Brigham Young University-Idaho

University Operations

Energy/Sustainability Plan

2025

EXECUTIVE SUMMARY

Our current energy/sustainability plan focuses on a comprehensive review and action plan of current sustainable strategies and practices used at BYU-Idaho. We use best in class planning, procurement, delivery, and operations of our facilities to discover opportunities to reduce controllable operating costs.

Sustainability continues to be at the forefront as the local economy continues to expand. BYU-I's continued growth is no different and will require dependable, fairly priced resources to provide everything from cleaning supplies to electricity.

Natural Resources are vital to BYU-I's core business of educating students, these resources include natural gas, electricity, water and building materials.

The sheer scale of BYU-I's operations necessitates an annual expenditure of millions of dollars to acquire and deliver essential resources. This sustainability plan focuses on establishing a comprehensive sustainability strategy for BYU-I.

In addition, BYU-I seeks to stay abreast of innovative technologies, identify opportunities and methods to encourage consumption management and implement energy conservation projects. As new facilities are built, they will be delivered in alignment with the BYU-I comprehensive energy/sustainability plan.

ENERGY (GAS-ELECTRICITY)

BYU-I operates over 3 million square feet of building space. Most of the space is conditioned with utility services (electricity, steam, gas, chilled water, and water/sewer) supplied at various points from multiple sources.

Procurement/Delivery

To fully understand BYU-I's energy strategy, it is beneficial to understand how energy is generated, transmitted, and distributed to campus.

Natural Gas—BYU-I procures natural gas from BP and Intermountain Gas as a "bundled utility," with separate meters at each building or building cluster. Bundled refers to the fact that commodity, transportation, distribution, storage, shipping, and ancillary services are all included in the rate.

Natural gas is supplied to the campus via the Intermountain Gas underground gas distribution system infrastructure. Natural gas is delivered to individual buildings and is used mostly for our gas fired boilers, Co-Generation, and student housing facilities.

Some naturals gas is used by ancillary facilities that do not have steam available.

Electricity energy is by far the predominant energy resource utilized by BYU-I. As such, electric energy has been and continues to be our focus for conservation and reduction. Rocky Mountain Power provides BYU-I's campus electricity.

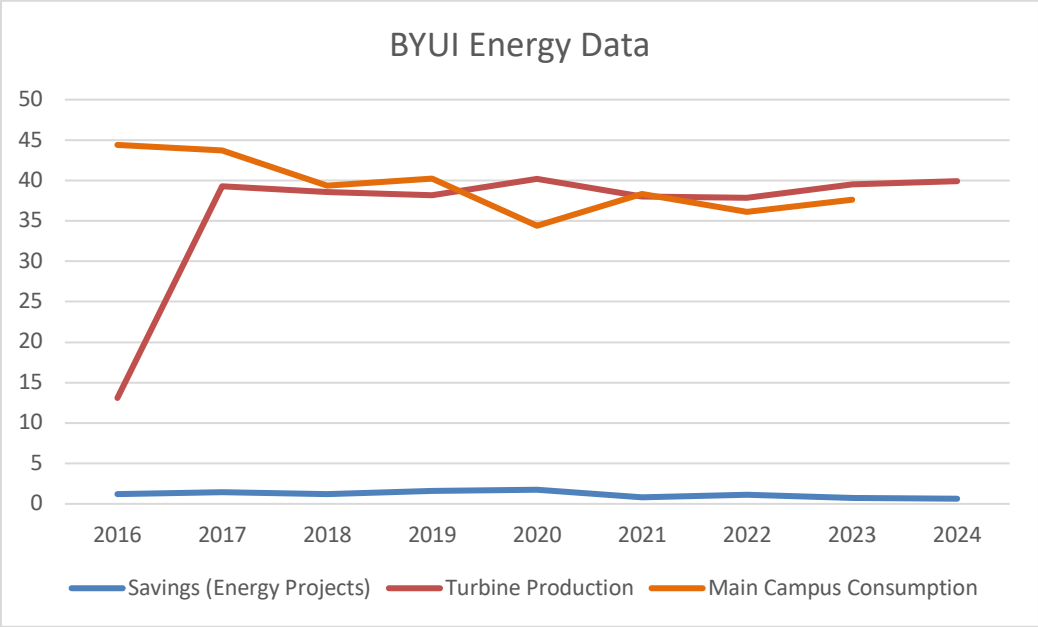
Gas and Electric utilities are responsible for all energy delivery systems (substations, transmission lines, distribution systems) up to the service entrance on campus, either gas meters or the BYU-I sub-station. BYU-I is responsible for all electrical and gas equipment and systems beyond the metering points.

Energy Generation

In 2016 BYU-I installed and began operating a 5 MW (Mega Watt) Turbine. This allows us to generate electricity. As Part of our power production BYU-I has partnered with Rocky Mountain Power in selling and purchasing power. Annually BYU-I produces equal amounts of electricity that we consume. (see figure 1) This has been made achievable by energy savings projects and installing a Steam Driven Chiller.

As the Turbine produces power, waste heat is captured to create steam. The steam is then used on campus for heating creating a low-cost energy source. In 2020 a Steam Driven Chiller was installed to utilize steam production in the summer months. This allows for a reduction in electrical costs by using a low-cost steam as energy. The Chilled water is then used on campus for building cooling.

Figure 1: Power production and consumption.



Providers/Roles/Responsibilities

BYU-I maintains a close relationship with its utility providers, Rocky Mountain Power, and Intermountain Gas. Both companies have worked with BYU-I to develop a service plan that addresses capacity, growth, and reliability of energy services.

Past and Present Energy Practices & Guidelines

BYU-I has made energy conservation a priority in new construction as well as with renovations in existing buildings. BYU-I has invested significantly in constructing methods that provide long-term energy savings that exceed the Idaho State Energy Code and NFPA 70. This work has allowed the achievement of the State of Idaho Energy in Excellence Award for the years listed: 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, and 2024.

New Construction

New Construction has incorporated many energy efficient systems, including:

- Variable speed drives for motors in the heating, ventilating and air conditioning (HVAC) systems that match pump and fan speed to building requirements. This allows a modulating system, such as chilled water, to be controlled to a level that is only required by the level of demand.
- Ethylene propylene diene monomer (EPDM) is our standard roof material. EPDM has many sustainable benefits, including its outstanding weathering characteristics, flexibility, durability, hail resistance and life cycle costs. However, when seeking a "cool" roofing option, many building professionals do not realize that EPDM provides similar energy savings as its white, non-EPDM, counterparts, especially in this climate zone.
- Exhaust fans with carbon monoxide sensors that run fans only when needed.
- Efficient LED lighting fixtures and lamps, programmable lighting control systems, and occupancy or photocell sensors control both internal and external campus lighting after hours or when buildings or portion of buildings are unoccupied.
- Air Handling Unit "Economizers," which allow the increased use of outside air to provide air conditioning when temperatures allow, thus reducing the demand for mechanical refrigeration systems which require electricity to operate motor driven compressors.
- High efficiency transformers for both primary energy conversion and internal building distribution systems result in lower power conversion losses and less heat generation.
- Occupancy sensor lighting controls are typically installed in areas that are not used continuously. Conference rooms, offices and restrooms are equipped with occupancy sensors that turn light "on" when motion is detected in the room and turn the light "off" after a programmed time limit through which no motion is detected. This type of conservation measure reduces the operating hours of the lighting equipment, thereby reducing the energy (kWh) consumption. Savings are evident not only in lighting energy, but also in cooling energy as less heat is radiated into the building when the lights are off.
- Envelope insulation has been improved moving from Concrete Masonry Unit (CMU) exterior walls to metal studs with batt insulation.
- Thermal ice storage has been incorporated into many BYU-I facilities to reduce peak demand load. Facilities that have been constructed with thermal storage are as follows: Taylor, Kimball, Ricks, and Spori. Other buildings have added thermal storage as a retrofit: Romney and McKay.
- Thermally improved aluminum frames and insulated glazing with low-e film replacing single glazed and solid aluminum frames.
- West and south facing windows receive window coverings to reduce heat gain.
- Most new carpeting procured is made in whole or in part from recycled carpets.
- Low or no VOC paints

- New Chillers and renovations in multiple buildings which install high efficiency chillers.
- High efficiency HVAC equipment

Retrofits

BYU-I has also evaluated and implemented energy efficient programs in existing buildings to reduce energy consumption. Previously implemented measures include:

Occupancy Sensors to control lighting have been retrofitted in most BYU-I buildings. All new buildings beginning with the Manwaring Center and Auditorium include these sensors as part of the base building package. These sensors turn off lights in office and corridors when not in use, reducing the consumption when not in use.

Chiller Plant renovations in multiple buildings which reconfigured pumping systems and re-sequenced operations resulted in kWh savings and energy demand.

Steam and condensate lines receive update insulation when replaced, this retrofit has proven to save thousands of dollars in energy savings. The insulation retrofit along with higher student loads has allowed the campus to increase in size yet maintain steam production at the same level.

Many facilities on campus have been retrofitted with new glazing replacing the single glazed window units with double glazed units with low-e gas. Replacing the glazing units also has benefited the buildings with a tighter overall envelope reducing heating and cooling costs.

High efficiency gas furnaces in University Housing.

High efficiency motors are installed when retrofitting motors and pumps.

Other Evaluations

BYU-I has evaluated additional energy savings opportunities that are incremental in savings but collectively add up to large savings. Some of the recent projects implemented are as follows:

- LED exit sign replacement: Program to replace existing incandescent or florescent exit signs with low wattage LED exit signs.
- All new buildings and majority of existing buildings have been retrofitted to include Power Link Panels with programmable equipment.
- Daylight Harvesting is being done in the Crossroads of the MC, Snow Hallways and Lobby, Hart, University Operations, Ricks, Smith, Hinckley, Spori, and Kimball
- Wide scale early replacement of major components in our chiller plants. At present, even though innovative technology chillers are more efficient, they are not cost justified considering the capital cost and the reduced energy consumption alone. Thus, the replacement of major components in our existing chillers that are heavy energy users are being replaced. If electricity rates increase significantly, early replacement of total equipment could be implemented.
- Reduction in the total number of dedicated computer labs.

Occupant Behavior

BYU-I encourages the use of power management features within department equipment and operations. These features can automatically schedule standby modes and shut off equipment when not being used for a prescribed period.

Setting temperature guidelines that are based around ASHRAE standards of 68-76 degrees in the winter months and 70-78 degrees in the summer months allows broad energy management tactics and tools to be used to reduce energy. Typically, campus is set for 70 degrees in the winter months and 72 degrees in the summer months.

Energy and Business Continuity

BYU-I relies heavily on utility-provided energy in every aspect of our educational environment. While the responsibility to maintain a reliable energy source lies with the utilities, BYU-I has taken steps to minimize risks associated with planned and unplanned outages.

Operation on Outage/Interruption

In the event of an outage, BYU-I relies heavily on the following:

UPS – Uninterrupted Power Supply and Generators

Many spaces throughout BYU-I's facilities (Student labs, telecom Rooms, Data Center locations, Health Center, MC, etc.) utilize panel-wired UPS systems connected to generators for long term power supply. These systems provide uninterrupted power to attached equipment for ~15 minutes in the case of a power outage. This is sufficient for minor power disruptions (bumps), and allows our telecom rooms, data center spaces or other space managers to take initiative-taking action to power down equipment in a controlled manner, should the outage persist. Individual plug-level UPS's are installed at user discretion in individual offices, student labs, etc. for the same purpose. Plug load availability is determined by the energy committee based on not exceeding 80% of the load of any generator capacity.

ATS-Automatic Transfer Switch

All buildings with an emergency generator have an ATS (Automatic Transfer Switch). BYU-I design guidelines specify that an Automatic Transfer Switch starts the generator and switch load in the event of a utility outage. Included in emergency circuits are emergency lighting, card access control systems, elevators (in most cases), Telecom equipment, and Telecom cooling equipment.

SCADA-Supervisory Control and Data Acquisition

Rocky Mountain Power typically designs their distribution system to maintain a contingent method of providing power to their customers with alternate circuit feeds. In the event of a power outage, Rocky Mountain Power operates switches to provide power via these alternate circuits to restore power to the customer. In most cases, a Rocky Mountain Power service technician manually operates the switch. This requires a site visit to the location of the switch. Manual operation of a switch (and thus the duration of the outage) can take many hours depending on the severity of the outage and the workload of the service technicians. Storm conditions increase these outage durations.

Rocky Mountain Power and BYU-I have worked cooperatively in evaluating opportunities to further leverage the functionality of the SCADA system. These efforts have resulted in a key success in improving reliability.

One opportunity is for BYU-I to operate our electrical generation in a standalone mode and power a portion of campus during an outage.

BYU-I also participates in Rocky Mountain Powers demand response program. This allows BYU-I to reduce power consumption for a short duration to assist the utility in meeting the demands of the system. Through this program BYU-I can reduce electrical costs.

Ensuring Continued Operation

Electrical Preventative Maintenance Program

Every year, the Facilities Management team performs electrical preventive maintenance of the primary electrical system to ensure reliable and uninterrupted service. The intent is to prevent damage that would be more costly to restore under adverse and emergency conditions. This program includes:

Testing of all main circuit breakers serving the building

Cleaning and maintenance of main switchgear

Functional testing of Automatic Transfer Switches

Emergency generator (engine and electrical)

Oil samples of all transformers.

Power Monitoring & Control System (PMCS)

BYU-I has deployed throughout its main Campus Facilities a Power Monitoring and Control System, which monitors power level (including voltage, current, kW, kVA, etc.) and tracks power usage at each building.

This not only provides intelligence of how BYU-I uses power (and thus data for future planning) but also provides alarms for abnormal conditions that could result in an outage. Primary uses of this system are usage monitoring and maintenance support.

Additionally, we are in the process of installing more advanced energy monitoring systems which will overlay on our HVAC building control software to identify additional energy saving opportunities.

Usage Monitoring:

Facilities Management staff through our Electrical Services Department monitors and reports status alarms received via the campus wide PMCS, including identifying risks to PBX equipment, labs, and cable rooms.

Facilities Management acknowledges and acts on alarms reported by the PMCS to all needed parties 7x24x365.

Maintenance Support:

The BYU-I Facilities Management team maintains the Power Monitoring System with regular data backups, communication loss investigations, and upgrades as required.

ENERGY BENCHMARK ANALYSIS

Energy Use in the Education Industry

Energy surveys have been conducted in house and data has been compared to IFMA and APPA national campus standards.

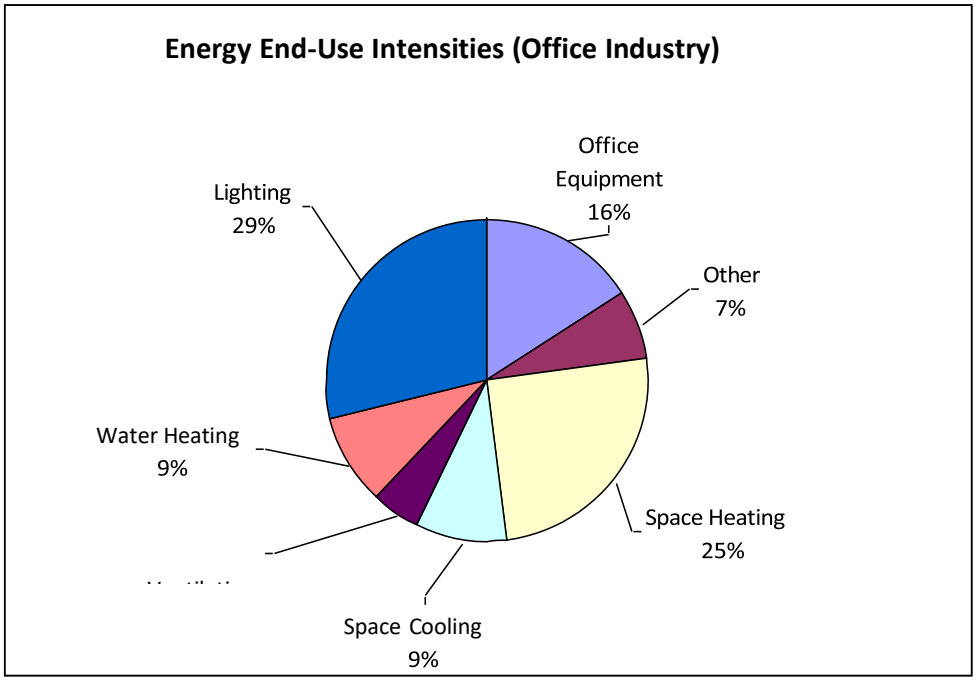


Figure 2: End Use Intensity for Typical "Campus Office" Building

BYU-I's Energy Use

BYU-I's energy use varies significantly across its facilities. For this reason, it is useful to compare campus buildings to their type of use.

By Building Type

For energy use evaluation, BYU-I buildings can be grouped under three general headings: Administration, Classrooms or Industrial. These classifications are based primarily on the amount of electric equipment and cooling requirements of the building.

Administration buildings (such as the Kimball) contain little more than PCs and monitors in every office. Classroom buildings have diversified uses, whereas Industrial buildings like Ag Engineering can have large temperature fluctuations that are not as expensive to control via the HVAC system or no controls at all.

End-Use Breakdown

BYU-I buildings use energy in the same classifications as those of other industry campuses and college campuses, primarily in lighting, air conditioning, ventilation, and plug loads (including labs/data centers). However, the specific breakdown of energy by end use in BYU-I buildings has not been gathered 100% to date. Gathering precise information regarding energy use requires metering at the electric panel and circuit levels.

Energy Use in Telecom Rooms, Data Centers, and Student Computer Labs

Telecom rooms, data center spaces and student labs are scattered throughout BYU-I facilities and are an integral part of how BYU-I conducts business Student Labs are designed and built specifically with a large inventory of computer equipment in mind and corresponding plug load.

While overall campus telecom, lab and data center energy use is not metered independently of the buildings, measurements monitored at the PDU's, and Schnieder Software does offer some insight to the extent of energy used.

WATER, SEWER, GARBAGE AND WASTE STREAMS

Water and Sewer are often viewed as part of the utilities on any campus or municipality, but for our Sustainability plan we felt it was best to aggregate these with other waste streams that BYU-Idaho generates:

Water—

Water is provided to BYU-I via the City of Rexburg Water Department. Water is generated from deep water wells.

The following data shows where we have converted from high water usage fixtures to low water fixtures and the savings per fixture we receive by the change out:

- 3.5 gallon/flush urinal changed to 1/8 gallon/flush 96.4% savings.
- 3.5 gallon/flush urinals changed to 1 gallon/flush 71.4% savings.
- gallon/flush urinal changed to 1/8 gallon/flush 87.5% savings.
- 3.5 GPF toilet changed to 1.6 GPF 54.3% savings.
- 3.5 GPF toilet changed to 1.28 GPF 63.4% savings.
- 4.5 GPF toilet changed to 1.6 GPF 64.4% savings.
- 4.5 GPF Toilet changed to 1.28 GPF 71.5% savings.

In addition to the water conservation methods above BYU-I also uses:

- Low consumption faucets and shower heads
- Low flow lawn sprinkler heads that reduce water consumption by more than 50%
- Certified lawn irrigation technicians that have been trained in designing and managing irrigation systems with the lowest amounts of water possible.
- Smart sprinkler controllers
- Converting water cooled chillers over to air cooled chillers wherever possible.

Sewer—

We are the largest commercial sewer producer for the City of Rexburg Wastewater Treatment Facility and as such have a responsibility to insure we use their sewer treatment facilities as little as possible to keep costs down for all sewer customers and provide needed capacity for new construction on campus and in the community.

Storm Water---

Storm water is considered part of our waste stream and is processed through storm water retention basins on campus, then processed at retention ponds near Rexburg Golf Course, then distributed to the City of Rexburg.

Other Waste Streams—

There are a number of waste streams at BYU- Idaho that we manage. They include:

- Pulper—Located in Manwaring center allows disposed food products to be drained of excess weight before disposal.
- Sawdust from academic and facilities wood shops
- Metal scraps from academic welding labs and facilities mechanical shop
- Copper and metal piping from the facilities mechanical and plumbing shops
- Copper wiring from the facility's electrical shops
- Dead sod from winter kill and landscape renovation and construction projects
- Irrigation materials from landscape renovations and construction
- Organic debris from trees, bushes, and flowers on campus
- Used carpet
- Unrecyclable building materials from renovation and new construction projects
- Hazardous waste generated by academics and facilities. This includes asbestos, fluorescent light fixtures, automotive contaminants including used batteries, paints, solvents, etc.

Items from these other waste streams are collected and recycled or disposed of in accordance to environmental regulations.

Sewer and Storm Water

Storm water retention is not currently monitored in gallons of storm water released, but with the storm water retention ponds and basins built at University Village, 9th Stake Center, Taylor Quad, Central Energy Facility, and our mega pond near our substation, we have built for growth and keep storm water from burdening the City of Rexburg storm water retention ponds. Thus, decreasing the chances of polluted storm water flooding areas and making it to the local water ways.

Garbage

All garbage collection on the BYU-I campus, except for Food Services and Book Store compactors, are picked up and disposed of by our on-campus Garbage services.

Management of garbage across campus is a daily event that is conducted by a number of different individuals across campus.

BYU-I collects garbage daily through a network of containers placed throughout campus. In all, we have 164 containers to dump daily, which total between 2 to 3 tons of garbage per day---year-round. The garbage for married and student housing is collected by students and deposited in these containers. Garbage in buildings across campus is collected by our custodial crew and then deposited in these containers.

MISC FUELS

Diesel

Diesel is used on campus as a backup energy source in the heat plant for our gas fired boilers and Co-Generation unit that have dual fuel burners. It is used and stored in double walled containers across campus for our backup generators. Diesel is also used for many of our fleet services vehicles and equipment that support campus such as Dump Trucks, Garbage Truck, etc.

Diesel consumption is closely monitored as we work with our regulatory environmental agencies.

Gasoline

Gasoline is primarily used by our rental vehicle fleet of vans, cars, and fuels many of the service trucks and vehicles across campus.

Propane

Propane is used for portable heaters used by the HVAC department and for misc. academic departments across campus.

Alternate Fuels

Currently BYU-I does not power any of our vehicles or buildings with alternate fuels, although we continue to monitor new alternate fuel technology for opportunities to be used on campus.

RECYCLING

With in the current Eastern Idaho region Recycling is cost prohibitive and not a current practice. Cost and locations for recycling are periodically reviewed for viability for future opportunities.

CONCLUSION

Here at BYU-Idaho we are mindful of the resources, the environment, and the economics associated with Sustainability. The BYU-Idaho Sustainability initiative seeks to educate students about resource management, provide meaningful employment, and leadership experiences to BYU-Idaho Staff and Students. Our goal is to be sustainable while aligning with mission of the University.

In addition, BYU-I seeks to stay abreast of innovative technologies, identify opportunities and methods to encourage energy consumption management. We strive to implement energy conservation projects all while maintaining a financial and achievable balance.