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Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis – 2025

Annual Supplement to NIST Handbook 135

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Abstract

This is the 2025 edition of energy price indices and discount factors for performing life-cycle cost analyses of energy and water conservation and on-site energy generation projects in federal facilities. It will be effective from the publication date to the publication of the 2026 edition. This publication supports the federal life cycle costing methodology described in 10 CFR 436A and OMB Circular A-94 by updating the energy price projections and discount factors that are described, explained, and illustrated in NIST Handbook 135 (HB 135, Life-Cycle Costing Manual for the Federal Energy Management Program).

Keywords

Building economics; Life cycle cost analysis; Energy efficiency; On-site energy generation.

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Foreword

This is the 2025 Annual Supplement to NIST Handbook 135, Life-Cycle Costing Manual for the Federal Energy Management Program (FEMP) [1]. The annual supplement provides energy price indices and discount factors for use with the FEMP procedures for life-cycle cost analysis, as established by the U.S. Department of Energy (DOE) in Subpart A of Part 436 of Title 10 of the Code of Federal Regulations (10 CFR 436A) [2] and amplified in NIST Handbook 135. These indices and factors are provided as an aid to implementing life-cycle cost evaluations of potential energy and water conservation and on-site energy generation investments in existing and new federally owned and leased buildings.

The price indices and discount factors are calculated with the most recent energy price projections from DOE's Energy Information Administration (EIA) Annual Energy Outlook (AEO) [3] (https://www.eia.gov/outlooks/aeo/) and the most recent discount rates from FEMP and the Office of Management and Budget (OMB) Circular A-94 [4]. This issue of the Annual Supplement is intended for use until the publication of the 2026 edition. The updated edition of NIST's Building Life-Cycle Cost (BLCC) and Energy Escalation Rate Calculator (EERC) programs are released at the same time as this Annual Supplement, for use over the same time period. The software products are discussed below.

Along with the final data tables, the EIA energy price projections underlying this Annual Supplement have been made available by NIST. The Annual Supplement and the associate data table spreadsheet are available at https://www.energy.gov/femp/building-life-cycle-cost-programs. The data tables are also available at this DOI: https://doi.org/10.18434/mds2-3848.

The life cycle costing methods and procedures, as set forth in 10 CFR 436A, are to be followed by all federal agencies, unless specifically exempted, for evaluating the cost effectiveness of potential energy and water conservation and on-site energy generation investments in federally owned and leased buildings. For most other federal LCC analyses OMB Circular A-94 provides the relevant guidelines.

As called for by legislation (Energy Policy and Conservation Act, P.L.94-163, 1975, 92 Stat 3206, 42 USC 8252 et seq) [5], NIST has provided technical assistance to the U.S. DOE in the development and implementation of life-cycle costing methods and procedures. The following publications and software products provide the methods, data, and computational tools for federal life-cycle cost analysis:

(1) *Life-Cycle Costing Manual for the Federal Energy Management Program*, National Institute of Standards and Technology, Handbook 135 – 2025 edition.

This manual is a guide to understanding life cycle costing and related methods of economic analysis as they are applied to federal decisions, especially those subject to 10 CFR 436A rules. It describes the required procedures and assumptions, defines and explains how to apply and interpret economic performance measures, gives examples of federal decision problems and their solutions, explains how to use energy price indices and discount factors, and provides computational aids and instructions for calculating the required measures. The 2020 edition broadened the scope of consideration to include federal resilience projects. The 2022 edition expanded discussion on pricing externalities. The 2025 edition of Handbook 135 supersedes the 2022 (update 1) edition and includes minimal changes focused on addressing language in new executive orders and their implications on federal cost-effectiveness analysis. If users are looking for content (e.g. historical information or excluded data and examples) removed for the most recent edition, please see the 2022 edition of the handbook that is still publicly available from NIST.

(2) *Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis, Annual Supplement to NIST Handbook 135*, National Institute of Standards and Technology, NISTIR 85-3273.

This report, which is updated annually, provides the current DOE and OMB discount rates, projected energy price indices, and corresponding discount factors needed to estimate the present values of future energy and non-energy-related project costs. The 2022 edition was restructured to provide a report with the data tables available in a supplemental spreadsheet. The 2025 edition further refines the supplemental data tables to be more machine readable and includes supplement python scripts used to automate the creation of the published data.

(3) *BLCC 5.3-25, NIST Building Life-Cycle Cost.* This program uses as default values the same discount factors and energy price projections that underlie the discount factor tables in the Annual Supplement. It is recompiled annually and available for Windows. A web-based version of BLCC is currently under development and is currently available as a "beta" version at https://blcc.nist.gov/, which means the main capabilities and features are working, but there may be significant "bugs" that must still be addressed. The BLCC web application will replace BLCC 5.3 for the 2026 annual release.

BLCC 5.3 provides comprehensive economic analysis capabilities for the evaluation of proposed capital investments that are expected to reduce the long-term operating costs of facilities and building systems. It computes the LCC for project alternatives, compares project alternatives to determine which has the lowest LCC, performs annual cash flow analysis, and computes net savings (NS), savings-to-investment ratio (SIR), and adjusted internal rate of return (AIRR) for project alternatives over their designated study period. The BLCC program can be used to perform economic analysis of capital investment projects undertaken by federal, state, and local government agencies. In the application to federal energy efficiency, water conservation, and on-site energy generation projects, BLCC5 is consistent with NIST Handbook 135, and the federal life-cycle cost methodology and procedures described in 10 CFR 436A and OMB Circular A-94.

BLCC 5.3 has six modules, all of them consistent with the life-cycle cost methodology of 10 CFR 436A, but programmed to include default inputs and nomenclature for specific uses:

- **FEMP Analysis, Energy Project**

  for energy and water conservation and on-site energy generation projects under the FEMP rules, agency-funded;

- **Federal Analysis, Financed Project**

  for federal projects financed through Energy Savings Performance Contracts (ESPC) or Utility Energy Services Contracts (UESC) as authorized by Executive Order 13123 (6/99);

- **OMB Analysis, Federal Analysis, Projects subject to OMB Circular A-94**

  for projects subject to OMB Circular A-94 (most other, non-energy, federal government construction projects, but not water resource projects);

- **MILCON Analysis, Energy Project**

for energy and water conservation and on-site energy generation projects in military construction,

agency-funded;

- **MILCON Analysis, ECIP Project**

  for energy and water conservation projects under the Energy Conservation Investment Program (ECIP) – renamed Energy Resilience Conservation Investment Program (ERCIP) in 2021;

- **MILCON Analysis, Non-Energy Project**

  for military construction designs that are not primarily for energy or water conservation.

(4) *EERC, Energy Escalation Rate Calculator*, a program that computes a compound annual average rate of escalation for a specified time period, which can be used as an escalation rate for contract payments in Energy Savings Performance Contracts (ESPC) and Utility Energy Services Contracts (UESC). Escalation rates can be computed based on the EIA energy price projections used for calculating the FEMP discount factors and on EIA projections. EERC is available as a web interface at https://pages.nist.gov/eerc/ and no longer available as a downloadable application. The 2025 release removed the previously available externality pricing option because the EIA projections internalize the impact of state externality markets.

For further information on the Federal Energy Management Program and the latest versions of the programs and publications described above can be downloaded from the DOE/FEMP web site at https://www.energy.gov/femp/building-life-cycle-cost-programs.

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1. Introduction

This report provides tables of present-value factors for use in the life-cycle cost analysis of capital investment projects for federal facilities, including energy efficiency, water conservation, sustainability, and resilience. It also provides energy price indices based on Department of Energy (DOE) forecasts from 2025 to 2050. The factors and indices presented in this report are useful for determining the present value of future project-related costs, especially those related to operational energy costs. Discount factors included in this report are based on two different federal sources: (1) the DOE discount rate for projects related to energy conservation, on-site energy resources, and water conservation; and (2) Office of Management and Budget (OMB) discount rates from Circular A-94 for use with most other capital investment projects in federal facilities.

The DOE discount and inflation rates for 2025 are as follows:

Real rate (excluding general price inflation):	3.0 %
Nominal rate (including general price inflation):	4.5 %
Implied long-term average rate of inflation:	1.5 %

The DOE nominal discount rate is based on long-term Treasury bond rates averaged in the previous year (2024). The nominal, or market, rate is converted to a real rate to correspond with the constant-dollar analysis approach used in most federal life-cycle cost (LCC) analyses. The method for calculating the real discount rate from the nominal discount rate is described in 10 CFR 436 and uses the 10-year simple average projected rates of general inflation published in the most recent Report of the President's Economic Advisors, Analytical Perspectives (2.3 % for 2025).[1] The procedure would result in a real discount rate for 2024 of 2.2 %, which is lower than the 3.0 % floor prescribed in 10 CFR 436.

Thus the 3.0 % floor is used as the real discount rate for Department of Energy (DOE) Federal Energy Management Program (FEMP) analyses in 2025. The implied long-term average rate of inflation based on the real discount rate (3.0 %) and nominal discount rate (4.5 %) was calculated as 1.5 %. Federal agencies and contractors to federal agencies are required by 10 CFR 436 to use the DOE discount rates when conducting LCC analyses related to energy conservation, on-site energy resources, and water conservation projects for federal facilities.

The nominal and real discount rates applicable to general (non-energy or water) capital investments are published annually in OMB Circular A-94, Appendix C.[2] OMB has specified two basic types of discount rates: (1) a discount rate for public investment and regulatory analyses; and (2) a discount rate for cost-effectiveness, lease-purchase, and related analyses. Only discount rates for the second type of analyses are included in this Annual Supplement, since the primary purpose of this report is to support cost-effectiveness studies related to the design and operation of federal facilities.

OMB discount rates for cost-effectiveness and lease-purchase studies are based on interest rates on Treasury Notes and Bonds with maturities ranging from 3 years to 30 years. Currently six

[1] The long-run general rate of inflation is a constant value used over the entire study period. Therefore, it does not account for short-term variability in inflation such as that realized during and after the COVID-19 pandemic.
[2] The most recent Appendix C was released in December 2023 at the time of publication.

maturities have been specifically identified by OMB, and are shown here with the corresponding real interest rate to be used as the discount rate for studies subject to OMB Circular A-94 Appendix C (as of December 2024):

Maturity:	3-year	5-year	7-year	10-year	20-year	30-year
Rate:	1.5 %	1.6 %	1.8 %	1.9 %	2.2 %	2.3 %

OMB suggests that the actual discount rate for an economic analysis be interpolated from these maturities and rates, based on the study period used in the analysis. Due to limitations on the size of this Annual Supplement, discount factors for only two of these maturities are presented in the data tables: factors for short term analyses (up to 10 years) based on the 7-year real rate (1.8 %), and factors for long-term analyses (longer than 10 years) based on the 30-year real rate (2.3 %). As a result, these discount factors are for approximation purposes only. It is suggested that the NIST Building Life Cycle Cost (BLCC) program be used to compute the present value factors for the discount rate corresponding to the length of the study period when approximate values are not satisfactory for the project analysis. (See preface for details on obtaining this program.)

The energy price indices and corresponding present value factors published in this report are computed from energy price forecasts from the DOE's Energy Information Administration (EIA) for the Reference Case of the Annual Energy Outlook (AEO). The EIA energy price forecast used in this report was the most recent available at the time this report was prepared. A description of the methodology used by EIA to project energy prices through 2050 is included in Section B of this report. DOE has not projected escalation rates for water prices to be used in the LCC analysis of water conservation projects. FEMP recommends estimating water escalation rates based on the following options (in order or preference): (1) local water utility forecasts, (2) historical rate data (with caps), and historical consumer price index data. The FEMP guidance on utility rate estimation is available at the following link: https://www.energy.gov/femp/articles/guidance-utility-rate-estimations-and-weather-normalization-performance-contracts [6].

Federal agencies and contractors to federal agencies are encouraged to seek energy price projections from their local utility to use in place of the DOE/EIA projections, especially when evaluating alternative fuel types. In such cases the BLCC program can be used to calculate appropriate "modified uniform present value" (UPV*) factors for use in the LCC analysis of federal capital energy efficiency, water conservation, or on-site energy resource projects. Otherwise, 10 CFR 436 requires the use of the DOE energy price forecasts when conducting LCC analyses of such projects. The UPV* factors for energy costs presented in this report have been precalculated with the DOE forecast data. Thus, the use of these UPV* factors automatically ensures that the DOE forecast data have been included in the analysis.

Most financed federal projects, such as Energy Savings Performance Contracts (ESPC), base contract payments on projected annual energy cost savings. When setting up the contract, compound annual average rates of energy price escalation over the contract term are a matter of negotiation, including consideration of state-specific conditions (e.g., legislative impacts on energy prices). Previous annual supplements have included information on emissions-related markets that have been excluded from this release. For additional information, please see the 2024 release of the Annual Supplement.

All the tables of discount factors provided with this report are based on real discount rates and are therefore intended for use only with economic analyses conducted in constant dollars (in which the purchasing power of the dollar is held constant). The energy price escalation rates and corresponding energy price indices for federal analyses contained in this report are also expressed in real terms. If nominal discount rates and current dollar costs (which both include inflation) are used in the LCC analyses of federal projects, choose the current-dollar-analysis option in the BLCC computer program, which uses a nominal discount rate and adds the rate of general inflation to all dollar amounts.

This report uses the term "present value" instead of "present worth" for the discount factors presented. The meaning of these two terms is considered identical for purposes of economic analysis. This change in terminology was made to be consistent with the terms used in the ASTM International compilation of standards on building economics [7].

In all tables, the “end-of-year” discounting convention is used, that is, all factors and indices are computed to adjust future dollar amounts to present value from the end of the year in which they are expected to occur. The factors and indices in this publication which include energy price escalation rates (e.g., UPV* factors and energy price indices) were calculated using January 2025 as their base date. However, these factors and indices can be used without adjustment for the LCC analysis of projects with other base dates until the release of the next revision of this publication. Adjustment of these factors and indices for differences in the month-specific base date is not generally warranted due to uncertainties in estimating future energy prices.

There have been several key changes to this document over the last few years. Starting in the 2022 edition of this document, the tables and ENCOST data are provided in a supplemental spreadsheet (NISTIR85-3273-XX.xlsx) available for download with this document. Starting in the 2023 edition of this document, the sections and associated table nomenclature changed to align with NIST’s newest technical publication formatting requirements. Section headings have changed from roman numeral to numerical. Subsection headings have changed from alphanumerical to numerical. For example, Part I B-2 becomes Section 2.2.2. Starting the 2024 edition of this document, additional data has been provided at the nine Census divisions to provide greater granularity than that found at the four Census regions. The Census division level data has been incorporated into both EERC and BLCC. Starting in the 2025 edition of this document, the supplemental material now includes the python scripts used for extracting the data from the EIA API and converting that data into the tables published in the supplement spreadsheet tables. The data is provided solely at the Census Division level.

2. Tables for Federal Life-Cycle Cost Analysis

This section provides the data tables (see associated spreadsheet) for federal life-cycle cost analysis, the underlying formulas for calculating the values in those tables, and examples showing how to use the data tables.

2.1. Single Present Value and Uniform Present Value Factors for Non-Fuel Costs

Table 1 presents the single present value (SPV) factors for finding the present value of future non-fuel, non-annually recurring costs, such as repair and replacement costs and salvage values.

The formula for finding the present value (P) of a future cost occurring in year t (denoted as C_t) is Eq. 1:

$$P = C_t \times \frac{1}{(1+d)^t} = C_t \times SPV_t \qquad (1)$$

Where *d = discount rate, and*
t = number of time periods (years) between the present time and the time the cost is incurred.

Table 2 presents uniform present value (UPV) factors for finding the present value of future non-fuel costs recurring annually, such as routine maintenance costs. The formula for finding the present value (P) of an annually recurring uniform cost (A) is Eq. 2:

$$P = A \times \frac{(1+d)^N - 1}{d(1+d)^N} = A \times UPV_N \qquad (2)$$

where *d* = *discount rate, and*
N = *number of time periods (years) over which A recurs.*

Tables 3 (a,b,c) present modified uniform present value (UPV*) factors for finding the present value of annually recurring non-fuel costs, such as water costs, which are expected to change from year to year at a constant rate of change (or escalation rate) over the study period. The escalation rate can be positive or negative. The formula for finding the present value (P) of an annually recurring cost at base-date prices (A_0) changing at escalation rate e is Eq. 3 (for $d \neq e$) and Eq. 4 (for $d = e$):

$$P = A_0 \times \left(\frac{1+e}{d-e}\right)\left[1 - \left(\frac{1+e}{1+d}\right)^N\right] = A \times UPV^*{}_N \ (d \neq e) \qquad (3)$$

or

$$P = A_0 \times N = A \times UPV^*{}_N \ \ (d = e) \qquad (4)$$

where *A_0* = *annually recurring cost at base-date prices,*
d = *discount rate,*
e = *escalation rate, and*
N = *number of time periods (years) over which A recurs.*

Note: if the discount rate is expressed in real terms, i.e., net of general inflation, then the escalation rate must also be expressed in real terms. If the discount rate is expressed in nominal terms, i.e., including general inflation, then the escalation rate must also be expressed in nominal terms.

In the Indices – Non-Energy Tables 1, 2, and 3 (a,b,c), SPV, UPV, and UPV* factors are provided for both the DOE and the OMB Circular A-94 real discount rates current as of the date of this publication. The FEMP SPV, UPV, and UPV* factors were computed using the DOE discount rate. The FEMP factors are for finding the present value of future costs associated with federal energy and water conservation projects and on-site energy generation projects. The OMB

SPV, UPV, and UPV* factors were computed using the OMB discount rates. The OMB factors are for finding the present value of future costs associated with most other federal projects (except those specifically exempted from OMB Circular A-94). The DOE and OMB discount rates used in computing these tables are real rates, exclusive of general price inflation. Thus, the resulting discount factors are intended for use with future costs that are stated in constant dollars.

Note: *We have added to Table 3a a column of UPV* factors that incorporate an escalation rate of -1.5 %, the negative of the inflation rate used to calculate the DOE nominal discount rate for 2025. The UPV* factors in this column can be used to calculate present values of fixed dollar amounts when performing a constant-dollar analysis. An example might be a fixed contract payment in an ESPC project. For these fixed amounts, the assumption that in a constant-dollar analysis all cash flows change at the rate of general inflation (so that the differential escalation rate is zero) does not apply. In real terms, fixed amounts change at a differential rate equal to the negative of the inflation rate.*

Examples of How to Use the Factors:

SPV (FEMP): To compute the present value of a replacement cost expected to occur in the 8th year for an energy efficient heating system, go to Table 1, find the 3.0 % SPV factor for year 8 (0.789), and multiply the factor by the replacement cost as of the base date.

SPV (OMB, Short-term): To compute the present value of a repair cost in the 5th year for a floor covering (non-energy related), go to Table 1, find the 1.8 % SPV factor for year 5 (0.915), and multiply the factor by the repair cost as of the base date.

SPV (OMB, Long-term): To compute the present value of a repair cost in the 15th year for a floor covering (non-energy related), go to Table 1, find the 2.3 % SPV factor for year 15 (0.711), and multiply the factor by the repair cost as of the base date.

UPV (FEMP): To compute the present value of an annually recurring maintenance cost for an on-site energy generation system over 20 years, go to Table 2, find the 3.0 % UPV factor for 20 years (14.877), and multiply the factor by the annual maintenance cost as of the base date.

UPV (OMB, Short-term): To compute the present value of annually recurring costs of office cleaning over 10 years (for a project not primarily related to energy conservation), go to Table A-2, find the 1.8 % UPV factor for 10 years (9.077), and multiply the factor by the annual cleaning cost as of the base date.

UPV (OMB, Long-term): To compute the present value of annually recurring costs of office cleaning over 25 years (for a project not primarily related to energy conservation), go to Table 2, find the 2.3 % UPV factor for 25 years (18.853), and multiply the factor by the annual cleaning cost as of the base date.

UPV* (all): To compute the present value of annually recurring costs of water usage which are expected to increase at 2.0 % faster than the rate of general inflation over 25 years, find the UPV* factor from Table 3 (a, b, or c as appropriate) that corresponds to 2 % escalation and a 25-year study period. From Table 3a (3.0 % DOE discount rate) the corresponding UPV* factor is 22.077. Multiply this factor by the annual water cost as computed at base year prices to determine the present value of these water costs over the entire 25 years.

UPV* (negative inflation rate): To compute the present value of an annually recurring contract payment that is fixed over a contract period of 10 years, find the UPV* factor from Table 3a that corresponds to an escalation of 1.0 % and a 10-year time period. From Table A-3a (3.0 % DOE discount rate) the corresponding UPV* factor is 8.992. Multiply this factor by the annual contract payment as of the base year to determine the present value of these contract payments over the entire 10-year period.

Note: UPV factors are generally applied to costs that recur annually in substantially the same amount. Examples of such costs are routine operating and maintenance costs. UPV factors are generally applied to costs that recur annually but change from year to year at a constant escalation rate. Examples of such costs are water usage costs when they increase from year to year. These costs usually occur every year over the service period of the building life. If there is a planning/design/construction period before the service life begins, during which these annual costs are not incurred, the appropriate UPV (or UPV*) factor for the service period is the difference between the UPV (or UPV*) factor for the entire study period and the UPV (or UPV*) factor for the planning/design/construction period. For example, if the planning/ design/construction period is 3 years and the service period is 25 years, for a total study period of 28 years, the corresponding UPV factor (from Table 2, DOE 3.0 % discount rate) is 18.764 – 2.829 =15.935.*

For further explanation and illustration of how to use these factors, see NIST Handbook 135.

2.2. Modified Uniform Present Value Factors for Fuel Costs

This section presents FEMP and OMB modified uniform present value (UPV*) discount factors for calculating the present value of energy usage for federal projects. Factors are provided for the nine major Census divisions and for the overall United States. The factors are modified in the sense that they incorporate energy price escalation rates based on future energy prices projected by DOE for the years 2025 to 2055. There are two sets of UPV* tables: the DOE UPV* factors in UPV-DOE (formerly Ba) based on the DOE discount rate (3.0 % real), and the OMB UPV* factors from UPV-OMB (formerly Bb) based on two OMB discount rates (1.8 % real for short-term study periods of 1 year to 10 years, 2.3 % real for long-term study periods of 11 years to 30 years). The underlying energy price indices for the years 2025 to 2055, on which these UPV* calculations are based, are shown in Indices – Real (formerly Ca-1 through Ca-5). The corresponding average energy price escalation rates for selected time intervals between 2025 and 2055 are shown in Comp Esc Rates (formerly Cb-1 through Cb-5).

Energy Price Projections. The DOE/FEMP and OMB UPV* factors incorporate energy price escalation rates computed from future energy prices projected by the EIA. Energy prices through 2050 were generated by EIA using the National Energy Modeling System (NEMS) and published in the AEO2025 [3]. The projection period for the AEO2023 projections is through 2050. Any years beyond the EIA projections are extrapolated assuming escalation equivalent to the simple average of the last 5 years of EIA projections (2046 through 2050).

NEMS is an energy market model designed to project the impacts of alternative energy policies or assumptions on U.S. energy markets. NEMS produces projections of the U.S. energy future, given current laws and policies and other key assumptions, including macroeconomic indicators from Data Resources, Inc., the production policy of the Organization of Petroleum Exporting Countries, the size of the economically recoverable resource base for fossil fuels, and the rate of development and penetration of new technologies. NEMS balances energy supply and demands with modules representing primary fuel supply, end-use demand for four sectors, and conversion of energy by refineries and electricity generators. Macroeconomic and international oil modules reflect the impacts of energy prices, production, and consumption on world oil markets and the economy.

The EIA energy price projections presented in this report, like those of other forecasts, are dependent on the data, methodologies, and specific assumptions used in their development. Many of the assumptions concerning the future cannot be known with any degree of certainty. Thus, the projections are not statements of what will happen, but what might happen given the specific assumptions and methodologies used. Although EIA has endeavored to make these forecasts as objective, reliable, and useful as possible, these projections should serve as an adjunct to, not a substitute for, the analytical process. The AEO2025 was prepared by EIA as required under statute by federal legislation. The price projections to 2050 were prepared in accordance with a Service Request from the Federal Energy Management Program.

Note: Section 441 of the Energy Independence and Security Act of 2007 (EISA) extends from 25 years to 40 years the maximum service period for conducting FEMP life-cycle cost analyses. To account for the legislated change, the BLCC program now incorporates unofficial projections of future energy prices beyond 2050 to accommodate FEMP service periods of up to 40 years. The projections are based on simple average growth rate of the last 5 years of EIA projections. BLCC users should exercise caution when interpreting energy cost savings beyond 30 years and do sensitivity analyses to test different out-year assumptions.

UPV* Calculation Method. The formula for finding the present value (P) of future energy costs or savings is Eq. 5:

$$P = A_0 * \sum_{t=1}^{N} \frac{I_{(2025+t)}}{(1+d)^t} = A_0 * UPV_N^* \qquad (5)$$

where A_0 = *annual cost of energy as of the base date (2025);*
t = *index used to designate the year of energy usage;*
N = *number of periods, e.g., years, over which energy costs or savings accrue;*
$I_{(2025+t)}$ = *projected average fuel price index*[3] *given in Indices - Real for the year 2025+t (where* $I_{2025} = 1.00$*); and*
d = *the real discount rate.*

This formula is based on end-of-year energy prices and end-of-year discounting. Note that annual energy costs as of the base date of the LCC analysis (A_0, to be supplied by the analyst) should reflect the current energy price schedule as of that date, which may not be the same as the energy price itself on that date.[4] That is, the annual energy cost should reflect summer-winter rate differences, time-of-use rates, block rates considerations, and demand charges (as appropriate) anticipated to be in effect that year. If energy and demand costs are calculated separately (as is sometimes done for electricity), the UPV* factor should be applied to both costs.

[3] For greater precision, the UPV* factors reported in the UPV-DOE and UPV-OMB were computed using the unrounded form of the indices given in Indices -Real.

[4] While the UPV* factors provided in this publication were computed using energy price indices that correspond to energy prices as of April in the current and future years, the analyst is encouraged to use for determining A_0 the energy prices prevailing as of the base date of the LCC analysis for the project evaluated.

The data in the supplemental tables are reported for the nine Census divisions and the U.S. average. Figure 1 presents a map showing the states corresponding to the four Census regions and nine Census divisions. The Census regions and divisions do not include American Samoa, Canal Zone, Guam, Puerto Rico, associated states and commonwealths in the Pacific Islands, or the U.S. Virgin Islands. Analysts of federal projects in these areas should use data that are "reasonable under the circumstances," and may refer to the tables with U.S. average data for guidance.

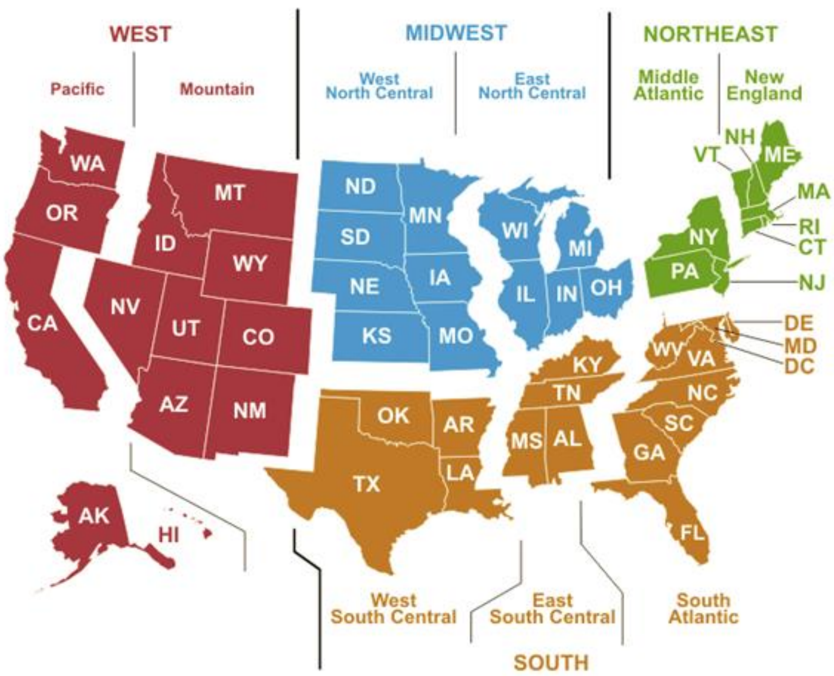

Fig. 1. Census Regions and Districts[5]

2.2.1. FEMP Modified Uniform Present Value Factors

The FEMP Modified Uniform Present Value (FEMP UPV*) factors presented in UPV-DOE, based on the current DOE discount rate (3.0 %), are for calculating the present value of energy costs or savings accruing over 1 year to 30 years and are to be used in life-cycle cost analyses of federal energy conservation and on-site energy generation projects. These factors may be applied to projects with or without planning/design/construction periods, as shown below.

These factors apply only to annual energy usage or energy savings that are assumed to be the same each year over the service period. The BLCC computer program can compute the present value of energy usage and savings that are not the same in each year.

Examples of How to Use the FEMP UPV* Factors:

FEMP UPV*, no planning/design/construction period: To compute the present value of heating with natural gas over 25 years in a federal office building in New Mexico, go to UPV-DOE, find

[5] Source: EIA - https://www.eia.gov/consumption/commercial/maps

the FEMP UPV* factor for Mountain - commercial - natural gas for 25 years (14.886), and multiply this factor by the annual heating cost at base-date natural gas prices.

FEMP UPV*, with planning/design/construction period: To compute a present value factor for a service period following a planning/design/construction period (1) find the UPV* factor for the combined length of the planning/design/construction period and the service period, and (2) subtract from (1) the UPV* factor for the planning/design/ construction period alone. The difference is the UPV* factor for the years over which energy costs or savings accrue. For example, suppose a new federal office building in New York is being evaluated with several energy conserving design options. It is expected to have a planning/design/construction period of 5 years, after which it will be occupied for 25 years. To compute the present value of natural gas costs over 25 years of occupancy, go to UPV-DOE and find the UPV* factors for Middle Atlantic - commercial - natural gas for 5 years (4.086) and for 30 years (10.083). The difference (5.997) is the FEMP UPV* factor for natural gas costs over 25 years, beginning 5 years after the base date. Multiply 5.997 by the annual natural gas cost at base date prices (not occupancy-date prices) to calculate the present value of natural gas costs over the entire 25-year occupancy period.

2.2.2. OMB Modified Uniform Present Value Factors

The OMB Modified Uniform Present Value (OMB UPV*) factors presented in the UPV-OMB, based on the current OMB discount rates (1.8 % short term and 2.3 % long term), are for calculating the present value of energy costs accruing over 1 year to 30 years when conducting a life-cycle cost analysis of a federal project not explicitly related to energy or water conservation or on-site energy resources. These factors apply only to annual energy usage that is assumed to be the same each year over the service period. The BLCC computer program can compute the present value of energy usage and savings that are not the same in each year.

Examples of How to Use the OMB UPV* Factors:

OMB UPV* (OMB discount rate): To compute the present value over 30 years of electricity costs associated with the occupancy of a federal office building in Ohio (where energy conservation is not a specific consideration in the LCC analysis), go to UPV-OMB, find the UPV* factor for East North Central - commercial - electricity for 30 years (15.772), and multiply this factor by the annual electricity cost in base-date dollars.

Note: Because the discount rate used to calculate UPV-OMB values (OMB discount rate) is usually different for years 1 to 10 than for years 11 to 30, these factors cannot be used with a planning / design / construction period as shown above for UPV-DOE values (DOE discount rate). Use the BLCC computer program for this purpose. For further explanation of the use of UPV factors, see NIST Handbook 135.*

2.3. Projected Average Fuel Price Indices and Escalation Rates (Real)

Indices – Real presents projected fuel price indices for the nine Census divisions and for the United States. These indices, when multiplied by annual energy costs computed at base-date prices (i.e., 2025), provide estimates of future-year costs in constant base-date dollars. Constant-dollar cost estimates are needed when discounting is performed with a real discount rate (i.e., a rate that does not include general price inflation). These indices were used in the calculation of the UPV* factors for energy prices in UPV-DOE and UPV-OMB in this publication.

Example of How to Use the Indices:

To estimate the price of industrial coal in 2026 in Connecticut (in constant 2025 dollars), go to Indices-Real, find the year 2025 index for New England - industrial - coal (0.997), and multiply by the price for industrial coal in Connecticut in 2025.

For further explanation of how to use these tables, see NIST Handbook 135.

Comp Esc Rates presents the projected compound annual average fuel price escalation rates (percentage change compounded annually) for selected periods from 2025 to 2055 for the nine Census divisions and for the overall United States. Note that these are real rates exclusive of general price inflation. Their use results in prices expressed in constant dollars.

The average fuel escalation rates consolidate the information provided by the indices in Indices-Real so that trends in projected price changes can be seen at a glance. They are provided primarily to accommodate computer programs (such as BLCC) which require price escalation rates as inputs.

Unless there is a compelling reason to use escalation rates, it is recommended that you use the indices (Indices-Real) or annual escalation rates (Esc Rates) when you need estimates of future-year energy prices, since the indices include year-to-year information rather than averages over several years provided in the compound annual average escalation rates.

Example of How to Use the Compound Annual Average Escalation Rates:

To estimate the unit price of residential natural gas at the end of 2035 (p_{35}) in Wyoming using the DOE energy price escalation rates, go to Comp Esc Rates and find the 2025 to 2030 and the 2030 to 2035 escalation rates for Mountain - residential - natural gas (-0.45 % for 5 years and 2.59 % for 5 years, respectively). Enter these values and the unit price of residential natural gas in Wyoming in 2025 (p_{25}) into the following formula in Eq. 6. Then solve for the 2035 energy price (stated in 2025 dollars):

$$p_y = p_{0*} \prod_{i=1}^{N} (1 + e_i)^{k_i} \qquad (6)$$

$$\begin{aligned} p_{35} &= p_{25} * (1 + e_1)^{k_1} * (1 + e_2)^{k_2} \\ &= p_{25} * (0.9955)^5 * (1.0259)^5 \\ &= p_{25} * 1.111 \end{aligned}$$

where *p_y = price at end of year y;*
p_0 = unit price at base date;
e_i = annual compound escalation rate for period i from Comp Esc Rates(in decimal form); and
k_i = number of years over which escalation rate e_i occurs.

Note: The compounded escalation rate factor (1.111) corresponds to the fuel price index in Mountain - residential - natural gas, for the year 2035 in Indices-Real (1.111).

The data in Indices-Real and Comp Esc Rates on the following pages are reported for the nine Census divisions and the U.S. average. Figure B-1 presents a map showing the states corresponding to the nine Census divisions. The Census divisions do not include American Samoa, Canal Zone, Guam, Puerto Rico, associated states and commonwealths in the Pacific

Islands, or the U.S. Virgin Islands. Analysts of federal projects in these areas should use data which are "reasonable under the circumstances," and may refer to the tables with U.S. average data for guidance.

3. Energy Price Indices for Private Sector LCC Analysis

This section presents tables of projected nominal (i.e., including inflation) fuel price indices for four fuels in the residential sector and five fuels in the commercial sector for each of the years from 2025 through 2055. These price indices are based on the DOE energy price projections used to calculate the DOE/FEMP and OMB UPV* factors for energy costs.

As a convenience for the user, the indices include the effect of four alternative, hypothetical rates of general price inflation: 2 %, 3 %, 4 %, and 5 %. Selection of these rates is in no way intended to suggest what actual rates might be. Use of the indices produce price estimates in current dollars, inclusive of general price inflation. Current-dollar prices are needed when discounting is performed with discount rates that include general price inflation (i.e., nominal or market discount rates).

The calculated indices with inflation rates of 2 %, 3 %, 4 %, and 5 % allow the analyst to perform evaluations based on the assumption of a positive rate of general price inflation that changes the purchasing power of the dollar. Performing evaluations in current dollars is sometimes preferred for private investment decisions, primarily because it facilitates the treatment of taxes.

The indices in Indices – Nominal are derived from the indices reported in Indices - Real by means of the following Eq. 7:

$$I_S = I_C \times (1 + g)^N \qquad (7)$$

where I_S = *index found in* Indices - Nominal*;*
I_C = *index found in* Indices - Real*;*
g = *annual rate of general price inflation in decimal form; and*
N = *number of years, in this case equal to the year of the index minus 2025.*

Example of How to Use the Indices:

Suppose you wish to estimate the annual cost of natural gas for a house in Maryland in year 2030, given the annual cost in 2025 prices, and you expect an annual inflation rate of 3 % per year. From Indices - Nominal, find the column for South Atlantic - residential - natural gas indices at an inflation rate of 3 %; then locate the index for the year 2030. This index is 1.27. Multiply the annual cost in 2025 prices by the index to find the estimated annual cost in year 2030 prices.

If this annual cost in year-2025 prices is to be discounted to present value, you must use a nominal discount rate that includes the same assumption about general price inflation (3 % in this example). To obtain a present-value cost over the entire study period, the present-value calculation must be repeated for each year that there are natural gas costs, and the results summed. (UPV* factors are not given for private sector use because of the large number of tables required to cover potential discount rates that might be used by the analyst.) The BLCC computer program can perform LCC analyses using any discount rate, in constant or in current (market) dollars. The private sector analyst may use the UPV* factors provided the analysis is performed in constant dollars and the desired discount rate corresponds to the DOE or OMB discount rates.

The data in the Indices - Nominal are reported for the nine Census divisions and the U.S. average. **Fig. 1** presents a map showing the states corresponding to the nine Census divisions. The Census divisions do not include American Samoa, Canal Zone, Guam, Puerto Rico, associated states and commonwealths in the Pacific Islands, or the U.S. Virgin Islands. Analysts of federal projects in these areas should use data which are "reasonable under the circumstances," and may refer to the tables with U.S. average data for guidance.

4. Trends in Energy Price Projections

This section was originally added to the 2024 edition of this document because of significant interest in better understanding how the energy price projections have changed over the last couple of years. This new interest was largely driven by concerns about projected decreases in real prices in the short-term due to recent shocks to the energy markets from which the markets are still developing a new equilibrium. This section will discuss the current EIA energy price projections and why the resulting energy price escalation rates published with in this document may be lower than expected. The first three reasons are based on perception while the last reason is based on real world conditions that vary from the projections.

First, the EIA projections accounted for recent large spikes in the energy prices and projected that the markets would normalize over the following years (typically by 2030). **Fig. 2** shows the U.S. average real price projection indexed to 2024 prices from AEO2025 for electricity and natural gas for commercial customers. Electricity is expected to initially decrease in price (negative escalation rates) until 2028, increase to the early-2030s, trend down again until 2040, and then trend up again through 2050. Note that the current prices are expected to be much higher than any prices throughout the entire projection. Natural gas is also expected to initially decrease in price (negative escalation rates) until 2027 and then steadily increase until the mid-2030s, returning to current price levels in early 2030s. After which, the price level will decrease and then increase again but remain above current price levels through 2050. These trends can explain the negative escalation rate estimates in the current (2025) release of this document and associated data in EERC (compound annual average real annual escalation rate) and BLCC (non-constant annual real escalation rates), particularly for shorter study periods. Although, please note that these are U.S. average projections and regional and local price changes could vary significantly. Please see the most recent FEMP guidance on escalation rate selection (found here: https://www.energy.gov/femp/articles/guidance-utility-rate-estimations-and-weather-normalization-performance-contracts [6]), particularly in cases where documented short-term escalation rates from the utility deviate from the projections in this document.

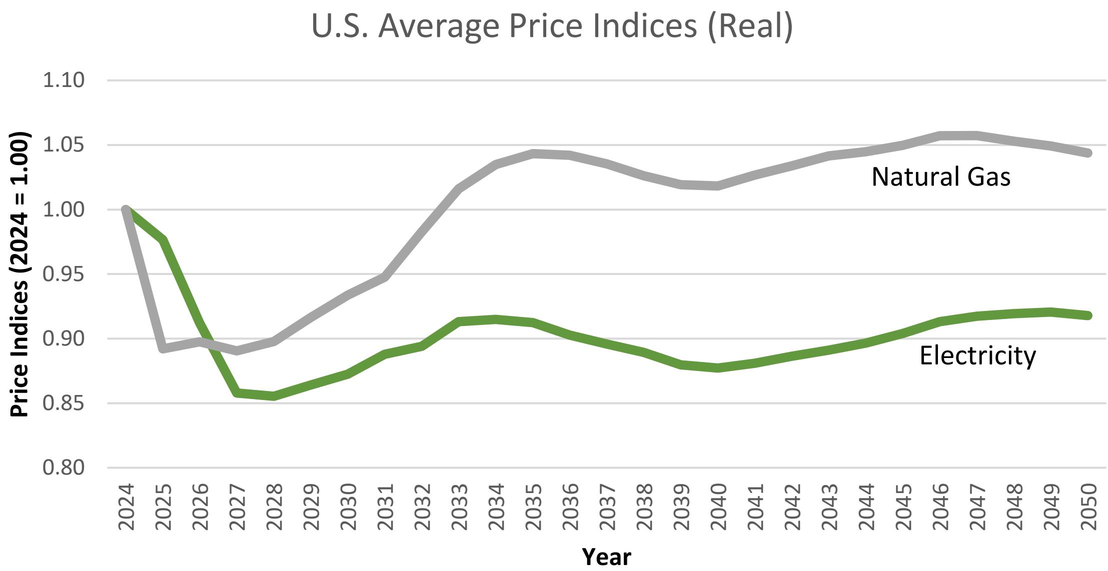

Fig. 2. Energy Price Indices (Real) by Fuel Type (US Average)

Second, these projections are provided in real terms, which excludes general inflation. Therefore, nominal prices (i.e., the prices consumers see and pay) may increase 10 %, but if general inflation increases at the same rate of 10 % then the real escalation rate is zero. To take this a step further, if nominal energy prices decrease (i.e., revert to previous long-term trends) while general inflation remains positive (i.e., Federal Reserve target of 2.0 %), it can lead to even larger negative real escalation rates.

Third, there may be a recency bias in which consumers expect the most recent short-term trend to continue. In this case, consumers have been seeing higher prices both for general price inflation as well as increases for energy specifically over the last few years. Therefore, they may be expecting prices to continue to increase year-over-year at rates higher than have been the historical norm or what the AEO2025 projections are reporting.

Fourth, the projections may not accurately represent the energy price changes being experienced in real world conditions, with shifts in prices being slower than expected at the end-customer level as well as other factors potentially not accounted for in the long-term modeling. Along with the long-term projections from AEO2025, the EIA also provides short-term forecasts in their Short-Term Energy Outlook (STEO), which used different models for projections than AEO2025. These differences appear to be leading to current STEO projections that are not consistent with projections from AEO2025. **Fig. 3** shows monthly data (released in May 2025) from the STEO data browser **[8]** that includes both historical data from January 2024 through February 2025 and monthly projections for March 2025 through December 2026 for commercial sector real price indices for electricity and natural gas using January 2024 the benchmark. The STEO projections show a positive trend in prices for both natural gas and electricity, which is significantly different than the decreases in prices in 2025 and 2026 energy price projections in the AEO2025.

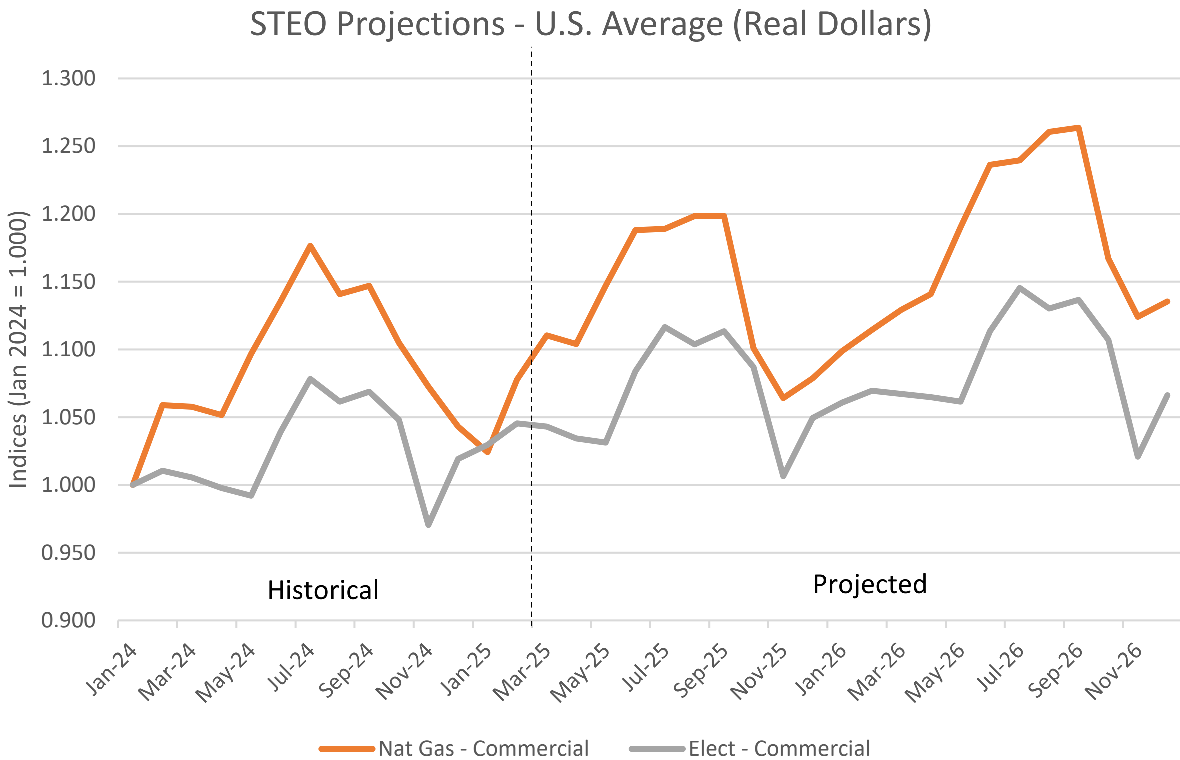

Fig. 3. Natural Gas and Electricity Price Indices (Real) [8]

The discrepancy between the STEO and AEO2025 projections through 2026 emphasize that the NEMS model used by AEO2025 may not accurately account for short-term factors that may make the data less representative of the conditions faced by specific projects in specific locations. This highlights the importance of using the most recent FEMP guidance (found here: https://www.energy.gov/femp/articles/guidance-utility-rate-estimations-and-weather-normalization-performance-contracts [6]) to ensure accurate and justifiable escalation rate selection.

References

[1] Kneifel J , Webb D (2020) *LIFE CYCLE COSTING MANUAL for the Federal Energy Management Program* (https://nvlpubs.nist.gov/nistpubs/hb/2020/NIST.HB.135-2020.pdf), (Technology NIoSa).

[2] CFR (2018) *10 Code of Federal Regulations (CFR) 436, Subpart A, Methodology and Procedures for Life-Cycle Cost Analysis.* (https://www.ecfr.gov/cgi-bin/text-idx?SID=1772217352e2b3956b37b48739ebd676&mc=true&node=pt10.3.436&rgn=div5).

[3] EIA (2022) Annual Energy Outlook 2022. (U.S. Energy Information Administration (EIA), https://www.eia.gov/outlooks/aeo/).

[4] OMB (1992) *GUIDELINES AND DISCOUNT RATES FOR BENEFIT-COST ANALYSIS OF FEDERAL PROGRAMS*, MEMORANDUM FOR HEADS OF EXECUTIVE DEPARTMENTS AND ESTABLISHMENTS.

[5] 42 U.S.C. § 8287 (2010) Title 42 - THE PUBLIC HEALTH AND WELFARE CHAPTER 91 - NATIONAL ENERGY CONSERVATION POLICY SUBCHAPTER VII - ENERGY SAVINGS PERFORMANCE CONTRACTS Sec. 8287 - Authority to enter into contracts. ed Congress US.

[6] FEMP (2023) *Guidance on Utility Rate Estimations and Weather Normalization in Performance Contracts* (https://www.energy.gov/femp/downloads/guidance-utility-rate-estimations-and-weather-normalization-performance), (U.S. Department of Energy OoEERE, Federal Energy Management Program).

[7] ASTM (2012) *ASTM Standards on Building Economics: 7th Edition* (ASTM International, West Conshohocken, PA).

[8] U.S. Energy Information Administration (EIA) (2025) *Short-Term Energy Outlook (STEO) Data Browser*. Available at https://www.eia.gov/outlooks/steo/data/browser/.

Appendix A. Abbreviations

Abbreviations

A	-	Annual amount
A_0	-	Annual amount at base-date prices
AEO2025	-	2025 Annual Energy Outlook
BLCC	-	Building Life Cycle Cost
COAL	-	Coal
d	-	discount rate
DIST	-	Distillate Oil
DOE	-	U.S. Department of Energy
e	-	price escalation rate (annual rate of price change)
EIA	-	Energy Information Administration (DOE)
ELEC	-	Electricity
EPA	-	U.S. Environmental Protection Agency
ESPC	-	Energy Savings Performance Contract
FEMP	-	Federal Energy Management Program
FY	-	Fiscal Year
GASLN	-	Gasoline
kg	-	kilogram
LCC	-	Life-Cycle Cost
LPG	-	Liquefied petroleum gas
N	-	Number of discount periods (in years)
NEMS	-	National Energy Modeling System
NIST	-	National Institute of Standards and Technology
NREL	-	National Renewable Energy Laboratory
NTGAS	-	Natural Gas
OMB	-	Office of Management and Budget
RESID	-	Residual Oil
SPV	-	Single Present Value (factor)
UESC	-	Utility Energy Services Contract
UPV	-	Uniform Present Value (factor)
UPV*	-	Modified Uniform Present Value (factor)

Appendix B. Supplemental Resources

Versions of this document prior to 2022 included data tables that have been moved to an associated spreadsheet for a given release year (NISTIR85-3273-XX.xlsx). The data table nomenclature has been updated as of the 2023 release to align with the new NIST Technical Publication formatting. The 2025 release has renamed the data tables and are provided in the following spreadsheet tabs:

- README – Provides description of each tab, data sources, and change log
- State by Census Division – State to Census division mapping
- DiscountRateMemo - Discount rate and inflation data used for calculations
- ENCOST – Energy price projections from EIA (previous format)
- Energy Costs - Energy price projections from EIA (new format)
- Indices - Non-Energy (replaces Table A) - SPV, UPV, and UPV* values for non-energy costs
- UPV – DOE (replaces Table Ba) - UPV* values for real energy costs (Census region)
- UPV – OMB (replaces Table Bb) - UPV* values for real non-energy costs
- Indices – Real (replaces Table Ca and Table E) - Projected real fuel price indices (Census division)
- Indices – Nominal (replaces Table S) - Projected nominal fuel price indices (Census division)
- Esc Rates (replaces Table F) - Projected real fuel annual escalation rates (Census division)
- Comp Esc Rates (replaces Table Cb) – Compound annual average escalation rates for real energy costs

Note that Table D has been removed. The data tables are available from NIST at the following DOI: https://data.nist.gov/od/ds/mds2-3848. The python scripts used to collect and convert the source data from EIA is published with this document as a supplemental zip file available from NIST at the following DOI: https://doi.org/10.6028/NIST.IR.85-3273-40sup1.