

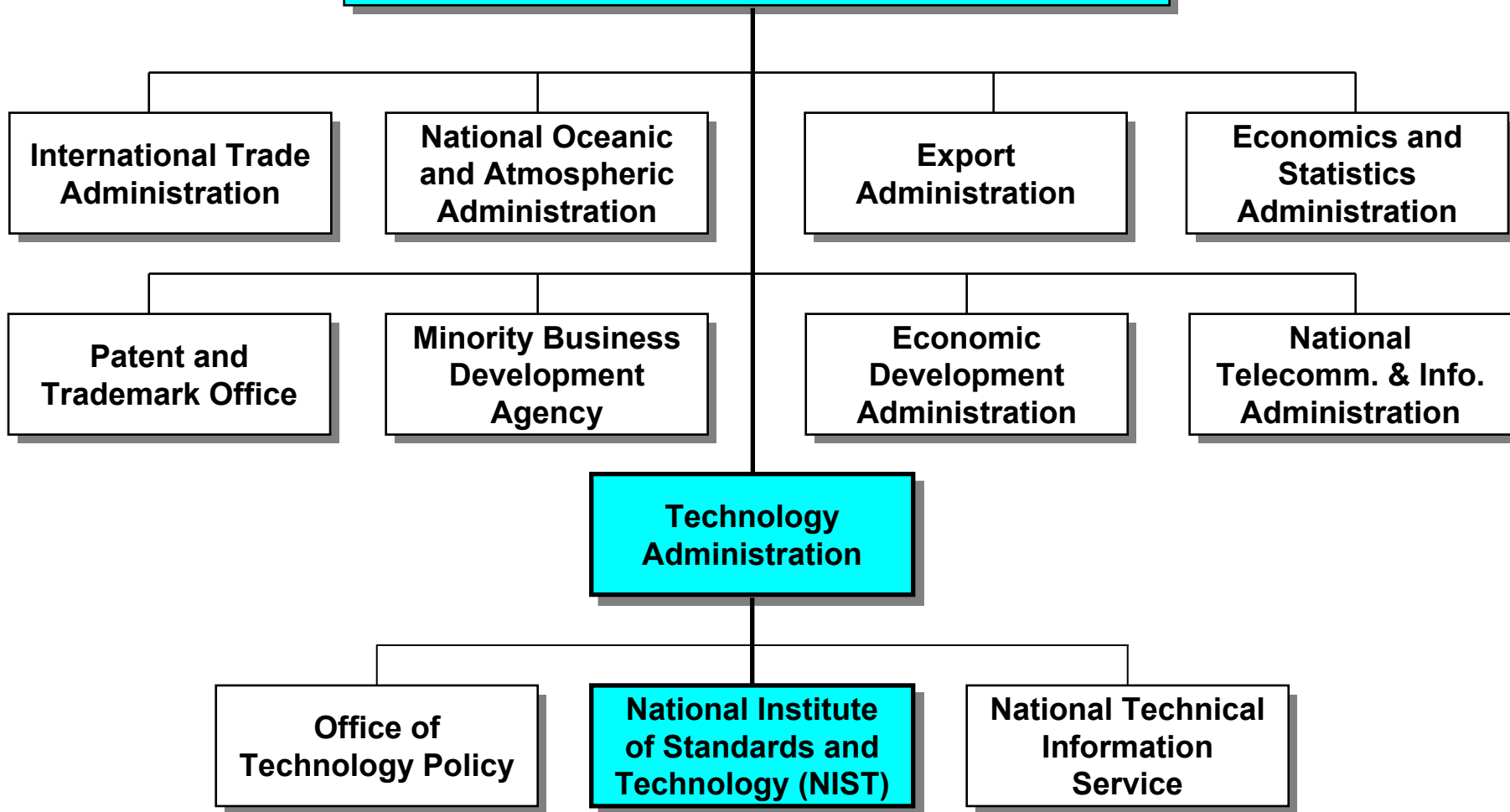
# **Testing and Certification**

National Institute of Standards and Technology  
(NIST)  
Information Technology Laboratory  
Information Access Division

Fred Byers  
E-mail: [byers@nist.gov](mailto:byers@nist.gov)



# Department of Commerce



# Information Technology Laboratory (ITL)

Mathematics and  
Computational Science  
Division

Statistical  
Engineering  
Division

Computer  
Security  
Division

Networking  
Research  
Division

Software  
Testing  
Division

## Information Access Division 5 Groups

Speech Group

Retrieval Group

Digital Media  
Group

Image Group

Visualization and  
Usability Group

# State of Optical Disc Longevity

- Disc longevity
  - Varies across the industry
  - Changes across the industry
  - Commoditization: competition based primarily on price, - may be affecting disc longevity across the industry
- Consumer is uncertain or incorrect about disc longevity

# User versus Disc in Disc Longevity

1. Handling √ User can control
2. Storage Conditions √ User can control
3. Initial recording quality ? User can control
  - Condition of disc at time of recording
  - Quality of burn (depends on disc, burner, system)
4. Disc construction × User cannot control
  - Materials
  - Manufacturing process, quality control

# Predicting Consumer Purchasing

Do consumers care more about price than quality?

- Will consumer purchasing respond to differentiated discs based on quality versus price?
- Will consumers look for these discs?
- Will consumers pay more?
- How much?

# Initial Consumer Survey Response

Indications from Government agencies:

(Government Information Preservation Working Group Survey)

- They will respond to quality versus price with differentiated discs based on quality.
- They will look for, or request these discs.
- They will pay more (based on assumptions).
- How much?

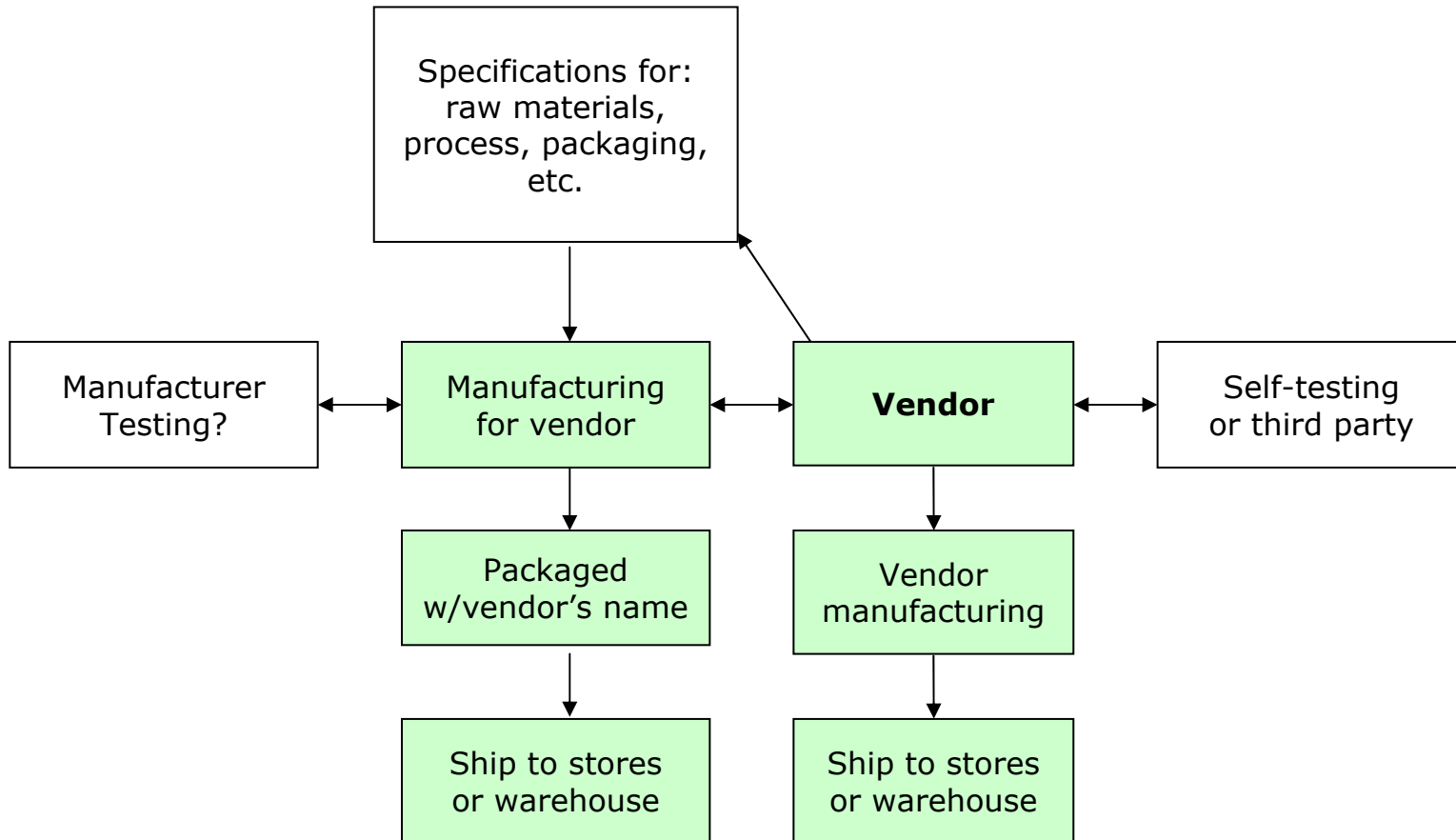
# Proposed Test Method and Disc Certification

## Goals:

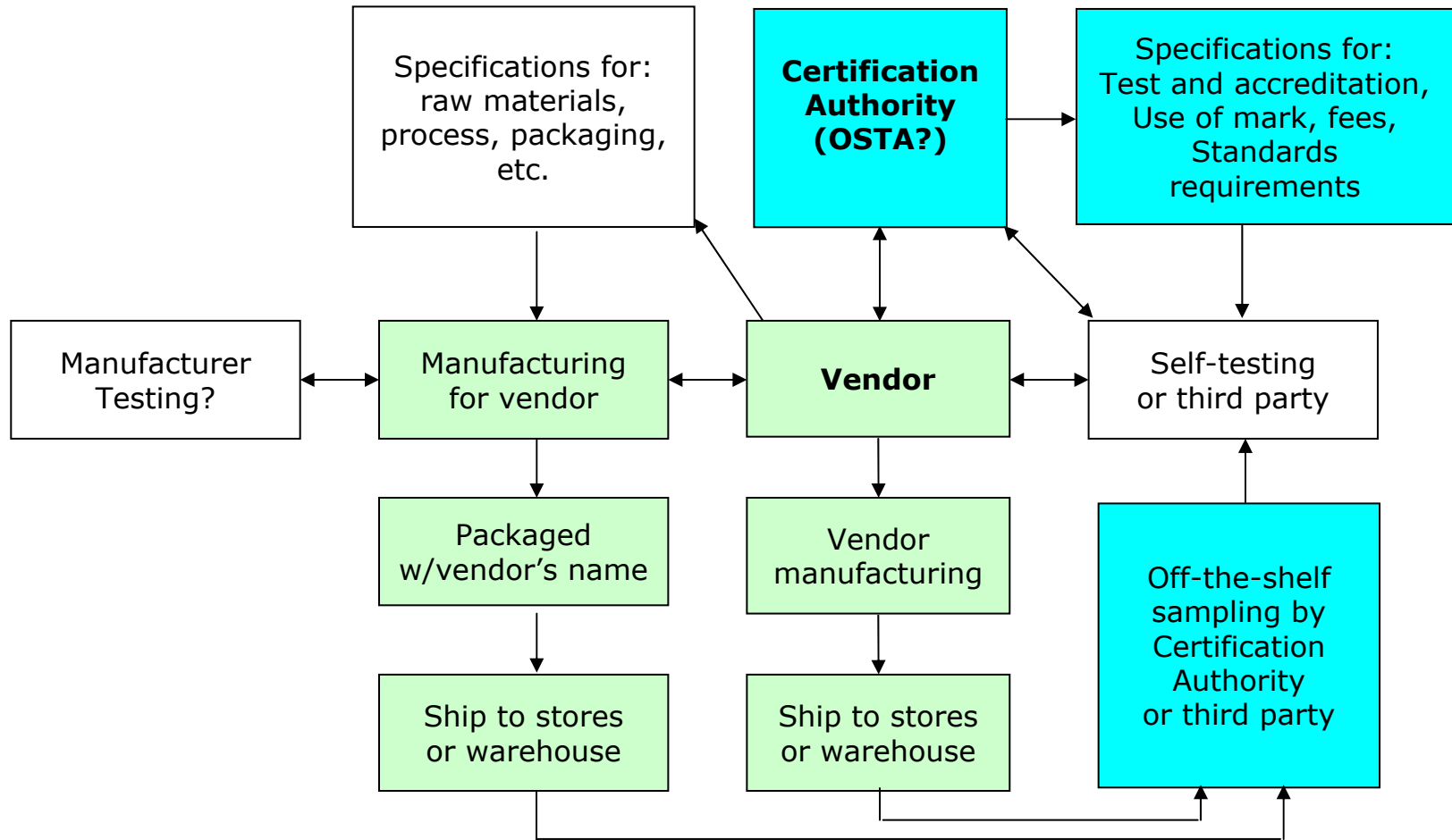
- Industry Standard Test Method
  - A consistent test for discs intended for long-term storage
- A test that industry accepts
  - Industry supports the development and the use
- Labeling for consumers
  - Statement or logo (certification) identifying disc as passing the test
  - A metric for the consumers to use (e.g. 30 years, 50 years)



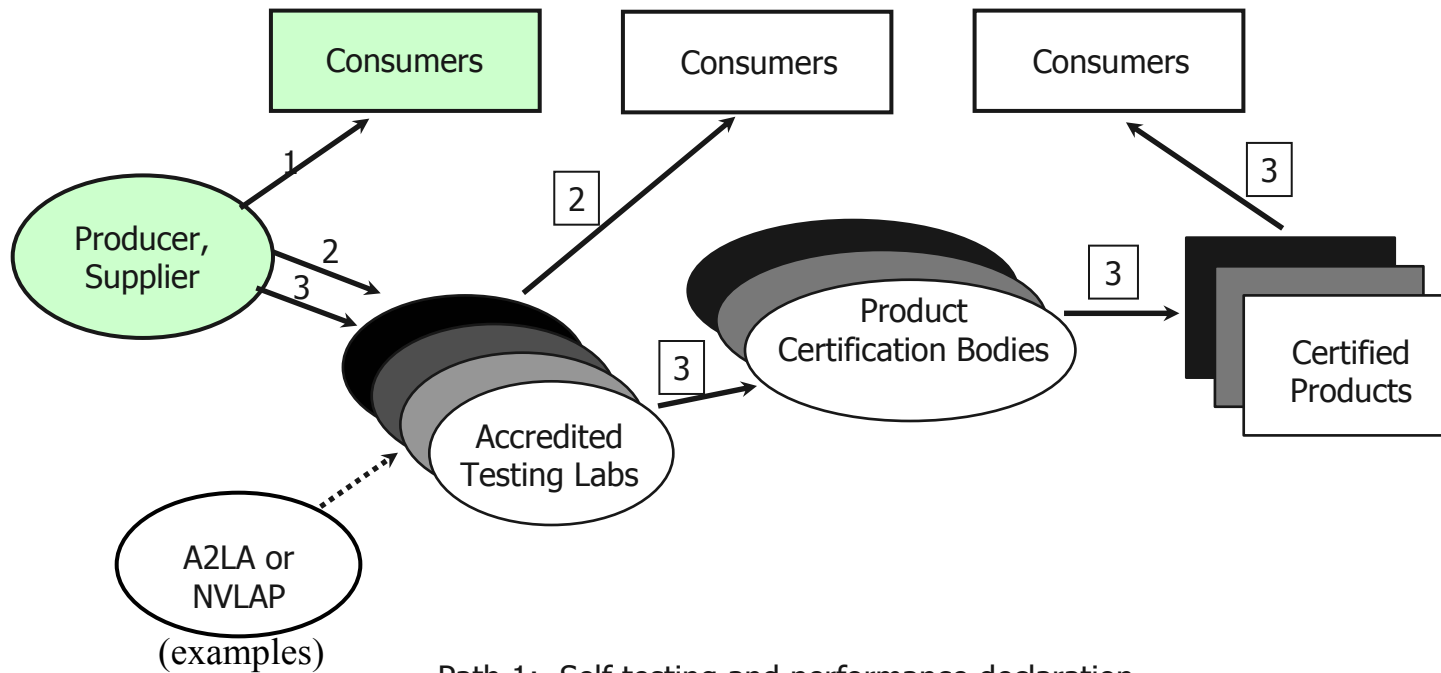
# Current



# - Alternative - Disc Certification Approach



# Paths to Consumer



Path 1: Self testing and performance declaration

Path 2: Performance demonstrated by testing in accredited laboratory and/or by accredited test

Path 3: Performance demonstrated by testing and product certification

# Testing Consistency

## Testing consistency and conformity across different testing laboratories:

- Laboratory Accreditation Requirements
  - defines what must be met for a testing laboratory to achieve accreditation
- Laboratory Accreditation Process
  - evaluation of a testing laboratory for satisfying accreditation requirements to achieve accreditation

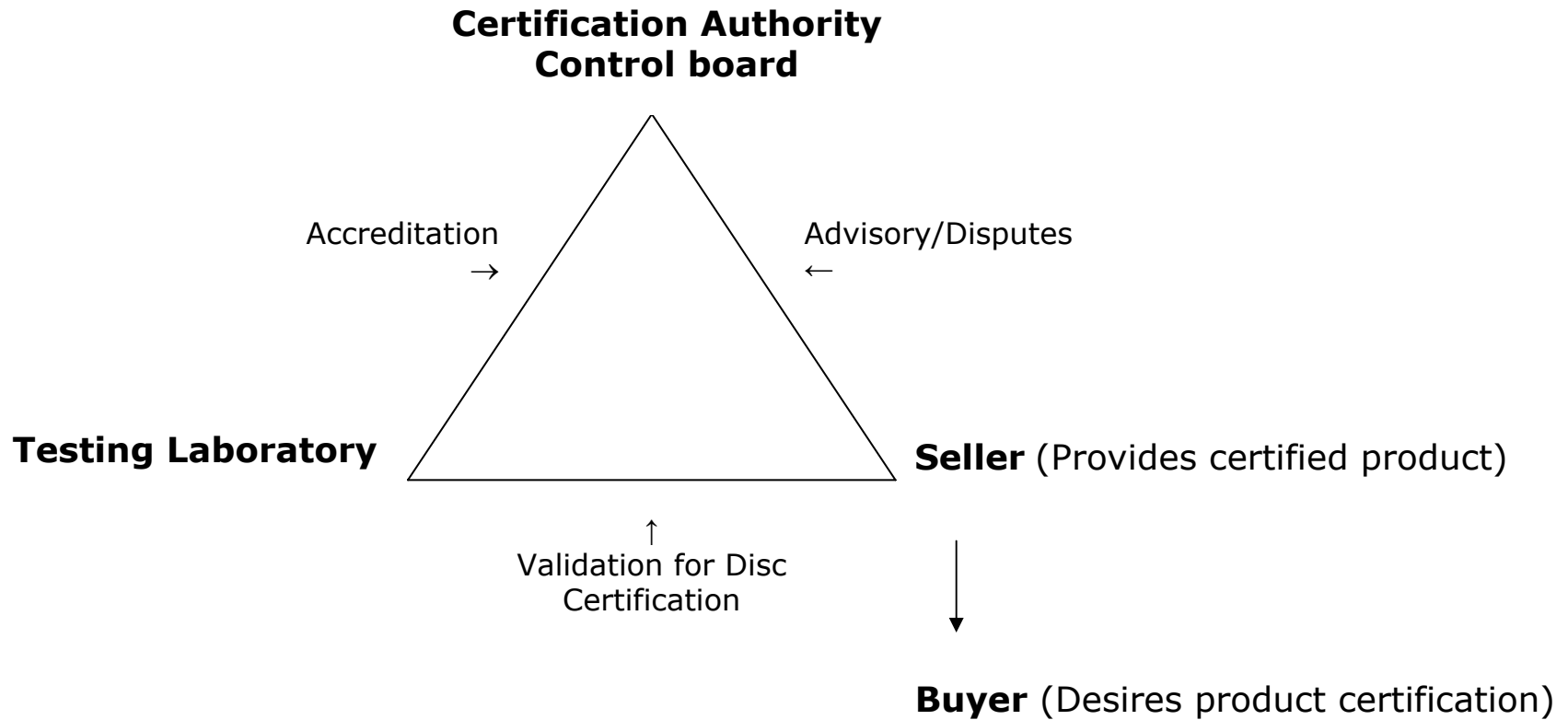
# Disc Validation and Certification

- Validation is the end result of the successful passing, by a set of discs in an accredited laboratory, of the test requirements for a given grade certification (e.g. 30, 50, 75, 100 years.
- Certification is the acknowledgment that validation has been successful for a disc type and that any other criteria, established by a certifying organization for issuing certification, has been met.

# **Validation through testing and disc certification**

- Accredited testing Laboratory
- Certification Authority/Control Board
- Testing Policies and Procedures

# Validation and Certification Process Interaction



# Accredited Testing Laboratory

- Can be accredited by a formal accreditation organization.
- Tests discs using an official test method.
- Vendor self-testing or third party laboratory.
- Documents the test results of disc testing.
  - a complete description of the disc type under test,
  - the dates that the testing occurred,
  - the name and traceable manufacturer number of the disc type,
  - the pass/fail and grade results of the disc type,
  - the name of the testing laboratory,
  - signature



# Certification Authority

- Responsible for establishing the process for certification of discs
- May be a trade association, consortium, standards group, or private sector company
- Sets rules/criteria for issuing the certificates
- Owns the logo and any related IP (if any)

# Control Board

- Can be comprised of members from the Testing Laboratories, Certification Authority, standards committees, as well as experts in the field
- Neutral body to resolve technical questions or disputes related to the testing process
- Can serve as an advisory to the Certification Authority
  - Roles can include assisting in developing rules/criteria for:
    - recognizing Test Laboratories
    - assessing Test Laboratories
    - recommendations for changes to the certification process and/or policy

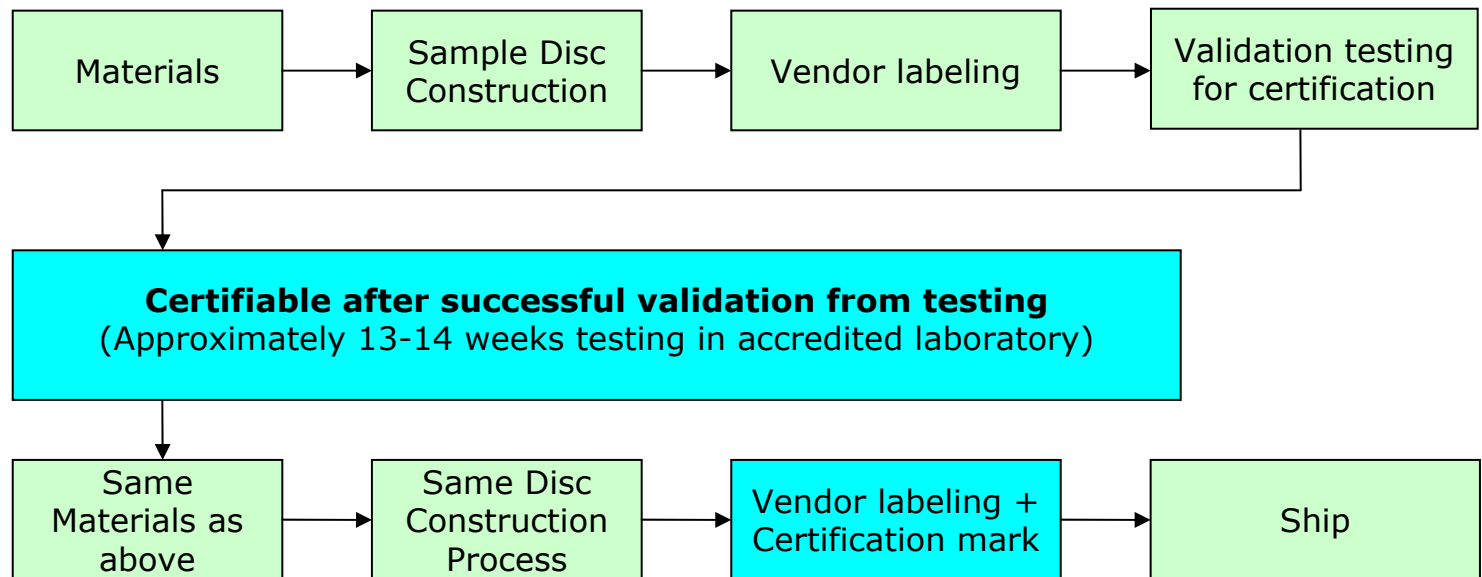
# Testing Policies and Procedures

Defines the administrative and operational testing process

Should address at least the following:

- responsibilities of the Certification Authority including Control Board, Testing Laboratory, Vendor
- test laboratory recognition and accreditation evaluation process
- complete definition of the disc validation and certification process
- test results security, confidentiality, and publication,
- licensing approval, pricing, conditions, and cancellation,
- handling of queries and disputes, withdrawn certifications, and maintenance,

# Logistics for applying certification mark



# Performing the test

- Three stress levels
- Calculate  $A$ ,  $\Delta H$ ,  $B$  from  $L_{50}$  at each stress level
- Compare  $A$ ,  $\Delta H$ ,  $B$  against possible combinations for 30, 50, 75, or 100 years:
  - storage condition, 20°C, 50%RH
  - or
  - ambient room temperature, approx. 25°C, 50%RH

# Stress Conditions and Times

Stresses and times from ISO 18927			Incubation times					
	Temperature	RH	1	2	3	4	Total	Approx.
Stress 1	80C	85%	250	250	250	250	1000	44 days
Stress 2	80C	55%	250	250	250	250	1000	44 days
Stress 3	70C	85%	375	375	375	375	1500	64 days
Two chambers			Two chambers working in parallel					Total time
1.	44 + 44 = 88 days	~ 13 wks	Plus testing time (approx. 5-10 days)					~14 wks
2.	64 days	~ 9 wks	Plus testing time (approx. 5 days)					

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Two chambers			Two chambers working in parallel					Total time
1.	44 + 44 = 88 days	~ 13 wks	Plus testing time (approx. 5-10 days)					~14 wks
2.	64 days	~ 9 wks	Plus testing time (approx. 5 days)					

* Stress 2 not in ISO 18927			Incubation times					
	Temperature	RH	1	2	3	4	Total	Approx.
Stress 1	80C	55%	250	250	250	250	1000	44 days
* Stress 2	70C	70%	350	350	350	350	1400	60 days
Stress 3	60C	85%	500	500	500	500	2000	83 days
Two chambers			Two chambers working in parallel					Total time
1.	44 + 60 = 104 days	~ 15 wks	Plus testing time (approx. 5 days)					~16 wks
2.	84 days	~ 12 wks	Plus testing time (approx. 5 days)					

# Continuing the stress time

Keep the environmental conditions going after the first grade test milestone									
			Incubation times (hours)						
	Temperature	RH	1	2	3	4	5	6	7
Stress 1	80C	85%	250	250	250	250	250	250	500
Stress 2	80C	55%	250	250	250	250	250	250	500
Stress 3	70C	85%	375	375	375	375	375	375	750
						Check for		Check for	Check for
						50 years		75 years	100 years

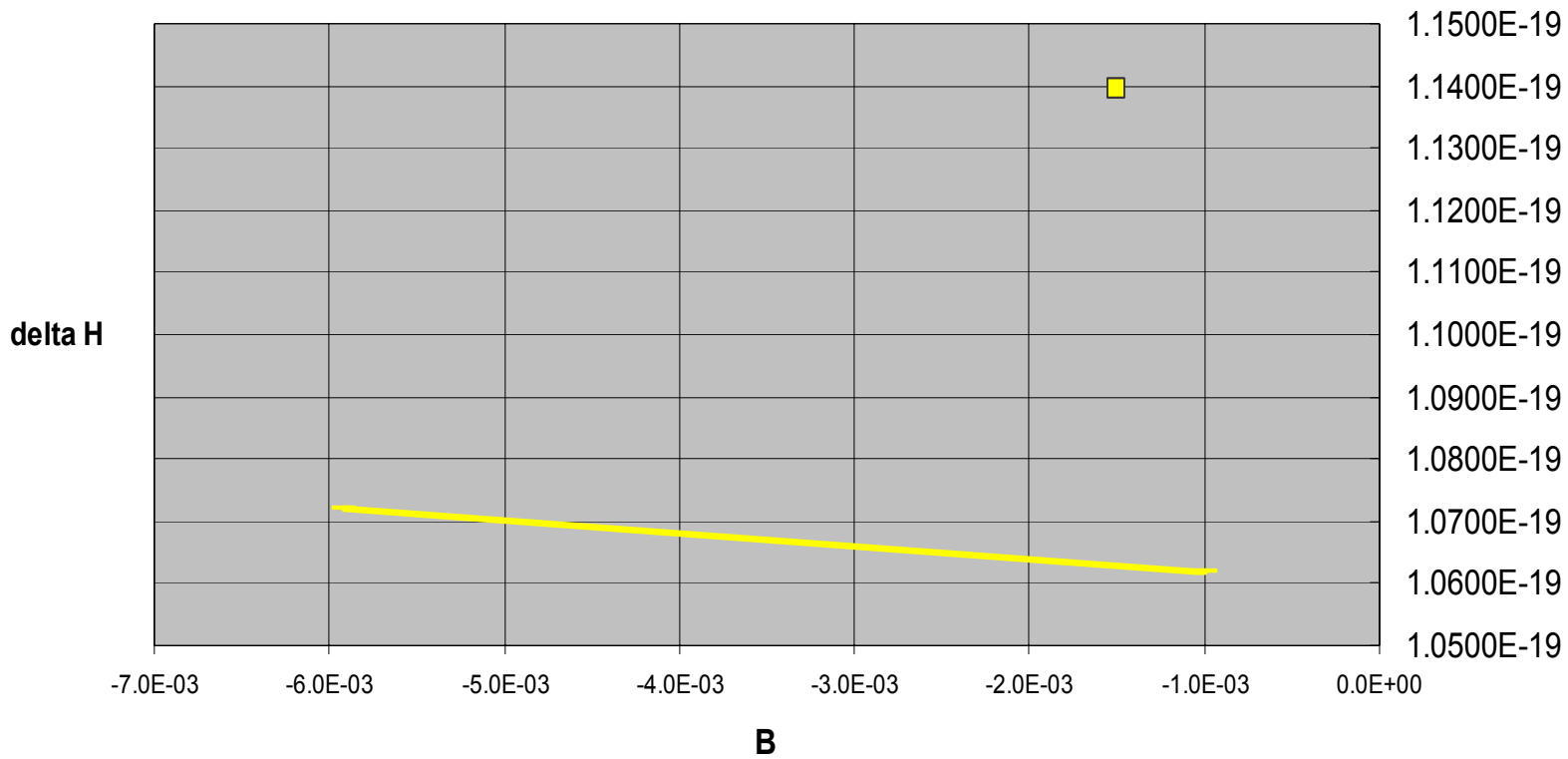


# Incubation + Testing Time

Test for 30 or 50 yrs	Incubation time (hours)		No. of weeks		Testing time (2 analyzers)		Total Time (weeks)	
	ISO 18927	Alt.	ISO 18927	Alt.	ISO 18927	Alt.	ISO 18927	Alt.
1	13,000	3,500	78	21	6 wks	3 wks	84	24
2	7,000	2,000	42	12.5	4 wks	1-2 wks	46	14
3	5,000	1,500	30	9	3 wks	1 wk	33	10
4	4,000		24		2 wks		26	

# Comparing Disc to Target Year

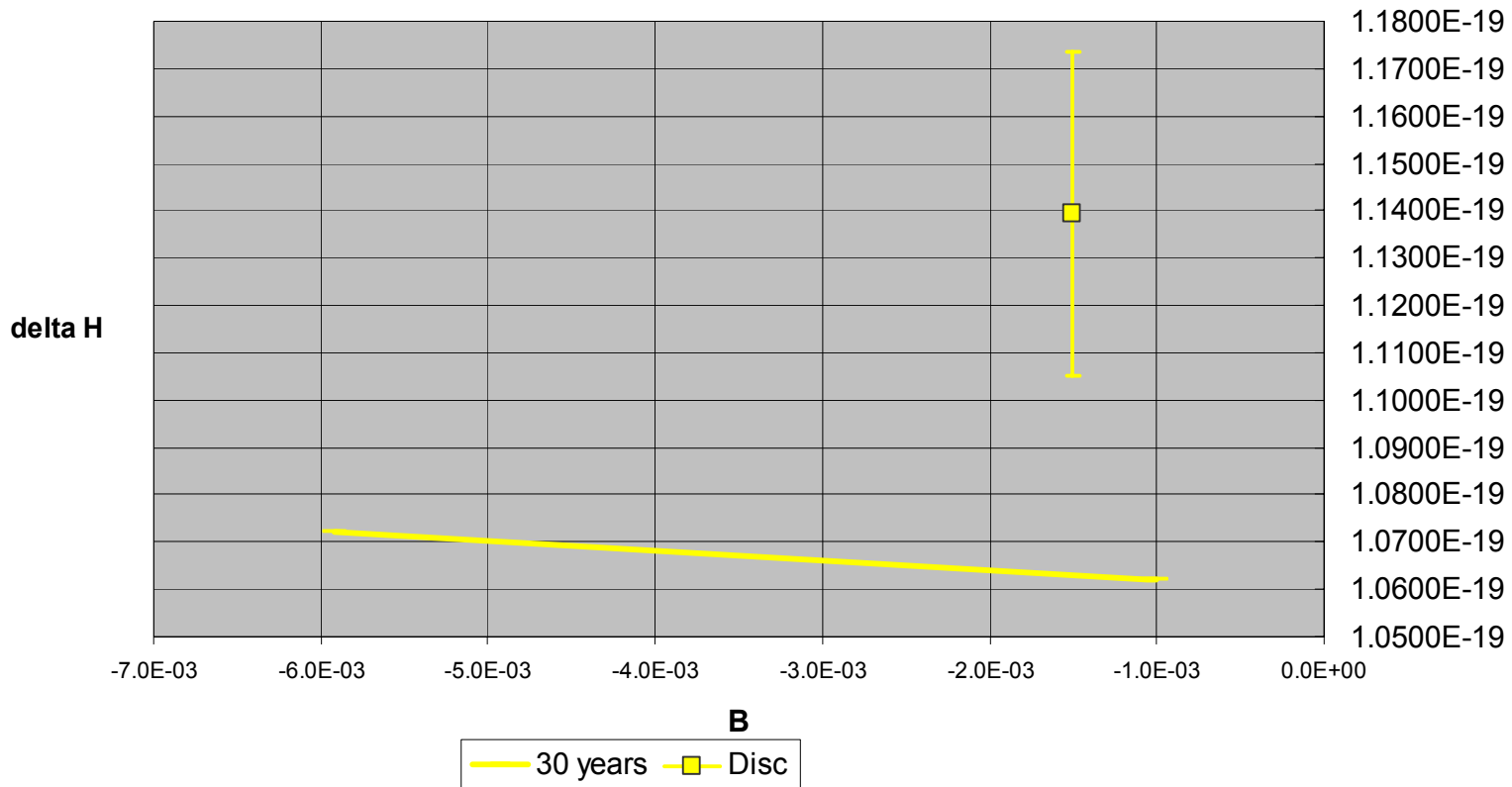
Tool



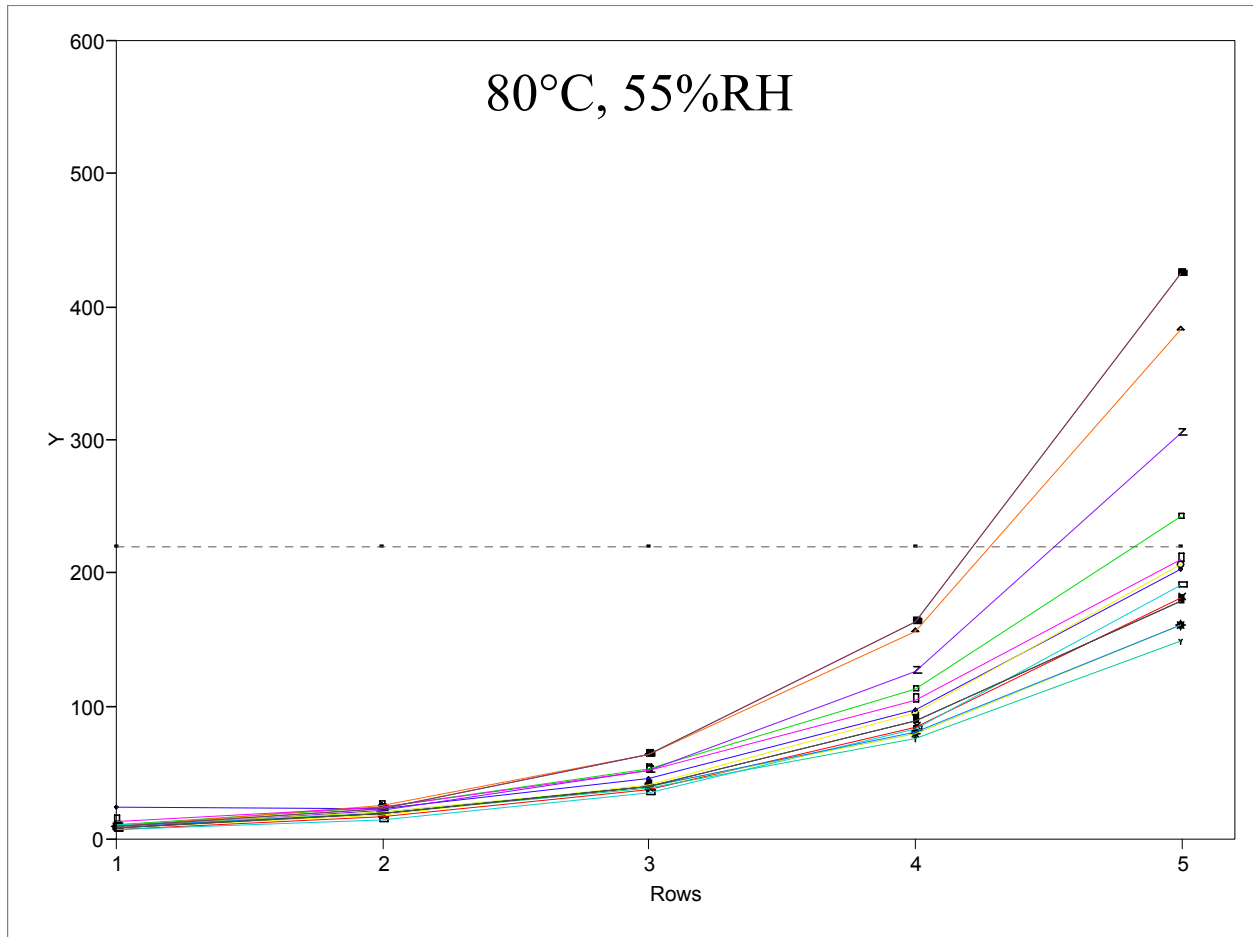
— 30 years — Disc

6/13/05 OSTA Meeting- Fred Byers

# Comparing Disc to Target Year



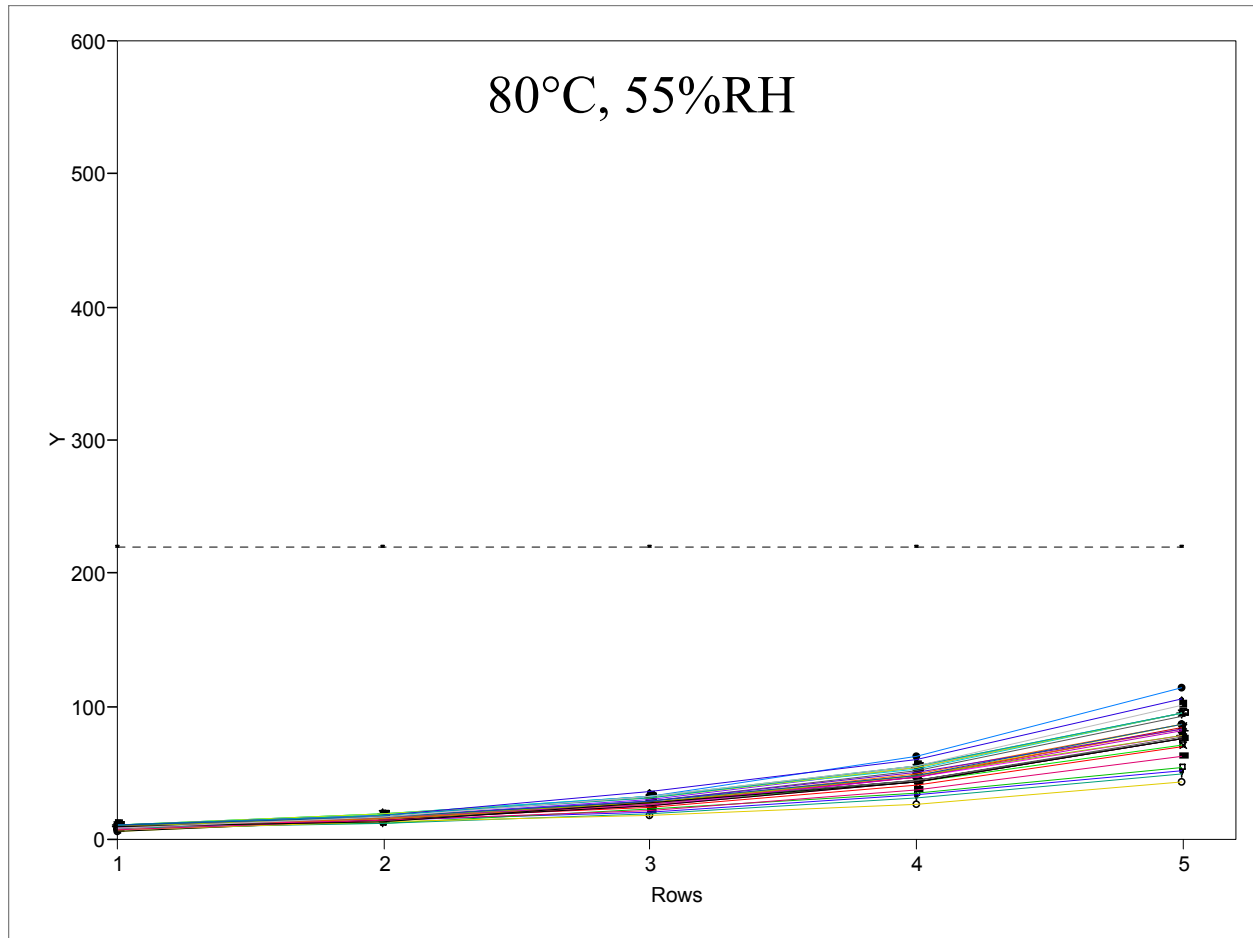
# Normally four 500 hour intervals Change to four 250 hour intervals



Each color represents a disc

6/13/05 OSTA Meeting- Fred Byers

# Longer life disc at same stress



Each color represents a disc

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# Differentiated Discs

Possible labels for differentiation:

“Archival Grade”

“Standard-Tested”

“Lifetime-Grade”

“Benchmark-Tested”

“Storage Grade”

“Storage Quality”

other?

- Differentiation by quality, not price
- Performance importance versus commodity

## **Possible Disclaimer/Limitation**

The result of passing the test and displaying the certification mark only indicates that the disc will minimally last with *relatively high probability* for the number of years as stated by the certification mark, under usage/storage conditions specified by seller, and based on the accuracy and limitations generally accepted by the scientific community for accelerated aging testing in general.

# Life Expectancy Calculation

Eyring Equation  
(From ISO 18927)

$$L_{50} = A * e^{\Delta H/kT} * e^{(B)RH}$$

or

$$\ln L_{50} = \ln A + \Delta H/kT + (B)RH$$



Thank you!

Fred Byers

NIST

byers@nist.gov

301-975-2909

# Initial DVD Recording Analyzed

