Energy Conservation Program for Appliance Standards:

SNOPR Public Meeting for Microwave Ovens

March 14, 2012

Wes Anderson

Department of Energy
Energy Efficiency & Renewable Energy

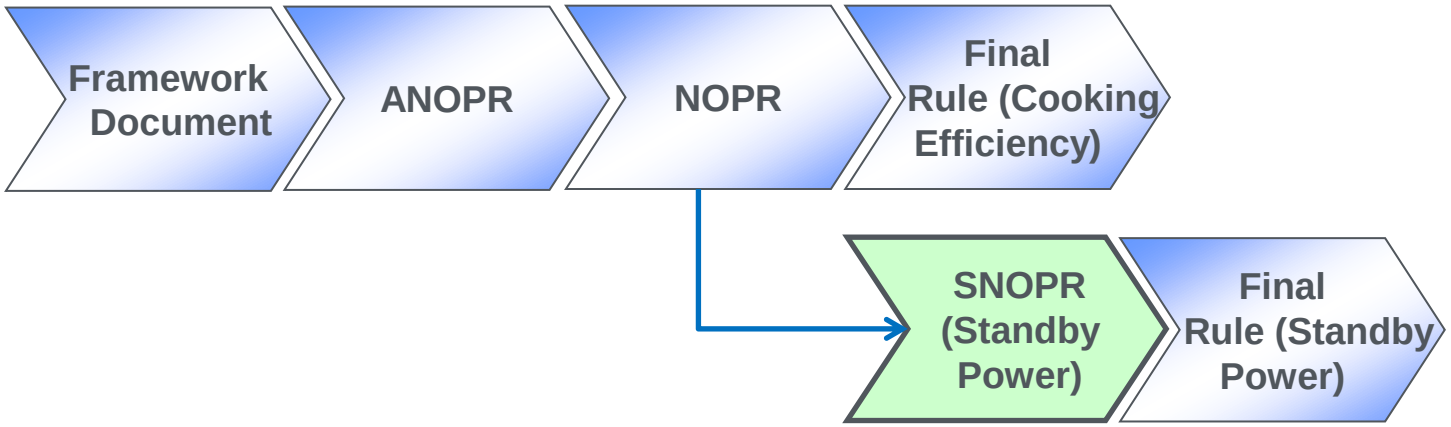
Purpose of the Public Meeting

- To present revised methodologies based on stakeholder feedback, and characterize results for analyses
- To discuss specific issues related to each analysis
- To seek input from attendees on methodologies, assumptions and data sources
- To describe remaining steps before issuance of Final Rule

Issues for Comment

DOE welcomes comments, data, and information concerning its analysis on microwave ovens. Throughout this presentation, issues that correspond to issues raised in DOE's published material from this analysis are raised for discussion in boxes like this one. Nonetheless, comments are welcome on any part of DOE's analysis.

Steps in the Microwave Oven Energy Conservation Standards Rulemaking



- Framework Document made available by DOE on March 15, 2006. (71 FR 15059)
- ANOPR issued by DOE on November 15, 2007 (72 FR 64432) (ANOPR Public Meeting on December 13, 2007)
- NOPR issued by DOE on October 17, 2008 (73 FR 62034) (NOPR Public Meeting on November 13, 2008). Comments from stakeholders led DOE to continue rulemaking for microwave oven standby power.
- Final Rule issued by DOE on April 8, 2009 addressing cooking efficiency standards. (74 FR 16040) DOE determined that new cooking efficiency standards for microwave ovens were not justified.

Purpose of the SNOPR

- **The October 2008 NOPR analyzed microwave standby power as a measure of energy consumption separate from cooking efficiency, and proposed new prescriptive standards for standby power.**
- **DOE received comments that it should consider an updated version of the international standby power standard (International Electrotechnical Commission (IEC) 62301), which was expected shortly.**
- **Therefore, the rulemaking for microwave oven standby power was continued rather than included in the April 2009 Final Rule to allow DOE to consider IEC 62301 Second Edition**
  - EPCA's statutory requirement to consider the "most current version"
  - International harmonization
- **The SNOPR analysis also addresses comments on other topics received on the NOPR.**
- **This SNOPR presents the revised analysis and proposes new standard levels for comment.**

SNOPR Schedule

- **SNOPR for microwave oven standby power issued by DOE on January 31, 2012 (SNOPR Public Meeting today, March 14, 2012)**
- **Comments on SNOPR from interested parties**
  - Transcript records oral comments from today's public meeting
  - Written comments (comment period closes April 16, 2012)
- **DOE reviews and considers all comments submitted on a timely basis.**
- **Final Rule Publication**
  - In accordance with EPCA, as amended by EISA 2007.

Test Procedure

- **DOE published an interim final rule for the microwave oven test procedure on March 9, 2011, to incorporate measures of standby mode and off mode energy use.**
- **The test procedure amendments are based on IEC 62301 First Edition, which was the most current at the time that the interim final rule was finalized.**
  - IEC Standard 62301 Second Edition published on January 27, 2011.
- **DOE received comments on the interim final rule supporting the incorporation by reference of the second edition.**
- **DOE published an SNOPR on November 23, 2011, to propose amendments based on IEC 62301 Second Edition and to address covered products.**
  - DOE is currently considering comments received.

Proposed Standards

Proposed Amended Energy Conservation Standards for Microwave Oven Standby Power (TSL 3)

Product Class	Proposed Energy Conservation Standards
Microwave-Only Ovens and Countertop Combination Microwave Ovens	Maximum Standby Power = 1.0 watt
Built-In and Over-the-Range Combination Microwave Ovens	Maximum Standby Power = 2.2 watts

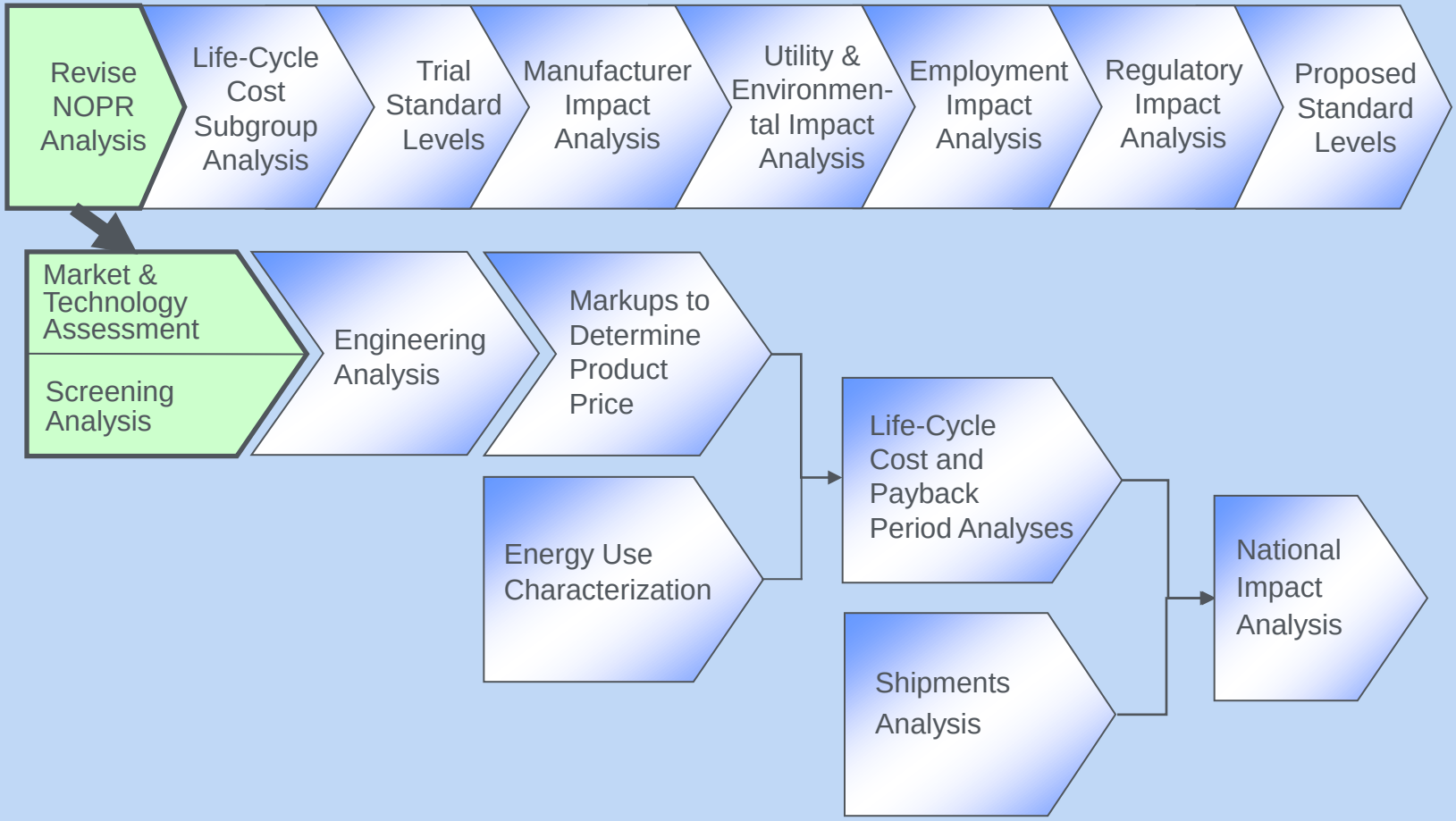
- **The compliance date of these standards would be three years from the publication of the final rule.**

DOE invites comments on these newly proposed energy conservation standards.

Opening Remarks and Comments from Interested Parties on the Proposed Energy Conservation Standards

At this time, DOE welcomes opening remarks from interested parties on the SNOPR for microwave oven standby power.

SNOPR Analyses Flow Diagram



The SNOPR analyses consist of revisions to the NOPR analyses.

SNOPR Updates: Product Classes

- **DOE divides covered products into classes by:**
  - the type of energy used,
  - capacity, or
  - other performance-related features that affect consumer utility and efficiency.
- **DOE defines a microwave oven as follows:**

  "A class of kitchen ranges/ovens which is a household cooking appliance consisting of a compartment designed to cook or heat food by means of microwave energy."
- **In the 2008 NOPR, DOE proposed a single product class encompassing microwave ovens with and without browning (thermal) elements,**
  - Did not include microwave ovens incorporating convection systems ("combination microwave ovens").
- **In response to comments, DOE reassessed the covered products.**
  - *Determined that combination microwave ovens would also be considered covered products under the regulatory definition because they are capable of cooking or heating food by means of microwave energy.*

Product Classes

- **DOE investigated whether there are any performance related features that would justify separate energy conservation standards based on:**
  - Microwave-only vs. Combination
  - Configuration:

Countertop

Built-In

Over-the-Range

Product Classes: Microwave-Only Over-the-Range vs. Countertop

- **DOE conducted a survey of over-the-range microwave-only units available on the U.S. market.**
  - Display technologies used are similar to those used in countertop microwave-only units (i.e., LED displays, LCDs, and VFDs).
  - In-store standby mode testing on a limited sample of over-the-range microwave-only units showed similar standby power consumption as countertop microwave-only units.
- ***DOE tentatively concludes that over-the-range microwave-only units would not warrant a separate product class from microwave-only countertop units.***
  - May have additional components that are energized during active mode operation.
  - However, DOE's testing showed that the presence of such features did not increase the standby power consumption.

Product Classes: Countertop Combination vs. Microwave-Only

- **DOE also conducted standby power testing on a sample of 13 representative combination microwave ovens.**
- **Countertop Combination Microwave Ovens:**
  - Use similar display technologies as countertop microwave-only units.
  - Standby power consumption ranging from 1.2 W to 4.7 W, similar to the standby power consumption for countertop microwave-only units.
- ***DOE tentatively concludes that countertop combination microwave ovens would not warrant a product class separate from microwave-only ovens*.**

Product Classes: Built-In and Over-the-Range Combination

- DOE testing showed standby power consumption for these products ranged from 4.1 W to 8.8 W, higher than the standby power consumption for other microwave oven product types.
- DOE's reverse-engineering analysis suggests that additional features for these products are required to handle the thermal loads associated with their installation and to provide consumer utility.
- Require a significant number of additional relays on the control board and thus require a larger power supply for the control of such relays.

Product Classes

- **DOE believes that a separate product class should be established for built-in and over-the-range combination microwave ovens.**

Product Class
1. Microwave-Only Ovens and Countertop Combination Microwave Ovens
2. Built-in and Over-the-Range Combination Microwave Ovens

Issue 7: ***DOE requests information on any utility or performance impacts to built-ins at the standard level proposed by DOE.***

SNOPR Updates: Operating Modes

- **The DOE test procedure, as amended in the interim final rule, provides definitions for standby mode and off mode in microwave ovens :**
  - "*Standby mode* means any mode in which a … microwave oven is connected to a mains power source and offers one or more of the following user-oriented or protective functions which may persist for an indefinite time:
    - To facilitate the activation of other modes (including activation or deactivation of active mode) by remote switch (including remote control), internal sensor, or timer;
    - Continuous functions, including information or status displays (including clocks) or sensor-based functions. A timer is a continuous clock function (which may or may not be associated with a display) that allows for regularly scheduled tasks and that operates on a continuous basis."
  - "*Off mode* means a mode in which a … microwave oven is connected to a mains power source and is not providing any active mode or standby mode function and where the mode may persist for an indefinite time. An indicator that only shows the user that the product is in the off position is included within the classification of an off mode."

Operating Modes

- **In the NOPR, DOE noted that it observed no microwave ovens in its test sample that were capable of operation in off mode, and further that its research suggested that no microwave ovens available in the United States are capable of off mode operation.**
- **DOE received no comments or data indicating that microwave ovens with an off mode are currently available or expected to become available on the U.S. market.**
- **DOE investigated the potential for microwave ovens with an on/off switch to operate in off mode.**
  - Such units would be capable of off mode.
  - Zero energy would be consumed in off mode.
- **DOE did not propose in the SNOPR standards for off mode because there would be no benefit associate with such a standard.**

Issue 1: ***DOE requests input and data regarding off mode power for microwave ovens.***

SNOPR Updates: Technology Options

- **In the NOPR, DOE identified features which affect standby power:**
  - Cooking sensors;
  - Display technologies; and
  - Control strategies and associated control boards, including a function to turn off power to components during standby mode.
- **Additional testing showed that standby power characteristics for countertop combination microwave ovens and over-the-range microwave-only units are similar to that of countertop microwave-only units.**
- **Tests on over-the-range combination microwave ovens showed that standby power for these products also depend largely on the features listed above.**

Technology Options: Cooking Sensors

- **DOE noted in the NOPR that zero-standby power piezoelectric steam sensors were available in microwave ovens in the U.S. market, and that other sensors (infrared, weight, relative humidity sensors) had either been applied in microwave ovens sold elsewhere or had been identified as feasible for these applications.**
- **Commenters raised concerns about:**
  - Availability, reliability, and accuracy;
  - Intellectual property issues.
- **DOE conducted additional research, and notes:**
  - Alternate sensor technologies have been available on the market internationally for years.
  - It is not aware of data showing that these sensors would have reliability and accuracy significantly different than the absolute humidity sensors commonly employed in U.S. microwave ovens.
  - It is not aware of any intellectual or patent infringement issues for any of the above-listed sensors.

Technology Options: Display Technologies

- **DOE identified three display technologies for microwave ovens:**
  - Light-emitting diode (LED) displays
  - Liquid crystal displays (LCDs) with and without backlighting
  - Vacuum fluorescent displays (VFDs)
- **Commenters submitted information on the utility of display technologies:**
  - Reliability in higher-heat installations, such as over-the-range;
  - Viewing angle and visibility;
  - Availability of sizes and colors demanded by consumers of higher-end products and which allow manufacturers to provide a consistent appearance among products in a suite.
- **Additional DOE research indicates:**
  - Each display technology is currently incorporated in multiple over-the-range models.
  - Temperature ratings for the three types of displays are comparable.
  - Each display technology offers acceptable brightness, viewing angle, and ability to display complex characters in both countertop and over-the-range microwave ovens.
  - No microwave oven display had intermittent backlighting or other features that lessen utility.
- **DOE continues to believe that all display technologies can be integrated in countertop and over-the-range microwave ovens with no loss of utility.**

Issue for Public Comment

Issue 2: ***DOE requests input and data on the utility provided by specific features that contribute to microwave oven standby power. In particular, DOE seeks information on the utility of display technologies, as well as on cooking sensors that do not require standby power.***

Technology Options: Power Supply and Control Boards

- **DOE determined for the NOPR that switching power supplies could improve standby power by increasing power supply and control board efficiency.**
  - Up to 75-percent conversion efficiency with 0.2 W or less standby power.
  - DOE believed such power supplies were unproven in long-term microwave oven applications.
- **Additional DOE research indicates:**
  - Switching power supplies are found in many consumer products and appliances, suggesting adequate reliability and durability.
  - No data suggests that reliability is significantly worse than conventional linear power supplies over the lifetime of a microwave oven.
  - While switching power supplies in other consumer applications may achieve 92-percent efficiency, DOE is unaware of any switching power supplies suitable for application in microwave ovens that exceed 75-percent efficiency.
- **DOE observed switching power supplies in certain combination microwave ovens in its recent test sample.**

Technology Options: Automatic Power-Down

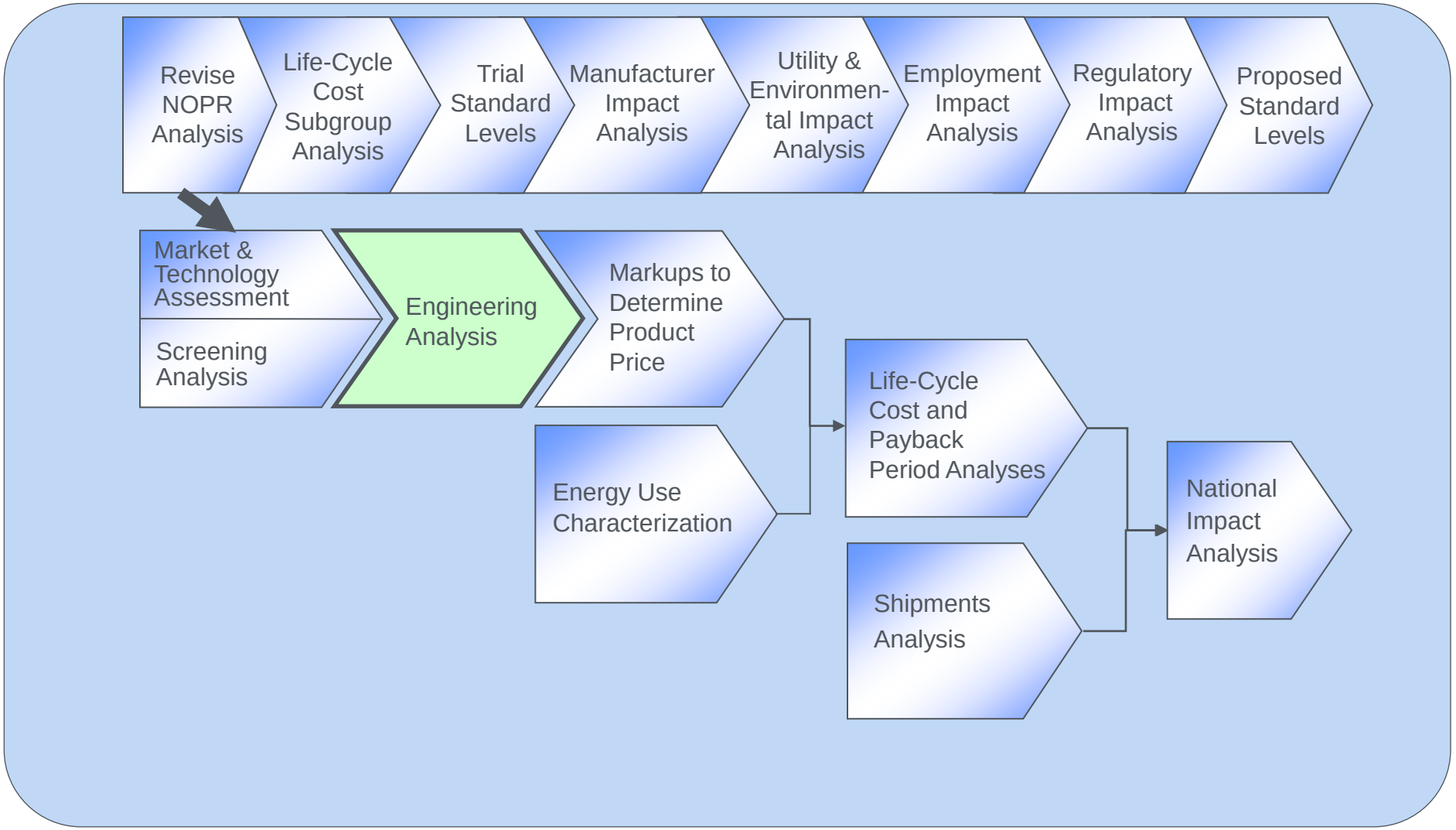
- **Automatic power-down allows manufacturers to make design tradeoffs between incorporating standby power-consuming features (such as displays or cooking sensors) and including a function to cut power to those components during standby mode.**
- **Commenters requested DOE consider a user-activated control to turn off the display.**
  - With the display switched off, the microwave oven would be in off mode unless other features associated with standby mode remain energized.
  - DOE is not aware of any products incorporating such a user-activated control.
  - DOE also does not have information on how often consumers might make use of this feature.
  - Although DOE is unable to consider user-activated controls for turning off the display as a design feature, manufacturers are not precluded by the proposed standards from incorporating it in their products.

Issues for Public Comment

Issue 3: ***DOE requests input and data on control strategies available to enable manufacturers to make design tradeoffs between incorporating standby-power-consuming features such as displays or cooking sensors and including a function to turn power off to these components during standby mode. DOE also seeks comment on the viability and cost of microwave oven control board circuitry that could accommodate transistors to switch off cooking sensors and displays.***

Issue 4: ***Whether switching or similar modern power supplies can operate successfully inside a microwave oven and the associated efficiency impacts on standby power.***

SNOPR Analyses Flow Diagram



Standby Power Levels – Product Class 1

- **For the NOPR, DOE established the following standby power levels for analysis:**

Standby Power Level (TSL)	Source	Standby Power *(W)*
Baseline	Baseline	4.0
1	FEMP Procurement Efficiency Recommendation	2.0
2	Gap Fill	1.5
3	IEA 1-Watt Program	1.0
4	Max Tech	0.02

- **DOE believes that the TSLs and associated analyses are still valid for product class 1.**

Standby Power Levels – Product Class 2

- **For the SNOPR, DOE reverse-engineered a representative sample of built-in and over-the-range combination microwave ovens.**
  - Analyzed the various components that contribute to the standby power consumption.
  - Measured standby power consumption of individual components.

Standby Power Level (TSL)	Description	Standby Power *(W)*
Baseline	Baseline	4.5
1	Zero-standby cooking sensor	3.7
2	Switch mode power supply	2.7
3	Solid state relays and optimized switch mode power supply	2.2
4	Max Tech – automatic power down	0.04

Incremental Manufacturing Costs – Product Class 1

- **DOE believes the standby power levels and corresponding incremental manufacturing costs presented in the NOPR remain fundamentally valid for product class 1.**
- **Scaled incremental costs to 2010$ using the Producer Price Index.**

Standby Power Level	Standby Power *(W)*	Incremental Cost *(2010$)*
Baseline	4.0	N/A
1	2.0	$0.27
2	1.5	$0.60
3	1.0	$1.31
4	0.02	$4.58

Incremental Manufacturing Costs – Product Class 2

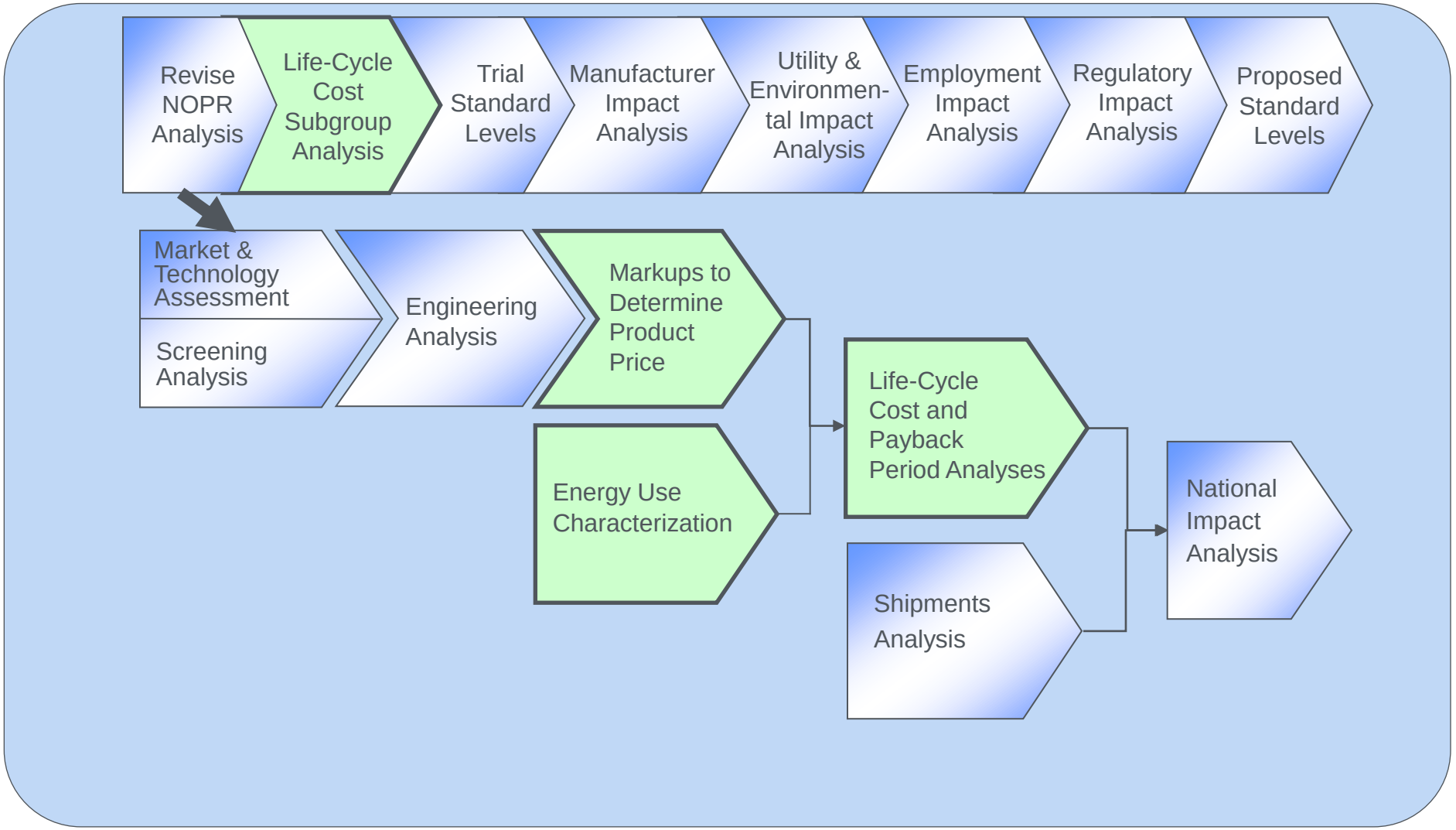
- **To evaluate the built-in and over-the-range combination microwave oven product class, DOE conducted analyses on a test sample of 13 combination microwave ovens.**
  - Product teardowns
  - Control board cost analyses
- **DOE estimated the cost associated with each standby power level by using quotes from various component suppliers to determine the cost of the components used in each design option.**

Standby Power Level	Standby Power *(W)*	Incremental Cost *(2010$)*
Baseline	4.5	N/A
1	3.7	$0.00
2	2.7	$2.29
3	2.2	$9.44
4	0.04	$5.18

Issue for Public Comment

Issue 5: ***DOE requests input and data on the estimated incremental manufacturing costs, as well as the assumed approaches to achieve TSL 3 for microwave oven standby mode and off mode. DOE also seeks comment on whether any intellectual property or patent infringement issues are associated with the design options considered in the analyses.***

SNOPR Analyses Flow Diagram



LCC and PBP Analysis Inputs Update

Inputs	October 2008 NOPR	Changes for the SNOPR
Affecting Installed Costs		
Product Cost	Derived by multiplying manufacturer cost by manufacturer, distributor markups and sales tax.	Used experience curve fits to forecast a price scaling index to forecast product prices.
Affecting Operating Costs		
Annual Energy Use	Annual energy use determined from the annual usage (average daily use cycles).	No change
Energy Prices	Electricity: Updated using EIA's 2006 Form 861 data. Variability: Regional energy prices determined for 13 regions.	Electricity: Updated using EIA's 2009 Form 861 data. Variability: No change.
Energy Price Trends	Energy: Forecasts updated with EIA's Annual Energy Outlook 2008 (AEO 2008).	Reference Case, High Growth, and Low Growth forecasts updated with EIA's AEO 2010 May Release.
Repair and Maintenance Costs	Assumed no repair or maintenance costs.	No change
Affecting Present Value of Annual Operating Cost Savings		
Product Lifetime	Developed a Weibull probability distribution based on an average lifetime of 9 years.	No change
Discount Rates	Average value: 4.8%. Variability: Characterized using Weibull probability distributions.	No change
Affecting Installed and Operating Costs		
Effective Date of New Standard	2012	2014

Base and Standards Case Efficiency Distributions

- **LCC and PBP analysis typically analyzes standard levels relative to a baseline efficiency level**
- **Not all consumers purchase products at baseline levels**
  - Must account for consumers purchasing more efficient products to accurately estimate consumer economic impacts
- **Base-Case efficiency distributions define the percentage of products being purchased at various efficiency levels**
  - Consumers already purchasing products at efficiencies greater than or equal to a prospective standard level are not impacted by the standard
- **Base-Case Efficiency Distributions**
  - Determined from tests conducted on 52 units by DOE and AHAM.
- **Standards-Case Efficiency Distributions**
  - Applied a “roll-up” approach to estimate the distribution for each standards case.

Base and Standards Case Efficiency Distributions

- DOE maintained the shipments-weighted standby power and annual energy use shown in the following tables throughout the forecast period, 2014–2043.

Microwave and Countertop Combination Ovens: Standby Energy Consumption Distributions in 2014 for Base and Standards Cases

Stand-by Power *(W)*	Annual Energy Use *(kWh/yr)*	Market Share *(%)*				
		Base Case	Standby Power Level			
			1	2	3	4
4.00	34.8	46%				
2.00	17.4	35%	81%			
1.50	13.0	19%	19%	100%		
1.00	8.69	0%	0%	0%	100%	
0.02	0.17	0%	0%	0%	0%	100%
Shipments Weighted Standby Power		2.83	1.90	1.50	1.00	0.02
Shipments Weighted Annual Energy Use		24.6	16.5	13.0	8.7	0.17

Base and Standards Case Efficiency Distributions

- DOE maintained the shipments-weighted standby power and annual energy use shown in the following tables throughout the forecast period, 2014–2043.

Over the Range Combination Ovens: Standby Energy Consumption Distributions in 2014 for Base and Standards Cases

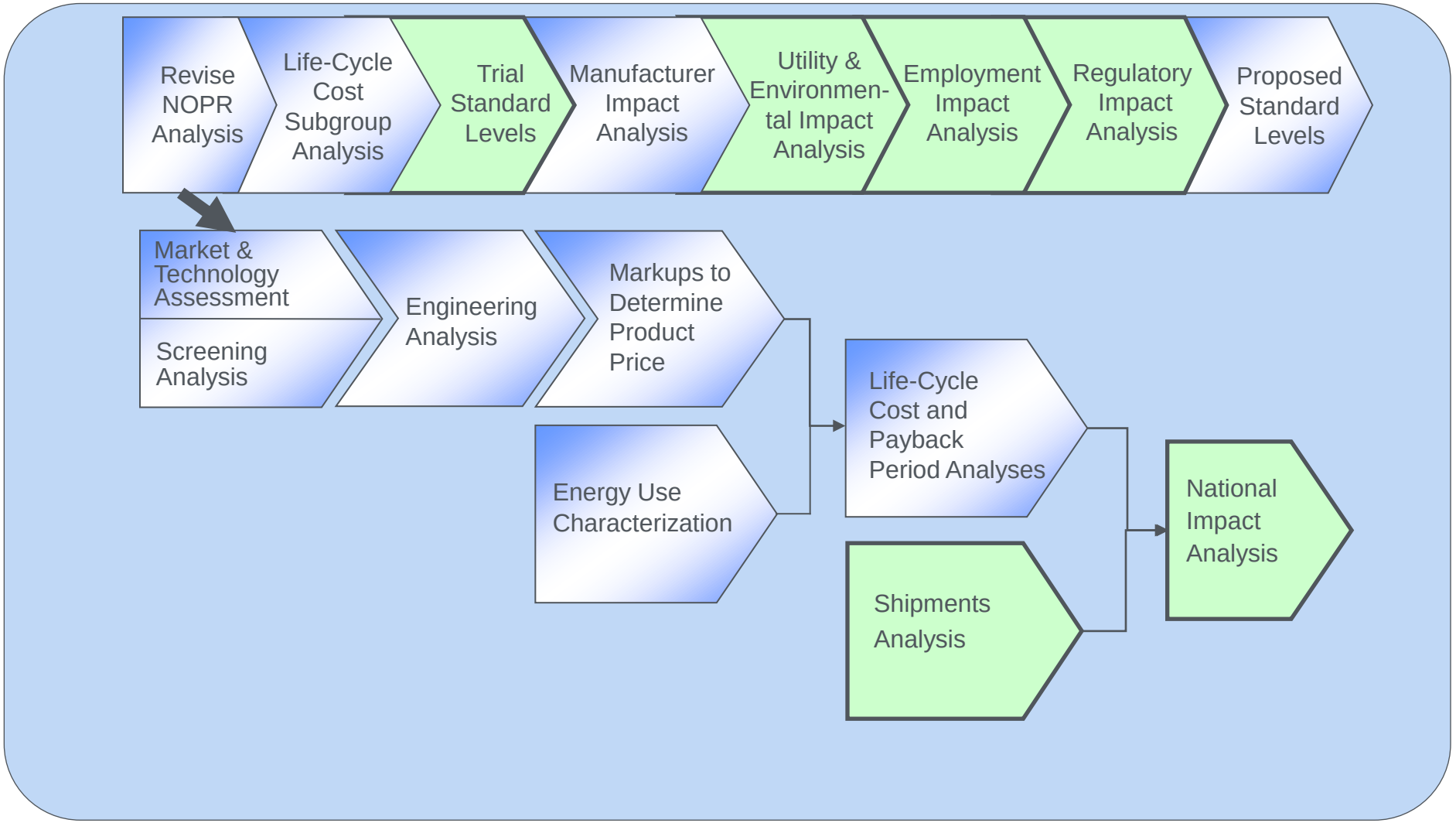
Stand-by Power *(W)*	Annual Energy Use *(kWh/yr)*	Market Share *(%)*				
		Base Case	Standby Power Level			
			1	2	3	4
4.50	39.1	100%				
3.70	32.1	0%	100%			
2.70	23.5	0%	0%	100%		
2.20	19.1	0%	0%	0%	100%	
0.04	0.35	0%	0%	0%	0%	100%
Shipments Weighted Standby Power		4.50	3.70	2.70	2.20	0.04
Shipments Weighted Annual Energy Use		39.1	32.1	23.5	19.1	0.35

Issue for Public Comment

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

Issue 6: ***DOE requests input and data on the estimated market share of microwave ovens at the standby power consumption stipulated by the proposed standards (1.0 W for countertop; 2.2 W for combination)***

SNOPR Analyses Flow Diagram



Shipments Analysis

- **Shipments Analysis Inputs 1 through 3**

Inputs	2008 NOPR Description	Changes for the SNOPR
Number of Product Classes	One product class. Market share data provided by AHAM.	Two product classes: (1) all microwave oven-only and countertop microwave oven-combination; (2) over-the-range microwave oven-combination. Market share data provided by AHAM; 99% product class #1 and 1% product class #2. Product class market shares held constant over forecast period.
New Construction Shipments	Housing forecasts updated with EIA AEO 2009 April release forecasts for the Reference case, High growth case, and Low growth case.	No change in approach. Housing forecasts updated with EIA AEO 2010 forecasts for the Reference case, High growth case, and Low growth case.
Replacements	Determined by tracking total product stock by vintage and establishing the failure of the stock using retirement functions from the LCC and PBP analysis. Retirement functions revised to be based on Weibull lifetime distributions.	No change.

Shipments Analysis

- **Shipments Analysis Inputs 4 through 6**

Inputs	2008 NOPR Description	Changes for the SNOPR
Historical Shipments	Data sources include AHAM data submittal and Appliance magazine.	No change.
Purchase Price, Operating Cost, and Household Income Impacts due to Efficiency Standards	Developed “relative price” elasticity, which accounts for the purchase price and the present value of operating cost savings divided by household income. Used purchase price and efficiency data specific to residential refrigerators, clothes washers, and dishwashers between 1980 and 2002 to determine a “relative price” elasticity of demand of -0.34.	No change.
Fuel Switching	Not considered.	No change.

Impact Analyses

- **NIA inputs 1 through 5; NIA generates necessary outputs for utility, environmental, employment, and regulatory impact analyses**

Inputs	2008 NOPR Description	Changes for the SNOPR
Base-Case Forecasted Efficiencies	Shipment-weighted efficiency (SWEF) determined in 2005. SWEF held constant over forecast period.	No change.
Standards-Case Forecasted Efficiencies	Analyzed as one product class. Roll-up scenario used for determining SWEF in the year that standards become effective for each standards case. SWEF held constant over forecast period.	Analyzed as two product classes. Roll-up scenario used for determining SWEF in the year that standards become effective for each standards case. SWEF held constant over forecast period.
Annual Energy Consumption per Unit	Annual weighted-average values as a function of SWEF.	No change.
Total Installed Cost per Unit	Annual weighted-average values as a function of SWEF.	Incorporated learning rate to forecast product prices.
Energy Cost per Unit	Annual weighted-average values as a function of the annual energy consumption per unit and energy prices.	No change.

Impact Analyses

- **NIA inputs 6 through 10; NIA generates necessary outputs for utility, environmental, employment, and regulatory impact analyses**

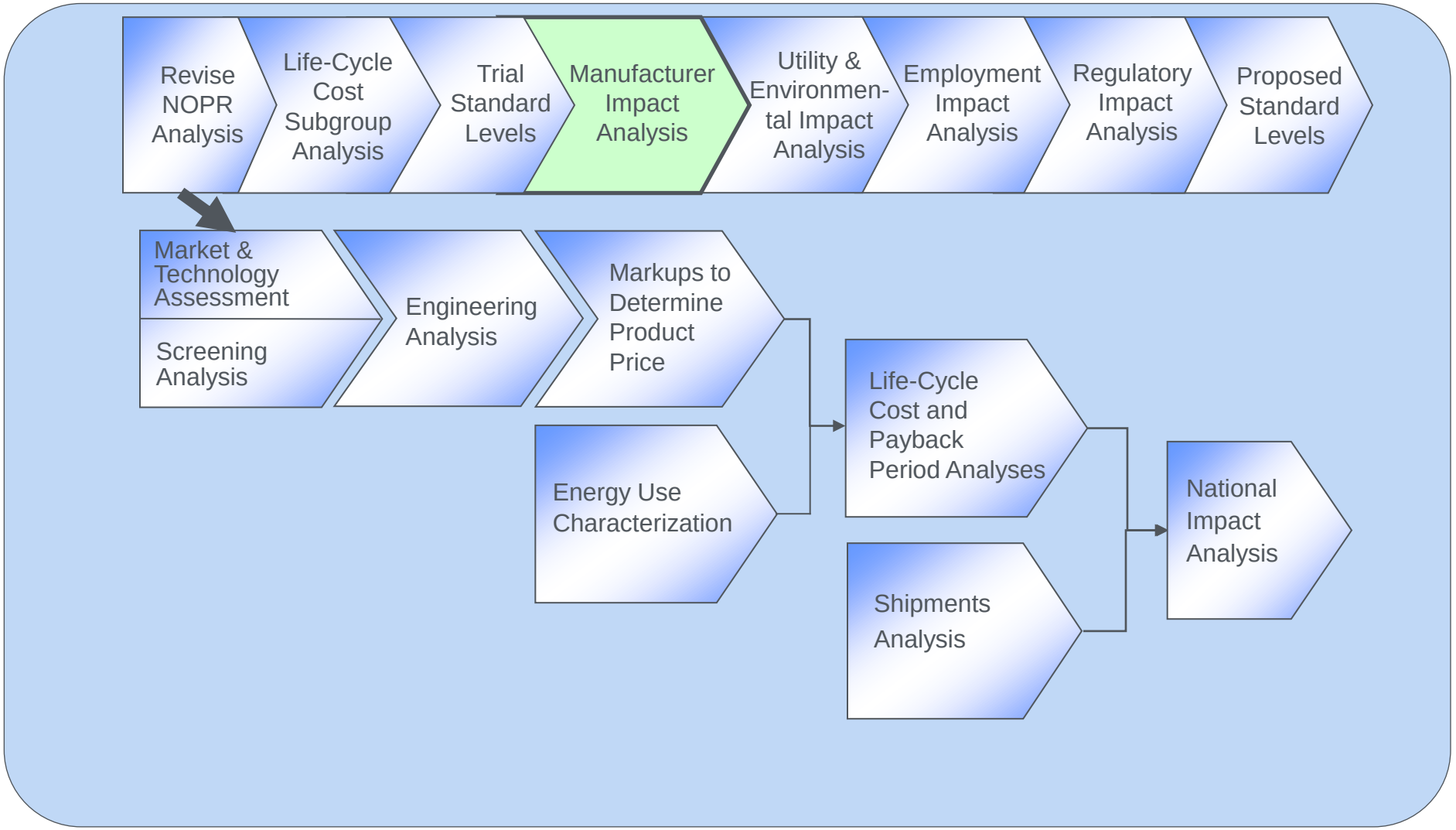
Inputs	2008 NOPR Description	Changes for the SNOPR
Repair Cost and Maintenance Cost per Unit	Assumed no increase in repair and maintenance costs as a function of standby power.	No change.
Escalation of Energy Prices	AEO 2008 forecasts (to 2030); extrapolated to 2042.	Updated to AEO 2010 May release forecasts (to 2035); extrapolated to 2043.
Energy Site-to-Source Conversion	Conversion varies yearly and is generated by DOE/EIA's NEMS program (a time-series conversion factor; includes electric generation, transmission, and distribution losses).	No change.
Discount Rate	3 and 7 percent real.	No change.
Present Year	Future expenses discounted to 2007.	Future expenses discounted to 2011.

Trial Standard Levels

- **The TSLs analyzed are equivalent to the standby power levels**

Trial Standard Level	Standby Power *(W)*	
	Product Class 1: Microwave-Only and Countertop Combination	Product Class 2: Built-In and Over-the-Range Combination
1	2.00	3.70
2	1.50	2.70
3	1.00	2.20
4	0.02	0.04

SNOPR Analyses Flow Diagram



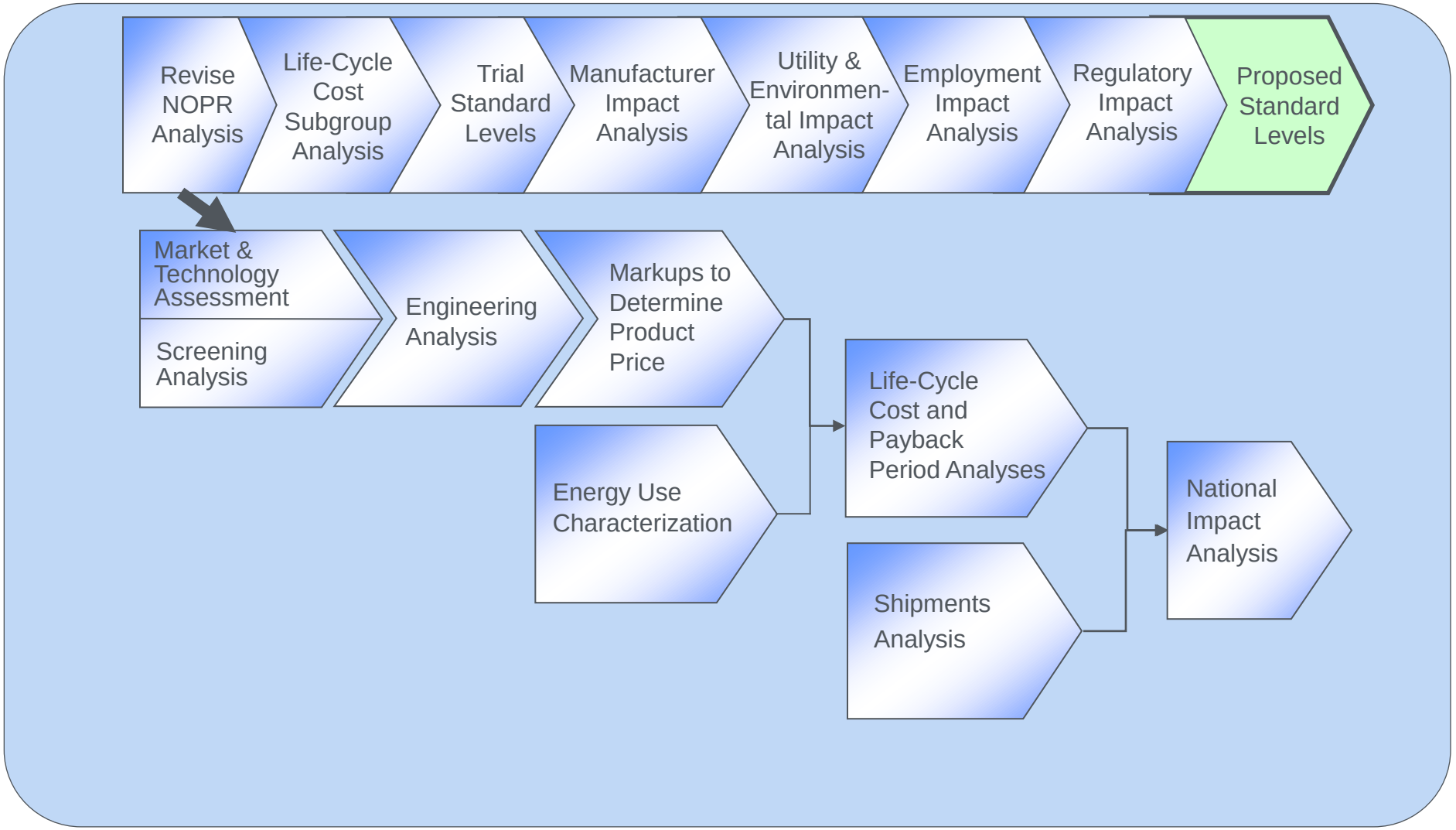
SNOPR Updates

- **DOE updated the MIA results based on several changes to other analyses that impact the MIA:**
  - Engineering Analysis - Updated manufacturing production costs (MPCs) for Product Class 1, new MPCs for Product Class 2, and all costs converted to 2010$.
  - NIA - Updated total shipments and efficiency distributions, used a new analysis period (2014-2043) and base year (2011), and incorporated price trends into the analysis;
- **DOE also updated the conversion costs**
  - To segment total product and capital conversion costs between Product Class 1 and Product Class 2, DOE used the same split between these two product classes as used in the NIA
  - DOE used the same per-platform costs at each standby power level for both product classes, but converted these product and capital conversion costs to 2010$ using the PPI.

Summary of Results at the Proposed Standards Level

- **At TSL 3, the impacts on INPV range from approximately -$52.9 million to -$73.6 million (a change in INPV of -4.7 percent to -6.5 percent).**
  - Base case industry value is estimated to be $1.1 billion in $2010.
  - The required conversion costs are estimated to be $94.7 million at TSL 3. As an indication of the magnitude of these conversion costs, industry cash flow decreases by approximately 29.9 percent, to $59.0 million, compared to the base-case value of $84.2 in the year before the compliance date of the standard.
  - The incremental MPCs at TSL 3 are estimated to be $1.31 for Product Class 1 and $9.44 for Product Class 2. The range of the impacts on INPV and cash flow at TSL 3 varies depending on the ability of manufacturers to pass on these increases in MPCs to their customers.
- **The vast majority of microwave ovens are imported and the employment impacts in the GRIM are small.**

SNOPR Analyses Flow Diagram



Selection of Proposed Standard

- **DOE considered four TSLs for standby power, beginning with the most efficient level (TSL 4) and worked down to a level where the benefits of potential standards outweighed the burdens.**
  - DOE tentatively concludes that at TSL 4, the benefits of energy savings, economic gain, and emissions reductions would be outweighed by the potential economic burden on consumers from loss of product utility and the large capital conversion costs that would result in a reduction in INPV for manufacturers.
  - DOE tentatively concludes that TSL 3 saves a significant amount of energy and is technologically feasible and economically justified.

Proposed Standards

		Microwave-Only and Countertop Combination Ovens	Built-In and Over-the-Range Combination Ovens
Proposed standard level		**3**	**3**
National Energy Savings *(quads)*		0.41	0.01
Net Present Value *(2010$ billion)*	**3% discount rate**	3.58	0.02
	7% discount rate	1.81	0.01
Industry Net Present Value	***2010$ million***	1031.6 to 1050.6	22.3 to 23.9
	% change	(6.5) to (4.8)	(7.1) to (0.3)

How to Submit Comments…

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

- Written comments – Reference docket #: EERE-2011-BT-STD-0048 and/or RIN #: 1904-AC07

Email: MWO-2011-BT-STD-0048@ee.doe.gov

Mail: Mrs. Brenda Edwards
U.S. Department of Energy
Building Technologies Program
1000 Independence Avenue, SW, Mailstop EE-2J
Washington, DC 20585-0121

Courier: Mrs. Brenda Edwards
U.S. Department of Energy
Building Technologies Program
950 L'Enfant Plaza, 6th Floor
Washington, DC 20024
Telephone: (202) 586-2945

APPENDIX

Statutory Authority – the Energy Policy and Conservation Act (EPCA) as Amended

- **EPCA (42 U.S.C. 6291 *et seq*.) set forth criteria and procedures for DOE's adoption and amendment of energy conservation standards and test procedures for covered products.**
- **Energy Independence and Security Act of 2007 (EISA 2007) Amendments to EPCA**
  - Any final rule establishing or revising a standard for a covered product, adopted after July 1, 2010, shall incorporate standby and off mode energy use into a single standard if feasible. If not feasible, DOE shall prescribe a separate standard for standby and off mode energy use, if justified.
- **New microwave oven standby power standards are being considered as part of a rulemaking that also initially covered residential dishwashers, dehumidifiers, and conventional cooking products and commercial clothes washers.**
  - Amended dishwasher and dehumidifier standards were established by EISA 2007.
  - Standards for conventional cooking products and microwave ovens as to cooking efficiency were addressed in a final rule in April 2009.
  - Amended commercial clothes washer standards were adopted by final rule in January 2010.

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 impacts 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 impacts 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

Test Procedure Background

- **DOE's test procedure for microwave ovens appears at appendix I to part 430 subpart B of Title 10 of the Code of Federal Regulations.**
- **DOE repealed the regulatory provisions establishing the cooking efficiency test procedure for microwave ovens under EPCA in a final rule published on July 22, 2010.**
  - DOE determined that the microwave oven test procedure provisions to measure cooking efficiency do not produce accurate and repeatable test results.
  - Was unaware of any test procedures that have been developed that address the concerns with the DOE microwave oven cooking efficiency test procedure.
- **EISA 2007 Amendments to EPCA direct DOE to incorporate a measure of standby and off mode energy consumption into its microwave oven test procedure by March 31, 2011.**

Efficiency Metric

- **DOE eliminated the active mode cooking efficiency test procedure provisions in a July 2010 Test Procedure Final Rule.**
  - Existing provisions did not produce accurate and repeatable results.
  - Absence of active mode provisions result in a de facto separate energy use descriptor for microwave oven standby mode and off mode energy use.
- **Proposed standards are based on a maximum average standby power, in Watts (W).**

Incremental Manufacturing Costs

- **From product testing and reverse engineering, DOE observed correlations between:**
  - Specific components and technologies, or combinations thereof, and
  - Measured standby power
- **DOE obtained preliminary incremental manufacturing costs associated with standby power levels by considering combinations of those components as well as other technology options identified to reduce standby power.**
- **DOE presented manufacturing cost estimates based on quotes obtained from:**
  - suppliers,
  - interviews with manufacturers and subject matter experts,
  - research and literature review, and
  - numerical modeling.

Baseline and Incremental Markups

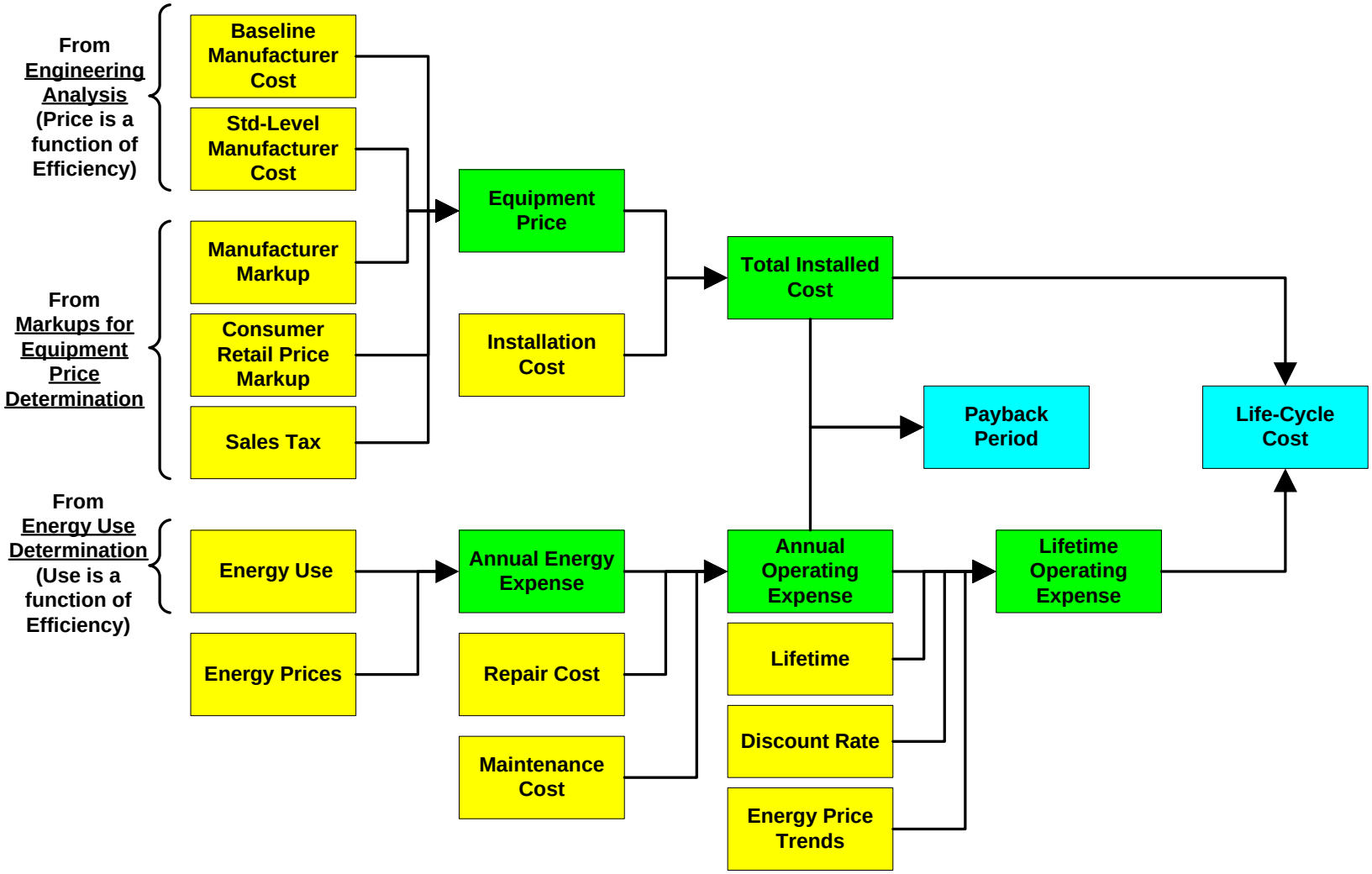
- ***Markups* relate customer price to cost of goods sold (CGS)**
- ***Baseline markups* relate price to cost prior to a change in efficiency**
  - Baseline markups indicate a customer price that covers all of a retailer's expenses plus profit.
  - Direct labor costs (salaries, payroll, rental and occupancy) are included.
- ***Incremental markups* relate the incremental change in customer price to the incremental change in CGS beyond baseline**
  - Some distribution costs remain constant with CGS increases.
  - Incremental markups cover only expenses that vary with CGS – 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 CGS.
  - DOE assumes other operating costs and profit will scale proportionally with CGS.

Estimates of Retail Market Competition

- DOE assumed that competition in the retail market, combined with inelastic demand, will put downward pressure on retail margins, supporting the incremental markup approach.
- To confirm that retail markets are competitive, DOE used a commonly-used index of market concentration, the Four Firm Concentration Ratio (FFCR).*
- An FFCR < 40% indicates a relatively unconcentrated market, while an FFCR > 70% indicates a concentrated market (oligopoly).
- FFCRs were evaluated for major appliance sales in three retail channels: Electronics and Appliance Stores, Building and Material and Supplies Dealers, and General Merchandise Stores. In each case, the resulting FFCR was well below the 40% threshold.

* The Department of Justice uses a more complete index, the Herfindahl-Hirschman Index (HHI), but DOE lacked the information necessary for calculating an HHI.

LCC and PBP Analysis Inputs



Regulatory Flexibility Act

- **Background**
  - DOE must publish an initial regulatory flexibility analysis if it cannot certify that the rule will not have a significant economic impact on a substantial number of small entities.

- **Findings**
  - DOE identified no small business manufacturer of microwave ovens for which there would be a significant economic impact

Summary of Results

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

	TSL 1	TSL 2	TSL 3	TSL 4 (Max Tech)
National Energy Savings *(quads)*	0.21	0.30	0.41	0.63
NPV of Consumer Benefits *(2010$ billion)*				
7% discount rate	1.02	1.42	1.82	2.25
3% discount rate	1.98	2.78	3.59	4.60
Maximum Industry NPV Change *(2010$ billion)*	(27.1) to (29.3)	(45.2) to (52.4)	(52.9) to (73.6)	(90.4) to (165.7)
Maximum Industry NPV Change *(%)*	(2.4) to (2.6)	(4.0) to (4.6)	(4.7) to (6.5)	(8.0) to (14.7)
Mean LCC Savings *(2010$)*				
Microwave-Only Ovens and Countertop Combination Microwave Ovens	7	10	13	12
Built-In and Over-the-Range Combination Microwave Ovens	6	11	4	27
Present Value of CO_2 Emissions Savings *(2010$ billion)*	70 to 1,066	101 to 1,539	139. to 2,118	213 to 3,259

Proposed Level