Energy Design Assistance
Energy Modeling Protocol

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1. General

1.1 Introduction

This document describes the Protocol for energy modeling for the Energy Design Assistance (EDA) program.

The goal of the EDA program is to provide energy savings estimates for a wide range of design options, early enough so that those options are still viable within the context of the project. The *energy savings* are a differential between a proposed design and the baseline design. This effort, undertaken in the design phases, does not assert an ability to forecast actual operating energy consumption, either for a proposed building or the baseline.

The EDA program does not attempt to provide feedback or documentation on whether or not a building is complying with the referenced energy code or standard.

A computer model of a baseline design is developed for each project that has been accepted into the program. Development of the baseline building and proposed building design options follows the Protocol outlined in this document.

The EDA Protocol is based on a utility-modified version of the locally adopted *ANSI/ASHRAE/IESNA Standard 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings* utilizing Appendix G. Projects in Minnesota incorporate changes made by the Minnesota Commercial Energy Code (chapter 1323 of Minnesota Rules). In all cases the ASHRAE 90.1 standard baseline model shall be set up according to this Protocol and reported to Xcel Energy.

> Exception: Projects that are regulated under the 2018 IECC should utilize ASHRAE 90.1-2013 Appendix G modeling protocol, but utilize baseline efficiencies for envelope, HVAC/DHW, and lighting from the tables in ASHRAE 90.1-2016 sections 5-9, plus any local amendments that specifically change mandatory minimum or prescriptive baseline efficiencies within ASHRAE 90.1-2016.

1.2 Scope

The purpose of this document is to specify the method for determining the proposed building performance of a customer's proposed design relative to the reference standard for the purpose of calculating energy savings results and Xcel Energy new construction rebates for the EDA program.

1.3 Definitions

As Modeled	As modeled includes the savings identified within the modeled bundle during early design.
Building Energy Model	A computer simulation of the projected energy use and associated energy costs of a building.

Baseline	The energy performance and associated costs developed with use of a computer representation of a hypothetical design based on the parameters defined in this Protocol.
Bundle/Design Alternative	An integrated group of strategies or Energy Conservation Measures that represent a potential version of the building.
Energy Code	The legal requirement, as defined by a local governing agency that must be followed in designing and building the subject project. The locally adopted energy code may vary from jurisdiction to jurisdiction within Xcel Energy territory.
Energy Consultant	Providers of energy modeling services.
Design Team	The architects and engineers of record for designing and constructing the project.
Process Load	Energy that is consumed in support of a manufacturing, industrial, or commercial process other than space conditioning and maintaining comfort and amenities for the occupants of a building.
Proposed Building	The building that the Design Team could build with energy enhancements.
Proposed Building Performance	The annual energy and energy cost calculated for a proposed design.
Proposed Design	A computer representation of a proposed building or portion thereof used as the basis for calculating energy and energy cost.
Measurement and Verification (M&V)	M&V includes the review of a constructed building for energy conservation measures installed. Measurement is limited to selected strategies as noted in this Protocol.
Simulation Program	A computer program capable of building energy modeling on an hour-by-hour basis.
Results	Energy usage and cost projections for the baseline building as compared to the modeled building versions. Selected by the design team and owner; operated in the model according to criteria in the Protocol and according to discretionary parameters not governed by the Protocol but that are set or accepted by the design team and owner during the design phase. The results may be adjusted for variances found during a construction document review. Final modeling results are adjusted for variances found during the verification visit.

1.4 Protocol Standard

The Energy Design Assistance program uses the locally adopted version of ASHRAE Standard 90.1, including Appendix G with modifications listed in Section 3.2 of this document. Modifications are a result of three specific concerns surrounding Appendix G:

- Appendix G allows cross fuels: The primary metric for the Appendix G is energy costs. The accounting of what happens with individual energy units as required by Demand Side Management (DSM) programs is not an area of focus for Appendix G. The EDA Protocol adjusts this focus to meet the requirements of the DSM program. See Appendix A for the detailed policy on cross fuels policy.

- Appendix G is written for use in evaluating completed designs: EDA is structured to work with participants during the early design phases before designs are finalized. This helps customers and Design Teams identify energy savings early in the design process when they have better opportunities to make design changes. Appendix G sets baseline criteria after the design decisions have been made. If the baseline is reset at the end of the design process, there can be a change in calculated savings compared to that which was forecasted in the earlier stages of design. Xcel Energy claims credit for the influence on design; therefore, the resetting of the baseline is not required within this Protocol unless there is a significant building change; this is thus further discussed in section 3.2 and 4.4.3.

- This EDA Protocol requires the use of the Appendix G system type, taking into consideration fuel use (to avoid fuel switching). This may or may not correspond with the Proposed system. If the Energy Consultant determines that the Appendix G Baseline system type does not address these requirements, the proposed HVAC system may be used in the baseline model instead, taking into consideration fuel switching. The Energy Consultant will document which Baseline is used.

- Technologies or measures not covered in Appendix G

2. Simulation Requirements

2.1 Process

The Energy Design Assistance program requires an hour-by-hour energy simulation program to determine the baseline model energy use and calculate as well as savings for individual energy conservation strategies and bundles.

2.2 Software Requirements

2.2.1 Simulation Program

An hour-by-hour simulation program capable of predicting annual energy use and energy cost for a building, including both energy consumption and peak energy by fuel source.

Colorado projects must use the OpenStudio collection of modeling software due to its integration with Xcel Energy's EDA Program Tracker (EDAPT). Projects enrolled in the Colorado program after July 22, 2019 must use OpenStudio v2.8.1 or later.

2.2.2 Weather

A standard typical year weather file for the building location is used. Typical Meteorological Year weather files for many Minnesota and Colorado locations are available from http://rredc.nrel.gov/solar/old_data/nsrdb/1991-2005/tmy3/ (TMY3 files). If a weather file is not available for the exact location, a weather file will be chosen based on proximity to the building location or climate region.

2.2.3 Utility Rates

All utility rates used in the modeling shall be documented in the results report to document the values used in the model. Electric rates shall be based on the most recent rates available in the year the project is first modeled. Rates should be updated up until the time of bundle selection. If the project goes on hold or the design is stalled for a period of time, the Energy Consultant should update rates when the design restarts.

2.2.3.1 Electric Rates

While many of our programs use base rates as described in our most recent filings, EDA does it differently for electric rates. Other programs are based on energy costs savings while EDA uses rates to do projections for two to three years in the future. Therefore, please use the forecast utility rates as provided by Xcel Energy. Use the actual Xcel Energy rate structure(s) on which the building will be when occupied. The rates account for peak, consumption, and meter charges. Any time of day or seasonal variations are also accounted for. Updated forecast rates will be provided by Xcel Energy annually.

2.2.3.2 Gas Rates

Use an average gas rate as provided by Xcel Energy from January of each year. Monthly meter charges are included in this information. Updated forecast rates will be provided by Xcel Energy annually.

2.2.3.3 District and Campus Heating and Cooling Rates

Use actual district or campus energy charges for the proposed building provided by the building owner when the project is first modeled. Include demand and consumption charges as well as ratchets and seasonal variations.

3. Modeling Protocol

The Baseline for the Energy Design Assistance Program is determined using this Protocol, based on the ASHRAE Standard 90.1 Appendix G methodology. Please note that the rating authority listed in the following tables is Xcel Energy. Once baseline is established and modeling has been conducted, the baseline should not change except in instances of fuel switching or major mechanical system changes.

3.1 Modeling Assumptions

3.1.1 Plug/ Process Loads

Plug and process loads are based on ASHRAE Handbook of Fundamentals suggested values; however, there are exceptions as noted below. Values other than ASHRAE must be validated by the engineers of record and approved by Xcel Energy before inclusion in energy alternatives/bundle(s) for rebates.

Projects, such as labs or hospitals, that may have large plug loads can be disadvantaged if the plug loads are not available for energy savings within the EDA program. On a per project basis, and approved by Xcel Energy, exceptions can be made to separate the plug load from the total energy savings to calculate the final requirement for minimum savings.

Types of plug load examples:

- Computers/monitors, laptops, IPADs
- Hospital plug-in equipment
- Coffee makers, refrigerators, microwaves, dishwashers
- Clothes washers
- Fans
- Desk and table lamps
- Televisions

3.1.2 Process Energy

Buildings with sizeable process loads such as data centers and other process end uses (examples below) that are not regulated by ASHRAE 90.1 shall document the baseline and ECM parameters used in the energy model as *Exceptional Calculation Methods* as described in Appendix G.

Types of process energy examples:

- Cooking
- Special HVAC, process systems
- Hospital systems
- Special motor driven systems

- Data centers[1]
- Exhaust systems
- Refrigeration systems

Many times these process systems can be integrated with the building services and reduce the overall energy consumed. An example would be the use of hot gas from a refrigeration system to preheat service water.

While the modeling of these particular process loads is not defined by this Protocol, Xcel Energy has significant documentation in these areas and should be notified regarding their use. Please contact Xcel Energy to discuss process loads prior to modeling completion.

When process loads are estimated during the time of early modeling, Xcel Energy requests that these loads be updated if changes are made during design or construction that result in a change of more than 10% of the process load energy use.

3.1.3 Fans and Fan Power

- Outside air dampers shall be assumed to be closed when the fans are scheduled off (5% leakage) and fans cycle on as needed to maintain unoccupied temperature settings.
- Fan energy peak demand can be verified through a review of the test, adjust, and balance (TAB) report, if available, along with fan motor data logging. To verify demand savings through fan motor data logging, fan motor amp draw, fan airflow volume and duct static pressure can be monitored either from the BAS or independent data logging. If the fan does not run at full speed during the trending period, fan laws can be used to calculate peak fan kW from operational kW. Measured fan peak kW should then be compared to the calculated baseline kW to verify estimated peak fan kW savings in the energy model.

  Fan energy use for variable volume systems will be verified through short-term (2 week) or long-term (4 week) trending to verify savings from reduced fan kW relative to the baseline.

[1] Please note that Xcel Energy does have a Data Center Efficiency program and whenever possible, customers should combine efforts between Energy Design Assistance and this program.

3.2 ASHRAE Standard 90.1 Appendix G Assumptions and Modifications

The Baseline and Proposed models shall be simulated according to the methodology of the 90.1Appendix G with the changes outlined in Table 3.2, below.

Table 3.2 EDA Assumptions and Modifications to Appendix G

	Proposed Design	Baseline Design
Scheduling and Set Points		
Occupant Densities & Load Characteristics	The number of people and heat and moisture gain per person shall be based on values suggested in the ASHRAE Handbook of Fundamentals for the modeled space types. The number of people shall be held constant between the Baseline, all strategies, bundles and design versions.	Same as proposed design
Schedules	Lighting, equipment, and fan hours of operation shall be based on published data and experience from past projects and updated with input from the owners, architects, and engineers of record.	Same as proposed design
Thermostat Settings	Occupied space temperature set points shall be set to 70°F for heating and 75°F for cooling, unless directed otherwise by the design team or owner. Unoccupied space temperature set points shall be set to 65°F for heating and 80°F for cooling. Semi-heated spaces (such as heated garage or stairwells) setpoint shall be set to 50°F.	Same as proposed design
	Cooling savings from ceiling fans in residential dwelling units can be modeled by increasing the occupied cooling set point in the proposed model, as follows: a) 78°F cooling set point when ceiling fans are installed in living rooms and all bedrooms b) 77°F cooling set point when ceiling fans are installed in all bedrooms, or one bedroom and all living rooms c) 76°F cooling set point when ceiling fans are installed in some living rooms or bedrooms	Baseline design shall be modeled without ceiling fans and therefore occupied space temperatures shall be set to 75°F for cooling
Building Envelope		
Opaque Assemblies		For residential spaces in buildings that are regulated by the Residential section of the IECC, the baseline shall be set in accordance with the Opaque Thermal Envelope Assembly Requirements of the IECC Residential code.
Vertical Fenestration		Fenestration U-factors and SHGC values shall match the appropriate requirements for Metal Framing (all other). For residential spaces in buildings that are regulated by the Residential section of the IECC, the baseline shall be set in accordance with the Building Envelope Requirements: Fenestration of the IECC Residential code.
Existing Buildings		Existing building properties can be modeled for the baseline, provided that: 1) The customer is not required to make a change to the assembly (roof, window, wall, etc.) as part of the project. 2) The existing assembly will not need to be replaced or repaired in the near foreseeable future. If the assembly will need to be replaced within the next few years, then the baseline shall be the code minimum. 3) Either the use or occupancy of the building will not change as a result of the project.
Infiltration Rates	Infiltration rates are based on ASHRAE Handbook of Fundamentals 2013 Chapter 16 suggested values for the different building types.	Same as Proposed Design, unless measures are identified that have a quantifiable effect on infiltration. Infiltration strategies need to be approved by Xcel Energy before inclusion in bundle(s) for rebates.
Lighting		
Interior Lighting	Lighting system power shall not include task lighting, furniture mounted fixtures, or process lighting.	Lighting power in the baseline building design shall be determined by using the Space-by-Space Method described in ASHRAE 90.1 Section 9.6 OR referencing COMCheck values as provided by the Design Team. In-unit lighting shall be included in the performance rating calculations and based on hard – wired lighting fixtures. Lighting energy savings credit may be claimed for reduced power density only if the fixtures are capable of meeting the recommended light levels for the given space type, per the IESNA Lighting Handbook. For area without hard-wired fixtures, or areas that do not meet the IESNA lighting levels, the LPD shall be set as equal to the baseline design LPD.

		For multi-family dwelling units assume a baseline LPD as follows: Minnesota projects – 1.1 w/sf Colorado projects: 2012 IECC and older – 1.54 w/sf. 2015 IECC – 1.1 w/sf. 2018 IECC and newer – 0.90 w/sf.
		For multi-family dwelling units, the schedule shall be set consistent with Xcel's Technical Assumptions for the Home Lighting program. Reference Appendix B.
Automatic Lighting Controls	For automatic lighting controls in addition to those required for minimum code compliance, credit may be taken for automatically controlled occupancy sensors by reducing the connected lighting power or lighting schedule by 24%, as consistent with Xcel Energy's Lighting Efficiency program. Vacancy sensor credit may be taken at 30%.	
Manual Lighting Controls	Credit may be claimed for installing dual-level or manual dimming fixtures according to the procedure described in Section 3.4.12.3 of this protocol.	
HVAC		
System Type		The HVAC system(s) in the baseline building design shall be of the type and description specified in section 3.2.1 of this protocol.
Ventilation	Ventilation rates shall be as designed or, where not specified, modeled according to the space type ventilation requirements of the locally adopted version of ASHRAE 62.1	Same as Proposed Design.
System-specific Requirements	If modeling a system type that is not addressed by this protocol, please contact the Program Implementer for guidance.	
		The same cooling energy source (electricity vs gas) shall be used in the baseline model as in the proposed design. For example, if natural gas-driven absorption chillers are used in the proposed design, gas absorption chillers must also be used in the baseline model.
Service Water Heating		
Showerheads and Aerators	As designed	Baseline flowrates shall be based on the Federal EPAct standard or local jurisdictional requirements, which ever is more stringent. Flow rates, hours of operation, and water temperature shall be documented in the report.
Receptacle and Process Loads		
Receptacles	Receptacle loads, such as those for office or other equipment, shall be determined by the modeler's professional judgement or taken from the 2005 California Energy Commission Non-residential Alternative Calculation Method (ACM) Approval Manual Table N2-3, based on the space type category. Loads not listed therein must be validated by the engineers of record and approved by Xcel Energy before inclusion in energy alternatives/bundle(s) for rebates.	Same as proposed design
	Occupancy sensor control of plug loads shall be omitted	Same as proposed design
Refrigeration	As designed	Baseline refrigerated display merchandisers shall be modeled as outlined by the Department of Energy document 10 CFR Part 431 and ANSI/AHRI Standard 1200-2010.

3.2.1 Mechanical System Selection

The Baseline mechanical system shall be determined according to the methodology of ASHRAE 90.1 Appendix G with the following modifications:

- For Systems 5 through 8, each floor may be modeled with a separate air handling system. Alternatively, the baseline model may have the same number of air-handlers with the same zone assignments as the proposed design.
- If portions of the building are heated entirely by gas and portions of the building are heated entirely by electricity and there is no overlap then additional system type(s) may be used for non-predominant conditions (i.e., residential/nonresidential or heat source) if those conditions apply to more than 5,000 ft^2 of conditioned floor area.

- If Exception (b) under G3.1.1 is utilized and System 3/System 4 is used to serve the unique space, the system(s) serving the remaining portions of the building shall be determined based on the size of the remaining areas.
- The Baseline efficiency for System 1 – PTAC shall refer to ASHRAE 90.1 Table 6.8.1-4. If the project is using SPVAC as the baseline, then model the baseline as SPVAC. If the project is using PTAC as the baseline, then model the baseline as PTAC.
- If portions of the buildings are heated by multiple fuel sources, due to the fuel switching concern, a "Mixed Fuel" category is available in Table 3.2.2 in Appendix C. The intent of this category is to use the same fuel type allocation in the same sequence in the Baseline as in the Proposed Design. If the multiple fuel sources can be mapped directly to that Baseline system (e.g. main AHU gas heat, electric reheat, electric baseboards), do so. For the purpose of establishing the Baseline system, ground-coupled loops are deemed to be electric in the Baseline as the heat pumps that utilize the loop are electrically–driven. Loads served by solar thermal energy in the design shall be served by their backup fuel in the Baseline
    - Mixed Fuel Heating Example 1 – 75,000 sf school building, 2 floors.
        - Proposed Mechanical System: Ground-coupled heat pump with gas-fired DOAS.
        - Baseline Mechanical System: Modified System5 – Packaged VAV with gas boiler preheat and main heating coils, electric resistance zone reheat.
    - Mixed Fuel Heating Example 2 – 100,000 sf Multi-family residential, 3 floors.
        - Proposed Mechanical System: Water to air heat pumps served by gas boiler and cooling tower.
        - Baseline Mechanical System: Modified System 1 - PTAC with hot water serving residential units, Modified System 3 – PSZ with hot water serving common areas. Hot water consists of gas and electric boilers staged so that the gas and electric heating in the baseline are proportional to the Proposed Mechanical System.
    - Mixed Fuel Heating Example 3 – 100,000 sf office with electric reheat.
        - Proposed Mechanical System: Gas-fired PVAV with electric reheat.
        - Baseline Mechanical System: Modified System 5 – Packaged VAV with gas boiler preheat and main heating coils, electric resistance zone reheat.
- For the following proposed system types, the corresponding baseline system type shall be used in lieu of the system types outlined in Appendix G. Xcel Energy reserves the right to change the baseline system type at any time.

Proposed	Baseline
GSHP	Water Source Heat Pump with Tower and Electric Boiler
Air Source VRF (Commercial)	PSZ-HP backup to match the VRF
Air Source VRF with gas backup (High-Rise Residential)	PTHP with gas backup
Air Source VRF with electric backup (High-Rise Residential)	PTHP with electric resistance backup

Water Source VRF (Tower / Gas Boiler)	Water Source Heat Pump with Tower and Gas Boiler
Water Source VRF (Tower / Electric Boiler)	Water Source Heat Pump with Tower and Electric Boiler
Water Source VRF (ground loop)	Water Source Heat Pump with Tower and Electric Boiler
Radiant Heating	Unit Heaters (Gas-Fired or Hot Water, match proposed)
Fan-Powered Boxes (Parallel or Series)	VAV Shut Off Boxes

3.3 Additional Modeling Requirements for Enhanced EDA Projects

For projects pursuing certification options with a different baseline requirement than the EDA baseline (i.e. LEED v4 requires use of ASHRAE 2010), two baselines and two versions of the as-specified and as-verified models shall need to be run: (1) for claiming energy savings under the EDA program and providing customer rebates, and (2) for certification analysis. As part of the consulting process provided under the Energy Design Assistance program, it is the responsibility of the Energy Consultant to provide clarity in the presentation of the results so as not to confuse the design team and owners, while meeting the requirements of Xcel Energy for internal documentation and consistency of results.

3.3.1 Enhanced EDA Requirements

Enhanced projects must implement a combination of energy-saving measures that meet or exceed Xcel Energy's required minimum annual energy savings thresholds in order to achieve the full potential of cash incentives. If this requirement is not reached, the project may receive a reduced incentive to offset some of the Energy Design Assistance costs associated with early energy modeling. In addition, if the minimum required savings are not met, Green Building Certification submittal work, such as LEED EA Credit 1, will not be paid for by Xcel Energy for projects in the Enhanced track.

3.3.2 Enhanced EDA Non-Performance Penalty (Minnesota Only)

The relevant deliverable (Incentive Request, CD Review or M&V Report) will calculate a reduced customer incentive, using a reduction of **$20 per 1% lost, to a maximum reduction of $100 per kW**. The base rebate rate is currently $400 per kW. Therefore, a project in the Enhanced track that predicts 29% savings (versus the 30% requirement for the Enhanced track) could have an incentive of $380 per kW; at 28% it is $360, etc. Savings will be calculated to the nearest tenth of a percent, and the next level of reductions will be applied when whole number percentages (i.e. 29.0%, 28.0%, etc.) are reached. The lowest incentive rate for any project would be $300 per kW. However, other program minimum policies still apply, such as the policy stating that all projects must achieve at least 5% savings to realize *any* incentive. For example, a project in the Basic track that predicts 4% savings above baseline will receive no rebate.

3.3.3 Modeling Requirements for LEED

As part of the EDA Enhanced process, energy consultants complete additional work to satisfy the requirements of the U.S. Green Building Council (USGBC) and their reviewing body, the Green Building Certification Institute (GBCI) is done by the consultants.

The following notes the additional requirements:

- Additional modeling for USGBC baseline requirements
- Partial documentation for the USGBC's Energy and Atmosphere Prerequisite 2 – the modeler will complete the portion of the documentation related to energy performance, however, the architect and/or engineer of record will be responsible for the mandatory provisions in the final submission
- Documentation for the USGBC's Energy and Atmosphere Credit 1 for either the Design or Construction submittal AND the opportunity for responses to GBCI during preliminary and final review.

The additional scope of work is noted below:

- Develop an energy model that meets the protocol outlined by USGBC for EA Credit 1
- Set up a meeting time and location to review the draft results with the Design Team
- If needed, revise the model based on feedback from the draft results meeting and sets another review meeting with the Design Team
- Complete the LEED Templates and associated documentation—for Design or Construction Submittal, not both—required by GBCI within 2-3 weeks from completion and acceptance by the Design Team of the USGBC-compliant energy model
- Respond to questions from GBCI regarding EA Credit 1 Template for Final Review

3.3.4 Modeling Requirements for SB2030 (Minnesota Only)

The SB 2030 program provides energy performance targets for new buildings. The goals are expressed in total energy use, kBtu/sf-yr. Certain projects are required to pursue the SB 2030 targets. If targets are not met, the owners must document their attempts and demonstrate that all reasonable measures to achieve the goal were implemented. Projects are considered to be in compliance with SB 2030 energy requirements if they either: a) have energy performance below the required value; or b) have a variance approved that certifies what they did what was reasonable. The definition of reasonable is all measures with less than a 15-year payback.

Utilities in Minnesota are required to support customers SB 2030 energy efforts. The EDA program provides kBtu/sf-yr performance metrics on all projects. In addition, the program provides SB 2030 program-compliant target value information during the design phase on each project. Projects that are approved for the

Enhanced EDA program also receive documentation for reporting to the State of Minnesota.

The additional scope of work included in the Enhanced track is noted below:

- Work with the Design Team to gain access to Minnesota Sustainability Tracker
- Enter building simulations outputs for energy usage into tracker at Schematic Design
- Update energy outputs and tracker website as necessary through the CD stage
- Update energy model per SB 2030 requirements for final review and submittal to the Minnesota Center for Sustainable Building Research
- Create a memo detailing analysis, opportunities and justification for variance if applicable

The following notes the additional requirements of SB 2030 outside the scope of EDA:

- Documentation of building simulation outputs of energy usage entered into E1D Document predicted and actual energy use by type (found at www.msbgtracking.com when officially registered with SB 2030).
- Documentation of EDA process and results as it pertains to official variance procedures
- Additional modeling after building verification to true-up analysis per SB 2030 requirements

Costs for activities outside the approved scope of the EDA program are the responsibility of the Customer and/or Design Team.

3.4 Special Baseline Considerations

3.4.1 Cross-Fuel Policy

Baseline systems shall be selected to eliminate the situation where an end use's energy source is changed from one energy stream to a different energy stream in the bundle. The Cross-fuel policy, according to regulation, is: "Fuel switching from natural gas to other fossil fuel derived energy sources shall not be included in the gas utility's DSM program. Programs to save natural gas through switching to renewable energy sources such as solar heating and ground source heat pumps are allowed." Xcel interprets this rule to mean switching from electricity sources to other fossil fuel sources as well. Historically, the EDA program had created a number of baselines when addressing different HVAC systems to avoid fuel switching.

An example of an allowable fuel switching is where a customer implements a ground source heat pump strategy which will reduce gas consumption but increase electric consumption. Calculations for cross fuel, savings and an incentive shall be followed in accordance with the policy attached in Appendix A of this protocol.

An example of what is fuel switching but NOT allowable is where a customer implements a gas-fired absorption chiller instead of an electric chiller which will reduce electric consumption but increase gas consumption. To avoid fuel switching, an appropriate baseline for this system would be a gas fired absorption chiller modeled with the same efficiency prescribed in the protocol.

In the case where a project is considering a number of systems for a given strategy, it may be necessary to create multiple baseline models in order to prevent incentives for fuel switching.

3.4.2 Load Shifting

Load shifting shall be defined as a measure that shifts electrical energy and demand usage to an off-peak period, without reducing the total load served over a defined time period (for example, one day or one week). Energy consumption to meet the loads of the affected end use shall not be significantly reduced. Example load shifting measures include thermal energy storage (examples - ice storage, chilled water, or eutectic solutions) and equipment rescheduling. Peak shaving and demand control technologies (for example, lighting voltage reduction) shall not be classified as load shifting if they reduce the total load being served.

Load shifting strategy results shall be developed as an independent modification and **shall be reviewed by Xcel Energy** for potential eligibility for inclusion in incentive calculations.

3.4.3 On-Site Generation/ Renewable Energy

On site generation including co-generation, on-site wind, or photovoltaic (PV) systems shall not be rebated through the EDA program as they are not deemed “conservation” by Xcel Energy. While the overall impact of these systems may be analyzed for the overall building, switching from one source to another is considered fuel switching.

3.4.4 Solar Thermal Systems

Projects including solar thermal systems for heating of service hot water, building heat or pool water heat can include the solar thermal system’s energy savings in the model. The consultant shall document in the project report(s) the methodology of calculating the energy savings of these systems. Calculations are required to be based on 8,760 hours per year weather file for the project location, as described in Section 2, and heating load calculated from the project’s energy model for the service hot water, building heating water, or pool water heating load. In order to avoid incentives for fuel switching, the solar thermal system energy savings shall be of the same fuel type as the backup or supplemental heat source designed for that heating end use. For the solar thermal system, if there is no back up fuel source, the baseline system shall be electric heat if the rest of the building is all-electric and natural gas fired if the building has a gas line for other uses.

3.4.5 District Heating Systems

Projects using district heating (i.e. purchased steam heat) shall use the following methodology to determine the district component of the natural gas savings impacts for the project. All energy simulations shall use district heating as the source for heating. The difference between the baseline model annual heating energy use and the proposed bundle annual heating energy use shall be divided by 74% (From an Energy Star Technical Reference published 2/2018). For CO EDA projects, select the 'District heating' checkbox within the 'Building Information' section of EDAPT and this calculation happens automatically within EDAPT. The district component of the natural gas savings shall then be added to the building natural gas savings, the sum of these two shall comprise the total natural gas savings that the incentive is based on. The project is only credited an incentive for saving natural gas if the district system uses Xcel Energy retail gas.

The methodology is developed to approximate the energy savings without detailed information on the district heating system. The true differential energy performance cannot be determined without detailed knowledge and even simulation of each system's equipment and operation. For the EDA program, Xcel Energy determines an energy value that can be assigned to these load reductions for purposes of calculating an incremental incentive.

3.4.6 District Cooling Systems

Projects using district cooling shall use the following methodology to determine the district component of the electricity use and demand savings impacts for the project. All energy simulations shall use district cooling as the source for cooling. The cooling energy use and demand reductions from the EDA baseline to the proposed bundle are used to calculate kW and kWh savings based on a default baseline assumed efficiency of the respective system. The difference between the baseline model peak cooling energy use and demand and the proposed bundle peak-cooling energy use and demand shall be determined using a default efficiency of 1.09 kW/ton (From an Energy Star Technical Reference published 2/2018) and 1.09 kWh/ton-hr (if the actual district cooling plant efficiency is not known). For CO EDA projects, select the 'District cooling' checkbox within the 'Building Information' section of EDAPT and this calculation happens automatically within EDAPT. The district cooling electricity use and demand savings shall then be added to the building use and demand savings, the sum of these two shall comprise the total demand savings that the incentive is based on. The project is only credited an incentive for saving electricity if the district system uses Xcel Energy's electricity.

The methodology is developed to approximate the energy savings without detailed information on the district cooling system. The true differential energy performance cannot be determined without detailed knowledge and even simulation of each system's equipment and operation. For the EDA program, Xcel Energy determines an energy value that can be assigned to these load reductions for purposes of calculating an incremental rebate.

3.4.7 Campus Heating Systems

Buildings or additions to buildings that are added to an existing heating plant that is not being updated or to a central campus heating plant that serves buildings or areas not in the study shall use the same modeling approach as the listed in the above section for District Heating Systems.

3.4.8 Campus Cooling Systems

Buildings or additions to buildings that are added to an existing cooling plant that is not being updated or to a central campus cooling plant that serves buildings or areas not in the study shall use the same modeling approach as the listed in the above section for District Cooling Systems. Condenser water loop system should be modeled in the baseline and proposed models. The fan power and pump power should be the same between the baseline and proposed models for the condenser water loop system.

3.4.9 Underfloor Air Distribution and Thermal Displacement Ventilation

Projects using underfloor air distribution (UFAD) or thermal displacement ventilation (TDV) HVAC systems shall use the following modeling methodology for modeling in energy simulations.

Adjust the amount of internal gain to the space from the baseline case with all lighting, people, and equipment loads assigned to the space, to a case were a portion of the loads are assigned to the plenum or return air duct. This is to account for the stratification of the internal heat gain that is not in the occupied zone.

	Percent Load to Space		Percent Load to Plenum/Return Duct	
	Underfloor Air Distribution	Thermal Displacement Ventilation	Underfloor Air Distribution	Thermal Displacement Ventilation
People	75%	67%	25%	33%
Lights	67%	50%	33%	50%
Equipment	67%	50%	33%	50%

Adjust the minimum supply air temperature from the traditional 55°F for overhead systems, to the 60°F to 67°F used in the UFAD or TDV system design. The minimum supply air temperature set point shall be obtained from the engineer of record and match the supply air temperature that the project shall be designed to use.

The outside air quantity provided to the zone is allowed to be different from the baseline overhead supply system since the ventilation effectiveness is greater with the UFAD or TDV systems. The baseline system outside air for the overhead supply system should be obtained from the engineer of record if available.

The supply air quantity of the UFAD or TDV system is allowed to be different from the baseline overhead supply system designed for a 20°F ΔT. The baseline system supply air for the overhead supply system should be obtained from the engineer of record.

3.4.10 ENERGY STAR® Rated Equipment

Projects that shall be installing new appliances and equipment can include the energy savings of the ENERGY STAR rated equipment in the model. The baseline shall use comparable sized appliance or equipment that just meets the minimum efficiency rating of the appliance or equipment.

3.4.11 Manual Lighting Controls

Energy savings from lighting controls above what is required by code can be claimed and should use the following methodology for modeling:

Dual Level Fixtures

- Dual level fixture use is applicable for rooms with variable light level requirements. Manual switches should provide two or more levels of light output from each fixture, and must be readily accessible and located such that occupants can see the controlled lighting from the switch location. The controlled lighting should have at least one control step between 30% and 70% (inclusive) of full lighting power in addition to all off. This can be accomplished by inboard/outboard lamp switching or stepped ballasts.
- Gymnasiums are modeled as 30% reduction on both peak and annual hours.
- All other spaces where applicable are modeled as 15% reduction on both peak and annual hours.

Manual Dimming

- Manual dimming is applicable for rooms with concentrated Audio/Visual requirements. Electronic dimming ballasts are used with manual dimming controls in place of wall switches.
- Where applicable model as a 25% reduction on both peak and annual hours.

Bank Switching

- Five percent (5%) credit can be given for bank switching for kW and kWh as long as there is clear evidence of bank switching. For example, they can be specifically metered, and/or one light switch must control at least 33% of the fixtures.

3.4.12 Adjustments

The goal of the EDA program is to provide timely results on a wide range of design options, early enough so that those options are still viable within the context of the project. Xcel Energy acknowledges that the window of opportunity to complete this is often very short and therefore assumptions shall need to be made in early modeling on such things as window area, ventilation rates and process load. These assumptions are made to allow for timely comparative analysis so that the customer is able to make decisions on energy efficiency and take advantage of potential incentives. Discretionary

parameters are always an estimate until the building is completed and operating for an extended period in time. As such, while discretionary parameters may change throughout the process, the savings and incentives are determined based on the initial moment in time and as such should not be adjusted unless physical changes occur.

Adjustments for physical changes in the building such as square footage, window area, equipment governed by this Protocol should be made if the results are expected to be affected in a significant way. It is the responsibility of the Energy Consultant to monitor the progression of design during the design, CD review and M&V stages of the EDA process and make adjustments to the baseline or alternate versions of the building such that the results provide accurate results for the purposes of the program. This includes both the reporting of results to Xcel Energy for demand-side management accounting and, if applicable, any adjustments needed for third-party certification efforts approved by Xcel Energy as part of the scope of work on a particular project.

3.4.13 Excess System Capacity

In the case that a design team has purposefully over-sized a mechanical system to accommodate expected future growth and that mechanical system would otherwise be eligible for prescriptive rebates from other programs offered by Xcel Energy, the following steps will be taken:

- The energy consultant will reduce the capacity of the system within the energy model to meet the modeled building load.
- The excess capacity (i.e. the difference in the capacity of the actual system and the theoretical system created for the energy model) will be treated as a separate piece of equipment with characteristics identical to those of the modeled equipment apart from capacity.
- The excess capacity system will be subject to the current prescriptive rebates and deemed energy savings available at the time of the bundle meeting. These rebates and impacts will be absorbed by the EDA program (i.e. the prescriptive rebate is then added to the EDA rebate).

3.4.14 Renovating Historical Properties

Projects at Historical sites oftentimes have antique lighting fixtures that they intend to preserve as part of the design. In those situations, customers may purchase screw-in products as opposed to replacing these fixtures.

4. Reporting and Submissions

4.1 Simulation Outputs

The results shall include reporting of total annual energy cost in current dollars and also a cost breakdown by energy end-use (heating, cooling, service hot water, fans and pumps, lighting, refrigeration, and equipment). Similar output information shall be provided for all strategy, energy conservation measures (ECM) and bundle simulations.

The energy use shall be reported in total annual energy use per square foot and also a breakdown of energy use by end-use per square foot, in units of kbtu/sf/year.

Total energy consumption shall be reported for all energy sources, e.g. total annual kWh electric energy use (kWh) and Dekatherms for energy gas use.

Customer Peak Coincident Demand shall be reported for electric (kW), and can be requested for cooling (tons) and gas (kbtu/h). Peak Coincident Demand (kW) is defined to occur on weekdays, between 2pm and 6pm, excluding holidays, in the months of June through September.

Additional metrics such as carbon emissions, reported in tons of CO_2, may be requested. If requested, Xcel Energy will provide average generation system emissions data.

4.2 Simulation Inputs

Simulation inputs shall include the following:

- Description of any differences between the baseline and proposed models
- Description of energy analysis work done to quantify things that the simulation program was not capable of doing
    - Wall mass types and insulation R-values and assembly U factors
    - Glazing U factors and SHGC
    - Window-to-wall ratio by orientation
    - Roof types and insulation R-values and assembly U factors
    - Space type, floor area, and other design parameters
    - Space internal gains
    - Hourly space schedules
    - Lighting/equipment power densities
    - Full load equivalent hours of operation for lighting, equipment and occupancy
    - Mechanical (HVAC) system characteristics
    - Supply and outdoor ventilation air capacities

- Supply and fan total static pressure
- Service hot water system characteristics
- Utility schedules
- Weather (meteorological) data
- Energy conservation measure descriptions

4.3 Measurement and Verification Requirements

4.3.1 Construction Document Review

Construction documents are reviewed for measures identified through the EDA process, and selected by the design team for implementation in the project. The design team and customer are notified whether or not these measures were found within these documents. Results should be modified at this time if any significant changes in the design occur.

Xcel Energy shall be provided with a report called Construction Document Review.

In Minnesota, construction document review is only applicable to EDA Enhanced projects.

In Colorado, the Construction Document Review will include the Project Verification Plan.

4.3.2 On-site Verification Requirements

Site visit 1 – Approximately two months after construction completion, resolution of related commissioning items, and occupancy (exceptions are made for certain building types such as jails, retail or hospitals), the M&V team shall visit the project site and verify that specified measures were installed and functioning. Reasonable effort will be made to allow the Customer to repair measures that are found to be not functional before verification is complete. Data loggers can be placed during site visit 1, but monitoring should begin (data loggers activated) approximately 2 months after 80% occupancy[2].

Site visit 2 – A second site visit, if necessary, may be conducted to verify equipment installation and operation (if not fully completed in site visit 1 due to equipment not operating or installed at time), and to remove data loggers.

Monitoring/Data Logging:

For projects where individual measures that have savings greater than or equal to 1.0 GWh or 20,000 Dth per year, data logging is required for a time period of four weeks. Individual measures less than 1.0 GWh or 20,000 Dth per year, may require data logging at Xcel Energy's discretion.

[2] At least 80% occupancy is required because certain measures operate at maximum energy consumption based on occupants. Example - Laboratory fume hoods.

Verified results:

Verify the operational hours with the design team. Provide the assumed modeled operation hours along with the verified operational hours prior to completing the verification.

The As-Verified modeling results will be used to determine the final rebate.

In Minnesota, Xcel Energy will audit all projects over 2 GWh and 5% of all other projects. After Xcel Energy receives the BRD, it will be determined if the project is to be audited; projects will be selected based on opportunity number and audited by the Xcel Energy Efficiency Engineer. For the audit, the modeler to provide information including:

- 8760 kW data
- Summary of inputs into the baseline and proposed models

4.3.3 Reporting requirements

The following reports shall be provided to Xcel Energy in order to meet verification compliance:

- Construction Document Review (Enhanced track only in MN)
- Project Verification Plan (CO only)
- Final Verification Report

A final verification report shall be provided to Xcel Energy and forwarded to the customer and design team as a last project deliverable.

The following details shall be provided:

- Project Identification Number
- Program Track
- Building Type
- Building Square Footage
- Certification
- Consultant
- Savings
    - Peak kW
    - kWh
    - Dekatherms
    - kGal of water
- Rebates
- Incremental Costs
- Project strategy level detail

4.4 Custom Strategies

All measures not covered under ASHRAE 90.1 shall be reviewed by Xcel Energy prior to acceptance. The Energy Consultant shall submit calculations to Xcel Energy in an unlocked Microsoft Excel workbook for review.

5. Professional Judgment

Certain modeling techniques and compliance assumptions applied to the proposed design(s) are fixed or restricted by the Energy Modeling Protocol. That is, there is no discretion to choose input values regarding specific input variables for compliance modeling purposes. However, there remain other aspects of computer modeling for which professional judgment is necessary. In those instances, it is important to verify whether a given assumption is appropriate.

Xcel Energy has full discretion to question the appropriateness of a particular input.

Two questions may be asked in order to resolve whether good judgment has been applied and are taken from the *2005 Nonresidential Compliance Manual for California's Title 24:*

- Is the approach or assumption used in modeling the proposed design(s) consistent with the approach or assumption used in generating the baseline?
    - The rule is to model the proposed design(s) using the same assumptions and/or techniques used by the program to calculate the baseline unless drawings and specifications indicate specific differences that warrant conservation credit or penalties.
- Is a simplifying assumption appropriate for a specific case?

If simplification reduces the energy use of the proposed building when compared to a more explicit and detailed modeling assumption, the simplification is not acceptable.

6. Policies

6.1 As-Verified Energy Modeling

An as-verified model must be run updated with any changes identified during the on-site verification.

6.2 Incremental Costs

Xcel Energy shall be provided with the incremental cost for the project as a whole and for the individual measures included within. When possible, the incremental costs shall be provided by the design team; however, should these costs not be available, the energy modeler may estimate these costs based on published sources or professional judgement. Xcel Energy may request detailed documentation of how these costs were calculated. Incremental costs should be for equipment only and should exclude labor, taxes, and any architectural/structural cost impacts. When possible, costs that do not contribute to the energy efficiency of the equipment should be excluded from the incremental cost of the equipment, such as an expensive user interfaces or network controls. I.e. if the energy savings would still occur without those costs, those costs should be excluded from the equipment incremental costs.

6.3 Hold Status

Projects that have been on hold status for one year may be cancelled by Xcel Energy. An email will be sent letting the customer know the project will be cancelled and how they

can reapply if/when the project becomes feasible. If the customer can show reason why the project should not be cancelled in writing, Xcel Energy will re-evaluate.

Exception: Held projects that have already been through the Bundle meeting (Minnesota) or Final Energy Analysis meeting (Colorado) will be held for a maximum of two years and may continue to use the original modeled baseline. In the event the EDA baseline changes, projects on hold (for more than one year) that have not selected a bundle, will be modeled at the new baseline requirements.

6.4 Phasing

There are several reasons in which a project could be phased. Each are identified below; however, dealing with projects will be done on a case-by-case basis with these rules in mind.

Tenant Spaces: Often, office buildings are phased due to the nature of completion. The shell of the building may be completed prior to individual floors as tenants decide the final details of their space or sign a lease. In these cases, Xcel Energy may phase the project claiming the shell of the building (including all mechanical design). Then we do a second phase, once the building is 80% occupied, following the below process.

1. One to two site visits are completed to verify the strategies that are implemented in the construction completion of Phase I. Typically at the time of the first visit all of the architectural and mechanical items have been completed and a portion of the electrical items. The amount of the completed electrical items varies for every project.
2. After the first site visit, Xcel Energy will determine how much of the savings strategies have been installed and prorate the credit based on these figures.
3. A draft for Phase I is sent to the Design Team for comment. This report details the percentage of the total building that was verified, what the total modeled incentive was (for a 100% completed building), and what incentive is at this time for Phase I. Xcel Energy will also explain that another site visit will be conducted after the remaining building is complete and additional savings will be determined.
4. A final Phase I Report is sent to the Design Team, Owner and Utility with the same information as the draft.
5. Xcel Energy issues a Phase I incentive.
6. After building is at least 80% complete, begin Phase II and add on the additional savings to Phase I.
7. Draft is sent to the Design Team.
8. A final Phase II Report is sent to the Design Team, Owner and Utility.
9. Xcel issues a Phase II incentive.
10. Project is closed.

Phased Construction: When a project completes construction in two subsequent years, the project may be phased for incentives. If the phases occur within one year, Xcel Energy will wait until the final phase is completed prior to Verification.

6.5 EDA Projects and Prescriptive Rebates

Although attempts are made to prevent customers from receiving prescriptive rebates in addition to the EDA rebate, there are occasions when both are accidentally paid.

- If the prescriptive rebate is paid prior to the EDA rebate, Xcel Energy will remove the savings associated with that measure/technology and deduct the prescriptive rebate amount they received from the final EDA rebate amount.
- If the prescriptive rebate is paid after the EDA rebate, we'll request the customer refund the prescriptive rebate and back the savings out of the prescriptive measure.

6.6 Avoided Revenue Requirements (ARR) (Minnesota Only)

ARR values are used to allocate fees and incremental cost across the electric and gas savings.

- The ARR used in developing fee proposals is the year the project is started
    - ARR values are applied to Net Gen kWh, PC kW, and Therms
- The ARR values used in creating the incremental cost amount for the rebate ops form is the year the project is completed
- The Xcel Energy Engineer will provide updated ARRs and rate schedules at the beginning of each calendar year

Appendix A: EDA/Custom Cross-Fuel/Combo-Fuel Project Policy

Cross-Fuel rules apply to projects that include negative energy savings on either the gas or the electric fuel. Cross-Fuel impacts are determined based on a Source BTU analysis. For a project to be rebated, it must result in positive Net Source BTU Savings.

Net Source BTU Savings = Source BTU Impact (Primary Fuel Savings) - Source BTU Impact (Secondary Fuel Increase)

Source BTU Impact (Electric) = Heat Rate * Customer kWh / (1 – Energy Line Loss)

- Heat Rate = 7,500 Btu/kWh typical Heat Rate for Combined-Cycle Natural Gas-fired Plant
- Energy Line Loss Factor = Energy loss due to transmission and distribution efficiencies between the generator and the customer point of use.

State	2019
CO	0.0533
MN	0.066

Source BTU Impact (Gas) = Customer Therms * 100,000 / (1 – Gas Line Loss)

1 Therm = 100,000 Btu

Gas Line Loss Factor = 2% Losses due to gas distribution piping

Source BTU Penalty = Source BTU Impact (Secondary Fuel Increase)/ Source BTU Impact (Primary Fuel Savings)

For projects with a Source BTU Penalty >= 10%, the savings should be deducted by the fraction of the increased fuel's Source BTU Impact over the conserved fuel's Source BTU Impact. This percentage should then be applied to all aspects of the energy savings, including Marketing kW, Generator kW and Generator kWh on the electric side, and Dth on the gas side. This will result in a reduction of the rebate paid and the assumed other utility costs (administration and marketing costs). Net benefits are calculated from this reduced conservation of the rebated fuel, rather than from the net benefits of the two fuels.

The full Incremental Capital and non-energy O&M Costs or Savings shall be used in the cost-effectiveness test and payback calculations. Payback calculations should use the bill savings based on the savings of the primary fuel and the increase in the consumption of the secondary fuel.

For projects with a Source BTU Penalty < 10% or projects that have a Source BTU Penalty > 10% due to secondary savings associated with a conditioned space (i.e. lighting savings resulting in increased gas heating), the cross fuel penalty should be reported as an O&M penalty equivalent to the bill impact of the secondary fuel increase.

For Colorado projects, the above cross-fuel penalty calculations occur automatically within EDAPT.

Appendix B: Technical Assumptions for Home Lighting Program

For multi-family dwelling units, follow the current annual operating hours for residential spaces as specified in Xcel Energy's Technical Assumptions for the Home Lighting program. The current filed annual hours are as follows:
Colorado: 986 (2019-2020 DSM plan)
Minnesota: 909 (2017 – 2019 & 2020 Extension CIP plan)

Current applicable filings can be found here:
Colorado:
https://www.xcelenergy.com/company/rates_and_regulations/filings/colorado_demand-side_management
Minnesota:
https://www.xcelenergy.com/company/rates_and_regulations/filings/minnesota_demand-side_management

Appendix C: Mixed-Fuel System Types

Table 3.2.2 Baseline HVAC System Types

System Types **Building Type**	**All Fossil Fuel**	**All Electric or Ground Loop Heat Pump Heat**	**Mixed Heating Fuels***
Residential	System 1--PTAC	System 2--PTHP	Modified System 1 - PTAC with hot water coil. Boilers should be sized proportionate to fuel uses and staged the same as the proposed design. If proposed design uses hot water, follow Appendix G requirements for pump energy. If proposed design does not have pumping energy, model the hot water loop with zero pump head in the baseline. If the proposed design includes a DOAS system, the baseline may be modeled with a DOAS of similar fuel type. Follow ASHRAE 62.2-2013 for ventilation requirements in apartments. Ventilation may be supply only, exhaust only or supply and exhaust (balanced). Model identically in baseline and proposed. Credit can be taken for more efficient supply and exhaust fans in the proposed design.
Nonresidential and 3 floors or less and <25000 ft_2	System 3--PSZ, AC	System 4--PSZ-HP	Modified System 3 - PSZ with fossil fuel furnace. If the proposed design includes a DOAS system, the baseline preheat coil and main air handler heating coil fuel types should match that of the DOAS, terminal reheat fuel source shall be the same as design.
Nonresidential and 4 or 5 Floors and <25,000 or 5 Floors or less and 25,000 to 150,000 sf	System 5--Packaged VAV with Reheat	System 6--Packaged VAV with PFP Boxes	Modified System 5 - Packaged VAV. Boilers should be sized proportionate to fuel uses and staged the same as the proposed design. If the proposed design includes a DOAS system, the baseline preheat coil and main air handler heating coil fuel types should match that of the DOAS, terminal reheat fuel source shall be the same as design.
Nonresidential and More than 5 Floors or >150,000 sf	System 7--VAV with Reheat	System 8--VAV with PFP Boxes	Modified System 7 - VAV. Boilers should be sized proportionate to fuel uses and staged the same as the proposed design. If the proposed design includes a DOAS system, the baseline preheat coil and main air handler heating coil fuel types should match that of the DOAS, terminal reheat fuel and radiant zone heat source shall be the same as design.
Retail, Warehouse and Manufacturing; 2 floors or less	System 3--PSZ, AC	System 4--PSZ-HP	Modified System 3 - PSZ with hot water coil. Boilers should be sized proportionate to fuel uses and staged the same as the proposed design. Each thermal block shall be modeled with its own HVAC system. If the proposed design includes a DOAS system, the baseline preheat coil and main air handler heating coil fuel types should match that of the DOAS, terminal reheat fuel source shall be the same as design.
Heated Only Storage	System 9 - Heating and Ventilation (Furnace - gas fired, constant volume)	System 10 - Heating and Ventilation (Furnace - electric, constant volume)	Modified System 9 - Heating and Ventilations system with hot water coil. Boilers should be sized proportionate to fuel uses and staged the same as the proposed design. If the proposed design includes a DOAS system, the baseline preheat coil and main air handler heating coil fuel types should match that of the DOAS, terminal reheat fuel source shall be the same as design.

*If the mixed heating fuel system does not seem like it will maintain a similar allocation of fuel usage between the Baseline and Proposed, please contact the Program Implementer.