of 700/800 MHz



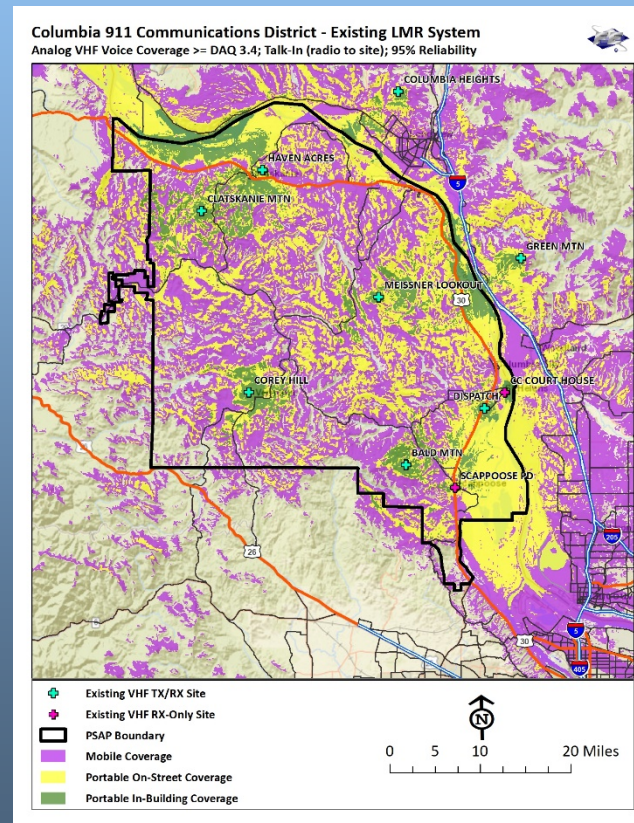
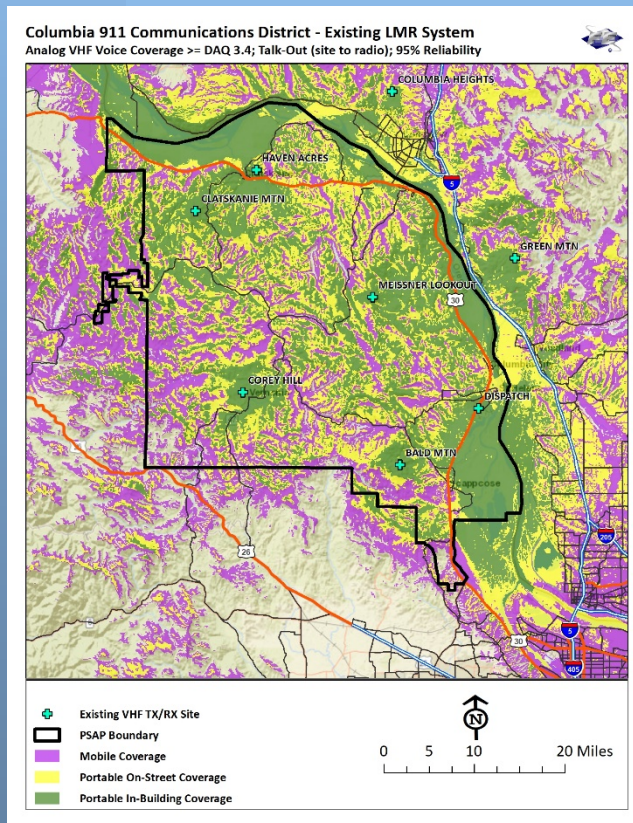
- Less congestion (i.e., less noise, less interference)
- Structured band (30 MHz spacing at 700, 45 MHz spacing at 800)
- Typically, there is better in-building penetration (higher frequency signals usually cover average buildings better than lower frequency signals)
- Interoperability with neighboring regional systems
- More frequencies available



Coverage Concerns: Poor Existing VHF Performance



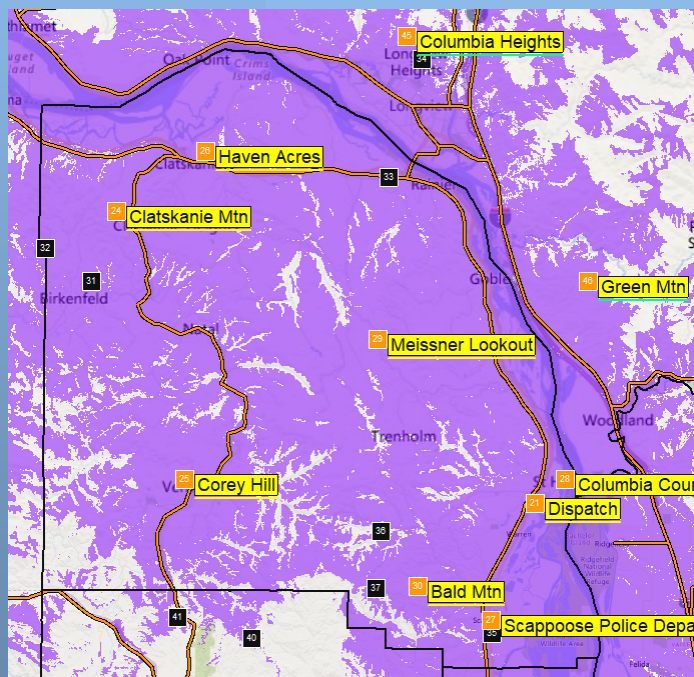
- Outbound/inbound issues, even with receive sites



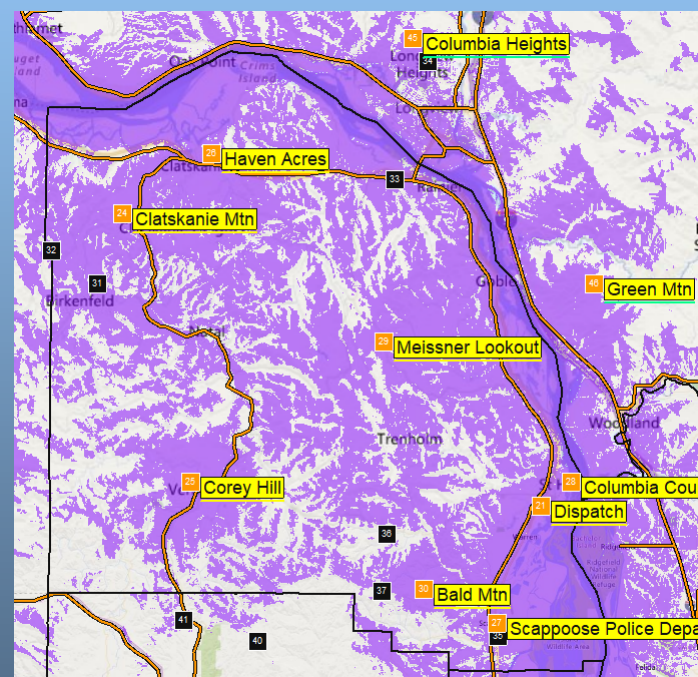
Coverage Concerns: Poor Existing VHF Performance



- Interference and Noise Floor Concerns



**“Best-Case”:
No Noise Floor Issues**



**Potential “Real-World”:
10 dB Noise Floor**



Coverage Concerns



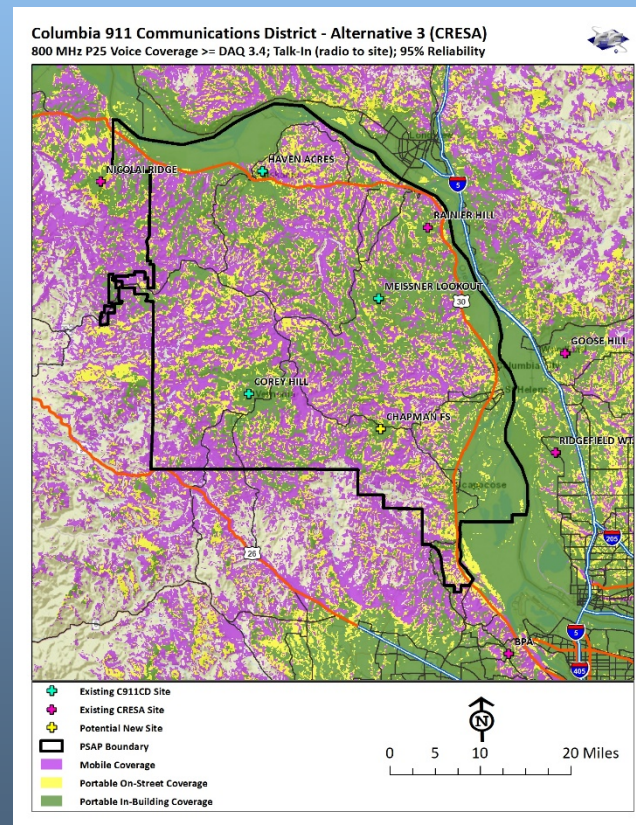
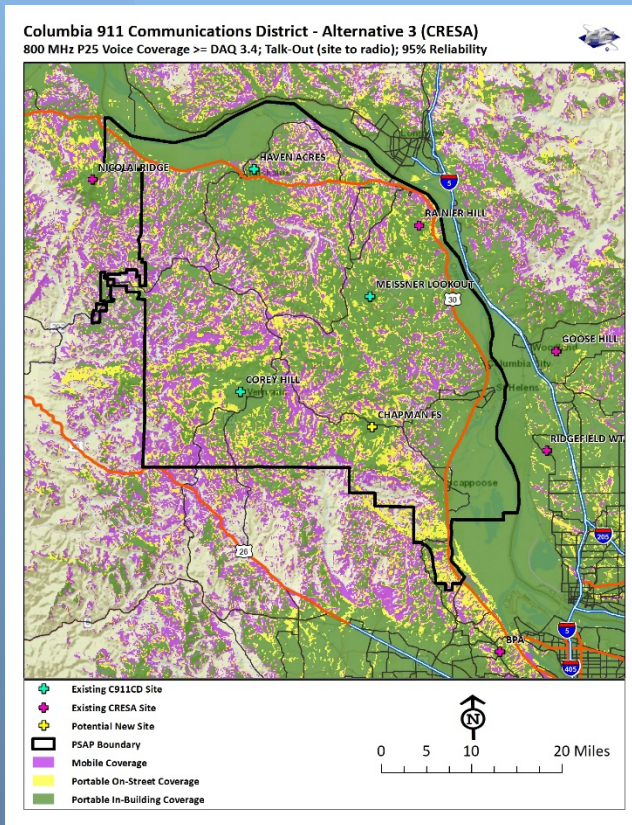
- A well designed 700/800 MHz system would:
 - Improve in-building coverage throughout the District
 - Provide more reliable coverage in a less interference-prone band
 - Need no receive-only sites, as inbound coverage is often balanced with outbound coverage using special equipment unavailable in VHF (i.e., tower top amplifiers)
- More sites may be needed – dependent on many factors



Coverage Concerns



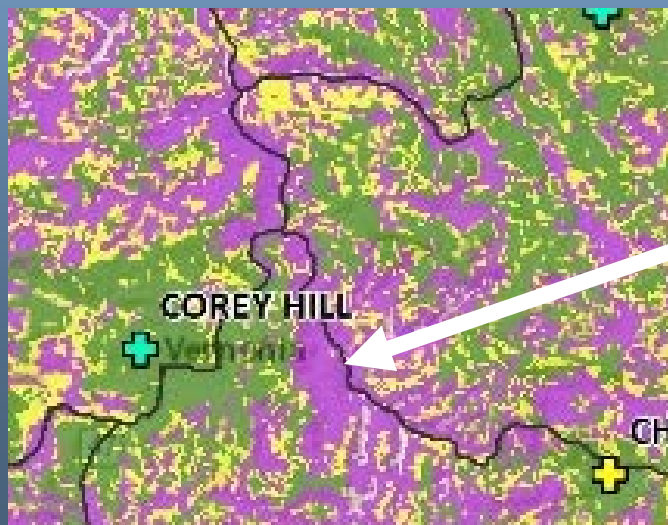
- 7/800 MHz outbound/inbound more “balanced”



Coverage Concerns



- The District's service area is challenging (rugged/forested)
 - New system should provide mobile coverage throughout the service area at a high level of reliability
 - Where portable coverage cannot meet public safety-grade levels, vehicular repeaters may be used



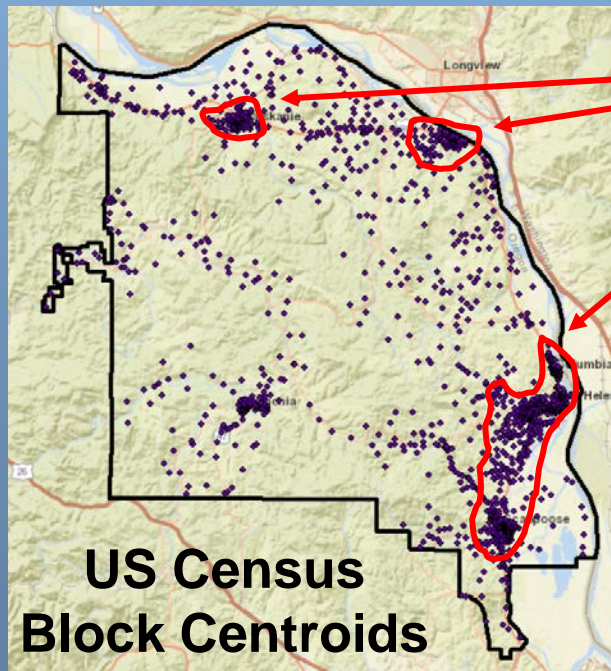
**Good mobile,
spotty portable**



Coverage Concerns



- 95% “wide-area” coverage: public safety standard
- Requiring higher percentages leads to overdesign
- Areas can be called out for more robust requirements



**Potential
“In-Building” or
“Small Tile” areas**



Coverage Concerns



- CRESA Alternative involves four new sites (in addition to the existing CRESA sites)
- For a stand-alone option, in any band, the District would need to operate/maintain more sites than in the CRESA Alternative



Recap of Alternatives Differences



System Alternatives Comparison				
<i>Item</i>	<i>Alternative 1 VHF System</i>	<i>Alternative 2 700 MHz</i>	<i>Alternative 3 CRESA</i>	<i>Alternative 4 WCCCA</i>
Ownership and control	<ul style="list-style-type: none"> • District-owned • Full control 	<ul style="list-style-type: none"> • District-owned • Full control 	<ul style="list-style-type: none"> • CRESA-owned • Shared control 	<ul style="list-style-type: none"> • WCCCA-owned • Shared control
Technology	<ul style="list-style-type: none"> • Analog • Conventional 	<ul style="list-style-type: none"> • P25 Phase 1 • Conventional 	<ul style="list-style-type: none"> • P25 Phase 1 • Trunking 	<ul style="list-style-type: none"> • P25 Phase 2 • Trunking
Spectrum	VHF	700 MHz	800 MHz	800 MHz
Mobile radio coverage	95%	99%	97%	98%
In-building coverage of industrial, commercial, and residential areas	15%	75%	60%	65%



Recap of Alternatives Differences



System Alternatives Comparison				
Item	Alternative 1 VHF System	Alternative 2 700 MHz	Alternative 3 CRESA	Alternative 4 WCCCA
Features	<ul style="list-style-type: none"> No added features 	<ul style="list-style-type: none"> P25 std. features 	<ul style="list-style-type: none"> P25 std. features 	<ul style="list-style-type: none"> P25 std. features
		<ul style="list-style-type: none"> AES encryption 	<ul style="list-style-type: none"> AES encryption 	<ul style="list-style-type: none"> AES encryption
			<ul style="list-style-type: none"> OTAR 	<ul style="list-style-type: none"> OTAR
			<ul style="list-style-type: none"> GPS 	<ul style="list-style-type: none"> OTAP
			<ul style="list-style-type: none"> Smartphone Integration 	<ul style="list-style-type: none"> GPS
				<ul style="list-style-type: none"> Smartphone Integration
Subscriber units	<ul style="list-style-type: none"> Re-use existing VHF radios 	<ul style="list-style-type: none"> New dual-band VHF/700MHz radios 	<ul style="list-style-type: none"> New dual-band VHF/800MHz radios 	<ul style="list-style-type: none"> New dual-band VHF/800MHz radios
Estimated 20-year cost to acquire and maintain	\$11,590,000	\$29,560,000	\$27,750,000	\$35,770,000



Differences - CRESA vs. WCCCA



CRESA vs. WCCCA		
	CRESA	WCCCA
Spectrum and Technology	800 MHz P25 Trunking	800 MHz P25 Trunking
Features	P25 Phase 1 Standard Features	P25 Phase 2 Standard Features & OTAP
Core Location / Technical Support	1300 Franklin St., Vancouver 34 miles and 50 min away from C911	5900 NW Pinefarm Place, Hillsboro 23 miles and 30 min away from C911
New Simulcast Cells	1	1
New Simulcast Sites	4	6
New Multicast Sites	0	1
Voice Channels at New Sites	5	4
Data Channels at New Sites	0	2
New Channels at Existing Sites	4	0
FCC Frequency Pair Licenses	13	12
Cost Comparison	Lower than WCCCA due to fewer sites, channels and P25 Phase 1	Higher than CRESA due to more sites, channels, and P25 Phase 2



Pros and Cons to Own/Operate



Pros vs. Cons to Own/Operate		
	<i>Pros</i>	<i>Cons</i>
Ownership	Full Control (VHF or 700 MHz)	700 MHz is more expensive to implement, manage, and maintain
Configuration	VHF site count remains the same	700 MHz higher site count requires Greenfield site and additional backhaul links
Capacity	VHF channel count remains the same; 700 MHz spectrum available	700 MHz requires 7 simulcast channels at 9 sites
Spectrum	No changes to VHF plan; 700 MHz spectrum available	700 MHz requires FCC licensing and coordination for 7 frequency pairs
Features	700 MHz provides Digital P25 and Encryption	VHF no added features; 700 MHz requires hardware, software, and licensing (infrastructure and subscriber equipment)
Reliability	Re-use of all existing backhaul (District is in the process of upgrading)	Unknown if entire system updated prior to the new radio system build-out; 700 MHz requires two new District microwave hops; Microwave hop between Dispatch and Bald Mountain is potentially problematic
Interoperability	Retain existing on VHF; 700 MHz allows Analog backwards compatible and interop with other P25 systems	No added capability with VHF; 700 MHz requires dual-band VHF/700MHz subscriber equipment
CAPEX Comparison	VHF is least cost of all alternatives	700 MHz is more expensive than County VHF or CRESA 800 MHz



Pros and Cons to Partnering



Pros vs. Cons to Partnering

	<i>Pros</i>	<i>Cons</i>
Ownership	Shared cost	Limited control
Configuration	Regional system provides wider service area	Coverage requirements drive additional RF sites and backhaul links
Capacity	P25 Trunking can provide better Grade of Service than Analog and Conventional systems	Requires additional channels to support other regional system users and data only channels
Spectrum	800 MHz; frequency pairs available	Existing infrastructure and subscribers require replacement with 800 MHz
Features	P25 Phase 1 or Phase 2 Trunking with AES, OTAR and OTAP	Requires hardware, software, and licensing and infrastructure and subscriber equipment
Reliability	Both P25 systems have redundant core configurations	Portions of system reliability and backhaul availability are out of County control (including existing Partner network and new District MW hop assumptions)
Interoperability	Analog backwards compatible, interop with CRESA or WCCCA users, State of Oregon, and City of Portland	Requires dual-band VHF/800MHz subscriber equipment
CAPEX Comparison	CRESA is least expensive of County 700 MHz and WCCCA	WCCCA is most expensive of all alternatives



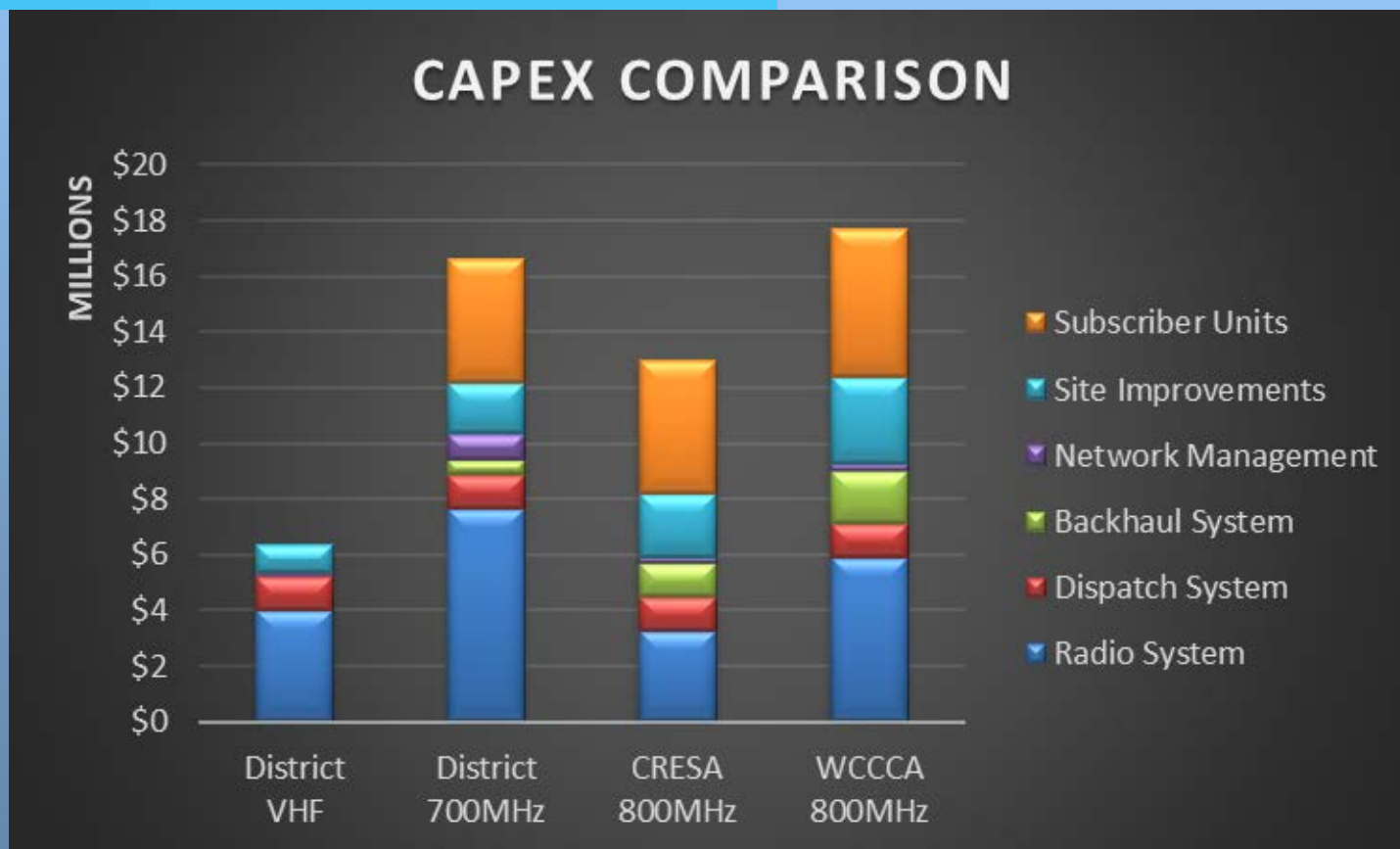
O&M Differences - Own vs. Partner



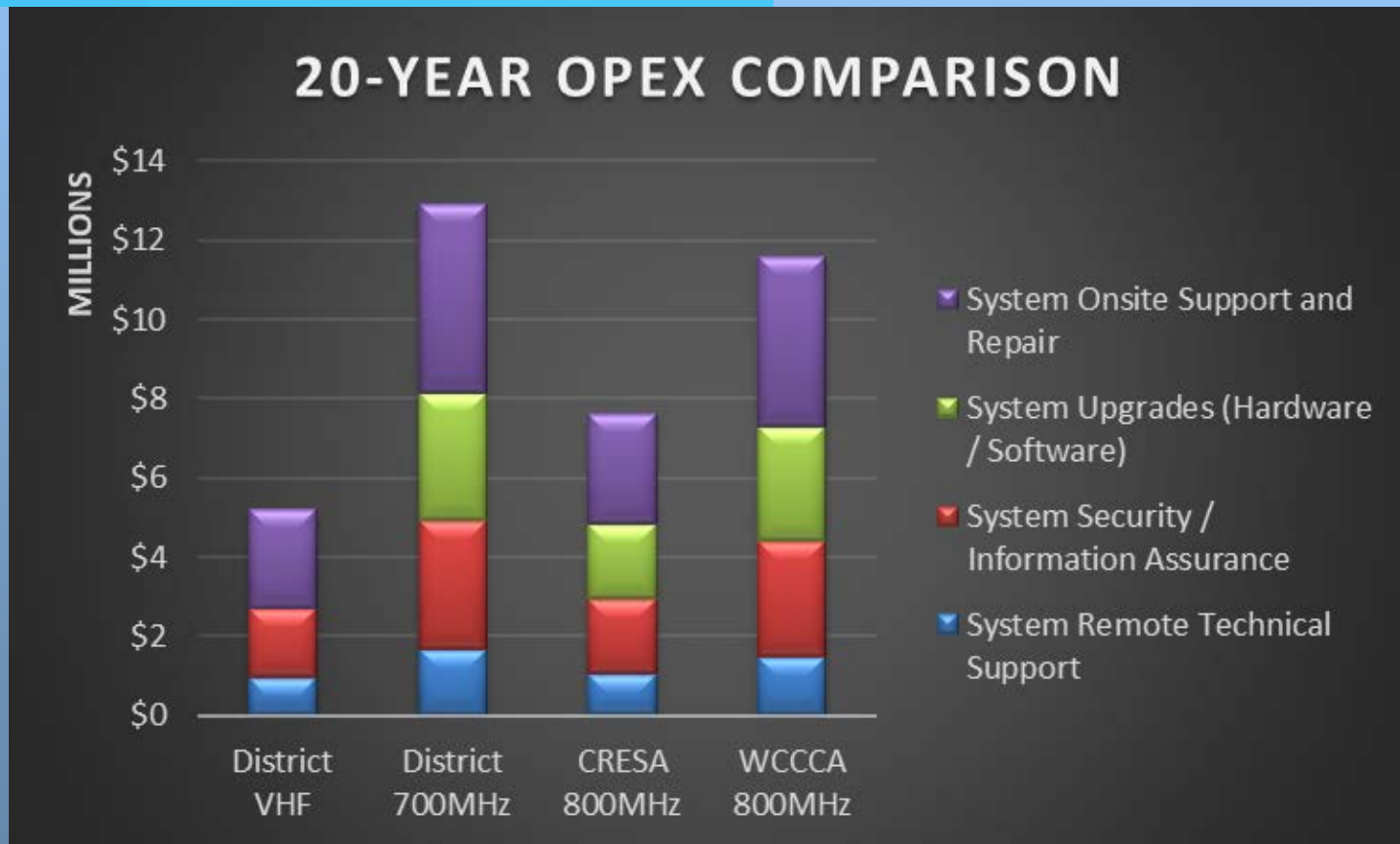
O&M Differences - Own vs. Partner		
	<i>Own</i>	<i>Partner</i>
System Remote Technical Support	County fully responsible; VHF remains the same; 700 MHz requires additional RF equipment and backhaul links, increasing overall O&M	County fully responsible for existing sites needed for backhaul; Current cost estimates reflect County responsible for new radio, dispatch, backhaul, and subscriber support
System Security / Information Assurance		
System Upgrades (Hardware / Software)		
System Onsite Support and Repair		
Site Maintenance and Utilities (not included in our costs)	County fully responsible; VHF remains the same; 700 MHz requires additional sites, increasing overall O&M	Potential for hybrid support model where District own and maintain their sites, shelters, HVAC and fuel, and Partner would be responsible for towers, radio equipment, microwave system, and subscriber units; Unknown nor confirmed at this time
20-Year System User Fees	Not Applicable	Range from \$6.5M to \$7.2M
OPEX Comparison (subscriber refresh not included)	VHF lowest cost option; 700 MHz highest cost option	800 MHz options lower than County 700 MHz; CRESA lower than WCCCA



CAPEX Comparison



OPEX Comparison



20-Year TCO Comparison



Open Discussion

