NEXRAD Program/
Radar Operations Center Update

(Informational Briefing)

Richard J. Vogt
Director, Radar Operations Center

8 March 2011
NEXRAD Technical Advisory Committee Meeting
Norman, OK

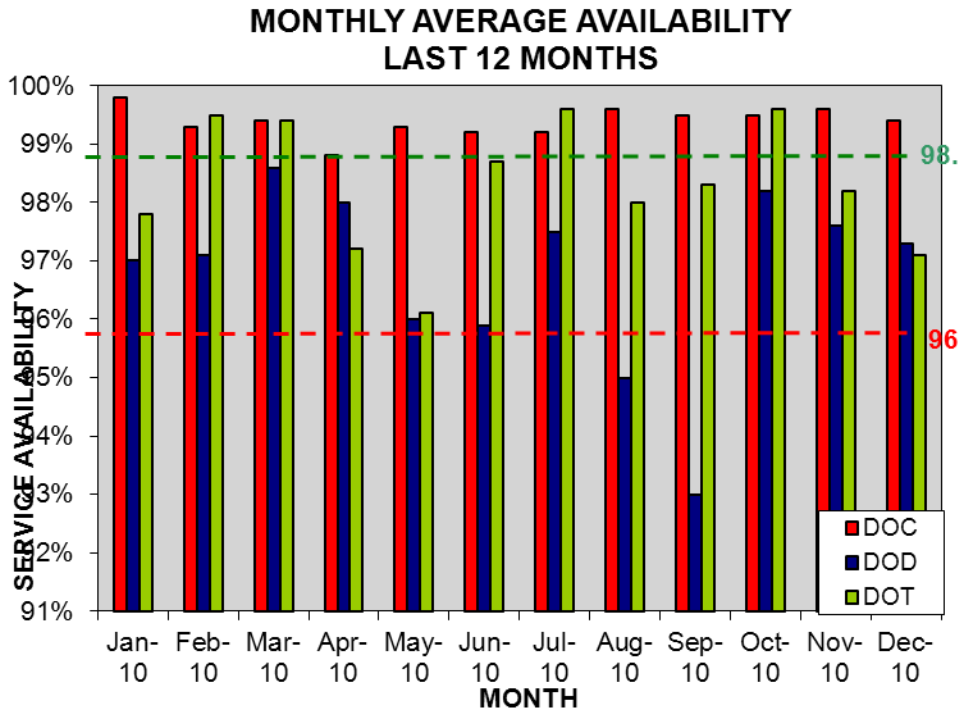
Overview

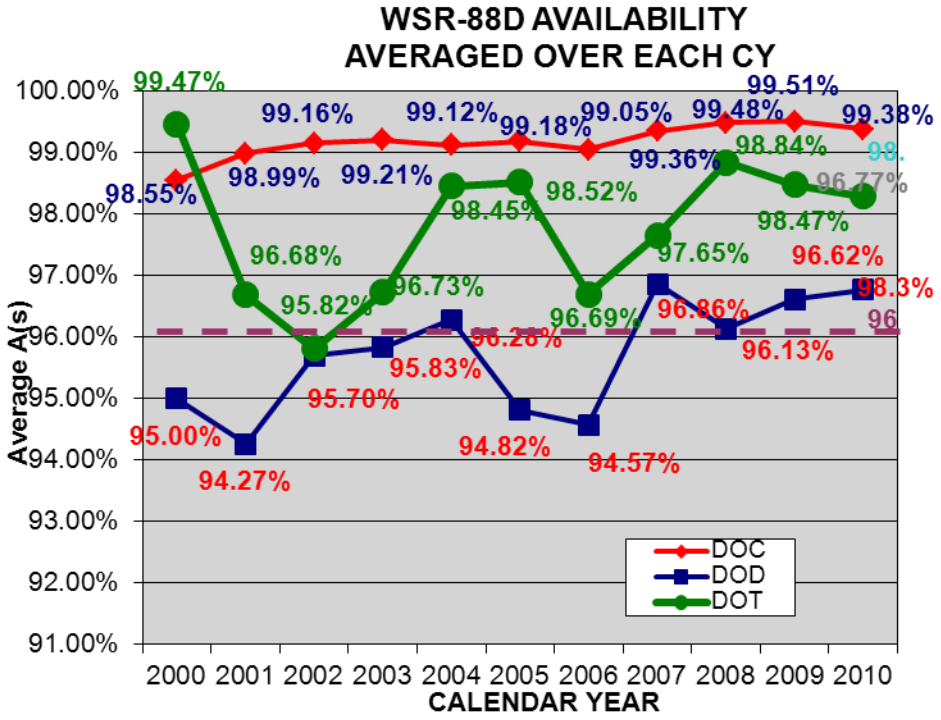
- Review status of ROC's four mission priorities
- Highlight major events since last TAC
- Discuss major NEXRAD Program challenges
- Review preliminary plans on WSR-88D SLEP

Keep Operational Systems Running

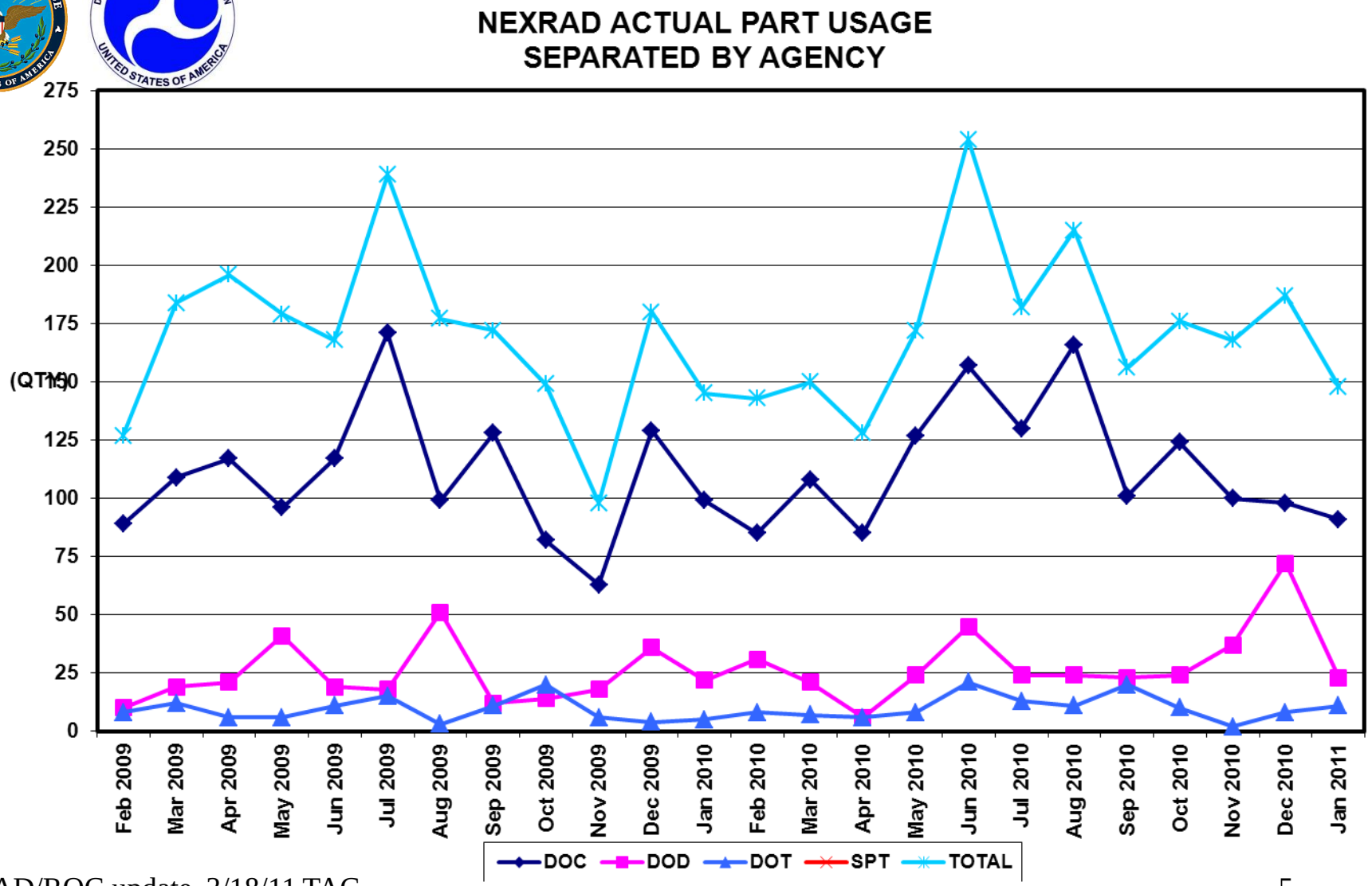
- Averaging ~800 Hotline Assistance Requests monthly
- Completing ~50 trips annually to field sites for radar issues
  - Includes pedestal bull gears: 1–CY06; 1–CY07, 5–CY08, 1-CY09, 0-CY10
- Conducting depot-level tower/radome maintenance via contractor
  - All NWS and DoD towers…good shape
  - Some FAA towers have significant corrosion
  - Radomes as required at NWS/DoD sites

Keep Operational Systems Running
(Triagency Availability)

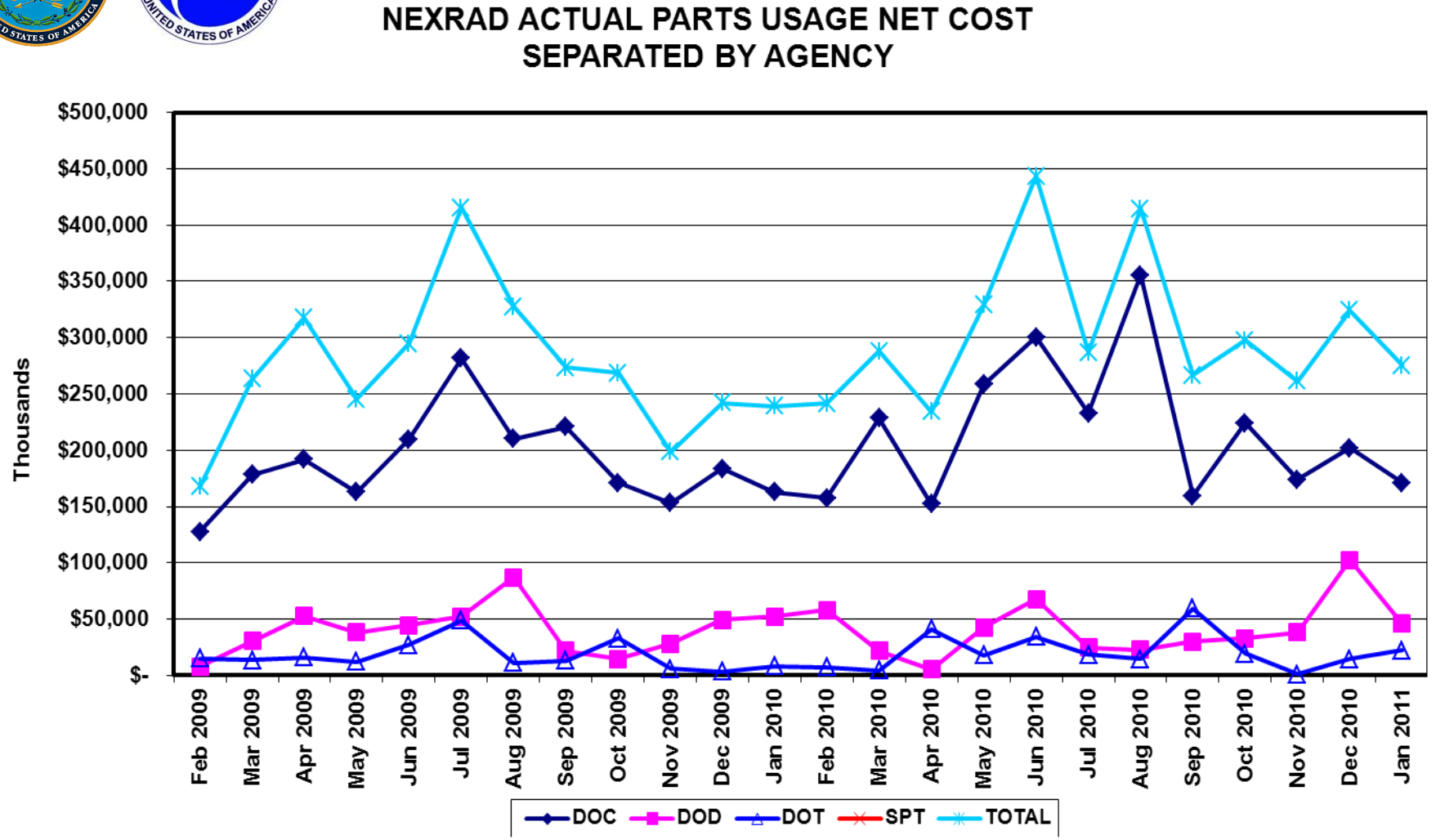




Keep Operational Systems Running



Keep Operational Systems Running



Keep Operational Systems Running

- Logistics Working Group monitoring/projecting spares usage trends; availability
  - Recently identified need for additional long-lead items (e.g., klystrons, slip rings)
- NSSL and ROC DQ Team continue monitoring WSR-88D data quality and working with sites to resolve problems
  - Key for Dual Pol DQ evaluations

Sustain Baseline Operational Radar System Capabilities

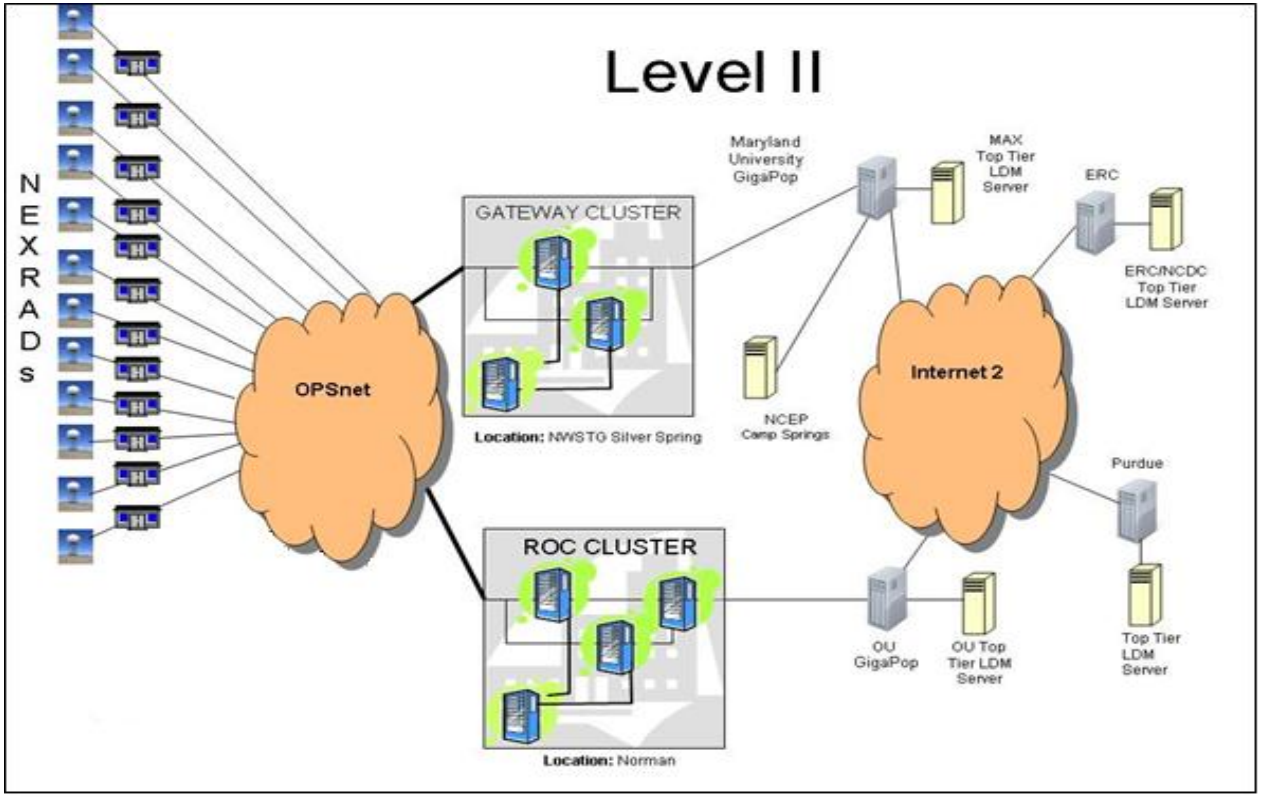
- Increased IT security requirements lead to more “point” releases; stresses software/testing resources
- Technology Refreshment Modifications
  - RDA RVP8 Motherboard/CPU upgrade to support Dual Pol processing
    - Deployment began 1FY11
  - MSCF Refresh: hardware only, deployment begins summer 2011
  - RDA Router Replacement: IPv6, OEM support
    - Deploy with RDA Build 13 (target: July 2012)

Sustain Baseline Operational Radar System Capabilities

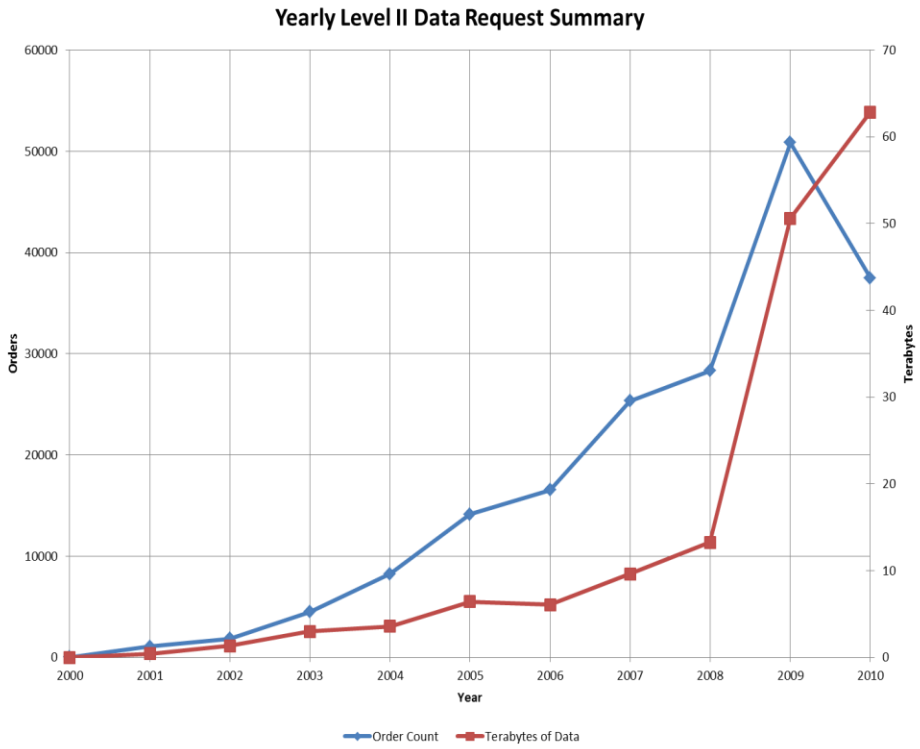
- OPUP Refresh: new hardware and Linux OS
  - Upgrade to Digital Communications: transition to Private IP WAN enables display of High- and Super-Resolution products
  - Beta Test of OPUP Build 12 started Feb 2011
  - Deployment schedule dependent on AF Networx circuit installations
- Average CPU usage (with Dual Pol)
  - RDA: 22%
  - RPG: 14%
- Frequency/Spectrum/Interference
  - Increasing challenges
  - Lynn Allmon will brief these topics tomorrow

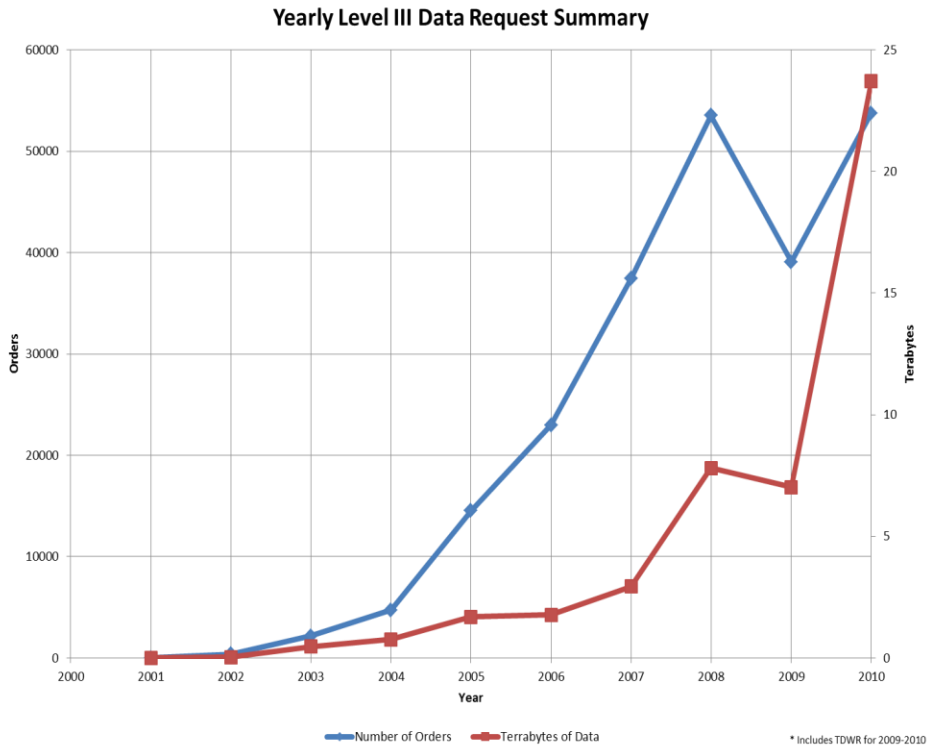
Sustain Baseline Operational Radar System Capabilities

- Refreshed Level II data collection and distribution network – new architecture improved availability and latency



Annual Requests for WSR-88D Level 2 and 3 Data NCDC Filled





Sustain Baseline Operational Radar System Capabilities

- ROC Wind Farm – WSR-88D Interaction efforts
  - Completed 800+ case-by-case analyses since 2006
  - Refining evaluation criteria to:
    - More closely match field experience
    - Reduce ROC workload….focus on the proposals that will degrade severe weather warning performance
  - Working with DHS, DoD, FAA on DHS-funded radar/wind turbine interaction model development contract; tool will model
    - Radars (air surveillance and weather)
    - Wind turbines
    - Environment
  - Participating in Interagency Task Force
    - Define short-, medium-, longer-term R&D strategies

Nearby Wind Turbines Can Impact Radar and Severe Weather Operations

Impacts up to 3km

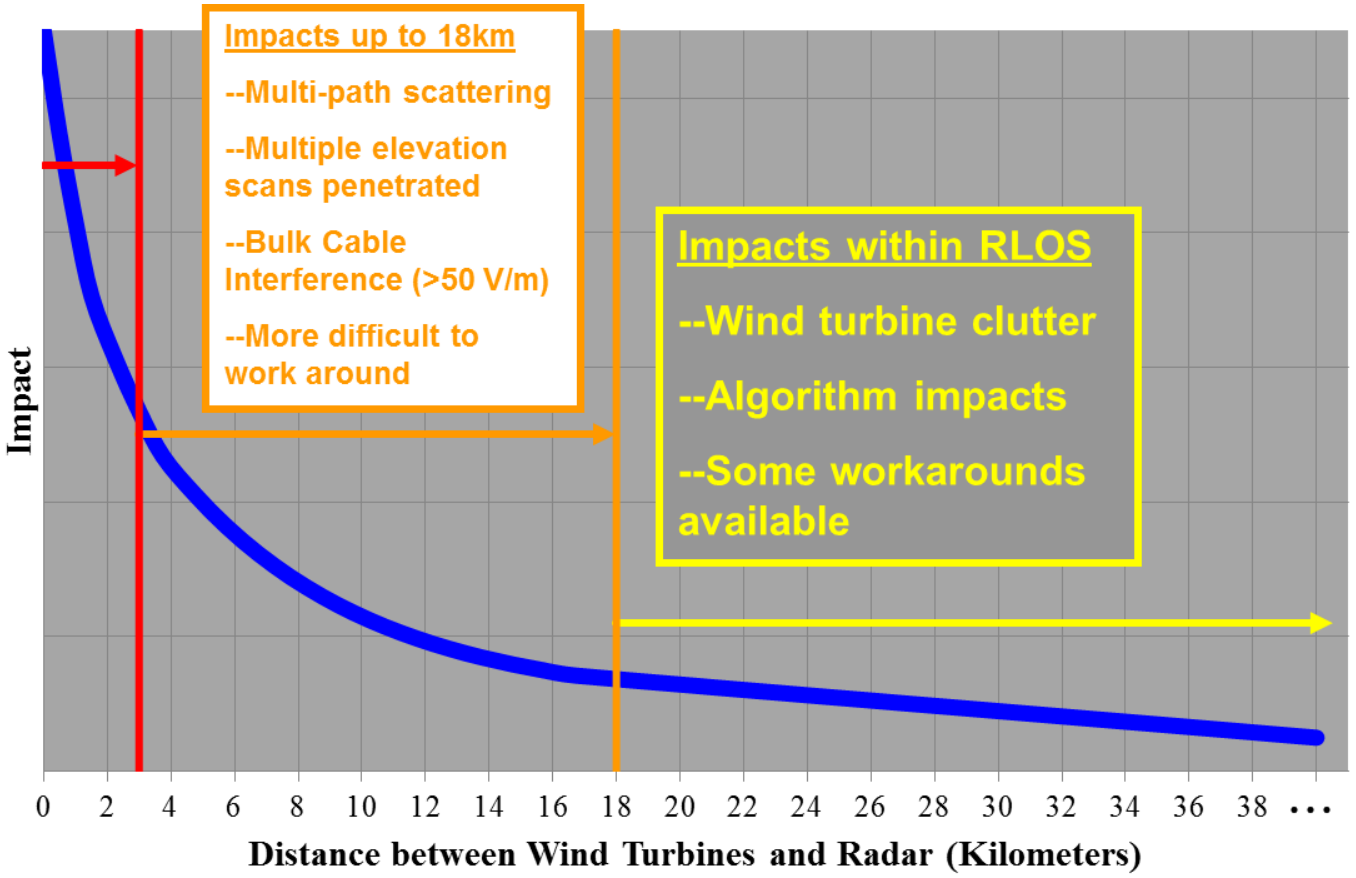
--Receiver Damage (if >53 dBm returned)

--Nacelles can block beam (within 3km)

--Blades can block beam (within 1km)

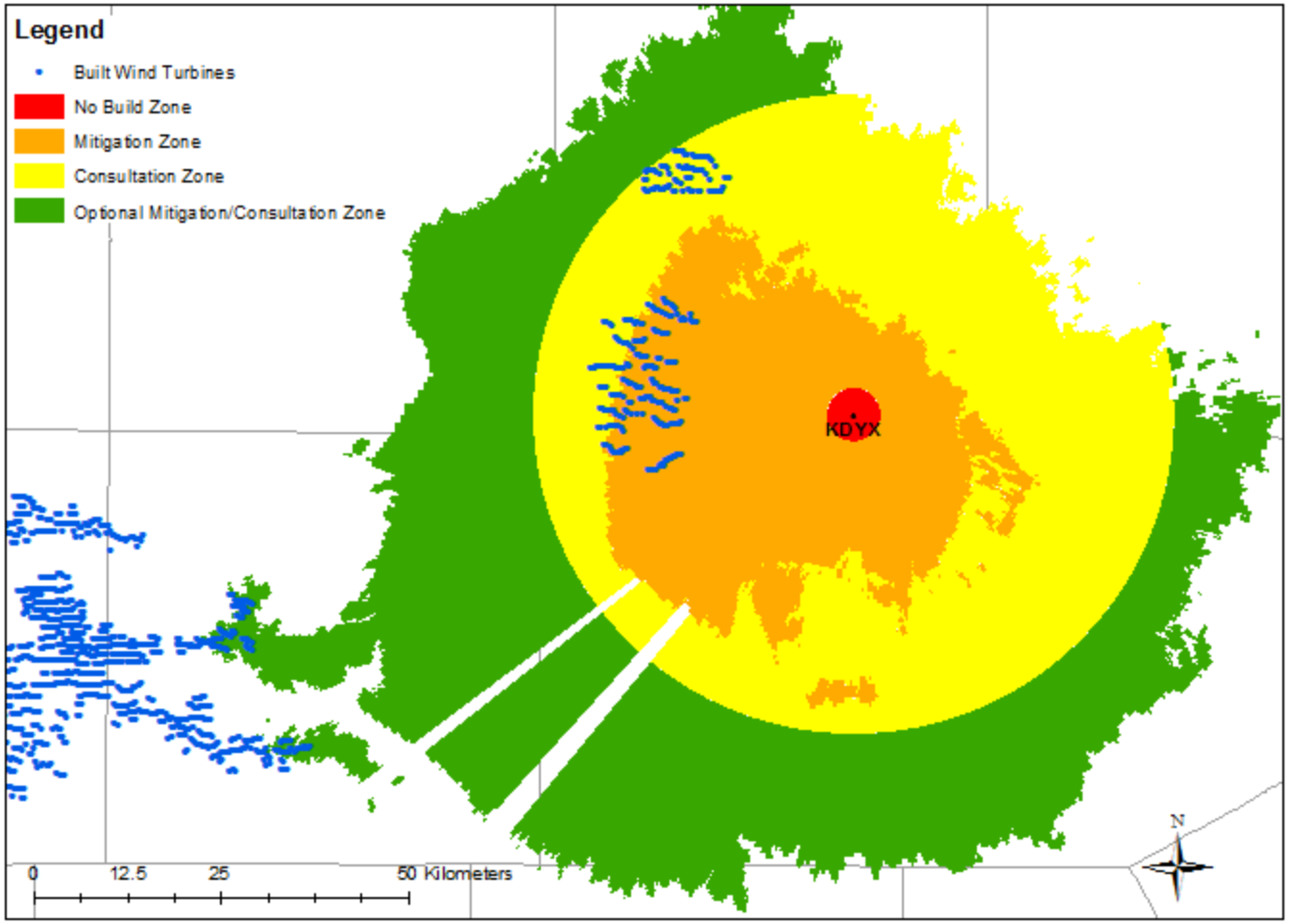
--Personnel Safety (within 200 meters)

--Limited or no forecaster workarounds



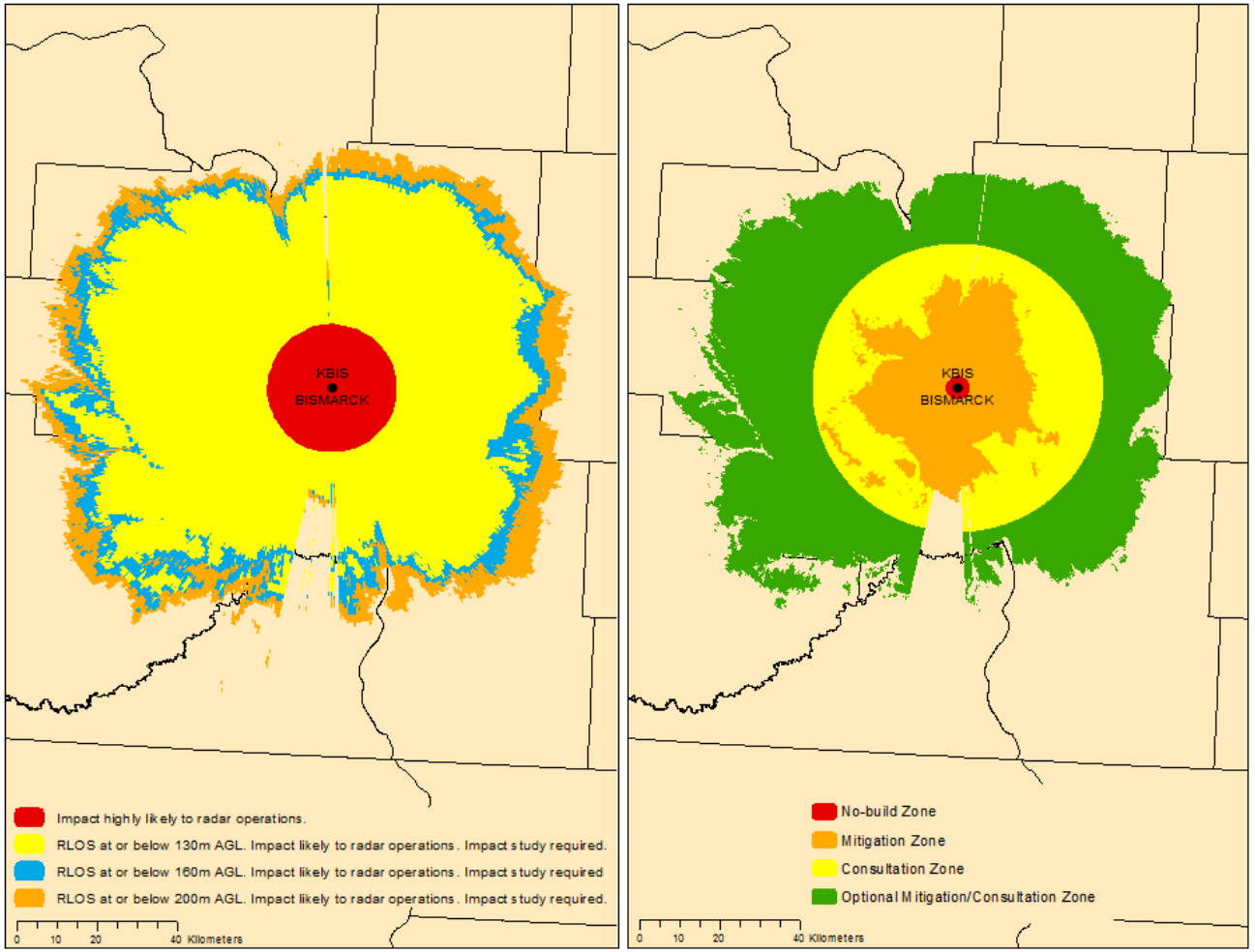
Sustain Baseline Operational Radar System Capabilities

- Example of new ROC Wind farm – WSR-88D Interaction evaluation criteria (Dyess AFB)



Sustain Baseline Operational Radar System Capabilities

- Example comparison of new, vice legacy ROC Wind farm – WSR-88D interaction OE/AAA evaluation criteria (KBIS)

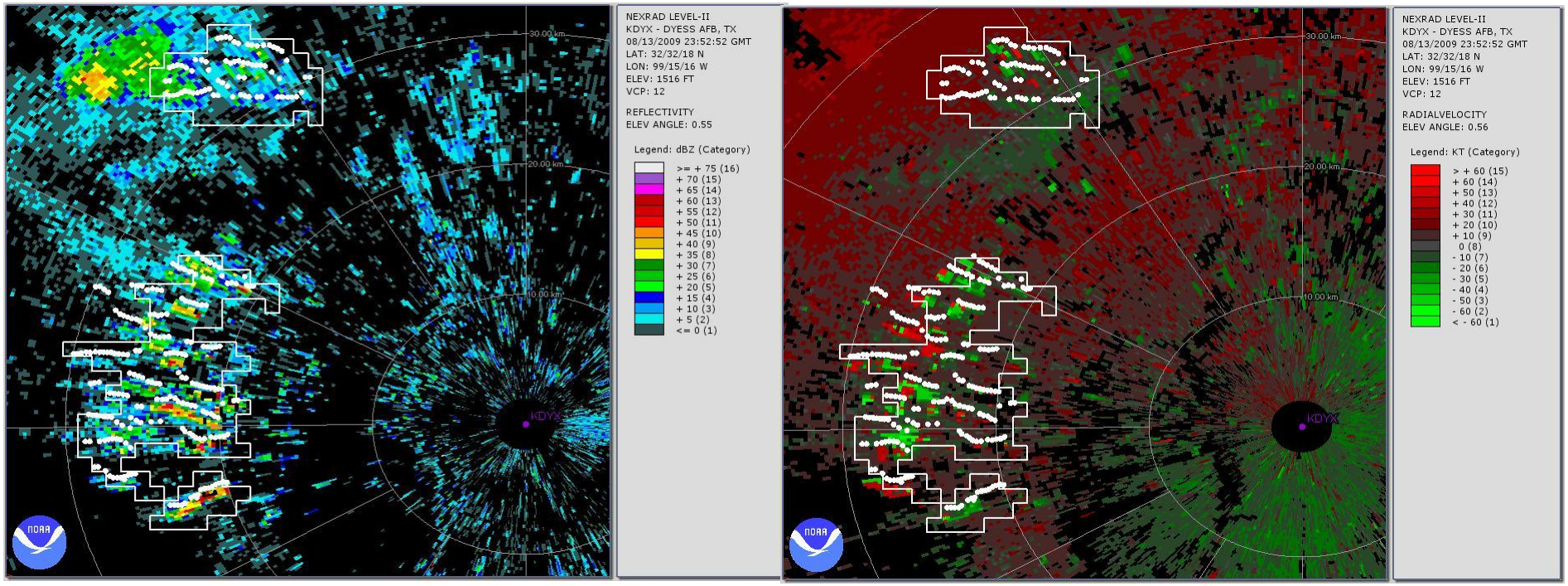


Sustain Baseline Operational Radar System Capabilities

- ROC Wind farm – WSR-88D Interaction efforts (continued)
  - Continued interaction with AWEA, wind energy industry
    - Increased awareness of weather radars and possible WTC impacts
  - Mitigation
    - WDTB produced on-line course “Wind Farms, the WSR-88D and Co-existence”
    - Supporting OU ARRC automated WTC tool and potential signal processor mitigation approach; Bob Palmer to brief tomorrow
    - Collaborated with NSSL (Ken Howard’s team) to produce *shp* files of turbine locations from 12-months of QPE data; AWIPS overlay

Sustain Baseline Operational Radar System Capabilities

- NSSL - ROC Wind turbine shp file example:



Improve Radar System Reliability And Integrate New Capabilities
(Continued)

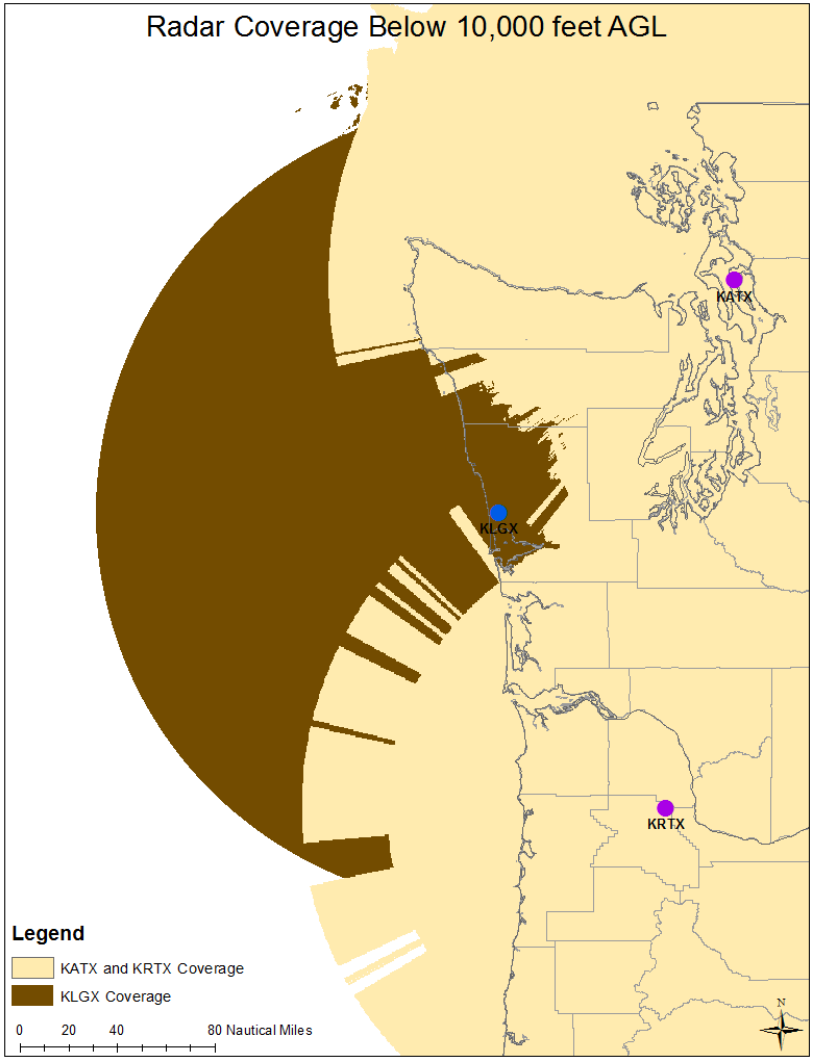
- RPG and RDA Build 11, May 09 release
  - CMD implemented and MDA improvements
- RPG Build 11.1, Sep 09 release
  - RPG Router hardware and software installation
- RPG Build 12.0, Aug 10 release
  - Integrate Dual Pol algorithms and products operationally; remove legacy Mesocyclone algorithm and products
- RPG Build 12.1, Nov 10 release
  - Completed support for Dual Pol algorithm and product integration
  - Super-Res definition changed
- RPG Build 12.2 (Apr 11); 12.3 (Oct 11)
  - Security updates; other content TBD

Improve Radar System Reliability And Integrate New Capabilities
(Continued)

- RDA Build 13.0, targeting late July 2012 release
  - Re-enable CMD, using DP data; DP algorithm fixes
- RPG Build 13.0, targeting May 2012 release
  - Deployed with Dual-Pol Redundant
- ROC SW Engineering has built a Wiki (accessible within ROC)
  - For the RPG:
    - http://swewww/wiki/index.php/RPG/SPG_Software_Group#RPG_Build_Information and click on the appropriate Build number
  - For the RDA:
    - http://swewww/wiki/index.php/RDA_Software_Group#RDA_Build_Information and click on the appropriate Build number
  - There is a wealth of information available….will eventually be transferred to ROC web page

Improve Radar System Reliability And Integrate New Capabilities

- WSR-88D (KLGX) to be installed in Grays Harbor County, WA
  - Congressionally mandated
  - Operational NLT 9/30/11
    - Baseline system
    - Dual Pol
  - Field test of lower elevation angle
    - Jessica Shultz briefing tomorrow on planned lower elevation angle field test



Support NPI Program

- Assisting Dual Polarization Program
- Several Dual Polarization presentations
  - Dual Pol Beta Test Update and Deployment Schedule: Greg Cate
  - Dual Pol Data Quality Update: Bob Lee
  - ZDR Calibration: Darcy Saxion
  - Dual Pol QPE Verification and Validation: Mark Fresch
  - Dual Pol Operational Assessment: Lt Col Cocks
  - Non-Uniform Beam Filing, Attenuation and Affects on Dual Pol Data: Alexander Ryzhkov
  - Dual Pol QPE Algorithm Improvement Initiatives: Alexander Ryzhkov
  - Dual Pol and CMD: Olen Boydsten and John Hubbert

Thoughts on Technology Refresh & SLEP

- Average Age WSR-88D ~17 yr…..installed 1992-97…..design life 20 yr
  - Age, wear & tear, parts obsolescence likely to drive O&M cost higher
    - Vulnerable components include pedestals, transmitters, UPSs, generators, shelters, grounding systems, etc.
- Strong O&M and Program Initiatives have increased radar capabilities while controlling O&M costs
  - Product Improvement, Technology Refresh and Sustaining Engineering Mods, and new science infusion
- Through Sustaining Engineering and Technology Refresh investments, WSR-88D continues to be upgradable, reliable and maintainable through at least 2020
  - Limited OEM support for modern IT components (typically 5-7 yr), and IT Security mandates drive on-going Technology Refresh requirement
  - Component obsolescence/reliability issues drive on-going Sustaining Engineering mods
- With SLEP investment, WSR-88D can remain viable through 2030 or until replacement technology is operational

364 NEXRAD: Still the Best and Getting Better

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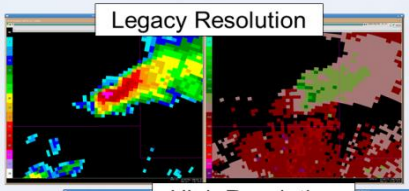
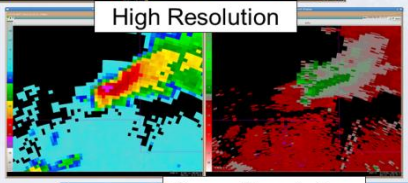
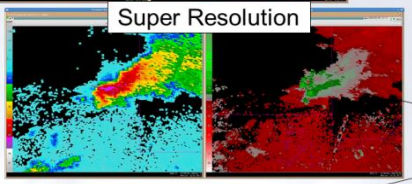
B. Saffle, D. Melendez, K. Kelleher, and D.E. Forsyth

Emerging Technologies







WSR-88D is the World's Best Operational Radar thanks to NEXRAD Product Improvement and Tech Refresh investments, and new science infusion. These initiatives have increased capabilities while controlling O&M costs.

With Service Life Extension investment, WSR-88D can remain viable until replacement technology (e.g., MPAR) is operational

Through Sustaining Engineering and Tech Refresh investments, WSR-88D continues to be upgradable, reliable and maintainable through at least 2020

2020

Future Dual Pol & Super Resolution Science

2010

Dual Polarization

Improved QPE, Hydrometeor Classification, etc

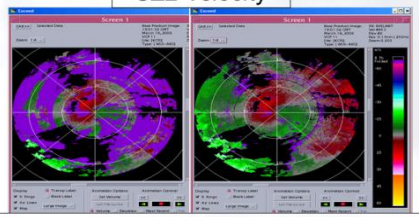
RPG Tech Refresh

ORDA

Digital Receiver, GMAP Clutter Filter, Open Systems processor and software that support infusion of new science, faster VCPs, etc.,

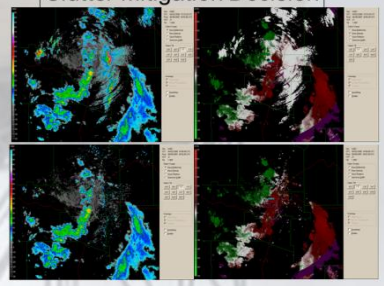
2005

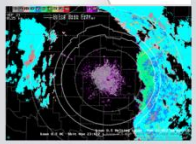
SZ2 Velocity



Reduces Range-Folded Data to <10% of the Field

Clutter Mitigation Decision





Real-time Level II Distribution

2000

Last WSR-88D Installed 1997 (Avg age 16 yrs)

After installation of WSR-88D, percentage of tornadoes warned for increased from 35% to 60%, while mean lead time on warnings increased from 5.3 to 9.5 min. *Simmons and Sutter, 2005*

1995

Conversion from circular polarization to linear horizontal polarization

First Test Bed WSR-88D Installed

WSR-88D Deployment Began

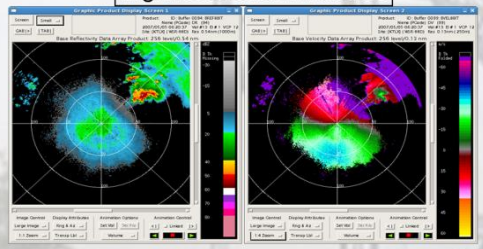
1990

Operational Support Facility (OSF), now known as the Radar Operations Center (ROC), is established

1987

Unisys Contract Award

High Resolution Products



ORPG

Open Systems processor and software that support infusion of new science.

Digital Communications

MPDA, SCIT, REC, MDA, TDA, DVIL, EET, Upgraded Hydromet Algorithms and Products, Snow Accumulation Algorithms and Products, Automated Data Quality Algorithms, etc,

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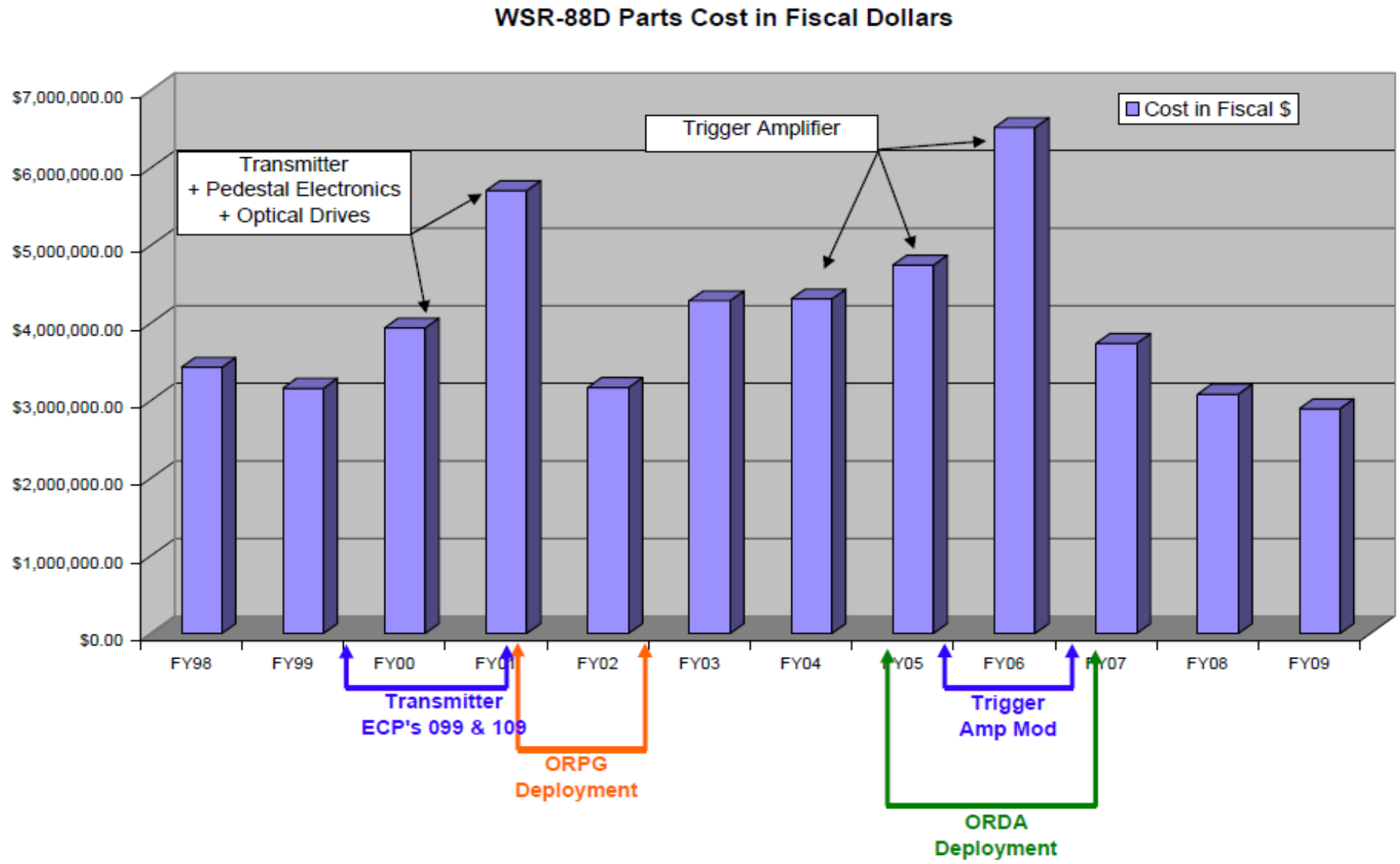
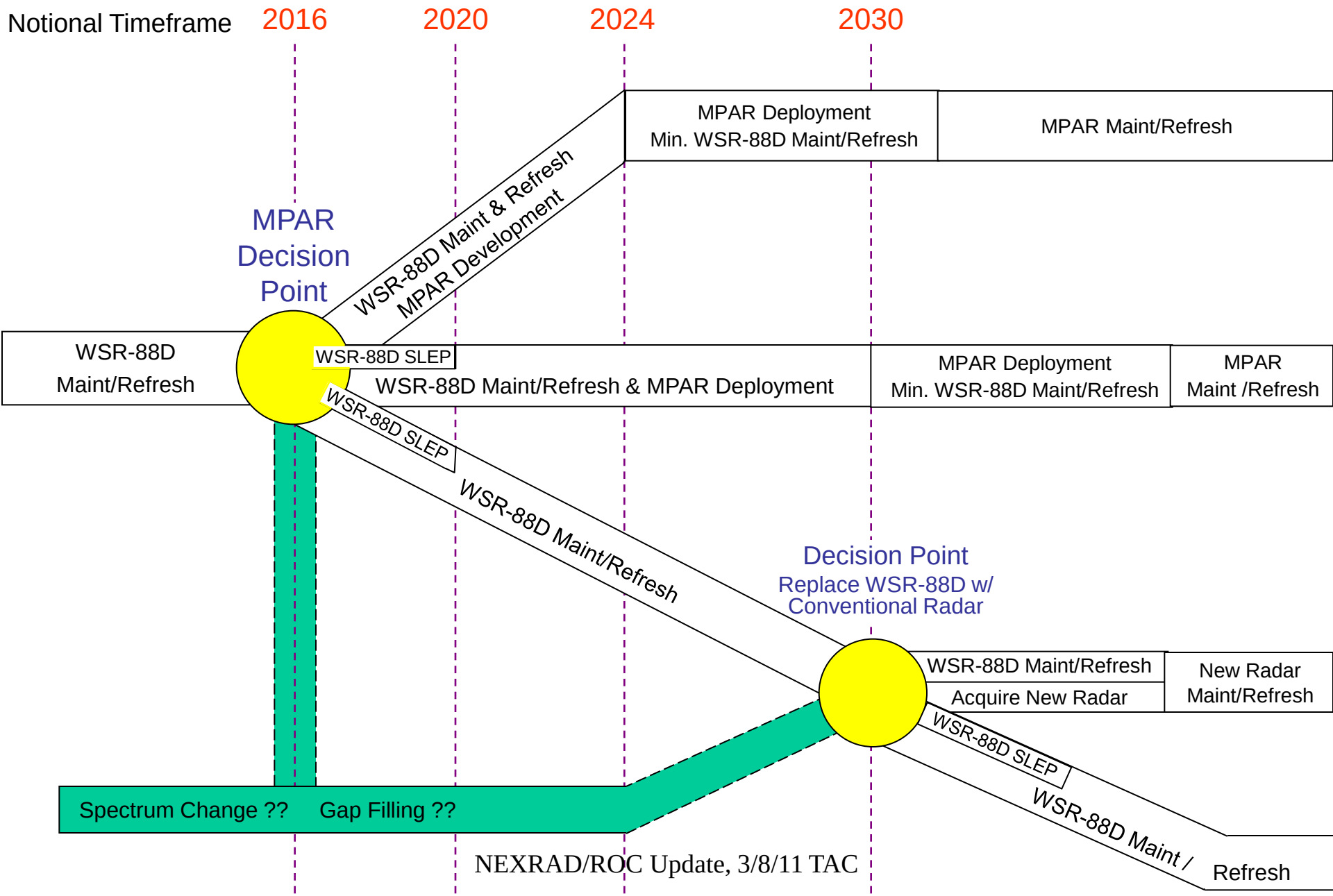
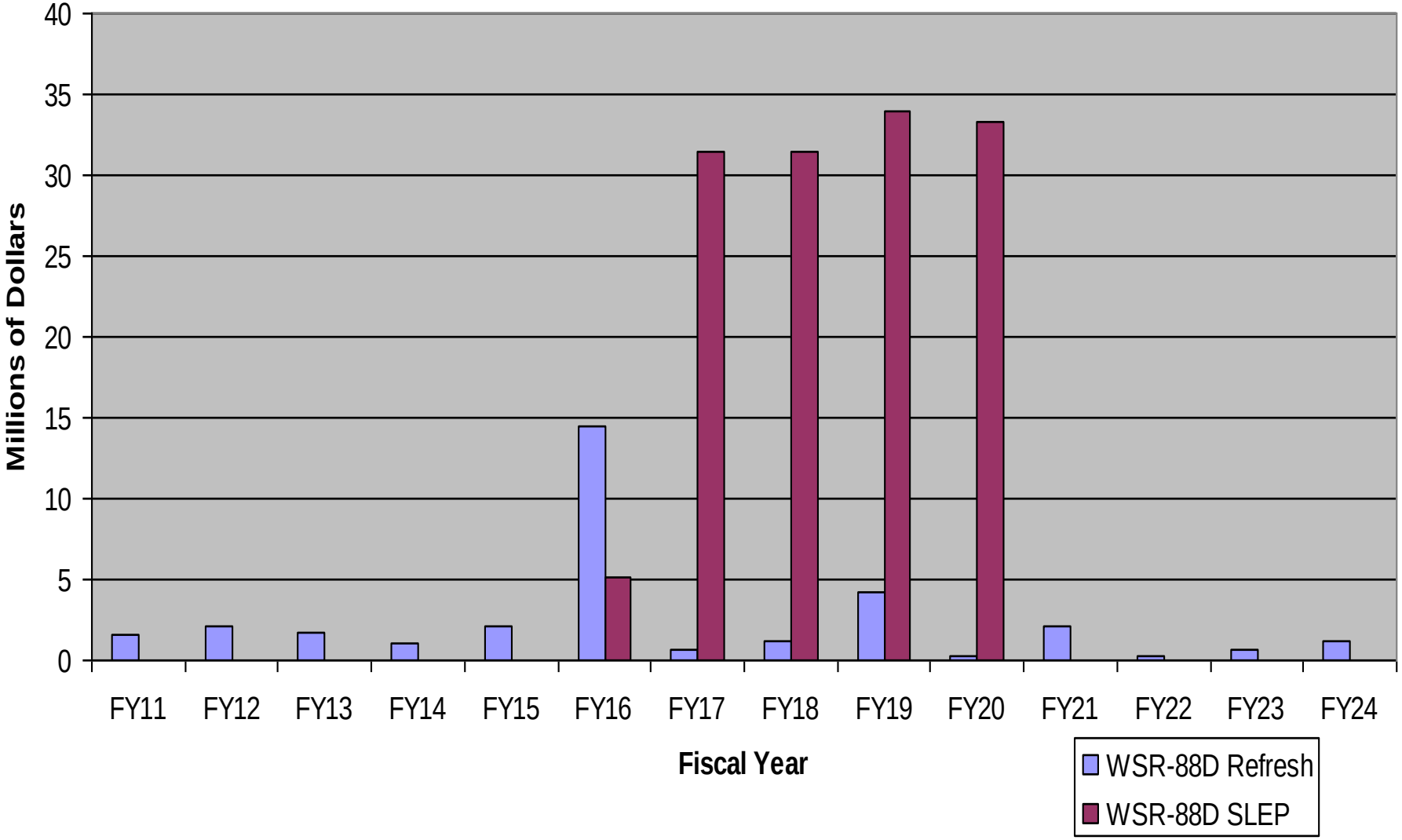
O&M Costs Controlled Through Sustaining Engineering Mods, and Product Improvement and Technology Refresh Investments



RADAR LIFE CYCLE DECISION TREE



Notional WSR-88D Funding Profile - Refresh & SLEP



Summary

- WSR-88D…..arguably World's Best Operational Weather Surveillance Radar
  - Tri-Agency program for Sustaining Engineering, NPI and Tech Refresh Investments, and New Science Infusion Initiatives have increased capabilities while controlling O&M costs
- Current program challenges:
  - Deploy dual-pol
  - Tough budget environment:
    - Sustain robust preventive maintenance/logistics and tech refresh mods
    - Implement follow-on algorithm enhancements that leverage dual-pol investment
- WSR-88Ds aging…..if not replaced by mid-2020s, need SLEP investment