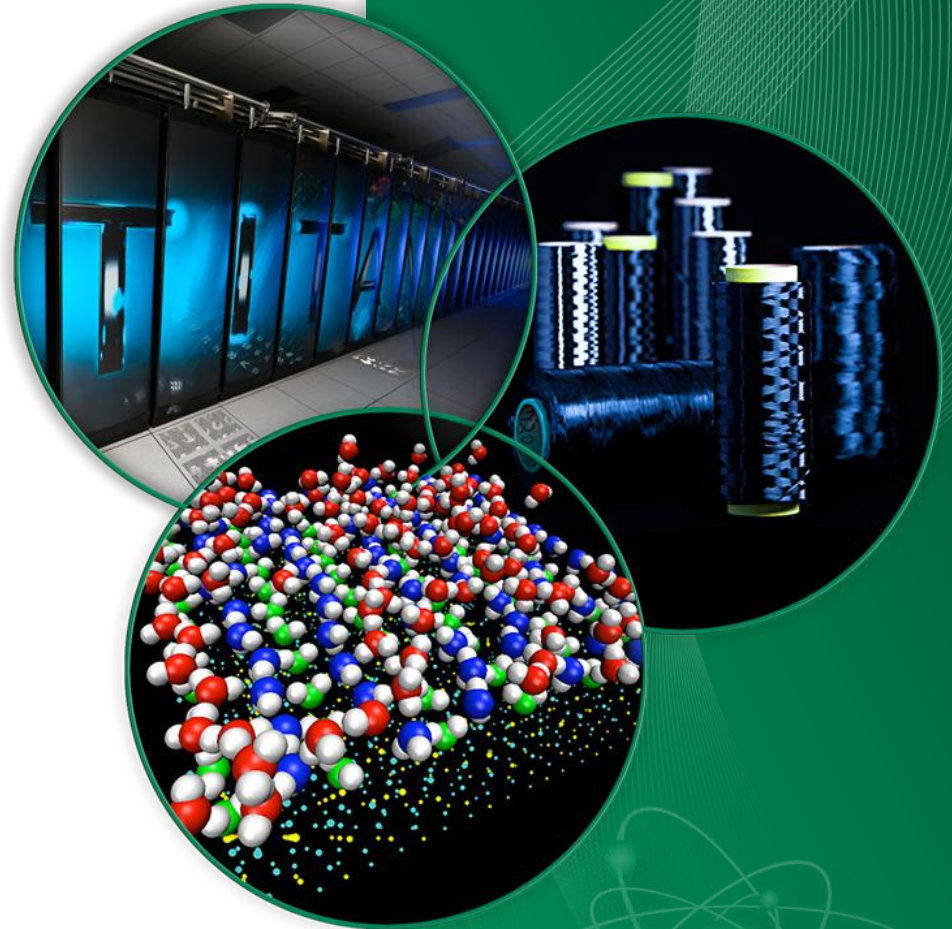# Thoughts on QA for a New ENDF Data Format/Structure

Michael Dunn

WPEC Subgroup 38 Meeting

May 21-22, 2013

Outline

- Mission and Goals

- Needs and Wants

- Roadmap
    - Quality Assurance Plan and Procedures
    - Testing, Testing and Testing
    - Continuous Integration Model and QA

- Needed Resources and Potential Problems/Obstacles

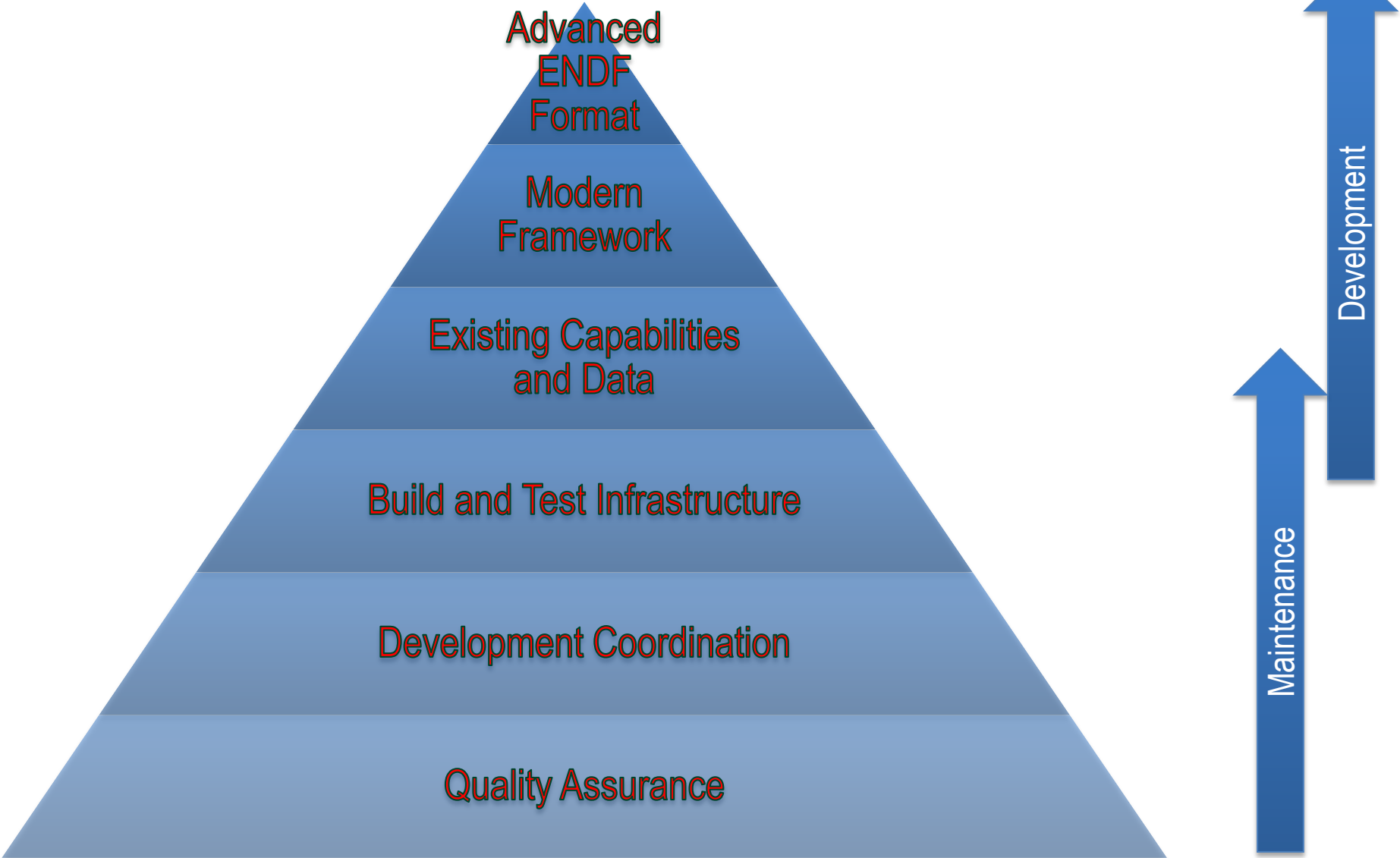# Quality Assurance Plan and Procedures

- Mission

  – Develop and implement the quality assurance (QA) infrastructure, which ensures QA requirements are verifiably met and is as low-impact as possible, to support the development, deployment and maintenance of a new, modern international database format/structure.

- Goals (Tasks):

  – Determine the QA requirements

  – Develop the QA plan (QAP) with implementing procedures

  – Determine and implement the testing requirements to support the QAP implementation and ensure QA

  – Develop and deploy the infrastructure needed to provide QA to the nuclear database—continuous integration model

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Needs and Wants

- Sponsor and/or end-user requirements

- Annual assessment is required

- Graded / scalable

- Low-impact / integrated

- Modern / best industry practices
  - NQA-1 Part IV Subpart 4.2 "Guidance on Graded Application of Quality Assurance (QA) for Nuclear-Related Research and Development"
  - ISO-9001

- Take credit for what we are already doing
  - ENDF-102 manual and procedures developed over the past 50+ years—a lot of lessons learned and do not want to repeat past mistakes
  - Established checking and processing codes
  - Validation Committee testing
  - ADVANCE – in development at NNDC

- Note: The QA plan is not the end result

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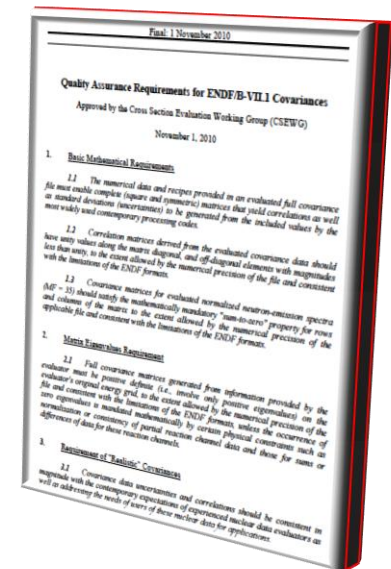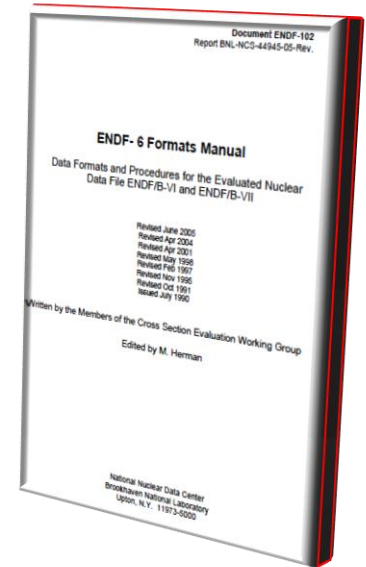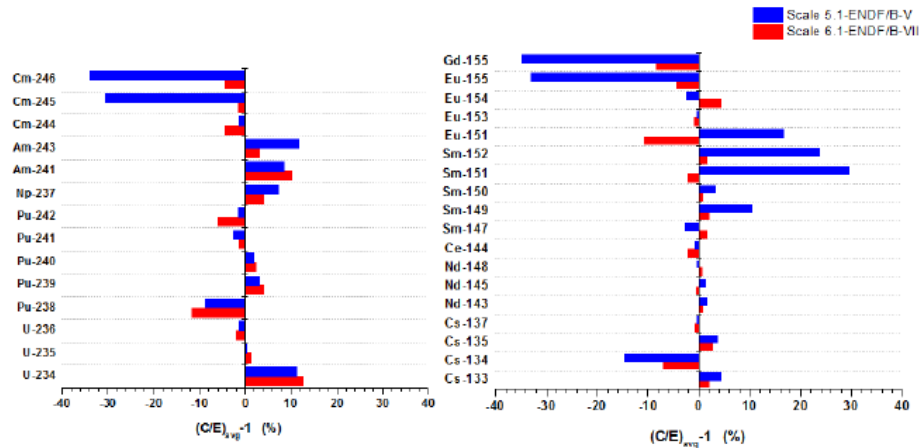
ENDF Modernization Roadmap

Development Coordination

- Before the QAP can be developed need to define roles and responsibilities for duration of QAP

  – Approval authority for approving and responsible for the QAP (suggestion: SG38 Chair, ENDF Formats Chair, etc.)

  – Records custodian

- ENDF Format Development Team — WPEC SG 38

  – Coordinates overall vision for new ENDF data structure

  – Sets priorities and reviews development progress

  – Meets regularly to coordinate development, deployment, maintenance

- After deployment need to establish long-term maintenance and development plan

  – Use existing ENDF Covariance Committee for long term management of format?

  – Establish on-going WPEC Subgroup (e.g., analogous to HPRL)?

- Team Communication

  – Regular project meetings (SG meetings, CSEWG Formats Meetings, etc.)

  – Development team meetings

  – Wiki pages

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Build and Test Infrastructure

- Three types of testing – need comprehensive coverage

  - Unit Testing – evaluator level (e.g., matrix summations, mass/energy balances, etc.)

  - Regression – Verification tests performed on database to ensure integrity of database as commits come in (e.g., ADVANCE at NNDC)

  - Validation and Verification – For ENDF happens now at the Validation Committee

- Team tasks:

  - Identify and determine the tests needed

  - formalize and document each phase of testing (e.g., through project dashboard reporting

Isotopic validation – ENDF/B-V and -VII

Radium decay series (4n+2)

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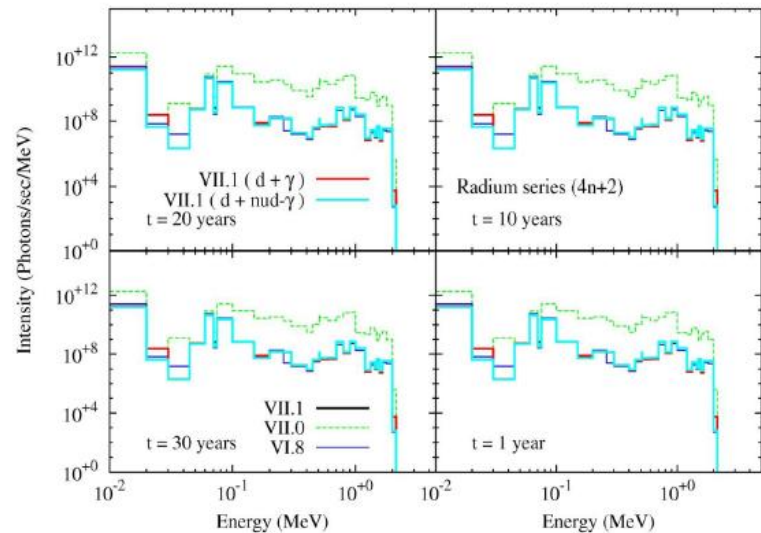
Build and Test Infrastructure

- ## FogBugz or GForge

  – Track QA feature development

  – Helpline tickets and email

  – Monitor changes to code/data repository

Example from SCALE Development using Fogbugz

SCALE Example for Test Harness and Dashboard

- After every update, SCALE is automatically built and tested to ensure functionality of all tested features

  – ~500 test cases (still need more)

  – Linux, Mac, Windows

  – Intel and GNU compilers

  – Release and Debug mode

Linux Regression

Site	Build Name	Update		Configure			Build			Test				Build Time	Labels
		Files	Min	Error	Warn	Min	Error	Warn	Min	NotRun	Fail	Pass	Min		
node16.ornl.gov	LEGACY-RELEASE-Intel-12.0.3.174	13	0.2	0	0	1.3	0	0 -16	5.6	0	4	477	221.6	2012-03-07T11:50:42 EST	(none)
node16.ornl.gov	LEGACY-RELEASE-Intel-12.0.3.174	11	0.4	0	0	3.4	0	16 +16 -39	14.1	0	4	477	223.8	2012-03-07T07:48:54 EST	(none)

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Build and Test Infrastructure

BNL leading effort to develop ADVANCE – Automated Data Verification and Assurance for Nuclear Calculations Enhancement

Visit http://www.nndc.bnl.gov/endf/b7.dev/qa/

Updated every hour!

Build and Test Infrastructure

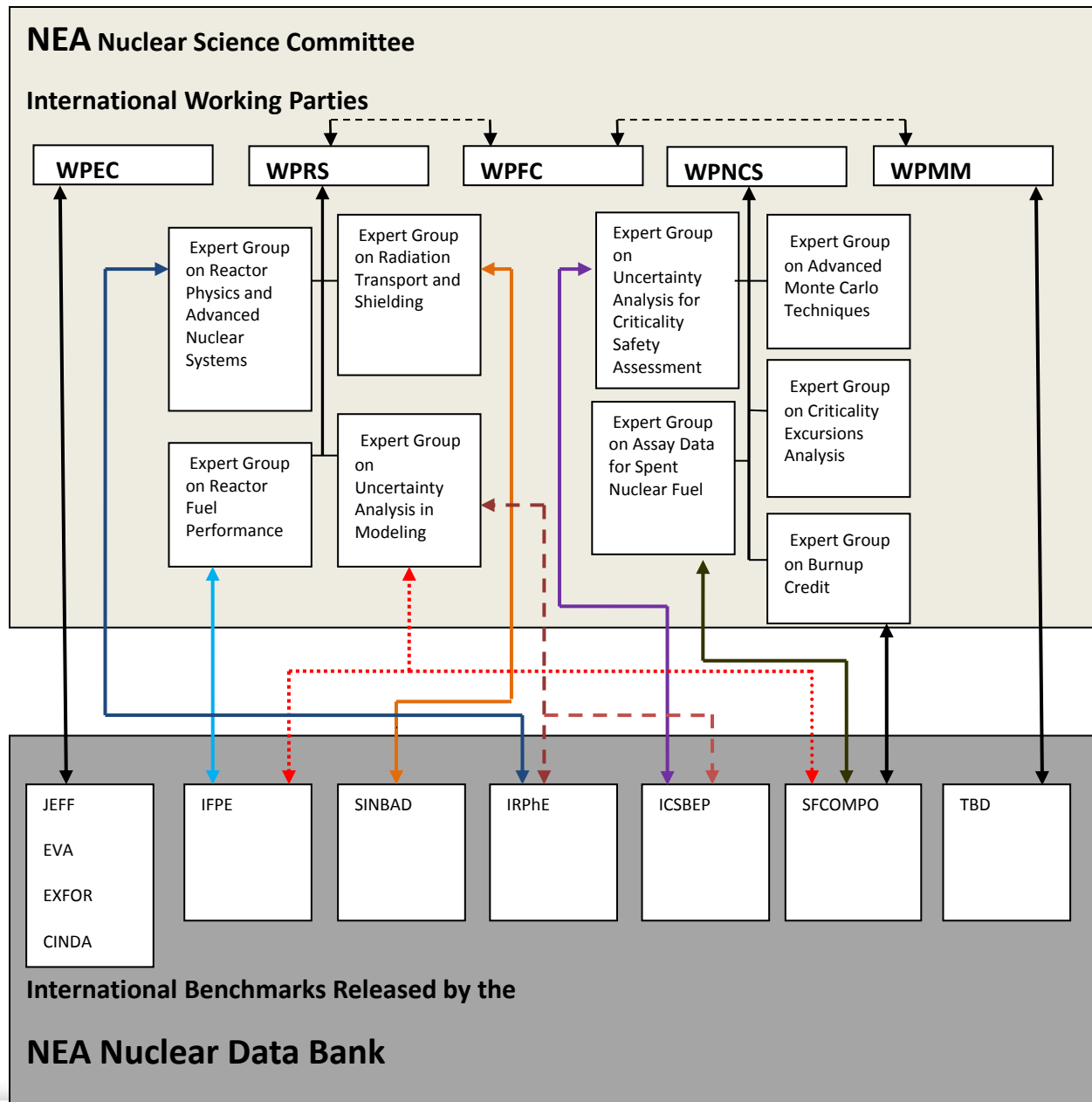BNL leading effort to develop ADVANCE – Automated Data Verification and Assurance for Nuclear Calculations Enhancement
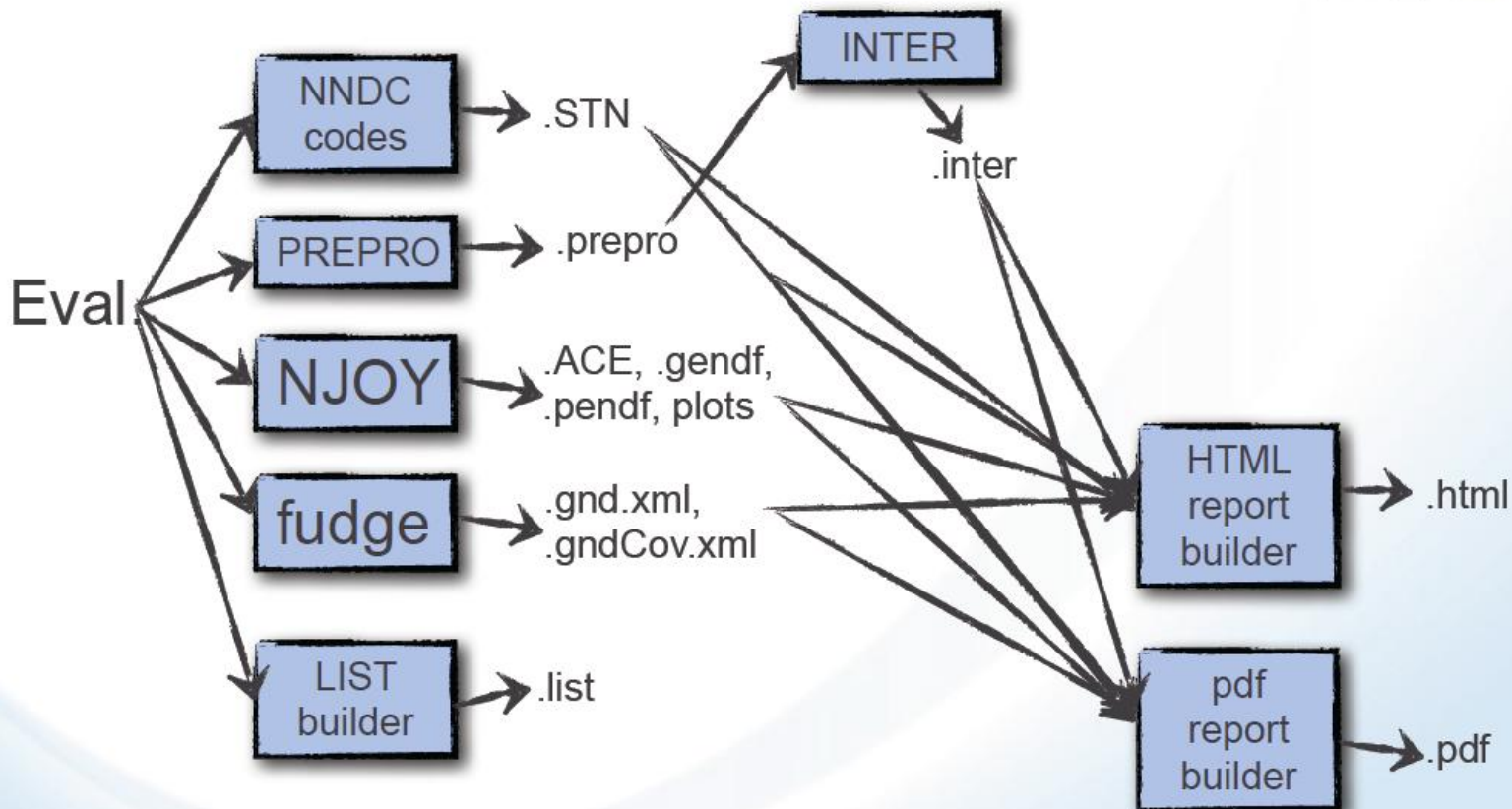
NEA Science Committee and Data Bank

Multiple, international benchmark databases that can be leveraged to support nuclear database V&V

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ENDF Modernization Roadmap
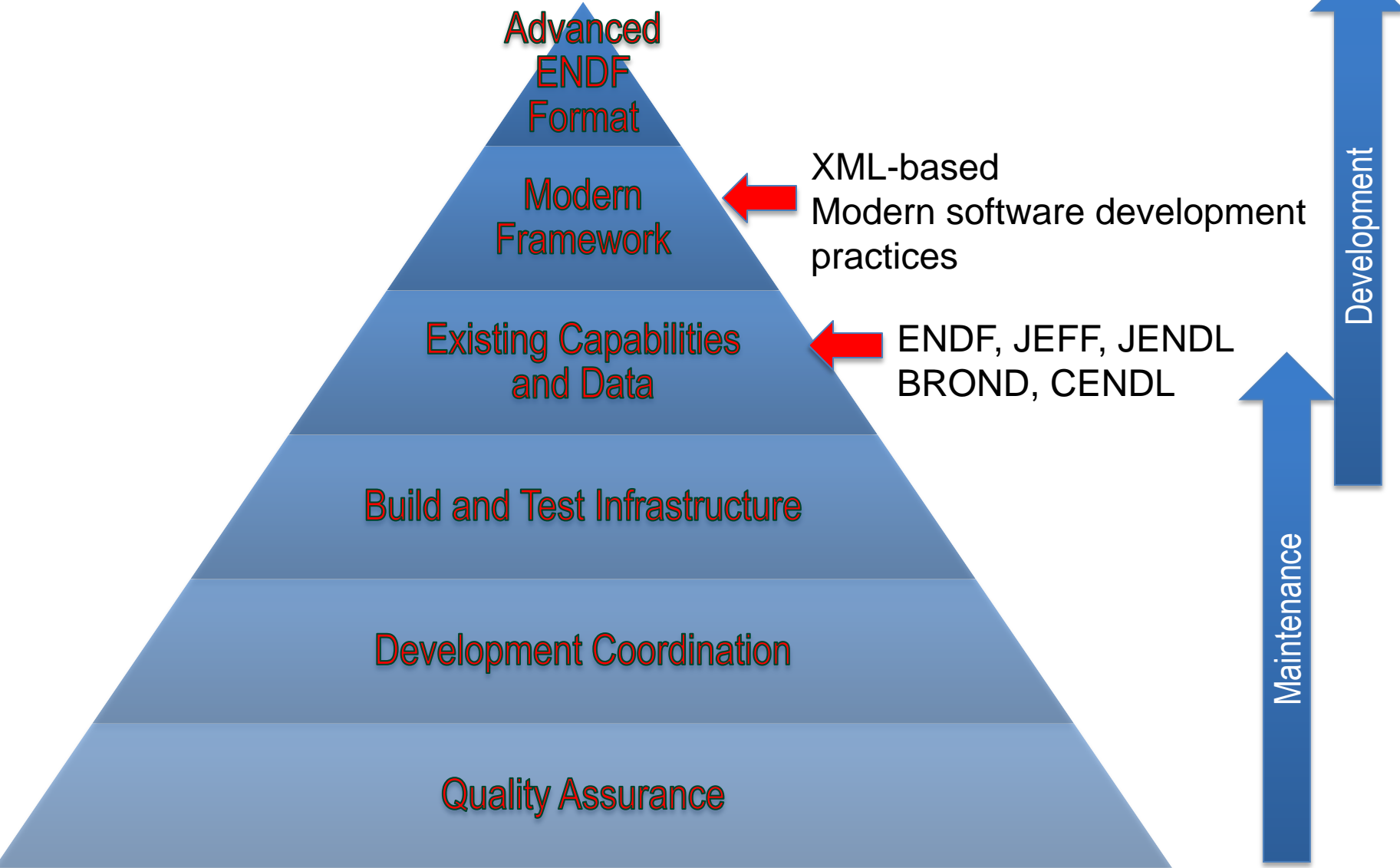
Quality Assurance Tasks

- Tasks:

  - Determine the QA requirements – August 2013

  - Develop the QA plan (QAP) with implementing procedures – November 2013

  - Determine and implement the testing requirements to support the QAP implementation and ensure QA – May 2014

  - Develop and deploy the infrastructure needed to provide QA to the nuclear database—continuous integration model – November 2014

Needed Resources and Potential Issues

- Resources

  - Decision points on QAP organization

  - Infrastructure for supporting continuous-integration and testing – Data Centers (staff and computing resources)

- Potential Issues - None