

NBL PROGRAM OFFICE OVERVIEW & UPDATE

Pete Mason
Acting Director



U.S. DEPARTMENT OF
ENERGY

Office of
Science

Brief History

- Founded as GOGO lab in 1949 to study uranium chemistry
- Assisted NBS (now NIST) in characterizing analyzed samples and Standard Reference Materials
- Added Plutonium in 1959
- Re-located to Argonne in 1976
- NIST transferred nuclear program in 1987

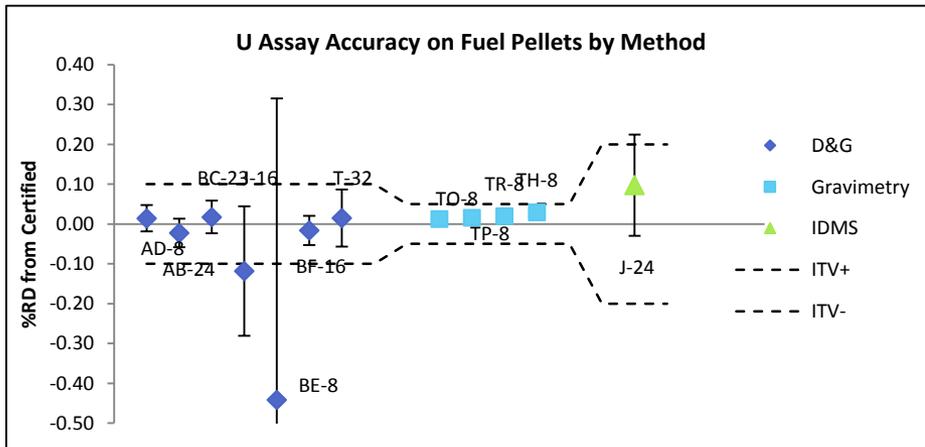
Recent issues:

- 2004: OPA review & stand-down
- 2005: A-76 competition
- 2006: transferred to SC
- 2008-13: reviews
- 2014: COV review
- 2014: Stand-down of all operations
- 2015: Limited ops under JCO & ESS
- 2015: AoA assessment
- 2016: Reorganization



NBL Certified Reference Materials

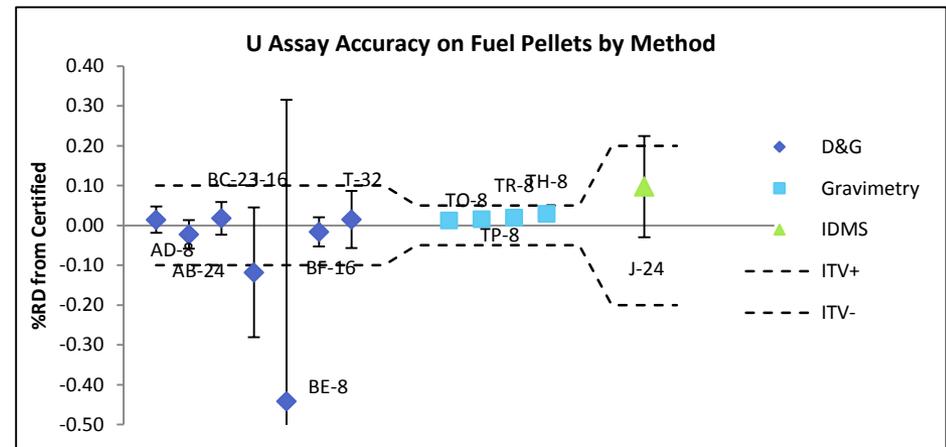
- NBL has a catalog of 56 nuclear reference materials
- Like NIST, NBL sells these materials to customers from around the world
- NBL provides major supplier of the worlds nuclear CRM's
- NBL's largest programmatic customers reside in the NNSA
- NBL also provides technical support relating to CRM's and measurement quality
- Annually: 60-120 CRM shipments, 300-800 units
- Approximately 50% US, 50% international



Typical Domestic Customers

- **DOE**
 - Y-12 National Security Complex
 - Los Alamos National Laboratory
 - Lawrence Livermore National Lab
 - Pacific Northwest National Lab
 - Savannah River Site
 - Oak Ridge National Laboratory
- **Research Institutions**
 - Texas A&M
 - University of Florida
 - University of Michigan
 - Georgia State University
 - University of Utah
 - University of Chicago
- **Other Government/Research/DOE-related**
 - Centers for Disease Control
 - Brooks Air Force Base
 - Materials & Chemistry Lab (ETTP)
 - Air Force Institute of Technology
 - Nuclear Fuel Services
 - BWXT Lynchburg
 - Various State EPA & Health Departments

- **Commercial Users**
 - GLE, URENCO, USEC
 - Honeywell
 - High Purity Standards
 - Westinghouse
 - Denison Mines
 - Test America
 - INNOV-X Systems, Inc.
 - Isotope Products





Certificate of Analysis

CRM 116-A

Uranium (enriched) Metal Assay and Isotopic Standard

Certified Property Values

Amount Content	Value	Expanded ¹ Uncertainty	Isotope-Amount Ratio	Value	Expanded ¹ Uncertainty
g U·g ⁻¹ metal	0.99945	0.00014	$n(^{233}\text{U})/n(^{235}\text{U})$	0.0000003863	0.0000000086
			$n(^{234}\text{U})/n(^{235}\text{U})$	0.0115836	0.0000097
Molar Mass	Value	Expanded ¹ Uncertainty	$n(^{236}\text{U})/n(^{235}\text{U})$	0.0094713	0.0000077
			$n(^{238}\text{U})/n(^{235}\text{U})$	0.051277	0.000041
g·mol ⁻¹	235.18572	0.00011	$n(^{236}\text{U})/n(^{235}\text{U})$	0.051277	0.000041
			$n(^{238}\text{U})/n(^{235}\text{U})$	0.051277	0.000041
Isotope-Amount Fraction (·100)	Value	Expanded ¹ Uncertainty	Isotope Mass Fraction (·100)	Value	Expanded ¹ Uncertainty
$n(^{233}\text{U})/n(\text{U})$	0.00003603	0.00000080	$m(^{233}\text{U})/m(\text{U})$	0.00003570	0.00000079
$n(^{234}\text{U})/n(\text{U})$	1.08023	0.00089	$m(^{234}\text{U})/m(\text{U})$	1.07497	0.00088
$n(^{235}\text{U})/n(\text{U})$	93.2547	0.0038	$m(^{235}\text{U})/m(\text{U})$	93.1985	0.0038
$n(^{236}\text{U})/n(\text{U})$	0.88324	0.00071	$m(^{236}\text{U})/m(\text{U})$	0.88647	0.00071
$n(^{238}\text{U})/n(\text{U})$	4.7818	0.0036	$m(^{238}\text{U})/m(\text{U})$	4.8401	0.0037

¹ Expanded uncertainties for certified property values have a coverage factor of approximately 2.0 with the exception of the amount content value which has a coverage factor of 2.4 and the ²³³U values which have a coverage factor of 3.3 for isotope amount ratio, isotope-amount fraction, and isotope mass fraction.

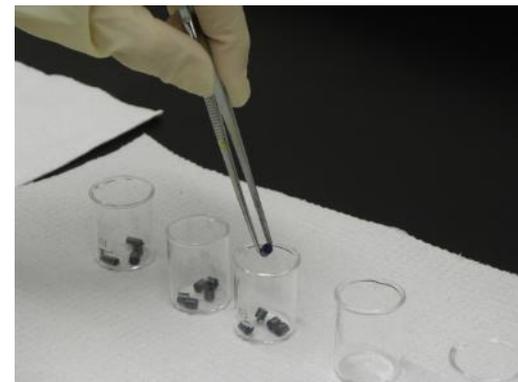
Notes:

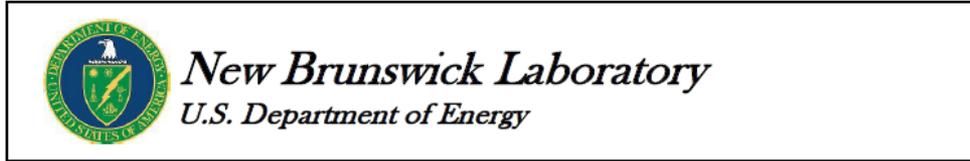
Certified Reference Material 116-A (CRM 116-A) is a uranium amount content and isotope-amount ratio standard intended for use in calibration of and/or quality control for uranium analysis methods. Each unit of CRM 116-A consists of a metal piece with a mass of approximately 1.1 grams. This CRM is not characterized for total quantity of material which may be somewhat greater or less than the nominal mass (between 1.0 g and 1.2 g).

CRM 116-A is a radioactive material and should be handled and stored under proper radiologically-controlled conditions at all times.

October 31, 2013
Steven Bakhtiar
Laboratory Director

New Brunswick Laboratory
Argonne, Illinois
www.science.energy.gov/nbl





CRM 126-A

Plutonium Metal Assay and Isotopic Standard

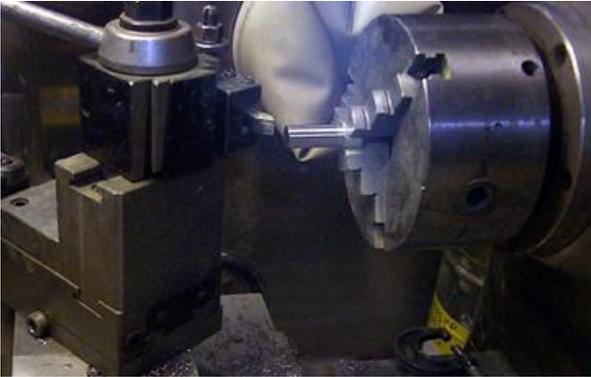
**(In cooperation with the University of California
Los Alamos National Laboratory, Los Alamos, New Mexico)**

Plutonium Concentration (Mass Fraction)0.99960 ± 0.00026 kg Pu/kg

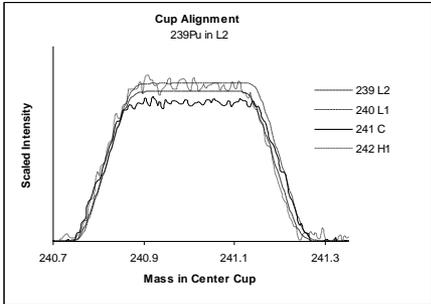
<u>Isotopic Ratios</u>	<u>²³⁸Pu/²³⁹Pu</u>	<u>²⁴⁰Pu/²³⁹Pu</u>	<u>²⁴¹Pu/²³⁹Pu</u>	<u>²⁴²Pu/²³⁹Pu</u>	
Atom Ratios	0.00013022 ± 0.00000030	0.062744 ± 0.000016	0.00157886 ± 0.00000076	0.00038465 ± 0.00000025	
<u>Isotopic Abundance</u>	<u>²³⁸Pu</u>	<u>²³⁹Pu</u>	<u>²⁴⁰Pu</u>	<u>²⁴¹Pu</u>	<u>²⁴²Pu</u>
Atom Fraction (x 100)	0.012229 ± 0.000028	93.9110 ± 0.0015	5.8923 ± 0.0015	0.148272 ± 0.000072	0.036123 ± 0.000024
Mass Fraction (x 100)	0.012175 ± 0.000028	93.8863 ± 0.0015	5.9155 ± 0.0015	0.149476 ± 0.000072	0.036568 ± 0.000024

Relative Atomic Mass of Plutonium239.115113 ± 0.000015

Certified values above are valid for July 30, 2003



	NBL	DOE Lab	100%-Imp
Pu Wt %	99.9598	99.9582	99.9550
2 SE	0.0053	0.0102	-
%RD from NBL	-	-0.0016	-0.0048



Brief History

- Founded as GOGO lab in 1949 to study uranium chemistry
- Assisted NBS (now NIST) in characterizing analyzed samples and Standard Reference Materials
- Added Plutonium in 1959
- Re-located to Argonne in 1976
- NIST transferred nuclear program in 1987

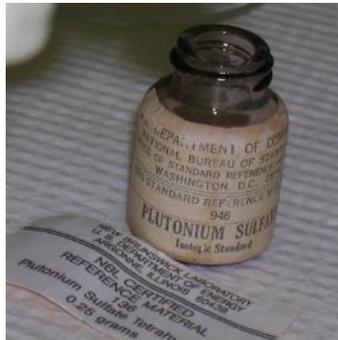
Recent issues:

- 2004: OPA review & stand-down
- 2005: A-76 competition
- 2006: transferred to SC
- 2008-13: Pgm & facility reviews
- 2014: COV review
- 2014: Stand-down of all operations
- 2015: Limited ops under JCO & ESS
- 2015: AoA assessment
- 2016: Reorganization



Establishing NBL Program Office

- NBL PO development to meet ISO 17034 “General requirements for the competence of reference materials producers”
- Established NBL Program Office by reorganization & transfer mission personnel out of the Building 350 laboratory: May 15, 2016
- Established Building 350 Legacy project to:
 - Oversee move of vital CRM’s to new locations (~12,000 items)
 - Disposition excess nuclear materials (~11,000 items)
 - Transition building to Argonne National Lab for future use
 - Maintain CRM shipping continuity during transition
- Prepare contractor-operated storage/shipping location for CRM’s
- Establish Interagency Working Group
- Prepare for first CRM project: plutonium isotopic standards

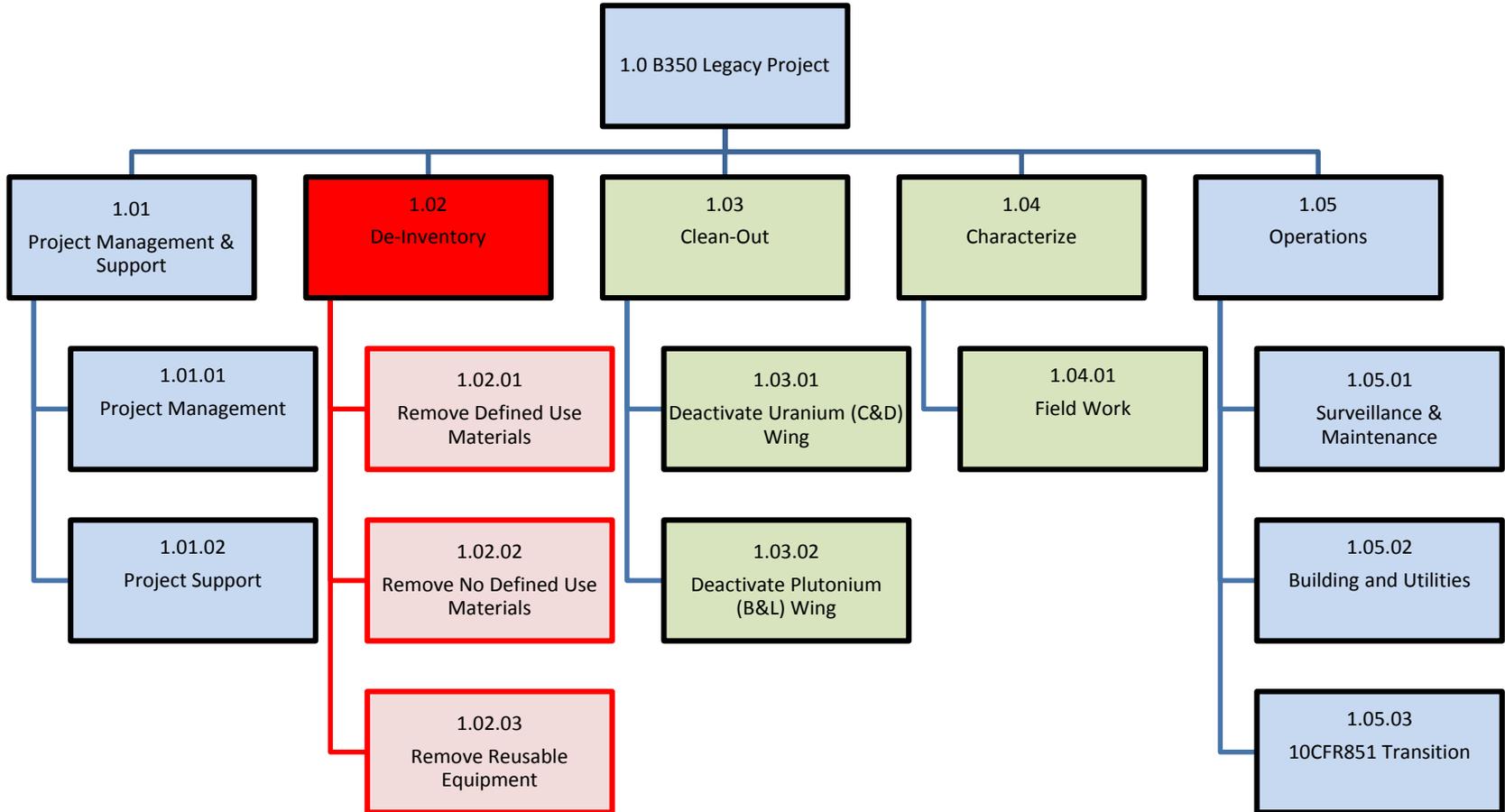


NBL Program Office Mission Statement

The NBL Program Office is dedicated to supporting the nation's national security, international safeguards and nonproliferation programs, and assisting organizations engaged in research and the nuclear industry. The NBL PO provides this support through:

1. Standards excellence: producing and certifying world-class nuclear certified reference materials
2. **Standards availability: ensuring the reliable distribution and availability of our products**
3. Measurement quality: providing proficiency testing and measurement quality expertise

B350 Legacy Project



Future CRM Storage/Distribution



Future CRM Storage/Distribution

Standard Mobile Office Trailers

Our standard mobile office trailer models are available in many sizes and configurations. We can also customize a unit to match your exact requirements. Interiors are finished with paneled walls and vinyl or tiled floors, horizontal slider windows, fluorescent lights, air conditioning and baseboard heat. Exteriors are aluminum siding with drip-rail gutters.

24'x56', 1,344 SF (nominal)

The model 2460 double-wide mobile office trailer features a large common area and two 12'x12' offices at each end (four total). Ask about custom configurations to meet your exact requirements.

Interior Finish

- Paneling or vinyl-covered gypsum walls
- Vinyl or tile floors
- One or two-restroom models available

Electric

- Fluorescent lights
- Breaker panel

Windows/Doors

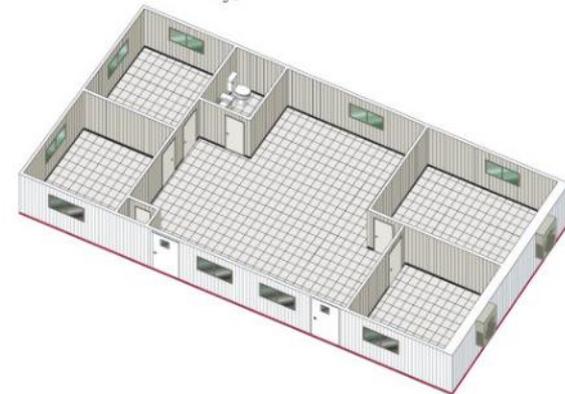
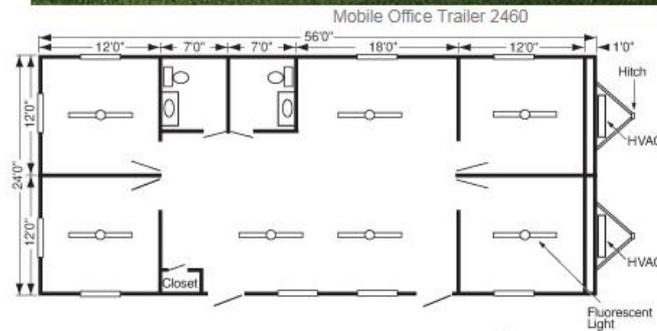
- Horizontal slider windows
- 36" x 80" exterior doors with locking hardware

Heating and Air Conditioning

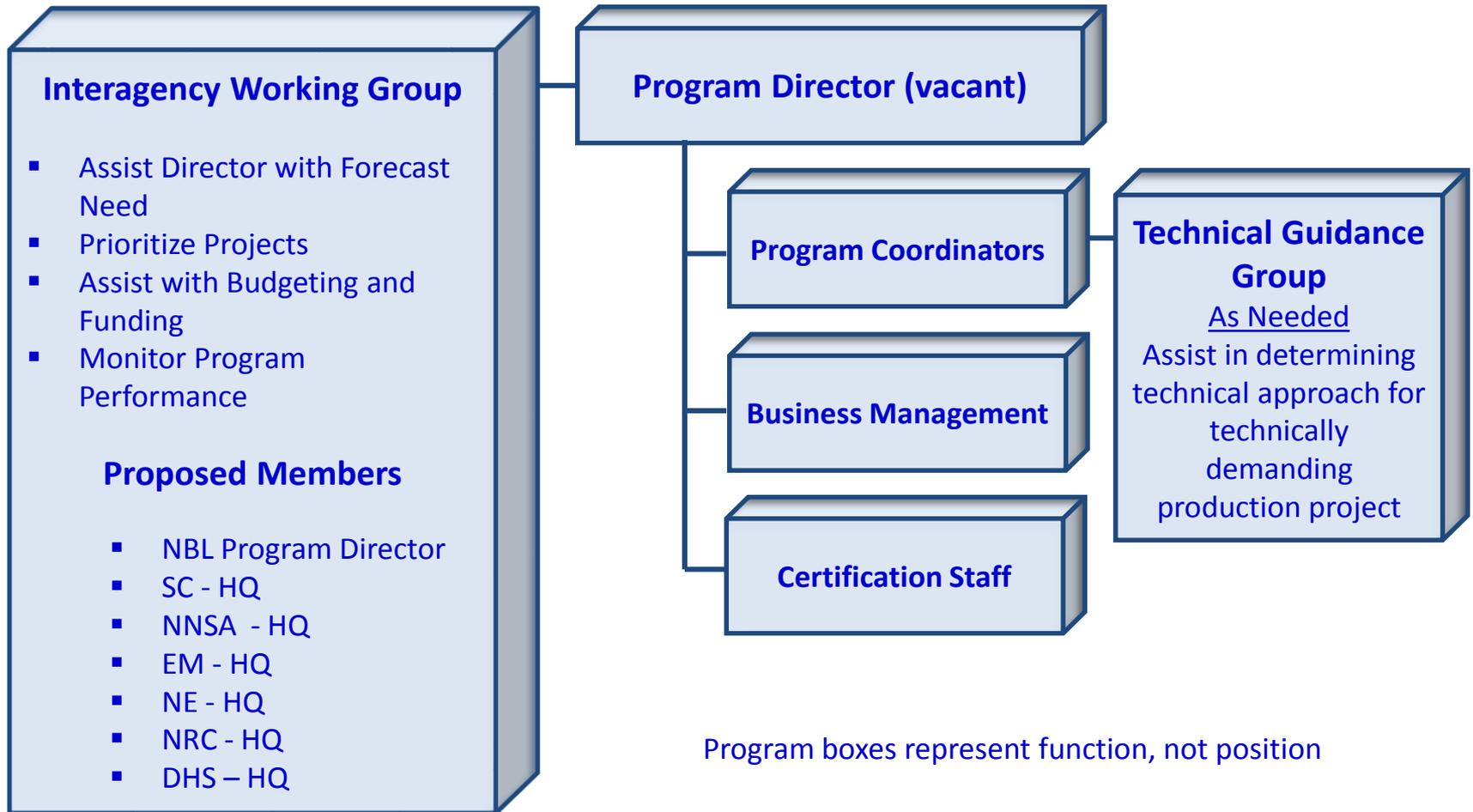
- Central HVAC

Exterior Finish/Frame

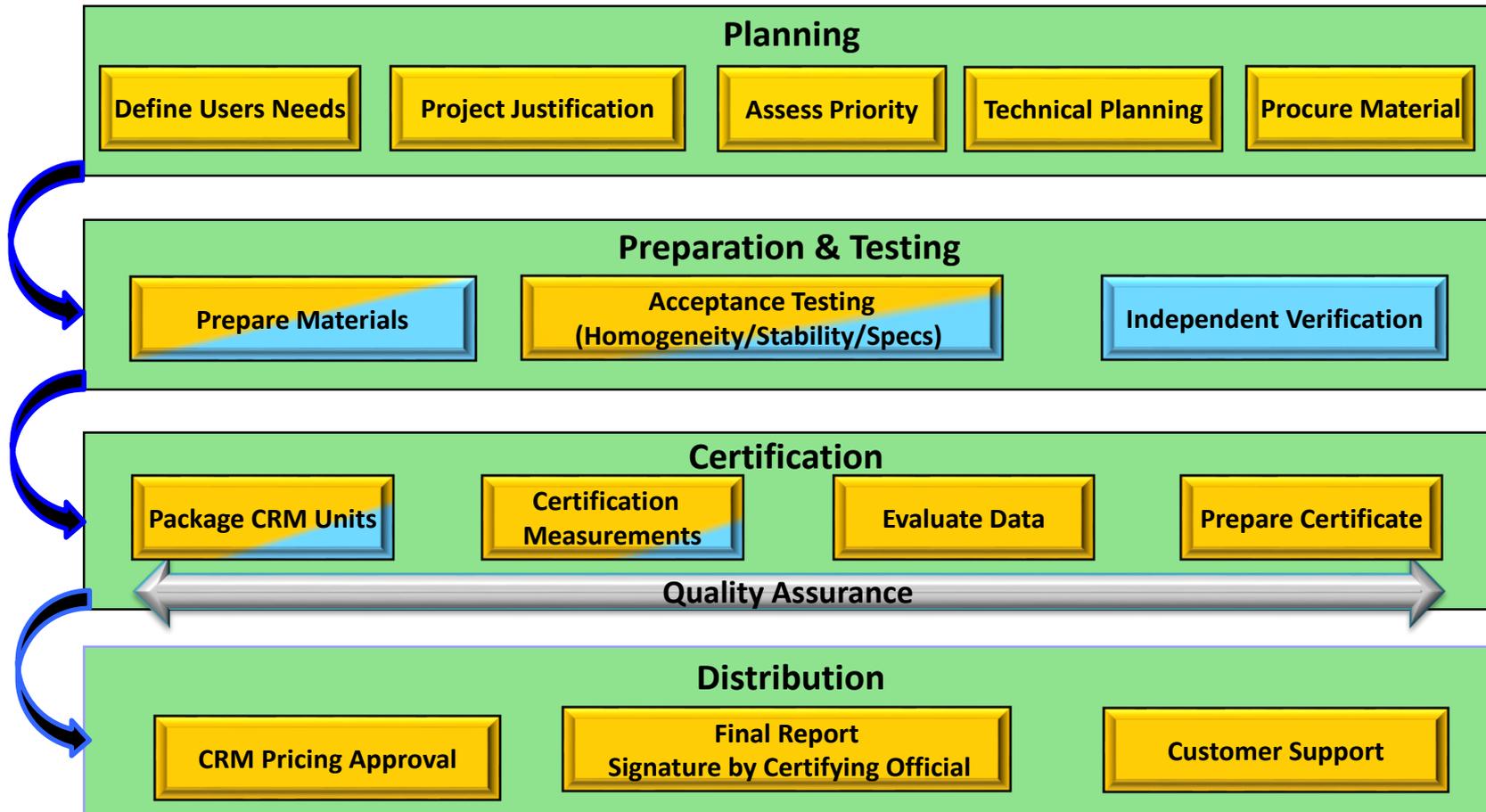
- .019 Aluminum siding
- I-Beam frame
- Standard drip-rail gutters



NBL Program Office Org Chart

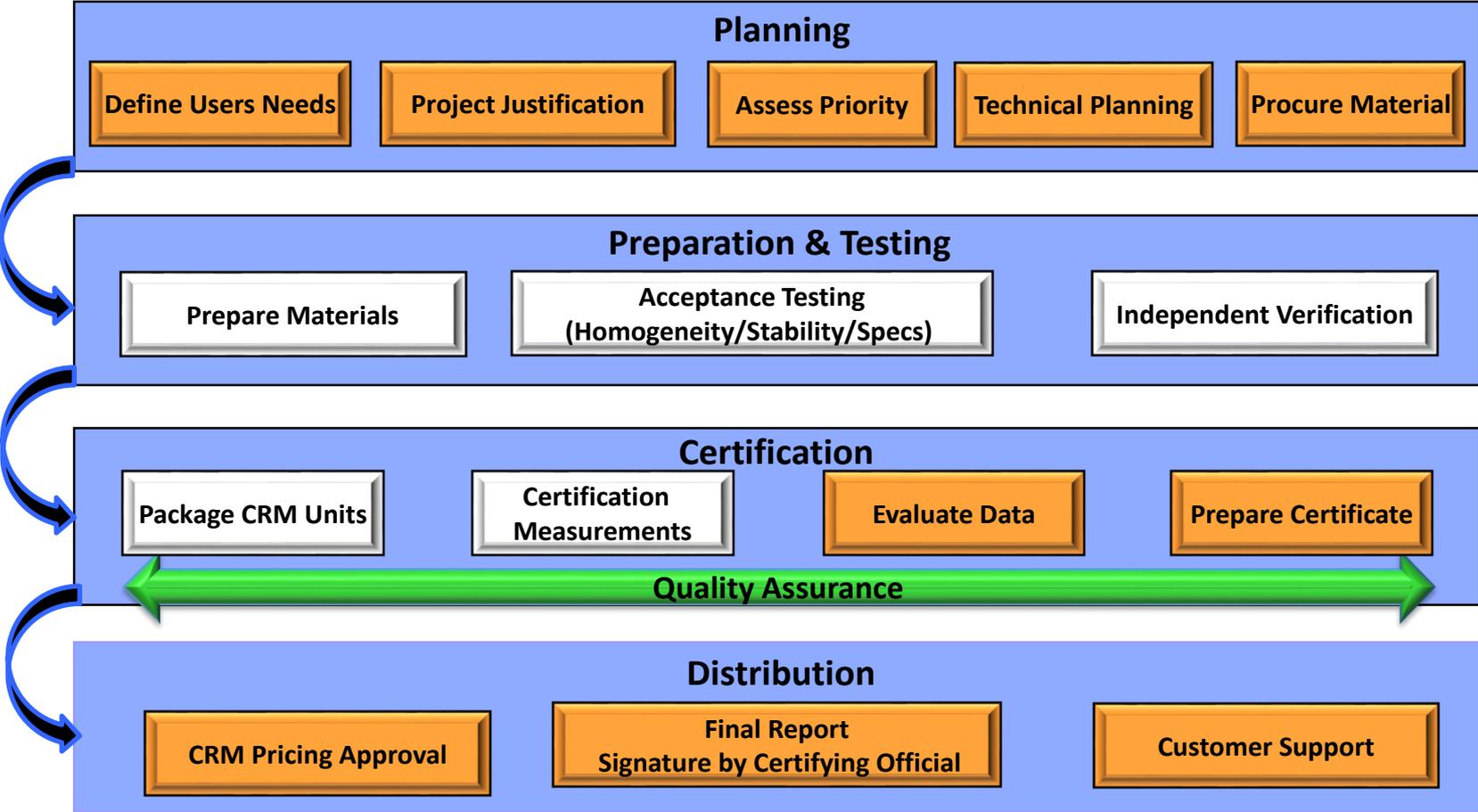


In-House CRM Production (17034)



 NBL Role  NBL/Contractor  Contractor Role

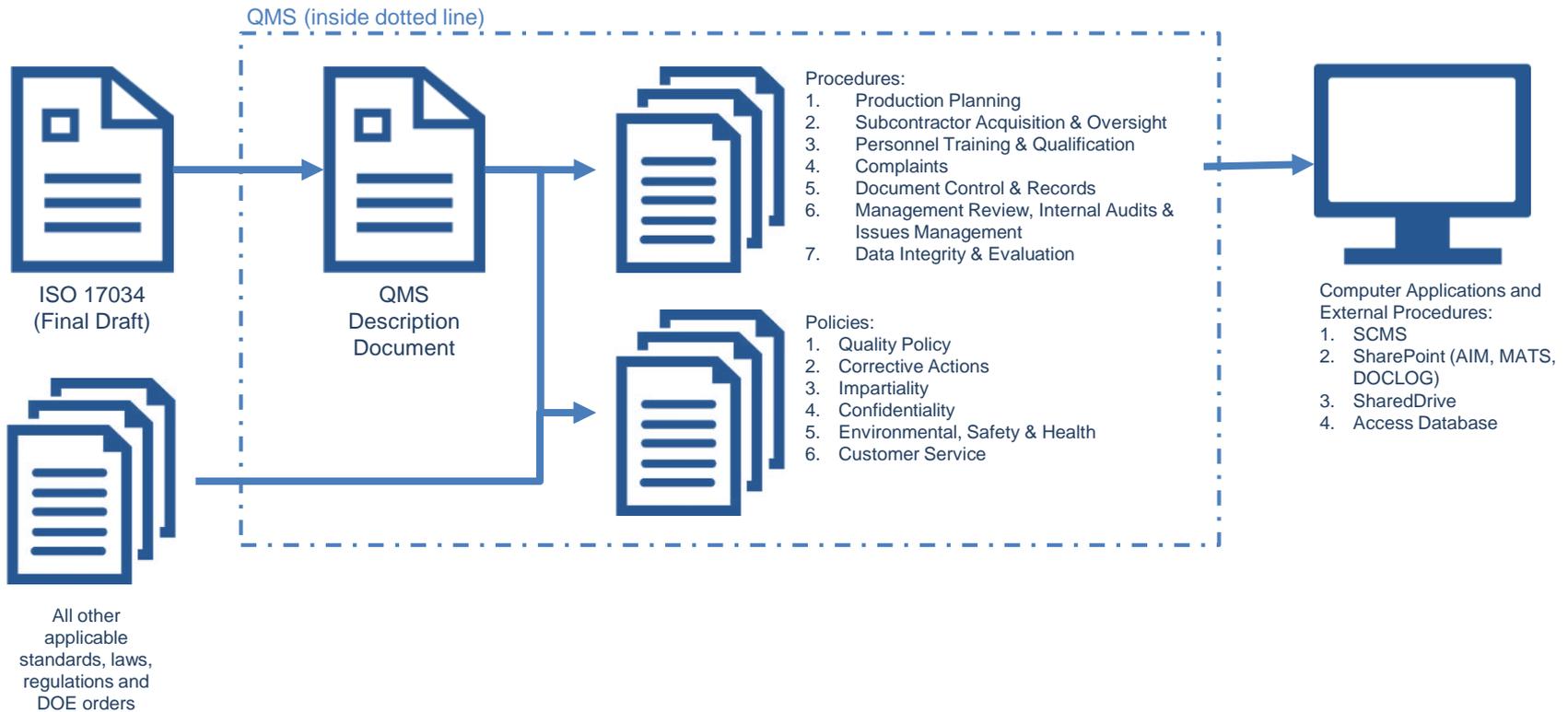
NBL PO Production Method (17034)



 Federal Program Office Role

 Contractor Role

NBL Program Office Quality Management System (QMS)



Establishing Technical Basis: Adapt NIST “Modes” Policy

- Two ‘tiers’ of Reference Materials:
 - **Reference Material (RM):** Material, sufficiently homogenous and stable with respect to one or more specified properties, which has been established to be fit for its intended use in a measurement process.
 - **Certified Reference Material (CRM):** Reference material (RM) characterized by a metrologically valid procedure for one or more specified properties, accompanied by an RM certificate that provides the value of the specified property, its associated uncertainty, and a statement of metrological traceability. *[ISO Guide 30:2015(E)[8]]*
- Clarify what NBL CRM’s and RM’s mean (and impact on production and use):
 - **NBL Certified Value/CRM:** A value reported on the Certificate/Certificate of Analysis for which the Program Office has the highest confidence in its accuracy in that all known or suspected sources of bias have been fully investigated or accounted for in defining the value. Values are generally referred to as certified when Modes 1, 2, or 3 have been used for value-assignment and all the criteria for that mode are fulfilled.
 - **NBL Reference Value/RM:** A Reference Material, accompanied by a Report of Analysis, for which one or more measurands have been determined using the modes of analysis that only result in **reference values**. A Reference Value is a best estimate of the true value, provided on a Certificate or Report of Analysis, where all known or suspected sources of bias have not been fully investigated.

Modes of Value Assignment

Mode	Description	Certified Value	Reference Value	Info Value
1	Certification based on measurements made in a designated laboratory using a single primary method with confirmation by other method(s)	x		
2	Certification based on measurements made in a designated laboratory using two independent critically-evaluated methods	x	x	
3	Certification/Value-Assignment using one or more critically evaluated methods at two or more collaborating laboratories	x	x	
4	Value-Assignment based on measurements by two or more laboratories using different methods		x	x
5	Value-Assignment based on a method-specific protocol		x	x
6	Value-Assignment based on measurements by a designated laboratory using a single method		x	x
7	Value-Assignment based on selected data from inter-laboratory comparison studies		x	x

- New techniques/modifications will require critical evaluation if desired to provide certified values (vs reference values)
- Mode 1: Per CIPMs CCQM: “A primary method of measurement is a method having the highest metrological properties, whose operation can be completely described and understood, for which a complete uncertainty statement can be written down in terms of SI units”
- Mode 2: Independent generally means significant sources of error are different (e.g. coulometry & IDMS) and minimize common steps in sample prep & analytical measurement techniques

Summary

- NBL reorganized May 15th into NBL Program Office and 350 Legacy Project
- Building 350 Legacy Project (deinventory/disposition) underway
- NBL Program Office formed
 - Adopt & adapt NIST model
 - Develop & implement QMS to yield ISO 17034 compliant program
 - Implement site for storage, distribution & maintenance of CRM inventory
 - Identify urgent CRM needs & program plans, convene IAWG
 - Project planning and working group for first CRM production underway
 - Implementing business plans & policies
 - Develop long-term plan for ensuring technical competency and CRM production capability under new Program Office model
 - Maintain continuity of CRM availability during transition & evolution