FEMP
Federal Energy Management Program

Guidance on Utility Rate Estimations and Weather Normalization in Performance Contracts

March 2024

Disclaimer

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

Foreword

This guidance document explains how to use estimated energy and water rates and normalized weather data in determining payments under a federal energy savings performance contract (ESPC) or utility energy service contract (UESC). This document is an update to the February 2019 guidance. This is DOE's official guidance for agencies in determining energy and water escalation rates for ESPCs and UESCs.

Authors

The authors of this report are:

Kurmit Rockwell, U.S. Department of Energy (DOE)

Priya Stiller (DOE)

Christine Walker, Pacific Northwest National Laboratory (PNNL)

Phil Voss, National Renewable Energy Laboratory (NREL)

Acknowledgments

The authors would like to acknowledge the valuable guidance and input provided during this report. Contributors to the earlier version of this document include Phil Coleman with Lawrence Berkeley National Laboratory (LBNL). The authors are grateful to the following list of contributors in updating this guidance:

Contributors:

Douglas Elliott, PNNL

Kate Stoughton, PNNL

Scott Unger, PNNL

Josh Kneifel, National Institute of Standards and Technology

This report was prepared by Pacific Northwest National Laboratory for the U.S. Department of Energy, Federal Energy Management Program.

List of Acronyms

CEA President's Council of Economic Advisers

DOE U.S. Department of Energy

EERC Energy Escalation Rate Calculator

EIA U.S. Energy Information Administration

ESCO Energy service company

ESPC Energy savings performance contract

FEMP Federal Energy Management Program

IDIQ Indefinite delivery, indefinite quantity (an umbrella ESPC issued by DOE)

NIST National Institute of Standards and Technology

O&M Operations and maintenance

PPA Power purchase agreement

PNNL Pacific Northwest National Laboratory

UESC Utility energy service contract

Table of Contents

1 Introduction

1.1 Purpose

The use of estimated energy rates[1] and normalized weather[2] data in determining energy service company (ESCO) payments in an energy savings performance contract (ESPC) is permitted. This document provides guidance for agencies and ESCOs in determining energy and water escalation rates[3] and addressing weather normalization. Agencies and utilities implementing performance contracts under a utility energy service contract (UESC) will find this guidance useful as well.

1.2 Authority

The National Energy Conservation Policy Act (NECPA), as amended, establishes the authority for ESPCs (see 42 U.S.C. § 8287 et seq.). DOE established regulations for ESPCs at 10 C.F.R. Part 436, subpart B. The UESC authority for civilian agencies is derived from 42 U.S.C. § 8256; the UESC authority for defense agencies is derived from 42 U.S.C. §§ 2913 (gas and electric) and 2866 (water).

2 Guidance

2.1 Energy Escalation Rate Determination

Section 801(a)(2)(B) of NECPA states that an ESPC must provide for a guarantee of savings to the agency and requires the establishment of payment schedules reflecting such guarantee. See 42 U.S.C. § 8287(a)(2)(B); 10 C.F.R. § 436.35(a)(4)-(5) (2018). The ESPC authority also requires that the contract specify the terms and conditions of any government payment and mandates annual energy audits to ensure that ESPC projects are achieving the established savings guarantee. See id. at 8287(a)(2)(A); 10 C.F.R. § 436.37. Given that ESPCs rely on estimates of future conditions, the statute allows for agencies to rely on utility rate estimates in ensuring that energy savings exceed aggregate annual payments in each year of the ESPC. See 42 U.S.C. § 8287(a)(2)(B).

To the extent that payments will rely on projected energy rates, FEMP recommends that agencies rely on the Energy Escalation Rate Calculator (EERC)[4] in establishing future energy rates for the purposes of determining the value of energy savings (and thus payments to ESCOs). EERC, a cost calculator for estimating escalation rates in performance contracts, has been developed

[1] For the purpose of this guidance, "energy rates" includes rates for energy, energy-related costs, water, water-related costs, and wastewater treatment.
[2] "Weather normalization" is a method to enable a like-for-like comparison of energy consumption from different periods. Generally, weather normalization factors out variations in outside air temperature to allow for a fairer comparison of energy performance.
[3] The escalation rate is the rate of change in price for a particular good or service (as contrasted with the inflation rate, which is an average for all goods and services).
[4] https://pages.nist.gov/eerc/

under a FEMP contract with the National Institute of Standards and Technology (NIST) to develop life-cycle costing tools for the purposes of federal energy management. EERC incorporates projections from DOE's Energy Information Administration (EIA) Annual Energy Outlook for changes in future energy prices in various regions of the United States. It also incorporates a default long-term inflation rate that is developed annually by the President's Council of Economic Advisers and incorporated by NIST; this inflation rate should not be altered, as it represents the government's best estimate of future inflation. The EERC also allows for adjustment due to potential carbon pricing, however calculation of contractor payments in ESPC and UESC projects may include such adjustments only to the extent that the applicable energy rates are influenced by an existing carbon pricing regime. Carbon pricing that is speculative must not be included in the contractor payment calculation.

Based on historical analysis, FEMP has determined that EERC provides a credible estimation of long-term changes in future utility rates for locations covered by EERC (states within the U.S.). Note that the EERC does not apply to international locations; it is recommended that agencies reach out to FEMP for assistance with energy escalation in international locations.

To the extent that relevant future utility rates have been established and are available to a federal agency upon entering a performance contract, these rates should be used to calculate performance period payments wherever possible. Published future rates may be used for short-term escalations (i.e., for the duration of those known rates), with the EERC values used for years beyond the published or known future utility rates. Two examples highlight this:

1. If the serving utility has published utility rates (e.g., for the next two years or other known period), those rates should be used for the known period, with the EERC estimations used for the remaining term of the contract.
2. If a site has entered into a contract (such as in a competitive electricity market) for a period of years of its ESPC or UESC term, the contract rates should be used to calculate savings under the ESPC/UESC during the period covered by the utility contract.

For energy- or water-related expenses – such as those for expected operations and maintenance (O&M) labor or repair and replacement parts – escalation of prices over the term of a performance contract may also be warranted. In these cases, in the absence of compelling evidence to the contrary, the long-term general inflation rate as forecast by the President's Council of Economic Advisers (CEA), as found in NIST's current EERC tool[5], is a logical escalator. If the site or agency has historical O&M cost data, or contracts in place with O&M providers that include annual escalation factors, that information can also be used in determining price escalation.

[5] This inflation forecast is derived by NIST from the current year's *Analytical Perspectives: Budget of the U.S. Government*, which includes CEA's year-by-year inflation forecasts in its "Economic Assumptions" table. It is the default inflation rate provided annually in NIST's EERC tool.

2.2 Water and Wastewater Escalation Rate Estimation Methods

Determining appropriate forecasts of water and wastewater price rates is necessary for performance contracts that include water conservation measures, but this can be more difficult than ascertaining comparable rates for various forms of energy. While the EIA forecasts changes in energy prices (see above), no governmental organization estimates future long-term changes in water and wastewater prices. Delivered energy prices are primarily governed by underlying commodity prices, whereas infrastructure projects typically drive the variances in prices across water and wastewater service providers. FEMP has worked with Pacific Northwest National Laboratory (PNNL) to provide guidance on three viable options to forecast water and wastewater price escalation rates (listed in the order to be considered, and of expected accuracy):

1. **Direct forecast from serving utility**: The preferred source for price projections is the serving water/wastewater utility. Contact the serving utility to determine if there are any forecasts of future water and wastewater rate changes, whether published or via a written statement or other documentation from the utility. If possible, obtain year-specific price escalation rates, rather than a multi-year average. Where only a portion of the project term is covered by the utility's projections, apply to those years of the term only and then address the remainder of the term using method 2 or 3, below.
2. **Historical rate data, with cap**: Absent a forecast from the serving water/wastewater utility, the next best method with which to forecast water and wastewater prices is to look to past local rate changes as a general prediction for future ones. To determine historical annual rates of change, collect the most recent eight years of billing statements or rate data from the local utility and use this general formula to calculate a compound annual escalation rate[6]:

$$Compound\ Annual\ Escalation\ Rate = \left(\frac{Final\ Year\ Rate}{First\ Year\ Rate}\right)^{\frac{1}{(Final\ Year - First\ Year)}} - 1$$

Example calculation:

- 2010 water rate = $3.40 per thousand gallons (kgal)
- 2018 water rate = $4.40/kgal

[6] A compound annual escalation rate should not be confused with an average annual escalation rate as defined in EERC. The former is a rate that, as its name implies, accounts for compounding, and yields the **final** price or value at the end of an analysis period, if applied uniformly each year to an initial price or value (i.e., PT = P0 * (1 + e)^T). The latter is the uniform escalation rate that results in approximately the same total amounts over the performance period as the variable escalation rates. To illustrate the difference between the two types of rates, consider an extreme example, with a 2-year analysis period, where prices increase 100% in the first year, and decrease 50% in the second year, taking them back to their initial state. The average annual escalation rate would be 30.3% (see EERC User Guide for the underlying formula), yielding an incorrect final price. But the compound annual escalation rate would be zero, and correctly yield the final price. For more on the differences between the two types of rates, see: https://www.investopedia.com/terms/a/aagr.asp#toc-aagr-vs-compound-annual-growth-rate.

- Cumulative annual average escalation rate = ($4.40 / $3.40) ^ (1 / (2018 – 2010)) – 1 = 3.28%.

Using this method, maximum real (or net-of-inflation) compound annual escalation rates should be capped at 3.0% for water supply and 3.2% for wastewater. These represent average real compound annual price increases from a 2023 FEMP-funded Pacific Northwest National Laboratory (PNNL) report on U.S. water and wastewater utility rates from 2008 to 2021[7]. For example, if the calculated annual average rates for water and wastewater are 2.9% and 3.5%, respectively, use 2.9% for water, and 3.2% for wastewater, or develop a weighted average using the respective water and wastewater volumes. These caps have been instituted to avoid potential overestimation of price escalations when employing historical rate data to predict future rates.

Note that values expressed in nominal (i.e., including inflation) dollars are more relevant to performance contracting. To convert these real caps to nominal caps, use the following formula:

$$Nominal\ Rate = [(1 + Real\ Rate) * (1 + Expected\ Inflation\ Rate) - 1]$$

The expected inflation rate should be obtained from the most current version of EERC, which provides the CEA long-term annual inflation rate forecast that is updated annually.

Thus, using the real water price escalation cap of 3.0% and an expected long-term annual rate of general inflation of 2.3%, the corresponding nominal cap would be 1.03 * 1.023 – 1 = .054, or 5.4%. In the case of wastewater, with a real price escalation cap of 3.2%, the corresponding nominal cap would be 1.032 * 1.023 – 1 = .056, or 5.6%.

Other key requirements of this option:

- Use marginal rates (typically $/kgal or $/hundred cubic feet (CCF)), rather than average rates. Do not simply take a bill total and divide it by total usage to obtain an average rate. Rather, obtain the volumetric charge for water (and wastewater, as relevant), which should be derived from the bill or provided by the serving utility in its rate schedule. In some cases, average and marginal rates can differ tremendously, and water efficiency projects avoid costs at the marginal rates; the sometimes large, fixed components of water and wastewater bills remain unaffected.
- If monthly rates differ within a calendar year, make sure the beginning and ending month are identical. For example, if the most recent month available is January 2018, the starting rate should be that of January 2010.
- Calculate water and wastewater price escalation rates separately (though the two can be combined into an average for water conservation measures where the volumetric water savings is the same for each bill).

[7] Unger S.R., E.M. Kilgannon, D.B. Elliott, K.A. Cort, and K. Stoughton. 2023. Water and Wastewater Annual Price Escalation Rates for Selected Cities Across the United States. Richland, WA: Pacific Northwest National Laboratory.

3. **Forecasts of general inflation**: If projections via the first two options are not possible, projects should default to using the current long-term general inflation rate forecast of the CEA.

2.3 Weather Normalization

On the separate but similar issue of weather forecasting, use of normalized weather data is permissible when determining savings (and thus payments) under an ESPC or UESC. Under the ESPC regulations (10 C.F.R. § 436.37(b)(6)), when estimating energy savings, energy usage can be adjusted to account for weather. This is also allowable for UESCs. There are several tools available for executing this normalization, such as NREL's "Typical Meteorological Year" data.[8] The most recent TMY dataset and location should be used that best matches the project or site. More information on the use of weather data in performance contracts can be found in the most recent version of FEMP's Measurement and Verification Guidelines for Performance-Based Contracts.

2.4 Contract Terms

If a performance contract relies on projected energy costs or normalized weather data in determining contractor payments, the projected energy costs and normalized weather data must be included in the terms of the ESPC or UESC task order. Details should be included in the Risk, Responsibility, and Performance Matrix; Measurement and Verification Plan; and financial schedules.

[8] https://nsrdb.nrel.gov/tmy

FEMP
Federal Energy Management Program

For more information, visit:
energy.gov/femp

DOE/FEMP-0014 • March 2024