

# Activities of NNSA's Digital Radiography Thrust Area Team

**DR**  
THRUST AREA

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NSRP Joint Panel Meeting

June 31, 2007



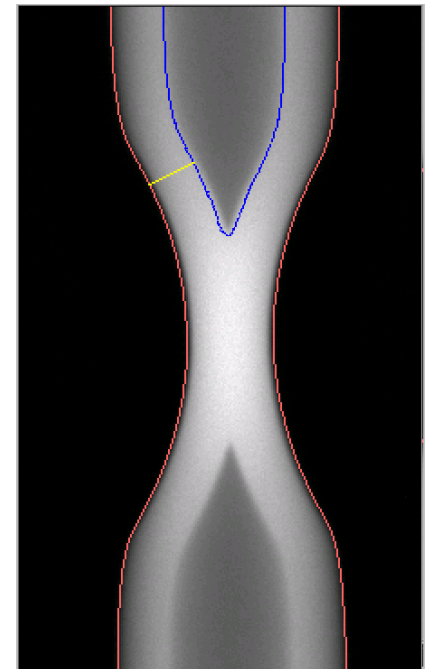
- Background of DRTA
- Need for Standardization and DICONDE Project
- Moving Forward

- Department of Energy Office for Nuclear and National Security
- Missions for Nuclear Security
  - Enhance national security through the military application of nuclear energy
  - Maintains and enhances the safety, reliability, and performance of the U.S. nuclear weapons stockpile
- Missions for National Security
  - Provide Navy with nuclear propulsion plants
  - Promote international nuclear safety and nonproliferation
  - Reduce global danger of WMDs
  - Support U.S. leadership in science and technology



## Radiography is a Cornerstone Technology

- Establish manufacturing process control
- Establish the quality characteristics of both products and processes
- Conduct surveillance & significant finding investigations
- Certify the condition of the nuclear weapons stockpile



# Diverse Capabilities & Applications



-Low, Mid, Hi (9 MeV) Energy  
-Film, DR, CT, Microfocus



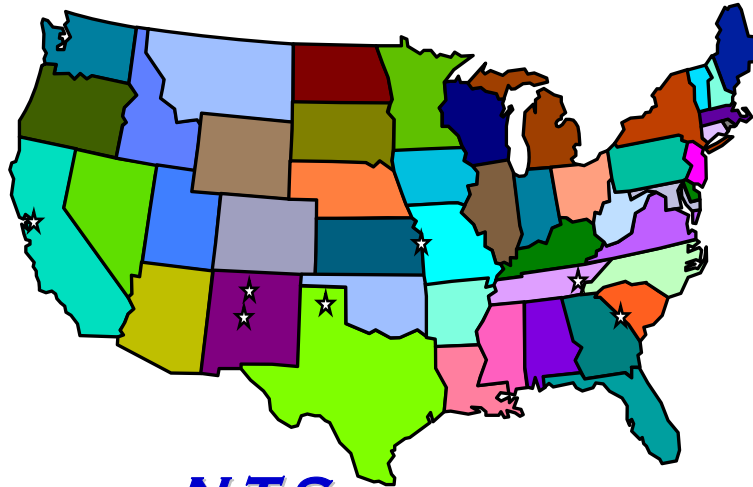
-Low, Mid, Hi (9 MeV) Energy  
-Film, DR, CT, Microfocus



-Low, Mid, Hi (2 MeV) Energy  
-Film, DR, CT, Microfocus



-Low, Mid, Hi (20 MeV) Energy  
-Film, DR, CT, Microfocus



**NTS**

-Low, Mid, Hi Energy  
-Film, DR, Dynamic, Microfocus



-Low, Mid, Hi (9 MeV) Energy  
-Film, DR, Microfocus



-Low, Mid, Hi (6 MeV) Energy  
-Film, DR, CT, Microfocus



**We Put Science To Work**

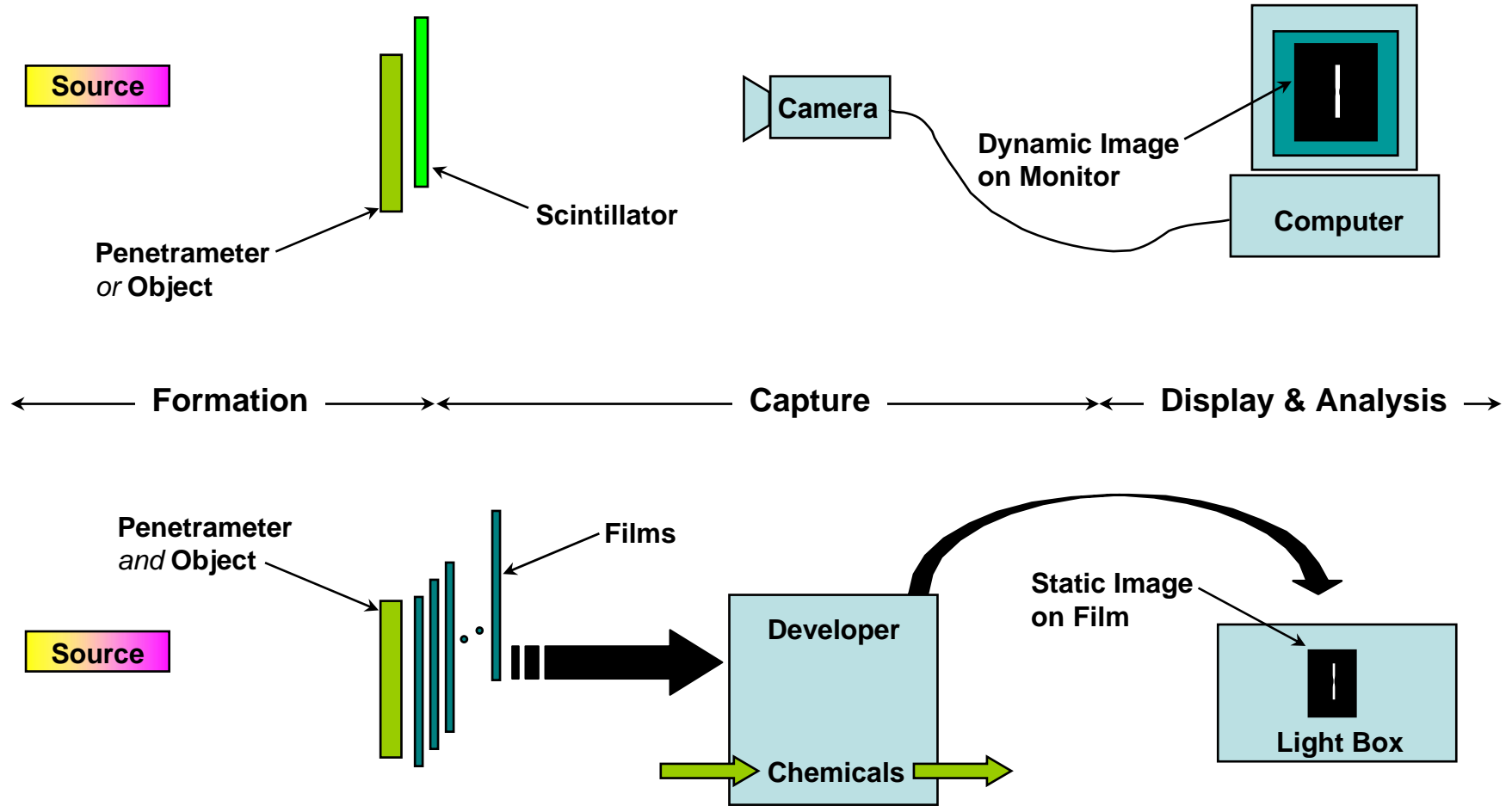
-Low, Mid (450 kV) Energy  
-Film, DR, CT, Microfocus

## A transition from film to DR is in process

- Long-term availability of high quality film is a critical concern
  - Three documented cases
- Environmental Concerns
  - Chemical disposal and silver recovery
- Cost Savings
  - Process efficiencies and reduced procurements
- Higher quality inspections
  - Larger Dynamic Range
  - More Coverage & Computed Tomography
- Near Real-time Sharing of Images

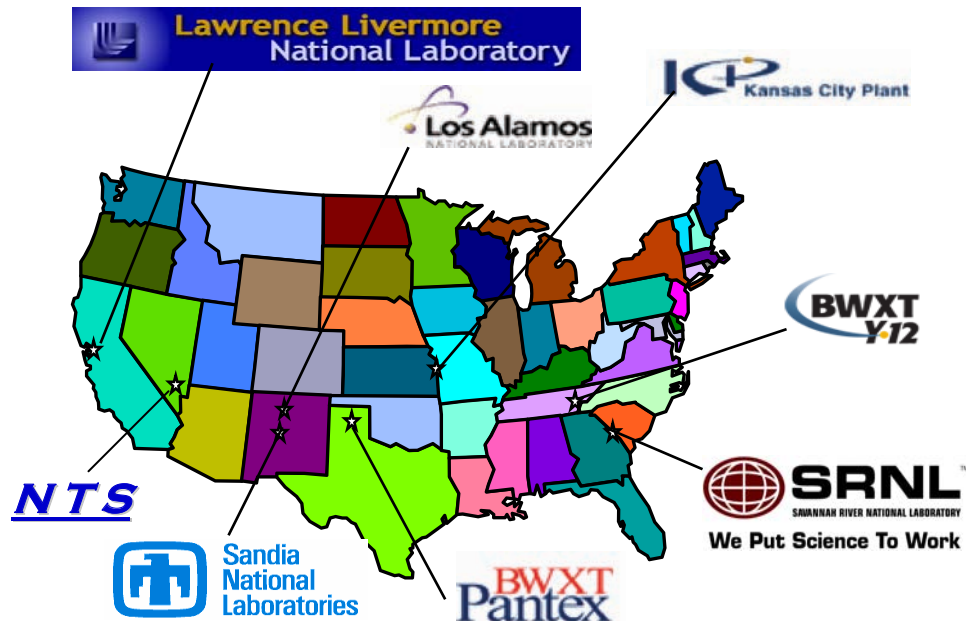


# DR/Film Comparison



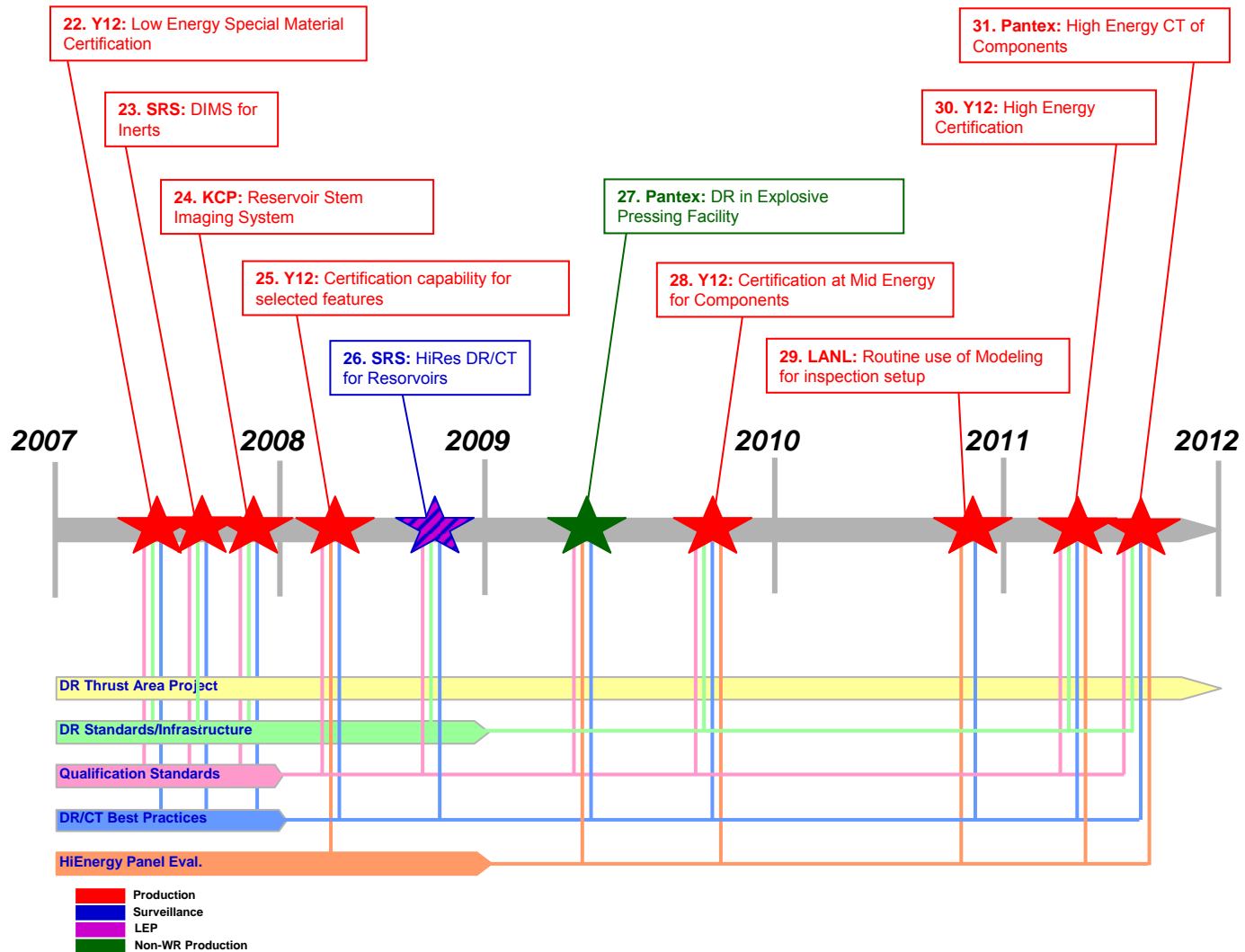
# Digital Radiography Thrust Area

- Chartered: 2004
- Membership
  - Representatives from each site
- Goals:
  - Ensure a successful transition from film to digital radiography
  - Facilitate Collaboration
  - Leverage other programs and commercial technologies
  - Serve as a technical resource
  - Establish standards



We believe there is synergy between  
NNSA and DoD radiography needs.

# DR Report & Timeline



# Need for Standardization Drivers

- DR/CT is in use extensively in the NWC
- At least Five DR or CT Systems are currently performing War Reserve (WR) Evaluations
- Additional Systems are scheduled for introduction into WR processes in the next few years.

- **DR Best Practices**
  - Website to collect documentation of the best practices for Film, DR, and CT used throughout the NWC.
- **Product Realization Standard**
  - PRS21301 - Standard for Qualification of Digital Radiography Techniques
- **DR Flat Panel Survey**
  - Surveyed available technologies per NWC Requirements

# Need for Standardization Drivers

- There was no Standard in place to ensure:
  - A universal storage technique throughout the NNSA
    - Seamless exchange of data
    - Leverage expertise across the complex
  - A data management program is established to ensure the integrity and retrievability of the data in the future.

# Need for Standardization Drivers

**WR data must be available  
for the life of the component....**

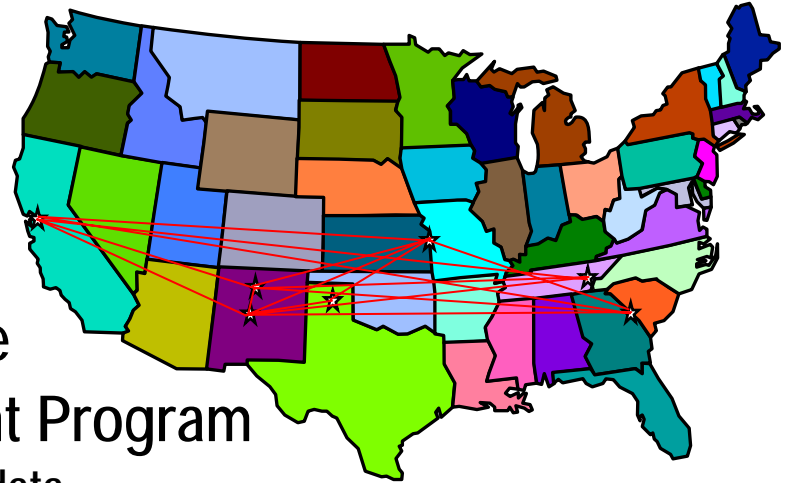
....which may exceed 30 years.

- ASTM E2339, Standard Practice for Digital Imaging and Communication in Nondestructive Evaluation (DICONDE)
- Leveraged on DICOM
  - ACR/NEMA Standard issued in 1993 for Medical Industry
  - *Promote communication of digital image info*
  - *Facilitate development and expansion of PACS*
  - *Allow creation of diagnostic information databases*

- **Standardization:** Every site stores WR and Surveillance data according to the DICONDE standard.
- **Archival:** Assurance of data integrity and the ability to retrieve and review DR/CT data in the future.
- **Exchange:** Facilitates the exchange of DR/CT data with the assurance of data integrity.
- **Cost Reduction:** Data management, seamless exchange of data, leveraged expertise.

# Vision for DICONDE in the NNSA

- Implement DICONDE on all DR Systems used for WR and Surveillance
- Comprehensive NDE Data Management Program
  - ensures the integrity and ability to retrieve DR data
  - ensures the ability to query, retrieve, and review important data
- Remotely Query and Review Data Seamlessly
- Real-time, Remote Collaboration and Review of Images
- Implementation of Workflow Management
- Expansion to other Modalities (UT, Visual, etc)



DICONDE Project continues through FY08.

- Continue Implementation of DICONDE
  - Integrate into Production Floor
- Future Projects
  - DR Flat Panel Development
  - High Energy Scintillator Development
  - CT Algorithm Development
  - Image-Based Metrology Algorithms
  - Automated Image Analysis Algorithms
  - Phase Contrast Imaging
- Completion of the DR/CT 5 Year Plan

# Moving Forward

- DOE/DOD Workshop on the Future of Radiography
  - Thursday, August 2 – Groton, CT
  - Goals
    - Begin dialog between DOE and DoD regarding DR
    - Identify commonality for future vision of DR
    - Identify hurdles to achieving this vision
    - Determine future direction of the meeting
  - Attendees are diverse
    - 33 military-related personnel from 20 installations
      - Shipyards, Warfare Centers, Arsenals, Space Systems, Proving Grounds, AVCRAD, NACAIR, Air Force Bases, KAPL, etc
    - 16 NNSA-related
      - National Labs, Production Facilities, NTS

# Summary

This Core Technology is used in every weapon program, and is at the beginning of a major transition. NNSA has decided to invest in DICONDE to ensure future confidence in the stockpile.

Failure to standardize data archival and implement a standard Data Management Program throughout the NWC could result in the inability to retrieve data for future analysis, an un-necessary risk.

NNSA has elected to implement DICONDE, an internationally recognized standard based on DICOM, which ensures backwards compatibility.

The DRTA is interested in exchanging ideas and experiences with the DOD for mutual benefit toward the successful implementation of DICONDE and other technologies to ensure a successful transition.