# STUDY WORK SCOPE

**A – K**

**A. Executive summary**
**Report will include an Energy Conservation Opportunities (ECO) form, a brief description of the purpose of the study, existing conditions, and options considered.**

**B. Introduction**
**In addition, the report will contain an introduction section consisting of customer information and an Xcel Energy disclaimer.**

**C. Study summary**
**A qualified expert with proven experience as assessed by Xcel Energy will fill out the Energy Conservation Opportunities (ECO) form (i.e. material and/or format provided by Xcel Energy) of capital costs, incentives, energy reduction/increase in kilowatts and kilowatt hours, and reduction/increase in natural gas Dth, reduction/increase in district cooling energy use, reduction/increase in other fuels/utilities.**

**D. Project description**
**The following will be provided for each opportunity:**

- Description of existing equipment, including sketches, drawings, flow diagrams, photos as necessary to explain and describe the project; and
- Explanation of how the proposed project will modify the plant process or building.

**The following will be provided for equipment upgrade situations:**

- Description of the proposed energy alternative(s) and the comparable "standard" or "normal" alternative;
- Description of plant upgrade and how the different energy alternatives will affect operation and function;
- Description, sketches, drawings or flow diagrams as necessary to explain and describe the energy use relative to the "standard" alternatives.

**E. Energy estimate**
**The following energy-use calculations and calculated estimates will be provided with regard to the project scope of work:**

- A calculated estimate of annual electric energy use in kWh, monthly maximum demand in kW and/or natural gas Dth. This calculation will include an indication of when, during the day and year, the demand and energy consumption will occur.
- A calculated estimate of annual electricity/natural gas reductions/increases in use and cost, based on the rate schedule most appropriate for the customer. Confirm rate code with the customer's company account manager. Use the current rates posted on xcelenergy.com/TradePartners.
- Calculations along with an indication of how estimated data was derived (e.g., theoretical calculations, field measurements, manufacturer's data, etc.)
- An estimate of the project cost and payback period.
- A description of the proposed modifications to improve energy efficiency.

**F. Measurement of energy**
**The study will include a plan to verify the electric energy use (e.g., after the project is implemented how will the building owner or plant manager know that the project is using/reducing the energy estimated). Costs associated with verification must be identified.**

**G. Non-energy project impacts**

- The study will estimate other quantifiable benefits and costs to implement the potential energy project, such as impact on production or building function levels, operating and maintenance costs, and plant reliability. Positive and negative impacts will be considered.
- The study also will provide an indication of project impacts that may be difficult to quantify, such as safety and environmental considerations and product quality.

**H. Project costs/vendor quotations**

Estimated and/or vendor quotations of the incremental project costs will be provided. This will involve a category breakdown of the major pieces of equipment to be installed, removed or replaced, subdivided into internal customer labor, external contractor labor, additional engineering, and equipment component costs. Also, any incremental operating and maintenance costs compared to the existing process or equipment operation should be identified.

**I. Financial analysis**

The study will include a financial analysis according to criteria established by the customer (i.e. payback requirements, return on investment requirements). Xcel Energy's Energy Conservation Opportunities (ECO) form, to be filled out with all studies, will calculate simple paybacks and applicable Recommissioning rebates. This analysis takes into consideration all energy and non-energy project costs and benefits including applicable Company prescriptive rebate amounts. If the customer has no preference, then Simple Payback should be used. The engineering firm is responsible for calculating prescriptive rebate estimates. The customer should submit a Custom Efficiency preapproval application to determine Custom Efficiency rebates.

**J. Implementation**

The study is designed to provide business case justification and sufficient information to proceed with implementation.

**K. If applicable, assess cost savings from improved building power factor ratchet charges and Saver's Switch® program and Electric Rate Savings program, including Time of Day and Peak-Controlled Tiers I and II.**


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## Program Requirements

### DATA CENTER EFFICIENCY

Data Center Efficiency studies can examine the IT and/or facilities (cooling, airflow, humidification, lighting, power) systems load reductions as detailed below.

**1. IT Systems Improvements**

- Include a description of the existing data center IT equipment, applications, architecture, total square footage and square footage available for growth. Provide a simple drawing of the data center space showing rack layouts, CRAC/CRAH unit locations, etc.
- An estimate of the current IT energy use through spot measurement or customer data if available (Total UPS output power from the UPS display panel is usually sufficient).
- Projected growth including IT workload power requirements, space requirements, and growth timetable.
- Opportunities for improved IT system efficiency, such as virtualization consolidation, storage consolidation, etc.

**2. Facilities system efficiency improvements including: cooling efficiency improvements, free cooling (airside or waterside economizer), air management improvements (hot or cold aisle containment, blanking panels, extended return plenums, cable management, and other measures that allow fan energy and air flow reductions), evaporative humidification, electronically commutated motor (ECM) fan retrofits, lighting retrofits and occupancy sensors, UPS and PDU efficiency improvements, etc.**

- Provide a detailed description of the existing systems including layout, capacities and current loads, rated and actual efficiencies, and current set points such as air temperature, chilled water temperature, cooling tower temperature, fan airflow, humidification, dehumidification, free cooling outdoor air temperature. The current IT loads (total UPS output power) are an important indicator of the loads on the facilities systems.
- Current system deficiencies and recommended improvements.
- Identify the ECOs (Energy Conservation Opportunities) considered and analyzed.
- If appropriate, a formal computational fluid dynamics (CFD)-based analysis of the computer space may be included but it is not required.

### FLUID SYSTEM OPTIMIZATION

**Study Work Scope: Program Requirements**

- Characterize current operating conditions (e.g. flow, pressure, & power) and control parameters.
- Determine the present and estimate future changes in production levels.
- Gather and analyze operating data and develop operating schedules.
- Assess alternative system designs and improvements

**Fan/Blower System Studies**

- Fan selection (size and type)
- Drive selection (direct drive, belts & sheaves, etc)
- Performance curves & control method (inlet and/or outlet dampers, variable pitch blades, variable speed drive, etc)
- System sequencing & configuration (to address insufficient air delivery, unnecessary pressure drop, etc)
- Leakage or waste reduction

**Pump/Hydraulic System Studies**

- Pump selection (size and type)
- Performance curves & control method (recirculation/bypass lines, control valves, variable speed drive, etc)
- Pump sequencing & configurations (parallel or series operation for multiple-pump systems)
- Pipe and other system component configuration (liquid properties, elevation, tank pressure, etc)
- Waste reduction

**Compressed Air/Vacuum Pump System Studies**

- Pump selection (size and control type)
- Clean up equipment selection (filters, dryers, and storage)
- Performance curves & control method (load/no load, inlet modulation, variable speed, etc)
- Multiple-compressor configuration and control sequence
- Pipe and other system component configuration (reduce pressure drop between compressor room and end-use)
- Waste reduction (high to low pressure conversion, pneumatic to electric conversion, open blowing, etc).

### LIGHTING REDESIGN

Lighting Redesign study providers should be NCQLP certified or need to submit relevant experience and qualifications prior to study preapproval.

### RECOMMISSIONING

**Recommissioning Study Requirements**

The Study prepared by the engineering firm must contain the following when appropriate, in addition to A–K details. Recommissioning studies are focused on low cost and/or short payback opportunities that optimize the operation of existing HVAC systems. Air test and balancing is not considered part of this program, although it may be a recommendation. Qualifying customers must indicate a willingness to support the recommissioning program using on-site staff, and must be willing to commit funding to support up-front diagnostic study costs, perform repairs, and modify control system strategies.

- Consider all existing buildings within scope and their control systems including central heating/cooling strategies, and site maintenance activities/schedules.
- Develop a recommissioning plan that:
  - Provides a description of the mechanical systems, their operation/control strategies, and site maintenance activities/schedules.
  - Identifies and describes the role of the building operations staff during the diagnostic investigative phase.
  - Describes and documents recommended energy and cost saving strategies and energy savings (kW, kWh, Dth) based on standard engineering calculations and site measurement data.
  - The plan can include provisions to provide measurement and verification of energy savings through a combination of engineering calculations using spot check data and on-line monitoring and trending using the existing building energy management system and/or data loggers.
  - Document a plan for building operator awareness training aimed at sustaining optimum system operation by performing continuous system monitoring, assessment, and maintenance (e.g., maintenance activities and schedules, training).
  - Identifies any potential prescriptive or Custom Efficiency rebate opportunities that might facilitate system optimization.

**REQUIRED LIST OF MEASURES TO BE ANALYZED**

Please refer to Addendum A on xcelenergy.com/Recomm for full measure explanation.

1. Replace/repair/calibrate sensor
2. Tune/upgrade controls
3. Reduce equipment runtime
4. Reduce lighting schedule
5. Adjust photocell/occupancy/daylight sensor
6. Reduce valve leakage
7. Reduce AHU/RTU air leakage
8. Reduce AHU/RTU fan static by coil cleaning
9. Restore VFD to 'auto'
10. Reduce equipment/actuator cycling
11. Relocate/shield temp sensor
12. Increase dead band
13. Eliminate simultaneous heating and/or cooling
14. Add/replace/repair damper, linkage and/or actuators
15. Heating plant enable
16. Waterside economizer & cooling plant enable
17. Revise control sequence
18. Optimize airside economizer
19. Add/optimize SAT reset
20. Lower/reset VAV box flow
21. Adjust space static controls
22. Adjust outside air min flow set point
23. Add/optimize demand control ventilation
24. Add/optimize zone setup/setback
25. Add/optimize optimum start/stop
26. Reduce/reset DSP set point
27. Trim pump impeller
28. Pump flow reduction
29. Pressure differential change
30. Reduce/reset the differential pressure set point
31. Add/optimize chiller staging
32. Optimize waterside economizer
33. Add/optimize chiller lockout
34. Add/optimize cooling tower staging
35. Add/optimize CWST reset
36. Add/optimize CHWST reset
37. Add/optimize HWST reset
38. Add/optimize boiler lockout

**Exemptions:**

If a customer has electric heat, you only need to analyze measures 1–36.

If a customer has direct expansion cooling, you only need to analyze measure 1–29 and 37–38.

If a customer does not have heating/cooling, you only need to analyze measures 1–5 and 27–38.