DEPARTMENT OF ENERGY

10 CFR Part 460

[EERE-2009-BT-BC-0021]

RIN 1904-AC11

Energy Conservation Program: Energy Conservation Standards for Manufactured Housing: Availability of Provisional Analysis

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Supplemental notice of proposed rulemaking; reopening of public comment period and notification of data availability (NODA).

SUMMARY: The U.S. Department of Energy (DOE) is reopening the public comment period for the supplemental notice of proposed rulemaking ("SNOPR") regarding proposals to amend energy conservation standards for manufactured housing. DOE published the SNOPR in the *Federal Register* on August 26, 2021. DOE is also publishing a notice of data availability (NODA) for the manufactured housing energy conservation standards rulemaking announcing the availability of updated analyses and results, and is giving interested parties an opportunity to comment on these analyses and submit additional data.

DATES: The comment period for the SNOPR which published on August 26, 2021 (86 FR 47744), is reopened. DOE will accept comments, data, and information regarding the SNOPR and NODA received no later than **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**. See section IX, "Public Participation," for details.

ADDRESSES: Any comments submitted must identify the NODA for Energy Conservation Standards for Manufactured Housing and provide docket number EERE-2009-BT-STD-0021 and/or regulatory information number (RIN) number 1904-AC11.

Submit electronic comments in WordPerfect, Microsoft Word, PDF, or ASCII file format, and avoid the use of special characters or any form of encryption.

Although DOE has routinely accepted public comment submissions through a variety of mechanisms, including postal mail and hand delivery/courier, the Department has found it necessary to make temporary modifications to the comment submission process in light of the ongoing Covid-19 pandemic. DOE is currently suspending receipt of public comments via postal mail and hand delivery/courier. If a commenter finds that this change poses an undue hardship, please contact Appliance Standards Program staff at (202) 586-1445 to discuss the need for alternative arrangements. Once the Covid-19 pandemic health emergency is resolved, DOE anticipates resuming all of its regular options for public comment submission, including postal mail and hand delivery/courier.

No telefacsimilies (faxes) will be accepted. For detailed instructions on submitting comments and additional information on the rulemaking process, see section IX.A of this document.

Docket: The docket for this activity, which includes *Federal Register* notices, comments, and other supporting documents/materials, is available for review at *www.regulations.gov*. All documents in the docket are listed in the *www.regulations.gov* index. However, not all documents listed in the index may be publicly available, such as information that is exempt from public disclosure.

The docket web page can be found at *www.regulations.gov/docket?D=EERE-2009-BT-BC-0021*. The docket web page contains instructions on how to access all documents, including public comments, in the docket. See section IX.A for information on how to submit comments through *www.regulations.gov*.

FOR FURTHER INFORMATION CONTACT:

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SUPPLEMENTARY INFORMATION:

Table of Contents

I. Background
II. Summary of the Analyses Performed by the Department of Energy
III. Summary of the Updated Inputs Since the August 2021 MH SNOPR
  A. 2021 CFPB Manufactured Housing Finance Report
  B. 2020 Manufactured Housing Survey
  C. AEO 2021
  D. 2020 Shipments
IV. Summary of Updated SNOPR Analysis Results
V. Sensitivity Analysis Results – Alternate Size-Based Tier Threshold For the Tiered Standard
VI. Sensitivity Analysis Results – Alternate R-21 Exterior Wall Insulation for Climate Zone 2 and 3 for Tier 2 and Untiered Standards
  A. Sensitivity Analysis Results – Alternate R-21 Exterior Wall Insulation for Climate Zone 2 and 3 Combined with Alternate Size-Based Tier Threshold for Tiered Standard
VII. Comparison of the August 2021 MH SNOPR and NODA Results
VIII. Reopening of Comment Period
IX. Public Participation
  A. Submission of Comments
X. Approval of the Office of the Secretary

I. Background

DOE published a supplemental notice of proposed rulemaking ("SNOPR") proposing amended energy conservation standards for manufactured housing on August 26, 2021 ("August 2021 MH SNOPR"). 86 FR 47744. In the August 2021 MH SNOPR, DOE's primary proposal was the "tiered" approach, based on the 2021 IECC, wherein a subset of the energy conservation standards would be less stringent for certain

manufactured homes in light of the cost-effectiveness considerations required by statute. Under the tiered proposal, two sets of standards would be established in proposed 10 CFR part 460, subpart B (i.e., Tier 1 and Tier 2). Tier 1 would apply to manufactured homes with a manufacturer's retail list price of $55,000 or less, and also incorporate building thermal envelope measures based on certain thermal envelope components subject to the 2021 IECC, but would limit the incremental purchase price increase to an average of approximately $750. Tier 2 would apply to manufactured homes with a manufacturer's retail list price above $55,000, and incorporate building thermal envelope measures based on certain thermal envelope components and specifications of the 2021 IECC (i.e., the Tier 2 requirements would be the same as those under the proposed single, "untiered" set of standards). 86 FR 47744, 47746.

As noted in the August 2021 MH SNOPR, several data sources that served as inputs to the August 2021 MH SNOPR have since been updated to include more recent data that DOE did not incorporate in its analyses in the August 2021 MH SNOPR. 86 FR 47758. DOE sought comment on the use of these data sources for this rulemaking. Further, based on comments and consultations with the U.S. Department of Housing and Urban Development (HUD), DOE conducted a sensitivity analysis using an alternate tier threshold based on size (e.g., single-section vs. multi-section homes) for the tiered proposal. DOE also performed a sensitivity analysis with alternate wall insulation requirements for climate zones 2 and 3 for both the tiered and the untiered standards. This notice of data availability (NODA) announces the availability of these updated inputs and corresponding analyses results and invites interested parties to submit comments on these analyses or provide any additional data. DOE will consider the updated inputs and corresponding analyses, as well comments on the inputs and analyses, as part of this rulemaking. DOE may further revise the analysis presented in this rulemaking based on

any new or updated information or data it obtains. DOE encourages stakeholders to provide any additional data or information that may inform the analysis.

II. Summary of the Analyses Performed by the Department of Energy

DOE conducted analyses of manufactured housing for both the August 2021 MH SNOPR and this NODA in the following areas: (1) life-cycle cost ("LCC") and payback period ("PBP"), (2) national impacts, and (3) emissions impacts.

DOE conducts LCC and PBP analyses to evaluate the economic impacts on individual consumers of energy conservation standards for manufactured housing. The LCC is the total consumer expense of a manufactured home over the life of that home, consisting of total installed cost plus total operating costs. To compute the total operating costs, DOE discounts future operating costs to the time of purchase and sums them over the lifetime of the product (or another specified period).[1] The PBP is the estimated amount of time (in years) it takes consumers to recover the increased purchase cost of a more-efficient manufactured home through lower operating costs.

DOE conducts the national impact analysis ("NIA") to assess the national energy savings ("NES") and the national net present value ("NPV") from a national perspective of total consumer costs and savings that would be expected to result from new or amended standards. DOE calculates the NES and NPV based on projections of annual product shipments, along with the annual energy consumption and total incremental cost data from the LCC analyses.

Finally, DOE estimates environmental benefits in the form of reduced emissions of air pollutants and greenhouse gases associated with electricity production. DOE bases these estimates on a 30-year analysis period of manufactured home shipments and

[1] In the August 2021 SNOPR, DOE performed LCC analyses for a 30-year period, based on the assumed lifetime of manufactured homes. 86 FR 87744, 87791-87792. Additionally, based on comments received, to measure the LCC of the first homeowner of a manufactured home, DOE also performed LCC analyses for a 10-year period. *Id.* Analyses for both a 30-year and 10-year period are presented in this NODA.

includes the reductions in emissions that accrue over the 30-year home lifetime. DOE's analysis estimates reductions in emissions of six pollutants associated with energy savings: carbon dioxide (CO_2), mercury (Hg), nitric oxide and nitrogen dioxide (NO_X), sulfur dioxide (SO_2), methane (CH_4), and nitrous oxide (N_2O). These reductions are referred to as "site" emissions reductions. Furthermore, DOE estimates reductions due to "upstream" activities in the fuel production chain. These upstream activities comprise extraction, processing, and transporting fuels to the site of combustion. Together, site emissions reductions and upstream emissions reductions account for the FFC. Further, DOE calculates the value of the reduced emissions of CO_2, CH_4, and N_2O (collectively, greenhouse gases or GHGs) using a range of values per metric ton of pollutant, consistent with the interim estimates issued in February 2021 under Executive Order 13990. Separately, DOE also estimates the monetary benefits from the reduced emissions of NO_X and SO_2.

III. Summary of the Updated Inputs Since the August 2021 MH SNOPR

As noted in the August 2021 MH SNOPR, several data sources that served as inputs to the August 2021 MH SNOPR have since been updated to include more recent data that DOE did not incorporate in its analyses in the August 2021 MH SNOPR. 86 FR 47758. Table III.1 presents a summary of the updated inputs and the analyses that are impacted because of the updates to the data. DOE will consider the updated inputs and corresponding analyses, as well comments on the inputs and analyses, as part of this rulemaking. DOE may further revise the analysis presented in this rulemaking based on any new or updated information or data it obtains. DOE encourages stakeholders to provide any additional data or information that may inform the analysis.

Table III.1 Updated Inputs to the Analysis Conducted for the Energy Conservation Standards

SNOPR	NODA	Analyses Impacted
2014 Consumer Finance Protection Bureau (CFPB) Manufactured Housing Finance Report	2021 CFPB Manufactured Housing Finance Report	Impacts the LCC, PBP and NIA analyses.
2019 Manufactured Housing Survey (MHS)	2020 MHS	Determines the manufacturer's retail list price threshold for the tiered proposal, and affects shipments for NIA and emissions analyses.
Annual Energy Outlook (AEO) 2020	AEO 2021	Impacts the LCC, PBP, NIA and emissions analyses.
2019 Shipments	2020 Shipments	Impacts the NIA and emissions analyses.
2015 Energy Star Shipments	2020 Energy Star Shipments	

Sections III.A through III.D provide a summary of the input updates for this NODA. Sections IV through VI provide the LCC, PBP, national and emissions impacts results based on the input updates discussed in this section.

A. *2021 CFPB Manufactured Housing Finance Report*

The CFPB manufactured housing ("MH") report analyzes the differences between mortgage loans used for site-built homes, and mortgage loans and chattel loans used for manufactured homes.[2] For the August 2021 MH SNOPR, the proposed manufacturer's retail list price tier threshold for the tiered standard was developed using loan data derived from the 2014 CFPB report,[3] and purchase price data derived from the MHS 2019 Public Use File ("PUF") data.[4] 86 FR 47744, 47760. In this NODA, DOE maintained the same analysis as the August 2021 MH SNOPR, but updated the CFPB MH report source to the latest version, which is the 2021 CFPB MH report. Section III.B provides the discussion regarding the updated purchase price data using MHS 2020 PUF data.

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[2] Manufactured Housing Finance: New Insights from the Home Mortgage Disclosure Act; *https://www.consumerfinance.gov/data-research/research-reports/manufactured-housing-finance-new-insights-hmda/*

[3] CFPB report, 2014. *https://files.consumerfinance.gov/f/201409_cfpb_report_manufactured-housing.pdf*.

[4] Manufactured Housing Survey, Public Use File (PUF) 2019. *https://www.census.gov/data/datasets/2019/econ/mhs/puf.html*

To calculate the tier threshold for the tiered standard, DOE considered that low-income purchasers of manufactured homes would mostly likely use chattel loans, or similar loans that are high-priced.[5] The 2014 CFPB MH report explicitly stated that high-priced manufactured housing loans (including chattel loans) account for roughly 68 percent of total manufactured housing loans.[6]

The 2021 CFPB MH report no longer reports this information. Instead, the 2021 CFPB MH report lists the proportion of loans that are chattel loans, as well as the proportion of chattel and non-chattel loans that are high-priced loans. The 2021 CFPB MH report states that 42 percent of all manufactured home loans are chattel loans; accordingly, DOE determined that the remaining (58 percent) would be non-chattel loans. Of the chattel loans, the 2021 CFPB MH report states that 93.8 percent are high-priced loans. Similarly, of the non-chattel loans, the 2021 CFPB MH report states that 52.4 percent are high-priced loans. Using these data, DOE estimates that approximately 70 percent (42% * 93.8% + 58% * 52.4% = 70%) of all manufactured housing loans (i.e., chattel and non-chattel loans) were high-priced loans. Accordingly, for this NODA, DOE assumed that high-priced manufactured housing loans (including chattel loans) account for roughly 70 percent of total manufactured housing loans. This percentage is used to determine the updated manufacturer's retail list price tier threshold, which is discussed further in section III.B.

Additionally, the 2021 CFPB MH report also lists the median chattel loan term as 23 years, which differs from the 15-year value that DOE assumed in the August 2021 MH SNOPR, which was based on suggestions from the MH working group. 86 FR 47744, 47793. For this NODA, DOE assumes a chattel loan term of 23 years, which is

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[5] The Consumer Finance Protection Bureau (CFPB) generally describes a higher-priced mortgage loan as a loan with an annual percentage rate, or APR, higher than a benchmark rate called the Average Prime Offer Rate. The requirements for this loan can be found in 12 CFR 1026.35.

[6] 2014 CFPB MH report; See page 6.

consistent with the 2021 CFPB MH report. The impact of the longer loan on the analysis is that it increased LCC savings and decreased NPV at 3 percent discount rate.

B. *2020 Manufactured Housing Survey*

The MHS, which is sponsored by HUD and collected by the Census Bureau, provides data on shipments, prices and characteristics of new manufactured housing.[7] Specifically, the MHS PUF data provide estimates of average sales prices for new manufactured homes sold or intended for sale by geographical region and size of home.

As discussed in section III.A, for the August 2021 MH SNOPR, the purchase price data used to determine the manufacturer's retail list price tier threshold was derived from the MHS 2019 PUF data. 86 FR 47744, 47760. In this section, DOE discusses the updates based on the latest MHS data, which is the MHS 2020 PUF data.[8]

The MHS 2020 PUF data set provides data that relates Census region (the U.S. Census Bureau divides the country into four census regions) with sales price. Table III.2 summarizes the average, minimum and maximum sales prices based on census region and number of sections. In general, the data indicate that average sales price (specifically for single-section homes) does not differ significantly based on census region.

Table III.2 MHS PUF 2020 Census Region and Sales Price Data

Census Region	Single-section Sales Price (*2020$*)			Dual-section Sales Price* (*2020$*)		
	Average	Minimum	Maximum	Average	Minimum	Maximum
Northeast	$57,916	$35,600	$95,000	$107,951	$56,000	$233,000
Midwest	$56,983	$33,200	$79,000	$104,987	$54,000	$184,000
South	$56,798	$31,400	$79,000	$106,942	$58,000	$170,000
West	$61,748	$34,100	$117,000	$118,282	$64,000	$236,000
All	$57,233	$31,400	$117,000	$108,583	$54,000	$236,000

* The MHS PUF 2020 dataset provides multi-section home sales price separately for dual-section homes and triple-section (or larger) homes; however the triple-section (or larger) homes data is not differentiated by census region. Therefore, DOE only presents the dual-section data in this table, which should generally represent the sales price for multi-section homes (triple-section or larger represent 1 percent of the market in 2020 based on the MHS PUF 2020 dataset).

[7] Manufactured Housing Survey; *www.census.gov/programs-surveys/mhs.html*
[8] Manufactured Housing Survey, Public Use File (PUF) 2020. *https://www.census.gov/data/datasets/2020/econ/mhs/puf.html*

Further, the MHS also summarizes average manufactured home sales price by state.[9] Table III.3 presents the average sales prices in 2020 per HUD climate zone based on the MHS data discussed previously and manufactured home shipments published by Manufactured Housing Institute.[10]

Table III.3 MHS Average Sales Price Data by HUD Climate Zone

HUD Climate Zone	Single-section Average Sales Price (*2020$*)	Dual-section Average Sales Price (*2020$*)
1	$57,124	$107,003
2	$57,290	$111,208
3	$56,207	$109,147

To determine the updated manufacturer's retail list price tier in a similar manner to what was considered in the August 2021 MH SNOPR, DOE assumed that price-sensitive, low-income purchasers rely on high-priced loans, given the inability to qualify for conventional loans. Based on the analysis in section III.A, the 70th percentile manufactured housing price gives an estimate for the upper bound for a manufactured home sales price that a price-sensitive low-income purchaser could afford. If people typically receive one primary loan, the percentage of high-priced loans used should be roughly equivalent to the percentage of people receiving high-priced loans (e.g., 70 percent). DOE considered that low-income purchasers would mainly purchase single-section homes that are, on average, at a lower sales price than multi-section homes. Applying the 70th percentile for single-section manufactured homes using the MHS PUF 2020 data yields a sales price of approximately $63,000 (in real 2020$).

Using the updated tier threshold at $63,000 (in real *2020$*) and the MHS PUF 2020 data set, DOE determined the shipment breakdown based on tier and climate zone using the same methodology as presented in the August 2021 MH SNOPR. 86 FR 47744,

[9] Manufactured Housing Survey, Annual Tables of New Manufactured Homes: 2014 – 2020; *https://www.census.gov/data/tables/time-series/econ/mhs/annual-data.html*
[10] Manufactured Housing Institute, Annual Production and Shipment Data; *https://www.manufacturedhousing.org/annual-production/*

47809-47810. This included applying a "substitution effect"[11] to 20 percent of homes within $1,000 of the price threshold ($63,001 - $64,000) that would shift to less stringent standards, i.e., from Tier 2 to Tier 1. *Id*. Accordingly, Table III.4 presents the corresponding percentage of total manufactured homes placed/sold applicable to each tier based on climate zone and size using the updated inputs. Compared to the August 2021 MH SNOPR, a higher percentage of single-section manufactured home shipments are in Tier 1, *i.e.*, Climate zone 1 or 2: 73.85 percent in this document vs. 53.58 percent in the August 2021 MH SNOPR; Climate zone 3: 73.28 percent in this document vs. 57.32 percent in the August 2021 MH SNOPR). Further, a portion of multi-section manufactured home shipments will also be in Tier 1.

Table III.4 Shipment Breakdown based on Tier and Proposed Climate Zone

	Climate Zone 1 or 2		**Climate Zone 3**		**Combined Climate Zone (%)**
	Single-section (%)	**Multi-section (%)**	**Single-section (%)**	**Multi-section (%)**	
Tier 1 Standard	74	5	73	3	35
Tier 2 Standard	26	95	27	97	65
Total	100	100	100	100	100

C. *AEO 2021*

The *AEO* presents long-term annual projections of energy supply, demand, and prices. The projections, focused on U.S. energy markets, are based on results from DOE Energy Information Administration's ("EIA") National Energy Modeling System ("NEMS"). NEMS enables EIA to make projections under internally consistent sets of assumptions. DOE used *AEO* projections as inputs into several analyses for the August 2021 MH SNOPR, which are discussed in more detail in this section.

For the August 2021 MH SNOPR, DOE used inputs from *AEO 2020* for establishing energy prices, escalation rates, inflation rates and housing starts. 86 FR

[11] DOE considered that a percentage of manufactured homes placed/sold would shift to less stringent standards, i.e., a percentage of homes from Tier 2 would shift to Tier 1. The inclusion of this shift in the market is to more accurately estimate energy savings (and other downstream results).

47744, 47794. In this NODA, DOE maintains the same source as the August 2021 MH SNOPR, but updated the *AEO* source to the latest version, which is *AEO 2021*.[12] Further, DOE updated the electricity prices from the EIA *Short-Term Energy Outlook*.[13] Specifically, DOE used electricity prices from 2020 quarter 2 and quarter 3 for summer electricity prices, and quarter 4 of 2020 and quarter 1 of 2021 for winter electricity prices. Table III.5 presents a comparison of the August 2021 MH SNOPR and NODA fuel prices and escalation rates.

Table III.5 AEO 2021 Fuel Prices and Escalation Rates Updates

	SNOPR		NODA	
	Price	**Escalation Rate**	**Price**	**Escalation Rate**
Electricity Summer Winter	 13.3 cents/kWh 12.9 cents/kWh	2.3%	 13.3 cents/kWh 13.2 cents/kWh	2.2%
Natural gas	10.3 $/MBtu	2.8%	10.1 $/Mbtu	2.8%
Liquid petroleum gas (LPG)	21.6 $/Mbtu	4.1%	17.3 $/Mbtu	3.7%
Oil	22.8 $/Mbtu	3.3%	17.8 $/Mbtu	3.8%

To forecast the nominal price increase of manufactured homes, DOE used the inflation forecast rate built into the *AEO 2021* at 2.28 percent, compared to the August 2021 MH SNOPR inflation based on *AEO 2020* at 2.33 percent. To forecast shipments into the future, DOE used a 5-year-average projection for growth in new housing starts from *AEO 2021* resulting in a 0.42 percent growth per year compared to the August 2021 MH SNOPR projection for growth based on *AEO 2020* at 0.3 percent growth per year.

For the August 2021 MH SNOPR, DOE derived annual average site-to-power plant factors based on the version of the NEMS that corresponds to AEO 2020. DOE calculated primary energy savings (power plant consumption) from site electricity savings by applying a factor to account for losses associated with the generation, transmission, and distribution of electricity. DOE computed the full-fuel cycle ("FFC") by encompassing the energy consumed in extracting, processing, and transporting or

[12] Energy Information Administration. Annual Energy Outlook 2021 with Projections to 2050. (2021).
[13] Energy Information Administration. Short-Term Energy Outlook: Real Prices Viewer. Available at: *www.eia.gov/forecasts/steo/realprices/.*

distributing primary fuels, which we refer to as "upstream" activities. 86 FR 47744, 47814. In this NODA, DOE updated the same inputs to *AEO 2021*. Table III.6 presents a comparison of the August 2021 MH SNOPR (based on *AEO 2020*) and NODA (based on *AEO 2021*) primary energy and FFC factors.

Table III.6 Primary Energy and FFC Factors, 2020-2050

Factor Type	Fuel Type	Dimensionless Factor			
		2020	2030	2040	2050
SNOPR					
Primary	Electricity	2.881	2.669	2.650	2.653
FFC	Electricity	1.049	1.044	1.044	1.041
	Natural Gas	1.109	1.114	1.112	1.107
	LPG/Oil	1.174	1.172	1.176	1.180
NODA					
Primary	Electricity	2.845	2.714	2.698	2.677
FFC	Electricity	1.044	1.039	1.037	1.037
	Natural Gas	1.101	1.098	1.098	1.099
	LPG/Oil	1.169	1.171	1.179	1.185

For the August 2021 MH SNOPR, DOE also used the *AEO 2020* to derive the power sector marginal emissions intensity factors for CO_2, NO_X, SO_2, and Hg. 86 FR 47744, 47814. For this NODA, DOE updated the emissions factors to *AEO 2021*.

Finally, in the August 2021 MH SNOPR, DOE also proposed that under the tiered proposal the manufacturer's retail list price thresholds would be adjusted for inflation (for the applicable year of compliance) using the most recently available AEO GDP deflator time series, which at the time was *AEO 2020*. 86 FR 47744, 47761. As such, in Table III.7, DOE provides the updated AEO 2021 GDP deflator series.

Table III.7 AEO 2021 GDP Deflator

	GDP Deflator
2020	1
2025	1.0756
2030	1.2203
2035	1.3702
2040	1.5208
2045	1.7038
2050	1.9527

D. *2020 Shipments*

The Institute for Building Technology and Safety ("IBTS") provides yearly shipments of manufactured homes, which is also published by the Manufactured Housing Institute ("MHI").[14] For the August 2021 MH SNOPR, DOE considered the 2019 shipment data provided through MHI as the latest data available at the time of the analysis. 86 FR 47744, 47798. For the August 2021 MH SNOPR, DOE only received historical shipment data of ENERGY STAR certified manufactured homes categorized by state from 2001 to 2015. Chapter 10 of the August 2021 MH SNOPR Technical Support Document ("TSD"). Further, DOE did not account for ENERGY STAR homes for the no-standard shipments and therefore excluded any ENERGY STAR shipments to avoid overestimating energy savings. 86 FR 47744, 47808.

In this NODA, DOE updated the August 2021 MH SNOPR analysis by considering the 2020 shipment data provided through MHI.[15] Further, DOE also received updated 2020 ENERGY STAR shipment data, albeit not separated by size (i.e., single-section vs. multi-section). DOE notes that there are more ENERGY STAR shipments in 2020 than projected in the August 2021 MH SNOPR, which reduces the total number of shipments applicable for the no-standards case and standards case compared to the August 2021 MH SNOPR, in turn reducing the net present value (NPV) for both the

[14] See Manufactured Home Shipments by Product Mix, 2019, MANUFACTURED HOUSING INSTITUTE. *www.manufacturedhousing.org/annual-production/*

[15] See Manufactured Home Shipments by Product Mix, 2020, MANUFACTURED HOUSING INSTITUTE. *www.manufacturedhousing.org/annual-production/*

untiered and tiered standards. Finally, as discussed in section III.C, DOE also updated the housing starts (shipment growth rate) to be consistent with *AEO 2021*. Table III.8 and Table III.9 presents the single-section and multi-section manufactured home shipments considered in the August 2021 MH SNOPR and this NODA.

Table III.8 Single-Section Manufactured Homes Shipments

Year	No-Standards Case		Tiered Standard		Untiered Standard	
	SNOPR	NODA	SNOPR	NODA	SNOPR	NODA
2025	41,304	36,855	40,610	36,388	40,041	35,642
2030	41,923	37,632	41,225	37,155	40,640	36,395
2035	42,558	38,429	41,853	37,938	41,255	37,164
2040	43,198	39,243	42,481	38,744	41,876	37,950
2045	43,853	40,074	43,128	39,565	42,507	38,754
2050	44,514	40,927	43,768	40,403	43,153	39,579

Table III.9 Multi-Section Manufactured Homes Shipments

Year	No-Standards Case		Tiered Standard		Untiered Standard	
	SNOPR	NODA	SNOPR	NODA	SNOPR	NODA
2025	48,268	43,045	47,247	42,069	47,247	42,038
2030	48,999	43,952	47,961	42,965	47,961	42,924
2035	49,738	44,886	48,685	43,869	48,685	43,836
2040	50,489	45,836	49,421	44,800	49,421	44,768
2045	51,249	46,803	50,163	45,752	50,163	45,710
2050	52,019	47,798	50,919	46,727	50,919	46,681

IV. Summary of Updated SNOPR Analysis Results

This section provides the results for the LCC and PBP, NIA and Emissions analyses based on the updates discussed in section III.

Table IV.1 Average Manufactured Housing Purchase Price (and Percentage) Increases under the Tiered Standard (2020$)

	Tier 1				Tier 2			
	Single-Section		Multi-Section		Single-Section		Multi-Section	
	$	*%*	*$*	*%*	*$*	*%*	*$*	*%*
Climate Zone 1	$627	1.2%	$897	0.9%	$2,567	4.8%	$4,131	4.0%
Climate Zone 2	$627	1.2%	$897	0.9%	$4,806	9.0%	$6,149	5.9%
Climate Zone 3	$719	1.4%	$700	0.7%	$4,645	8.7%	$5,822	5.6%
National Average	**$660**	**1.2%**	**$839**	**0.8%**	**$3,902**	**7.3%**	**$5,267**	**5.1%**

Table IV.2 Average Manufactured Housing Purchase Price (and Percentage) Increases under Untiered Standard (2020$)

	Untiered			
	Single-Section		Multi-Section	
	$	*%*	*$*	*%*
Climate Zone 1	$2,567	4.8%	$4,131	4.0%
Climate Zone 2	$4,806	9.0%	$6,149	5.9%
Climate Zone 3	$4,645	8.7%	$5,822	5.6%
National Average	**$3,902**	**7.3%**	**$5,267**	**5.1%**

Table IV.3 Average Manufactured Home LCC Savings (30 years) under the Tiered Standard by Climate Zone (2020$)*

	Tier 1		Tier 2	
	Single-Section	Multi-Section	Single-Section	Multi-Section
Climate Zone 1	$1,042	$1,601	$2,427	$3,844
Climate Zone 2	$1,143	$1,705	$1,156	$1,983
Climate Zone 3	$2,560	$3,550	$2,311	$3,056
National Average	**$1,606**	**$2,205**	**$2,045**	**$3,023**

* No cities exhibit negative LCC savings in Tier 1. San Francisco is the only city that exhibits negative LCC savings in Tier 2.

Table IV.4 Average Manufactured Home LCC Savings (30 years) under the Tiered Standard by Climate Zone (2020$)*

Climate Zone	City	Tier 1		Tier 2	
		Single-Section	Multi-Section	Single-Section	Multi-Section
1	Miami	$460	$850	$1,345	$2,336
1	Houston	$931	$1,541	$2,231	$3,747
1	Atlanta	$1,532	$2,481	$3,258	$5,468
1	Charleston	$1,093	$1,773	$2,494	$4,176
1	Jackson	$1,312	$2,104	$2,989	$4,968
1	Birmingham	$1,317	$2,101	$2,895	$4,806
2	Phoenix	$616	$1,026	$665	$1,763
2	Memphis	$1,493	$2,364	$1,491	$2,743
2	El Paso	$990	$1,547	$1,106	$2,185
2	San Francisco	$543	$812	($387)	($68)
2	Albuquerque	$1,089	$1,719	$1,074	$2,096
3	Baltimore	$2,422	$3,678	$2,002	$3,164
3	Salem	$1,475	$2,191	$411	$822
3	Chicago	$2,443	$3,738	$2,018	$3,239
3	Boise	$1,682	$2,562	$890	$1,558
3	Burlington	$2,503	$3,798	$2,193	$3,439
3	Helena	$2,441	$3,631	$2,431	$3,631
3	Duluth	$3,917	$5,794	$5,013	$7,256
3	Fairbanks	$5,851	$8,516	$9,307	$13,065
	National Average	**$1,606**	**$2,205**	**$2,045**	**$3,023**

* negative values in parenthesis.

Table IV.5 Average Manufactured Home LCC Savings (30 years) under the Untiered Standard by Climate Zone (2020$)*

	Single-Section	Multi-Section
Climate Zone 1	$2,154	$3,409
Climate Zone 2	$863	$1,573
Climate Zone 3	$1,942	$2,583
National Average	**$1,733**	**$2,585**

* San Francisco is the only city that exhibits negative LCC savings in the untiered standard results.

Table IV.6 Average Manufactured Home LCC Savings (30 years) under the Untiered Standard by Climate Zone (2020$)*

Climate Zone	City	Single-Section	Multi-Section
1	Miami	$1,142	$1,998
1	Houston	$1,971	$3,318
1	Atlanta	$2,931	$4,928
1	Charleston	$2,217	$3,719
1	Jackson	$2,680	$4,459
1	Birmingham	$2,592	$4,308
2	Phoenix	$403	$1,368
2	Memphis	$1,176	$2,286
2	El Paso	$817	$1,766
2	San Francisco	($585)	($349)
2	Albuquerque	$781	$1,674
3	Baltimore	$1,662	$2,696
3	Salem	$167	$495
3	Chicago	$1,667	$2,751
3	Boise	$614	$1,183
3	Burlington	$1,822	$2,929
3	Helena	$2,053	$3,118
3	Duluth	$4,462	$6,501
3	Fairbanks	$8,478	$11,933
	National Average	**$1,733**	**$2,585**

* negative values in parenthesis.

Table IV.7 Average Manufactured Home Simple Payback Period under the Tiered Standard by Climate Zone

	Tier 1		Tier 2	
	Single-Section	Multi-Section	Single-Section	Multi-Section
Climate Zone 1	4.7	4.5	8.5	8.5
Climate Zone 2	4.5	4.4	13.3	12.5
Climate Zone 3	2.9	2.1	11.5	11.3
National Average	**3.7**	**3.5**	**11.0**	**10.6**

Table IV.8 Average Manufactured Home Simple Payback Period under the Tiered Standard by Climate Zone

Climate Zone	City	Tier 1		Tier 2	
		Single-Section	Multi-Section	Single-Section	Multi-Section
1	Miami	7.4	6.5	10.8	10.5
1	Houston	5.1	4.6	8.8	8.6
1	Atlanta	3.7	3.3	7.3	7.1
1	Charleston	4.6	4.2	8.4	8.2
1	Jackson	4.1	3.8	7.6	7.5
1	Birmingham	4.1	3.8	7.8	7.6
2	Phoenix	6.5	6.0	14.5	12.9
2	Memphis	3.7	3.5	12.6	11.4
2	El Paso	4.9	4.6	13.3	12.1
2	San Francisco	7.2	7.0	18.5	17.1
2	Albuquerque	4.8	4.5	13.9	12.7
3	Baltimore	2.9	2.0	11.5	10.7
3	Salem	4.3	3.2	15.8	15.1
3	Chicago	3.0	2.1	12.1	11.2
3	Boise	3.9	2.8	14.4	13.6
3	Burlington	3.0	2.1	12.2	11.3
3	Helena	3.0	2.1	11.4	10.7
3	Duluth	2.0	1.4	8.4	7.8
3	Fairbanks	1.4	1.0	5.7	5.3
	National Average	**3.7**	**3.5**	**11.0**	**10.6**

Table IV.9 Average Manufactured Home Simple Payback Period under the Untiered Standard by Climate Zone

	Single-Section	Multi-Section
Climate Zone 1	8.5	8.5
Climate Zone 2	13.3	12.5
Climate Zone 3	11.5	11.3
National Average	**11.0**	**10.6**

Table IV.10 Average Manufactured Home Simple Payback Period under the Untiered Standard by Climate Zone

Climate Zone	City	Single-Section	Multi-Section
1	Miami	10.8	10.5
1	Houston	8.8	8.6
1	Atlanta	7.3	7.1
1	Charleston	8.4	8.2
1	Jackson	7.6	7.5
1	Birmingham	7.8	7.6
2	Phoenix	14.5	12.9
2	Memphis	12.6	11.4
2	El Paso	13.3	12.1
2	San Francisco	18.5	17.1
2	Albuquerque	13.9	12.7
3	Baltimore	11.5	10.7
3	Salem	15.8	15.1
3	Chicago	12.1	11.2
3	Boise	14.4	13.6
3	Burlington	12.2	11.3
3	Helena	11.4	10.7
3	Duluth	8.4	7.8
3	Fairbanks	5.7	5.3
	National Average	**11.0**	**10.6**

Table IV.11 National Average Per-Home Cost Savings*

	Single-Section	Multi-Section
Tier 1 Standard		
Lifecycle Cost Savings (30-Year Lifetime)	$1,606	$2,205
Lifecycle Cost Savings (10-Year Lifetime)	$726	$1,015
Annual Energy Cost Savings in 2020$	$176	$238
Simple Payback Period	3.7	3.5
Tier 2 Standard		
Lifecycle Cost Savings (30-Year Lifetime)	$2,045	$3,023
Lifecycle Cost Savings (10-Year Lifetime)	$78	$235
Annual Energy Cost Savings in 2020$	$354	$496
Simple Payback Period	11.0	10.6
Untiered Standard		
Lifecycle Cost Savings (30-Year Lifetime)	$1,733	$2,585
Lifecycle Cost Savings (10-Year Lifetime)	($57)	$50
Annual Energy Cost Savings in 2020$	$354	$496
Simple Payback Period	11.0	10.6

* negative values in parenthesis.

Table IV.12 Cumulative Full-Fuel-Cycle National Energy Savings of Manufactured Homes Purchased 2023–2052 with a 30-Year Lifetime

	Single-Section quadrillion Btu (quads)	Multi-Section (quads)
Tiered Standard		
Climate Zone 1	0.163	0.526
Climate Zone 2	0.139	0.475
Climate Zone 3	0.274	0.435
Total	**0.576**	**1.436**
Untiered Standard		
Climate Zone 1	0.276	0.542
Climate Zone 2	0.249	0.489
Climate Zone 3	0.370	0.439
Total	**0.894**	**1.470**

Table IV.13 Net Present Value of Consumer Benefits for Manufactured Homes Purchased 2023-2052 with a 30-Year Lifetime at a 7% Discount Rate*

	Single-Section *billion 2020$*	Multi-Section *billion 2020$*
Tiered Standard		
Climate Zone 1	$0.15	$0.31
Climate Zone 2	$0.08	($0.01)
Climate Zone 3	$0.33	$0.18
Total	**$0.56**	**$0.48**
Untiered Standard		
Climate Zone 1	$0.16	$0.30
Climate Zone 2	($0.06)	($0.04)
Climate Zone 3	$0.11	$0.16
Total	**$0.21**	**$0.42**

* negative values in parenthesis.

Table IV.14 Net Present Value of Consumer Benefits for Manufactured Homes Purchased 2023-2052 with a 30-Year Lifetime at a 3% Discount Rate

	Single-Section *billion 2020$*	Multi-Section *billion 2020$*
Tiered Standard		
Climate Zone 1	$0.45	$1.15
Climate Zone 2	$0.29	$0.45
Climate Zone 3	$0.99	$0.86
Total	**$1.73**	**$2.47**
Untiered Standard		
Climate Zone 1	$0.57	$1.11
Climate Zone 2	$0.09	$0.35
Climate Zone 3	$0.62	$0.78
Total	**$1.28**	**$2.23**

Table IV.15 Emissions Reductions Associated with Manufactured Homes Purchased 2023-2052 with a 30-Year Lifetime

Pollutant	Tiered Standard		Untiered Standards	
	Single-Section	Multi-Section	Single-Section	Multi-Section

Site Emissions Reductions				
CO_2 (million metric tons)	23.7	55.1	35.7	56.2
Hg (metric tons)	0.037	0.097	0.058	0.0995
NO_X (thousand metric tons)	12.9	27.5	18.8	28.0
SO_2 (thousand metric tons)	8.8	20.9	13.4	21.3
CH_4 (thousand metric tons)	1.28	3.16	1.97	3.24
N_2O (thousand metric tons)	0.26	0.58	0.383	0.591
Upstream Emissions Reductions				
CO_2 (million metric tons)	2.4	5.2	3.52	5.3
Hg (metric tons)	1.84E-04	4.52E-04	2.84E-04	4.63E-04
NO_X (thousand metric tons)	30.4	66.6	44.8	68
SO_2 (thousand metric tons)	0.24	0.48	0.343	0.49
CH_4 (thousand metric tons)	155	362	234	370
N_2O (thousand metric tons)	0.013	0.027	0.019	0.028
Total Emissions Reductions				
CO_2 (million metric tons)	26.2	60.3	39.3	61.5
Hg (metric tons)	0.037	0.097	0.059	0.1
NO_X (thousand metric tons)	43	94.1	64	96
SO_2 (thousand metric tons)	9.1	21.4	13.7	21.8
CH_4 (thousand metric tons)	156	365	236	373
N_2O (thousand metric tons)	0.27	0.61	0.40	0.62

Table IV.16 Net Present Value of Monetized Benefits from GHG and Emissions Reductions

	Discount Rate *%*	**Net Present Value** *million 2020$*			
		Tiered Standard		**Untiered Standard**	
Monetary Benefits		**Single-Section**	**Multi-Section**	**Single-Section**	**Multi-Section**
GHG Reduction (using avg. social costs at 5% discount rate)*	5	254.2	587.8	382.2	600.7
GHG Reduction (using avg. social costs at 3% discount rate)*	3	1,074.3	2,481.0	1,614.1	2,535.2
GHG Reduction (using avg. social costs at 2.5% discount rate)*	2.5	1,763.2	4,069.6	2,648.5	4,158.4
GHG Reduction (using 95th percentile social costs at 3% discount rate)*	3	3,229.0	7,454.7	4,850.7	7,617.5
NO_X Reduction**	3	114.5	233.6	165.0	243.1
	7	39.9	81.6	57.5	84.9
SO_2 Reduction**	3	176.2	373.2	257.2	389.0
	7	62.0	132.3	90.8	137.9

* Estimates of SC-CO_2 SC-CH_4, and SC-N_2O are calculated using a range of discount rates for use in regulatory analyses. Three sets of values are based on the average social costs from the integrated assessment models, at discount rates of 5 percent, 3 percent, and 2.5 percent. The fourth set, which represents the 95th percentile of the social cost distributions. calculated using a 3-percent discount rate, is included to represent higher-than-expected impacts from climate change further out in the tails of the social cost distributions. The social cost values are emission year specific. See section IV.D of the August 2021 MH SNOPR for more details.

** The benefits from NOx and SO_2 were based on the low estimate monetized value.

V. Sensitivity Analysis Results – Alternate Size-Based Tier Threshold For the Tiered Standard

For this NODA, DOE also considered a sensitivity analysis where the tier threshold for the tiered standard would be based on the manufactured home size instead of the manufacturer's retail list price. Specifically, the Tier 1 standard would apply to all single-section homes, and the Tier 2 standard would apply to all multi-section homes. Table V.1 presents the updated shipments breakdown for this sensitivity analysis using the MHS 2020 PUF data set.

Table V.1 Shipment Breakdown based on Tier under the Alternate Size-Based Threshold

	All Climate Zones		
	Single-section (%)	**Multi-section (%)**	**Total (%)**
Tier 1 Standard	100	0	45
Tier 2 Standard	0	100	55
Total	100	100	100

The following tables present the results for the NIA and emissions analyses results based on the alternate size-based tier threshold for the tiered standard only. DOE notes that the LCC and PBP analyses results presented in section IV for both the tiered and untiered standards would not change for this sensitivity analysis. This is because the LCC and PBP analysis evaluates the economic impacts on individual consumers of energy conservation standards for manufactured housing, not the entire nation. Further, the NIA and emissions results presented in section IV for the untiered standard would also not change for this sensitivity analysis because the tier threshold does not apply.

Table V.2 Cumulative Full-Fuel-Cycle National Energy Savings of Manufactured Homes Purchased 2023–2052 with a 30-Year Lifetime under the Alternate Size-Based Threshold

Tiered Standard		
	Single-Section (quads)	**Multi-Section (quads)**
Climate Zone 1	0.123	0.542
Climate Zone 2	0.100	0.489
Climate Zone 3	0.239	0.439
Total	**0.462**	**1.470**

Table V.3 Net Present Value of Consumer Benefits for Manufactured Homes Purchased 2023-2052 with a 30-Year Lifetime under the Alternate Size-Based Threshold

Tiered Standard				
	7% Discount Rate		**3% Discount Rate**	
	Single-Section ***billion 2020$***	**Multi-Section*** ***billion 2020$***	**Single-Section** ***billion 2020$***	**Multi-Section** ***billion 2020$***
Climate Zone 1	$0.15	$0.31	$0.40	$1.17
Climate Zone 2	$0.13	($0.03)	$0.35	$0.44
Climate Zone 3	$0.40	$0.17	$1.10	$0.85
Total	**$0.68**	**$0.45**	**$1.85**	**$2.46**

* negative values in parenthesis.

Table V.4 Emissions Reductions Associated for Manufactured Homes Purchased 2023-2052 with a 30-Year Lifetime under the Alternate Size-Based Threshold

Tiered Standard		
Pollutant	**Single-Section**	**Multi-Section**
Site Emissions Reductions		
CO_2 (million metric tons)	19.5	56.2
Hg (metric tons)	0.0292	0.0995
NO_X (thousand metric tons)	10.9	28.0
SO_2 (thousand metric tons)	7.2	21.3
CH_4 (thousand metric tons)	1.03	3.24
N_2O (thousand metric tons)	0.21	0.59
Upstream Emissions Reductions		
CO_2 (million metric tons)	2.0	5.3
Hg (metric tons)	1.48E-04	4.63E-04
NO_X (thousand metric tons)	25.4	68.0
SO_2 (thousand metric tons)	0.21	0.49
CH_4 (thousand metric tons)	127	370
N_2O (thousand metric tons)	0.011	0.028
Total Emissions Reductions		
CO_2 (million metric tons)	21.5	61.5
Hg (metric tons)	0.029	0.100
NO_X (thousand metric tons)	36.3	96
SO_2 (thousand metric tons)	7.4	21.8
CH_4 (thousand metric tons)	128	373
N_2O (thousand metric tons)	0.23	0.62

Table V.5 Net Present Value of Monetized Benefits from GHG and Emissions Reductions under the Alternate Size-Based Threshold

Tiered Standard			
	Discount Rate %	**Net Present Value *million 2020$***	
Monetary Benefits		**Single-Section**	**Multi-Section**
GHG Reduction (using avg. social costs at 5% discount rate)*	5	208.5	600.7
GHG Reduction (using avg. social costs at 3% discount rate)*	3	881.3	2,535.2
GHG Reduction (using avg. social costs at 2.5% discount rate)*	2.5	1,446.6	4,158.4
GHG Reduction (using 95th percentile social costs at 3% discount rate)*	3	2,648.9	7,617.5
NO_X Reduction**	3	96.4	243.1
	7	33.5	84.9
SO_2 Reduction**	3	147.2	389.0
	7	51.7	137.9

* Estimates of SC-CO_2 SC-CH_4, and SC-N_2O are calculated using a range of discount rates for use in regulatory analyses. Three sets of values are based on the average social costs from the integrated assessment models, at discount rates of 5 percent, 3 percent, and 2.5 percent. The fourth set, which represents the 95th percentile of the social cost distributions calculated using a 3-percent discount rate, is included to represent higher-than-expected impacts from climate change further out in the tails of the social cost distributions. The social cost values are emission year specific. See section IV.D of the August 2021 MH SNOPR for more details.
** The benefits from NOx and SO_2 were based on the low estimate monetized value.

VI. Sensitivity Analysis Results – Alternate R-21 Exterior Wall Insulation for Climate Zone 2 and 3 for Tier 2 and Untiered Standards

For this NODA, DOE also conducted a sensitivity analysis using less stringent measures for exterior wall insulation for the Tier 2 and untiered standards. Specifically, the component requirements proposed in the August 2021 MH SNOPR for the prescriptive path for Climate Zone 2 and 3 require that exterior walls be sealed using R-20+5 exterior wall insulation. DOE proposed this requirement based on the 2021 IECC without modification. The "+5" involves using "continuous insulation," which is insulation that runs continuously over structural members and is free of significant thermal bridging. DOE's proposal requires continuous insulation only for the exterior wall insulation component. 86 FR 47744, 47772.

Accordingly, in this NODA, DOE considered a sensitivity analysis wherein DOE analyzed a less stringent exterior wall insulation requirement for the Tier 2/untiered standard instead. In this sensitivity analysis, DOE considered an R-21 exterior wall insulation as opposed to the proposed R-20+5, which would require continuous insulation. At R-20+5, the incremental cost relative to the baseline is $2,500, versus $850 for R-21. For this analysis, DOE maintained the NODA-updated manufacturer tier threshold (at $60,000 in real *2020$*) for the tiered standard.

The following tables present the results based on the alternate wall insulation for climate zone 2 and 3 for the Tier 2 and untiered standards only. DOE notes that the Tier 1 results presented in section IV would not change for this sensitivity analysis.

Table VI.1 Average Manufactured Housing Purchase Price (and Percentage) Increases under Tier 2 of the Tiered Standard and the Untiered Standard (2020$)

	Tier 2/Untiered			
	Single-Section		Multi-Section	
	$	*%*	*$*	*%*
Climate Zone 1	$2,567	4.8%	$4,131	4.0%
Climate Zone 2	$3,082	5.8%	$4,438	4.3%
Climate Zone 3	$2,921	5.5%	$4,111	4.0%
National Average	**$2,830**	**5.3%**	**$4,222**	**4.1%**

Table VI.2 Average Manufactured Home LCC Savings (30 years) by Climate Zone (2020$)*

	Tier 2 Standard		Untiered Standard	
	Single-Section	Multi-Section	Single-Section	Multi-Section
Climate Zone 1	$2,427	$3,844	$2,154	$3,409
Climate Zone 2	$2,401	$3,238	$2,105	$2,826
Climate Zone 3	$3,333	$4,101	$2,977	$3,639
National Average	**$2,740**	**$3,727**	**$2,432**	**$3,291**

* No cities exhibit negative LCC savings in Tier 1 or Tier 2.

Table VI.3 Average Manufactured Home LCC Savings (30 years) by Climate Zone (2020$)

Climate Zone	City	Tier 2 Standard		Untiered Standard	
		Single-Section	Multi-Section	Single-Section	Multi-Section
1	Miami	$1,345	$2,336	$1,142	$1,998
1	Houston	$2,231	$3,747	$1,971	$3,318
1	Atlanta	$3,258	$5,468	$2,931	$4,928
1	Charleston	$2,494	$4,176	$2,217	$3,719
1	Jackson	$2,989	$4,968	$2,680	$4,459
1	Birmingham	$2,895	$4,806	$2,592	$4,308
2	Phoenix	$1,987	$3,076	$1,718	$2,674
2	Memphis	$2,718	$3,967	$2,402	$3,508
2	El Paso	$2,353	$3,431	$2,061	$3,008
2	San Francisco	$951	$1,274	$745	$985
2	Albuquerque	$2,306	$3,325	$2,012	$2,902
3	Baltimore	$3,053	$4,211	$2,723	$3,752
3	Salem	$1,582	$1,992	$1,341	$1,668
3	Chicago	$3,079	$4,291	$2,738	$3,814
3	Boise	$2,001	$2,669	$1,732	$2,301
3	Burlington	$3,230	$4,468	$2,872	$3,970
3	Helena	$3,381	$4,583	$3,021	$4,087
3	Duluth	$5,778	$8,015	$5,258	$7,290
3	Fairbanks	$9,600	$13,363	$8,831	$12,291
	National Average	**$2,740**	**$3,727**	**$2,432**	**$3,291**

Table VI.4 Average Manufactured Home Simple Payback Period by Climate Zone

	Tier 2/Untiered Standard	
	Single-Section	**Multi-Section**
Climate Zone 1	8.5	8.5
Climate Zone 2	9.3	9.6
Climate Zone 3	8.1	8.6
National Average	**8.5**	**8.9**

Table VI.5 Average Manufactured Home Simple Payback Period by Climate Zone

Climate Zone	City	Tier 2 Standard/Untiered Standard	
		Single-Section	**Multi-Section**
1	Miami	10.8	10.5
1	Houston	8.8	8.6
1	Atlanta	7.3	7.1
1	Charleston	8.4	8.2
1	Jackson	7.6	7.5
1	Birmingham	7.8	7.6
2	Phoenix	10.1	9.8
2	Memphis	8.8	8.7
2	El Paso	9.3	9.3
2	San Francisco	13.0	13.2
2	Albuquerque	9.7	9.7
3	Baltimore	8.1	8.2
3	Salem	11.2	11.6
3	Chicago	8.5	8.5
3	Boise	10.3	10.5
3	Burlington	8.6	8.7
3	Helena	8.1	8.2
3	Duluth	5.9	5.9
3	Fairbanks	4.0	4.1
	National Average	**8.5**	**8.9**

Table VI.6 National Average Per-Home Cost Savings

	Single-Section	**Multi-Section**
Tier 2 Standard		
Lifecycle Cost Savings (30-Year Lifetime)	$2,740	$3,727
Lifecycle Cost Savings (10-Year Lifetime)	$632	$788
Annual Energy Cost Savings in 2020$	$331	$475
Simple Payback Period	8.5	8.9
Untiered Standard		
Lifecycle Cost Savings (30-Year Lifetime)	$2,432	$3,291
Lifecycle Cost Savings (10-Year Lifetime)	$518	$622
Annual Energy Cost Savings in 2020$	$331	$475
Simple Payback Period	8.5	8.9

Table VI.7 Cumulative Full-Fuel-Cycle National Energy Savings of Manufactured Homes Purchased 2023–2052 with a 30-Year Lifetime

	Single-Section (quads)	Multi-Section (quads)
Tiered Standard		
Climate Zone 1	0.163	0.526
Climate Zone 2	0.134	0.451
Climate Zone 3	0.265	0.405
Total	**0.562**	**1.382**
Untiered Standard		
Climate Zone 1	0.276	0.542
Climate Zone 2	0.231	0.463
Climate Zone 3	0.336	0.408
Total	**0.843**	**1.414**

Table VI.8 Net Present Value of Consumer Benefits for Manufactured Homes Purchased 2023-2052 with a 30-Year Lifetime at a 7% Discount Rate

	Single-Section *billion 2020$*	Multi-Section *billion 2020$*
Tiered Standard		
Climate Zone 1	$0.15	$0.31
Climate Zone 2	$0.12	$0.21
Climate Zone 3	$0.37	$0.33
Total	**$0.65**	**$0.85**
Untiered Standard		
Climate Zone 1	$0.16	$0.30
Climate Zone 2	$0.10	$0.20
Climate Zone 3	$0.29	$0.32
Total	**$0.55**	**$0.82**

Table VI.9 Net Present Value of Consumer Benefits for Manufactured Homes Purchased 2023-2052 with a 30-Year Lifetime at a 3% Discount Rate

	Single-Section *billion 2020$*	Multi-Section *billion 2020$*
Tiered Standard		
Climate Zone 1	$0.45	$1.15
Climate Zone 2	$0.37	$0.89
Climate Zone 3	$1.07	$1.16
Total	**$1.90**	**$3.20**
Untiered Standard		
Climate Zone 1	$0.57	$1.11
Climate Zone 2	$0.43	$0.83
Climate Zone 3	$0.96	$1.10
Total	**$1.96**	**$3.03**

Table VI.10 Emissions Reductions for Manufactured Homes Purchased 2023-2052 with a 30-Year Lifetime

Pollutant	Tiered Standard		Untiered Standard	
	Single-Section	Multi-Section	Single-Section	Multi-Section
Site Emissions Reductions				
CO_2 (million metric tons)	23.1	52.7	33.5	53.8
Hg (metric tons)	0.036	0.094	0.055	0.096
NO_X (thousand metric tons)	12.6	26.1	17.4	26.6
SO_2 (thousand metric tons)	8.6	20.0	12.5	20.4
CH_4 (thousand metric tons)	1.25	3.04	1.86	3.11
N_2O (thousand metric tons)	0.25	0.55	0.36	0.57
Upstream Emissions Reductions				
CO_2 (million metric tons)	2.35	5.0	3.3	5.1
Hg (metric tons)	1.79E-04	4.35E-04	2.67E-04	4.45E-04
NO_X (thousand metric tons)	29.6	63.5	41.7	64.8
SO_2 (thousand metric tons)	0.24	0.46	0.318	0.47
CH_4 (thousand metric tons)	151	347	219	354
N_2O (thousand metric tons)	0.013	0.026	0.017	0.026
Total Emissions Reductions				
CO_2 (million metric tons)	25.5	57.7	36.8	58.9
Hg (metric tons)	0.036	0.094	0.056	0.096
NO_X (thousand metric tons)	42	90	59	91
SO_2 (thousand metric tons)	8.9	20.4	12.9	20.9
CH_4 (thousand metric tons)	152	350	221	357
N_2O (thousand metric tons)	0.26	0.58	0.38	0.59

Table VI.11 Net Present Value of Monetized Benefits from GHG and Emissions Reductions

	Discount Rate *%*	Net Present Value *million 2020$*			
		Tiered Standard		Untiered Standard	
Monetary Benefits		Single-Section	Multi-Section	Single-Section	Multi-Section
GHG Reduction (using avg. social costs at 5% discount rate)*	5	247.8	563.0	358.0	574.9
GHG Reduction (using avg. social costs at 3% discount rate)*	3	1,047.3	2,375.8	1,511.8	2,426.0
GHG Reduction (using avg. social costs at 2.5% discount rate)*	2.5	1,718.8	3,896.9	2,480.4	3,979.1
GHG Reduction (using 95th percentile social costs at 3% discount rate)*	3	3,147.6	7,138.5	4,543.0	7,289.0
NO_X Reduction**	3	111.4	221.8	153.2	230.8
	7	38.8	77.5	53.4	80.7
SO_2 Reduction**	3	171.6	355.4	239.6	370.5
	7	60.4	126.0	84.6	131.4

* Estimates of SC-CO_2 SC-CH_4, and SC-N_2O are calculated using a range of discount rates for use in regulatory analyses. Three sets of values are based on the average social costs from the integrated assessment models, at discount rates of 5 percent, 3 percent, and 2.5 percent. The fourth set, which represents the 95th percentile of the social cost distributions calculated using a 3-percent discount rate, is included to represent higher-than-expected impacts from climate change further out in the tails of the social cost distributions. The social cost values are emission year specific. See section IV.D of the August 2021 MH SNOPR for more details.

** The benefits from NOx and SO_2 were based on the low estimate monetized value.

A. *Sensitivity Analysis Results – Alternate R-21 Exterior Wall Insulation for Climate Zone 2 and 3 Combined with Alternate Size-Based Tier Threshold for Tiered Standard*

DOE also considered the same sensitivity analysis using the alternate R-21 exterior wall insulation for climate zone 2 and 3, but using the alternate size-based tier threshold (as discussed in section V) instead of the manufacturer's retail list price tier threshold (as discussed in section III.B).

The following tables present the results for the NIA and emissions analyses results based on this sensitivity for the tiered standard only. The LCC and PBP results for Tier 1 presented in section IV and Tier 2/untiered standard presented in section VI would remain unchanged for this sensitivity analysis. The NIA and emissions analysis results for the untiered standard presented in section VI would remain unchanged for this sensitivity analysis.

Table VI.12 Cumulative Full-Fuel-Cycle National Energy Savings of Manufactured Homes Purchased 2023–2052 with a 30-Year Lifetime under the Alternate Size-Based Threshold

Tiered Standard		
	Single-Section (quads)	**Multi-Section (quads)**
Climate Zone 1	0.123	0.542
Climate Zone 2	0.100	0.463
Climate Zone 3	0.239	0.408
Total	**0.462**	**1.414**

Table VI.13 Net Present Value of Consumer Benefits for Manufactured Homes Purchased 2023-2052 with a 30-Year Lifetime under the Alternate Size-Based Threshold

Tiered Standard				
	7% Discount Rate		**3% Discount Rate**	
	Single-Section ***billion 2020$***	**Multi-Section** ***billion 2020$***	**Single-Section** ***billion 2020$***	**Multi-Section** ***billion 2020$***
Climate Zone 1	$0.15	$0.31	$0.40	$1.17
Climate Zone 2	$0.13	$0.20	$0.35	$0.89
Climate Zone 3	$0.40	$0.33	$1.10	$1.15
Total	**$0.68**	**$0.84**	**$1.85**	**$3.22**

Table VI.14 Emissions Reductions Associated with Electricity Production for Manufactured Homes Purchased 2023-2052 with a 30-Year Lifetime under the Alternate Size-Based Threshold

Tiered Standard		
Pollutant	**Single-Section**	**Multi-Section**
Site Emissions Reductions		
CO_2 (million metric tons)	19.5	53.8
Hg (metric tons)	0.0292	0.096
NO_X (thousand metric tons)	10.9	26.6
SO_2 (thousand metric tons)	7.2	20.4
CH_4 (thousand metric tons)	1.03	3.11
N_2O (thousand metric tons)	0.21	0.57
Upstream Emissions Reductions		
CO_2 (million metric tons)	2.0	5.1
Hg (metric tons)	1.48E-04	4.45E-04
NO_X (thousand metric tons)	25.4	64.8
SO_2 (thousand metric tons)	0.21	0.47
CH_4 (thousand metric tons)	127	354
N_2O (thousand metric tons)	0.011	0.026
Total Emissions Reductions		
CO_2 (million metric tons)	21.5	58.9
Hg (metric tons)	0.029	0.0964
NO_X (thousand metric tons)	36.3	91.4
SO_2 (thousand metric tons)	7.4	20.9
CH_4 (thousand metric tons)	128	357
N_2O (thousand metric tons)	0.23	0.59

Table VI.15 Net Present Value of Monetized Benefits from GHG and Emissions Reductions under the Alternate Size-Based Threshold

Tiered Standard			
	Discount Rate %	**Net Present Value *million 2020$***	
Monetary Benefits		**Single-Section**	**Multi-Section**
GHG Reduction (using avg. social costs at 5% discount rate)*	5	208.5	574.9
GHG Reduction (using avg. social costs at 3% discount rate)*	3	881.3	2,426.0
GHG Reduction (using avg. social costs at 2.5% discount rate)*	2.5	1,446.6	3,979.1
GHG Reduction (using 95th percentile social costs at 3% discount rate)*	3	2,648.9	7,289.0
NO_X Reduction**	3	96.4	230.8
	7	33.5	80.7
SO_2 Reduction**	3	147.2	370.5
	7	51.7	131.4

* Estimates of SC-CO_2 SC-CH_4, and SC-N_2O are calculated using a range of discount rates for use in regulatory analyses. Three sets of values are based on the average social costs from the integrated assessment models, at discount rates of 5 percent, 3 percent, and 2.5 percent. The fourth set, which represents the 95th percentile of the social cost distributions calculated using a 3-percent discount rate, is included to represent higher-than-expected impacts from climate change further out in the tails of the social cost distributions. The social cost values are emission year specific. See section IV.D of the August 2021 MH SNOPR for more details.
** The benefits from NOx and SO_2 were based on the low estimate monetized value.

VII. Comparison of the August 2021 MH SNOPR and NODA Results

This section provides summary tables that compare the results from the August 2021 MH SNOPR to all the scenarios presented in this NODA, including the sensitivity analyses. As such, each table presents results for the: (1) August 2021 MH SNOPR analysis; (2) NODA updated SNOPR analysis (section IV); (3) NODA sensitivity – alternate size-based tier threshold (section V); (4) NODA sensitivity – alternate R-21 wall insulation for climate zone 2 and 3 for Tier 2 and untiered (section VI); and (5) NODA sensitivity - alternate R-21 wall insulation for climate zone 2 and 3 and alternate size-based tier threshold (section VI.A).

In the August 2021 MH SNOPR, DOE estimated the SNOPR would result in a decrease in shipments of about 53,329 homes (single section and multi-section combined) for the tiered standard and about 71,290 homes (single section and multi-section

combined) for untiered standards based on a price elasticity of demand of -0.48 for the 30 year analysis period (2023-2052). 86 FR 47744, 47758. Table VII.1 presents the same results for the NODA and sensitivity analyses.

Table VII.1 Change In Shipments for Tiered and Untiered Standards

	Reduction in Shipments (Total)	
	Tiered	**Untiered**
August 2021 MH SNOPR	53,329	71,290
NODA Updated SNOPR	45,562	70,203
Sensitivity – Alternate Size-Based Tier Threshold	38,288	N/A
Sensitivity – Alternate R-21 Wall Insulation	36,648	53,185
Sensitivity – Alternate R-21 Wall Insulation and Size-Based Tier Threshold	31,956	N/A

The following tables present the NPV results for the August 2021 MH SNOPR and all the scenarios presented in this NODA, including the sensitivity analyses.

Table VII.2 Net Present Value of Consumer Benefits for Manufactured Homes Purchased 2023-2052 with a 30-Year Lifetime at a 7% Discount Rate, in *billion 2020$

Climate Zone	**August 2021 MH SNOPR**	**NODA Updated SNOPR**	**Sensitivity – Alternate Size-Based Tier Threshold**	**Sensitivity – Alternate R-21 Wall Insulation**	**Sensitivity – Alternate R-21 Wall Insulation and Size-Based Tier Threshold**
Tiered Standard (*Single-section + Multi-section)*					
1	$0.69	$0.46	$0.46	$0.46	$0.46
2	$0.16	$0.07	$0.10	$0.33	$0.33
3	$0.78	$0.51	$0.57	$0.70	$0.73
Total	**$1.62**	**$1.04**	**$1.13**	**$1.50**	**$1.52**
Untiered Standard (*Single-section + Multi-section)*					
1	$0.70	$0.46	N/A	$0.46	N/A
2	$0.06	($0.10)	N/A	$0.30	N/A
3	$0.61	$0.27	N/A	$0.61	N/A
Total	**$1.36**	**$0.63**	**N/A**	**$1.37**	**N/A**

* negative values in parenthesis.

Table VII.3 Net Present Value of Consumer Benefits for Manufactured Homes Purchased 2023-2052 with a 30-Year Lifetime at a 3% Discount Rate, in *billion 2020$***

Climate Zone	August 2021 MH SNOPR	NODA Updated SNOPR	Sensitivity – Alternate Size-Based Tier Threshold	Sensitivity – Alternate R-21 Wall Insulation	Sensitivity – Alternate R-21 Wall Insulation and Size-Based Tier Threshold
Tiered Standard (*Single-section + Multi-section)*					
1	$2.39	$1.60	$1.57	$1.60	$1.57
2	$1.17	$0.74	$0.79	$1.26	$1.24
3	$2.84	$1.85	$1.95	$2.23	$2.25
Total	**$6.40**	**$4.20**	**$4.31**	**$5.10**	**$5.07**
Untiered Standard (*Single-section + Multi-section)*					
1	$2.48	$1.68	N/A	$1.68	N/A
2	$1.02	$0.44	N/A	$1.26	N/A
3	$2.56	$1.40	N/A	$2.06	N/A
Total	**$6.06**	**$3.51**	**N/A**	**$4.99**	**N/A**

Table VII.4 Net Present Value of Monetized Benefits from GHG and Emissions Reductions

	Discount Rate *%*	Net Present Value *million 2020$*				
Monetary Benefits		**August 2021 MH SNOPR**	**NODA Updated SNOPR**	**Sensitivity – Alternate Size-Based Tier Threshold**	**Sensitivity – Alternate R-21 Wall Insulation**	**Sensitivity – Alternate R-21 Wall Insulation and Size-Based Tier Threshold**
Tiered Standard						
GHG	5	$1,075.4	$842.1	$809.2	$810.8	$783.4
	3	$4,525.0	$3,555.4	$3,416.5	$3,423.1	$3,307.2
NO_X	3	$446.0	$348.1	$339.5	$333.1	$327.2
	7	$157.2	$121.5	$118.5	$116.3	$114.2
SO_2	3	$734.7	$549.5	$536.2	$527.0	$517.7
	7	$259.3	$194.3	$189.6	$186.4	$183.1
Untiered Standard						
GHG	5	$1,190.5	$982.9	N/A	$932.9	N/A
	3	$5,009.4	$4,149.4	N/A	$3,937.7	N/A
NO_X	3	$491.7	$408.1	N/A	$384.0	N/A
	7	$173.3	$142.5	N/A	$134.1	N/A
SO_2	3	$811.0	$646.2	N/A	$610.1	N/A
	7	$286.3	$228.7	N/A	$216.0	N/A

VIII. Reopening of Comment Period

For the August 2021 MH SNOPR, comments were originally due no later than October 25, 2021. In light of this NODA, DOE has determined that it is appropriate to reopen the comment period to allow additional time for interested parties to prepare and submit comments. Therefore, DOE is reopening the comment period and will accept comments, data, and information on the August 2021 MH SNOPR and this NODA on

and before **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**. Accordingly, DOE will consider any comments received by this date to be timely submitted.

IX. Public Participation

While DOE is not requesting comments on specific portions of the analysis, DOE is interested in receiving comments on all aspects of the data and analysis presented in the NODA and supporting documentation that can be found at: *www1.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=64*.

A. *Submission of Comments*

DOE will accept comments, data, and information regarding this supplemental notice of proposed rulemaking before or after the public meeting, but no later than the date provided in the **DATES** section at the beginning of this proposed rule. Interested parties may submit comments, data, and other information using any of the methods described in the **ADDRESSES** section at the beginning of this document.

Submitting comments via www.regulations.gov. The *www.regulations.gov* webpage will require you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

However, your contact information will be publicly viewable if you include it in the comment itself or in any documents attached to your comment. Any information that you do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. Otherwise, persons viewing comments will see

only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

Do not submit to *www.regulations.gov* information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information ("CBI")). Comments submitted through *www.regulations.gov* cannot be claimed as CBI. Comments received through the website will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section.

DOE processes submissions made through *www.regulations.gov* before posting. Normally, comments will be posted within a few days of being submitted. However, if large volumes of comments are being processed simultaneously, your comment may not be viewable for up to several weeks. Please keep the comment tracking number that *www.regulations.gov* provides after you have successfully uploaded your comment.

Submitting comments via email. Comments and documents submitted via email also will be posted to *www.regulations.gov*. If you do not want your personal contact information to be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information in a cover letter. Include your first and last names, email address, telephone number, and optional mailing address. The cover letter will not be publicly viewable as long as it does not include any comments

Include contact information each time you submit comments, data, documents, and other information to DOE. No telefacsimiles ("faxes") will be accepted.

Comments, data, and other information submitted to DOE electronically should be provided in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format. Provide documents that are not secured, that are written in English, and that are free of any defects or viruses. Documents should not contain special characters or any

form of encryption and, if possible, they should carry the electronic signature of the author.

Campaign form letters. Please submit campaign form letters by the originating organization in batches of between 50 to 500 form letters per PDF or as one form letter with a list of supporters' names compiled into one or more PDFs. This reduces comment processing and posting time.

Confidential Business Information. Pursuant to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email two well-marked copies: one copy of the document marked "confidential" including all the information believed to be confidential, and one copy of the document marked "non-confidential" with the information believed to be confidential deleted. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

It is DOE's policy that all comments may be included in the public docket, without change and as received, including any personal information provided in the comments (except information deemed to be exempt from public disclosure).

X. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this supplemental notice of proposed rulemaking; reopening of comment period and notification of data availability.

Signing Authority

This document of the Department of Energy was signed on October 19, 2021, by Kelly Speakes-Backman, Principal Deputy Assistant Secretary and Acting Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on October 20, 2021

Treena V. Garrett
Federal Register Liaison Officer,
U.S. Department of Energy

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