Energy Conservation Standards
Rulemaking Framework Document for
Wine Chillers and Miscellaneous Refrigeration Products

U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
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AEO	Annual Energy Outlook
AHAM	Association of Home Appliance Manufacturers
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
BT	Building Technologies Program
Btu	British thermal units
CEC	California Energy Commission
CEE	Consortium for Energy Efficiency
CFC	chlorofluorocarbon
CFR	Code of Federal Regulations
CO_2	carbon dioxide
COP	Coefficient of performance
CSL	candidate standard level
DOE	U.S. Department of Energy
DOJ	U.S. Department of Justice
EER	energy efficiency ratio
EERE	Office of Energy Efficiency and Renewable Energy
EIA	Energy Information Administration
EISA	Energy Independence and Security Act of 2007
EPACT	Energy Policy Act of 2005
EPA	U.S. Environmental Protection Agency
EPCA	Energy Policy and Conservation Act
FR	*Federal Register*
GRIM	Government Regulatory Impact Model
GWP	global warming potential
HCFC	hydrochlorofluorocarbon
HFC	hydrofluorocarbon
IEC	International Electrotechnical Commission
ImSET	Impact of Sector Energy Technologies
kWh	kilowatt-hour
LCC	life-cycle cost
NAECA	National Appliance Energy Conservation Act of 1987
NECPA	National Energy Conservation Policy Act of 1978
NEMS	National Energy Modeling System
NES	national energy savings
NIST	National Institute of Standards and Technology
NOPR	notice of proposed rulemaking
NOx	oxides of nitrogen
NPV	net present value
NRCan	Natural Resources Canada
PBP	payback period
PNNL	Pacific Northwest National Laboratory
R&D	research and development
RECS	Residential Energy Consumption Survey

RoHS	Reduction of Hazardous Substances directive
SEC	Securities and Exchange Commission
SG&A	selling, general, and administrative costs
SO_2	sulfur dioxide
SWEF	shipment-weighted efficiency
TBD	to be determined
TSD	technical support document
TSL	trial standard level
TTAF	test temperature adjustment factor
TTD	through-the-door
U.S.	United States
U.S.C.	United States Code

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1. INTRODUCTION

The U.S. Department of Energy (DOE) Appliances and Commercial Equipment Standards Program, within the Office of Energy Efficiency and Renewable Energy (EERE) Building Technologies Program (BT), develops and promulgates test procedures and energy conservation standards for consumer appliances and commercial equipment. The process for developing standards involves analysis, public notice, and consultation with interested parties. Such parties, known as stakeholders, include manufacturers, consumers, energy conservation and environmental advocates, State and Federal agencies, and any other groups or individuals with an interest in these standards and test procedures.

This framework document describes DOE's anticipated procedural and analytical approaches for evaluating energy conservation standards for residential wine chillers and miscellaneous refrigeration products.

This document is also designed to inform stakeholders of the process that DOE plans to follow when evaluating potential standards for residential wine chillers and miscellaneous refrigeration products and to encourage and facilitate stakeholder input during that process. This document serves as the starting point for the potential development of standards and is not a definitive statement about any issue that this action will determine.

Section 1 provides an overview of the rulemaking process. Sections 2 through 17 discuss DOE's projected analyses for fulfilling the statutory requirements and guidance for this potential standards rulemaking.

Information about this action will be maintained on the DOE website at:

http://www.eere.energy.gov/buildings/appliance_standards.

DOE invites stakeholder comments on all aspects of the material presented in this document. This comment box and others highlight issues on which DOE seeks comment and requests feedback from interested parties. DOE uses these comment boxes to ask specific questions about the approaches that it proposes to follow for the analyses required for the standards rulemaking. Such requests for stakeholder feedback are numbered according to the section in which they appear.

1.1 The Appliances and Commercial Equipment Standards Program

The Energy Policy and Conservation Act (EPCA) of 1975, Pub. L. 94-163 (42 United States Code (U.S.C.) §§ 6291–6309), established an energy conservation program for major household appliances. The National Energy Conservation Policy Act of 1978 (NECPA), Pub. L. 95-619,

amended EPCA to add Part C[1] of Title III (42 U.S.C. § 6311–6317), which established an energy conservation program for certain industrial equipment. Additional amendments to EPCA gave DOE the authority to regulate the energy efficiency of several products, including residential refrigerators, refrigerator-freezers, and freezers, referred to as residential refrigeration products. The products that are the focus of this document are a subset of refrigerators and/or refrigerator-freezers. The amendments to EPCA in the National Appliance Energy Conservation Act of 1987 (NAECA), Pub. L. 100-12, established energy conservation standards for residential refrigeration products, as well as requirements for determining whether these standards should be amended. (42 U.S.C. § 6295(b))

While EPCA does not define these products, it provides certain criteria that these products must meet. *See* 42 U.S.C. § 6292(a)(1). Under this provision, these products must operate using alternating current electricity, use a compressor/condenser-based system that is integral with the cabinet assembly and be designed to be used with doors. EPCA also provides DOE with the authority to cover other products with energy conservation standards so long as certain other criteria are met. *See* 42 U.S.C. § 6292(b). As a result, those refrigeration products that fall outside of the prescribed criteria detailed in 42 U.S.C. § 6292(a)(1) could be covered through the provisions laid out in 42 U.S.C. § 6292(b).

NAECA first established performance standards for residential refrigeration products, and further required that DOE conduct two cycles of rulemakings to determine if more stringent standards are justified. (42 U.S.C. § 6295(b)) On November 17, 1989, DOE published a final rule in the *Federal Register* updating the performance standards previously set by NAECA. Those standards became effective on January 1, 1993. 54 FR 47916. DOE updated the performance standards again on April 28, 1997. 62 FR 23102. The new standards became effective on July 1, 2001. By completing a second standards rulemaking, DOE had fulfilled its legislative requirement to conduct the two cycles of standards rulemakings required under NAECA.

The Energy Independence and Security Act (EISA), Pub. L. No. 110-140 (December 19, 2007), required that DOE publish a final rule determining whether to amend the standards in effect for residential refrigeration products starting in 2014. Consistent with this requirement, DOE published a final rule on September 15, 2011. 76 FR 57516. The new standards take effect on September 15, 2014.

As part of this recent rulemaking, DOE addressed the coverage of wine chillers. 75 FR 59470, 59486 (September 27, 2010). Wine chillers currently are not covered because they are not designed to be capable of achieving compartment temperatures below the 39 ˚F limit specified in the definition for "electric refrigerator." (see 10 CFR 430.2) DOE chose to treat wine chillers separately from refrigerators in part because of their different purpose and performance characteristics. As a result, DOE modified the definition for refrigerators to ensure sufficient coverage over those products that were designed to safely store food (i.e. refrigerators) and indicated that the coverage of wine chillers would be considered by DOE under a separate, future rulemaking. *Id.* Today's framework document begins the process of examining the possible regulation of wine chillers, as well as other residential refrigeration products that are not yet

[1] Part C has been redesignated Part A-1

covered, but which fit the EPCA coverage requirements -- namely, those products that are designed to be used with doors which include a compressor and condenser unit as an integral part of the cabinet assembly, and which operate on alternating current electricity. (42 U.S.C. § 6292(a)(1)).

1.2 Scope of Coverage

1.2.1 Coverage

Currently, there are no energy conservation standards for wine chillers and the other types of related refrigeration products that fall into the categories described in 42 U.S.C. § 6292(a)(1). Wine chillers that use a conventional compressor/condenser system are not covered by energy conservation standards for refrigerators, refrigerator-freezers, and freezers, largely because they are not designed to be capable of achieving compartment temperatures colder than the 39 ˚F limit specified in the definition for electric refrigerator. As pointed out earlier, DOE opted to not establish energy conservation standards for wine chillers during the 2010-2011 rulemaking and to address those products separately. *See* 75 FR 59470, 59486 (September 27, 2010). However, many of these products are consistent with the requirements of 42 U.S.C. § 6292(a)(1) and hence, DOE has authority to extend coverage to and develop energy conservation standards for them. 75 FR at 59486.

EPCA does not define the term "refrigerator". To address this gap, DOE previously defined the term to include an upper temperature limit. DOE took this action in its 2001 final rule. 66 FR 57845. This limit was specifically applied to clarify that the energy conservation standards for refrigerators did not apply to wine chillers after manufacturers of these products submitted petitions for exemption. *Id.* at p. 57846.

DOE further modified the electric refrigerator definition in 2010. 75 FR 78810 (December 16, 2010). This modification, which was based on recommendations suggested by stakeholders, established a more distinct delineation between products covered by the existing standards and products DOE intended to exclude from coverage at that time. Specifically, the definition makes clear that products that are not designed to achieve storage temperatures below 39 ˚F are excluded, thus avoiding unintentional non-coverage of products designed for storage temperatures below 39 ˚F that may reach temperatures above 39 ˚F at warm temperature settings. Wine chillers fall into the category of products that are not designed to achieve storage temperatures below 39 ˚F, as do some other refrigeration products, such as some beverage centers and coolers.

The current action is examining how to address and establish coverage consistent with EPCA requirements for all residential refrigeration products DOE does not currently regulate.

1.2.1.1 Potential Exclusion of Thermoelectric and Absorption Units

Because of the limitations Congress included in the coverage provision of EPCA related to refrigerators, refrigerator-freezers, and freezers, DOE cannot regulate these products using those energy conservation standards that have already been promulgated. *See* 42 U.S.C. § 6292(a)(1) (denoting the criteria that residential refrigeration products must have, including a condenser and compressor integrated into the unit's cabinetry). Because of these criteria, neither absorption nor

thermoelectric products, would be covered because these products do not use a compressor and condenser system.

Notwithstanding these limitations, however, EPCA permits DOE to add products to its coverage if it first makes certain findings -- that coverage is necessary and appropriate for carrying out the purposes of EPCA and that the products are likely to exceed an average annual energy use threshold per household of 100 kilowatt-hours. *See* 42 U.S.C. § 6292(b). Satisfying these elements is an initial prerequisite in order to classify a product as covered. It is through the application of this provision that DOE is considering the coverage of these other miscellaneous residential refrigeration products.

Absorption-based refrigeration products work by using a heat source, powered either by electricity or fuel (e.g. natural gas or propane), to provide the energy needed to drive the cooling system. Absorption refrigeration products use the ammonia-water absorption cycle to cool the storage cabinet. These types of products have been produced for many decades. Electrically powered absorption refrigeration devices are used by the hotel industry for in-room refrigeration cabinets as they are much quieter than compressor-based units, while gas or propane units are designed for use in mobile applications and remote locations that do not have access to electricity. However, due to their specific purpose and generally higher cost (generally at least twice the cost as compared with vapor compression units), DOE believes it is unlikely that they represent any significant market share in the residential refrigeration market.

In contrast, thermoelectric residential refrigeration products are widely available. These types of products are powered by electric input and operate using solid-state thermoelectric cooling devices. Current thermoelectric cooling systems are generally less efficient than the vapor compression systems used in most residential refrigeration products (e.g., see Refrigerators, Refrigerator-Freezers, and Freezers, Energy Conservation Rulemaking, Technical Support Document, Chapter 4, page 4-12, http://www1.eere.energy.gov/buildings/appliance_standards/pdfs/refrig_finalrule_tsd.pdf) Thermoelectric technology is used mostly in products that do not maintain very low compartment temperatures, in particular wine chillers and “coolers”, although some “true” refrigerators (i.e. refrigerators that are capable of achieving storage temperature below 39 ˚F) use it as well. A number of thermoelectric wine chillers have recently been introduced to the market.

1.2.1.2 Establishing Energy Conservation Standards for Thermoelectric Products

DOE considered whether coverage and energy conservation standards could be established for thermoelectric products, under the following options:

1. Initiate a rulemaking to establish standards and a test procedure for vapor compression wine chillers and miscellaneous residential refrigeration products under DOE’s existing authority for refrigerators in EPCA (42 U.S.C. § 6292 (a)(1)) and initiate a separate rulemaking to establish coverage for thermoelectric products under the provisions of 42 U.S.C. § 6292(a)(20) (“Any other type of consumer product which the Secretary classifies as a covered product under subsection (b) of this section.”), or

2. Initiate a coverage rulemaking to establish coverage for all wine chillers and miscellaneous residential refrigeration products, both vapor compression and thermoelectric, and possibly also absorption-based products, under 42 U.S.C. § 6292(a)(20).

As described above, many wine chillers and related refrigeration products that do not fit the current definition for "refrigerator" do fit the requirements of 42 U.S.C. § 6292(a)(1), and DOE has authority to extend coverage to and develop energy conservation standards for them. Specifically, DOE would do this by modifying the definitions for "refrigerator" and/or "electric refrigerator". Once covered, these products are subject to energy conservation standards, as defined in 42 U.S.C. § 6295(b) and the Code of Federal Regulations (CFR), specifically 10 CFR 430.32(a), although DOE must determine whether new product classes must be established to address the products covered through the potential coverage extension.

In contrast, establishing coverage for refrigeration products that do not fit the requirements of 42 U.S.C. § 6292 (a)(1) would necessitate a determination that such coverage is necessary or appropriate to carry out the purposes of EPCA and the average annual energy use of the product is 100 kWh or greater. 42 U.S.C. § 6292(b)(1) Further, additional requirements must be satisfied if DOE wishes to establish energy conservation standards for such products. 42 U.S.C. § 6295 (l)(1) These requirements include: (a) a minimum average annual per household energy use associated with the product of 150 kWh and (b) an aggregate national annual energy use of 4.2 billion kWh. (42 U.S.C. § 6295(l)(1)(A, B))

DOE's estimates of aggregate national energy use, described in section 1.2.1.3, do not convincingly show that requirement (b) would be satisfied by those refrigeration products that cannot satisfy the design requirements of 42 U.S.C. § 6292(a)(1). While per household annual energy use is expected to be well above 150 kWh for these products[2], it is not apparent based upon available shipment data for wine chillers that aggregate national energy use reaches the 4.2 billion kWh threshold. It is for this reason that DOE considered coverage option 2 listed above—in order to allow consideration of a larger group of products when evaluating aggregate national energy use, thus increasing the possibility of satisfying the requirement.

However, DOE tentatively concluded that option 2 above is not viable because refrigeration products with integral compressors and condensers (i.e. those products that satisfy the requirements of 42 U.S.C. § 6292 (a)(1)) are already covered under EPCA. Accordingly, option 2 -- coverage under 42 U.S.C. §6292(a)(20) -- does not apply..

1.2.1.3 Per-Unit and National Energy Use of Wine Chiller Products

Not all information required to accurately estimate the national energy use of wine chillers, especially thermoelectric products, is publicly available. Because DOE is required by statute to determine the per-unit annual energy consumption (UEC) and the national energy consumption (NEC) of wine chillers in order to establish coverage for them, as well as to set energy efficiency

[2] See, for example, information about the EdgeStar thermoelectric wine chiller model TWR215ESS, which indicates that this model uses 1.2 kWh per 24 hours, or 438 kWh per year (http://www.edgestar.com/products/winecooler/twr215ess.asp)

standards, DOE developed preliminary UEC and NEC estimates of vapor compression and thermoelectric wine chillers.

Because of the limited available data regarding absorption-based products, DOE could only develop a broad range of UECs for vapor compression and thermoelectric products. DOE based the UEC of vapor compression wine chiller products on California's maximum energy use standards defined by the California Energy Commission (CEC)[3] as well as sales data purchased from the NPD Group[4], a marketing research firm. Each set of data provided DOE with insight into different aspects of these products. The CEC currently specifies a maximum allowable energy use for automatic- and manual-defrost wine chillers as a function of internal volume, which helped DOE in developing a picture of energy usage and internal volumes of those products that are already on the market. The NPD Group data, which covers 2007-2011 sales, also enabled DOE to deduce an internal volume for each listed model.. Therefore, DOE developed a range of vapor compression UECs for each model in the NPD database.

For thermoelectric products, DOE estimated a range of UEC estimates based on assumed vapor compression (1.5 to 2.0 COP[5]) and thermoelectric efficiencies (0.3 to 0.5 COP). Because web research indicated that most thermoelectric products have capacities of 30 bottles and less, DOE based its UEC estimates on two capacity categories -- (1) less than and equal to 30 bottles and (2) greater than 30 bottles. For thermoelectric products, estimates were derived only for the 30 bottle and less capacity. The derived UECs for thermoelectric products ranged from 721 to 3938 kWh.

Due to the high estimate for the top-end of the estimated UEC range, DOE performed limited metering of four thermoelectric wine chillers consisting of six-, 12-, 15-, and 28-bottle capacities. The loading of each wine chiller metered by DOE varied; the six- and 12-bottle units were metered at full capacity (i.e., loaded with the maximum number of bottles), the 15-bottle unit was metered with a load of 12 bottles, and the 28-bottle unit was metered while empty (i.e., loaded without any bottles). Even though the metering was conducted in a non-controlled ambient environment with room temperatures varying between 65 °F and 78 °F, DOE believed such metered estimates would provide a reasonable approximation of typical thermoelectric wine chiller energy use. The measured daily energy use for the four units over the approximately one-month time-period varied between 0.6 to 1.6 kWh per day, with the high value associated with the 28-bottle capacity wine chiller. Assuming wine chillers are powered year-round, i.e., consumers do not unplug the units for extended periods of time, the daily energy consumption translates into UECs of 218 to 598 kWh per year.

Table 1.1 below summarizes the range of UEC estimates for vapor compression and thermoelectric wine chillers (sales-weighted values are also reported for vapor compression units). For vapor compression units, the UEC estimates represent the values deduced from the CEC maximum energy use standards and the NPD data. For thermoelectric products, DOE

[3] California Energy Commission, 2010 Appliance Efficiency Regulations, December 2010. CEC-400-2010-012. <http://www.energy.ca.gov/2010publications/CEC-400-2010-012/CEC-400-2010-012.PDF>

[4] NPD Group, Inc. <http://www.npd.com/corpServlet?nextpage=corp_welcome.html>

[5] Coefficient of Performance, defined as the system's refrigerating capacity (in Watts) divided by the system power input (in Watts).

calibrated the derived UEC estimates to the metered data, which are significantly lower than the derived UEC estimates. Thus, DOE estimated a range extending from 218 kWh (the low-end of the metered UEC range) to 1978 kWh, which is the high-end of the metered UEC range (598 kWh) multiplied by the ratio of the low-end derived UEC to the low-end metered UEC (721 kWh divided by 218 kWh). Table 1.1 also reports the average UEC for thermoelectric units from the metered UEC range. These estimates indicate that both vapor compression and thermoelectric products exceed both the minimum average annual per household energy use of 100 kWh[6] required to establish coverage and the 150 kWh[7] required for establishing energy conservation standards.

Table 1.1 Wine Chiller Sales-Weighted Average UEC Estimates

	Unit Energy Consumption Range (kWh/yr)	
Capacity	**Vapor Compression**	**Thermoelectric**
≤ 30 bottles	288 to 591 (348*)	218 to 1978 (408**)
> 30 bottles	301 to 591 (375*)	NA

* Sales-weighted average. ** Average from metered UEC range.

To establish the NEC of vapor compression and thermoelectric products, historical household shipments are needed. Two sources were considered -- (1) data provided by AHAM as part of the residential refrigerator/freezer standards rulemaking[8] and (2) retail sales data from the NPD Group. In both cases, shipments were assumed to be entirely to the residential sector. The estimates from these sources, however, vary widely, with NPD estimates being as much as ten times greater than AHAM's estimates. Table 1.2 below summarizes the shipments estimates for 2009. Because AHAM does not represent all wine chiller manufacturers, and not all of AHAM's members necessarily reported their sales data, DOE believes that the shipments estimates from the NPD Group are likely to have been based on more comprehensive data and, as a result, are likely to be more representative.

Table 1.2 Wine Chiller Shipments Estimates for 2009

	Shipments	
Capacity	**AHAM**	**NPD Group**
≤ 30 bottles	73,800	469,736 to 704,603
> 30 bottles	14,385	115,809 to 173,713
Total	88,185	585,544 to 878,317

Based on the above UEC and shipments estimates, DOE developed a simple stock accounting model to estimate the NEC of wine chiller products. A key factor to the model's development was estimating historical shipments prior to 2005. DOE estimated that there were appreciable

[6] 42 U.S.C. § 6292(b)(1)(B)

[7] 42 U.S.C. § 6295(l)(1)(A)

[8] "Aggregated Refrigerator-Freezer Shipments and Efficiency Data for DOE Refrigerator-Freezer Energy Efficiency Standards Rulemaking", memorandum received from AHAM, January 16, 2009.

shipments dating back to 1990, but if wine chillers have only recently become a desired consumer good, and/or parts of the market, such as thermoelectric wine chillers, established high sales levels only recently, then such an estimate of historical shipments would lead to an overestimate of NEC. Table 1.3 below summarizes the range of NEC estimates for vapor compression and thermoelectric products. The NEC estimates are based on two assumptions: (1) thermoelectric products represent 80% of wine chiller sales for capacities of 30 bottles and less and (2) product lifetime is 12 years.

Table 1.3 Wine Chiller NEC Estimates

	2011 National Energy Consumption Range (billion kWh/yr)*			
	AHAM Shipments		**NPD Group Shipments**	
Capacity	**Vapor Compression**	**Thermoelectric**	**Vapor Compression**	**Thermoelectric**
≤ 30 bottles	0.04 to 0.08 (0.05**)	0.12 to 1.08 (0.22†)	0.28 to 0.87 (0.41**)	0.86 to 11.71 (1.93†)
> 30 bottles	0.04 to 0.08 (0.05**)	NA	0.49 to 1.44 (0.73**)	NA

*Market Share of thermoelectric for capacities ≤ 30 bottles = 80%; Product lifetime = 12 years.
** NEC based on sales-weighted average UEC. For NPD Group shipments, NEC also based on average shipments.
† NEC based on average UEC value from metered range. For NPD Group shipments, NEC also based on average shipments.

As evidenced from the above results, the NEC of thermoelectric products based on the shipments estimates from the NPD Group could potentially exceed the 4.2 billion kWh threshold required to pursue the establishment of standards. However, DOE recognizes that there is uncertainty associated with the UEC and shipment estimates for wine chillers, and has solicited comment and data on this matter in the proposed determination of coverage of non-compressor residential refrigeration products (proposed coverage determination). 76 FR 69147 (November 8, 2011).

Based on the currently available information, it is unclear whether the national aggregate energy use exceeds 4.2 billion kWh. As a result, while DOE may be authorized to establish coverage for these products under 42 U.S.C. § 6292(a)(20), DOE may not be authorized to set energy efficiency standards for them in light of the minimum energy consumption threshold that must be met. However, as described above, DOE may instead pursue coverage of wine chillers and related products with vapor compression refrigeration technology under its existing authority -- for those products, DOE would have the authority to establish standards for those products without having to satisfy the 4.2 billion kWh requirement. These standards, however, would not apply to thermoelectric wine chillers, which cannot be immediately covered under the existing statutory coverage set by Congress for residential refrigeration products because thermoelectric products do not use a compressor or condenser as provided in the statute. See 42 U.S.C. 6292(a)(1).

1.2.1.4 California Standard Treatment of Thermoelectric Units

DOE notes that the California wine chiller standards, unlike the statutory provision under which DOE must operate, do not make a distinction regarding the cooling technology used in the product. The California rule covers:

> (a) Refrigerators, refrigerator-freezers, and freezers that can be operated by alternating current electricity, including but not limited to refrigerated bottled or canned beverage vending machines, automatic commercial ice-makers, refrigerators with or without doors, freezers with or without doors, walk-in refrigerators, walk-in freezers, and water dispensers, but excluding the following types:
>
> 1. consumer products with total refrigerated volume exceeding 39 ft^3;
> 2. commercial refrigerators, commercial refrigerator-freezers, and commercial freezers with total refrigerated volume exceeding 85 ft^3; except that walk-in refrigerators and walk-in freezers are not excluded.
> 3. blast chillers; and
> 4. automatic commercial ice makers with a harvest rate less than 50 lbs./24 hours and automatic commercial ice makers with a harvest rate greater than 2500 lbs./24 hours.
>
> (California Code of Regulations, Title 20: Division 2, Chapter 4, Article 4, Section 1601(a))

The California regulations also (a) explain that the definitions for "refrigerator" and "refrigerator-freezer," which do not include an upper temperature limit for the "refrigerator compartment," include products that store wine and (b) clarify that a "wine chiller" is a refrigerator designed for the cooling and storage of wine. (Id., Section 1602)

The language of these regulations suggest that these standards, including the maximum energy use levels, apply to thermoelectric wine coolers. However, in examining the CEC's database, which contains a complete list of all products certified by manufacturers as satisfying California's energy conservation standards, DOE has identified no thermoelectric units in that list. The absence of thermoelectric products in the CEC database suggests either that thermoelectric-based units do not meet California's energy conservation standards or that manufacturers are not aware that they are covered by these standards.

1.2.1.5 Establishing DOE Coverage for Thermoelectric Products

The requirements for establishing coverage for new consumer products are less stringent than the requirements for establishing energy conservation standards. EPCA indicates that:

> The Secretary may classify a type of consumer product as a covered product if he determines that—
> (A) classifying products of such type as covered products is necessary or appropriate to carry out the purposes of this chapter, and
> (B) average annual per-household energy use by products of such type is likely to exceed 100 kilowatt-hours (or its Btu equivalent) per year.
>
> (42 U.S.C. § 6293(b)(1))

As indicated above, the average per-household energy use of thermoelectric wine chillers is higher than the 100 kWh coverage threshold. However, establishing DOE coverage of thermoelectric wine chillers would preempt California's standards for these products without establishing a national energy standard. Should DOE establish coverage over these products, it would be unclear whether this act alone would reduce national energy use because it would permit the sale in California of thermoelectric wine chillers that do not meet any energy conservation standards -- a result that has the potential to impact the level of energy savings that may already have been achieved by the California standards. In order to establish energy conservation standards at the Federal level, thermoelectric wine chillers must have an average per-household annual energy use of at least 150 kWh and an national aggregate annual energy use exceeding 4.2 billion kWh.

1.2.1.6 Summary of Coverage Options

The coverage options DOE considered for wine chillers and miscellaneous residential refrigeration products included the following:

1) Establish coverage and energy conservation standards for vapor compression products under 42 U.S.C. § 6292(a)(1) by modifying product definitions for refrigerator and refrigerator-freezer to include these products, and either;
    a. Establish coverage for thermoelectric products under 42 U.S.C. § 6292(a)(20) (and preempt current California standards for such products), or
    b. Do not pursue coverage for thermoelectric units.

2) Establish coverage for wine chillers and related products under 42 U.S.C. § 6292(a)(20), irrespective of the cooling technologies they use. This approach may preclude pursuit of energy conservation standards for any of these products because of the 4.2 billion kWh requirement.

As discussed in section 1.2.1.2, DOE considered the first option to be more appropriate in terms of the regulatory structure for covered products that is established by EPCA. With regard to thermoelectric units, as discussed in section 1.2.1.3, DOE has published a proposal for coverage of non-compressor residential refrigeration products, which includes thermoelectric units. 76 FR 69147 (November 8, 2011). Therefore, DOE plans to consider coverage of these products (sub-option a, above), subject to the comments and data received in response to the proposal.

Although DOE has tentatively decided to pursue the first option, it still seeks information and comments from stakeholders regarding the coverage of wine chillers. Some of these questions have also been asked in the coverage determination proposal. DOE may adjust its approach consistent with the input it receives from the public.

Item 1-1 *DOE requests shipment information from stakeholders for wine chillers and related refrigeration products. Segregation of such data is desired if possible by type of refrigeration technology (thermoelectric, vapor-compression, absorption), product size, product class, and any other relevant characteristics*

Item 1-2 *DOE requests energy use data for wine chillers and related refrigeration products that is not readily available in public databases such as that of the CEC. DOE requests that the data identify model numbers or basic product information (e.g. cabinet volume) and that the method of determining the energy use be identified for such data, specifically to identify the test procedure used and/or to indicate that the data are estimates, field measurements, or determined by other methods. DOE requests that such data be segregated if possible according to refrigeration technology, product class, and/or product size.*

Item 1-3 *DOE requests comment on its options for establishing coverage and energy conservation standards for wine chillers.*

1.2.2 Product Definitions

Existing definitions for the term "wine chiller" include the following:

AHAM HRF-1-2008 (section 3.4): "A cabinet designed and marketed exclusively for the cooling and storage of wine."

CEC-400-2006-002-REV2, Section 1602: ""Wine chiller" means a refrigerator designed for the cooling and storage of wine."

CSA 300-08, section 2: "a cabinet designed and marketed exclusively for the cooling and storage of wine."

Australia/New Zealand AS/NZS 4474.1:2007:

> Wine storage cabinet/compartment—An appliance or a compartment within an appliance which is specifically designed exclusively for the storage and/or long term maturation of wine. Key characteristics of wine storage cabinets/compartment include constant temperature over time, specific humidity characteristics and low vibration. They may be designed to have stratified temperature zones. Typical characteristics include—
>
> > (i) the capability of maintaining continuously a nominated temperature (typically 14°C to 16°C) at an ambient temperature either, above or below the nominated temperature usually with heating as well as cooling;
> > (ii) the capability of maintaining temperatures within a variation over time of less than 0.5 K;
> > (iii) control of the compartment humidity; and
> > (iv) construction to reduce the transmission of vibration to the compartment, whether from the refrigerator compressor or from external source.

DOE is considering the following definition for electric wine chiller:

> Electric wine chiller means a cabinet (a) designed for the refrigerated storage of beverages, non-perishable food products, and/or any other items, (b) not designed to be

> capable of achieving storage temperatures below 39 °F (3.9 °C), and (c) having a source of refrigeration requiring single phase, alternating current electric energy input only.

This definition differs from the other definitions mentioned above since it (a) does not limit itself to wine storage usage, (b) is based on a specific temperature range rather than marketing characteristics, and (c) is otherwise more consistent with the existing DOE definition for refrigerator. DOE has already clarified that products marketed as wine chillers that are consistent with the definition for refrigerator, i.e. products that are designed for storage temperatures below 39 ˚F, are considered refrigerators under the DOE test procedures and standards. (See, e.g. 75 FR 78810, 78817 (December 16, 2010)).

Further, DOE seeks to establish coverage for products that are not marketed exclusively for the cooling and storage of wine but that do not meet the definition for refrigerator (i.e. incapable of reaching temperatures below 39 ˚F) or any other covered product type. Such products might include, but not be limited to, those that are marketed as "beverage coolers" or "beverage centers". In the interests of consistency, a term other than "wine chiller" may be appropriate to refer to these products if they have compartment temperatures warmer than 39 ˚F. DOE has not selected an alternative term, but requests comment regarding whether an alternative should be used, and what an appropriate term might be.

DOE would also modify the definition for refrigerator as: "A refrigerator means an electric refrigerator or an electric wine chiller."

Further, DOE would modify the definition of compact refrigerator/refrigerator-freezer/freezer as follows to avoid establishing a separate compact category of wine chiller, since the majority of residential wine chiller sales are of products within the compact size range.

> Compact refrigerator/refrigerator-freezer/freezer means any refrigerator, refrigerator-freezer or freezer with total volume less than 7.75 cubic feet (220 liters)(rated volume as determined in Appendix A1 and B1 of subpart B of this part) and 36 inches (0.91 meters) or less in height that is not an electric wine chiller.

Item 1-4 *DOE requests comment on the suggested definition for wine chiller and the modified definitions for refrigerator and compact products.*

Item 1-5 *DOE requests comments from stakeholders regarding the selection of a term identifying the product category associated with wine chillers and related refrigeration products whose compartment temperatures are warmer than 39 ˚F—should they all just be called wine chillers? In addition, DOE seeks comment on whether multiple product categories are necessary to address such products.*

1.2.3 Hybrid Products

During the refrigerator energy conservation standards and test procedure rulemakings, DOE became aware of products that combine wine storage compartments with refrigerator (fresh food) compartments and/or freezer compartments. 75 FR 78810, 78816-78817 (December 16, 2010).

DOE clarified in its December test procedure notice that its refrigerator and refrigerator-freezer definitions applied to products that included one or more wine storage compartments but excluded those products that combined a wine chiller with a freezer. *Id*. at 78817. DOE did not develop a test procedure to address the wine storage compartments of products that are covered under the new refrigerator and refrigerator-freezer definitions. In early 2011, DOE provided guidance on how to test such products. ("Guidance with Respect to Scope of Coverage for Hybrid (Wine Storage) Refrigeration Products" (Feb. 10, 2011)) available at http://www1.eere.energy.gov/buildings/appliance_standards/residential/pdfs/refrigerator_definition_faq.pdf, p. 4). That guidance also indicated that test procedure waivers may need to be obtained if a product cannot be tested under the current test procedure. The guidance included a table showing a number of possible product configurations having different types of compartments, which is reproduced below as

Table 1.44.

Table 1.4 Product Definitions Applicable to Different Compartment Combinations in a Residential Refrigeration Product

		Compartment Types				
		Freezer ("long term")	Freezer ("short term")	Freezer ("ice only")	Fresh Food	"Wine Storage"
Product Types	COVERED PRODUCT COMBINATIONS					
	All-Refrigerator				✓	
					✓	✓
				✓	✓	
				✓	✓	✓
	Refrigerator other than an All-Refrigerator		✓		✓	
			✓		✓	✓
	Refrigerator-Freezer	✓			✓	
		✓			✓	✓
	Freezer	✓				
	EXAMPLES OF CURRENTLY UNCOVERED PRODUCT COMBINATIONS					
	Wine Storage only					✓
	Wine Storage with "long term" freezer	✓				✓
	Wine Storage with "short term" freezer		✓			✓

Note: All-refrigerators with "ice-only" freezer compartments may have just one such compartment. DOE is not aware of the existence of such products with more than one "ice-only" freezer compartment and has not made a determination of the product type definition applicable for such a combination.

The compartment types mentioned in the table were defined in the guidance document as follows:

- Freezer ("long-term"): a freezer compartment capable of 0 ˚F storage temperature. These compartments are typically found in refrigerator-freezers or freezers.
- Freezer ("short-term"): a freezer compartment larger than 0.5 cubic feet in volume capable of storage temperatures less than 32 ˚F but normally not less than 8 ˚F. These compartments are generally found in refrigerators other than all-refrigerators[9].
- Freezer ("ice only"): a freezer compartment of 0.5 cubic feet capacity or less capable of storage temperatures less than 32 ˚F but normally not less than 8 ˚F. These compartments may be found in all-refrigerators.
- Fresh food compartment: a compartment capable of storage temperatures less than 39 ˚F, generally not controllable to temperatures less than 32 ˚F.
- "Wine storage" compartment: a compartment not capable of 39 ˚F storage temperature that provides warmer temperatures than 39 ˚F. Generally such compartments are designed for storage of wine.

Adding a "wine storage" compartment, regardless of size, to a product that is otherwise a refrigerator or a refrigerator-freezer, does not change its status as a refrigerator or refrigerator-freezer or affect its coverage. As described in the guidance, such products must be tested as refrigerators or refrigerator freezers, using the applicable test procedures. Depending on the design details of the additional "wine storage" compartment, this compartment would be tested as a fresh food compartment, even if it cannot attain fresh food compartment temperatures. In contrast, the guidance indicated that adding a wine storage compartment, regardless of size, to a product that is otherwise a freezer, does change its status and places it outside of coverage. This result is largely due to the specifics of the freezer definition and the technical operation of these products.[10]

As indicated in the guidance, DOE recognized the limitations of its guidance and indicated that the agency was considering a separate rulemaking to resolve some of these limitations. This document initiates the process of evaluating a possible rulemaking for wine chiller products that would include provisions related to hybrid products. To that end, this document seeks input from manufacturers and other interested parties regarding hybrid products that combine wine storage compartments with fresh food and/or freezer compartments.

A possible framework for addressing the issues highlighted in this section could include the following changes to the applicable definitions and test procedures:

1) Setting a threshold size in cubic feet or as a percentage of total volume for a wine storage compartment at which a refrigerator, refrigerator-freezer, or freezer is no longer one of these products and becomes a "hybrid" product.

[9] An all-refrigerator is a refrigerator that does not have a compartment for the freezing and long-term storage of food below 32°F, but which may have a compartment not larger than 0.5 cubic foot in size for freezing and storage of ice. (10 CFR part 430, subpart B, appendix A1, section 1.2)

[10] In particular, the standardized temperature for a freezer is 0 ˚F, while the standardized temperature for the fresh food compartment of a refrigerator-freezer is 45 ˚F under current test procedures and 39 ˚F under test procedures that manufacturers will need to use for compliance purposes in 2014. A wine storage compartment can be expected to approach a 45 ˚F temperature during testing, but approaching 0 ˚F would be extremely unlikely given the nature of the product.

2) Establishing definitions for hybrid products as necessary to address product types that represent or are expected to soon represent significant market share.
3) Developing test procedures for products with wine storage compartments smaller than the thresholds set in item (1) above for (a) setting compartment temperatures during testing, (b) measuring wine storage compartment temperature, (c) modifying the manner in which to calculate energy use based on temperatures of all compartments (which could include the wine storage compartment), (d) modifying the adjusted volume calculation using a reduced (less than 1.0) volume adjustment factor for the wine storage compartment.
4) Applying either the current or September 2014 energy conservation standards to products that will remain classified as refrigerators, refrigerator-freezers, or freezers. Because of the operation of these products, DOE anticipates that such products will use less energy than products with the same volume that have no wine storage compartments. (Products with wine storage compartments should require less energy to chill their wine storage compartments because these compartments will operate at higher temperatures.) However, the maximum allowable energy use for the products would also be lower, due to the reduced adjusted volume.
5) Developing test procedures and energy conservation standards for hybrid products falling out of the modified definitions for refrigerator, refrigerator-freezer, and/or freezer.

Item 1-6 *DOE requests general comments on its draft framework for addressing products that include fresh food and/or freezer compartments as well as wine storage compartments.*

Item 1-7 *DOE seeks information regarding the types and configurations of products that might need to be considered under such a framework, including examples showing product details and information on annual shipments associated with such products.*

Item 1-8 *DOE seeks comment on whether there should be a threshold size or percent of total volume for wine storage compartments that would push a product out of the current definitions for refrigerator, refrigerator-freezer, or freezer into hybrid product categories. If so, what should this threshold be? What types of hybrid product categories should be established?*

Item 1-9 *DOE seeks comment on what kinds of test procedure revisions would be required to address these products, whether covered under the existing product categories or by new categories?*

Item 1-10 *DOE seeks comment on whether it should develop separate definitions and energy conservation standards for hybrid products.*

1.2.4 Refrigeration Products Using Either AC or DC Electricity

DOE is aware of some refrigeration products that operate using power input other than alternating current (AC) electricity -- e.g. direct current (DC) electricity. DOE's ability to regulate these products, however, is somewhat limited by the statutory framework laid out by EPCA. First, many of these products are used solely in mobile applications (such as boats or

recreational vehicles). Under EPCA, unless a product is designed solely for use in recreational vehicles or other mobile equipment, that product is potentially subject to coverage under relevant standards. *See* 42 U.S.C. § 6292(a). Second, the coverage established by EPCA with respect to refrigeration products is limited to those units that can operate on alternating current electricity. (42 U.S.C. § 6292(a)(1)). The language of this provision suggests that so long as a residential refrigeration product can operate on AC power, it would be covered under EPCA provided that it does not fall under the exclusions delineated in 42 U.S.C. § 6292(a)(1).

Item 1-11 *DOE seeks information regarding whether refrigeration products which operate on either alternating current (AC) or direct current (DC) electricity are distributed to any significant extent in commerce for personal or consumer use in stationary applications (e.g., in homes). What types of such products are sold, what are their annual shipment levels in the U.S., and what are their energy use characteristics?*

Item 1-12 *DOE seeks comment on the merits of developing test procedures, definitions, and energy conservation standards for refrigeration products which operate on either alternating current (AC) or direct current (DC) electricity.*

1.2.5 Other Residential Refrigeration Products

Section 1.1 above discusses the possibility of extending coverage and establishing energy conservation standards for all residential refrigeration products that DOE's standards do not currently cover. While DOE presumes that wine chillers and other refrigeration products with storage temperatures warmer than those of refrigerators represent the key product category that fits this description, there may be other residential refrigeration products not yet considered. This section addresses the question of whether additional residential refrigeration products exist and the available framework for addressing these products. As part of this discussion, DOE seeks information regarding all such potential products, including relevant information to assist DOE in determining whether such products are subject to coverage and whether pursuit of coverage and energy conservation standards would be appropriate.

One such product category that DOE may consider covering is residential ice makers. These devices consist of an insulated cabinet, a refrigeration system, and an automatic icemaker.[11] Some of these devices use automatic icemakers identical to those installed in refrigerator-freezers while others use automatic icemakers derivative of commercial automatic ice makers, in which the water being frozen circulates over the evaporator mold surface while freezing, using a sump, pump, and water distribution system. This latter arrangement allows dissolved gases and solids in the water to be carried to the sump rather than trapped in the freezing ice—a portion of the sump water must be drained between freeze cycles to remove the dissolved solids, thus, preventing them from coming out of solution in the form of scale coating on the icemaker

[11] Note, in this discussion DOE is using the term "ice maker" to denote a product or equipment that includes a refrigeration system whose sole purpose is to make and possibly store ice. In contrast, the term "automatic icemaker" denotes a device or system that is installed within an ice maker or other refrigeration product and that does not include a complete refrigeration system but can make ice when provided with cooling from a refrigeration system.

surfaces. (A typical icemaker found in a refrigerator-freezer freezes water held motionless in a mold.)

EPCA sets energy conservation standards for those automatic commercial ice makers with ice harvest rates between 50 and 2,500 lb/day. (42 U.S.C. § 6313(d)(1)) Residential ice maker products typically have ice production rates of up to 50 lb/day and, thus, are not subject to these standards.

Item 1-13 *DOE requests information regarding whether there are any residential refrigeration products not yet covered by energy conservation standards, other than the wine chillers and related hybrid products noted earlier, that DOE should regulate through energy conservation standards? Assuming such products exist, what are they (i.e. types), what are their annual shipment levels in the U.S., and what are their energy use characteristics?*

Item 1-14 *DOE seeks information regarding residential ice makers. Specifically, DOE seeks information regarding: (1) the annual sales levels for such products in the U.S,; (2) whether test procedures exist to address the energy use of these products; (3) information regarding the typical annual energy use of such a product in a residential usage setting; and (4) what information DOE should consider when determining whether to cover these products and what energy conservation standard levels to set for them?*

1.2.6 Combined Coverage of Wine Chillers used in both Residential and Commercial Applications

EPCA defines consumer product as follows:

> The term "consumer product" means any article (other than an automobile, as defined in section 32901 (a)(3) of title 49) of a type—
>
> (A) which in operation consumes, or is designed to consume, energy or, with respect to showerheads, faucets, water closets, and urinals, water; and
>
> (B) which, to any significant extent, is distributed in commerce for personal use or consumption by individuals;
>
> without regard to whether such article of such type is in fact distributed in commerce for personal use or consumption by an individual, except that such term includes fluorescent lamp ballasts, general service fluorescent lamps, incandescent reflector lamps, showerheads, faucets, water closets, and urinals distributed in commerce for personal or commercial use or consumption.
>
> (42 U.S.C. § 6291(1))

Likewise, EPCA distinguishes certain commercial equipment categories by indicating that they are not consumer products. For example, one of the seven attributes of a commercial refrigerator, refrigerator-freezer, or freezer is that it "is not a consumer product (as defined in section 6291 of this title)" (42 U.S.C. § 6311(9)(A)(i)) EPCA also indicates more generally that equipment can be defined as covered by these commercial and industrial categories if it is of a type that is, to

any significant extent, distributed in commerce for industrial and commercial use. (42 U.S.C. § 6311(2)).

DOE is aware that wine chillers are used in both commercial and residential (consumer) applications. However, DOE is concerned that market characterization of a product as "commercial" does not necessarily mean that such a product qualifies as commercial equipment under EPCA. While DOE is aware of several attributes that could distinguish commercial types of wine chillers from residential types, it has insufficient information to definitively conclude that wine chillers with uniquely commercial features exist or what those uniquely commercial features would be. Furthermore, DOE does not have access to the necessary distribution chain information to definitively conclude that wine chillers with commercial features are not distributed to any significant extent for personal use.

DOE notes that the products that could potentially be considered under this residential wine chiller rulemaking would be those that (a) have a compressor and condenser unit integrated with the cabinet, (b) operate on alternating current electricity, and (c) are designed to be used with doors. These criteria are specified under EPCA. *See* 42 U.S.C. § 6292(a)(1).

The ongoing Commercial Refrigeration Equipment (CRE) rulemaking has adopted an approach in which commercial wine chillers are categorized as one of the following two equipment classes established for CRE equipment -- "vertical closed transparent, medium temperature, self-contained" and "vertical closed solid, medium temperature, self-contained" (VCT.SC.M and VCS.SC.M).[12] However, the rating temperature for such equipment is 38 ˚F -- one degree less than the temperature specified for residential refrigerators and refrigerator-freezers for fresh food storage. Most commercial wine chillers rarely operate at temperatures this low, with the design operating temperature generally ranging between 50 ˚F and 60 ˚F.[13] DOE has not pursued separate equipment classes for commercial wine chillers in the CRE rulemaking because their market share is less than 1% of commercial refrigeration equipment. The CRE Technical Support Document (TSD) presents 2005 AHRI shipment data that includes 264,000 shipments.[14] Hence, according to these industry-provided data, commercial wine chiller annual shipments are expected to be under 3,000.

Under 10 CFR 430.32(a), the energy conservation standards are limited to those refrigerators and refrigerator-freezers with total volume no greater than 39 cubic feet and freezers with total volume no greater than 30 cubic feet. However, DOE may opt to alter this approach for residential wine chillers if it decides to establish energy conservation standards.

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[12] "Preliminary Technical Support Document (TSD): Energy Conservation Program for Certain Commercial and Industrial Equipment: Commercial Refrigeration Equipment", Market and Technology Assessment, Chapter 3 (CRE TSD Chapter 3), Table 3.2.4, page 3-16, http://www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/cre_pa_tsd_ch3_market.pdf

[13] "Delfield Specification Line Self-Contained Solid Door Wine Cabinet Reach-In", http://www.delfield.com/docs/uploaded/del/specsheets/DSSSW.pdf; "Traulsen Wine Cooler Models", http://www.traulsen.com/uploadedFiles/Traulsen/Products/Special_Applications/Wine%20Cooler%20Sales%20Flyer.pdf

[14] CRE TSD Chapter 3, page 3-18.

If necessary, DOE may also consider adjusting the wine chiller definition to help distinguish between consumer and commercial applications.

Item 1-15 *DOE seeks comment on what design and performance characteristics distinguish wine chillers used in commercial applications from residential wine chillers. DOE also requests comment on whether any wine chillers used in commercial applications are manufactured on the same product lines as residential wine chillers. Finally, DOE seeks information as to whether any commercial wine chillers are distributed in commerce for personal or consumer use. If any commercial wine chillers are in fact sold to individual consumers, DOE seeks details regarding the magnitude of those sales as a percentage of total sales of those products.*

Item 1-16 *DOE requests comment on whether commercial and residential wine chillers should be covered under the same test procedures and energy conservation standards.*

1.2.7 Near-Freezers

During the residential refrigeration product test procedure rulemaking, Earthjustice raised the issue of products sold as freezers that do not meet the standardized compartment temperature for freezers. 75 FR 78810, 78816 (December 16, 2010). Such products would not meet the regulatory definition for freezer -- "Freezer means a cabinet designed as a unit for the freezing and storage of food at temperatures of 0 °F or below, and having a source of refrigeration requiring single phase, alternating current electric energy input only."[15] Hence, under this definition, products sold as freezers but are not designed to store food at 0 °F or below would not be covered under the current definition and accompanying standards.

In order to prevent manufacturers from avoiding the standards by designing freezers with temperature ranges that hover just above 0 ˚F, DOE may consider modifying the freezer definition. DOE notes that the test procedure interim final rule specifies that, starting in 2014, freezers that are unable to meet the standardized temperature with their controls set at the coldest setting fail the test and may not be rated. 75 FR 78810, 78868 (December 16, 2010). Hence, the sale of such "near-freezers" could be banned by modifying the freezer definition to ensure that it is not limited to products that cannot meet the 0 ˚F standardized temperature.

Alternatively, DOE could consider modifying the freezer test procedure to allow testing of such products with a modified standardized temperature. Under that approach, DOE would consider using a modified volume adjustment factor for the tested product, which would allow for calculation of the adjusted volume based on the warmer standardized temperature. This method would lower the calculated energy standard for such a product by accounting for the reduced energy requirements for these products. Such changes may allow coverage and sale of near-freezers in a way that subjects them to the existing energy conservation standards without requiring the development of separate product classes. DOE could also consider the further step of establishing separate product classes for such products with their own energy conservation standards.

[15] 10 CFR 430.2

Item 1-17 *DOE seeks information regarding the prevalence of "near-freezer" products. DOE also seeks input regarding the need to revise the current freezer definition and/or test procedures to address such products. Further, DOE seeks input on whether it should include these products under existing classes or create separate product classes and standards for these products. If so, DOE requests comments regarding the nature of such needed revisions.*

1.2.8 Test Procedures

The Code of Federal Regulations (CFR) describes the DOE test procedures for residential refrigeration products.[16] The test procedures for products manufactured starting in 2014 appear in 10 CFR 430.23, Appendix A (for refrigerators and refrigerator-freezers), and Appendix B (for freezers). However, these test procedures do not include provisions for testing products such as wine chillers that do not meet the current definition for electric refrigerators. In particular, the standardized compartment temperatures specified in the test procedures are significantly lower than those typical for wine chillers. The standardized compartment temperatures provided in Appendix A are as follows:

- Fresh food compartments: 39 ˚F (3.9 ˚C)
- Freezer compartments of refrigerators: 15 ˚F (-9.4 ˚C)
- Freezer compartments of refrigerator-freezers: 0 ˚F (-17.9 ˚C)

Appendix A, section 3.2

In contrast, wine storage temperatures are typically much higher. For example, the Association of Home Appliance Manufacturers (AHAM), the California Energy Commission (CEC), and Natural Resources Canada (NRCan) have each adopted a standardized compartment temperature of 55 ˚F (12.8 ˚C) for wine chiller testing.[17]

There may also be other refrigeration products that do not meet the current definition for electric refrigerator, such as beverage coolers or beverage centers. These products currently are excluded from coverage under the standards for refrigerators if they are not designed for a 39 ˚F storage temperature. Hence, the current test procedure for refrigerators is also inappropriate for these products.

Further, DOE was unable to find examples of industry, state, or international standards specifying standardized temperatures for such products, other than wine chillers. Hence, there is no obvious alternative temperature other than 55 ˚F that might be used for them during testing. However, many of the products identified as wine chillers on the CEC list of certified

[16] Title 10—Energy, Chapter II—Department of Energy, Part 430—Energy Conservation Program for Consumer Products. Subpart B—Test Procedures: Section 23; Appendices A1 and B1 for products manufactured prior to January 1, 2014; and Appendices A and B for products manufactured on or after January 1, 2014.

[17] AHAM Standard HRF-1-2008, "Energy and Internal Volume of Refrigerating Appliances", section 5.6.2; "Appliance Efficiency Regulations", CEC-400-2006-002-REV2, Section 1604(a)(1), Table A-1; "Energy Performance and capacity of household refrigerators, refrigerator-freezers, freezers, and wine chillers", C300-08, section 5.3.6.2.

refrigeration products[18] are actually beverage centers or other beverage-oriented products other than wine chillers.

DOE believes that the key issues in developing test procedures for wine chillers and related residential refrigeration products are as follows:

- Establishing definitions for product categories and/or compartment types to clarify which products are subject to which test requirements. (See section 1.2.2 above.)
- Establishing standardized compartment temperatures that are appropriate for the product categories.
- Testing for hybrid products. (See section 1.2.3 above.)
- Potential consideration of test procedures for commercial wine chillers. See section 1.2.4 above.
- Applying a correction factor to determine the energy use of wine chillers and related products.
- Potential consideration of additional test procedure requirements to address standby and/or off mode energy use.

Item 1-18 *DOE seeks comment regarding whether there are any other key issues, aside from the ones noted in this document, that DOE should consider when developing test procedures for wine chillers and related refrigeration products, and, if so, what these issues are.*

1.2.8.1 Compartment Definitions and Standardized Compartment Temperatures

In section 1.2.3 above, DOE discussed establishing a definition for "wine chiller" to mean products that are not capable of storage temperatures below 39 ˚F (3.9 ˚C). Also, in section 1.2.3, DOE discussed so-called "hybrid" products that combine "wine storage" compartments with fresh food and/or freezer compartments. DOE anticipates that a new rule to establish test procedures for such products may include the addition of a definition for "wine storage" compartments and a standardized temperature for testing purposes. In establishing these test procedure details, DOE will consider the available test procedures that address wine chillers, e.g. AHAM HRF-1-2008, CSA C300-08, and CEC-400-2006-002-REV2, which all prescribe a standardized compartment temperature of 55 ˚F (12.8 ˚C).[19] The Australia/New Zealand test procedures establish a similar requirement for a "cellar" compartment by prescribing a target temperature during energy testing of 12 ˚C (53.6 ˚F).[20]

[18] California Energy Commission Appliance Database, <http://www.energy.ca.gov/appliances/database/index.html>

[19] AHAM Standard HRF-1-2008, "Energy and Internal Volume of Refrigerating Appliances", section 5.6.2; "Appliance Efficiency Regulations", CEC-400-2006-002-REV2, Section 1604(a)(1), Table A-1; "Energy Performance and capacity of household refrigerators, refrigerator-freezers, freezers, and wine chillers", C300-08, section 5.3.6.2.

[20] "Performance of household electrical appliances—Refrigerating appliances Part 1: Energy consumption and performance", AS/NZS 4474.1:2007, section 3.7.1, table 3.5

DOE recognizes that some products that are not refrigerators may control for temperatures different than 55 ˚F, especially if they are designed for specific purposes other than for the chilled storage of wine. Conversely, assuming that 55 ˚F is a reasonable test temperature for all such compartments, referring to them all as "wine storage" compartments may not be appropriate since these compartments could be capable of safely storing items other than wine.

Item 1-19 *DOE requests comment regarding a potential definition for compartments used in wine chillers and related refrigeration products that are currently not covered under the existing refrigeration product definitions. What compartment types should be defined and what should their standardized temperatures for energy testing be?*

1.2.8.2 Correction Factor

The AHAM, CEC, and CSA test procedures for wine chillers apply a correction factor to the wine chiller energy use calculation to account for average product usage.[21] This factor, equal to 0.85 for all of these test procedures, reduces the measured energy use by 15% to determine the daily energy consumption for a given temperature setting in order to account for the expectation that such products would have fewer door openings, on average, than a household refrigerator, may not be energized at all times, or other reasons that would reduce energy use. The DOE freezer test procedure applies a similar factor to calculate annual energy use, using a correction factor of 0.85 for upright freezers and 0.7 for chest freezers. (10 CFR 430, subpart B, appendix B1, section 5.2.1)

Item 1-20 *DOE requests comments on whether a correction factor is appropriate for calculating wine chiller energy use, and if so, whether 0.85 is an appropriate value for the correction factor. DOE further requests information supporting the selection of any recommended correction factor.*

1.2.8.3 Standby and Off Modes

EPCA, as modified by EISA, requires DOE to consider standby mode and off mode energy consumption when amending both its test procedures and energy conservation standards. Specifically, section 310 of EISA amended section 325 of EPCA (42 U.S.C. § 6295) by adding the following definitions and other requirements pertaining to standby and off mode energy use:

> (gg) STANDBY MODE ENERGY USE.
>
> (1) DEFINITIONS.—
>
> (A) IN GENERAL.—Unless the Secretary determines otherwise pursuant to subparagraph (B), in this subsection:

[21] AHAM Standard HRF-1-2008, "Energy and Internal Volume of Refrigerating Appliances", section 5.8.2.1; "Appliance Efficiency Regulations", CEC-400-2006-002-REV2, Section 1604(a)(1), Table A-1; "Energy Performance and capacity of household refrigerators, refrigerator-freezers, freezers, and wine chillers", C300-08, section 6.3.1.2.

(i) ACTIVE MODE.—The term "active mode" means the condition in which an energy-using product:—

(I) is connected to a main power source;

(II) has been activated; and

(III) provides 1 or more main functions.

(ii) OFF MODE.—The term "off mode" means the condition in which an energy-using product:—

(I) is connected to a main power source; and

(II) is not providing any standby or active mode function.

(iii) STANDBY MODE.—The term "standby mode" means the condition in which an energy-using product:—

(I) is connected to a main power source; and

(II) offers 1 or more of the following user-oriented or protective functions:

(aa) To facilitate the activation or deactivation of other functions (including active mode) by remote switch (including remote control), internal sensor, or timer.

(bb) Continuous functions, including information or status displays (including clocks) or sensor-based functions.

(B) AMENDED DEFINITIONS.—The Secretary may, by rule, amend the definitions under subparagraph (A), taking into consideration the most current versions of Standards 62301 and 62087 of the International Electrotechnical Commission (IEC).

(2) TEST PROCEDURES.—

(A) IN GENERAL.—Test procedures for all covered products shall be amended pursuant to section 323 to include standby mode and off mode energy consumption, taking into consideration the most current versions of Standards 62301 and 62087 of the International Electrotechnical Commission, with such energy consumption integrated into the overall energy efficiency, energy consumption, or other energy descriptor for each covered product, unless the Secretary determines that:—

(i) the current test procedures for a covered product already fully account for and incorporate the standby mode and off mode energy consumption of the covered product,; or

(ii) such an integrated test procedure is technically infeasible for a particular covered product, in which case the Secretary shall prescribe a separate standby mode and off mode energy use test procedure for the covered product, if technically feasible.

* * * * *

(3) INCORPORATION INTO STANDARD.—

(A) IN GENERAL.—Subject to subparagraph (B), based on the test procedures required under paragraph (2), any final rule establishing or revising a standard for a covered product, adopted after July 1, 2010, shall

incorporate standby mode and off mode energy use into a single amended or new standard, pursuant to subsection (o), if feasible.
(B) SEPARATE STANDARDS.—If not feasible, the Secretary shall prescribe within the final rule a separate standard for standby mode and off mode energy consumption, if justified under subsection (o).

For wine chillers and miscellaneous refrigeration products, DOE expects that any modified version of the existing test procedures for refrigeration products that DOE would develop for these products would capture standby and off mode energy use. All energy input for the test duration, including during compressor off cycles, would likely be captured under a modified version of the current procedure for refrigeration products. Hence, under the standby/off-mode provision, a special procedure to capture standby and off mode energy consumption would be unnecessary if this approach were adopted.

Item 1-21 *DOE requests input from stakeholders on its tentative conclusion that separate test procedures to address standby and off modes are not required for wine chillers and related refrigeration products.*

1.3 Overview of the Rulemaking Process

Under EPCA, any new or amended standards must achieve the maximum level of energy efficiency that is technologically feasible and economically justified. In setting any new or amended standards, DOE must consider: (1) the economic impact of the standard on the manufacturers and consumers of the affected products; (2) the savings in operating costs throughout the estimated average life of the product compared to any increases in the initial cost or maintenance expense; (3) the total projected amount of energy savings likely to result directly from the imposition of the standard; (4) any lessening of the utility or the performance of the products likely to result from the imposition of the standard; (5) the impact of any lessening of competition, as determined in writing by the Attorney General, that is likely to result from the imposition of the standard; (6) the need for national energy conservation; and (7) other factors the Secretary considers relevant. (42 U.S.C. § 6295(o)(2)(B)(i) and 42 U.S.C. § 6313(d))

As discussed in further detail below, the standards rulemaking process typically involves four steps for a given consumer product or commercial/industrial equipment type: (1) the publication of a framework document in which DOE describes the overall approach it is considering in developing potential energy conservation standards for a particular product or equipment; (2) the publication of a preliminary analysis that focuses on the analytical methodology DOE is considering in setting potential standards; (3) the issuance of a notice of proposed rulemaking (NOPR); and (4) the issuance of a final rule. At each of the first three steps, DOE holds a public meeting and actively solicits verbal and written comments from the public on a variety of relevant issues under consideration in developing potential standards.

DOE encourages interested parties to develop and submit joint recommendations and will carefully consider such recommendations in its decision making. Preliminary analysis results could serve as the initial basis for the development of these recommendations. DOE's initial analyses suggest that standards for the products examined in this document would likely meet the

necessary energy consumption thresholds required under EPCA. The additional work that will be performed as part of DOE's analyses will help determine whether standards for these products are likely to satisfy the statutory prerequisites noted above.

A brief description of the next steps in DOE's process follows below:

- *Preliminary Analysis* (section 1.3.1). The preliminary analysis is designed to publicly vet the models and tools that DOE intends to use in the rulemaking and to facilitate public participation before the proposed rule stage. Using these models and tools, DOE performs preliminary analyses to assess candidate standard levels (CSLs), which span the range of efficiencies from baseline equipment to the most efficient technology.

- *Notice of Proposed Rulemaking* (section 1.3.2). The NOPR presents a discussion of comments received in response to the preliminary analysis, DOE's analysis of the impacts of potential standards on consumers, manufacturers, and the Nation, DOE's weighting of these impacts, and any proposed standard levels for public comment.

- *Final Rule* (section 1.3.3). The final rule presents a discussion of comments received in response to the NOPR, revised analysis, as appropriate, of the impacts of any standards, DOE's weighting of those impacts, and the standard levels, if any, that DOE is adopting. The final rule also establishes the date by which manufacturers must comply with any standards.

1.3.1 Preliminary Analysis

As part of its energy conservation standards rulemaking activity, DOE typically identifies equipment technology options and makes a preliminary determination on whether to retain each option for detailed analysis or to eliminate it from further consideration. This process includes a market and technology assessment (section 3) and a screening analysis (section 4). DOE applies four screening criteria in the screening analysis to determine which technology options to eliminate from further consideration: (1) technological feasibility; (2) practicability to manufacture, install, and service; (3) adverse impacts on equipment utility or availability; and (4) adverse impacts on health or safety. Technologies that pass through the screening analysis are evaluated, and referred to as technology or design options, in the engineering analysis.

DOE consults with interested parties and independent technical experts and researches industry literature to identify the key issues and design options or efficiency levels that DOE will consider in the rulemaking. This framework document, along with the accompanying public meeting request for public comment, initiates DOE's dialogue with interested parties. This dialogue provides an opportunity for input into the structural and analytical approach planned for the subsequent energy conservation standards rulemaking.

At the start of the preliminary analysis, DOE considers design options or efficiency levels for each product class. DOE uses these design options or efficiency levels to collect manufacturer cost data, historical shipment data, shipment-weighted average efficiency data, and preliminary manufacturer impact data (*e.g.*, capital conversion expenditures, marketing costs, and research

and development (R&D) costs). As part of the preliminary analysis, DOE also conducts other principal analyses, many of which are described in this document, including:

1. Engineering analysis (section 5);
2. Consumer life-cycle cost (LCC) and payback period (PBP) analyses (section 8);
3. National impact analysis (NIA), which considers national energy savings (NES) and consumer net present value (NPV) (section 10); and
4. Preliminary manufacturer impact analysis (MIA) (section 12). DOE will present the results of these analyses in the preliminary analysis technical support document (TSD).

DOE selects candidate standard levels (CSLs) from the energy efficiency or energy use levels considered in the preliminary analysis. Discussion of various CSLs in the preliminary analysis helps interested parties review the spreadsheet models that underpin the analyses. DOE uses comments from interested parties to refine the models for the next stage of the rulemaking analyses. In addition to the efficiency level corresponding to the maximum technologically feasible ("max-tech") design and the efficiency level corresponding to the minimum LCC point, DOE generally considers levels or design options that span the full range of technologically achievable efficiencies. The range of efficiency levels DOE typically analyzes includes the following:

- The baseline efficiency level typically represents products or equipment with the lowest energy efficiency on the market. For equipment where minimum energy conservation standards already exist, the baseline efficiency level is typically defined by the existing energy conservation standard.

- The level with the minimum LCC or greatest LCC savings.

- The highest energy efficiency level or lowest energy consumption level that is technologically feasible (*i.e.*, max-tech).

- Levels that incorporate noteworthy technologies or fill large gaps between other efficiency levels being considered.

At the preliminary analysis stage, DOE uses analytical models and tools to assess the different product classes at each efficiency or energy use level analyzed. Many of these analytical models and tools are in the form of spreadsheets, which are used to conduct the LCC and PBP analyses and to determine the NES and NPV of prospective standards.

DOE makes the spreadsheet tools and results of the preliminary analysis available on its website for review.[22] When it publishes the preliminary analysis, DOE also makes a preliminary TSD available, which contains the details of all the analyses performed to date. After publication of

[22] All materials associated with the rulemakings for wine chiller and miscellaneous refrigeration product test procedures and energy conservation standards are available on DOE's website at:

http://www1.eere.energy.gov/buildings/appliance_standards/residential/refrigerators_freezers.html

the preliminary analysis, DOE provides a public comment period and holds a public meeting to discuss these analyses.

1.3.2 Notice of Proposed Rulemaking

In developing the NOPR, DOE considers all the comments it receives on the preliminary analysis, within the stated comment period. This process can result in revisions to the preliminary analysis, including the engineering and LCC analyses. At this point, DOE conducts additional economic and environmental impact analyses. These analyses, which are described throughout this document, generally include:

1. Consumer LCC subgroup analysis (section 11);
2. Complete MIA (section 12);
3. Utility impact analysis (section 13);
4. Employment impact analysis (section 14);
5. Environmental assessment (section 15); and
6. Regulatory impact analysis (RIA) (section 17).

DOE describes the methodology used and makes the results of all the analyses available on its website for review. Based on comments from interested parties, further revisions to the analysis may be made. This analytical process ends with the selection of proposed standard levels, if any, that DOE presents in the NOPR. DOE selects the proposed standard levels from the trial standard levels (TSLs) analyzed during the NOPR phase of the rulemaking. The NOPR is published in the *Federal Register* document, which describes the evaluation and selection of any proposed standards levels, along with a discussion of other TSLs considered but not selected and the reasons DOE did not select them.

For each product class, DOE identifies the max-tech efficiency level. If DOE proposes a lower level, DOE explains the reasons for eliminating higher levels, beginning with the highest level considered. DOE presents the analytical results in the NOPR and provides the details of the analysis in an accompanying TSD.

DOE considers many factors in selecting proposed standards. These factors are prescribed by EPCA and take into consideration the benefits, costs, and impacts of energy conservation standards.

When DOE publishes the NOPR, it provides the U.S. Department of Justice (DOJ) with copies of the NOPR and TSD to solicit feedback on the impact of any proposed standard levels on competition in the market of the products that are the subject of the rulemaking. DOJ reviews standard levels to help assess the impacts from any lessening of competition likely to result from the imposition of such standards. (42 U.S.C. § 6295(o)(2)(B)(i)(V) and (B)(ii)) Publication of the NOPR is followed by a public comment period that includes a public meeting.

1.3.3 Final Rule

After publication of the NOPR, DOE considers public comments it receives on the proposal and accompanying analyses. DOE reviews the engineering and economic impact analyses and any

proposed standards based on these comments and consider modifications where necessary. Before any final rule is issued, DOE also considers DOJ's comments on the NOPR relating to the impacts of any proposed standard levels on competition to determine whether changes to these standard levels are needed. DOE publishes the DOJ comments and DOE's response as part of the final rule.

In any final rule, DOE would determine whether to amend the standards, and if such determination is positive, select the final standard level based on the complete record of the standards rulemaking. The final rule would set any final standard levels and the compliance date, and would also explain the basis for the selection of any final standard levels. The final rule would be accompanied by a final TSD.

1.3.4 Acceleration of Rulemaking Timeline

DOE may consider accelerating the timeline of the potential rulemaking for an energy conservation standard for wine chillers and miscellaneous refrigeration products. Two options exist to allow for an acceleration of the timeline:

1. Stakeholders negotiate appropriate efficiency levels for the standard and DOE publishes a direct Final Rule. This option could save 7-21 months, depending on how early in the process an agreement is reached.
2. DOE bypasses publication of preliminary analysis documents and the preliminary analysis public meeting and proceeds directly to a NOPR. This option could save 6-8 months.

Item 1-22 *DOE requests comments from stakeholders regarding the possible acceleration of the timeline to publish the final rule and potential implications.*

2. OVERVIEW OF ANALYSES FOR RULEMAKING

The purpose of the analyses is to support DOE's determination on whether to establish energy conservation standards for wine chillers and miscellaneous refrigeration products. The analyses ensure that if standards are established, DOE selects standards that achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified and will result in significant energy savings, as required by EPCA. Economic justification includes the consideration of the factors set forth in EPCA (see section 1.3 of this framework document), which encompass the economic impacts on domestic manufacturers and consumers, national benefits including environmental impacts, issues of consumer utility, and impacts from any lessening of competition.

summarizes the analytical components of the DOE standards-setting process. The analyses are presented in the center column. Each analysis has a set of key inputs, which are data and information required for the analysis. "Approaches" are the methods that DOE will use to obtain key inputs, which may vary depending on the information in question. Some key inputs exist in

public databases. DOE will also collect information from interested parties or others with special knowledge and develop information independently to support the rulemaking. The results of each analysis are key outputs, which feed directly into the rulemaking. Arrows indicate the flow of information between the various analyses. DOE ensures a consistent approach to its analyses throughout the rulemaking by considering each analysis as a part of the overall standard-setting framework.

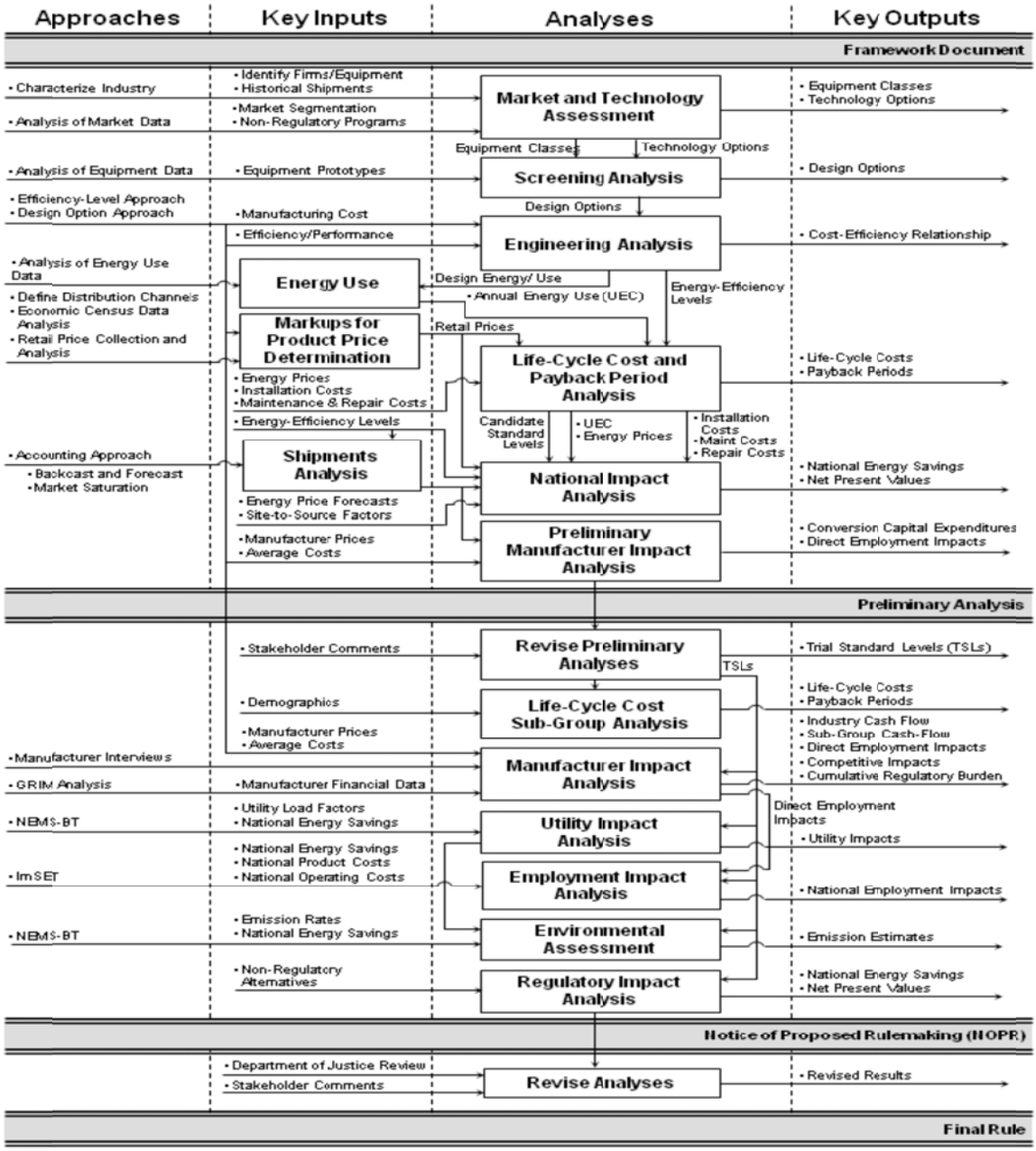

Figure 2.1 Flow Diagram of Analyses for the Wine Chiller and Miscellaneous Refrigeration Product Standards Rulemaking Process

DOE notes that section 1 above pertains to a range of product types, including wine chillers and miscellaneous residential refrigeration products that use any of three different refrigeration technologies (vapor compression, thermoelectric, and absorption). The section also discusses hybrid products and commercial wine chillers. However, the discussion in the following sections is limited to residential vapor compression refrigeration products that are currently not covered under the definitions for refrigerator, refrigerator-freezer, or freezer.

3. MARKET AND TECHNOLOGY ASSESSMENT

The market and technology assessment provides information about the residential wine chiller and miscellaneous refrigeration products industries and specifics about the performance attributes of these products. DOE uses this assessment throughout the rulemaking. This assessment is particularly important at the outset of the rulemaking to determine product classes and to identify potential design options or efficiency levels for each product class.

3.1 Market Assessment

DOE qualitatively and quantitatively characterizes the structure of the residential wine chiller and miscellaneous refrigeration products industries and markets. DOE's market assessment identifies and characterizes the manufacturers of this equipment, estimates market shares and trends, addresses regulatory and non-regulatory initiatives intended to improve the energy efficiency or reduce the energy consumption of products covered by this rulemaking, and explores the potential for technological improvements in the design and manufacturing of such equipment.

The market assessment phase allows DOE to gather data that can help identify important issues later in the potential rulemaking (*e.g.*, potential small business impacts, competitive disruptions, and other factors that may arise from enacting standards). For example, DOE uses historical equipment shipments and prices as an indicator of future shipments and prices. Market structure data can be particularly useful for assessing competitive impacts as part of the manufacturer impact analysis. This phase also allows DOE to start updating design options by reviewing product literature, industry publications, and company websites.

Item 3-1 *DOE requests information that would contribute to the market assessment for the residential wine chillers and miscellaneous refrigeration products that would be covered in this potential rulemaking. Examples of information sought include current product features and efficiencies, product-feature and efficiency trends, historical product shipments and prices).*

3.2 Product Classes

For some product types, DOE develops separate product classes and formulates separate energy conservation standards for each class. The general criteria for separation into different classes include (1) type of energy used, (2) capacity, and (3) other performance-related features such as

those that provide utility to the consumer, or others deemed appropriate by the Secretary that would justify the establishment of a separate energy conservation standard. (42 U.S.C. § 6295(q) and 6316(a))

DOE has identified two potential product classes for wine chillers and miscellaneous refrigeration products as shown in Table 3.1. While the CEC has established separate product classes for residential wine chillers with manual and automatic defrost, only five of the 219 units listed in the CEC database are categorized as manual defrost products. Further inspection of these units revealed that four of these five either are listed as having automatic defrost on the manufacturer's website or product literature, or have been discontinued from production. DOE has not confirmed whether the single remaining product is a manual defrost product. Section 3.3 asks whether any wine chiller or related refrigeration products actually use manual defrost -- if no such products exist, DOE would likely eliminate that class from further consideration.

DOE also notes that a potential rulemaking may address products designed for wine storage and other products that do not fit the current definitions for refrigerator, refrigerator-freezer, or freezer. Some of these other products may not have transparent doors, which are common for most wine chillers. Depending on the prevalence of such solid-door products, the efficiency differences between solid and transparent doors, and the consumer utility associated with transparent doors, DOE may consider establishing separate product classes for solid-door products.

Table 3.1 Residential Wine Chiller and Miscellaneous Refrigeration Product Classes

No.	Product Class
1	Residential wine chillers and miscellaneous refrigeration products with manual defrost
2	Residential wine chillers and miscellaneous refrigeration products with automatic defrost

Item 3-2 *DOE requests input from stakeholders on the proposed product classes. What other factors, if any, should DOE consider beyond those identified above as a basis for developing product classes? When answering, please explain in detail and cite specific examples to the extent possible.*

Item 3-3 *DOE requests information on solid-door products that would fit the definitions anticipated for wine chillers including: the prevalence of such products, the efficiency differences, if any, with respect to transparent-door products versus those products with solid doors, and whether there is sufficient consumer utility associated with transparent doors to merit creating a separate product class on this basis?*

3.3 Technology Assessment

The technology assessment centers on understanding how energy is used by the product or equipment and potential changes that would reduce energy consumption. DOE typically uses

information about existing "technology options," based on existing technologies and prototype designs and concepts, as input in identifying technologies that manufacturers of those products could use to attain higher energy efficiency levels. In consultation with interested parties, DOE develops a list of technologies to consider in this analysis. Initially, this list includes all those technologies considered to be technologically feasible and helps DOE determine the max-tech design, based on a review of efficiencies of available products and their features.

Table 3.2 below provides a preliminary list of technologies that DOE will consider. These include (a) technologies from the residential refrigeration product standards rulemaking, (b) additional technologies addressing efficiency improvements associated with transparent-door refrigerators, (c) additional technologies described in recent trade publications, research reports, and manufacturer product offerings. The technologies considered in DOE's 2011 residential refrigeration product rulemaking are identified in the corresponding TSD.[23] Technologies not identified in that TSD include anti-fog films and improved thermal resistance glass and frames for transparent doors. DOE has specific questions related to specific technology options.

Item 3-4 *DOE requests information on whether any wine chillers or miscellaneous refrigeration products utilize heating (electric or otherwise) on glass surfaces or on door face frames to prevent condensation. If so, what types of products utilize such heating and what percentage of shipments do they represent?*

Item 3-5 *DOE seeks clarification on whether any wine chillers or miscellaneous refrigeration products utilize defrost heating (i.e. automatic defrost methods other than by frost melting during the compressor off-cycle). If so, what types of products utilize defrost heating and what percentage of shipments do they represent? DOE also requests clarification on whether any wine chillers or miscellaneous refrigeration products utilize manual defrost—what types of products require manual defrost and what percentage of shipments do they represent?*

Item 3-6 *DOE requests information regarding whether any wine chillers or miscellaneous refrigeration products utilize anti-sweat heating of any kind (electric resistance, refrigerant loop, etc.)?*

[23] "Preliminary Technical Support Document (TSD): Energy Conservation Program for Consumer Products: Refrigerators, Refrigerator-Freezers, and Freezers", Market and Technology Assessment, Chapter 3 (RRP TSD Chapter 3), Table 3.3.1, page 3-46, http://www1.eere.energy.gov/buildings/appliance_standards/residential/pdfs/refrig_nopr_tsd_2010-09-23.pdf.

Table 3.2 Wine Chiller and Miscellaneous Refrigeration Product Technologies

Insulation	**Compressor**
1. Improved resistivity of insulation	11. Improved compressor efficiency
2. Increased insulation thickness	12. Variable-speed compressors
3. Vacuum-insulated panels	13. Linear compressors
Gasket and Door Design	**Evaporator and Condenser**
4. Improved gaskets	14. Increased surface area
5. Double door gaskets	15. Improved heat exchange
6. Improved door face frame	
7. Anti-fog film	**Cycling Losses**
8. Improved thermal resistance glass and frames	16. Fluid control or solenoid valve
Anti-Sweat Heater	**Defrost System**
9. Hot gas or Warm Liquid	17. Compressor cycling defrost
Fans and Fan Motor	**Other Technologies**
10. Fan blade and fan motor improvements	18. Alternative refrigerants

Item 3-7 *DOE seeks comment on whether any additional technologies in addition to the ones identified above should be considered for wine chillers and miscellaneous refrigeration products.*

4. SCREENING ANALYSIS

The purpose of the screening analysis is to screen out design options that DOE will not consider in its potential energy conservation standard rulemaking for residential wine chillers and miscellaneous refrigeration products.

As an initial matter, DOE develops a list of design options developed through its own research and in consultation with interested parties for consideration in the engineering analysis (section 5). Development of the list is based on the technologies shown in Table 3.2. The identified candidate design options encompass all those technologies that may be technologically feasible. Thereafter, DOE reviews each technology option considering the following four criteria, as provided in sections 4(a)(4) and 5(b) of *Procedures, Interpretations, and Policies for Consideration of New or Revised Energy Conservation Standards for Consumer Products* (see 10 CFR Part 430, Subpart C, Appendix A) and tailored to the current rulemaking:

1. *Technological feasibility.* DOE does not further consider technologies that are not incorporated in commercially available products or in working prototypes.

2. *Practicability to manufacture, install, and service.* If DOE determines that mass production of a technology in commercial products and reliable installation and servicing of the technology could not be achieved on the scale necessary to serve the relevant market by the time of the effective date of the standard, then it does not consider that technology further.

3. *Adverse impacts on product or equipment utility or availability.* If DOE determines that a technology will have a significant adverse impact on the utility of the product to significant subgroups of consumers, or result in the unavailability of any covered product type with performance characteristics (including reliability), features, size, capacities, and volumes that are substantially the same as products generally available in the United States at the time, it does not consider that technology further.

4. *Adverse impacts on health or safety.* If DOE determines that a technology will have significant adverse impacts on health or safety, it does not consider that technology further.

DOE fully documents the reasons for eliminating any design options during the screening analysis and publishes this documentation for stakeholder review and comment as part of the preliminary analysis.

Item 4-1 *Are there any technologies listed in Table 3.4 that DOE should not consider because of any of the four screening criteria? If so, which screening criteria apply to the cited technology or technologies?*

5. ENGINEERING ANALYSIS

After conducting the screening analysis described above, DOE performs an engineering analysis based on the remaining design options that would improve product efficiency. The engineering analysis consists of estimating the energy consumption and cost of products at various levels of increased efficiency. This section provides an overview of the engineering analysis (section 5.1), and discusses baseline units (section 5.2), DOE's proposed approach for determining the cost-efficiency relationship (section 5.3), efficiency levels (section 5.4), proprietary designs (section 5.5), and cumulative regulatory burdens that might affect the engineering analysis (section 5.6).

5.1 Engineering Analysis Overview

The purpose of the engineering analysis is to determine the relationship between manufacturer cost and energy efficiency for residential wine chillers and miscellaneous refrigeration products. In determining the cost-efficiency relationship, DOE estimates the increase in manufacturer cost

associated with technological changes that increase the efficiency of these products relative to the baseline models.

DOE may request cost information from manufacturers for the incremental costs to achieve specified efficiency levels for the relevant product classes and representative product adjusted volumes.

DOE carries out energy modeling for products to supplement the manufacturer-supplied data. The energy modeling is carried out for a few important product classes. Initially, DOE carries out calibration of the model for baseline product designs and for relevant higher-efficiency designs that can be identified. DOE takes design data for these units from reverse engineering work. DOE carries out energy modeling for product designs incorporating energy-saving design options and groups of energy-saving design options to determine the efficiency impact of these modified product designs.

DOE would carry out energy testing for a few selected models selected to provide a good representation of the market. DOE would conduct these tests according to the current energy test procedure used for wine chillers under existing regulations in California and Canada (see the discussion of existing test procedures in section 1.2.8) but may also consider any test procedure variant that may be appropriate for incorporation into DOE's regulations. This testing would establish the actual energy use of the products and would provide additional data to support energy modeling work.

DOE uses reverse engineering to identify design options used in baseline and improved efficiency products and to provide the basis for manufacturing cost analysis. The reverse-engineering process consists of a detailed product disassembly, whereby (1) representative units are torn down; (2) all components, processes, assembly, and manufacturing steps are noted in a process-based cost model; and (3) all manufacturing costs are calculated. Representative units are chosen based on the range of efficiencies, design options, and capacities.

The result is a "green-field" model[24] of the subject unit and the factory in which it would be built. DOE can then aggregate these unit-specific factory requirements by market share, unit shipments, or any other method it wishes to use to derive industry-wide estimates.

5.2 Baseline Models

Once DOE establishes product classes, it selects a baseline model as a reference point for each product class subject to analysis against which it can measure changes resulting from energy conservation standards. The baseline model in each product class represents the characteristics of common or typical equipment in that class. Typically, a baseline model would be a model that just meets current required energy conservation standards.

At a subsequent stage in its analysis, DOE uses the baseline models to conduct the engineering analysis and the LCC and PBP analyses. To determine energy savings and changes in

[24] A green-field model estimates the cost of a product as if it were built in a brand-new facility that had just broken ground.

manufacturer selling price, DOE compares each higher energy efficiency product design against the baseline model.

DOE does not currently regulate residential wine chillers and miscellaneous refrigeration products. Standards in California and Canada are expressed as maximum annual energy consumption as a function of the product's adjusted volume or total volume.[25] The volume adjustment factor for wine chillers is equal to 1.0,[26] so the total and adjusted volumes are equal. Table 5.1 sets forth the current California and Canadian energy conservation standards for the two existing product classes.

Table 5.1 Wine Chiller California and Canadian Energy Conservation Standards and Proposed Baseline Model Efficiencies

Product Class	Equations for Maximum Energy Use (kWh/yr)
Wine chillers with manual defrost.	13.7AV + 267 0.48 av + 267
Wine chillers with automatic defrost	17.4AV + 344 0.61 av + 344

AV, adjusted volume in cubic feet; av, adjusted volume in liters

Should DOE determine that additional product classes are merited, DOE would develop baseline efficiency levels for these product classes based on information regarding their typical energy use characteristics and present these classes for public comment.

Item 5-1 *DOE seeks input from stakeholders on whether the equations for maximum annual energy consumption of the California and Canadian regulations are appropriate to represent the performance of baseline wine chillers.*

5.3 Approach for Determining the Cost-Efficiency Relationship

DOE would likely use a combined approach for determining the cost-efficiency relationships for wine chillers and miscellaneous refrigeration products. The combined approach would include energy modeling, limited energy testing, manufacturing cost analysis supported by reverse-engineering teardowns, and possibly data collected from manufacturers through AHAM. While it is possible that efficiency-level analysis would be feasible, depending on the range of efficiency levels of current products, past experience has shown that manufacturing cost estimates for

[25] "Appliance Efficiency Regulations", CEC-400-2006-002-REV2, Section 1605.3(a)(1), Table A-4; Natural Resources Canada, Office of Energy Efficiency, Refrigerators, Refrigerator-Freezers and Wine Chillers, Energy Efficiency Regulations, http://oee.nrcan-rncan.gc.ca/regulations/product/refrigerators-freezers.cfm?attr=0

[26] "Energy Performance and capacity of household refrigerators, refrigerator-freezers, freezers, and wine chillers", C300-08, section 7.3.

residential refrigeration products are too sensitive to factors not related to efficiency to correlate consistently with the rated efficiency levels.

Depending on the level of support provided by AHAM and its members, DOE may request cost information from manufacturers for the incremental costs necessary to achieve specified efficiency levels for the relevant product classes and representative product adjusted volumes.

DOE would perform energy modeling on products representing the product classes identified in Table 5.1 and any other product class identified during the rulemaking. DOE would base its energy models on engineering design data provided by manufacturers and/or determined through reverse-engineering teardowns for both baseline and improved-energy product designs. This modeling would use a range of design options to reduce energy use and then compare the results of this design-option analysis with any information obtained from manufacturers through AHAM.

DOE would perform energy testing for a few selected models. DOE would conduct these tests according to the test procedure currently used by California and Canada. The results from these tests would establish actual energy use for the products. DOE would use additional instrumentation beyond that required for the test procedure to provide additional data to support the energy modeling work. The additional data that DOE would record include refrigeration circuit temperatures -- these temperatures are significant because they help to calibrate energy models with actual product performance.

DOE uses reverse engineering, as described above, to identify the incremental cost and efficiency improvement associated with each design option or design option combination. DOE conducts reverse engineering through physical teardowns and testing on wine chillers and miscellaneous refrigeration products at key efficiency levels to determine baseline manufacturing costs as well as incremental manufacturing costs above the baseline. DOE proposes to perform reverse engineering on units rated at the baseline level and improved energy consumption levels.

DOE sometimes supplements the reverse-engineering data with information from catalogs, websites, and trade publications to create a wider set of units for its efficiency-cost analysis.

To support this analysis, DOE would likely seek incremental cost data from manufacturers through AHAM for each efficiency level defined for each product class. These data would be used to represent the shipment-weighted average, industry-wide incremental production cost associated with each level of efficiency improvement. DOE seeks input on whether AHAM and the industry are willing to support such a data collection effort and on the format of the information that would be provided. DOE also seeks input on whether any other stakeholders may have access to and are willing to provide information that is relevant to the analysis.

To be useful in the manufacturer impact analysis, manufacturer cost information should reflect the variability in baseline models, design strategies, and cost structures that can exist among manufacturers. This information allows DOE to better understand the industry and its associated cost structure, and, thus, helps predict the most likely impact that new energy efficiency regulations would have. For example, the reverse-engineering methodology allows DOE to

estimate the green-field costs of building new facilities, yet the majority of plants in any given industry comprise a mix of assets in different stages of depreciation.

DOE attempts to qualify the cost-efficiency data that it generates through the reverse-engineering activities with industry-supplied data and information arising from consultation with stakeholders or technical experts. Specifically, DOE supplements these cost data with information obtained through follow-up manufacturer interviews. Interviews with manufacturers not only help DOE refine its capital expenditure estimates, but also allow DOE to refine its depreciation projections and other financial parameters.

If DOE is unable to reconcile information collected during the manufacturer interviews with the generated or collected cost data, or with information contained in the market and technology assessment, it supplements the collected data through consultation with outside experts and/or further review of publicly available cost and performance information.

DOE estimates the contribution of the depreciation of conversion capital expenditures to the incremental overhead. During the interviews, DOE gathers information about the capital expenditures that would be necessary to increase the efficiency of the baseline models to various efficiency levels (*i.e.*, conversion capital expenditures by efficiency or energy-use level). DOE also requests information about the depreciation method that manufacturers use to expense the conversion capital.

Item 5-2 *DOE requests feedback on the use of a design-option approach based on energy modeling and some energy testing as needed, possibly enhanced by data collection organized by AHAM or other parties to determine the relationship between manufacturer cost and annual energy consumption. Particularly, DOE is interested in whether this approach is appropriate for developing a cost/efficiency relationship for use as the basis for standards-setting and if the industry, AHAM, or any other parties are prepared to provide cost-efficiency information to support the rulemaking. If the suggested approach is not appropriate, why is it not?*

5.4 Efficiency Levels

For each of the product classes identified, DOE establishes potential efficiency levels and seeks to develop incremental cost data at each of these levels. DOE would conduct engineering, LCC, and PBP analyses on all representative product classes.

Figure 5.1 below shows energy use as a function of total volume for wine chillers listed in the CEC database.[27] Only one manual defrost model is plotted, because the status of four of the five models in the database listed as having manual defrost has been changed (see the discussion in section 3.2 above). The data show that the maximum efficiency level of currently available automatic defrost products is 40% (i.e. energy use is 40% lower than the baseline) and that the maximum efficiency level of the single manual defrost product is 0%. DOE is considering the

[27] California Energy Commission Appliance Database, <http://www.energy.ca.gov/appliances/database/index.html>

possibility that manual defrost wine chillers do not exist and may eliminate this product class. See Item 3-5 above. Further, DOE believes that the highest-efficiency automatic defrost products use off-cycle defrost, and thus do not consume any energy (i.e. using an electric heater) to achieve defrost. Hence, there is no reason that automatic defrost wine chillers should use more energy than manual defrost models. For this reason, the energy use of such automatic defrost products with the highest level of efficiency available should be representative also of the energy use attainable by manual defrost products, even though no actual manual defrost units are commercially available at the corresponding efficiency levels.

At a typical volume of 7 cubic feet (cu. Ft.), the manual defrost standard is 363 kWh/year. The automatic defrost standard is 466 kWh/year and a 40% reduction in energy use from this level is 280 kWh/year. Hence, applying these figures, the max tech level for manual defrost products would be 1 - 280/363 = 23% or better.

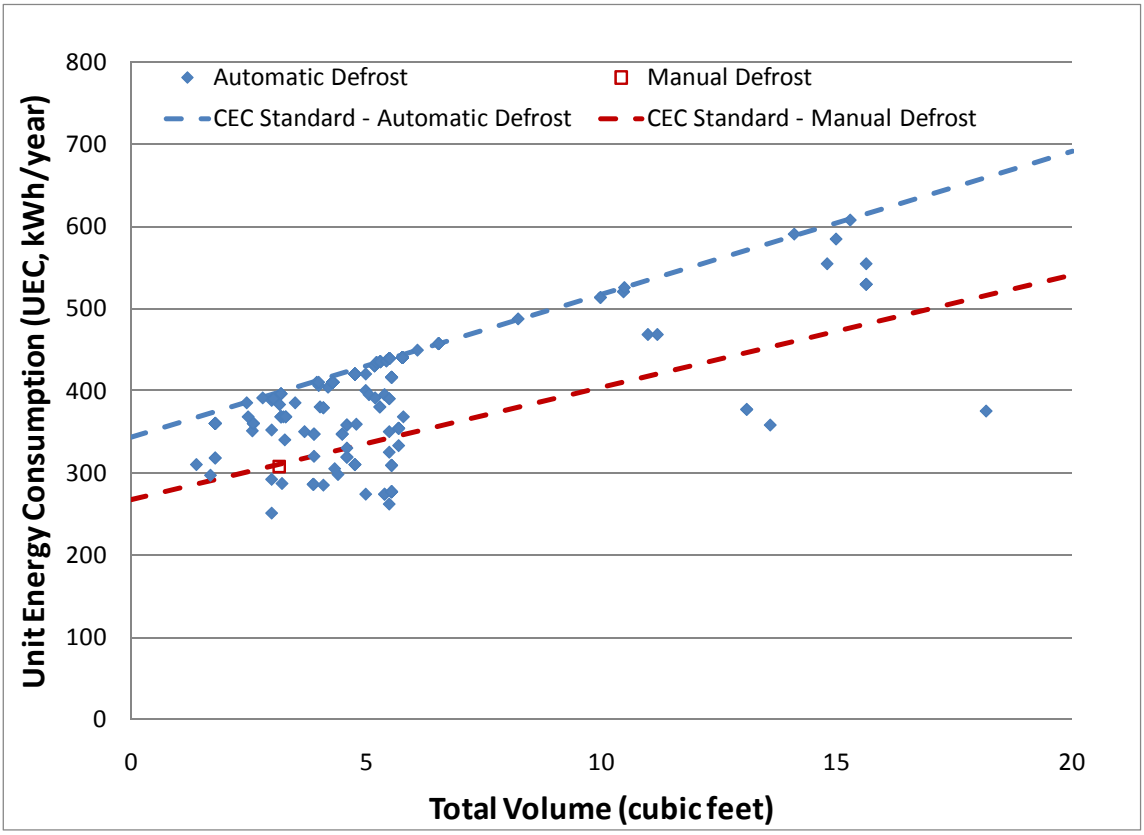

Figure 5.1 Wine Chiller Efficiency Data

DOE would expect to analyze improved efficiency levels for wine chillers and miscellaneous refrigeration products of up to 40% for automatic defrost products and up to 25% for manual defrost products (if DOE confirms that manual defrost wine chillers exist). However, these expected maximum levels may change, based on the results of further investigation and analysis. DOE notes that the maximum efficiency levels available in current products may not necessarily correspond to the max-tech levels. Maximum efficiency models may not incorporate all possible design options for increasing efficiency and, therefore, may not achieve an annual energy use as

low as the max-tech level. It is also possible that some of the design options that have met the screening criteria (*i.e.*, passed the screening analysis) may not yet be commercially available and, therefore, would not be found in today's available maximum efficiency products. Given this potential dichotomy between max-tech and available maximum efficiency levels, and DOE's obligation to analyze max-tech levels, DOE would seek stakeholder input to determine appropriate max-tech efficiency levels. (42 U.S.C. § 6295(p)(2))

It is not practicable for DOE to evaluate every product class or capacity range on the market, as the possible number of permutations is enormous. Instead, DOE would propose to evaluate several representative products in its reverse-engineering analysis that represent the majority of shipments and to then extrapolate the results to all products. DOE seeks comment on what to consider when selecting representative products.

Item 5-3 *DOE seeks input from stakeholders regarding the range of efficiency levels that should be examined as part of its analysis.*

Item 5-4 *DOE seeks comment on how to select representative products for detailed analysis and on how to extrapolate such analyses to the full range of wine chiller and miscellaneous residential refrigeration products.*

5.5 Proprietary Designs

DOE considers in its engineering and economic analyses all design options that are commercially available or present in a working prototype, including proprietary designs and technologies. However, DOE does not consider a proprietary design in the subsequent analyses if it is the only option for achieving a specific efficiency level. If the proprietary design is the only approach available to achieve a given efficiency level, then DOE rejects that efficiency level, as the analytical results would favor one manufacturer over others.

DOE is sensitive to manufacturer concerns regarding proprietary designs and will make provisions to maintain the confidentiality of any proprietary data submitted by manufacturers or discussed during manufacturer interviews. These data may be provided under a confidentiality agreement with Navigant Consulting, Inc. (NCI), the DOE contractor that is responsible for this part of the rulemaking analysis. As in other rulemakings, NCI regularly works with confidential data from manufacturers and other organizations, preparing aggregated results for DOE's analysis that do not divulge sensitive raw data, but that enable other stakeholders to review and comment on the aggregated dataset. Alternatively, stakeholders may submit confidential data to DOE, indicating in writing which data should remain confidential. To prevent public disclosure of the data due to actions taken by a third party, such as a request submitted to DOE under the Freedom of Information Act (FOIA), stakeholders providing confidential information to DOE must submit their data according to the requirements described in 10 CFR 1004.11, which addresses information that is exempt from public disclosure under FOIA. This information will provide input to the manufacturer impact analysis and other economic analyses.

Item 5-5 *Are there proprietary designs or technologies of which DOE should be aware for the products under consideration in this rulemaking? If so, how should DOE acquire the cost data necessary for evaluating these designs?*

5.6 Outside Regulatory Changes Affecting the Engineering Analysis

In conducting an engineering analysis, DOE accounts for the effects of regulatory changes outside DOE's statutory energy conservation standards rulemaking process that can affect manufacturers of products addressed by the rulemaking, some of which can also affect the energy efficiency or energy consumption of those products. For example, because of the mandatory phase-out of chlorofluorocarbons (CFCs) in the mid-1990s, the industry had to eliminate its use of CFC-12 as a refrigerant and now uses HFC-134a (a hydrofluorocarbon). More recently (in 2003), the industry addressed the mandatory phase-out of HCFC-141b (a hydrochlorofluorocarbon), which was used as a blowing agent for polyurethane foam insulation. As a result, insulation is now blown with non-HCFC alternatives, including HFC-245fa, HFC-134a, and cyclopentane. Both of the above changes occurred while the industry was making changes to address new standards; one set that became effective in 1993 and another set that became effective in 2001.

During the recent residential refrigeration product rulemaking, DOE raised for discussion possible issues associated with an expected movement away from HFC use, which would impact their use as both refrigerants and insulation blowing agents. Since no regulations banning the use of HFCs currently exist, the consideration of such a ban as part of the analysis to set potential standards for regulated products would be speculative. 75 FR 59470, 59497 (September 27, 2010) These limitations apply to any rulemaking that DOE may initiate for wine chillers and related refrigeration products.

DOE will attempt to identify this and all other cumulative engineering issues that could affect the engineering analysis. The consideration of these issues is closely related to the cumulative regulatory burden assessment that DOE will carry out as part of the manufacturer impact analysis. Based on consideration of the comments that DOE receives on the engineering analysis that will accompany the upcoming preliminary analysis, DOE will make the necessary changes to the analysis and reflect those changes in the NOPR documentation.

Item 5-6 *Are there outside regulatory issues that DOE should consider in its analysis of residential wine chillers and miscellaneous refrigeration products? If so, please identify what they are and how DOE should consider them for purposes of its analysis.*

6. MARKUPS FOR EQUIPMENT PRICE DETERMINATION

Because DOE would need retail (consumer) price data in order to establish the baseline efficiency level and all other efficiency levels under consideration for use in its lifecycle cost (LCC), payback period (PBP), and national impact analyses, DOE typically uses manufacturer-to-consumer markups to convert the manufacturer selling price estimates from the engineering analysis to consumer prices. The manufacturer-to-consumer markups are in addition to the mark-

ups on production costs that DOE would use to estimate manufacturer selling price in the engineering analysis. To validate these markups, DOE would collect data on existing prices in the market by either purchasing large datasets or downloading data from retailer Internet sites.

However, before it can develop markup information, DOE would first need to identify distribution channels (*i.e.*, how the product is distributed from the manufacturer to the consumer). AHAM's *2005 Fact Book* (the latest available version) shows that over 93 percent of all appliances are distributed from the manufacturer directly to some type of retailer. Retailers identified in AHAM's *2005 Fact Book* include home improvement stores (such as Lowe's or Home Depot), membership warehouse clubs/stores (such as Sam's Club or Costco), department stores (such as Sears or Kohl's), discount stores (such as Wal-Mart or Kmart), and appliance or consumer electronics stores. Because an overwhelming majority of appliances are sold through retail stores, DOE would analyze wine chiller product sales based on the assumption that these appliances are sold in a manufacturer-to-consumer distribution channel consisting of three parties: (1) the manufacturers producing the products; (2) retailers purchasing the products from manufacturers and selling them to consumers; and (3) the consumers that purchase the products.

DOE would determine an average manufacturer markup by examining the annual Securities and Exchange Commission (SEC) 10-K reports filed by publicly traded manufacturers engaged in appliance manufacturing whose combined product range includes wine chillers and miscellaneous refrigeration products. DOE would determine an average retailer markup by analyzing both economic Census data from the U.S. Census Bureau as well as the annual SEC 10-K reports filed by publicly traded retailers.

In addition to developing the manufacturer and retailer markups, DOE would develop and include sales taxes to calculate appliance retail prices. The Sales Tax Clearinghouse[28] is an Internet source that DOE would use to calculate applicable sales taxes.

DOE would also use collected retail price data to validate the overall manufacturer-to-consumer markup. DOE has already purchased wine chiller sales data for the years 2007-2011 from NPD Group, Inc., which provides sales-weighted retail price data for wine chillers and miscellaneous refrigeration products. As an alternative to purchasing retail price data, DOE may also rely on retailers' Internet sites, although the representativeness of any given price data point is unknown.

This analysis would generate retail prices for each possible efficiency level, assuming that each level represents a new minimum efficiency standard. DOE would make this assumption to capture the effect that higher manufacturer production volumes of more efficient products from the standard may have on retail price. Because DOE would expect to develop a range of price estimates, it may describe new retail prices within a range of uncertainty. If the range of retail prices for each product is large enough, DOE would develop retail price probability distributions to use as inputs to the LCC and PBP analysis to determine the impact of the uncertainty on the economic feasibility of amended energy conservation standards.

[28] Sales Tax Clearinghouse, Inc., *State sales tax rates along with combined average city and county rates.* Available at http://thestc.com/STrates.stm.

Item 6-1 *DOE welcomes suggestions and comments concerning its proposed approach for developing estimates of future retail prices.*

7. ENERGY USE DETERMINATION

The purpose of the energy use determination is to establish the annual energy consumption of the appliance and assess the energy-savings potential of different product efficiencies. DOE would use the annual energy consumption and energy-savings potential in the LCC and PBP analysis to establish the consumer operating savings of product efficiency levels. This section describes possible methodologies for developing the annual energy use of wine chillers in typical households.

Typically for household appliances, DOE relies on the Energy Information Administration's Residential Energy Consumption Survey[29] (RECS) to estimate the appliance's frequency of use or annual energy consumption. From RECS, DOE can develop a household sample that utilizes the appliance. From the household sample, DOE can develop not only a representative average annual energy use of the appliance, but the variability in appliance energy use across the households that utilize the product. Unfortunately, RECS has not attempted to obtain information on wine chillers. Therefore, DOE would need to rely on other sources of information to characterize wine chiller energy use.

As described previously in section 1.2.1.3, California's maximum energy use standards as a function of internal volume for auto- and manual defrost products could be combined with sales data from the NPD Group to estimate a range of annual energy use values for vapor-compression wine chillers. Because the total sales of each model in the NPD database are provided, this approach could yield an overall value for sales-weighted average energy consumption as well as a sales-weighted distribution of energy use values.

However, there are at least two shortcomings to the above approach: (1) only the maximum possible energy use of each model in the NPD database can be defined, as opposed to its actual rated energy use, and (2) it is unknown as to whether the CEC test procedure provides a reasonable estimate of wine chiller annual energy use. To address the first issue, DOE could utilize the energy use of wine chiller models in CEC's database as described in section 5.4 and depicted in Figure 5.2 to express the energy use of models in the NPD database with some level of statistical uncertainty. For a given internal volume, the uncertainty could be based on model availability at specific energy use values. To address the second issue, DOE would attempt to collect data that can validate the energy use estimates based on the CEC test procedure. Currently, DOE has been unable to identify sources of wine chiller energy use information. Because of the apparent lack of energy use data, DOE may rely on *in situ* field measurements as a means to characterize wine chiller energy use.

[29] Available at: http://www.eia.doe.gov/emeu/recs/contents.html.

If the above method of developing annual energy use estimates based on the combination of NPD sales data, CEC model data, and California's efficiency standards equations for establishing maximum energy use prove to be untenable, DOE may need to resort to characterizing wine chiller energy use with a sensitivity analysis to determine how high and low estimates of energy use might impact the economic feasibility of any amended energy conservation standards.

Item 7-1 *DOE seeks comments on the proposed approach of estimating the annual energy consumption of wine chillers based on a combination of NPD sales data, CEC model data, and California's energy conservation standards equations for establishing maximum energy use.*

Item 7-2 *DOE seeks input on potential data sources for establishing the annual energy consumption of wine chillers.*

Item 7-3 *DOE seeks comments on the viability of using in situ field measurements of wine chiller energy use as a proposed basis for characterizing the product's energy consumption.*

Item 7-4 *DOE seeks comments on whether annual energy use is best characterized with a sensitivity analysis to determine how high and low estimates of energy use might impact the economic feasibility of any amended energy conservation standards.*

DOE would account for the rebound effect in its determination of annual energy consumption. The rebound effect occurs when a more efficient product is used more intensively because its increased efficiency mitigates the cost of the additional use. This effect diminishes the expected energy savings from the efficiency improvement. In the case of more efficient domestic refrigeration equipment, limited research has been conducted to show that there is no rebound effect for home appliances (i.e. appliances not including space-conditioning and water-heating equipment), although the consumer may choose to purchase larger models with more features, which would result in increased energy use.[30]

Item 7-5 *DOE seeks comments on the rebound effect associated with more efficient wine chillers. In other words, DOE seeks input on what portion of the energy savings resulting from more efficient equipment may be lost due to consumers purchasing larger or more feature laden equipment.*

[30] L.A. Greening, D.L. Greene, and C. Difiglio. Energy efficiency and consumption – the rebound effect – a survey, Energy Policy 28 (2000) 389—401. Available for purchase at www.elsevier.com/locate/enpol

8. LIFE-CYCLE COST AND PAYBACK PERIOD ANALYSIS

The effects of increased energy conservation standards on a consumer of a product include a change in operating expense (usually decreased) and a change in purchase price (usually increased). DOE normally analyzes the net effect on consumers by calculating the LCC and PBP using the engineering performance data (as described in section 5), the equipment retail prices (as described in section 6), and the energy consumption data (as described in section 7). Inputs to the LCC and PBP calculation would include the total installed cost to the consumer (purchase price plus any installation cost) and operating cost (energy expenses and, if applicable, repair costs, and maintenance costs). Additional inputs to the LCC calculation would include energy price forecasts, the lifetime of the appliance or other defined period of analysis, and discount rates.

8.1 Approach for Conducting the LCC and PBP Analysis

In the preliminary analysis stage of the wine chiller rulemaking, DOE would conduct the LCC and PBP analysis by modeling both the uncertainty and variability in the inputs using Monte Carlo simulation and probability distributions. The Monte Carlo approach provides a significant advantage over less sophisticated approaches (e.g., an approach using typical or average values to characterize inputs) by identifying the percentage of consumers benefiting and being burdened by a prospective standard.

DOE would develop an LCC and PBP model that incorporates both Monte Carlo simulation and probability distributions by using Microsoft Excel spreadsheets combined with Crystal Ball (a commercially available add-in program). Each Monte Carlo simulation would consist of 10,000 LCC and PBP calculations. The model would perform each calculation using input values that are sampled from probability distributions or characterized with single point values. The analysis results would be a distribution of 10,000 data points showing the range of LCC savings and PBPs for a given efficiency level relative to the baseline level.

With the exception of repair and maintenance costs, DOE would use probability distributions to characterize the operating cost inputs to the LCC and PBP analysis, including product lifetimes and consumer discount rates. As described previously in section 6, DOE would attempt to use an approach that relies on a combination of NPD sales data, CEC model data, and California's energy conservation standards equations for maximum allowable energy use to establish the product's annual energy consumption. If this approach is successful, wine chiller energy use would be characterized with sales-weighted probability distributions. As described below, the LCC and PBP analysis would capture the regional variability in electricity prices. The methodology for developing maintenance and repair costs is described in more detail below.

DOE would expect to use point values to characterize most of the total installed cost inputs, including the manufacturer markup and the retailer markup. DOE would expect that installation costs would be negligible. If the manufacturer cost estimates developed in the engineering analysis are characterized with uncertainty or variability, DOE would use probability distributions to capture this uncertainty and variability; otherwise, DOE would use single point

values for this input as well. DOE would characterize sales taxes with probability distributions to capture their regional variability.

Another factor in identifying which consumers benefit from or are burdened by a prospective standard is the distribution of product efficiencies currently being sold in the marketplace, referred to as market-share efficiency data. In the case of wine chillers, product efficiency is expressed as annual energy use. Assuming these data are available, DOE would characterize the current product mix with probability distributions. DOE would determine the LCC and PBP for a particular standard level based on the distribution of appliance efficiencies. For example, in performing an iteration of the Monte Carlo simulation for a given consumer, product efficiency will be chosen based on its probability. If the chosen product efficiency is greater than or equal to the efficiency of the standard level under consideration, the LCC and PBP calculation would reveal that a consumer is not impacted by the standard level. By accounting for consumers who already purchase more-efficient products, DOE would avoid overstating the potential benefits from increasing product efficiency. To enable DOE to use this methodology, DOE would ask stakeholders — presumably either AHAM or individual manufacturers — to provide data on the current mix of product efficiencies, to account for those consumers already purchasing high efficiency products. Without such data, DOE could use the CEC model data described in section 5.4 to develop efficiency distributions based on model availability.

As discussed in section 7, DOE would take into account the rebound effect associated with more efficient wine chillers. The “take-back” in energy consumption associated with the rebound effect provides consumers with increased value (*e.g.*, more refrigerator internal volume). The net impact on consumers is thus the sum of the change in the cost of owning the refrigeration equipment (*i.e.*, life-cycle cost) and the increased value for the enhanced product features or usage patterns. DOE believes that if it were able to monetize the increased value to consumers added by the rebound effect, this value would be similar in value to the foregone energy savings. For this potential standards rulemaking, DOE estimates that this value would be equivalent to the monetary value of the energy savings that would have occurred without the rebound effect. Therefore, the economic impacts on consumers with or without the rebound effect, as measured in the LCC analysis, would be the same.

DOE would conduct the LCC and PBP analysis only for the two representative product classes on which it plans to perform an engineering analysis (see section 5.2). To identify the consumers who benefit from or are burdened by a prospective standard, DOE requests base-case efficiency distributions or market-share efficiency data from the industry.

During the NOPR stage, DOE may evaluate additional parameters not included in the preliminary analysis based upon information provided by stakeholders or which otherwise becomes available to the Department.

Based on the results of the LCC analysis, DOE would select CSLs for the preliminary analysis. The range of CSLs typically includes the efficiency level with the minimum LCC, the highest efficiency level that is technologically feasible, and other intermediate levels DOE has not yet determined.

The following sections discuss the methodologies DOE would use to develop several of the inputs to the LCC and PBP analysis, including (1) electricity prices; (2) maintenance, repair, and installation costs; (3) product lifetimes; and (4) discount rates. The other inputs to the LCC and PBP analysis—namely, manufacturer costs (section 5), markups for the determination of consumer retail prices (section 6), and annual energy consumption (section 7)—have been discussed previously.

DOE is also required to perform a PBP analysis to determine whether the three-year rebuttable presumption of economic justification applies (in essence, whether the purchaser will recover the higher installed cost of more energy efficient equipment through lowered operating costs within three years). (42 U.S.C. § 6295(o)(2)(B)(iii)) To determine the rebuttable-presumption PBP, DOE would determine the value of the first year's energy savings by calculating the quantity of those savings in accordance with DOE's test procedure. Although DOE will examine the rebuttable-presumption criteria, it would determine whether selected CSLs are economically justified through a more detailed analysis of the economic impacts of increased efficiency pursuant to section 325(o)(2)(B)(i) of EPCA. (42 U.S.C. § 6295(o)(2)(B)(i))

In preparing the NOPR, DOE would carefully review all of the comments it receives on the preliminary analysis LCC analysis, make any necessary revisions to the analysis, and evaluate additional parameters not included in the preliminary analysis, if necessary.

Item 8-1 *DOE seeks stakeholder input on the proposed approach of using probability distributions and Monte Carlo simulation to conduct the LCC and PBP analysis.*

Item 8-2 *DOE requests data from stakeholders to characterize the current mix of wine chiller efficiencies in the market.*

8.2 Electricity Prices

DOE would develop estimates of average electricity prices using EIA data covering 13 geographic areas — the nine U.S. Census divisions, with four large States (New York, Florida, Texas, and California) treated separately. For Census divisions containing one of these large States, DOE would calculate the regional average values, leaving out data for the large State—for example, the Pacific region average will not include California, and the West South Central region average will not include Texas. DOE would develop a discrete probability distribution consisting of 13 regional electricity prices based on the household population in each region. Therefore, DOE would be able to assess the variability of energy prices at the regional level for residential wine chillers.

To calculate electricity prices for residential consumers in each of the above geographic areas, DOE would use information provided by electric utilities as summarized in the most recent EIA Form 861 data.[31] These data, which cover the residential, commercial, and industrial sectors for every utility serving final customers, are published annually and include annual electricity sales in kWh, revenues from electricity sales, and number of consumers. The calculation of an average

[31] Available at http://www.eia.doe.gov/cneaf/electricity/page/eia861.html.

residential electricity price would proceed in two steps: (1) for each utility, estimate an average residential price by dividing the residential revenues by residential sales; and (2) calculate a regional average price, weighting each utility with customers in a region by the number of residential consumers served in that region.

DOE would use projections of national average electricity prices to residential consumers to estimate future energy prices in its LCC analysis. DOE would use the most recently available edition of EIA's *Annual Energy Outlook* (AEO) as the default source of projections for future energy prices.

Item 8-3 *DOE seeks stakeholder input on the planned approach for estimating current and forecasted energy prices.*

8.3 Maintenance, Repair, and Installation Costs

DOE would consider any expected changes to maintenance, repair, and installation costs for the wine chillers covered in this rulemaking. Typically, small incremental changes in product efficiency incur little or no changes in repair and maintenance costs over baseline products. There is a greater probability that equipment with efficiencies that are significantly higher than the baseline will incur increased repair and maintenance costs, since such equipment is more likely to incorporate technologies that are not widely available. DOE would rely on input from manufacturers and other stakeholders in developing appropriate repair and maintenance cost estimates, as necessary.

With regard to installation costs, unless the increased efficiency levels considered for this rulemaking result in significantly larger or heavier products, DOE would expect that more-efficient wine chillers will not incur increased installation costs.

Item 8-4 *DOE seeks stakeholder input on the merits of its proposed analytical assumption that changes in maintenance, repair, and installation costs will be negligible for more-efficient residential wine chillers. If it is incorrect, DOE is interested in the reasons why this is so and in specific ways in which to correct this assumption.*

8.4 Product Lifetimes

DOE has been unable to identify sources to establish an estimated generic wine chiller lifetime. Without data specific to wine chillers, DOE may need to rely on data specific to residential standard-sized and compact-sized refrigerator-freezers and freezers. For standard-sized refrigerator-freezers and freezers, DOE has characterized survival functions with Weibull distributions that have mean lifetimes of 17.4 and 22.3 years, respectively. For compact refrigerators and freezers, DOE has developed survival functions that have mean lifetimes of 5.6 and 7.5 years, respectively.[32]

[32] U.S. DOE, Technical Support Document for Refrigerators, Refrigerator-Freezers, and Freezers. September 2010. < http://www1.eere.energy.gov/buildings/appliance_standards/residential/refrigerators_freezers.html>

DOE would use information from available literature sources as well as input from manufacturers and other stakeholders to establish specific wine chiller lifetimes or whether the above product lifetimes for standard-sized and compact-sized refrigerators, refrigerator-freezers, and freezers are also representative of wine chillers.

Item 8-5 *DOE seeks stakeholder input on appropriate product lifetimes for wine chillers. Specifically, DOE seeks data sources for establishing product lifetimes and information regarding the merits of whether standard-sized and compact-sized refrigerator, refrigerator-freezer, and freezer lifetimes are representative of wine chillers.*

8.5 Discount Rates

The calculation of consumer LCC requires the use of an appropriate discount rate. DOE would use the discount rate to determine the present value of lifetime operating expenses. The discount rate used in the LCC analysis represents the rate from an individual consumer's perspective.[33] For residential consumers of wine chillers, DOE would use the same approach that it relied on to develop discount rates for its recent standards rulemakings for other residential products—*i.e.*, deriving the discount rates from estimates of the interest or "finance cost" to purchase residential products. The finance cost of raising funds to purchase these products can be interpreted as (1) the financial cost of any debt incurred to purchase products (principally interest charges on debt), or (2) the opportunity cost of any equity used to purchase products (principally interest earnings on household equity). Household equity is represented by holdings in assets such as stocks and bonds, as well as the return on homeowner equity. Much of the data required for determining the cost of debt and equity comes from the Federal Reserve Board's triennial *Survey of Consumer Finances*.[34]

Item 8-6 *DOE seeks stakeholder input on the planned approach for estimating discount rates for residential consumers.*

Based on consideration of the comments received on the LCC and PBP analysis documented for the preliminary analysis, DOE would make the necessary changes to the analysis, and reflect those changes in the documentation of the NOPR.

9. SHIPMENTS ANALYSIS

Shipments forecasts are required to calculate the national impacts of standards (NES and NPV) and to calculate the future cash flows of manufacturers. DOE would develop shipments forecasts based on an analysis of key market drivers for the particular products.

[33] The consumer discount rate is in contrast to the discount rates used in the national impact analysis, which are intended to represent the rate of return of capital in the U.S. economy as well as the societal rate of return on private consumption. Refer to section 10.3 for additional information.

[34] Available at http://www.federalreserve.gov/pubs/oss/oss2/scfindex.html.

9.1 Base-Case Forecast

To evaluate the various impacts of standards, DOE would develop a base-case forecast against which to compare forecasts for higher efficiency levels. (Higher efficiency level forecasts are also referred to as standards-case forecasts.) DOE would design the base-case to depict what would be anticipated to happen to energy consumption and costs over time if DOE does not adopt energy conservation standards. In determining the base-case for each set of products, DOE would calibrate its forecasts against historical shipments. DOE would also consider the mix of efficiencies sold in the absence of new standards and how that mix might change over time. As a result, DOE would need to collect data on historical product shipments and the market shares of the different efficiency levels offered in each product class. Based on detectable trends in the collected efficiency data, DOE would forecast base-case shipment-weighted efficiencies (SWEF). Forecasts of SWEFs are discussed in greater detail below in section 10.1.

As discussed previously in section 1.2.1.3, DOE has already reviewed historical shipments data from two sources: (1) data provided by AHAM as part of the residential refrigerator standards rulemaking and (2) sales data from the NPD Group. The AHAM shipments data are for the years 2005-2007. The NPD Group's sales data are for the five years spanning 2007-2011, and, according to NPD, represent 30% to 45% of total industry sales. Unfortunately, the estimates from the two sources are extremely different with NPD estimates as much as ten times greater than AHAM's estimates. Because AHAM does not represent all wine chiller manufacturers, and not all of AHAM's members necessarily reported their sales data, DOE suspects that the shipments estimates from the NPD Group are more representative. Due to the limited availability of shipments data, DOE would be taking into consideration any other sources or data provided by stakeholders. Without such data, DOE would rely exclusively on the AHAM and NPD data to construct scenarios of historical base-case shipments.

Because little is known regarding the adoption of wine chillers in existing and new households, and the limited historical data do not provide observable trends that can be relied upon to forecast shipments trends into the future, DOE would likely forecast base-case shipments using a number of scenarios. These scenarios may range from constant shipments (based either on a historical average observed in either the AHAM or NPD datasets or the lowest and highest shipments seen in the historical data) to increases in shipments tied to overall economic growth as indicated by the gross domestic product (GDP).

Item 9-1 *DOE seeks historical shipments data from stakeholders. If such data are provided, DOE requests that market share data showing the percentage of product shipments for compressor/condenser-based and thermoelectric-based products be included.*

Item 9-2 *If stakeholders are unable to provide historical shipments data, DOE seeks comment on which data source is more representative of historical shipments, the AHAM shipments data or the NPD Group sales data and why.*

Item 9-3 *DOE seeks input on the types of potential scenarios it should use to forecast base-case shipments and the reason(s) for the suggested scenario(s).*

9.2 Standards Impacts on Product Shipments

DOE would develop a set of shipment forecasts for each set of efficiency levels analyzed. It would use these standards-case forecasts to evaluate the impacts of standards on product shipments. DOE would derive standards-case forecasts using the same data sets as it used for the base-case forecasts. However, because the standards-case forecasts take into account the increase in purchase price and the decrease in operating costs caused by standards, forecasted shipments typically deviate from the base-case. Household income also factors into consumer purchase decisions. Therefore, the magnitude of the difference between the standards-case and base-case shipment forecasts depends on the estimated purchase price increase and the operating cost savings caused by the standard, relative to household income. Because the purchase price tends to have a larger impact than operating cost on appliance purchase decisions, standards-case forecasts typically show a drop in product shipments relative to the base-case.

DOE's past standards analyses have attempted to quantify the sensitivity of shipments to increased purchase prices and operating cost savings as well as to changes in household income. For example, DOE has conducted literature reviews and analyses of historical appliance price and efficiency data to develop sensitivities. Although DOE would attempt to develop purchase price and operating cost sensitivities for wine chillers since the data required to develop these sensitivities are likely to be unavailable, DOE would also consider modeling standards-case shipments forecasts with scenarios (*i.e.*, specified impacts to product shipments), if necessary.

Market-pull programs, such as consumer rebate programs that encourage the purchase of more-efficient products and manufacturer tax credits that encourage the production of more-efficient products, also affect standards-case shipments forecasts. To the extent that such programs exist, DOE would consider their impact on the forecast of both base-case and standards-case shipments.

Item 9-4 *As part of a possible preliminary manufacturer impact analysis, DOE seeks input from manufacturers on the potential impact of new energy conservation standards on wine chiller shipments. DOE also seeks input from other stakeholders on the potential impact of standards on product shipments.*

Item 9-5 *DOE also requests input on any market-pull programs that currently exist to promote the adoption of more-efficient wine chillers.*

10. NATIONAL IMPACT ANALYSIS

Section 8 discusses methods for estimating the LCC savings and PBP for individual consumers. This section discusses DOE's assessment of the aggregate impacts of potential efficiency standards at the national level. Measures of impact that DOE will report include the future NES from candidate standards and the NPV of total consumer life-cycle costs.

10.1 Inputs to NES and NPV Forecasts

Analyzing impacts of Federal energy conservation standards for wine chillers requires a comparison of projected U.S. energy consumption with, and without, new or amended energy conservation standards. The forecasts contain projections of annual appliance shipments (section 9), the purchase price of new appliances (section 6), and the annual energy consumption of new appliances (section 7).

A key component of DOE's estimates of NES and NPV are the product energy efficiencies forecasted over time for the base-case (without new standards) and each of the standards cases. For wine chillers, the forecasted efficiencies represent the annual shipment-weighted annual energy consumption of the products under consideration over the forecast period (*i.e.*, from the assumed compliance date of a new standard to 30 years after that date). Because key inputs to the calculation of the NES and NPV (annual energy consumption for the NES, and retail prices and annual operating costs for the NPV) depend on the estimated efficiencies, these efficiencies are very important to the analysis.

For past home appliance standards rulemakings, DOE relied on stakeholder input, particularly AHAM and appliance manufacturers, to develop base-case historical SWEF estimates. Although DOE hopes that AHAM and manufacturers will provide similar historical SWEF data for wine chillers, because of the apparent lack of information for this product, DOE may need to rely on other sources to develop such data. One option might be for DOE to use CEC data and develop average historical efficiencies for each year that such data are available.

To develop SWEFs for the various standards cases, DOE hopes to develop market-share efficiency data (*i.e.*, data on the distribution of product shipments by efficiency) for the wine chiller product classes DOE is currently considering. As discussed in section 8.1, these are the same market-share efficiency data (otherwise known as base-case efficiency distributions) that DOE is requesting for the LCC and PBP analysis so DOE can accurately quantify the percent of consumers that benefit from an increase in the minimum energy conservation standard. Realizing that this information may not be available, DOE could use the CEC model data described in section 5.4 to develop efficiency distributions based on model availability.

The market-share efficiency data will allow DOE to estimate the efficiency impact that standards may have in the year manufacturers must begin to comply with them. For example, DOE has assumed a "roll-up" scenario for past standards rulemakings.[35] Under this scenario, DOE

[35] For example, the residential central air conditioner standards rulemaking considered a "roll-up" scenario when estimating the impact of standards. Refer to the Chapter 7 of the central air conditioner TSD for more details, which is available at http://www.eere.energy.gov/buildings/appliance_standards/residential/ac_central_1000_r.html.

assumes (1) product efficiencies in the base-case that do not meet the standard level under consideration would "roll up" to meet the new standard level; and (2) product efficiencies above the standard level under consideration would not be affected. Once DOE establishes the shipment-weighed efficiency for the assumed effective date of the standard, it could estimate future shipment-weighted efficiencies using the same rate of forecasted efficiency growth as in the base-case efficiency trend.

Item 10-1 *DOE seeks historical SWEF data for wine chillers. DOE also seeks historical market share data showing the percentage of product shipments by efficiency level.*

10.2 National Energy Savings

DOE intends to calculate national energy consumption for each year beginning with the expected effective date of the standards. It will calculate national energy consumption for the base-case and each standard level analyzed. DOE plans to perform this calculation through the use of a spreadsheet model that effectively multiplies annual shipment forecasts by unit energy savings, accounting for the stock of appliances affected by standards.

In response to comments by stakeholders who asked for a simple, transparent model, DOE has developed NES spreadsheet models for its standards rulemakings since 1996, to forecast energy savings and to demonstrate how the growth in efficiency can be accounted for over time.[36] Although these models are specific to each product, DOE believes their general structure is applicable to the wine chiller market. DOE expects the NES spreadsheet model it develops for this rulemaking to provide a credible, stand-alone forecast of NES and NPV for residential wine chillers.

As discussed in section 7, DOE intends to take into account the rebound effect associated with more efficient wine chillers. DOE will incorporate the rebound effect utilized in the energy use analysis into its calculation of national energy savings.

Based on consideration of the comments DOE may receive on the preliminary analysis, DOE will make any necessary changes to the analysis. It will reflect those changes in the documentation for the NOPR.

Item 10-2 *DOE seeks input on its plan to develop NES spreadsheet models for estimating national impacts of amended energy conservation standards for wine chillers. For example, are spreadsheet models still the preferred approach for estimating national impacts?*

[36] Several NES spreadsheet models from previous rulemakings, including the rulemaking for residential clothes washers, can be found on DOE's website at www.eere.energy.gov/buildings/appliance_standards.

10.3 Net Present Value

DOE calculates the national NPV of energy conservation standards in conjunction with the NES. It calculates annual energy expenditures from annual energy consumption by incorporating forecasted energy prices, using the shipment and average energy efficiency forecasts described in section 9. DOE calculates annual equipment expenditures by multiplying the price per unit by the number of forecasted shipments. The difference between a base-case and a standards-case scenario gives the national energy bill savings and increased equipment expenditures in dollars. The difference each year between energy bill savings and increased equipment expenditures is the net savings (if positive) or net costs (if negative). DOE discounts these annual values to the present time and sums them to give a net present value. Consistent with guidelines set by the U.S. Office of Management and Budget (OMB), DOE will conduct two NPV calculations, one using a real discount rate of three percent and another using a real discount rate of seven percent (OMB, Circular A-4: Regulatory Analysis (Sept. 17, 2003). The discount rates for the determination of NPV are in contrast to the discount rates used in the LCC analysis (which are developed from a consumer's perspective). The seven percent real value is an estimate of the average before-tax rate of return to private capital in the U.S. economy. The three percent real value represents the "societal rate of time preference," which is the rate at which society discounts future consumption flows to their present value. Based on consideration of the comments received on the preliminary analysis, DOE will make any necessary changes to the analysis and the CSLs.

As noted above in section 10.2, DOE intends to take into account the rebound effect associated with more efficient wine chillers in its determination of national energy savings. As discussed section 8, because the rebound effect provides consumers with increased value, DOE believes that if it were able to monetize the increased value to consumers added by the rebound effect, this value would be similar in value to the foregone energy savings. For this standards rulemaking, DOE estimates that this value is equivalent to the monetary value of the energy savings that would have occurred without the rebound effect. Therefore, the economic impacts on consumers with or without the rebound effect, as measured in the NPV, are the same.

11. LIFE-CYCLE COST SUBGROUP ANALYSIS

This section describes how DOE analyzes the consumer impact of any new standards by dividing consumers into subgroups and accounting for variations in key inputs to the LCC analysis. A consumer subgroup comprises a subset of the population that is likely, for one reason or another, to be affected disproportionately by new or revised energy conservation standards. The purpose of a subgroup analysis is to determine the extent of this disproportional impact. DOE will work with stakeholders early in the rulemaking process to identify any subgroups for consideration. However, DOE will not analyze the consumer subgroups until the NOPR stage of the analysis.

In comparing potential impacts on the different consumer subgroups, DOE will evaluate variations in regional electricity prices, energy use profiles, and purchase prices that might affect the LCC of an energy conservation standard to certain consumer subgroups. To the extent possible, DOE may obtain estimates of the variability in each input variable and consider this

variability in its calculation of consumer impacts. DOE will discuss with stakeholders the variability in each input variable and likely sources of information.

Item 11-1 *DOE requests input as to what, if any, consumer subgroups are appropriate in considering standards for wine chillers.*

12. MANUFACTURER IMPACT ANALYSIS

DOE conducts its manufacturer impact analyses consistent with the Report to Congress, "Energy Conservation Standards Activities" (Jan. 31, 2006) (required report under Section 141 of the Energy Policy Act of 2005) (Standards Activities), available at http://www1.eere.energy.gov/buildings/appliance_standards/pdfs/congressional_report_013106.pdf.

DOE had not previously reported any manufacturer impact analysis results during the preliminary analysis phase; however, under the new format, DOE collects, evaluates, and reports preliminary information and data in the preliminary analysis. (*See* Standards Activities, p. 54.) Such preliminary information includes the anticipated conversion capital expenditures by efficiency level and the corresponding anticipated impacts on employment. DOE solicits further information during the preliminary analysis phase through the manufacturer interviews conducted as part of that phase's engineering analysis. A draft set of questions to be used for those interviews is contained in Appendix A.

DOE intends manufacturer impact analyses to help assess the potential impacts of energy conservation standards on manufacturers of products subject to new or revised energy standards. In addition to financial impacts, a wide range of quantitative and qualitative effects may occur following adoption of a standard that may require changes to the manufacturing practices for these products. DOE identifies these effects through interviews with manufacturers, as well as other stakeholders and experts.

For the NOPR, DOE supplements the results of the preliminary MIA conducted as part of the preliminary analysis with more detailed analyses, described in sections 12.1 through 12.5. Specifically, DOE carries out an industry-wide cash flow analysis using the Government Regulatory Impact Model (GRIM), identifies and analyzes subgroups of manufacturers whose business varies significantly from the industry as a whole, perform a competitive impacts assessment, and review the cumulative regulatory burden for the industry.

12.1 Sources of Information for the Manufacturer Impact Analysis

Many of the analyses described earlier provide important information that DOE uses as inputs for the manufacturer impact analysis. Such information includes financial parameters developed in the market assessment (section 3.1), manufacturing costs and prices from the engineering analysis (section 5.3), retail price forecasts (section 6), and shipments forecasts (section 9). DOE supplements this information with information gathered during manufacturer interviews.

DOE conducts detailed interviews with manufacturers to gain insight into the range of potential impacts of standards. The interview process plays a key role in the manufacturer impact analysis by providing an opportunity for directly affected parties to express their views on important issues. During the interviews, DOE solicits information on the possible impacts of standards on manufacturing costs, equipment prices, sales, direct employment, capital assets, and industry competitiveness. Both qualitative and quantitative information are valuable in terms of this analysis. DOE schedules interviews well in advance to provide every opportunity for key individuals to be available to participate. In addition, DOE provides manufacturers with the questionnaire before the interviews to facilitate the gathering of the appropriate information. Although a written response to its questionnaire is acceptable, DOE prefers an interactive interview process, because it helps clarify responses and provides the opportunity to identify additional issues.

DOE asks interview participants to identify all confidential information provided in writing or orally, and DOE determines whether the information submitted is entitled to confidential treatment. It considers information gathered, as appropriate, in the energy conservation standards decision-making process. However, DOE does not make confidential information available in the public record. DOE also asks participants to identify all information that they wish to have included in the public record but that they do not want to have associated with their interview that would identify that particular manufacturer; DOE incorporates this information into the public record, but reports it without attribution.

DOE collates the completed interview questionnaires and prepares a summary of the major issues and outcomes. This summary becomes part of the TSD produced in a rulemaking.

12.2 Industry Cash Flow Analysis

The industry cash flow analysis relies primarily on the GRIM. DOE uses the GRIM to analyze the financial impacts of new or more stringent energy conservation standards on the industries that produce the products covered by the standard.

The GRIM analysis uses a number of inputs—annual expected revenues; manufacturer costs such as costs of goods sold; selling, general, and administrative costs; taxes; and capital expenditures (both ordinary capital expenditures and those related to standards)—to determine a series of annual cash flows beginning from the announcement of the new standard and continuing for several years after its implementation. DOE compares the results against base-case projections that involve no new standards. The financial impact of new standards is the difference between the two sets of discounted annual cash flows. Other performance metrics, such as return on invested capital, also are available from the GRIM.

DOE gathers the inputs needed for the GRIM from two primary sources: (1) the analyses conducted to this point; and (2) interviews with manufacturers and other stakeholders. Information gathered from previous analyses includes financial parameters, manufacturing costs, price forecasts, and shipments forecasts. Interviews with manufacturers and other stakeholders are essential in supplementing this information.

12.3 Manufacturer Subgroup Analysis

It is possible that the use of average industry cost values may not adequately assess differential impacts among subgroups of manufacturers. DOE recognizes that smaller manufacturers, niche players, and manufacturers exhibiting a cost structure that differs significantly from the industry average may be affected differently by the imposition of standards. Ideally, DOE would consider the impact on every firm individually. In highly concentrated industries, this may be possible. In industries having numerous participants, however, DOE uses the results of the market and technology assessment to group manufacturers into subgroups, as appropriate.

Small businesses, as defined by the Small Business Administration (SBA) for household refrigerator and home freezer manufacturers, are enterprises with 1000 employees or fewer. Small business size standards are listed by North American Industry Classification System (NAICS) code and industry description. Household refrigerator and home freezer manufacturing is classified under NAICS 335222. A search of small businesses of this NAICS code listed in the U.S. Small Business Association website indicates that there may be thirteen small businesses that manufacture wine chillers and related products that would potentially be covered by this potential rulemaking. However, as this NAICS code covers all household refrigerator and home freezer manufacturing, it is not clear how many of these manufacturers produce residential wine chillers and other miscellaneous refrigeration products. As part of its subgroup analysis, DOE would identify small businesses that manufacture these products and interview small businesses affected by the rulemaking to determine if there are differential impacts on these companies that may result from new energy conservation standards. DOE examines publicly available data and contacts manufacturers, when needed, to determine if they meet the SBA's definition of a small manufacturing facility and if their manufacturing facilities are located within the United States.

The detailed manufacturer subgroup impact analysis entails calculating cash flows separately for each defined class of manufacturer.

> ***Item 12-1*** *DOE seeks comment on the appropriate manufacturer subgroups, if any, for residential wine chillers and miscellaneous refrigeration products that DOE should consider in a manufacturer subgroup analysis.*

12.4 Competitive Impacts Assessment

EPCA directs DOE to consider any lessening of competition that is likely to result from an imposition of standards. (42 U.S.C. § 6295(o)(2)(B)(i)(V) and 6316(a)) It further directs the Attorney General to determine in writing the impacts, if any, of any lessening of competition. (42 U.S.C. § 6295(o)(2)(B)(ii) and 6316(a))

DOE makes a determined effort to gather and report firm-specific financial information and impacts, and it will then report the aggregated impact of the standard on manufacturers. The competitive impacts analysis focuses on assessing the impacts to smaller, yet significant, manufacturers. DOE bases the assessment on manufacturing cost data and on information collected from interviews with manufacturers. These interviews focus on gathering information that will help in assessing asymmetrical cost increases to some manufacturers, increased

proportion of fixed costs potentially increasing business risks, and potential barriers to market entry (*e.g.*, proprietary technologies). DOE provides the Attorney General with a copy of the NOPR for consideration in his/her evaluation of the impact of standards on the lessening of competition.

12.5 Cumulative Regulatory Burden

DOE is aware that other regulations may apply to products which may be covered under this potential rulemaking, as well as to other products made by the same manufacturers covered under this potential rulemaking. Multiple regulations may result in a significant, cumulative regulatory burden on these manufacturers. Accordingly, DOE analyzes and seeks to mitigate the overlapping effects of amended DOE standards and other regulatory actions on manufacturers of residential refrigeration products. DOE is aware that home appliance manufacturers and trade groups have issued public comments concerning the excessive regulation of the home appliance industry in comparison to others and will consider these concerns during the manufacturer impact analysis.

Regulations that could affect the industries affected by this potential rulemaking include:

- *DOE standards for residential refrigeration products* – Manufacturers have previously gone through redesign cycles mandated by standards for residential refrigeration products enacted since 1990;
- *Phaseout of HCFC blowing agents in 2003*—Manufacturers predominantly switched to HFC-245fa blowing agent when HCFC-141b was phased out in 2003. However, different manufacturers may have chosen alternative approaches and as a result may be in differing positions with regard to foam insulation conductivity levels achieved in their production lines.
- *Reduction of Hazardous Substances (RoHS) directive* – The Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment was adopted in February 2003 by the European Union (EU) and became effective July 1, 2006.[37] RoHS identifies specific categories of products that can contain no more than threshold amounts of mercury, lead, cadmium, hexavalent chromium, and two fire retardants. Although this legislation does not currently extend to residential refrigeration products in the U.S., domestic manufacturers selling to the EU market must produce RoHS-compliant appliances. These manufacturers may choose to include the associated design changes across their entire product line.
- *Legislation limiting use of Greenhouse Gases* – The possibility of legislation to limit the use of greenhouse gases was discussed as part of the recent refrigeration product rulemaking. 76 FR 57516 (Sept. 15, 2011). While no such legislation has been enacted, if such legislation is enacted prior to the end of this rulemaking, it will impose impacts on manufacturers, who will need to consider converting both refrigerants and foam insulation blowing agents to alternative substances that have less global warming impact. Such changes may require capital expenditures, but may also impact product design options.

[37] http://ec.europa.eu/environment/waste/weee/index_en.htm.

Item 12-2 *What other regulations or pending regulations should DOE consider in its examination of cumulative regulatory burden?*

13. UTILITY IMPACT ANALYSIS

To estimate the impacts that energy conservation standards for residential wine chillers and other miscellaneous residential refrigeration products would have on electric utility industries, DOE plans to use a variant of the EIA's National Energy Modeling System (NEMS), called NEMS-BT. BT refers to DOE's Building Technologies Program. NEMS is a large, multi-sectoral, partial-equilibrium model of the U.S. energy sector that EIA has developed over several years, primarily for the purpose of preparing the *AEO*. NEMS produces a widely recognized reference case forecast for the United States through 2035 and is available in the public domain.[38]

The utility impact analysis is a comparison between the NEMS-BT model results for the base-case and standards-cases. Outputs of the utility impact analysis usually parallel results that appear in the latest *AEO*, with some additions. Typical outputs of the utility impact analysis include forecasts of electricity sales, price, and avoided capacity. DOE plans to conduct the utility impact analysis as a scenario departing from the latest *AEO* reference case. In other words, DOE will model the energy savings impacts from amended energy conservation standards using NEMS-BT to generate forecasts that deviate from the *AEO* reference case.[39]

Item 13-1 *DOE seeks input from stakeholders on its plans to use NEMS-BT to conduct the utility impact analysis. Examples of the type of input sought by DOE include, but are not limited to, whether the NEMS-BT model is appropriate for assessing the utility impacts of efficiency standards — and if not, what would be a more appropriate model to use?*

14. EMPLOYMENT IMPACT ANALYSIS

DOE estimates the impacts of standards on employment for equipment manufacturers, relevant service industries, energy suppliers, and the economy in general. This analysis covers both direct and indirect employment impacts. Direct employment impacts would result if standards led to a

[38] For more information on NEMS, please refer to the U.S. Department of Energy, Energy Information Administration documentation. A useful summary is National Energy Modeling System: An Overview 2000, DOE/EIA-0581(March 2000) and is available at http://tonto.eia.doe.gov/ftproot/forecasting/05812000.pdf. EIA approves use of the name NEMS to describe only an official version of the model without any modification to code or data. Because this analysis entails some minor code modifications and the model is run under various policy scenarios that are variations on EIA assumptions, DOE refers to the model by the name NEMS-BT ("BT" refers to DOE's Building Technologies Program, under whose aegis this work has been performed).

[39] Several descriptions of NEMS-BT models from previous rulemakings, including residential furnaces and boilers, can be found on DOE's website at http://www1.eere.energy.gov/buildings/appliance_standards/residential/pdfs/fb_fr_tsd/chapter_13.pdf.

change in the number of employees at manufacturing plants and related supply and service firms. DOE will evaluate direct employment impacts in the manufacturer impact analysis, as described in section 12.

Indirect employment impacts are impacts on the national economy other than in the manufacturing sector being regulated. Indirect impacts may result both from expenditures shifting among goods (the substitution effect) and changes in income that lead to a change in overall expenditure levels (the income effect). DOE defines indirect employment impacts from standards as net jobs eliminated or created in the general economy as a result of increased spending driven by the increased equipment prices and reduced spending on energy.

DOE will investigate the combined direct and indirect employment impacts in the employment impact analysis using the Pacific Northwest National Laboratory (PNNL)'s "Impact of Sector Energy Technologies" (ImSET) model. PNNL developed ImSET for DOE's Office of Planning, Budget, and Analysis. The model estimates the employment and income effects of energy-saving technologies in buildings, industry, and transportation. In comparison with simple economic multiplier approaches, ImSET allows for more complete and automated analysis of the economic impacts of energy efficiency investments. Although DOE intends to use ImSET for its analysis of employment impacts, it welcomes input on other tools and factors it might consider.

Item 14-1 *DOE welcomes feedback on its planned approach for assessing national employment impacts, both direct and indirect, and it is interested in whether other tools or factors should be considered as part of its analysis. If other tools or factors should be considered, please identify them and explain why, and how, they should be integrated into DOE's analysis.*

15. EMISSIONS ANALYSIS

In the emissions analysis, DOE will estimate the reduction in power sector emissions of carbon dioxide (CO_2), nitrogen oxides (NO_x), and mercury (Hg) using the NEMS-BT computer model. In the emissions analysis, NEMS-BT is run similarly to the AEO NEMS, except that wine chiller and other miscellaneous residential refrigeration product energy use is reduced by the amount of energy saved (by fuel type) due to each considered standard level. The inputs of national energy savings come from the NIA spreadsheet model, while the output is the forecasted physical emissions. The net benefit of each considered standard level is the difference between the forecasted emissions estimated by NEMS-BT at that level and the AEO 2011 Reference Case.

15.1 Carbon Dioxide

In the absence of any Federal emissions control regulation of power plant emissions of CO2, a DOE standard is likely to result in reductions of these emissions. The CO2 emission reductions likely to result from a standard will be estimated using NEMS-BT and national energy savings estimates drawn from the NIA spreadsheet model. The net benefit of the standard is the difference between emissions estimated by NEMS-BT at each standard level considered and the AEO Reference Case. NEMS-BT tracks CO2 emissions using a detailed module that provides results with broad coverage of all sectors and inclusion of interactive effects.

15.2 Sulfur Dioxide

SO2 emissions from affected electric generating units (EGUs) are subject to nationwide and regional emissions cap and trading programs, and DOE has preliminarily determined that these programs create uncertainty about the potential standards' impact on SO2 emissions. Title IV of the Clean Air Act sets an annual emissions cap on SO2 for affected EGUs in the 48 contiguous states and the District of Columbia (D.C.). SO2 emissions from 28 eastern states and D.C. are also limited under the Clean Air Interstate Rule (CAIR, 70 Fed. Reg. 25162 (May 12, 2005)), which created an allowance-based trading program. Although CAIR has been remanded to EPA by the U.S. Court of Appeals for the District of Columbia Circuit (D.C. Circuit), see *North Carolina v. EPA*, 550 F.3d 1176 (D.C. Cir. 2008), it remains in effect temporarily, consistent with the D.C. Circuit's earlier opinion in *North Carolina v. EPA*, 531 F.3d 896 (D.C. Cir. 2008). On July 6, 2011 EPA issued a replacement for CAIR, the Cross-State Air Pollution Rule. 76 FR 48208 (August 8, 2011). (See http://www.epa.gov/crossstaterule/). On December 30, 2011, however, the D.C. Circuit stayed the new rules while a panel of judges reviews them, and told EPA to continue enforcing CAIR (see *EME Homer City Generation v. EPA*, No. 11-1302, Order at *2 (D.C. Cir. Dec. 30, 2011)).

The attainment of emissions caps is typically flexible among EGUs and is enforced through the use of emissions allowances and tradable permits. Under existing EPA regulations, any excess SO_2 emissions allowances resulting from the lower electricity demand caused by the imposition of an efficiency standard could be used to permit offsetting increases in SO_2 emissions by any regulated EGU. However, if the standard resulted in a permanent increase in the quantity of unused emissions allowances, there would be an overall reduction in SO_2 emissions from the standards. While there remains some uncertainty about the ultimate effects of efficiency standards on SO_2 emissions covered by the existing cap and trade system, the NEMS-BT modeling system that DOE uses to forecast emissions reductions currently indicates that no physical reductions in power sector emissions would occur for SO_2.

15.3 Nitrogen Oxides

Under CAIR, there is a cap on NOx emissions in 28 eastern states and the District of Columbia. All these States and D.C. have elected to reduce their NOx emissions by participating in cap-and-trade programs for EGUs. Therefore, energy conservation standards for wine chillers and other miscellaneous residential refrigeration products may have little or no physical effect on

these emissions in the 28 eastern states and the D.C. for the same reasons that they may have little or no physical effect on NOX emissions. DOE is using the NEMS-BT to estimate NOx emissions reductions from possible standards in the States where emissions are not capped.

15.4 Mercury

In the absence of caps, a DOE energy conservation standard could reduce Hg emissions and DOE plans to use NEMS-BT to estimate these emission reductions. On December 21, 2011, EPA announced national emissions standards for hazardous air pollutants (NESHAPs) for mercury and certain other pollutants emitted from coal and oil-fired EGUs.[40] The NESHAPs do not include a trading program and, as such, DOE's energy conservation standards would likely reduce Hg emissions. For the emissions analysis for this rulemaking, DOE plans to estimate mercury emissions reductions using NEMS-BT based on *AEO2011*, which does not incorporate the NESHAPs. DOE expects that future versions of the NEMS-BT model will reflect the implementation of the NESHAPs.

15.5 Particulate Matter

DOE acknowledges that particulate matter (PM) exposure can impact human health. Power plant emissions can have either direct or indirect impacts on PM. A portion of the pollutants emitted by a power plant are in the form of particulates as they leave the smoke stack. These are direct, or primary, PM emissions. However, the great majority of PM emissions associated with power plants are in the form of secondary sulfates, which are produced at a significant distance from power plants by complex atmospheric chemical reactions that often involve the gaseous (non-particulate) emissions of power plants, mainly SO_2 and NO_x. The quantity of the secondary sulfates produced is determined by a very complex set of factors including the atmospheric quantities of SO_2 and NO_x, and other atmospheric constituents and conditions. Because these highly complex chemical reactions produce PM comprised of different constituents from different sources, EPA does not distinguish direct PM emissions from power plants from the secondary sulfate particulates in its ambient air quality requirements, PM monitoring of ambient air quality, or PM emissions inventories. For these reasons, it is not currently possible to determine how the amended standard impacts either direct or indirect PM emissions. Therefore, DOE is not planning to assess the impact of these standards on PM emissions. Further, as described previously, it is uncertain whether efficiency standards will result in a net decrease in power plant emissions of SO_2, which are now largely regulated by cap and trade systems.

Item 15-1 *DOE seeks input on its plans to use NEMS-BT to analyze emissions associated with the products covered by this potential rulemaking.*

[40] http://epa.gov/mats/pdfs/20111216MATSfinal.pdf.

16. MONETIZING CARBON DIOXIDE AND OTHER EMISSIONS REDUCTIONS

DOE plans to consider the estimated monetary benefits likely to result from the reduced emissions of CO_2 and NO_X that are expected to result from each of the standard levels considered.

In order to estimate the monetary value of benefits resulting from reduced emissions of CO_2, DOE plans to use the most current Social Cost of Carbon (SCC) values developed and/or agreed to by an interagency process. The SCC is intended to be a monetary measure of the incremental damage resulting from greenhouse gas (GHG) emissions, including, but not limited to, net agricultural productivity loss, human health effects, property damage from sea level rise, and changes in ecosystem services. Any effort to quantify and to monetize the harms associated with climate change will raise serious questions of science, economics, and ethics. But with full regard for the limits of both quantification and monetization, the SCC can be used to provide estimates of the social benefits of reductions in GHG emissions.

At the time of this notice, the most recent interagency estimates of the potential global benefits resulting from reduced CO_2 emissions in 2010, expressed in 2010$, were $4.9, $22.3, $36.5, and $67.6 per metric ton avoided. For emissions reductions that occur in later years, these values grow in real terms over time. Additionally, the interagency group determined that a range of values from 7 percent to 23 percent should be used to adjust the global SCC to calculate domestic effects, although DOE will give preference to consideration of the global benefits of reducing CO_2 emissions. To calculate a present value of the stream of monetary values, DOE will discount the values in each of the four cases using the discount rates that had been used to obtain the SCC values in each case.

DOE recognizes that scientific and economic knowledge continues to evolve rapidly as to the contribution of CO_2 and other GHG to changes in the future global climate and the potential resulting damages to the world economy. Thus, these values are subject to change.

DOE also intends to estimate the potential monetary benefit of reduced NO_X emissions resulting from the standard levels it considers. For NO_x emissions, available estimates suggest a very wide range of monetary values for NO_X emissions, ranging from $450 to $4,623 per ton in 2010$.[41] In accordance with U.S. Office of Management and Budget (OMB) guidance, DOE will conduct two calculations of the monetary benefits derived using each of the economic values used for NO_x, one using a real discount rate of 3 percent and another using a real discount rate of 7 percent.[42]

DOE does not plan to monetize estimates of Hg in this rulemaking. DOE is aware of multiple agency efforts to determine the appropriate range of values used in evaluating the potential economic benefits of reduced Hg emissions. DOE has decided to await further guidance

[41] For additional information, refer to U.S. Office of Management and Budget, Office of Information and Regulatory Affairs, 2006 Report to Congress on the Costs and Benefits of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities, Washington, DC.
[42] OMB, Circular A-4: Regulatory Analysis (Sept. 17, 2003).

regarding consistent valuation and reporting of Hg emissions before it once again monetizes Hg in its rulemakings.

17. REGULATORY IMPACT ANALYSIS

In the NOPR stage of this rulemaking, DOE will prepare a regulatory impact analysis that will address the potential for non-regulatory approaches to supplant or augment energy conservation standards to improve the efficiency of residential wine chillers on the market. DOE recognizes that voluntary or other non-regulatory efforts by manufacturers, utilities, and other interested parties can result in substantial efficiency improvements. DOE intends to analyze the likely effects of non-regulatory initiatives on product energy use, consumer utility, and LCCs. DOE will attempt to base its assessment on the actual impacts of any such initiatives to date, but will also consider information presented regarding the impacts that any existing initiative might have in the future.

If DOE proposes energy conservation standards for wine chillers and the NOPR constitutes a significant regulatory action, DOE would prepare and submit to OMB for review the assessment of costs and benefits required under section 6(a)(3) of Executive Order 12866, “Regulatory Planning and Review,” 58 FR 51735 (October 4, 1993).

APPENDIX A – DRAFT PRELIMINARY MANUFACTURER IMPACT ANALYSIS QUESTIONAIRE

1 Issues

1.1 What are the key issues for your company regarding a possible future product rulemaking?

2 Shipment Projections

2.1 What is your company's approximate market share?
2.2 Would you expect your market share to change once standards become effective? Does your outlook change with higher efficiency levels?
2.3 How would you expect shipments to change for the industry as a whole as a function of standards and why?
2.4 Looking at price/cost effects only, how would you expect shipments to change for a 5 percent, 10 percent, 25 percent, or 50 percent manufacturer price/cost increase?

3 Conversion Costs

3.1 What level of capital expenditure and product conversion costs would you anticipate to make at higher standard levels? Please describe what they are and provide your best estimate of their respective magnitudes.
3.2 How would the imposition of new energy conservation standards affect capacity utilization and manufacturing assets at your domestic production facilities? Would a new standard result in stranded capital assets? Would any facilities be closed or downsized? Added or upgraded?
3.3 How might a new standard impact product innovation?

4 Product Mix and Profitability

4.1 How would your company's product mix and marketing strategy change with changes in the efficiency standard?
4.2 What distribution channels are used from the manufacturer to the retail outlet? What is the share of product going through each distribution channel?
4.3 Generally, how would new product standards affect your customer mix, distribution channels, and corresponding profit margins?
4.4 How might a new standard affect the ENERGY STAR program, and consequently your firm?

5 Market Shares and Industry Consolidation

5.1 In the absence of new standards, do you expect any industry consolidation?
5.2 How would new standards affect your ability to compete?
5.3 Could new standards disproportionately advance or harm the competitive positions of some firms?

5.4 Are there concerns over intellectual property?
5.5 Could new standards result in disproportionate economic or performance penalties for particular consumer/user subgroups?
5.6 Beyond price and energy efficiency, could new standards result in products that will be more or less desirable to consumers due to changes in product functionality, utility, or other features?

6 Cumulative Regulatory Burden

6.1 Are there recent or impending regulations on your specific product or other products that impose a cumulative burden on the industry?
6.2 If so, what is the total expected impact of those other regulations?

APPENDIX B – SUMMARY OF ITEMS FOR STAKEHOLDER COMMENT

Summary of all items for stakeholder comment contained in the framework document.