BUILDING TECHNOLOGIES PROGRAM

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Energy Conservation Standards Framework Document for High-Intensity Discharge Lamps

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Energy Efficiency & Renewable Energy

Docket Number: EERE-2010-BT-STD-0043

HIDLamps-2010-STD-0043@ee.doe.gov

March 29, 2012

Welcome and Introduction

- Introductions
- Role of the Facilitator
- Ground Rules
  - Listen as an ally
  - Focus on issues
  - Use short, succinct statements/keep to the point
  - Hold sidebar conversations outside the room
  - One person speaks at a time (raise hand to be recognized; state your name for the record)
  - Set cell phones to silent/vibrate
- Housekeeping Items
- Agenda Review
- Opening Remarks

Morning Agenda

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

9:00 – 9:05 am	Welcome
9:05 – 9:20 am	Introductions and Agenda Review
9:20 – 9:40 am	Opening Remarks
9:40 – 10:15 am	Regulatory History, Rulemaking Overview, and Scope of Coverage
10:15 – 10:30 am	Break
10:30 – 11:00 am	Market and Technology Assessment and Screening Analysis
11:00 – 11:45 am	Engineering Analysis and Product Price Determination
11:45 am – 12:45 pm	Break for Lunch

Afternoon Agenda

12:45 – 1:00 pm	Energy Use Analysis
1:00 – 1:15 pm	Markup Analysis
1:15 – 1:45 pm	Life-Cycle Cost (LCC) and Payback Period Analysis
1:45 – 2:15 pm	Shipments Analysis, National Impact Analysis, and Life-Cycle Cost Subgroup Analysis
2:15 – 2:30 pm	Break
2:30 – 2:40 pm	Manufacturer Impact Analysis
2:40 – 3:10 pm	Utility Impact Analysis, Employment Impact Analysis, Emissions Analysis, and Regulatory Impact Analysis
3:10 – 3:30 pm	Other issues and comments; Closing remarks

Listening Via the Webcast

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

- The Department is broadcasting this meeting live over the Internet.
- DOE is providing the webcast to accommodate stakeholders that are unable to attend the public meeting in person.
- The web broadcast allows stakeholders to listen in and view the slides.
- All stakeholders are encouraged to submit written comments after the public meeting.

Purpose of the Public Meeting

- Present the procedural and analytical approaches to evaluate energy conservation standards for HID lamps.
- Invite comment on the energy conservations standards framework document.
- Discuss next steps in the rulemaking.
- Encourage participants to submit data, information, summary statements, and written comments, including additional issues for discussion.

Request for Comment

Item 1: Although DOE invites comment on all aspects of the material presented in this document, several specific issues on which DOE seeks comment are set out in comment boxes like this one. DOE uses these comment boxes to highlight issues and ask specific questions regarding the approaches DOE plans to follow to conduct the analyses required for the energy conservation standards rulemaking.

Issue box numbering corresponds to the list of items published at the end of the framework document, available at:

http://www1.eere.energy.gov/buildings/appliance_standards/commercial/high_intensity_discharge_lamps.html.

The deadline for submitting comments is **April 12, 2012**.

Opening Remarks

Meeting participants are invited to provide opening remarks or statements at this time.

Public Meeting Slides Topics

1. Overview; Scope of Coverage
2. Market and Technology; Screening
3. Engineering; Product Price Determination
4. Energy Use; Markup Analysis
5. LCC and Payback Period Analyses
6. Shipments Analysis; NIA Analysis
7. NOPR Analyses

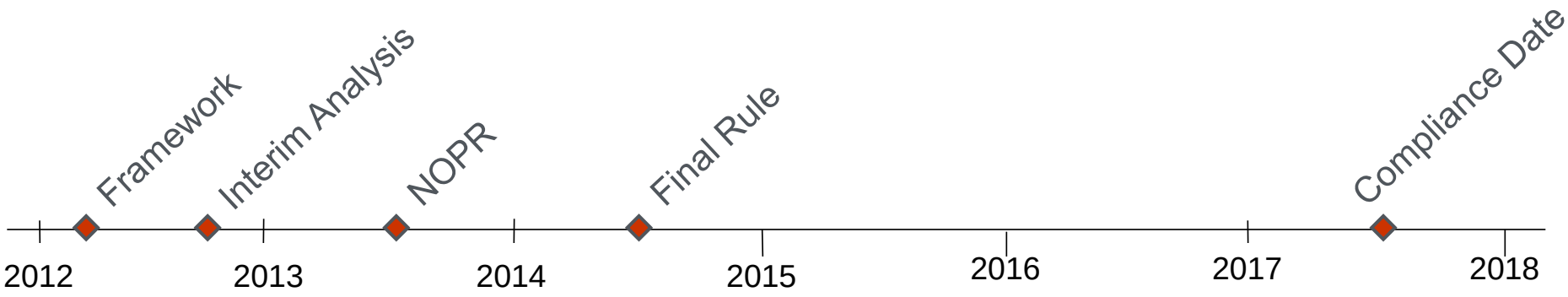
Regulatory History

- The Energy Policy Act of 1992 (EPACT 1992) amended the Energy Policy and Conservation Act of 1975 (EPCA) by adding HID lamps as covered equipment and requiring DOE to:
  - Determine whether energy conservation standards for HID lamps would be technologically feasible and economically justified, and would likely result in significant energy savings;
  - Prescribe testing requirements within 30 months for those HID lamps for which standards are justified; and
  - Prescribe energy conservation standards within 18 months of establishing testing requirements.

- On July 1, 2010, DOE published a positive final determination regarding HID lamps. 75 FR 37975.

- On December 15, 2011, DOE published a notice of proposed rulemaking (NOPR) for test procedures for HID lamps. 76 FR 77914.

HID Lamps Rulemaking Schedule



Milestone	Date
Framework Document	February 2012
Availability of the Interim Analysis (projected)	*September 2012*
Notice of Proposed Rulemaking (projected)	*June 2013*
Final Rule (projected)	*July 2014*
Compliance Date (projected)	*July 2017*

Item 2: DOE welcomes comments on how it should coordinate development of the final rules for HID lamps and metal halide lamp fixtures (MHLF).

EPCA Factors

42 U.S.C. 6295(o)(2)(B)(i) directs DOE to consider seven factors when setting energy conservation standards.

EPCA Factors	DOE Analysis
1. Economic impact on consumers and manufacturers	Life-Cycle Cost Analysis Manufacturer Impact Analysis
2. Lifetime operating cost savings compared to increased cost for the product	Life-Cycle Cost Analysis
3. Total projected energy savings	National Impact Analysis
4. Impact on utility or performance	Engineering Analysis Screening Analysis
5. Impact of any lessening of competition	Manufacturer Impact Analysis
6. Need for national energy conservation	National Impact Analysis
7. Other factors the Secretary considers relevant	Environmental Assessment Utility Impact Analysis Employment Impact Analysis

Scope of Coverage: Definitions

- High-intensity discharge is the generic name for a family of lamps including mercury vapor (MV), metal halide (MH), and high-pressure sodium (HPS) lamps.

- Although low-pressure sodium lamps are often included in the family, they are not included in the definition set forth in EPCA, and are therefore not considered in this rulemaking.

- Catalogs also offer “electrodeless” lamps (also referred to as light-emitting plasma lamps) that may be a subcategory of MV, MH, or HPS lamps.
  - Emit light in a process related to MV, MH, and HPS lamps.
  - Gas composition appears most similar to MH lamps.

Item 3: DOE welcomes comment on whether electrodeless HID lamps (also referred to as light-emitting plasma) are a subcategory of MV, HPS, or MH lamps.

Scope of Coverage: Wattage and CCT

- HID lamps span a range of wattages, though these wattages vary according to lamp technology. Initial light output could also be used to describe the range of lamps available.

- Similarly, HID lamps are available with a variety of correlated color temperatures (CCT), depending on lamp type and design.

- DOE is considering only a subset of available wattages and CCTs because the excluded lamps represent a small number of available equipment, and therefore do not represent significant potential energy savings.

Scope of Coverage: Summary

- DOE is considering including the following lamps in the scope of coverage:

Lamp Type	Rated Wattage	CCT
Metal Halide	≥ 50 and ≤ 2000 W	≥ 2500 and ≤ 6999 K
Mercury Vapor	≥ 50 and ≤ 1000 W	≥ 3200 and ≤ 6800 K
High Pressure Sodium	≥ 50 and ≤ 1000 W	≥ 1900 and ≤ 2700 K

- DOE is considering excluding the following lamps from the scope of coverage:
  - HID lamps designed and labeled for use with electronic ballasts only
  - Directional HID lamps
  - Self-ballasted HID lamps
  - Colored HID lamps
  - Specialty application MV lamps

Scope of Coverage

Item 4: DOE welcomes comments on its decision to define the scope of coverage using rated wattage instead of lumen output and the range of wattages included in coverage.

Item 5: DOE welcomes comments on its decision to exclude HID lamps designed and labeled for use with electronic ballasts only, directional HID lamps, self-ballasted HID lamps, and high CCT lamps from the scope of coverage. DOE also requests comments on the unique characteristics of colored HID lamps.

Scope of Coverage

Item 6: DOE welcomes comments on whether lamps for specialty applications have defining characteristics that differentiate them from lamps used for general illumination purposes. In addition, DOE welcomes comments on whether specialty applications relevant to MV technology can also be served by HPS or MH technology.

Item 7: DOE welcomes comment on any additional lamps that should be excluded from the scope of coverage.

DOE welcomes comments on the tentative decision to not include standby and off modes in the energy conservation standard.

Metrics – Omnidirectional Lamps

- DOE is considering establishing a minimum initial lamp efficacy requirement for HID lamps. Initial lamp efficacy is defined as the ratio of light output divided by lamp input power at the beginning of the life of the lamp.

- DOE is also considering setting a maximum lamp wattage requirement based on initial lamp light output.

Metrics – Directional Lamps

- Should DOE decide to include directional lamps within the scope of coverage, they would require a different metric to assess efficacy.
- Directional lamps are typically characterized by beam angle; DOE could require a minimum center-beam candlepower (CBCP) related to the beam angle of the lamp for a given lamp shape and diameter.
- Directional lamps can also be characterized by beam lumens (light output within the region outlined by the beam angle); DOE could require minimum beam lumens per input watt.

Metrics

Item 13: DOE welcomes comments related to the appropriateness of lamp efficacy as one of the potential metrics in HID lamp energy conservation standards.

Item 14: DOE welcomes comments on developing a center-beam intensity metric related to directional lamps. DOE requests information on other possible metrics in development or other metrics that DOE should consider, including beam lumens per watt. DOE requests comments on the appropriate definition of beam angle.

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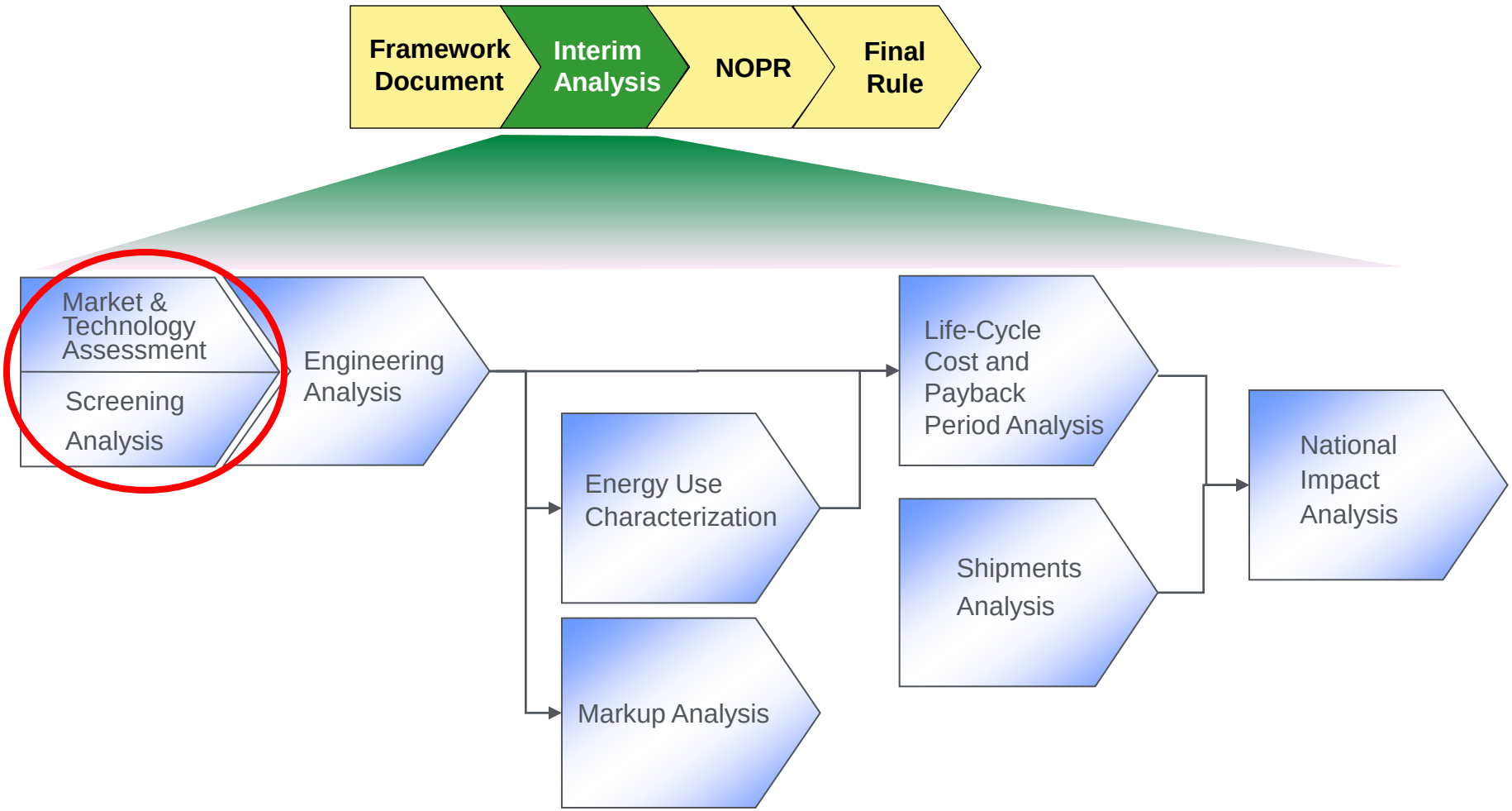
Steps in the Interim Analysis



Purpose of Market and Technology Assessment; Screening Analysis

- Market and Technology Assessment
  - Determine equipment classes
  - Identify technology options to improve efficacy

- Screening Analysis
  - Screen out technology options that DOE will not consider in the engineering analysis based on (1) technological feasibility; (2) practicability to manufacture, install, and service; (3) adverse impacts on utility to consumers or availability; and (4) adverse impacts on health or safety.

Equipment Classes

- DOE divides covered equipment into classes by:
  - the type of energy used;
  - capacity of the product; or
  - other performance-related features that justify different standard levels, such as features affecting consumer utility.

- DOE establishes separate energy conservation standards for each equipment class.

- DOE is considering establishing equipment classes based on CCT and initial light output.

- Because DOE is considering factors such as CCT and light output, DOE is not considering separating equipment classes based on lamp technology (i.e., not by MH, MV, and HPS).

Equipment Classes: CCT

- HID lamps are available with different CCT values depending on lamp type and design.
- Equipment usage indicates that some customers specify lamps of a particular color temperature for certain applications, indicating CCT provides utility to the consumer.
- CCT is related to lamp efficacy (*i.e.*, higher CCT lamps generally have lower efficacy).
- Based on the difference in efficacy and consumer utility, DOE is considering separating equipment classes by CCT.

Directionality	Ballast Location	CCT Range
Omni-Directional	Externally Ballasted	1900 – 2500 K
		2501 – 5000 K
		5001 – 6999 K

Equipment Classes: Initial Light Output

- HID lamps are available with a variety of light outputs and input powers. Light output and input power are highly correlated (increased input power typically leads to increased light output), but DOE finds that light output more directly addresses the feature valued by the customer.
- Customers require more or less light output from a lamp depending on the intended use for the lamp, indicating consumer utility for this feature.
- DOE's review of catalog data indicates that lamps of increased light output (or increased input power) are generally more efficacious.
- Based on the difference in lamp efficacy and consumer utility, DOE is considering establishing separate equipment classes on the basis of initial light output.

Equipment Classes: Example

In summary, DOE proposed the following equipment classes:

Directionality	Ballast Location	CCT Range	Lumen Range
Omni-Directional	Externally Ballasted	1900 – 2500 K	1 – 3,000 lm
			3,001 – 5,000 lm
			5,001 – 8,000 lm
			8,001 – 11,000 lm
			11,001 – 20,000 lm
			20,001 – 40,000 lm
			40,001 – 100,000 lm
			> 100,001 lm
		2501 – 5000 K	1 – 3,000 lm
			3,001 – 5,000 lm
			5,001 – 8,000 lm
			8,001 – 12,000 lm
			12,001 – 20,000 lm
			20,001 – 50,000 lm
			> 50,001 lm
		Continued	

Equipment Classes

Item 16: DOE welcomes comments on the proposed equipment classes for HID lamps and additional approaches to defining classes in accordance with the requirements of 42 U.S.C. 6295(q). Specifically, DOE seeks input on its proposal to establish equipment classes based on lumen output (rather than rated wattage) and CCT, and the appropriateness of the lumen output and CCT ranges selected.

Item 17: DOE seeks comment on whether the proposed equipment classes should be further subdivided by lamp orientation (also known as operating or burn position and typically includes vertical, horizontal, universal) or by other lamp characteristics (e.g., enclosed or open fixture rating, CRI, base type, coated or clear envelope). DOE also seeks comment on whether equipment classes should be separated based on lamp technology.

Technology Options

- Measures that improve efficacy are called technology options, and they are based on existing technologies as well as working prototypes.

- MV lamps
  - The common pathway to increased efficacy is a change of technology from MV to MH or HPS.

- HPS lamps
  - HID lamp catalogs indicate a range of HPS lamp efficacies, but DOE is not currently aware of the specific technology options used to achieve different the lamp efficacies.
  - DOE does not consider other lamp technologies to be substitutes for HPS.

Technology Options

- DOE is aware of a set of technology options that could improve MH lamp efficacy. DOE intends to evaluate the following:

Technology Option		Description
Starting Method		Use pulse-start instead of probe-start technology
Arc Tube Design	Arc Tube Material	Use ceramic rather than quartz arc tubes
	Arc Tube Size	Use formed or offset electrode
Arc Tube Fill Gas		Use novel gases
Lamp Electrodes		Use electrodes with improved design or material

Item 18: DOE welcomes comments on the preliminary technology options identified in this section, and on whether there are additional technology options it should consider.

Screening Analysis

- DOE will consider each technology option in light of four screening criteria:
  - technological feasibility;
  - practicability to manufacture, install, and service;
  - adverse effects on product utility or availability; and
  - adverse effects on health or safety.

- Those technology options that pass the four screening criteria are called design options; these options will be considered in the engineering analysis as ways to improve efficacy.

Item 19: DOE welcomes comments on how the above four screening criteria might apply to technology options under consideration by DOE, and how the screening criteria apply to any additional technology option(s) that an interested party recommends to DOE.

Public Meeting Slides Topics

1	Overview; Scope of Coverage
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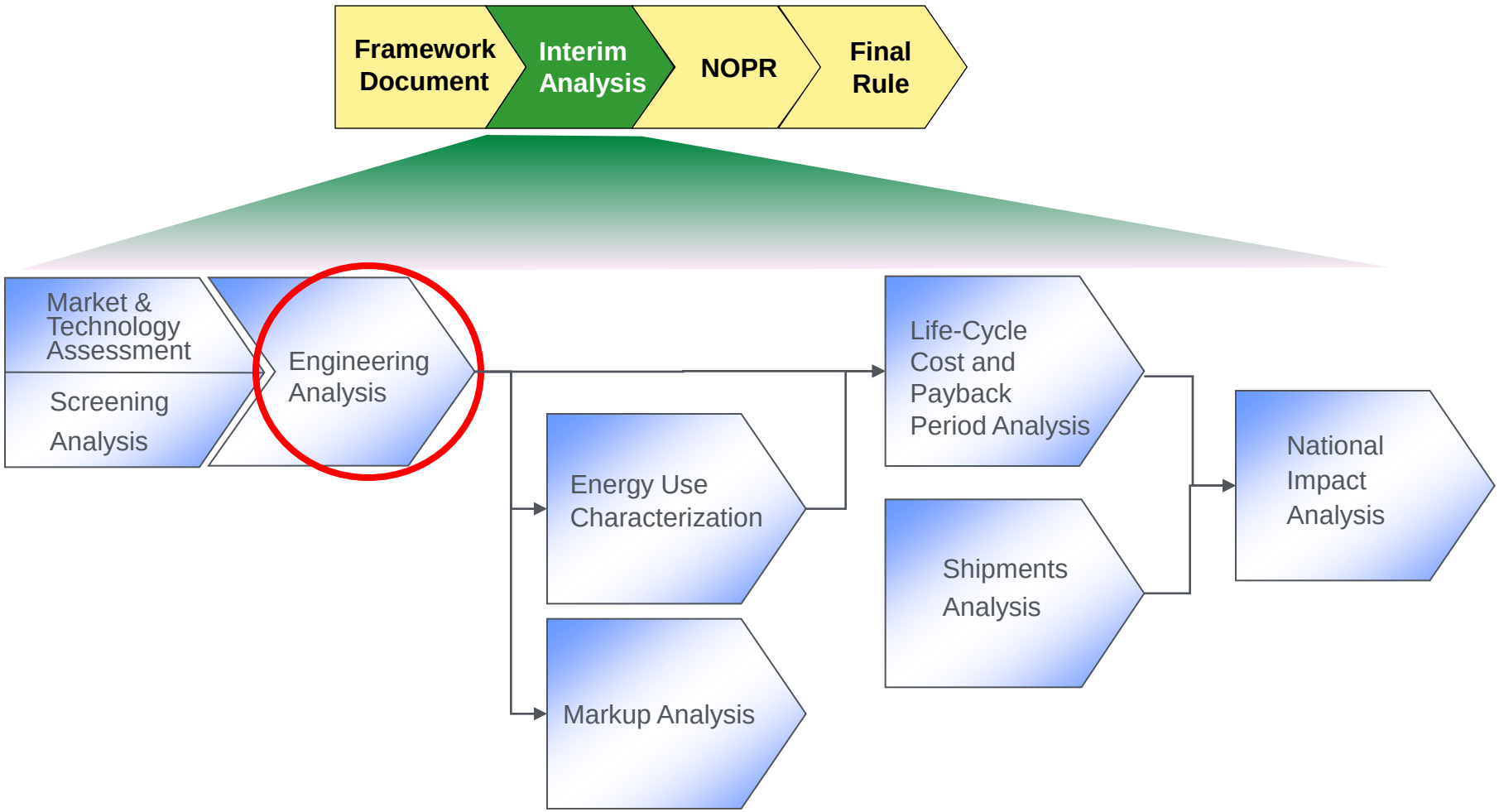
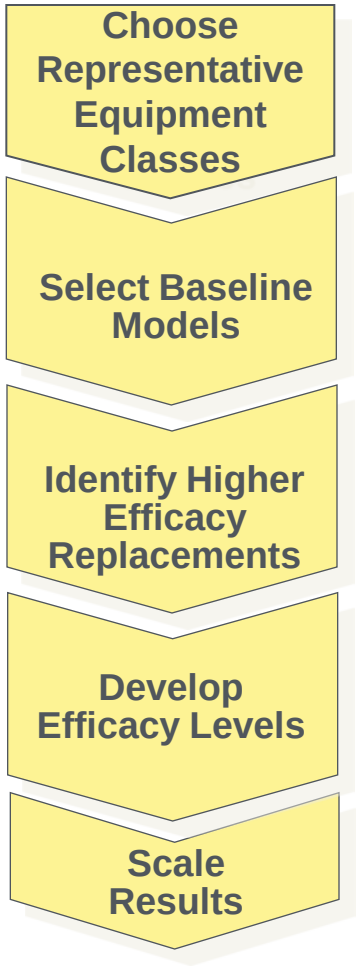
Steps in the Interim Analysis



Engineering Analysis Methodology



⇦ Choose equipment classes to be analyzed in the engineering analysis.

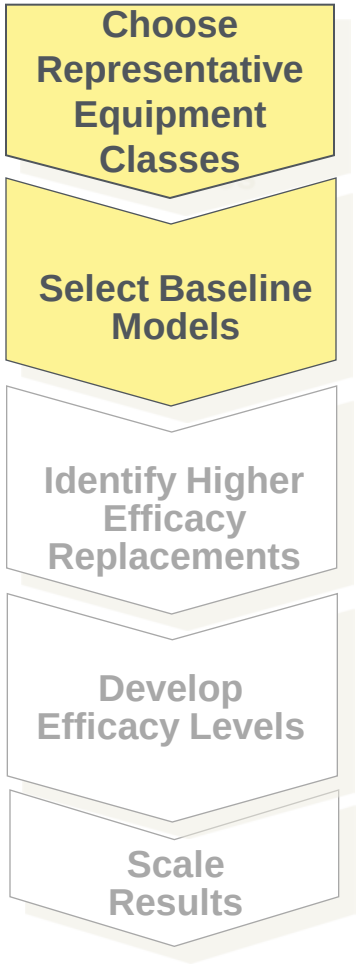
⇦ Identify baseline models in each representative equipment class that will serve as reference points to assess changes due to more stringent standard levels.

⇦ Select more efficacious replacements for each baseline model based on design options.

⇦ Develop candidate standard levels (CSLs) that range from the baseline to the maximum technologically feasible.

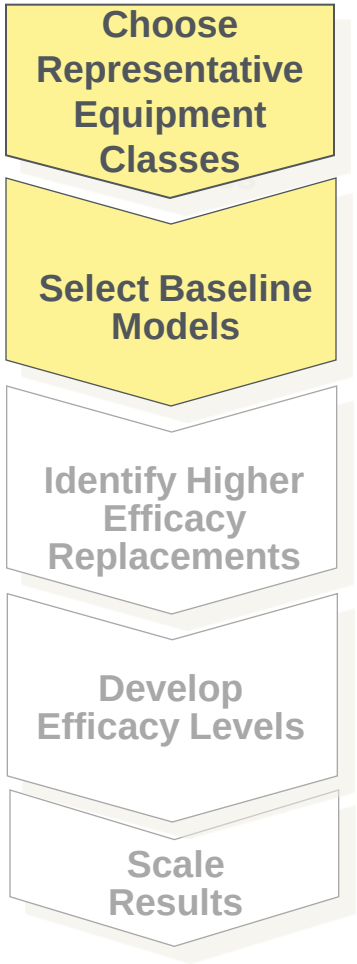
⇦ Scale results to equipment classes not analyzed.

Representative Equipment Classes and Baseline Models



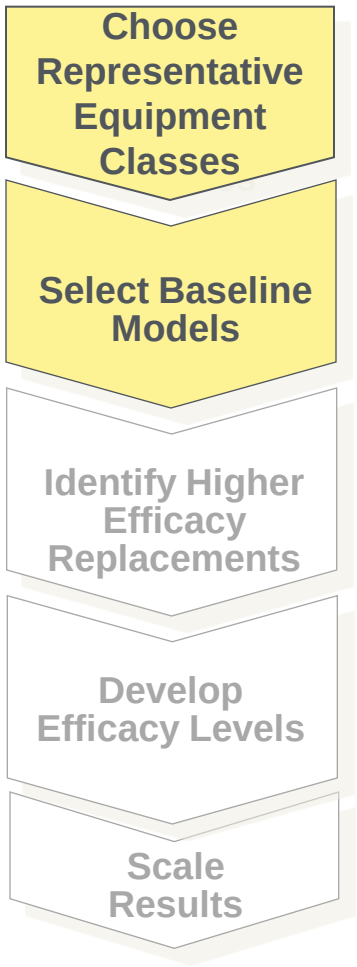
- DOE chooses representative equipment classes to concentrate its analytical effort.
  - DOE selects representative equipment classes based on high market volumes or unique performance characteristics.
  - DOE selected 9 equipment classes as representative.
- The baseline model typically represents the most common, least efficacious model on the market.
  - DOE identifies a baseline model in each representative equipment class.
  - In cases where a large portion of the market has already adopted a more efficacious lamp, DOE is considering analyzing two baseline models.

Representative Equipment Classes and Baseline Models



Class Description	Baseline Model
Omni-Directional, Externally Ballasted Lamps 1500-2500 K	
3,001 – 5,000 lm	50 W HPS
8,001 – 11,000 lm	100 W HPS
20,001 – 40,000 lm	250 W HPS
40,001 – 100,000 lm	400 W HPS
Omni-Directional, Externally Ballasted Lamps 2501–5000 K	
3,001 – 5,000 lm	100 W MV
	70 W Pulse-Start MH
8,001 – 12,000 lm	175 W MV
	150 W Probe-Start MH
12,001 – 20,000 lm	250 W MV
	175 W Probe-Start MH
20,001 – 50,000 lm	400 W MV
	400 W Probe-Start MH
> 50,001 lm	1000 W Probe-Start MH

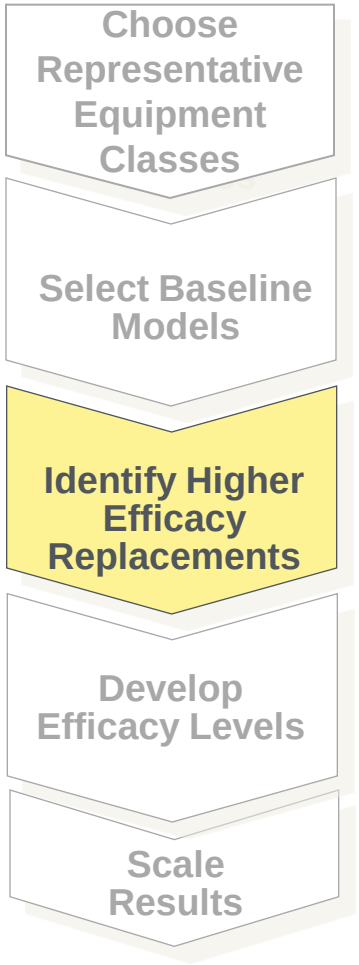
Representative Equipment Classes and Baseline Models



Item 20: DOE welcomes comments on the selection of representative equipment classes for HID lamps.

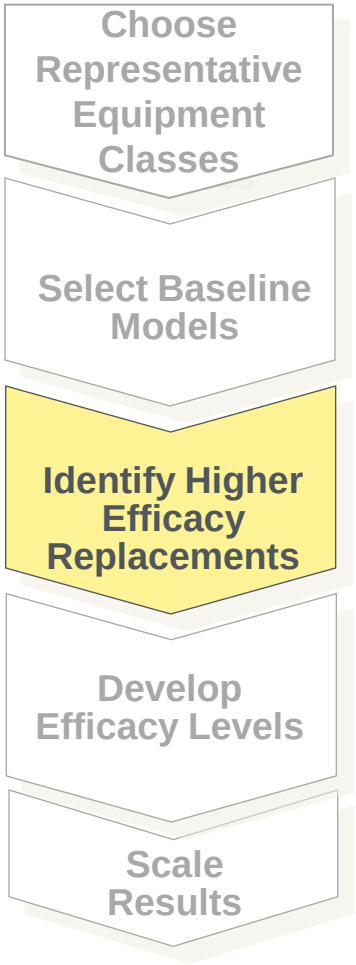
Item 21: DOE welcomes comments on the selection of baseline models for the proposed representative equipment classes.

Identify Higher Efficacy Replacements



- In identifying more efficacious lamps, DOE will use a database of HID lamp catalog information.
- DOE chooses more efficacious replacements with similar lumen outputs and performance characteristics (e.g., CRI, CCT) to those of the baseline models, while reducing system input power.
- DOE notes that its analysis of energy consumption will be based on a lamp-and-ballast system because the lamp and ballast operate together in practice.

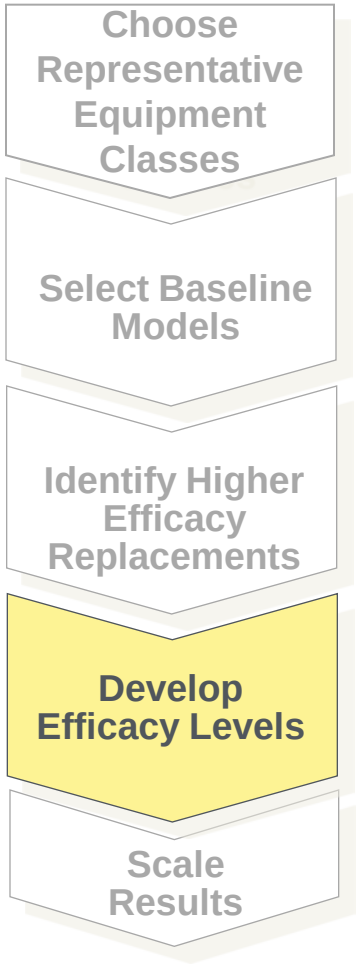
Identify Higher Efficacy Replacements



Item 22: DOE welcomes comments on more efficacious (and equal lumen output) substitutes for each proposed baseline model, up to and including the max tech lamp that would result in reduced energy consumption.

Item 23: DOE welcomes comment on the current and future availability of reduced wattage lamps and the practicality of reducing and respacing fixtures. DOE also invites comment on whether barriers exist to developing new lamps that would provide reduced wattage alternatives to today's lamps.

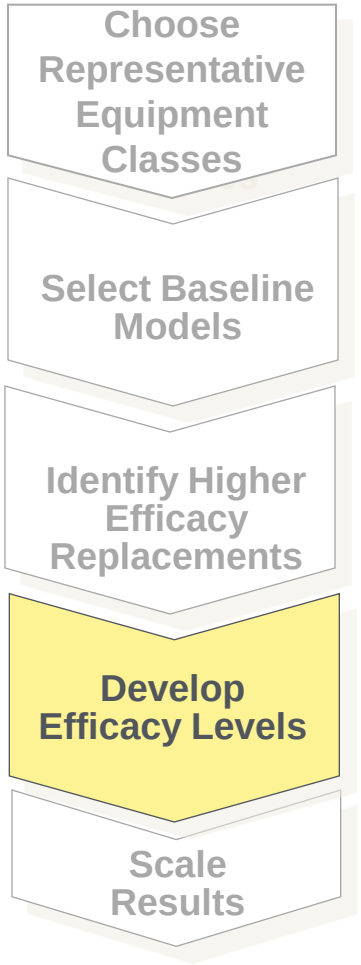
Develop Efficacy Levels



- After identifying the more efficacious substitutes for each baseline model, DOE will develop CSLs, a set of efficacy levels considered in the interim analyses that span the range of lamp efficacies from baseline to the maximum technologically feasible.

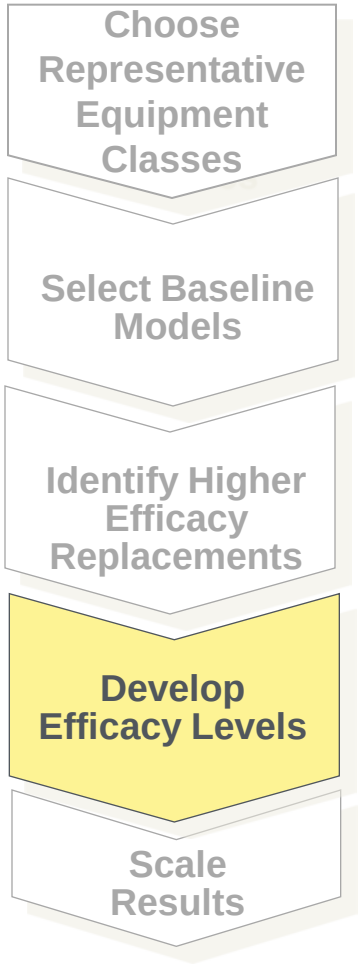
- CSLs for HID lamps are generally based on consideration of several factors, including:
  - Design options associated with the specific lamps being studied; and
  - The maximum technologically feasible efficacy level.

Develop Efficacy Levels



- The equipment class structure reflects a “binned” approach, which establishes a constant lamp efficacy requirement for particular ranges of light output.
- Although a constant efficacy requirement simplifies standards for manufacturers, it would subject all lamps in a particular light output range to the same standard, which could encourage the market towards the higher light output (and higher input power) end of the bin.
- DOE is also considering an equation-based approach, which would establish lamp efficacy requirements as a function of light output.

Develop Efficacy Levels



Item 24: DOE welcomes comments on the use of an equation-based versus binned efficacy level approach for HID lamps.

Item 25: DOE welcomes input on whether highly efficacious lighting systems could be eliminated given a particular lamp efficacy requirement.

Scale Results

- For the equipment classes not analyzed directly, DOE plans to scale the engineering results and CSLs from the representative equipment class test data based on ratios observed in catalog data or by extrapolation using regression equations.

Item 26: DOE welcomes comments on its proposed approach to scale from representative equipment classes to classes not directly analyzed in the engineering analysis.

Issues for Discussion

Item 28: DOE seeks information regarding the existence of relevant proprietary designs for the HID lamps under consideration in this rulemaking. DOE also seeks comment on whether these proprietary designs are the only pathway to increase lamp efficacy.

Item 30: DOE welcomes comments on other engineering issues that could affect the engineering analysis.

Product Price Determination

- DOE plans to estimate end-user price directly, rather than develop manufacturer selling prices (MSP) from a bill of materials and manufacturer markup analysis.

- DOE is considering collecting manufacturer suggested price lists ("blue books") and applying a discount based on the distribution channel through which the lamp is purchased.

- DOE will gather price information from State procurement contracts, large electrical supply distributors, home-improvement/hardware stores, and other sources of publicly available end-user prices such as Internet retailers, to estimate the appropriate discounts.

Item 27: DOE seeks comment on its end-user price approach for calculating the cost-efficacy relationship for HID lamps. In particular, DOE seeks comment on typical distribution channels for HID lamps, as well as the allocation of market share between these channels.

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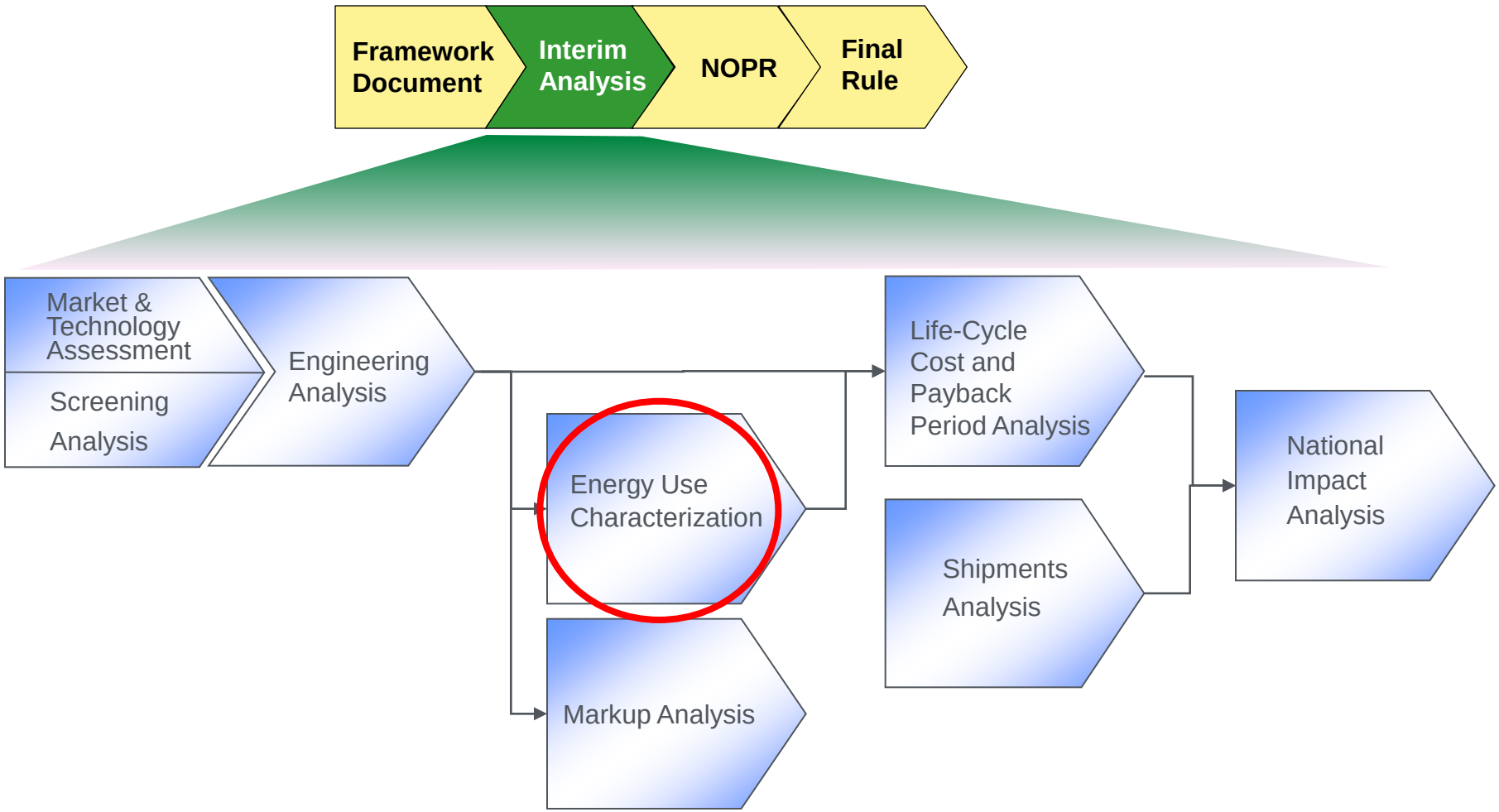
Steps in the Interim Analysis



Energy Use Analysis

- Purpose
  - Develop annual energy use data for HID lamp and ballast systems.

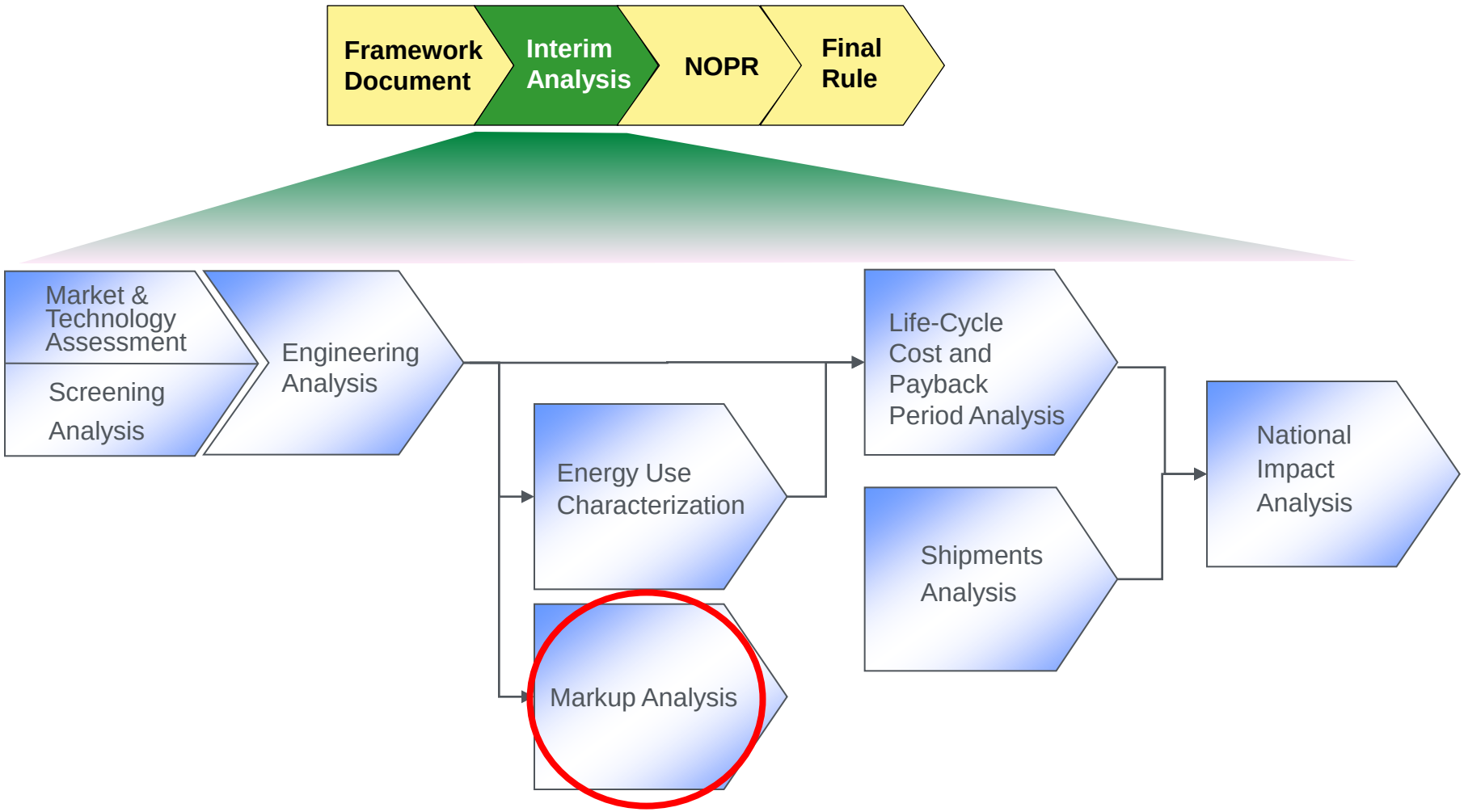
- Method
  - Obtain data to develop a distribution of operating hours for HID lamps by sector and census division. Data sources include:
    - 2010 U.S. Lighting Market Characterization
    - EIA's 2003 Commercial Building Energy Consumption Survey (CBECS)
    - EIA's 2006 Manufacturing Energy Consumption Survey (MECS).
  - Use system input power from engineering analysis.
  - Multiply system input power by the number of operating hours per year.

Issues for Discussion

Item 31: DOE welcomes comments on ballast input power and ballast efficiency for lamp and ballast systems stock installed prior to the effective date of standard.

Item 32: DOE welcomes comments on its proposed methodology to determine annual operating hours for covered HID lamps in the commercial and industrial sectors, and how operating hours may vary by lamp type and application.

Steps in the Interim Analysis



Markups for Equipment Price Determination

- Purpose
  - Determine MSP from HID lamp prices using manufacturer-to-customer markups to use in MIA.
  - Characterize HID lamp distribution channels.

- Method
  - Identify distribution channels.
  - Estimate the markups for each step from manufacturer to end-user. Derive MSP from end-user prices, developed at the price determination stage.

Markups for Equipment Price Determination

HID Lamp Distribution Channels:

1 Lamp manuf. → Wholesaler → Contractor → End user

2 Lamp manuf. → Wholesaler → End user

Replacement HID Ballast Distribution Channels:

Ballast manuf. → Wholesaler → Contractor → End user

Fixture Distribution Channels:

Fixture manuf. → Wholesaler → Contractor → End user

Item 33: DOE welcomes suggestions and comments concerning its proposed approach for existing customer prices for HID lamps, ballasts, and fixtures.

Item 34: DOE welcomes comments on typical manufacturer, wholesaler, and contractor markups associated with HID lamps, ballasts, and fixtures.

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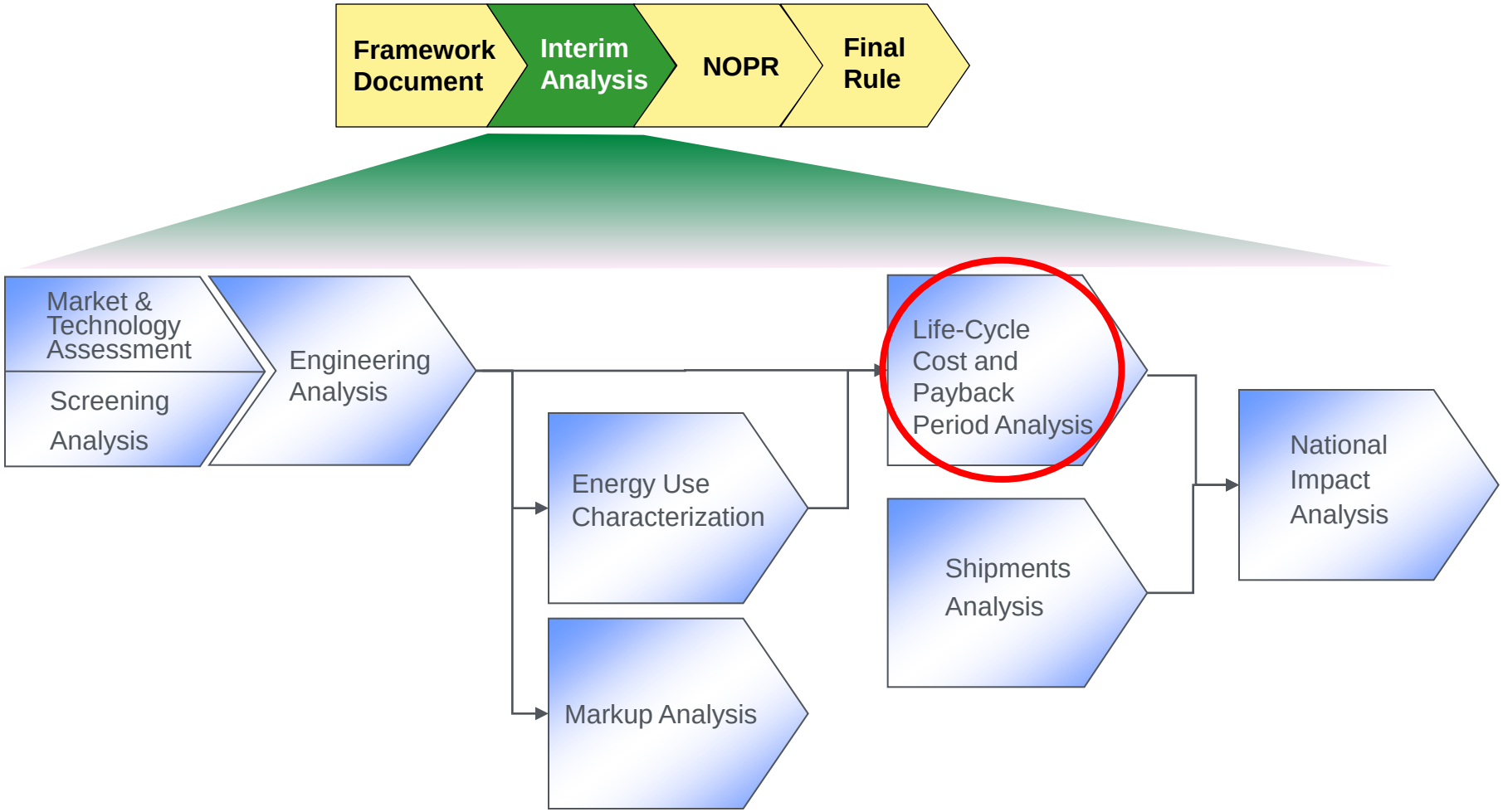
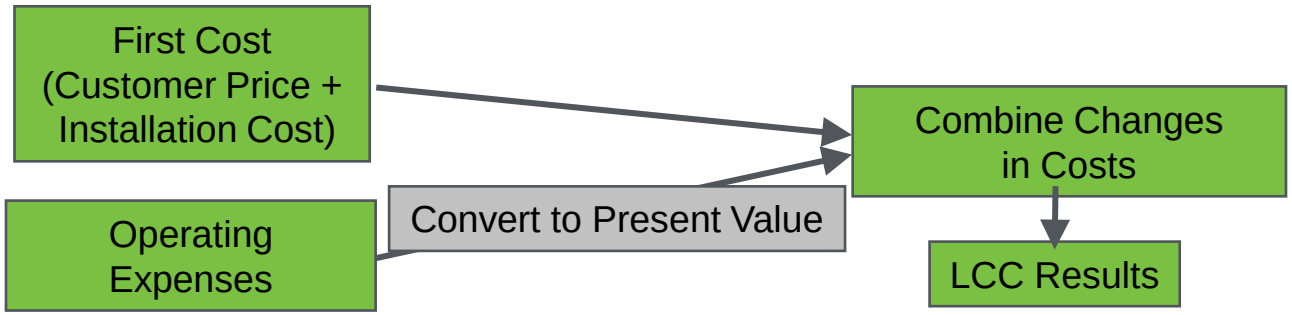


Life-Cycle Cost and Payback Period Analysis

- Purpose
  - Assess the LCC effects and PBP for customers of HID lamps under the considered efficacy levels.

- Methodology
  - LCC equals customer price plus the sum of annual operating costs over the analysis period (baseline lamp lifetime divided by average operating hours) discounted to a particular base year.
  - Analysis will model the uncertainty and variability of inputs using Monte Carlo approach and probability distributions.
  - Analysis will be implemented in MS Excel® spreadsheet combined with Crystal Ball.®



Life-Cycle Cost and Payback Period Analysis – Energy Prices

- Electricity prices are used to convert energy use to energy costs.

- DOE will use projections of national average energy prices for commercial and industrial customers – from the most recent EIA Annual Energy Outlook (AEO) – to project future energy prices for the LCC analysis

Item 35: DOE welcomes input on the proposed methodology for estimating electricity prices in this analysis.

Life-Cycle Cost and Payback Period Analysis – Discount Rates

- DOE uses the discount rate to determine the present value of lifetime operating expenses.

- DOE will derive a distribution of discount rates for the commercial and industrial sectors.
  - These distributions will be developed by estimating the weighted average cost of capital (WACC) for commercial and industrial customers of HID lamps.
  - WACC includes:
    - Financial cost of any debt incurred to purchase equipment.
    - Opportunity cost of any equity to purchase equipment.

Item 36: DOE welcomes input on the planned approaches for estimating discount rates for customers of the HID lamps covered under this rulemaking.

Life-Cycle Cost and Payback Period Analysis – Operating Costs

- DOE will evaluate how installation costs change with increased efficacy. DOE will consider:
  - Installation cost (labor rate x hours for labor) of a lamp
  - Installation cost for replacing a ballast
  - Installation cost for a fixture

- DOE will review and consider:
  - RSMeans
  - Industry literature for other installation cost

- Repair and Maintenance costs: DOE assumes HID lamps require no maintenance during operational lifetime and are replaced upon failure or early retirement.

Issues for Discussion

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Item 37: DOE welcomes suggestions on how to estimate installation costs for HID lamps. DOE specifically seeks comment on the availability and value of sources other than RSMeans Electrical Cost Data to consider in estimating installation costs.

Item 39: DOE welcomes comments on whether maintenance or repair costs for HID lamps, ballasts or fixtures should be considered in this analysis.

Life-Cycle Cost and Payback Period Analysis – HID Lamp Lifetimes

- DOE will use information from:
  - Manufacturer literature;
  - Various literature sources such as technical reports and conference proceedings; and
  - Inputs from manufacturers and other interested parties.

- In the 2009 GSFL/IRL, DOE adjusted rated lamp lifetimes to account for the effects of group relamping – reducing life to 91%–94% of rated lifetime.

- DOE is investigating group versus spot relamping.

- Group relamping is less per lamp because labor is pooled.

Issues for Discussion

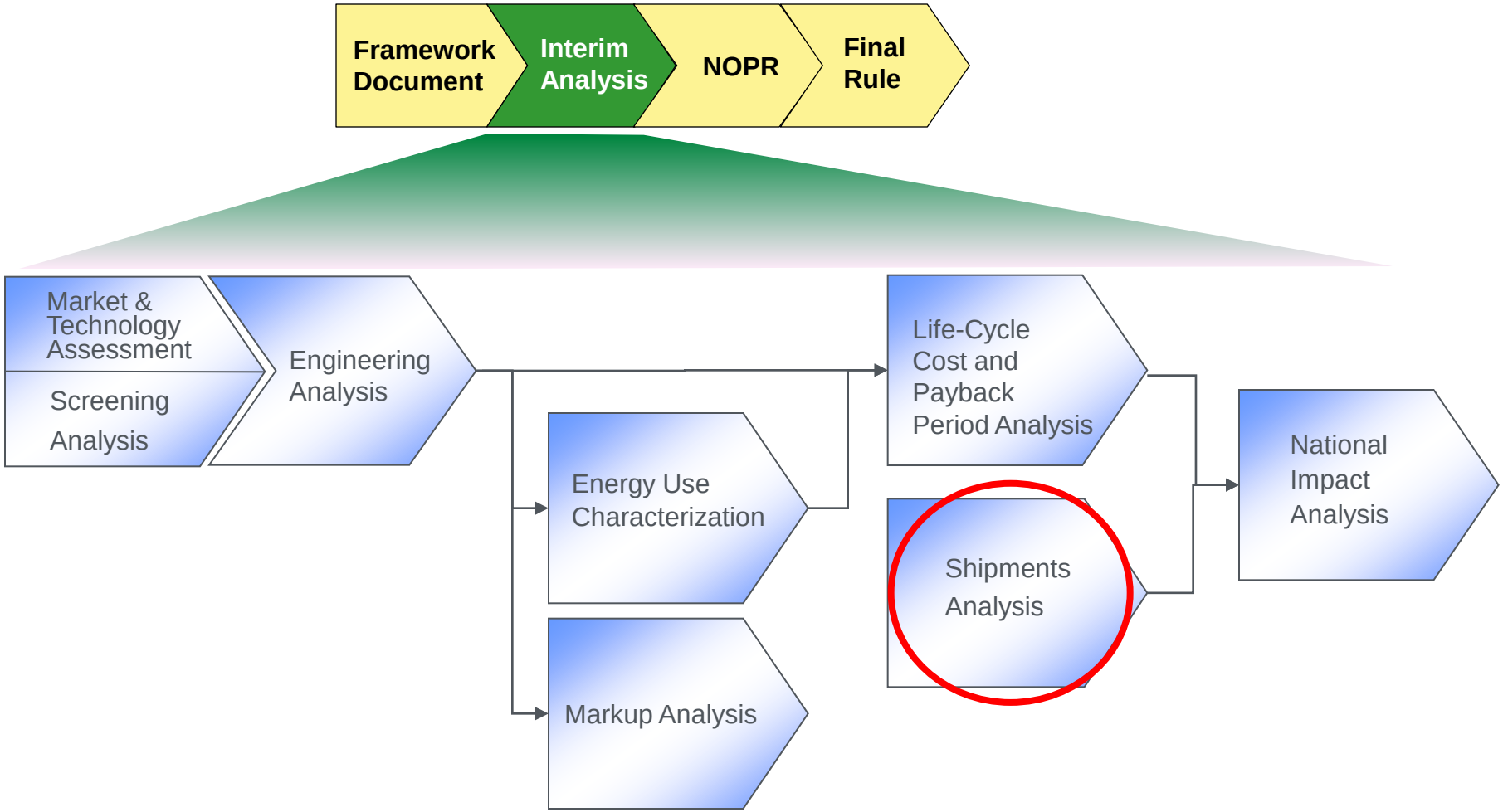
Item 40: DOE welcomes comments on appropriate lifetimes for the HID lamps covered in this rulemaking, and how lamp life should be adjusted to reflect group relamping practices by lamp type and sector.

Item 38: DOE welcomes comments on whether relamping practices (i.e., group or spot relamping) would change if HID lamp life is affected by new energy conservation standards.

Public Meeting Slides Topics

1	Overview; Scope of Coverage
2	Market and Technology; Screening
3	Engineering; Product Price Determination
4	Energy Use; Markup Analysis
5	LCC and Payback Period Analysis
6	Shipments Analysis; NIA Analysis
7	NOPR Analyses

Steps in the Interim Analysis



Shipments Analysis

- Purpose
  - To project HID lamp shipments in the base-case and standards cases to calculate the effects of standards on energy savings and present value of savings.

- Method
  - The shipments model will rely on a range of data sources including, but not limited to:
    - Manufacturers and industry organizations,
    - National market reports,
    - National energy and lamp use surveys, and
    - Historical HID lamp shipments from NEMA.

Issues for Discussion

Item 15: DOE welcomes input on disaggregated market share and shipment data based on input wattage for each HID lamp technology.

Item 41: DOE welcomes recommendations on sources of data for shipments of HID lamps by proposed equipment class. In addition, DOE welcomes comments on future long-term trends in HID lamp efficacy (e.g., market share of probe-start quartz MH versus pulse-start quartz and/or pulse-start ceramic MH) for the baseline shipments projections.

Shipments Analysis
Shipments Model - Methodology

- Accounting methodology
  - New Installations: Applies to HID lamps in new fixtures that are installed each year from growth in a particular sector. DOE proposes to determine this by using the National Energy Modeling System (NEMS) floor space growth projections for the commercial sector as well as historical growth rates for put-in-place construction from Census.
  - Replacements: HID lamps that have failed or retired from service. DOE bases this calculation on lamp shipments and retirement rates.
  - Retrofits (early replacements): Applies to lamps and fixtures installed to replacing existing equipment during renovation or remodeling. This replacement generally occurs before a lamp has failed.

Item 42: DOE welcomes comments on the accounting methodology described for each type of HID lamp covered in this rulemaking.

Shipments Analysis
Base-Case Shipments Projections

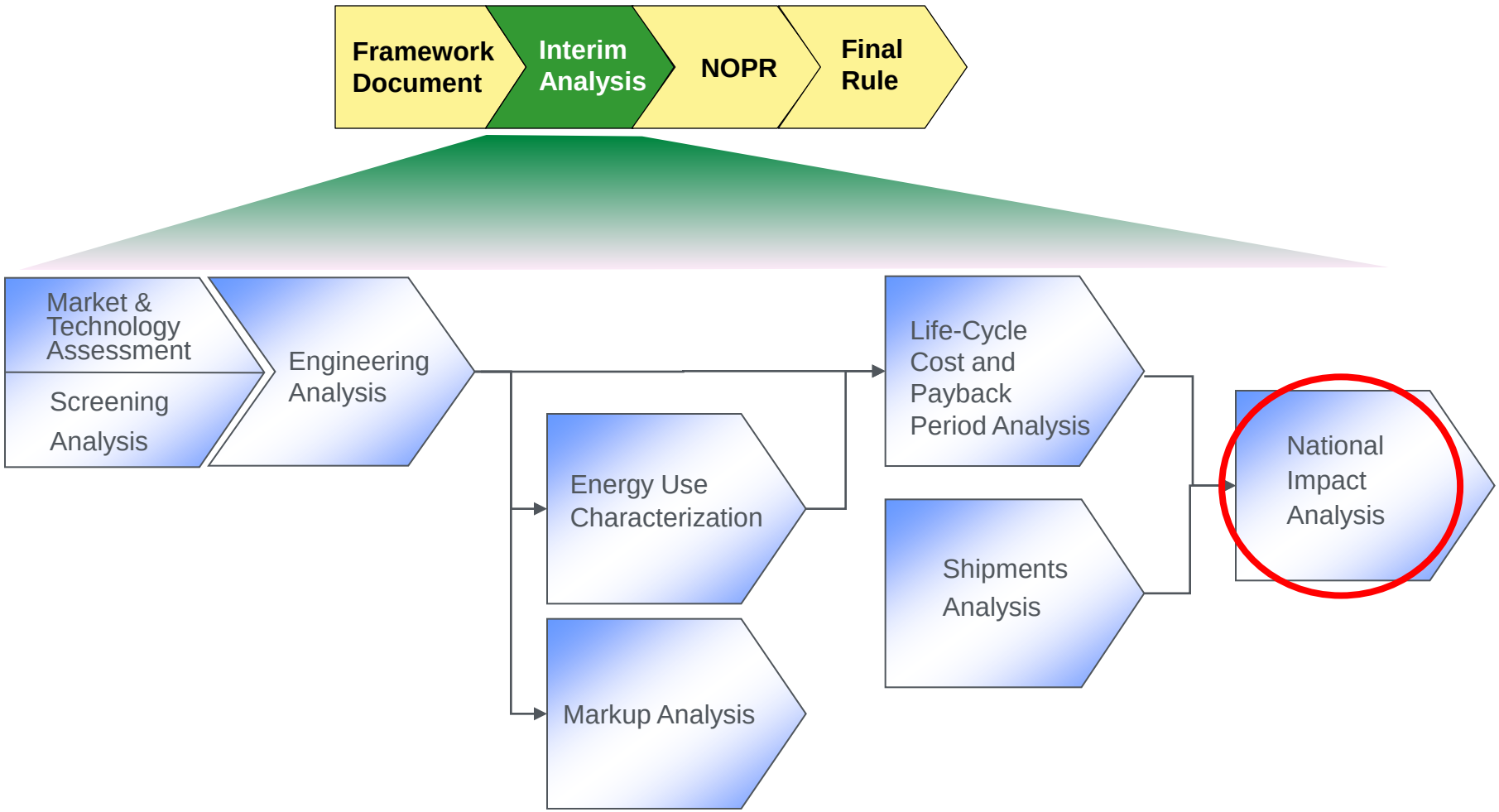
- Provides the basis to compare projections for higher efficiency levels (standards case).
- Depicts the situation where new or amended standards are not adopted.
- Depicts the current and projected mix of HID lamp efficacies sold in the absence of new regulation.
  - DOE will develop projected market shares of equipment by efficacy under the base case.
- Data requirements:
  - Historical shipments
  - Breakdown of shipments by equipment class
  - Lifetime distributions

Shipments Analysis
Standards Effects on HID lamps

- DOE develops standards-case projections from the same data it will use to develop the base-case projections.
- Standards-case projections may also use purchase price increases and operating cost savings to estimate shipments effects.
- DOE will also consider effects from market-pull programs.

Item 43: DOE welcomes comments on how proposed energy conservation standards might affect shipments of HID lamps. DOE also requests information on the effect of existing market-pull programs (e.g., customer rebates) on HID lamps.

Steps in the Interim Analysis

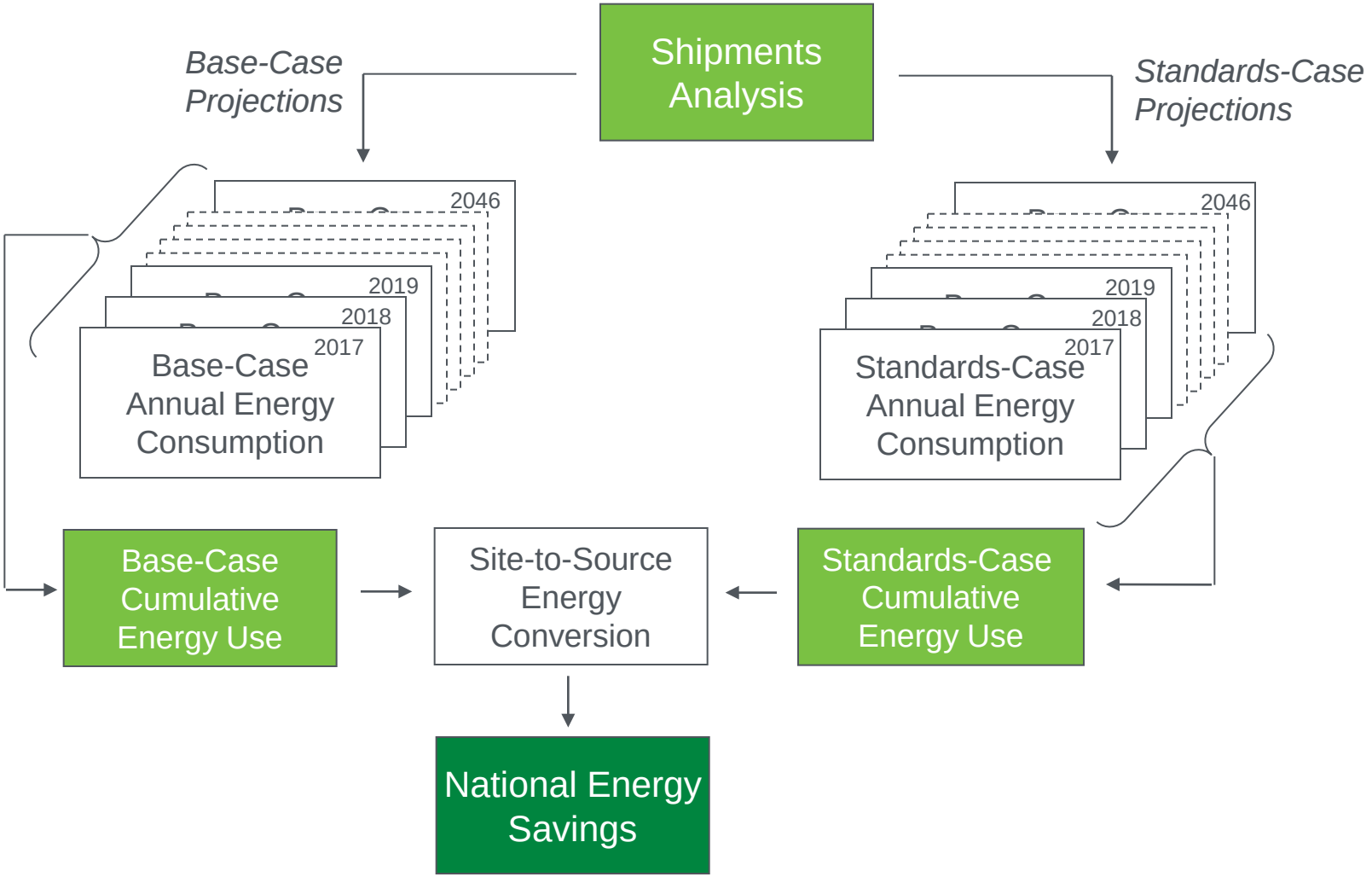


National Impact Analysis

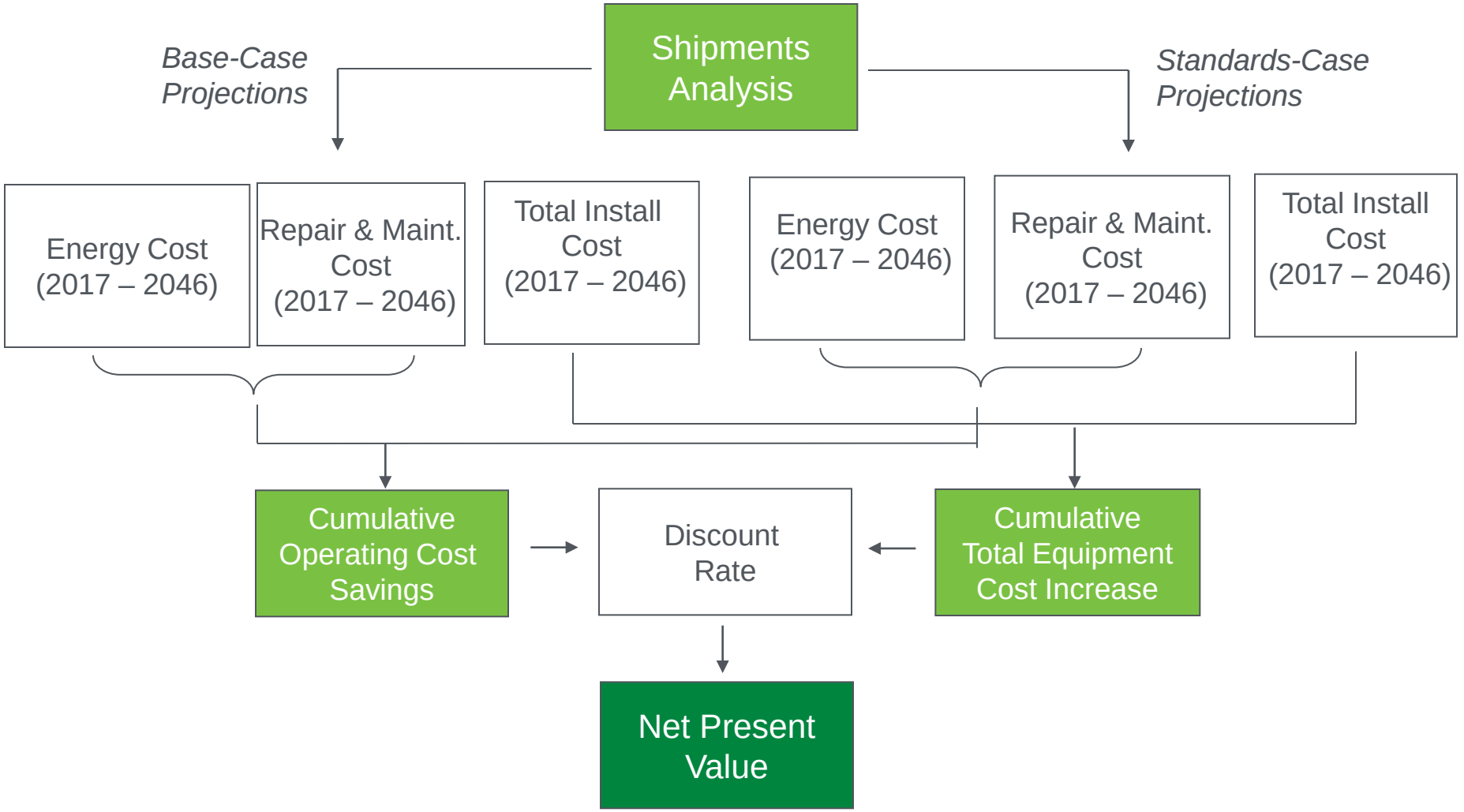
- Purpose
  - To assess the aggregate effects at the national level of potential energy conservation standards for each of the equipment classes, in terms of net present value (NPV) of total customer economic effects and national energy savings (NES).

- Method
  - DOE calculates annual equipment expenditures by multiplying the price per unit by projected shipments.
  - The difference between base- and standards-case scenarios gives the national energy bill savings and increased expenditure in dollars.
  - The difference each year between energy bill savings and increased equipment expenditures is the net savings (if positive) and net costs (if negative).

National Impact Analysis
NES Flow Diagram



National Impact Analysis
National Customer NPV Diagram



Issues for Discussion

Item 44: DOE welcomes comments on the proposed data and projection sources it anticipates using to develop inputs for the national impact analysis.

Item 45: DOE welcomes comments as to whether more efficacious HID lamp designs would be operated more as a result of their increased efficacy (i.e., whether a positive rebound effect would be expected for this equipment) and if so how much longer would they be operated.

National Impact Analysis
Calculation of NES

- DOE intends to calculate national energy consumption for each year beginning with the expected compliance date of the standards and over a 30-year period.

- DOE will use the DOE NES spreadsheet for standard rulemakings.

Item 46: DOE welcomes comment from interested parties on the NES spreadsheet models it plans to use for estimating national effects of new energy conservation standards for HID lamps.

Public Meeting Slides Topics

1	Overview; Scope of Coverage
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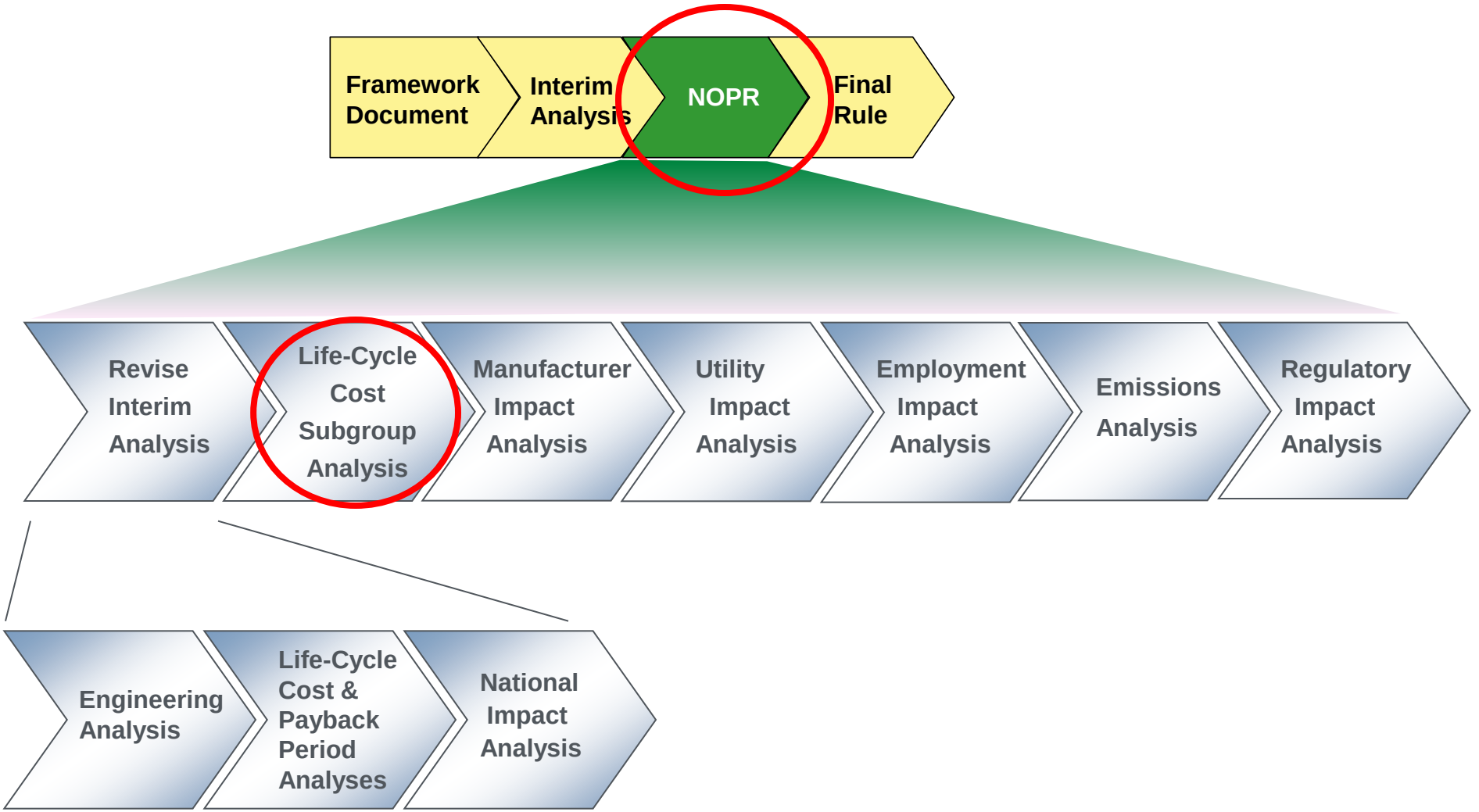
7	NOPR Analyses

Steps in the NOPR



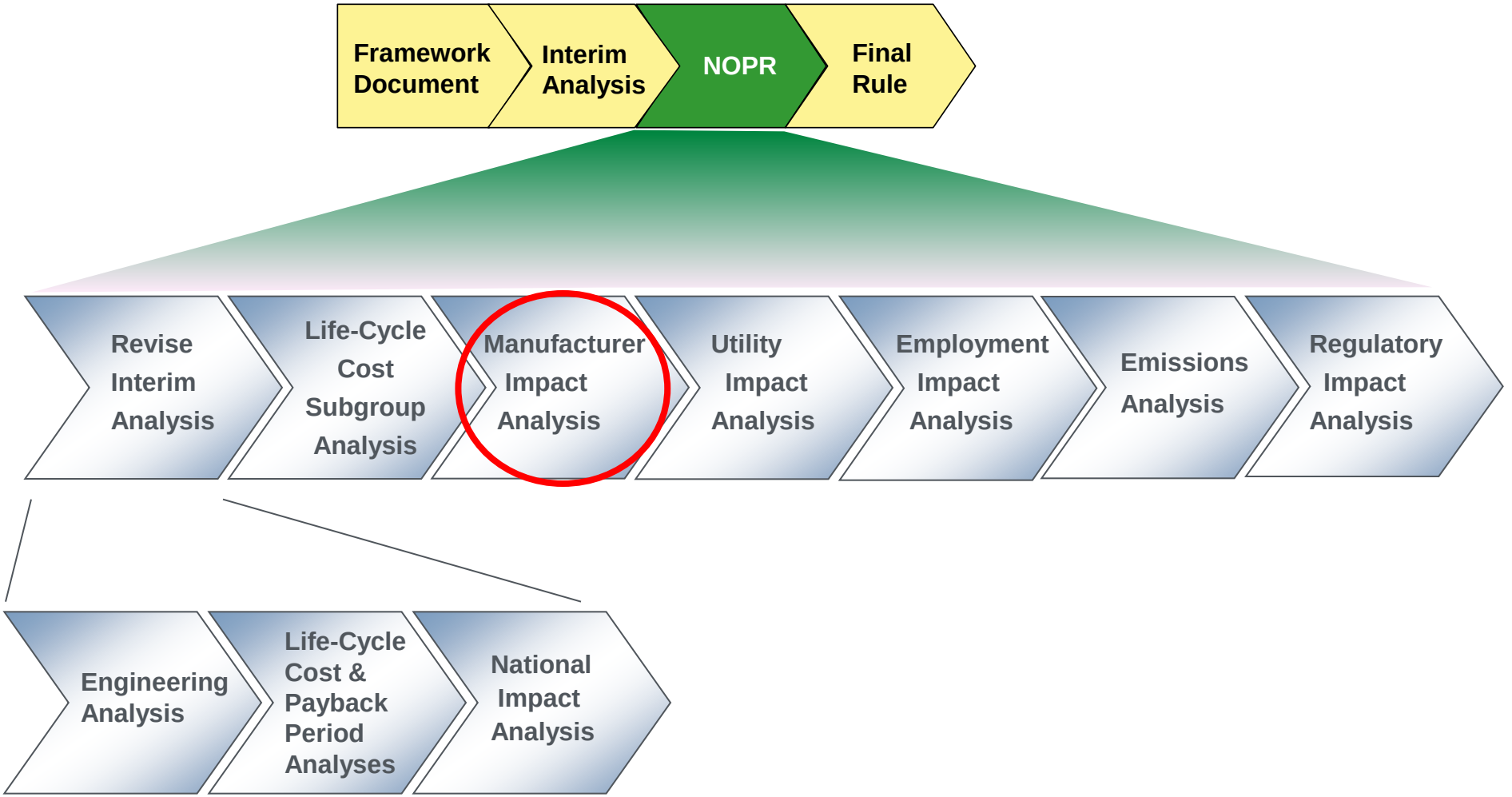
Life-Cycle Cost Subgroup Analysis

- Purpose
  - Analyze the economic effects of standards on customers, including subgroups who may be affected disproportionately compared with the general user population.
    - Possible examples for HID lamps: utilities, municipalities, transportation facilities.

- Method
  - Extend the LCC analysis to examine the effects for defined subgroups.
  - DOE will use inputs specific to each of the considered customer subgroups.

Item 47: DOE welcomes comments from interested parties on which, if any, customer subgroups should be considered when developing standards for HID lamps.

Steps in the NOPR



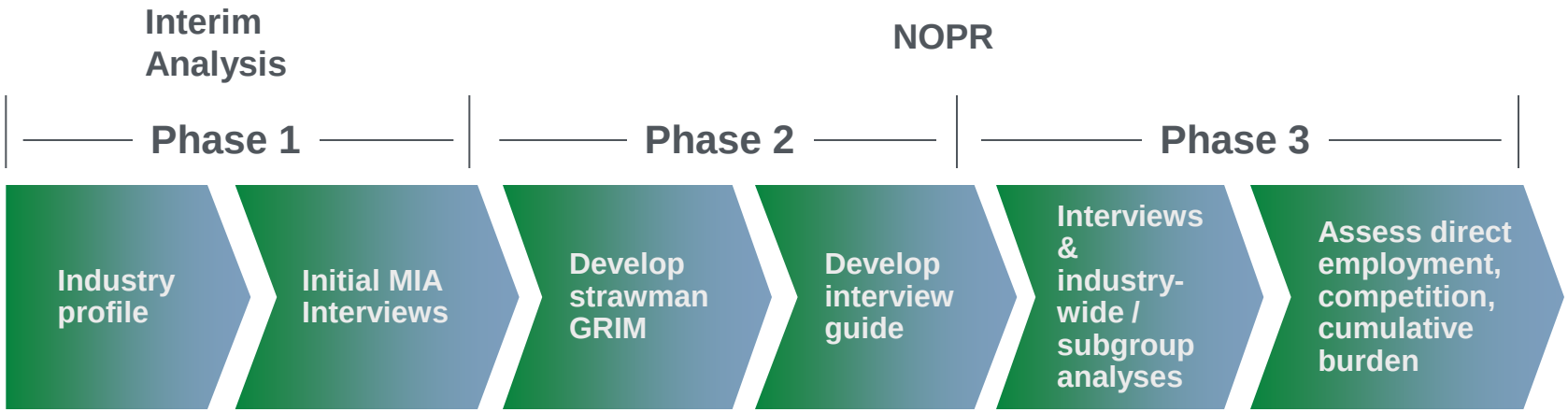
Manufacturer Impact Analysis

- Purpose
  - Assess the impacts of standards on manufacturers.
  - Identify and estimate impacts on manufacturer subgroups that may be more severely impacted than the industry as a whole.
  - Examine the impact of cumulative regulatory burden on the industry.

- Method
  - Analyze industry cash flow and NPV through use of the Government Regulatory Impact Model (GRIM).
  - Interview manufacturers to refine inputs to the GRIM, develop subgroup analyses, and address qualitative issues.

MIA Methodology

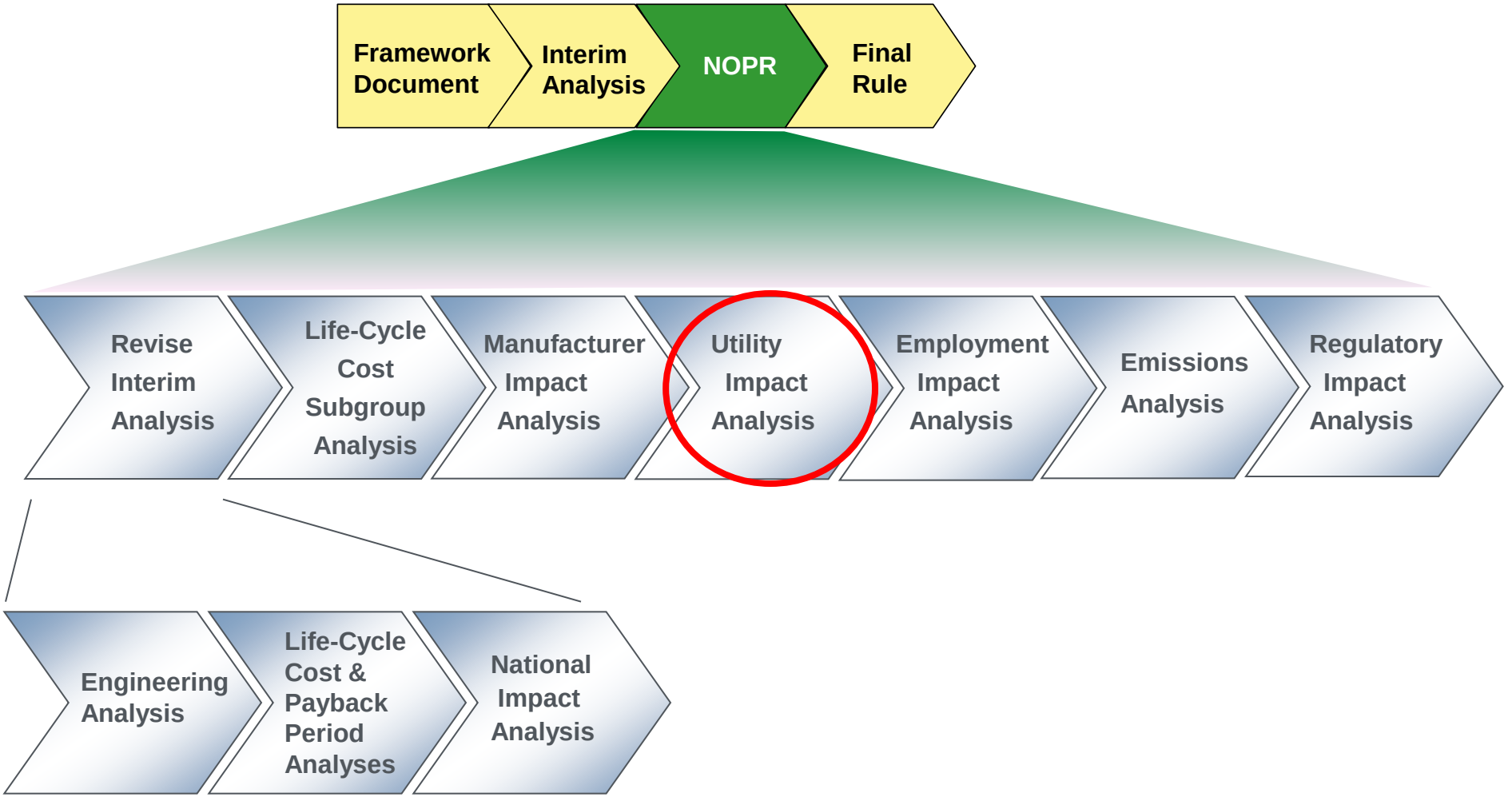
The MIA consists of three main phases:



Item 48: DOE seeks comments on the subgroups of HID lamp manufacturers that it should consider in a manufacturer subgroup analysis.

Item 49: DOE welcomes comments on other regulations or pending regulations it should consider in its examination of cumulative regulatory burden.

Steps in the NOPR



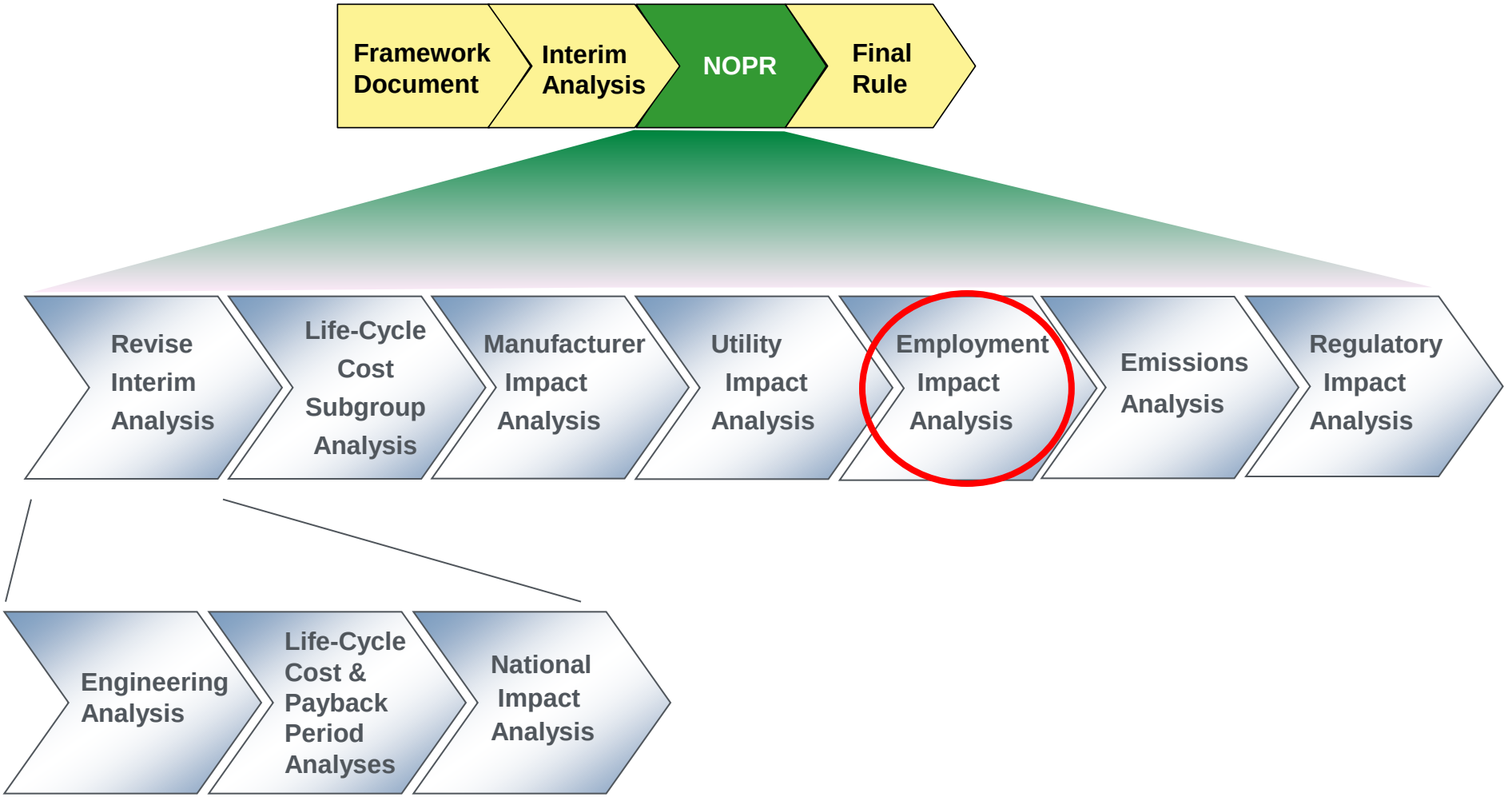
Utility Impact Analysis

- Purpose
  - Assess the overall effects on domestic energy supplies that would result from the imposition of standards.

- Method
  - DOE proposes to use National Energy Modeling System (NEMS)-Building Technologies (BT) developed and used by DOE/EIA for the AEO report, as the basis of the utility impact analysis.
  - DOE will model the energy savings impacts from energy conservation standards using NEMS-BT to generate projections that may deviate from the AEO reference case.
  - Outputs of the utility impact analysis include projections of electricity generation, and avoided capacity resulting from a comparison of base and standards cases.

Item 50: DOE seeks input on its plans to use NEMS-BT to conduct the utility impact analysis on the equipment covered under this rulemaking.

Steps in the NOPR



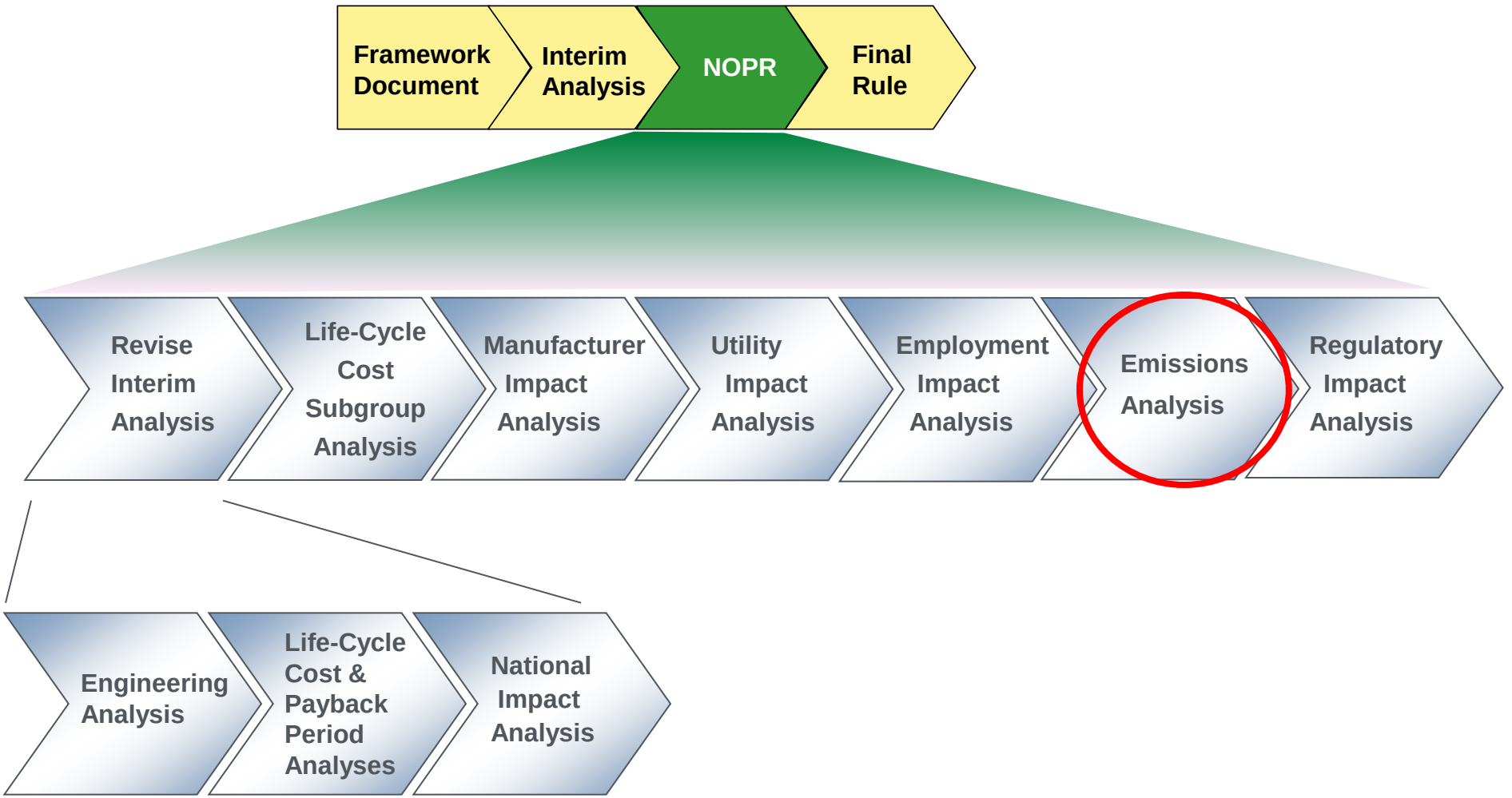
Employment Impact Analysis

- Purpose
  - Assess the overall effect on national employment from the imposition of energy conservation standards at differing levels.
  - Include both direct and indirect employment impacts.
  - Direct employment impacts are estimated in the manufacturer impact analysis.
  - Indirect employment impacts result from shifting customer expenditures among goods and services ("substitution effect") and changes in income and overall expenditure levels ("income effect").

- Method
  - DOE intends to use the Impact of Sector Energy Technologies (ImSET) model for the evaluation of indirect employment impacts.

Item 51: DOE requests feedback on its approach to assessing employment impacts on the equipment covered under this rulemaking.

Steps in the NOPR



Emissions Analysis

- Purpose
  - To report environmental effects resulting from energy conservation standards, including changes in power plant emissions.
- Method
  - DOE intends to use the emissions effects projected from the NEMS-BT modeling analysis used for the Utility Impacts Analysis.
    - Carbon dioxide (CO2) will be the primary emissions reported.
    - Existing legislation cap Sulfur Dioxide (SO2), so physical emission reductions will be zero or nearly zero from any single energy conservation standard.
    - Nitrogen Oxide (NOx) emissions will be reported for the 22 states where emissions are not capped.
      - Mercury (Hg) emissions will also be reported.

Item 52: DOE seeks input on its plan to use NEMS-BT to conduct the emissions analysis for the equipment covered by this rulemaking.

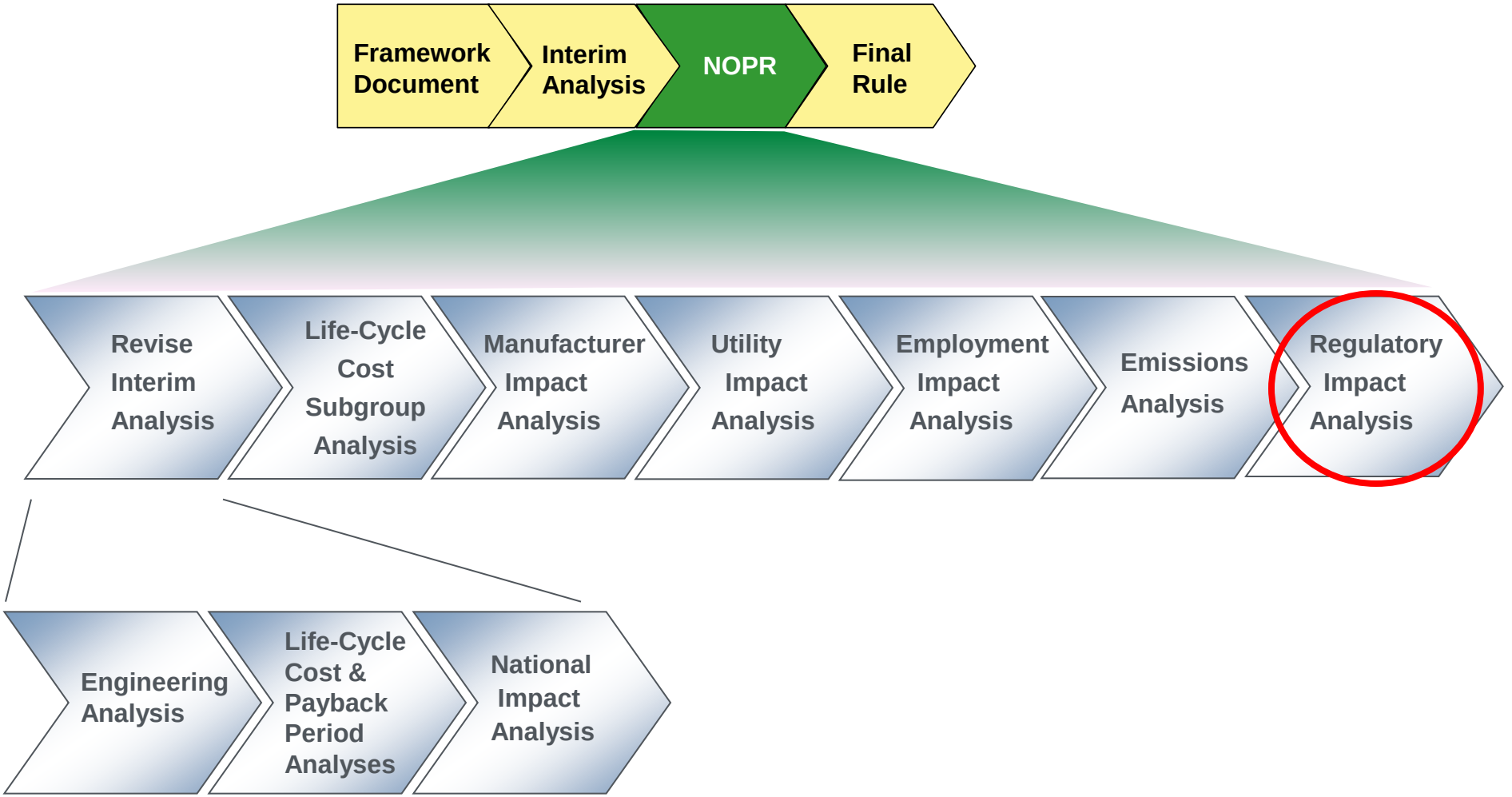
Monetization of Emission Reductions

- DOE intends to use the most current social cost of carbon (SCC) values developed by interagency reviews.
  - SCC is intended to be a monetary measure of the incremental damage resulting from greenhouse gas (GHG) emissions, including but not limited to agricultural productivity loss, human health effects, property damage from rising sea level, and changes in the ecosystem.

- At present, the most recent interagency estimates of the potential global benefits resulting from reduced CO_2 emissions in 2010 are $4.9, $22.3, $36.5, and $67.6 per metric ton in 2010 dollars.
  - For emission reductions that occur in later years, these values grow in real terms over time.

- DOE will also estimate the potential monetary benefit of reduced NO_x emissions resulting from the considered standard levels.

Steps in the NOPR



Regulatory Impact Analysis

- Purpose
  - To investigate the national effects of non-regulatory alternatives compared with mandatory energy conservation standards.
  - The non-regulatory alternatives that may be considered include:
    - Customer rebates;
    - Customer tax credits;
    - Manufacturer tax credits;
    - Voluntary efficiency targets;
    - Early replacement; and
    - Bulk government procurement.

- Method
  - Modify NES spreadsheet model to consider non-regulatory scenarios.
  - Estimate effects of non-regulatory scenarios based on experience with the considered policies.
  - Output will include NES and NPV of the non-regulatory alternatives.

How to Submit Written Comments

- **In all correspondence, please refer to the HID lamps rulemaking by:**
  - High-Intensity Discharge Lamps Energy Conservation Standard Rulemaking,
  - Docket Number EERE-2010-BT-STD-0043, and
  - Regulatory Identification Number (RIN) 1904-AC36

- **Email:** HIDLamps-2010-STD-0043@ee.doe.gov

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- **Comment period closes: April 12, 2012, 11:59 PM EDT**

Relevant URLs

- **DOE Appliance Standards**
  - http://www1.eere.energy.gov/buildings/appliance_standards/
- **HID Lamps Energy Conservation Standard and Test Procedure**
  - http://www1.eere.energy.gov/buildings/appliance_standards/commercial/high_intensity_discharge_lamps.html
- **Metal Halide Lamp Fixture Energy Conservation Standard**
  - http://www1.eere.energy.gov/buildings/appliance_standards/commercial/metal_halide_lamp_fixtures.html

Questions?