Energy Conservation Standards for Residential Furnaces and Boilers

ANOPR Public Meeting

Rulemaking Overview

Building Technologies Program
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

September 29, 2004

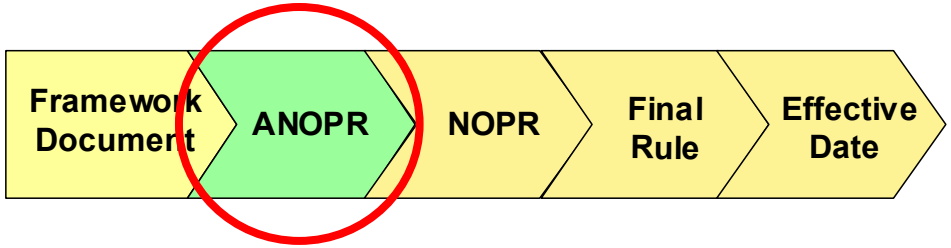
Purpose of the Public Meeting

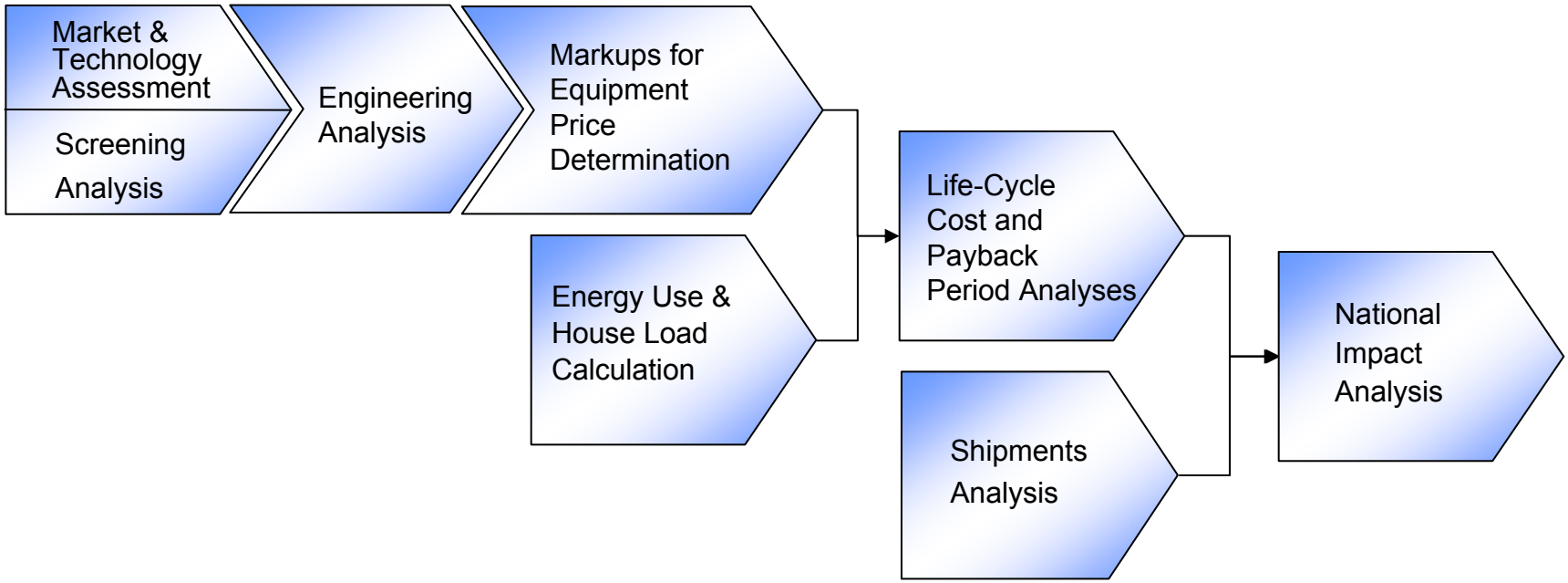
- To present methodologies and characterize results for analyses to date
- To discuss specific issues related to each analysis
- To seek input from attendees on methodologies, assumptions, and data sources
- To describe upcoming analyses and next steps

The Energy Policy and Conservation Act (EPCA) directs DOE to consider seven factors when setting energy conservation standards

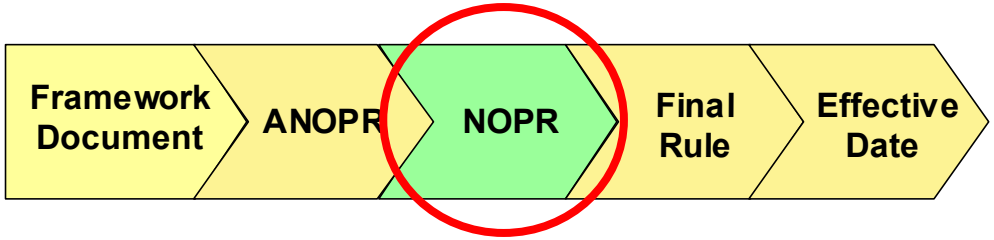
Factor	Analysis
1. Economic impact on consumers and manufacturers	Life-cycle cost analysis Manufacturer impact analysis
2. Lifetime operating cost savings	Life-cycle cost analysis
3. Total projected energy savings	National impact analysis
4. Impact on utility or performance	Screening analysis Engineering 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

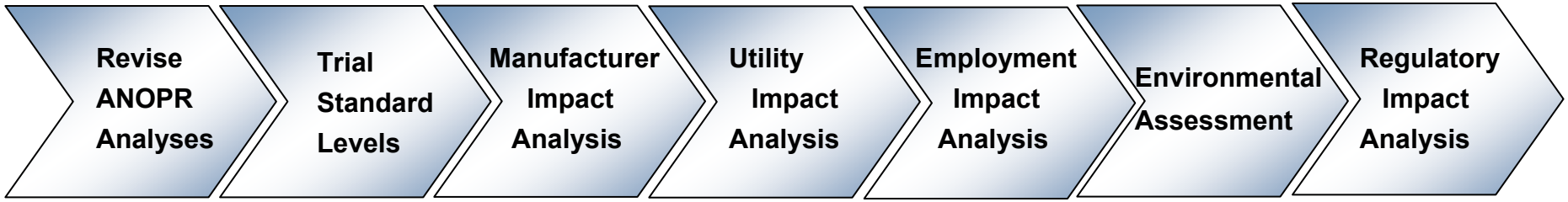
Steps in the Standards Rulemaking: ANOPR





Steps in the Standards Rulemaking: NOPR





Issues for Public Comment

1. Installation Model
2. Venting Issues
3. Efficiency Distributions of Weatherized Gas Furnaces
4. 81 percent AFUE Furnaces with and without Two-Stage Modulating Controls
5. Regulation of Furnace Electricity Consumption

Comments from Participants

- Participants are invited to provide summary comments or statements
- Participants are invited to raise additional issues for discussion today
- ANOPR comment period open through November 10, 2004

Energy Conservation Standards for Residential Furnaces and Boilers

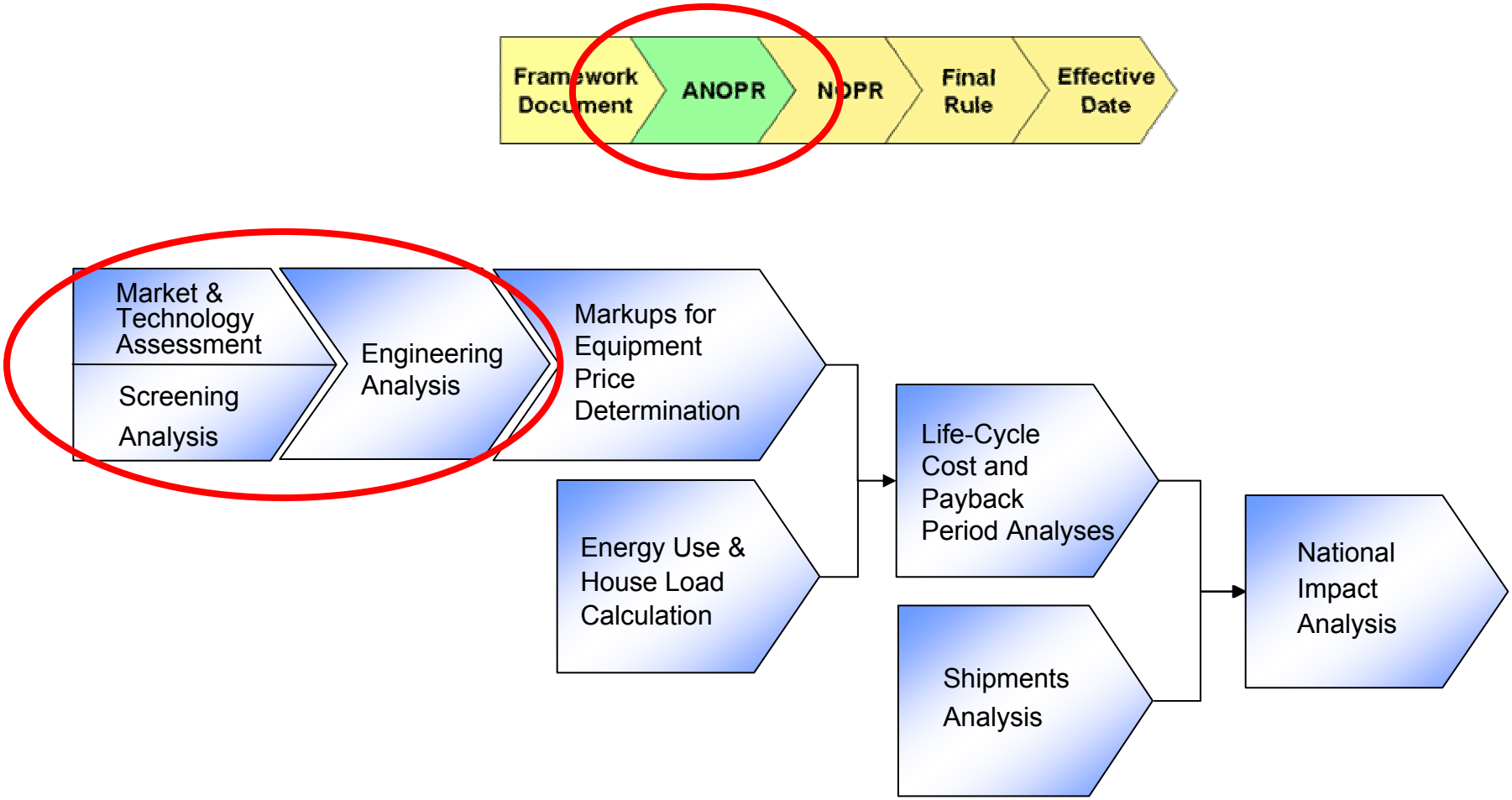
ANOPR Public Meeting

Engineering Analysis

Building Technologies Program
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

September 29, 2004

ANOPR Analyses Flow Diagram



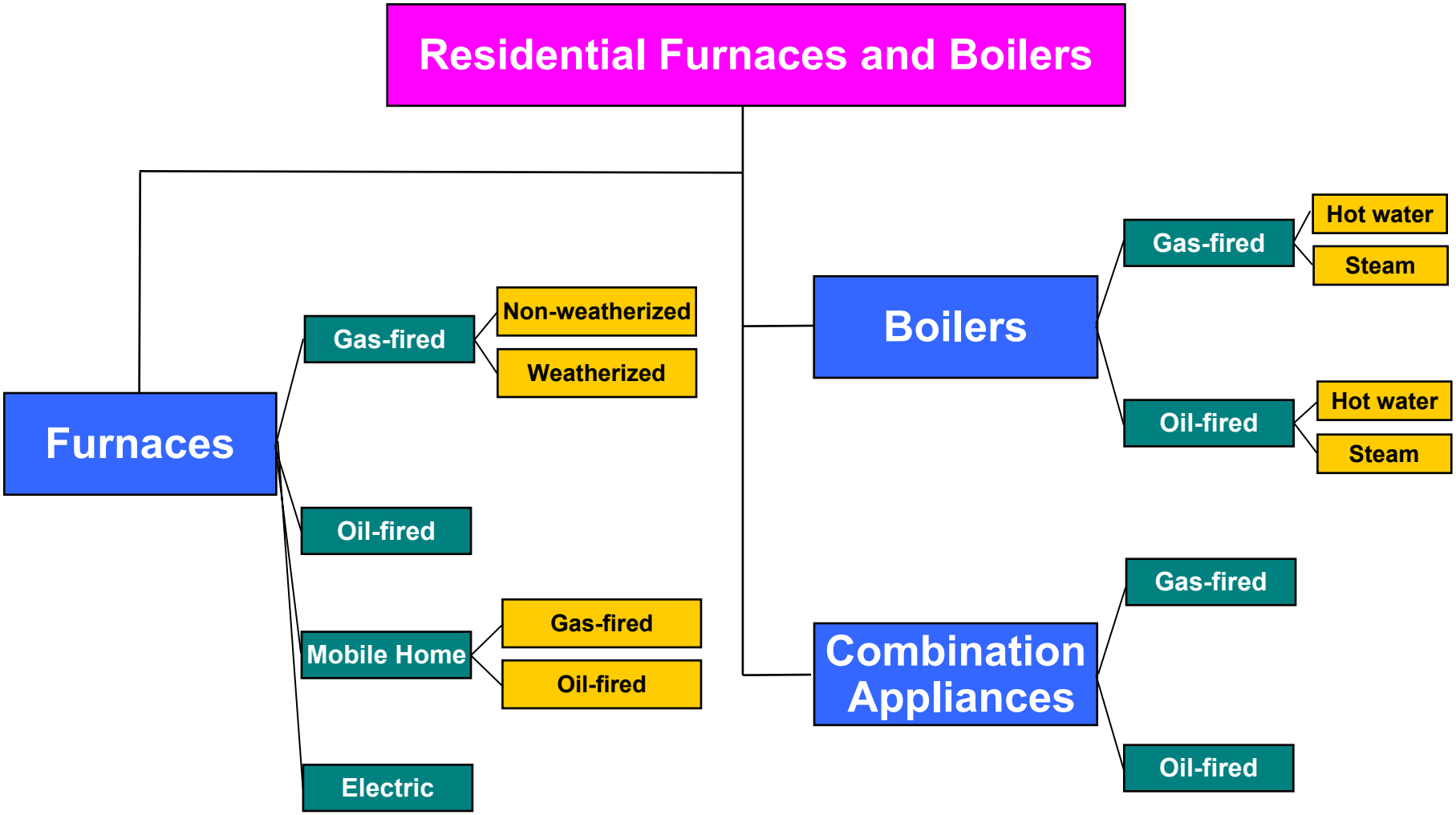
Purpose

- **Market & Technology Assessment**
  - To characterize the furnace and boiler market and identify / select product classes
- **Screening Analysis**
  - To identify design options that increase efficiency and apply screening criteria to determine which design options to evaluate and which to screen out.
- **Engineering Analysis**
  - To develop cost-efficiency relationships to show the equipment and installation costs of achieving increased efficiency
  - To account for ranges and uncertainties in data and generate LCC input distributions
  - To determine the simple “rebuttable” payback for each efficiency level (design option) based on the DOE test procedure

Issues For Public Comment

- Installation Model (ANOPR Issue #1)
- Venting Issues (ANOPR Issue #2)
- Regulation of Furnace Electricity Consumption (ANOPR Issue #5)

Product Classes



Furnace and Boiler Shipments

	FY 2003 Shipments	DOE Approach
Non-Weatherized Gas-Fired Furnaces	2,230,000	DOE Analysis
Electric Furnaces, Unit Heaters	>400,000	No Change in Standards
Weatherized Gas-Fired Furnaces	297,000	DOE Analysis
Gas-Fired Hot Water Boilers	271,000	
Mobile Homes Gas-Fired Furnaces	69,000	
Oil-Fired Furnaces	130,000	
Oil-Fired Hot Water Boilers	124,000	
Combination Appliances	~100,000	No Change in Standards
Gas-Fired Steam Boilers	36,000	Based on Hot Water Boiler Analysis
Oil-Fired Steam Boilers	13,000	
Mobile Homes Oil-Fired Furnaces	<1000	No Change in Standards

Source: GAMA Shipment Data, 2003, and DOE estimates.

Screening Analysis Method

- **Design options screened using the following criteria:**
  - Technological feasibility
  - Practicability to manufacture, install and service
  - Adverse impacts on product utility or product availability
  - Adverse impacts on health or safety

Design Options Selected For Further Consideration

- Improved Heat Exchanger Effectiveness
- Direct Vent
- Induced or Forced Draft
- Air-Atomized Burner with Modulation**
- Infrared Burner
- Fuel Filtration**
- Delayed Action Oil Pump Solenoid Valve**
- Condensing Secondary Heat Exchanger
- Electronic Ignition
- Modulating Operation
- Increased or Improved Insulation*
- Pulse Combustion***
- Increased Motor Efficiency
- Increased Blower Impeller Efficiency

*weatherized gas furnaces only *** gas equipment only

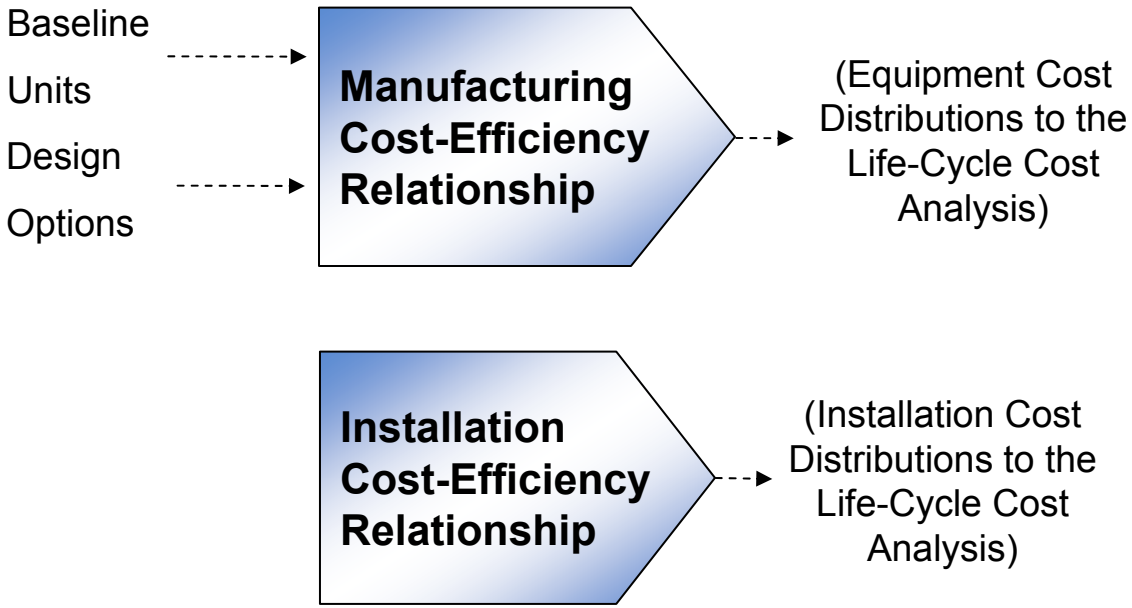
**oil equipment only

Design Options Screened Out

Design Option	Screening Criteria Not Met
Self-Generation of Electric Power	Technological feasibility Practicability to manufacture, install and service
Fuel-Driven Heat Pumps	Practicability to manufacture, install and service
Flue-Gas Recirculation	Adverse impacts on health or safety
Smart Valve**	Practicability to manufacture, install and service

**oil equipment only

Engineering Analysis Process



Baseline Units

Product Classes			Input Capacity[1] (Btu/hr)	Efficiency[2] (AFUE)	Equipment Characteristics			
					Config-uration [3]	Heat Exchanger[3]	Ignition[3]	Draft[3]
	Furnaces	Non-Weatherized Gas-Fired Furnaces	75,000	78	Upflow	Clam Shell or Tubular	Hot Surface	Induced
	Furnaces	Weatherized Gas-Fired Furnaces	75,000	75	Horizontal	Clam Shell or Tubular	Hot Surface	Natural
	Furnaces	Mobile Homes Gas-Fired Furnaces	70,000	75	Downflow	Drum	Standing Pilot	Natural
	Furnaces	Oil-Fired Furnaces	105,000	78	Upflow	Drum	Intermittent Ignition	Induced
	Boilers	Gas-Fired Hot Water Boilers	140,000	80	N/A	Sectional, Dry-base, Cast Iron	Standing Pilot	Natural
	Boilers	Oil-Fired Hot Water Boilers	105,000	80	N/A	Sectional, Wet-base, Cast Iron	Intermittent Ignition	Induced

Sources:
[1] Stakeholders' Input
[2] NAECA Minimum Standards
[3] Manufacturer Interviews, Market Assessment

Manufacturing Cost Components

Manufacturing Cost

Corporate Expenses
- Research and Development
- Profit
- General & Administration
- Warranty
- Taxes
- Sales and Marketing
- Shipping

Fixed Costs
- Equipment and Plant Depreciation
- Tooling Amortization
- Equipment Maintenance
- Utilities
- Indirect Labor
- Cost of capital
- Overhead Labor

Variable Costs
- Manufactured Materials
- Purchased Materials
- Fabrication Labor
- Assembly Labor
- Indirect Materials

Profit

General Expense

Sales Expense

Shipping

Factory Expense

Direct labor

Direct Materials

Total Product Cost

Total Product Cost + Distribution Markups = Consumer Price

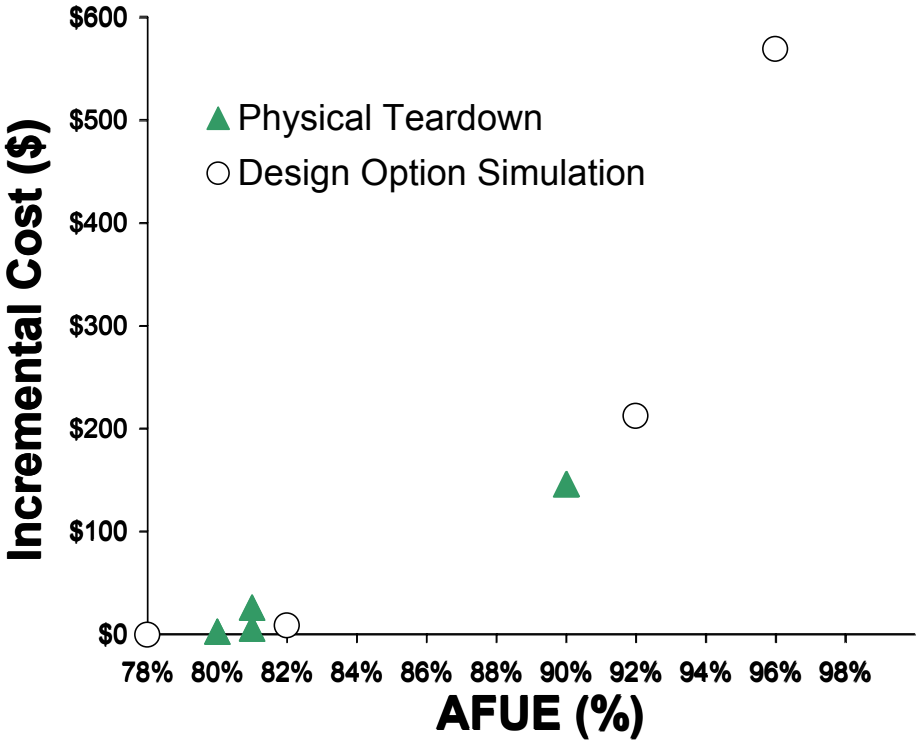
Manufacturing Cost-Efficiency Process

1) **Identify Baseline Units**

2) **Perform Physical Teardowns**
   - Select Teardown Units
   - Develop Bill of Materials
   - Cost Model Assumptions

3) **Design Option Simulations**
   - Identify Design Options
   - Performance Model AFUE
   - Cost Design Options

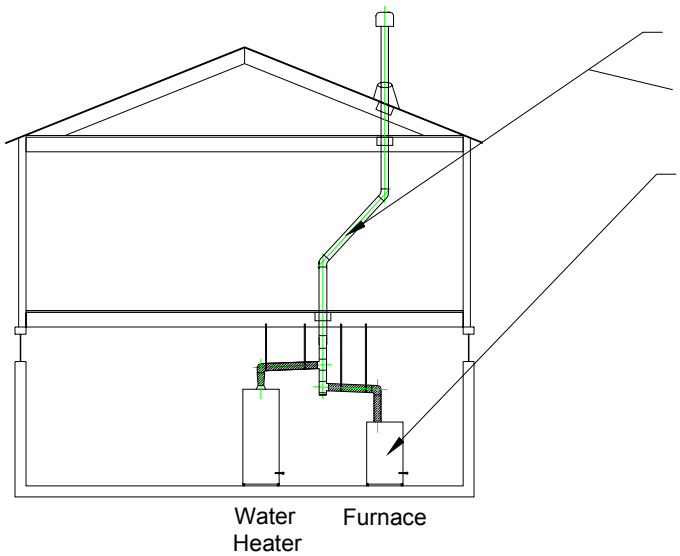
4) **Stakeholder Review, Finalize**



Non-weatherized Gas Furnaces

Installation Cost Approach

- Similar to the reverse engineering teardown approach used for manufacturing costs, DOE created a Bill of Materials installation cost model, based on the R.S. Means construction cost method.
- Installation costs included are:



Vent
Vent Modifications
Removal/Replacement
Condensate Drainage
Electrical Hookup
Nominal Ducting/Piping

Does not include: furnace or boiler itself

Installation Cost Factors

- **To account for a variety of installation configurations, DOE nationally weight-averages up to 24 Bills of Material Per Efficiency Level.**

Installation Configurations

Market – New Construction or Replacement

Water Heater – Gas or Electric

Existing Vent– Plastic, Metal, or Masonry

Existing Vent Connector – Single or Double Wall

Masonry Chimney Relining Practice

Orphaned Water Heater Practice

- **Based on national data, DOE calculates size parameters (i.e. average vent lengths) based on formulae; a Monte Carlo simulation is used to bound variability.**

Installation Size Parameters

Living Area

Number of Stories

Presence of a Basement

Vent Connector Diameter

Single or Multi Family

Furnace or Boiler Capacity

Example: Installation Cost Results for Non-weatherized Gas Furnaces

Efficiency Level (AFUE)	Incremental Cost ($)
78% - Baseline Model	$0
80%	$4
81% w/ modulation	$34
81% (8% Cat. III)	$80
82% (35% Cat. III)	$245
83% (100% Cat. III)	$639
90% +	$257

Installation Model Approach (ANOPR Issue #1)

Installation costs are based on the Installation Model developed by the Department of Energy. Assumptions include:

- Venting Category Assignments (for NWGF)
- New Construction and Replacement Markets (Installation Configurations)
- Installation Size

The Department invites comment on the methodology and assumptions used in the Installation Model.

Venting Issues (ANOPR Issue #2)

NFGC and NFPA 31 provide venting guidelines for gas boilers and oil appliances, but the efficiency level at which the use of Category III venting becomes necessary is not defined by these codes.

Fraction of Models Requiring an Upgraded Category III Vent

Class	AFUE						Comment
	80%	81%	82%	83%	84%	85%	
Gas Boilers	20%	20%	20%	20%	20%	100%	20% of installations for construction reasons; 85% AFUE threshold due to AFUE test procedure.
Oil-fired Furnaces					100%	100%	Decreased hydrogen content in fuel oil
Oil-fired Boilers						100%	Decreased hydrogen content in fuel oil

The Department invites comment on this issue.

Regulation of Furnace Energy Consumption (ANOPR Issue #5)

42 U.S.C 6291(6) states that *an "energy conservation standard" is either (A) "a…level of energy efficiency" or "a…quantity of energy use," or (B) "a design requirement for the products specified*…". Item (A) seems to say that a single "energy conservation standard" cannot have measures or descriptions for *both* energy efficiency and energy use. A standard that includes both a level of energy efficiency and a quantity of energy use (kWh of electricity) conflicts with the statutory language. 42 U.S.C. 6291(20) states that "*the term 'annual fuel utilization efficiency' means the efficiency descriptor for furnaces and boilers, determined using test procedures prescribed under section 323*…" Since the AFUE descriptor does not include electricity use, DOE cannot regulate the use of electricity by furnaces and boilers.

Based on these considered approaches and the statutory language, the Department has decided not to regulate electricity consumption of residential furnaces and boilers at this time using the above-mentioned descriptor approaches.

The Department invites comments on this issue.

Other Issues

The Department seeks comments and recommendations from stakeholders on any other aspects related to the Engineering Analysis.

Energy Conservation Standards for Residential Furnaces and Boilers

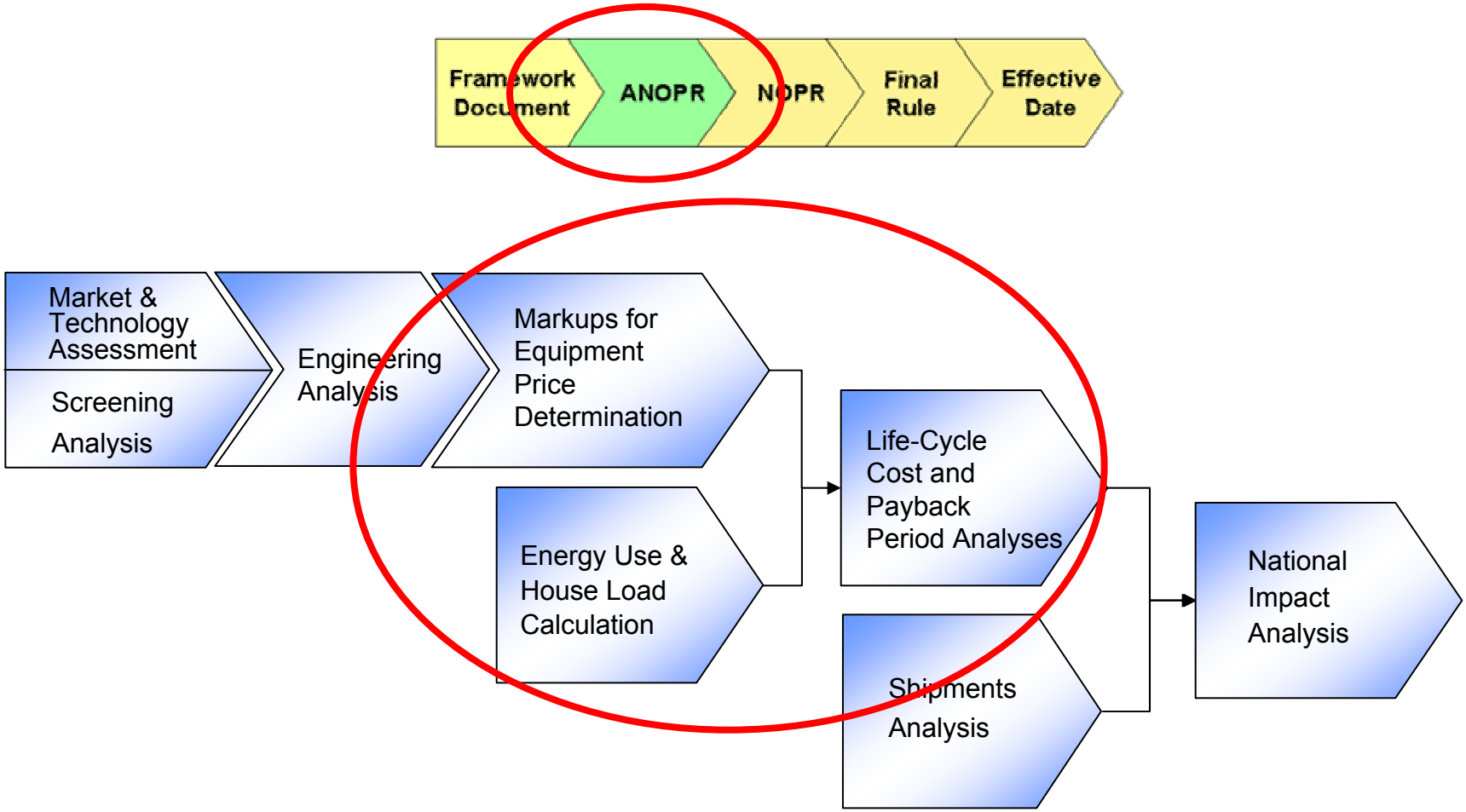
ANOPR Public Meeting

Life-Cycle Cost Analysis

Building Technologies Program
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

September 29, 2004

ANOPR Analyses Flow Diagram



Purpose

- **Energy Use & House Load Calculation**
  - To establish the energy use of higher efficiency residential furnace & boiler equipment and to determine the house heating load.

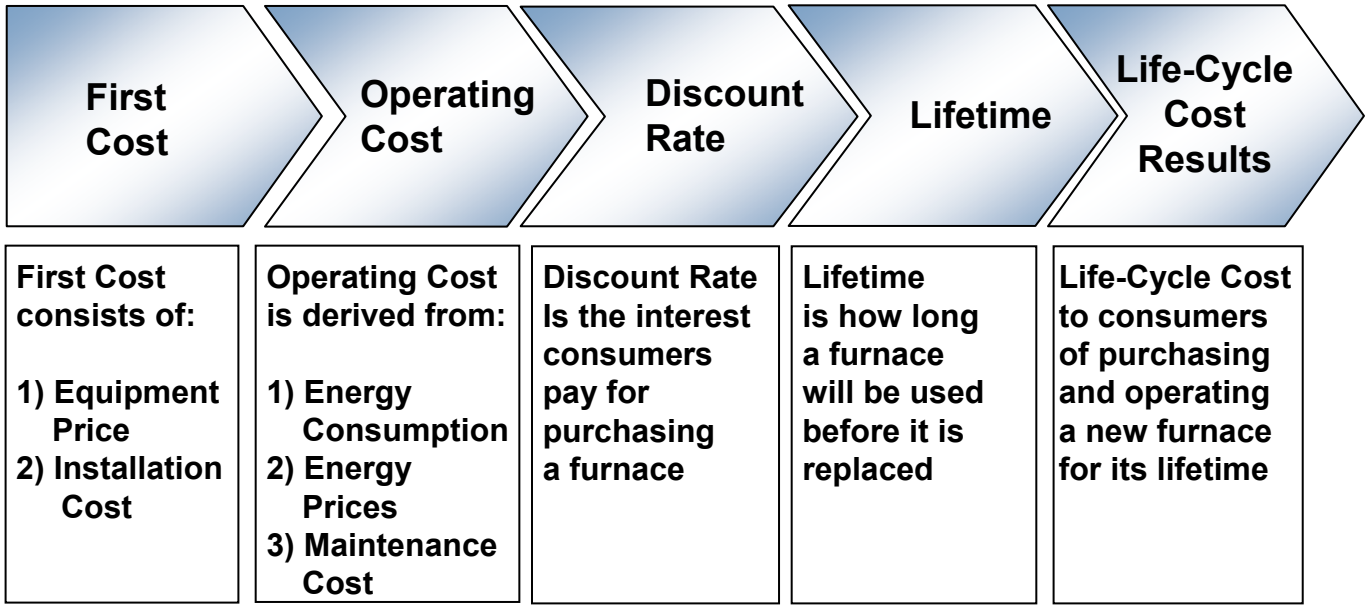
- **Markups for Equipment Price Determination**
  - To characterize the channels for how equipment is distributed from the manufacturer to the customer.
  - To determine prices paid by customers based on manufacturer costs of base case and higher efficiency equipment.

- **Life-Cycle Cost and Payback Period Analyses**
  - To develop the customer life-cycle cost savings and the payback periods of higher efficiency equipment.

Issues for Public Comment

- **Efficiency Distributions of Weatherized Gas Furnaces (ANOPR Issue #3)**
- **81 percent AFUE Furnaces with and without Two-Stage Modulating Controls (ANOPR Issue #4)**

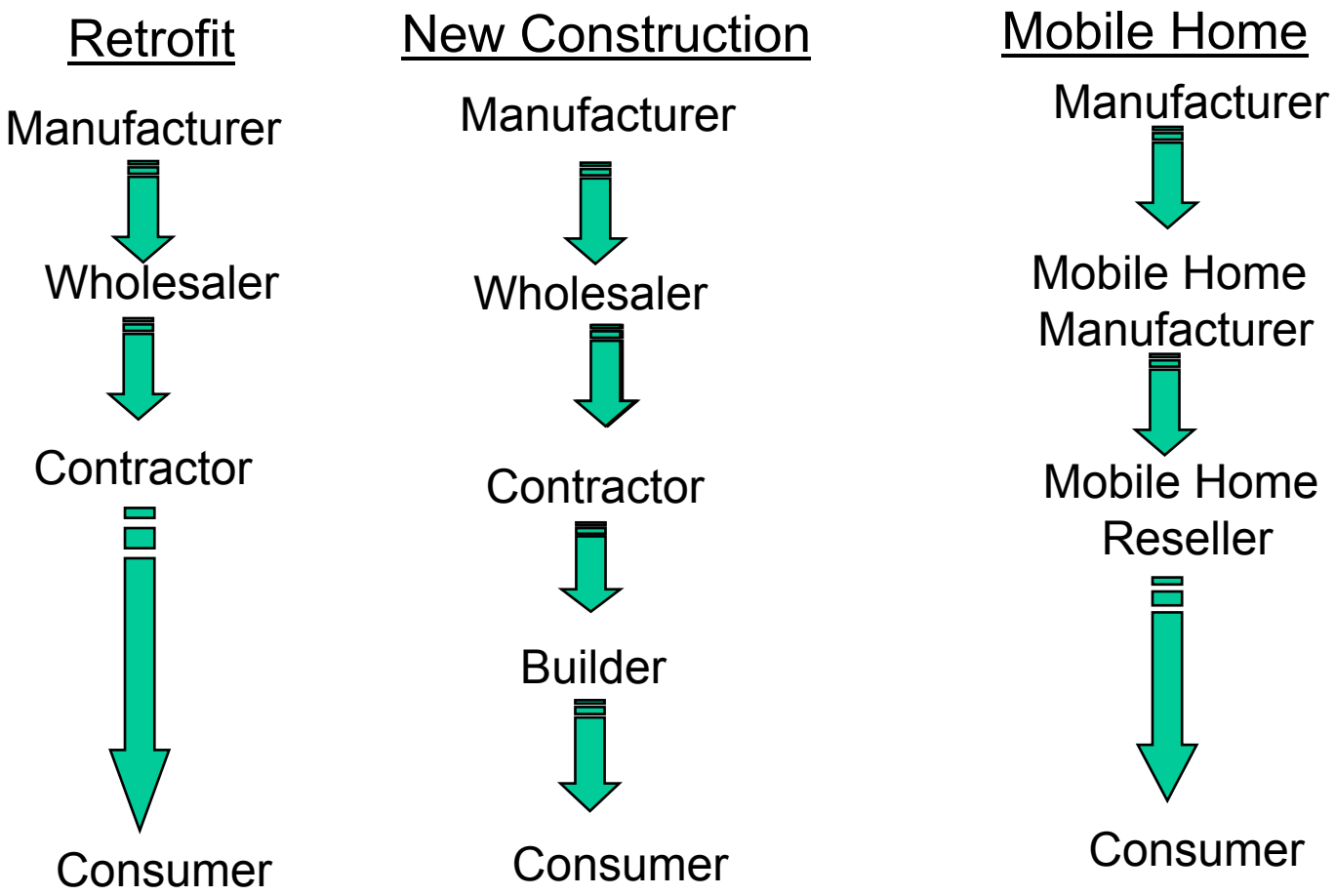
Components of the LCC Analysis



Purpose, Inputs, and Output

- **Purpose**
  - To determine customer prices based on manufacturer costs
  - Characterize distribution channels and market segments
  - Analyze company direct costs, expenses, and profits
- **Inputs**
  - Company balance sheets
    - Wholesalers: ARW *1998 Wholesaler PROFIT Survey Report for Wholesalers*
    - Contractors: ACCA *1995 Financial Analysis for the HVACR Contracting Industry*
  - U.S. Census Bureau data
    - Builders: *U.S. Department of Commerce, Single-Family Housing Construction, 1997 Economic Census, Construction, Industry Series, Nov., 1999. Washington, DC. Report No. EC97C-2332A(RV). Table 4.*
- **Output**
  - Baseline and incremental markups

Distribution Channels



Baseline and Incremental Markups

- ***Markups*** **relate customer price to cost of goods sold (COGS)**
- ***Baseline markups*** **relate price to cost prior to a change in efficiency**
  - Baseline markups indicate a customer price that covers all of a wholesaler's or contractor's expenses plus profit
  - Direct labor costs (salaries, payroll, rental and occupancy) are included
- ***Incremental markups*** **relate the incremental change in customer price to the incremental change in COGS**
  - Some costs remain constant with COGS increases
  - Incremental markups cover only expenses that vary with COGS – in this case, expenses that increase due to an increase in equipment efficiency
  - For example, direct labor costs (salaries, payroll, rental and occupancy) do not vary with efficiency-induced changes in COGS labor expenses

Example of Markup Results

Range of Markup Values

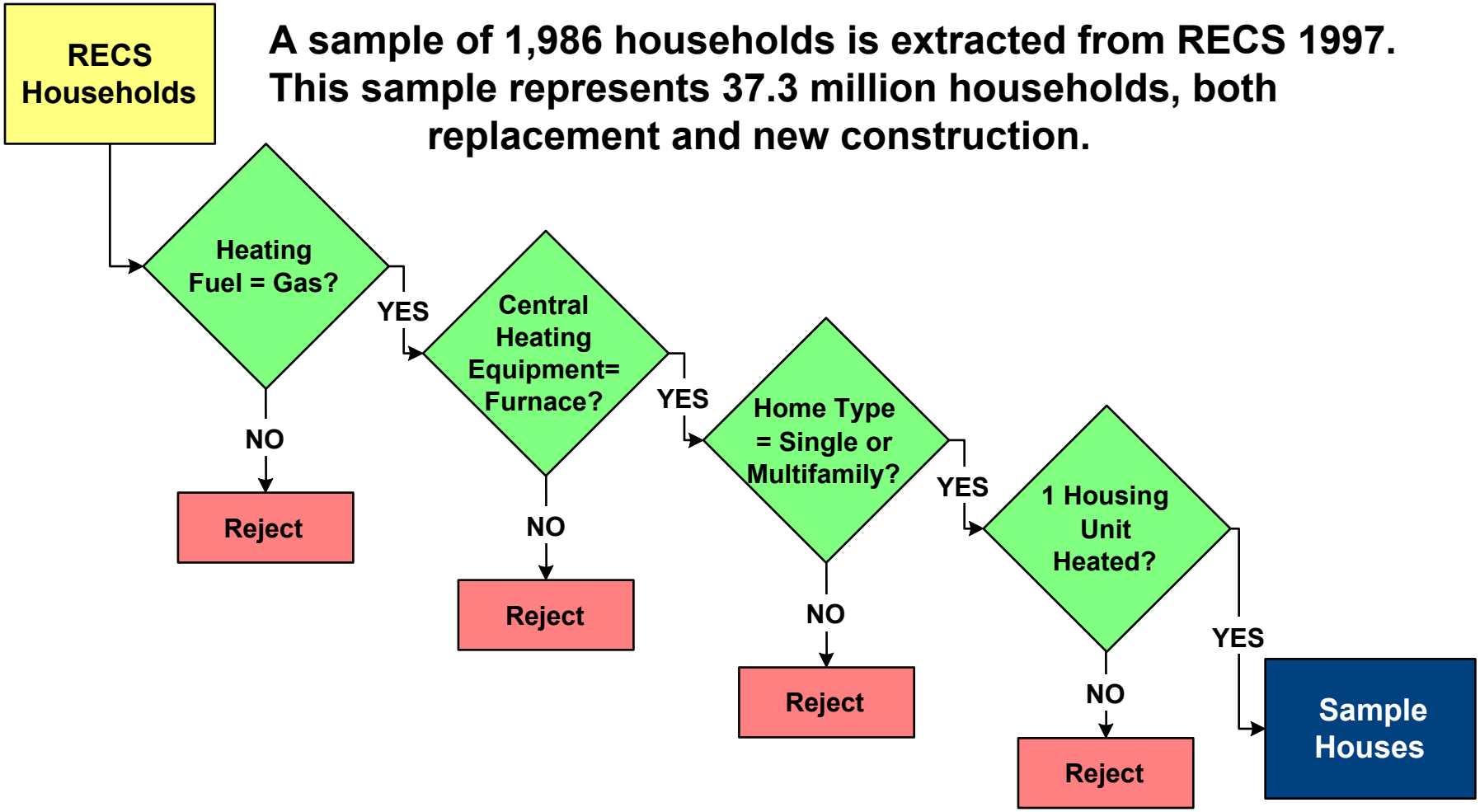
	Baseline	Incremental
Manufacturer	1.17 – 1.34	
Wholesaler	1.14 – 1.58	1.00 – 1.22
Contractor new	1.33 – 1.50	1.15 – 1.29
Contractor replacement	1.53 – 1.72	1.25 – 1.41
Builder (new construction only)	1.29 – 1.57	1.20 – 1.46
Sales Tax (replacements only)	1.00 – 1.10	1.00 – 1.10
Overall markup	2.49 – 3.92	

Average Overall Markups by Product Class

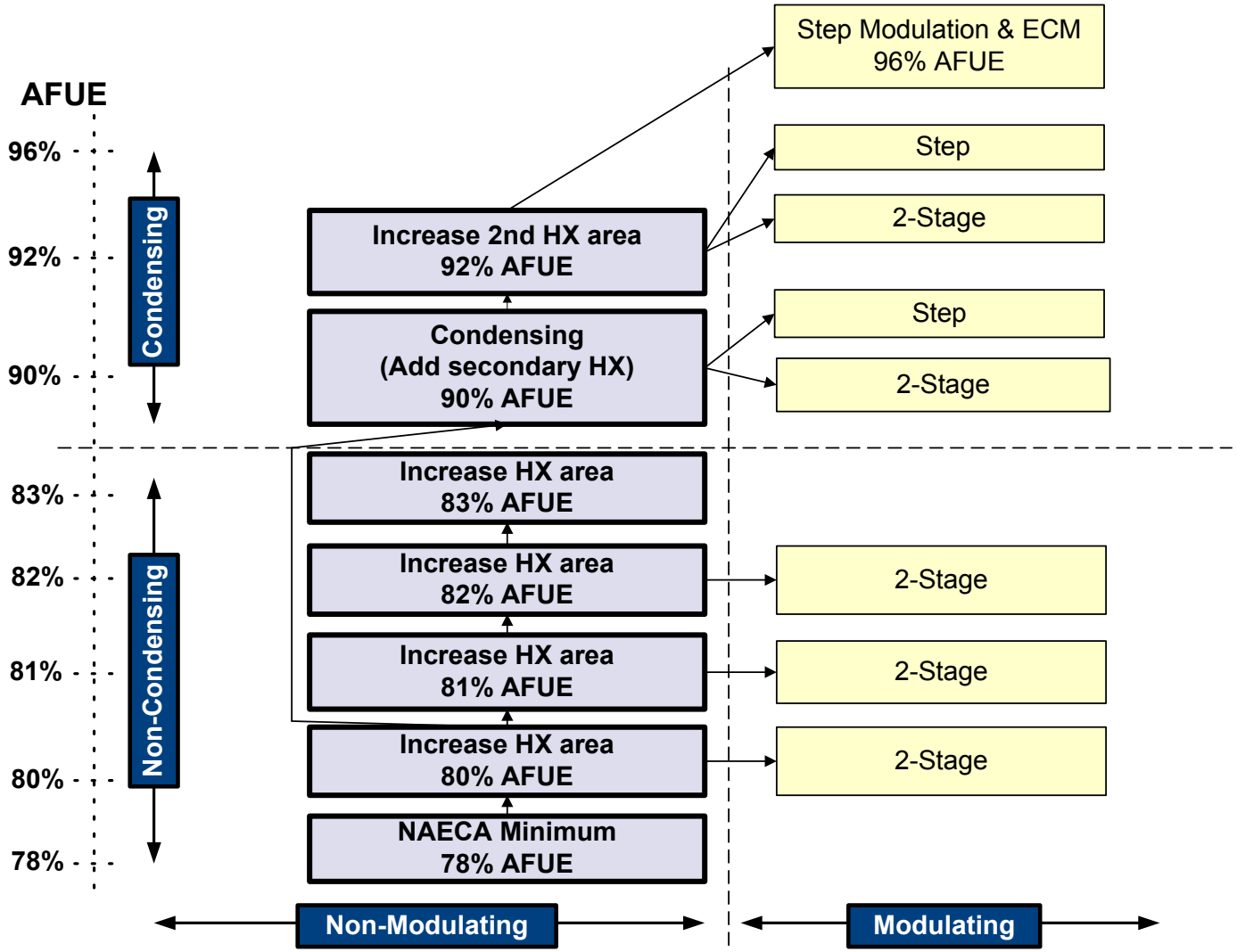
	Baseline	Incremental
Non-weatherized gas furnace	3.1	2.1
Weatherized gas furnace	3.1	2.1
Oil-fired furnace	3.0	2.0
Hot water gas boiler	3.0	2.0
Hot water oil-fired boiler	3.0	2.0
Mobile home gas furnace	2.2	2.2

Selection of Houses

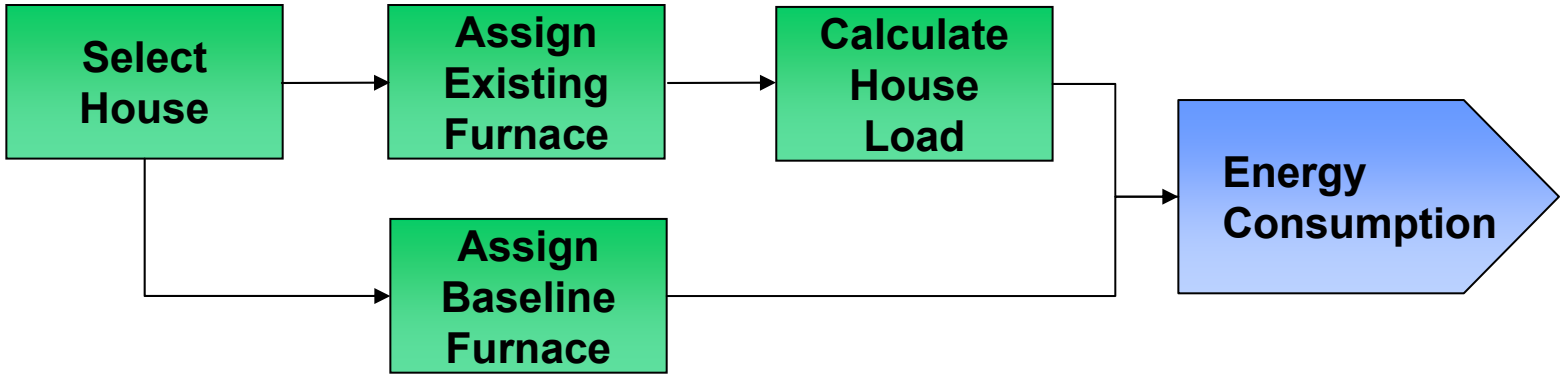
A sample of 1,986 households is extracted from RECS 1997. This sample represents 37.3 million households, both replacement and new construction.



Design Options and Efficiency Levels

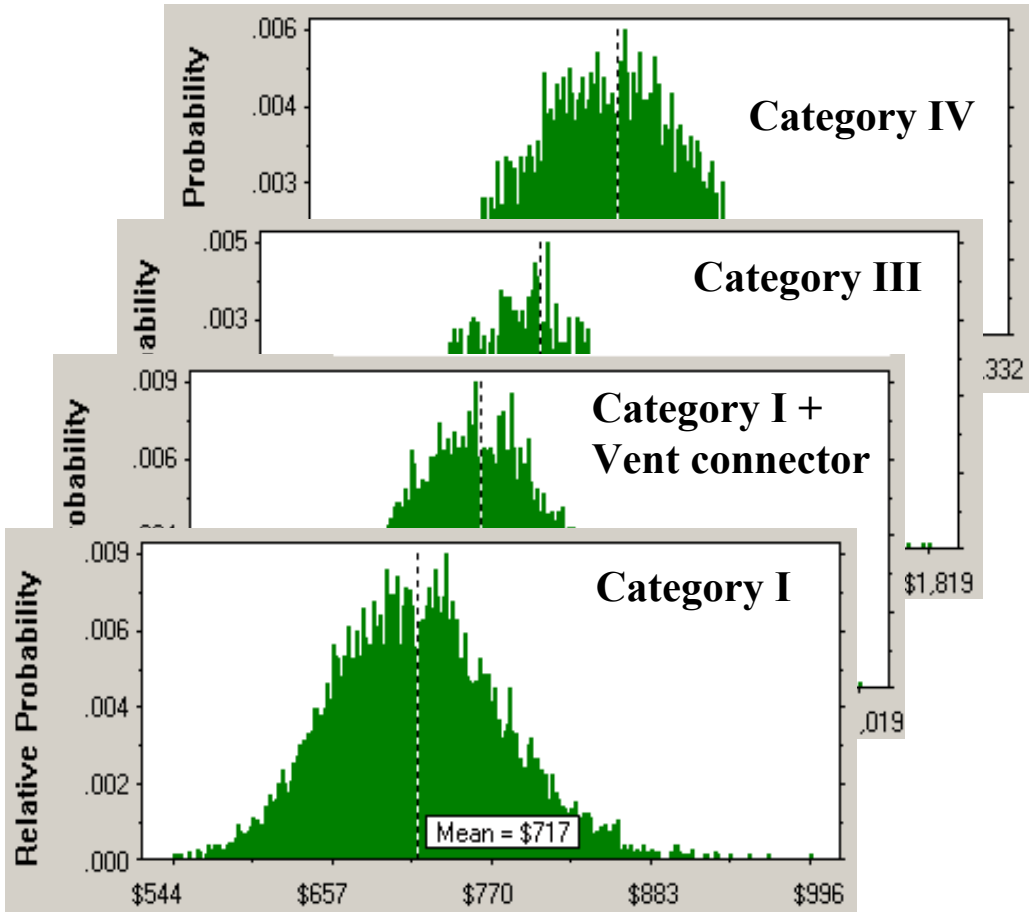


Energy Consumption Calculation



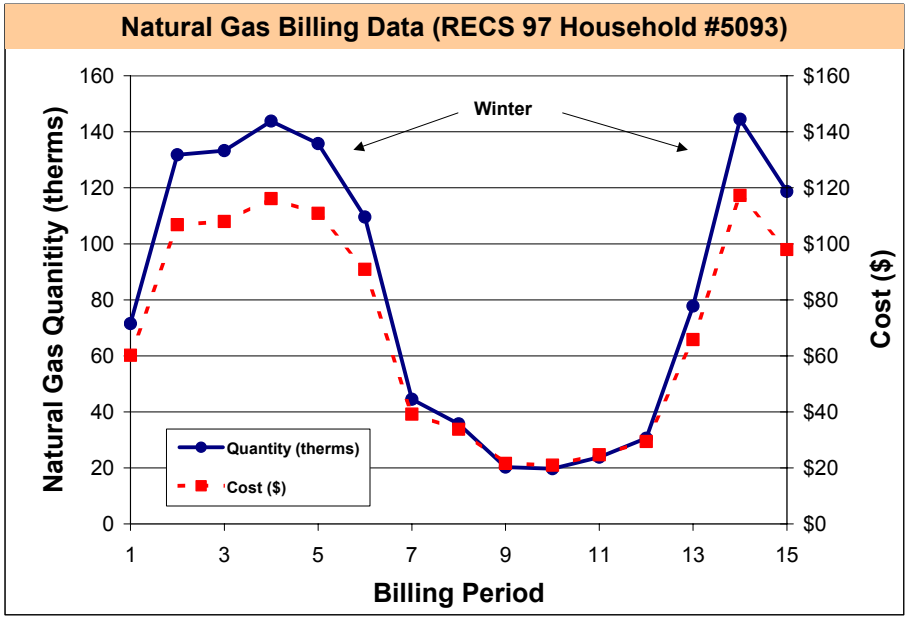
Installation Cost

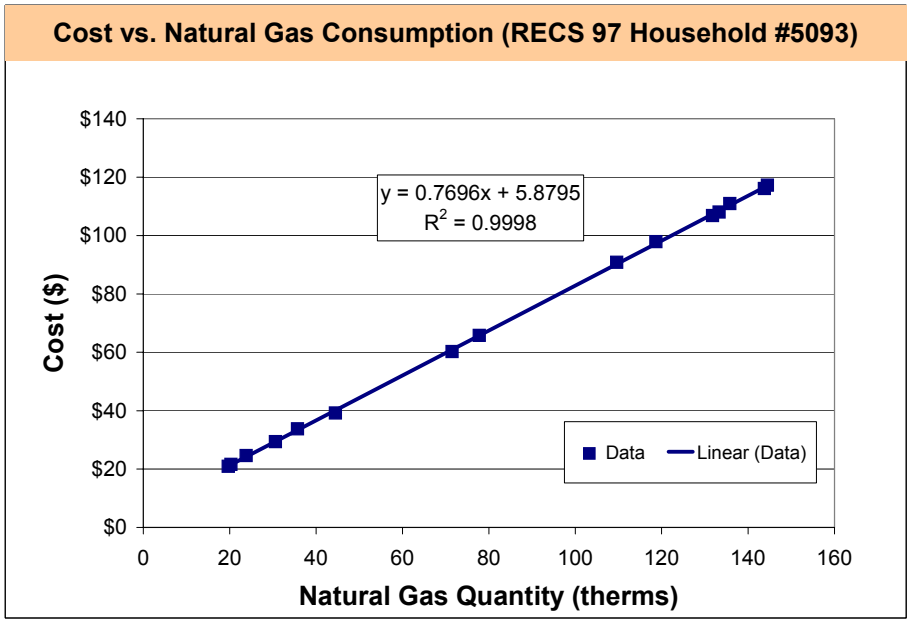
LCC Input Distributions		
Incremental Installation Cost	Mean	Std. Dev.
Category I	$717	$58
Category I + Type B vent connector	$753	$57
Category III	$1,256	$133
Category IV	$974	$91



Marginal Price Derivation

- **Average and marginal energy prices for each house are derived from RECS97 Household billing data.**



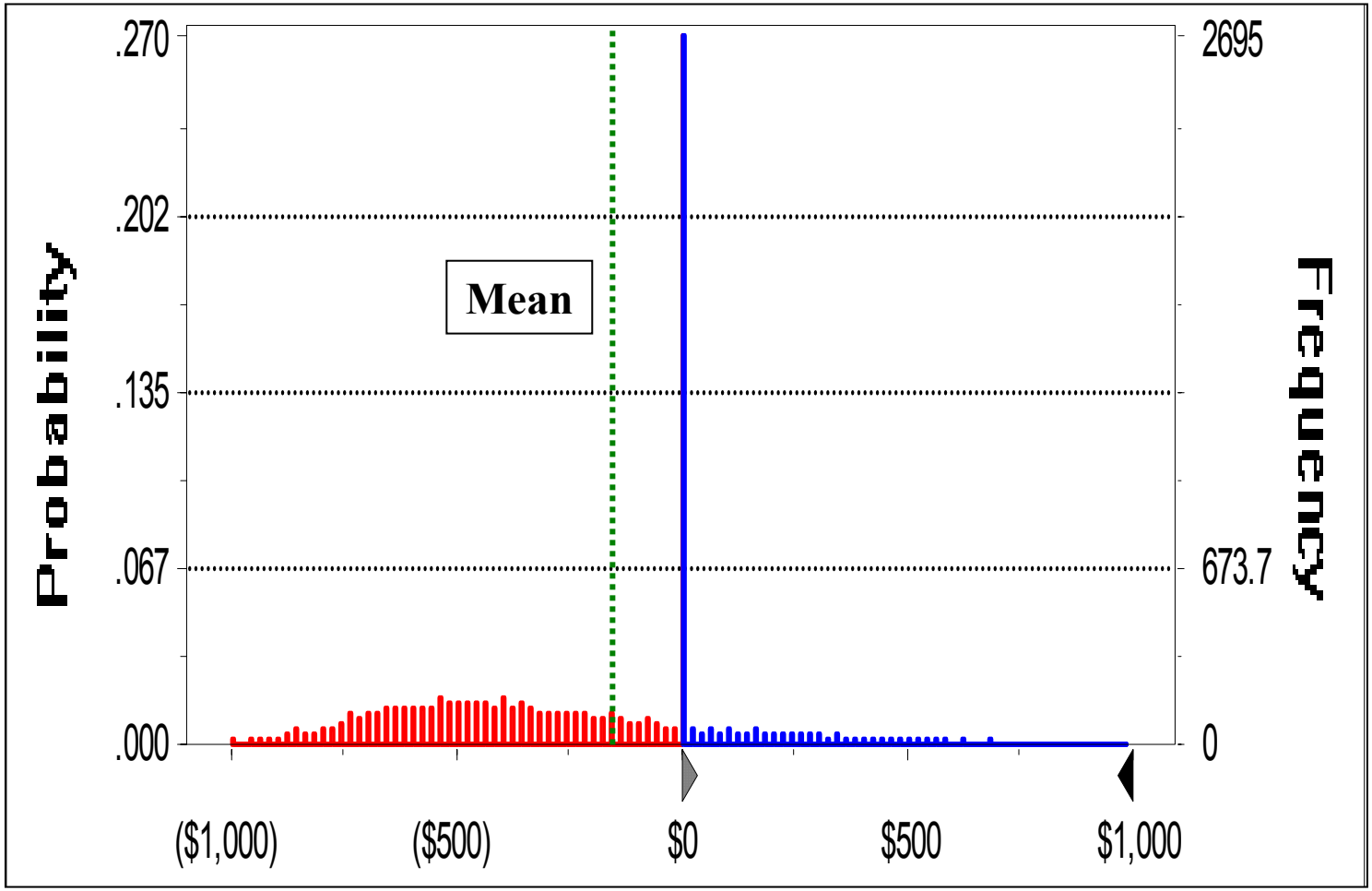


The national average natural gas price is 8.69 $/MMBtu.
The national marginal average natural gas price is 8.40 $/MMBtu.

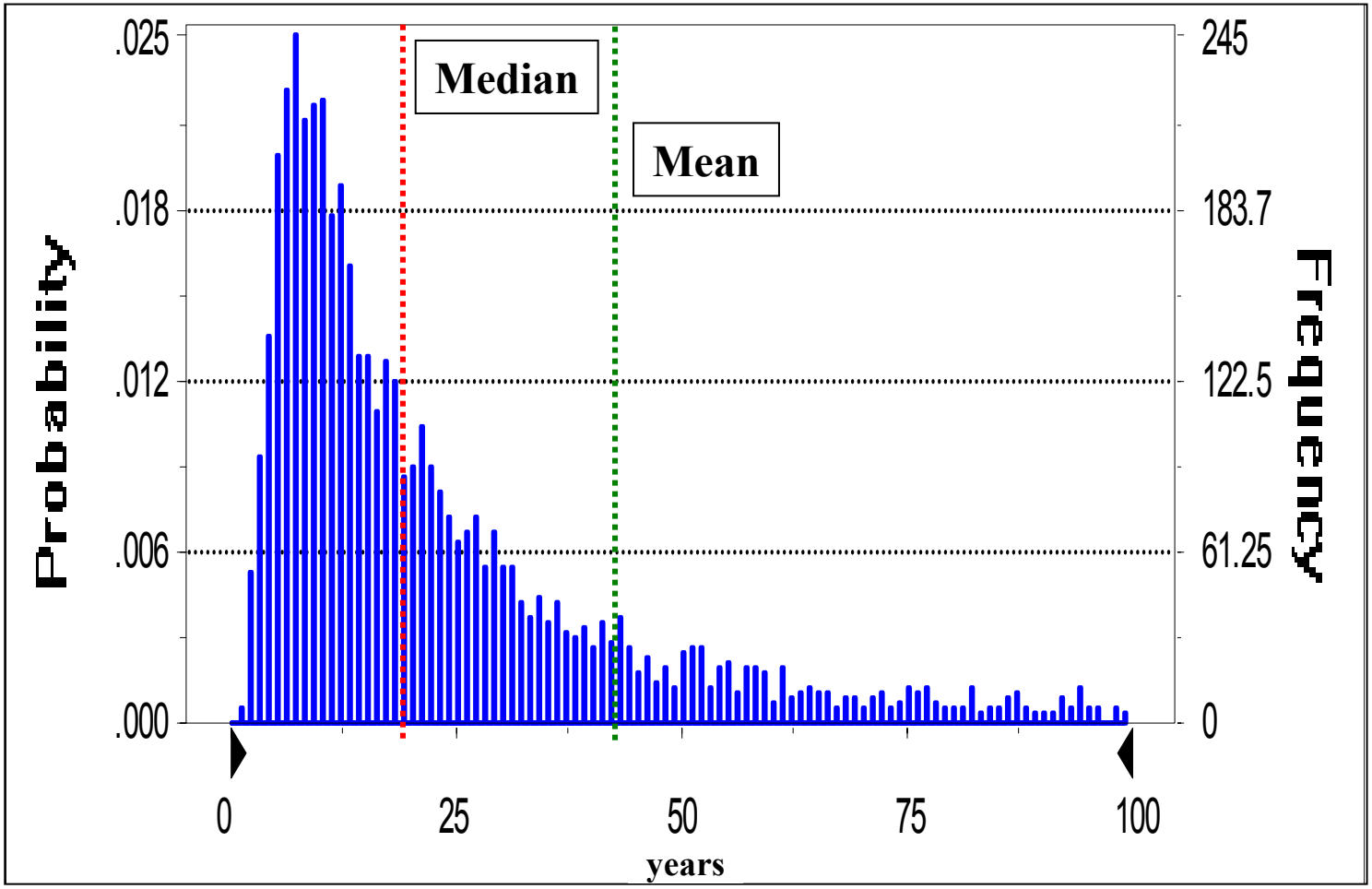
Other Inputs

- **Energy Price Forecasts**
  - Based upon trends from the *2003 Annual Energy Outlook*
- **Discount Rates**
  - Determined by the interest rate for borrowed money
  - Depend on type of debt or equity used to purchase furnace
- **Equipment Lifetime**
  - The equipment lifetime is based upon *Appliance Magazine*
- **Maintenance Costs**
  - Based on GRI—94/0175 report

Example of LCC Results: 90% condensing



Example of Payback Period Results: 90% condensing



Efficiency Distributions of Weatherized Gas Furnaces (ANOPR Issue #3)

For weatherized gas furnaces, estimates of national energy savings depend on the baseline model efficiency level. The Department has limited data on the efficiency distribution of current sales of this product class, and has estimated the baseline model efficiency level using historical data.

The Department invites comments on this issue.

81 percent AFUE Furnaces with and without Two-stage Modulating Controls (ANOPR Issue #4)

There are at least two major manufacturers that market a series of 81 percent AFUE, two-stage modulating furnace models and specify, for these furnaces, Category I vent systems. Therefore DOE analyzed 81 percent AFUE, two-stage modulating furnaces with Category I vent systems.

Also in the case of single-stage and two-stage furnaces at the same AFUE rating, the analysis points to a difference in the energy use between the designs.

The Department invites comments on this issue.

Other Issues

The Department seeks comments and recommendations from stakeholders on any other aspects related to the Life-Cycle Cost Analysis.

Energy Conservation Standards for Residential Furnaces and Boilers

ANOPR Public Meeting

National Impact Analysis

Building Technologies Program
Office of Energy Efficiency and Renewable Energy
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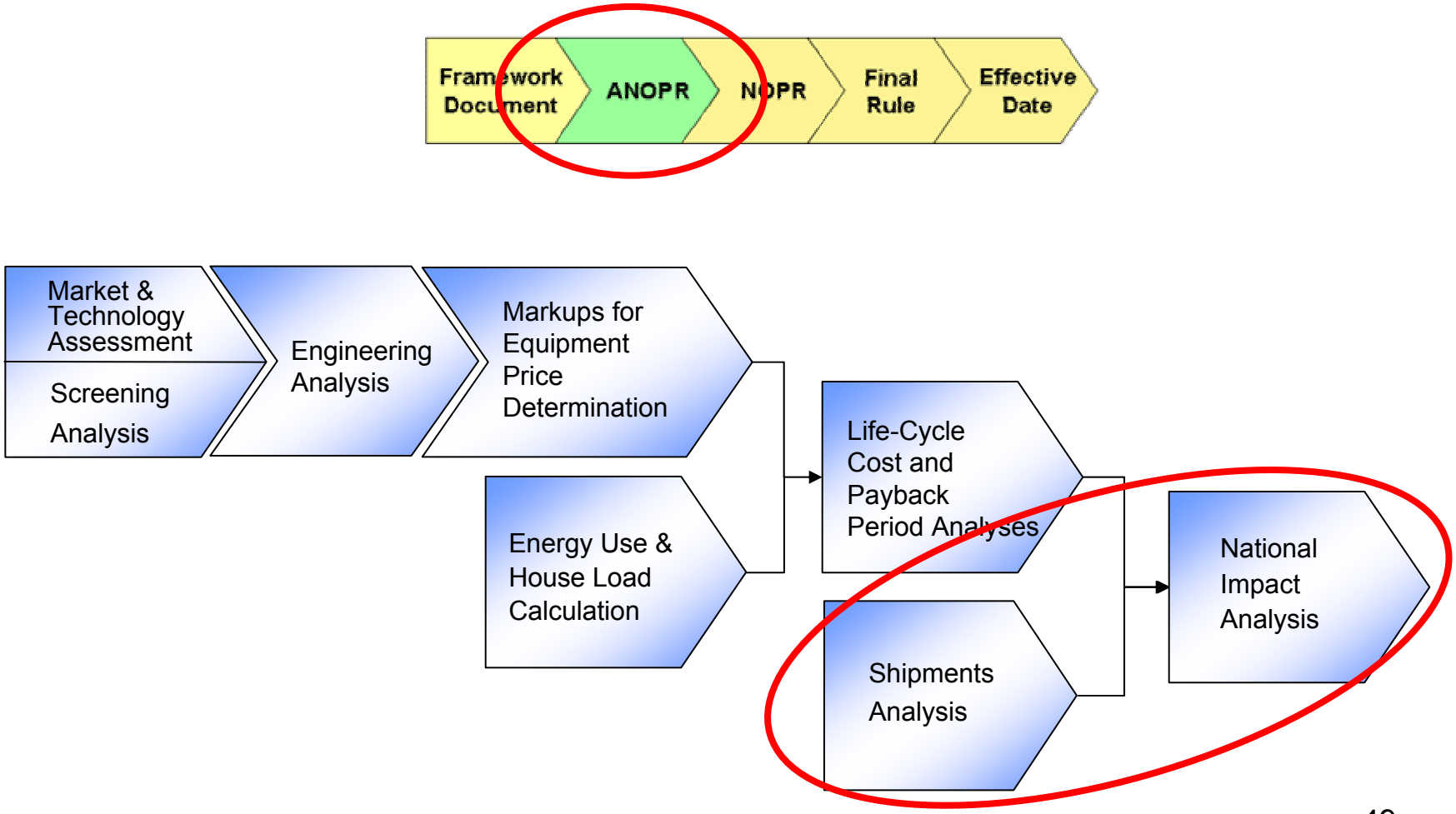
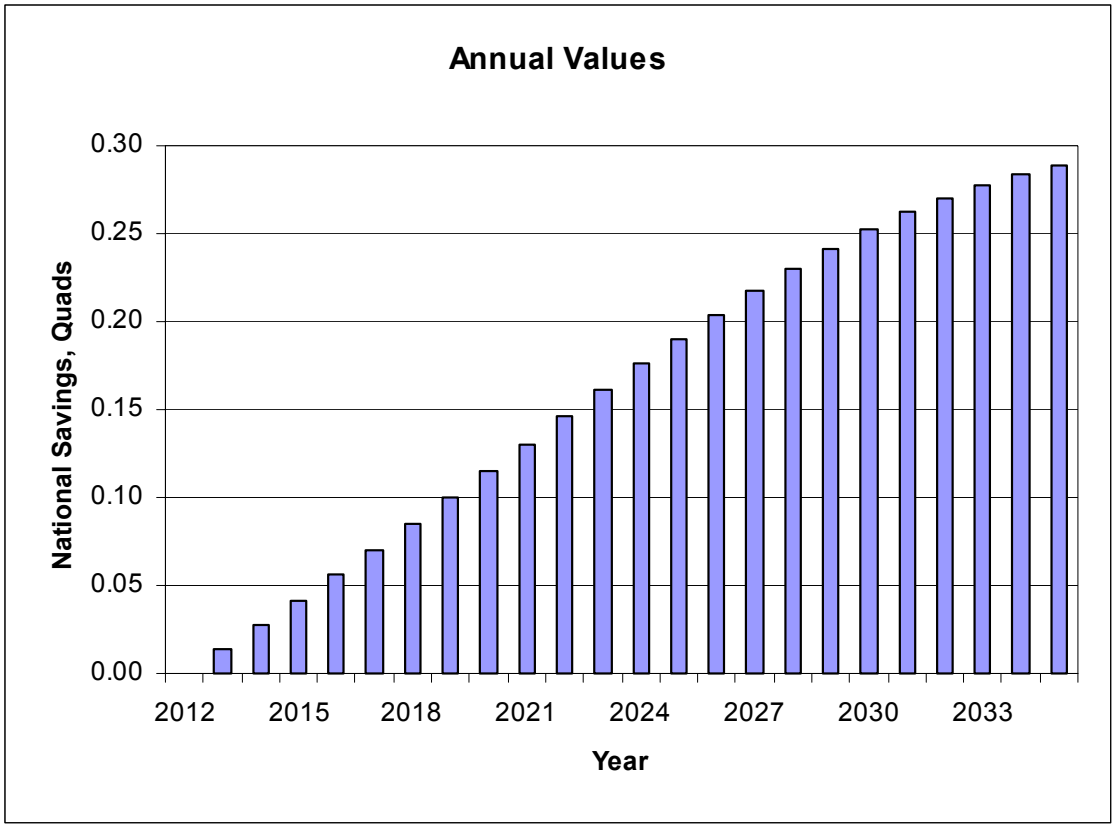
ANOPR Analyses Flow Diagram



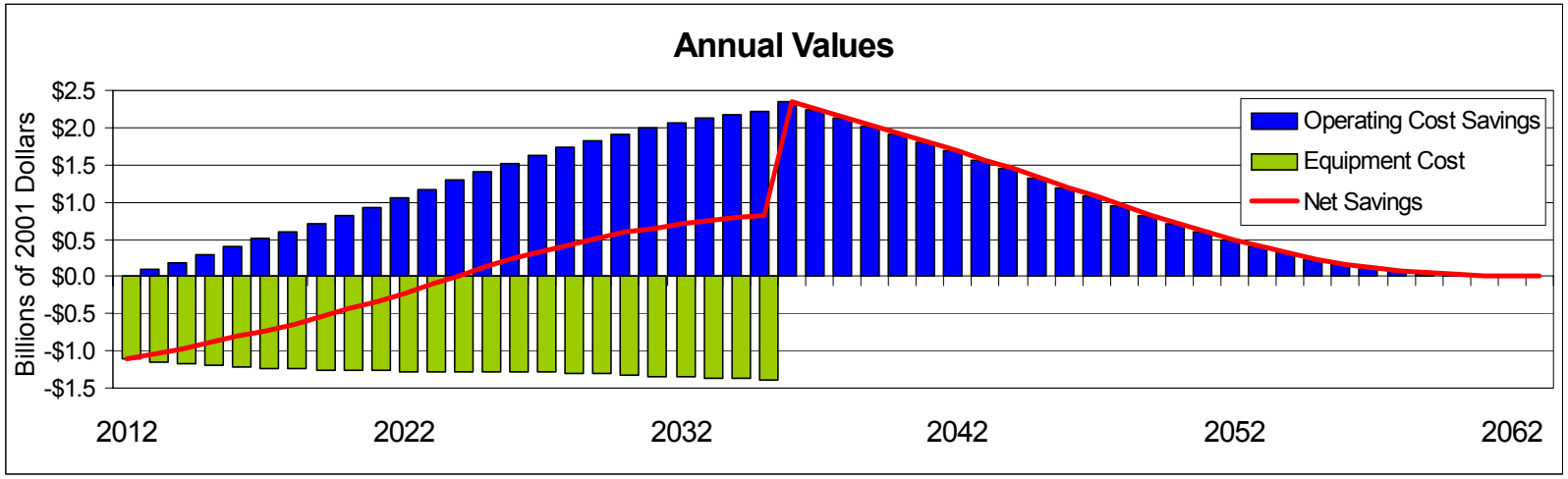
Purpose

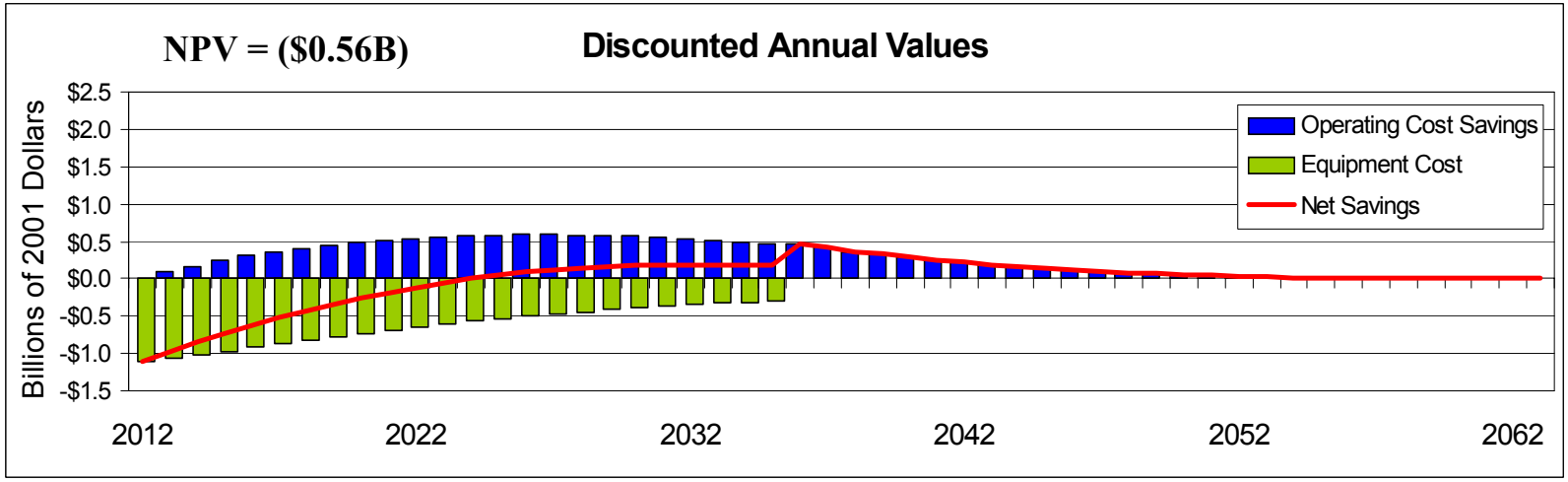
- **National Impact Analysis**
  - To estimate the National Energy Savings (NES) from higher efficiency standards levels.
  - To estimate the national economic impact on the nation (the Net Present Value (NPV)) from higher efficiency standards levels.
- **Shipments Analysis**
  - To estimate furnace and boiler shipments over time.

Example of National Energy Savings Results:
90% AFUE design option for Non-Weatherized Gas Furnaces

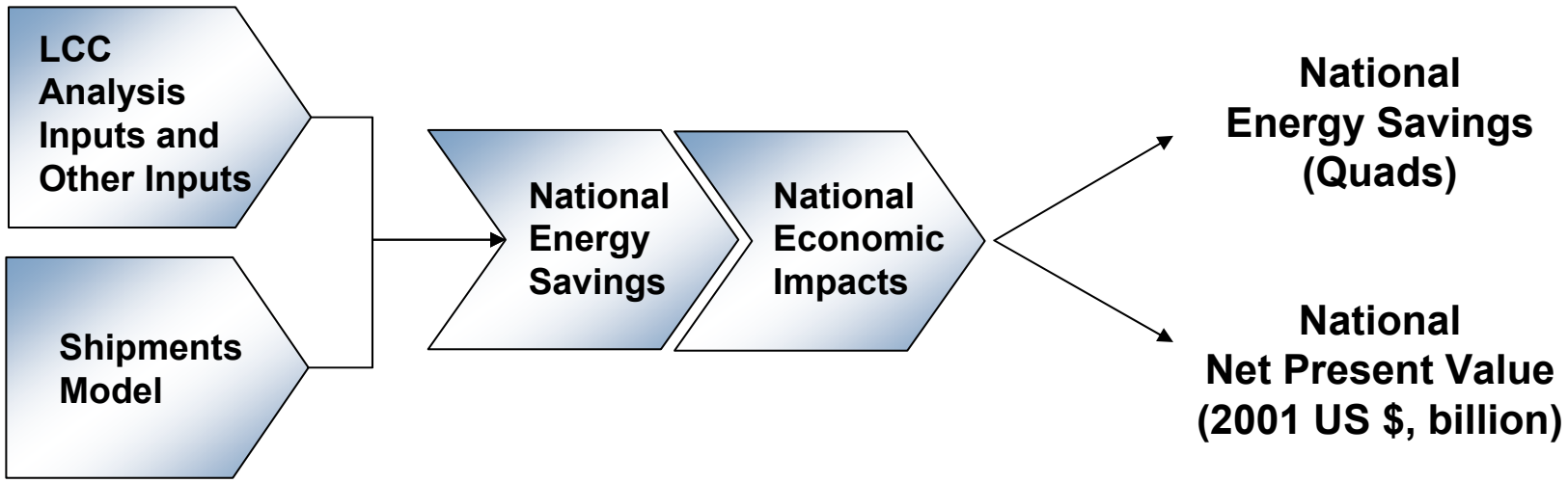


Example of Net Present Value Results:
90% AFUE design option for Non-Weatherized Gas Furnaces





Process Flowchart



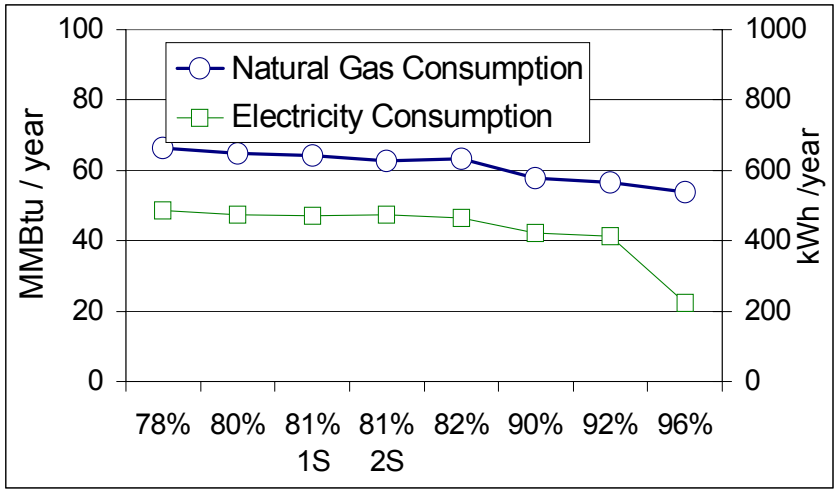
Inputs

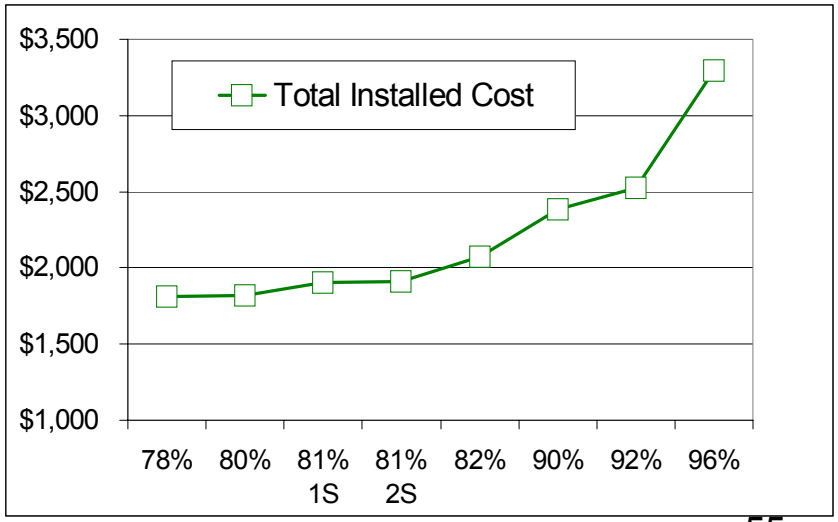
- **Total Installed Cost**
  - Average per unit values as a function of efficiency level taken from LCC analysis
  - Weighted average calculated according to efficiency market share
- **Annual Energy Use**
  - Weighted average per unit values as a function of efficiency level taken from LCC analysis
  - Weighted average calculated according to efficiency market share
- **Efficiency Trends**
  - Developed for the base case (without standards) and each standards case
  - Future trends based upon on historical condensing furnace market share (source GAMA)
- **Energy Prices**
  - Weighted-average marginal prices taken from LCC analysis
  - Future marginal prices are adjusted according to trend forecasted by the *2003 Annual Energy Outlook*
- **Energy Site-to-Source Conversion Factors**
  - Conversion factors forecasted by *2003 Annual Energy Outlook*
  - Factors vary annually and account for generation, distribution, and transmission losses
- **Discount Rate**
  - 7 percent and 3 percent real from OMB's *Guidelines to Standardize Measures of Costs and Benefits and the Format of Accounting Statements*
- **Present Year**
  - Future expenses are discounted to the year 2001

Input Examples to the National Impact Analysis:

Annual Energy Use and Per Unit Total Installed Costs for Non-Weatherized Gas Furnaces

Design Option		Unit Energy Consumption		Total Installed Cost
		Annual Gas Use	Winter Electricity Use	
		MMBtu	*kWh*	*$*
0	78% AFUE	66.5	487.3	1813
1	80% AFUE	64.9	475.5	1821
2	81% AFUE Single Stage	64.1	469.8	1902
3	81% AFUE Two Stage	62.8	473.2	1911
4	82% AFUE	63.3	464.2	2070
5	90% AFUE	57.9	421.0	2385
6	92% AFUE	56.6	412.0	2528
7	96% AFUE	54.0	224.7	3296





Shipments Model

Component	Definition	Assumptions
Replacement in Kind	Replace with same equipment type and same fuel	**Equipment Lifetime Distribution -** same as in LCC analysis **Replacements** – Based on historical shipments
Conversions	Replace with equipment utilizing a different fuel	**Conversion Rate -** Constant fraction of retirements based on recent trends[1] **Fuel Type –** From Oil or Electric to Gas **Equipment Type –** No switching
New Housing Installations	Install heating systems into new construction	**Housing Starts** – EIA AEO forecast[2] **Market Shares** –Depend on energy and equipment prices

[1] Source: AGA House heating Survey 1985-1995
[2] Source: Annual Energy Outlook (AEO) 2003

Market Share Model (New Housing)

- **The market share model assesses the potential for fuel and equipment shifting.**
  - Largest potential for fuel switching occurs between gas furnaces and heat pumps
  - Assumed market shares of oil equipment and boilers remain constant
  - Future market shares depend on fuel prices and equipment price elasticities

Fuel and Equipment Price Elasticity

	Other Than Mobile Homes		Mobile Homes
	South	Rest of US	
Fuel Price Elasticity	-0.83	-0.38	-0.95
Equipment Price Elasticity	-0.37	-0.02	-0.53

Issues

The Department seeks comments and recommendations from stakeholders on any aspects related to the National Impact Analysis.

Other ANOPR Issues

The Department seeks comments and recommendations from stakeholders on any other aspects related to any of the ANOPR Analyses.

Energy Conservation Standards for Residential Furnaces and Boilers

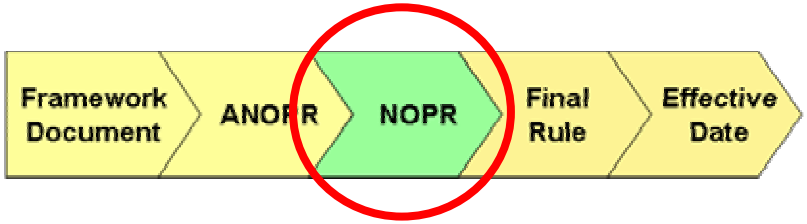
ANOPR Public Meeting

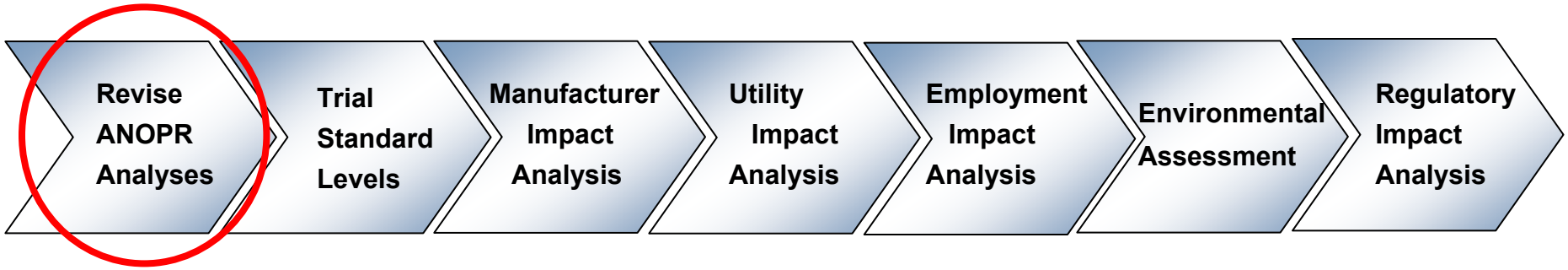
NOPR Analyses and Next Steps

Building Technologies Program
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

September 29, 2004

NOPR Analyses Flow Diagram

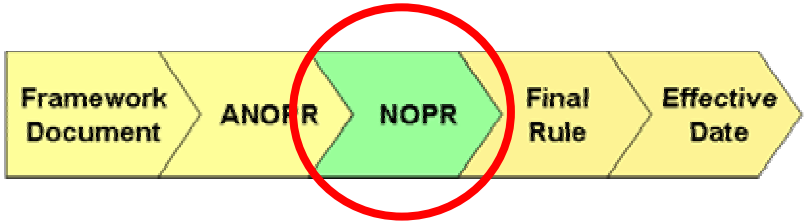


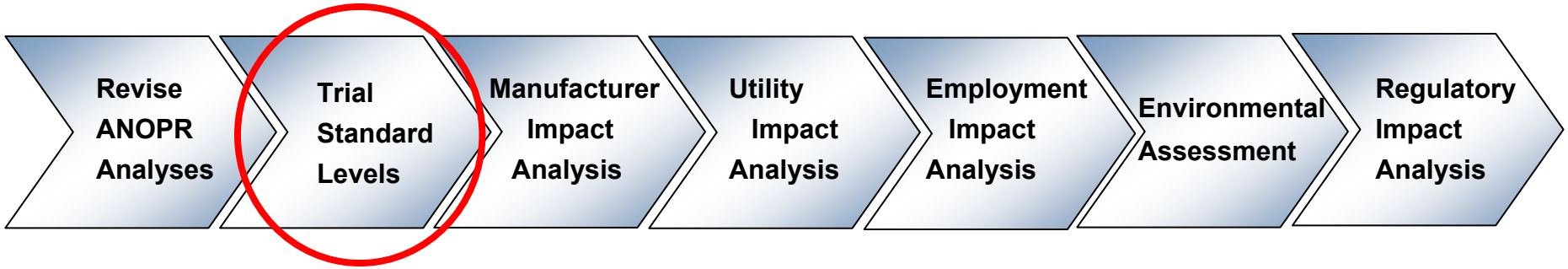


Revise ANOPR Analyses

ANOPR Analysis	Action
Engineering Analysis	• Consider ANOPR comments • Revise using latest data
Life-Cycle Cost and Payback Period Analyses	• Consider ANOPR comments • Revise using latest data • Conduct LCC Sub-Group Analysis
National Impacts Analysis	• Consider ANOPR comments • Revise using latest data

NOPR Analyses Flow Diagram





Selection of Trial Standard Levels

- **Purpose**
  - To develop a list of standard levels from which impacts are weighed and a proposed standard level is selected
    - Each trial standard level consists of a set of potential minimum efficiency levels covering all product classes, and may vary between product classes
    - NOPR analyses assess impacts for trial standard levels (not individual product classes)
- **Method**
  - Trial standard levels are assembled from the product classes identified in the ANOPR
    - Candidate standard levels cover a range of efficiencies including:
      - Most energy efficient level (max tech)
      - Efficiency level with the lowest life-cycle cost
      - Efficiency level with a payback period of three years or less
      - Efficiency levels with noteworthy technologies
      - Efficiency levels that fill in large gaps between candidate standard levels
    - Each trial standard level consists of the candidate standard level from each product class that meets one of the above criteria

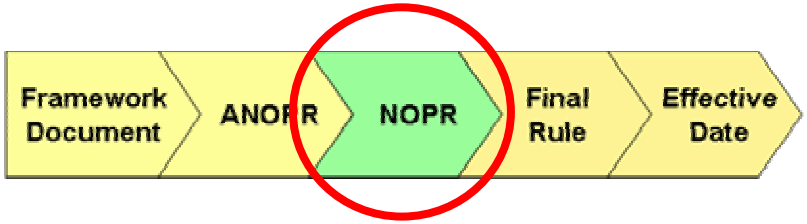
Trial Standard Level Criteria

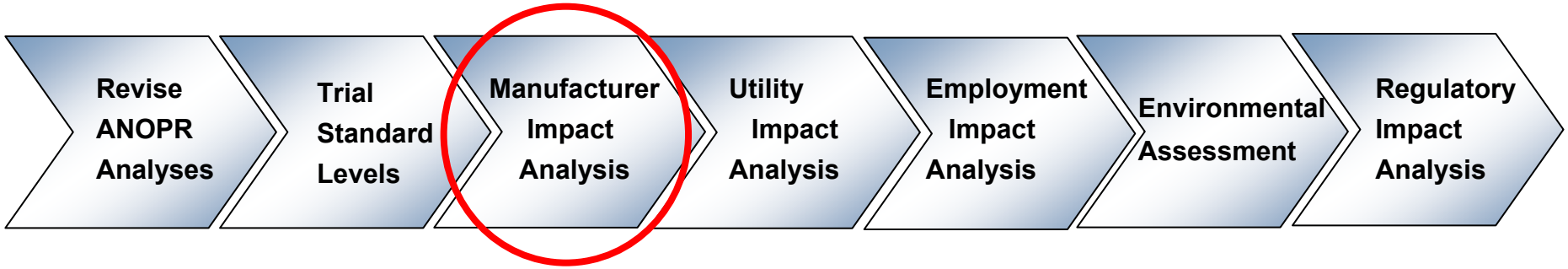
A critical part of the NOPR analysis on which the Department is seeking early guidance and input.

- **Trial standard levels are created from combinations of candidate standard levels at a product class level.**
- **Based around a consistent theme, such as lowest life-cycle cost or payback in 3-years or less.**

The Department seeks comments on the criteria for selecting Trial Standard Levels.

NOPR Analyses Flow Diagram



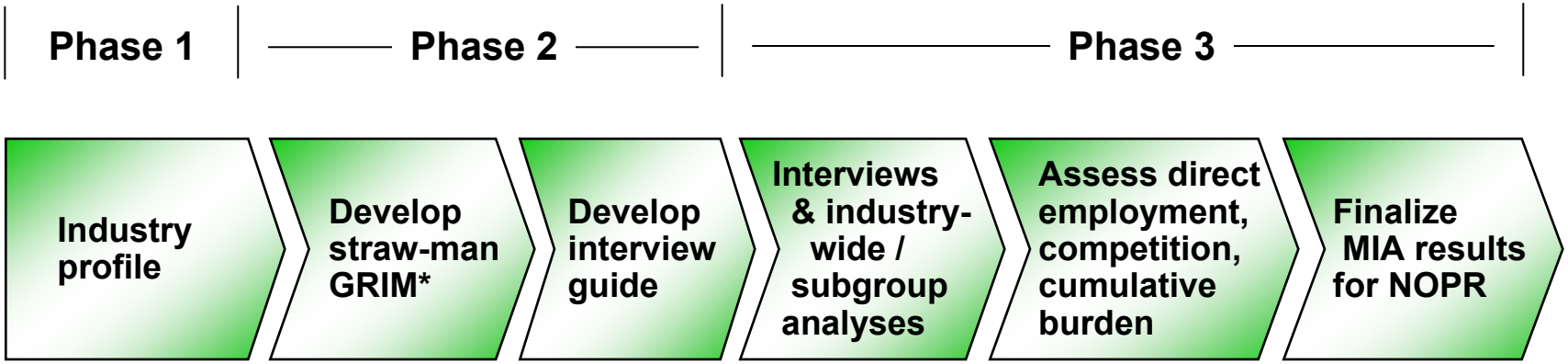


Manufacturer Impact Analysis

- **Purpose**
  - To assess the impacts of standards on furnace and boiler manufacturers
  - To identify and estimate impacts on manufacturer sub-groups that may be more severely impacted than the industry as a whole
  - To examine the impact of cumulative regulatory burdens on the industry
- **Method**
  - Analyze industry cash flow and net present value through use of the Government Regulatory Impact Model (GRIM)
  - Interview manufacturers to refine inputs to the GRIM, develop sub-group analyses, and address qualitative issues
- **Output**
  - Industry Net Present Value impacts
  - Sub-group Net Present Value impacts
  - Other impacts

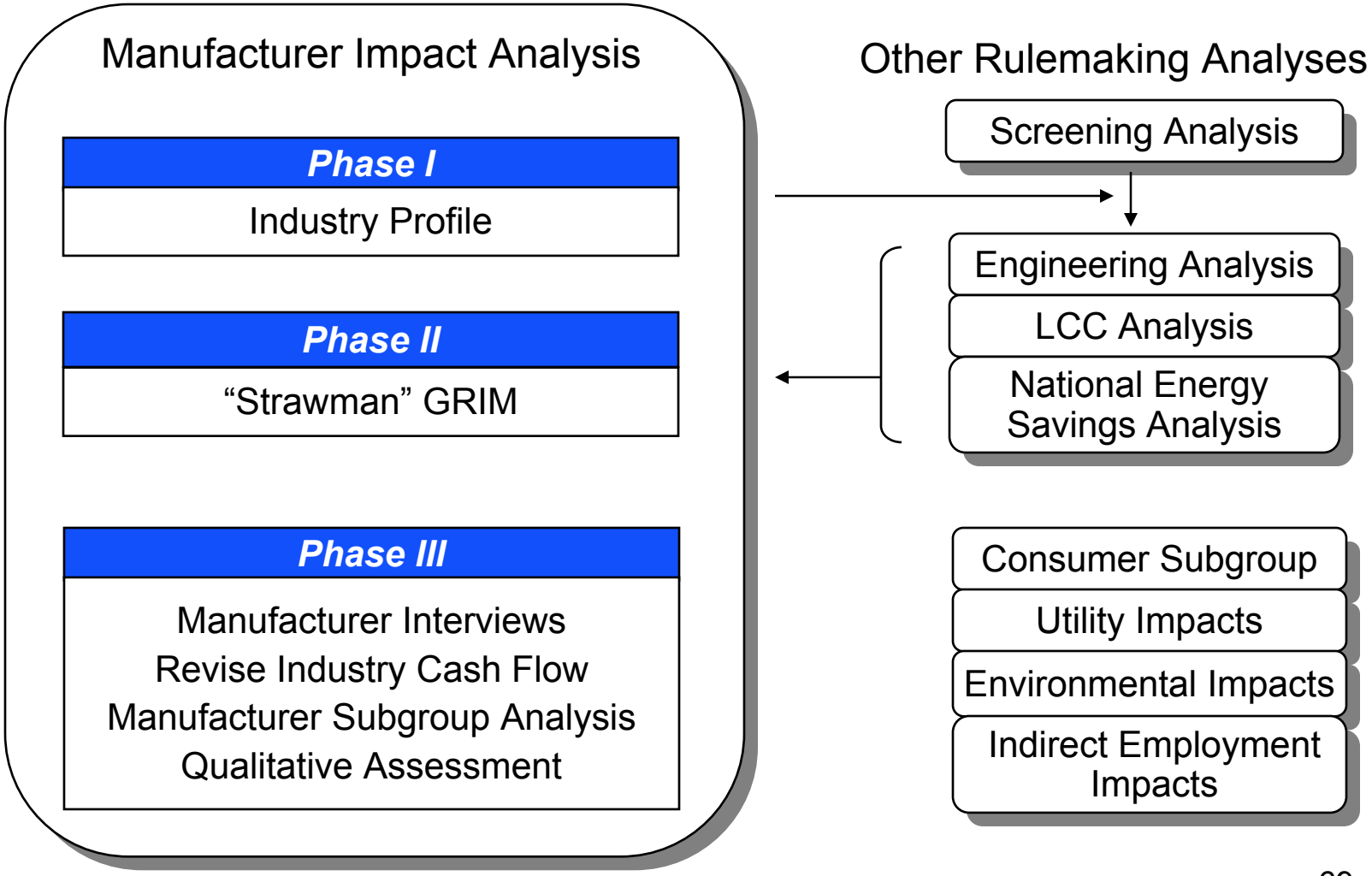
Manufacturer Impact Analysis Process

- The MIA consists of three phases



** Government Regulatory Impact Model (GRIM)*

The MIA is both concurrent and coordinated with activities throughout the rulemaking process.

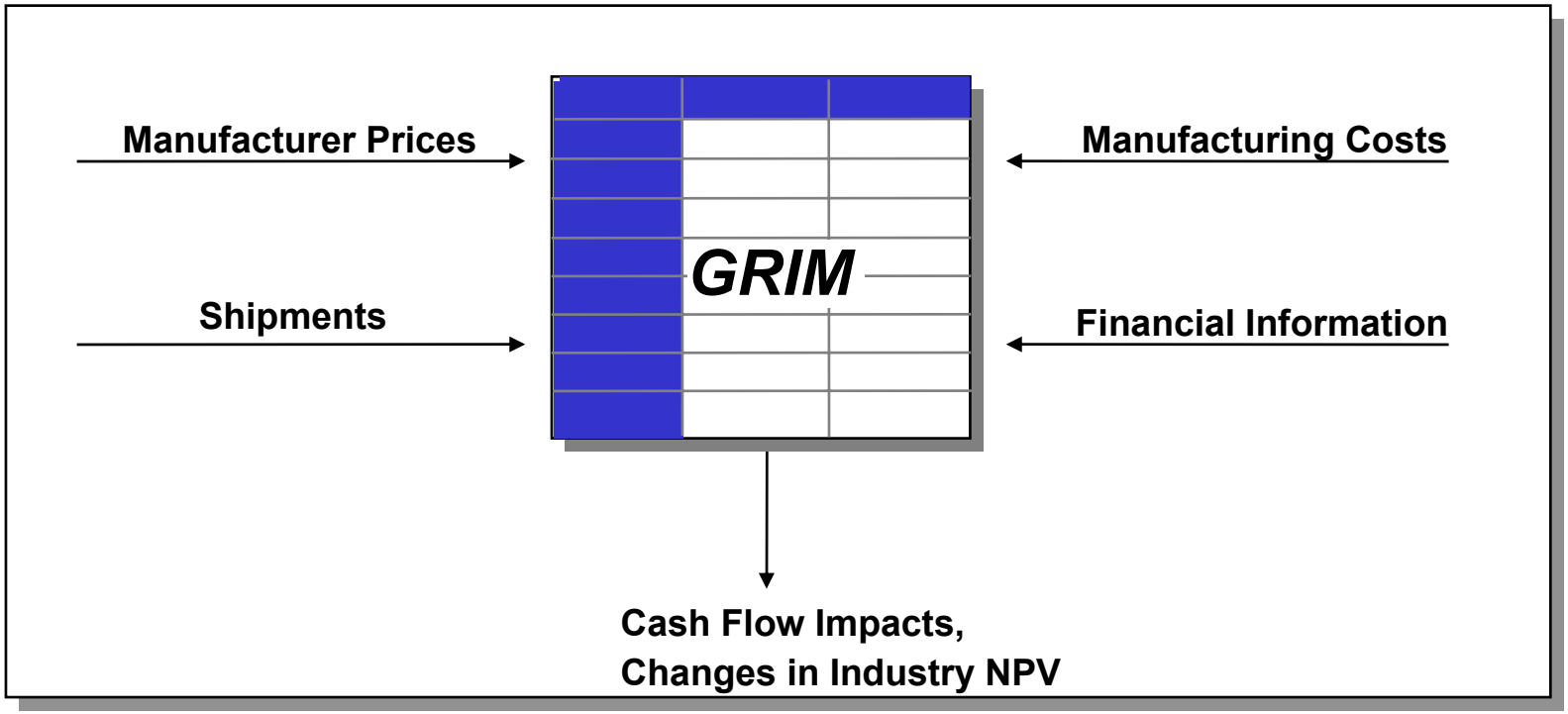


Phase I: Industry Profile

- **Collect financial and market information**
  - Industry reports
  - Company annual reports and websites
  - Trade journals
  - U.S. Census Bureau
  - SEC 10-K form filings
  - ANOPR information: manufacturer production costs, markups and manufacturer selling prices, shipments

Phase II: Develop Straw-man GRIM

- The Government Regulatory Impact Model (GRIM) is an industry cash flow analysis to estimate the change in industry value due to the introduction of new efficiency standards.



Phase II: Develop Interview Guide

- **A critical aspect of the MIA involves interviews with manufacturers. An interview guide is sent to manufacturers in preparation for Phase III.**
- **Interview topics will include . . .**
  - Engineering analysis
  - Shipments model
  - Cost structure and financial parameters
  - Conversion costs (capital expenditures, tooling, R&D, testing)
  - Impact of other regulations / cumulative burden
  - Direct employment impacts
  - Import / Export issues
  - Consolidation / competitive impacts
  - Replacement parts or refurbishments
  - Impact of the standard's effective date
  - Other topics important to manufacturers

Phase III: Manufacturer Interviews

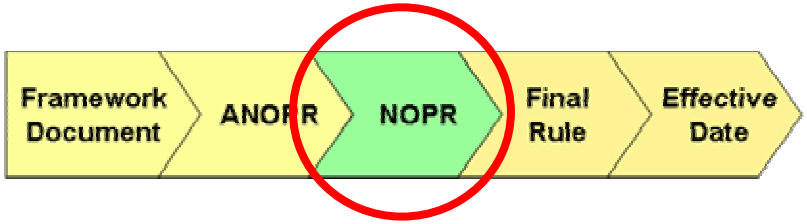
- Expected timeframe
- Time and personnel commitment for manufacturers (industry-wide GRIM, GRIM assumptions, subgroup analysis discussion)
- Confidentiality agreements

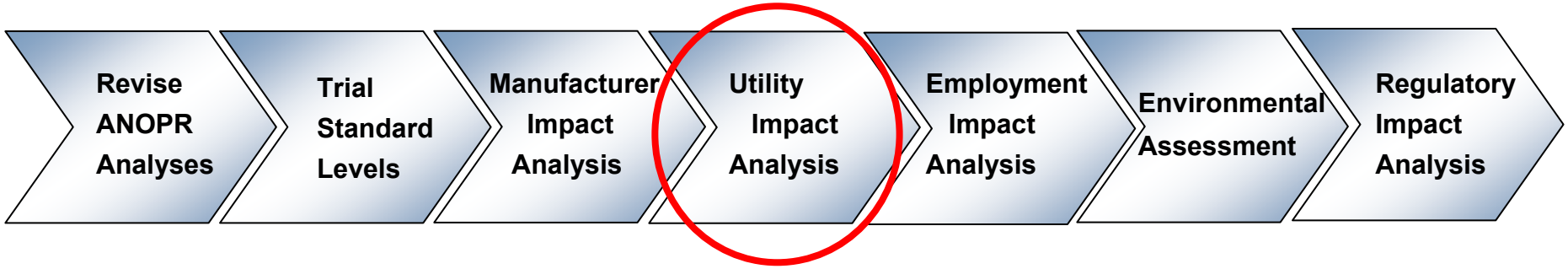
Phase III: Manufacturer Subgroup Analysis

- **The subgroup analysis is a more focused version of the industry-wide analysis.**
  - Work with subgroup representatives to tailor a GRIM incorporating unique financial characteristics
  - Consider and focus on issues of importance to the subgroup, including employment, capacity utilization and cumulative burden
  - Review draft findings with subgroup members during development

The Department invites comment and discussion on manufacturer subgroups to be analyzed.

NOPR Analyses Flow Diagram

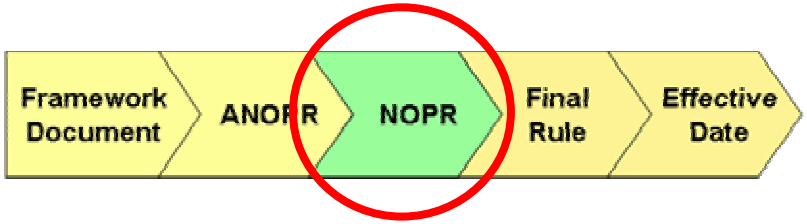


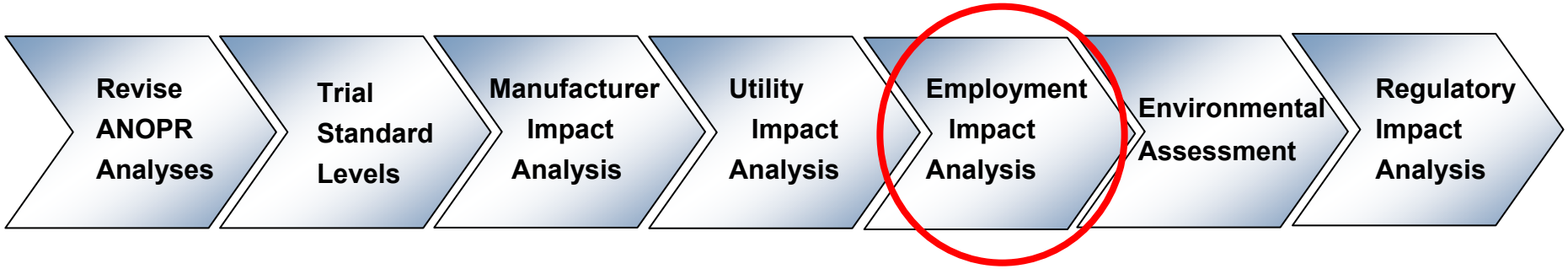


Utility Impact Analysis

- **Purpose**
  - To investigate the effects on gas and electric utilities from reduced energy sale and electricity peak load demand due to potential standards
- **Method**
  - Uses national energy savings results
  - Uses the Energy Information Administration's National Energy Modeling System (NEMS) tailored for DOE's Building Technologies Program (NEMS-BT)
- **Output**
  - Change in gas and electricity sales and price by region
  - Change in the mix of electricity generation
  - Change in new capacity construction

NOPR Analyses Flow Diagram

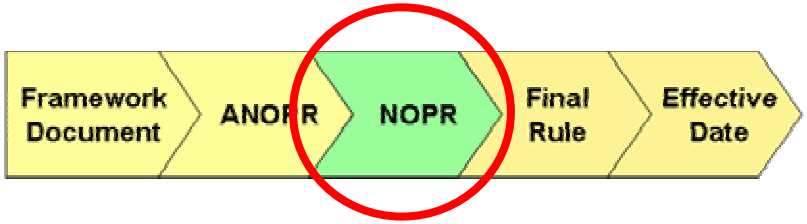


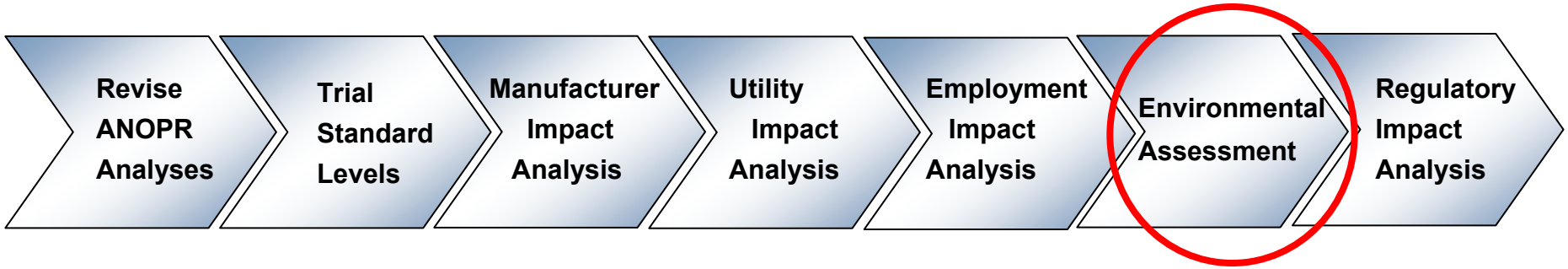


Employment Impact Analysis

- **Purpose**
  - To report net jobs created or eliminated nationally as a consequence of new energy efficiency standards
- **Method**
  - Uses the IMBUILD tool, a buildings-sector version of the IMPLAN national input-output model
  - Changes in equipment and energy expenditures taken from the National Energy Savings Analysis
  - Direct employment impacts taken from the Manufacturer Impact Analysis
- **Output**
  - Change in employment by sector as a consequence of new standards

NOPR Analyses Flow Diagram

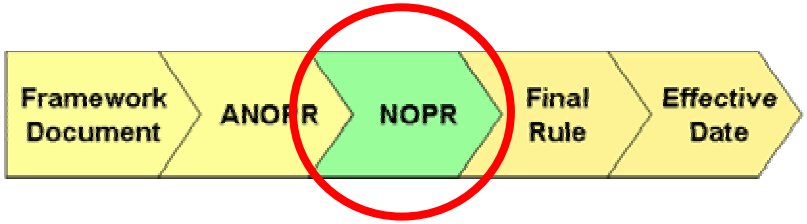


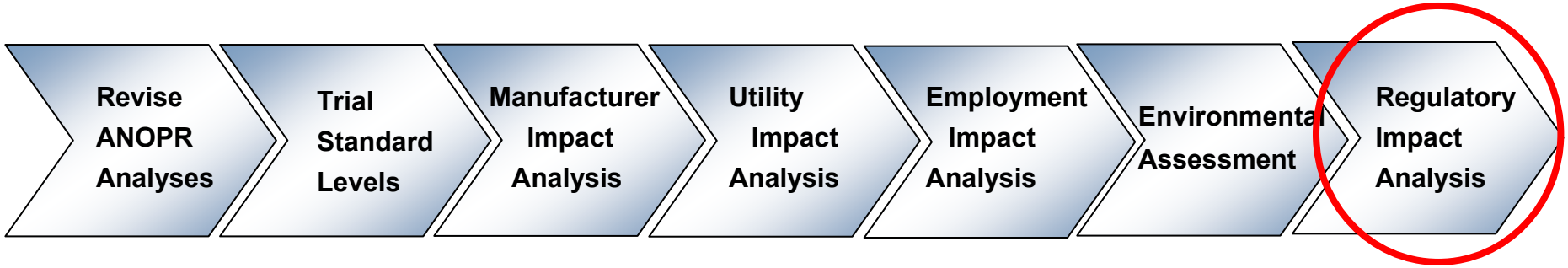


Environmental Assessment

- **Purpose**
  - To report environmental impacts as a consequence of new energy efficiency standards, including changes in air pollutants at both the site and the power plant
- **Method**
  - Energy savings results taken from the National Energy Savings Analysis
  - Energy Information Administration's National Energy Modeling System (NEMS) provides power-plant emissions
  - Other sources provide information about on-site emissions
- **Output**
  - Estimate of national emission reductions of SO_x, NO_x, and CO_2

NOPR Analyses Flow Diagram





Regulatory Impact Analysis

- **Purpose**
  - To investigate the national impacts due to non-regulatory alternatives compared with mandatory energy efficiency standards
  - The non-regulatory alternatives that may be considered:
    - No new regulatory action; early replacement; prescriptive standards; customer tax credits; manufacturer tax credits; customer rebates; voluntary efficiency targets; bulk government procurement
- **Method**
  - NES spreadsheet model modified to consider scenarios. Changes may include: energy prices and escalation factors; implicit market discount rates; customer purchase price, operating cost, and income elasticities; and equipment stock data
- **Output**
  - National Energy Savings and Net Present Value of the non-regulatory alternatives
  - Impact of non-regulatory alternatives on purchase price and use of energy-efficient equipment

The Energy Policy and Conservation Act (EPCA) directs DOE to consider seven factors when setting energy conservation standards

Factor	Analysis
1. Economic impact on consumers and manufacturers	Life-cycle cost analysis Manufacturer impact analysis
2. Lifetime operating cost savings	Life-cycle cost analysis
3. Total projected energy savings	National impact analysis
4. Impact on utility or performance	Screening analysis Engineering 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

How to Submit Comments…

- Public Meeting – all oral comments will be captured in the transcript and become part of the public record.

- Written comments – ANOPR comment period open until November 10, 2004. Reference docket #: EE–RM/STD–01–350 and/or RIN #: 1904–AA78.

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Building Technologies Program, Mail stop EE–2J
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Docket number EE–RM/STD–01–350 and/or RIN number 1904–AA78
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