Technical Resource Manual

for

Poultry Houses

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Comprehensive Services Program

DREMC Representative

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Introduction

The purpose of this resource manual is to promote the efficient use of electrical energy at poultry houses. Duck River Electric Membership Corporation (DREMC) requested that the Comprehensive Services Program (CSP) team compile this information to improve the energy efficiency for their members' poultry farms. CSP is a partnership between DREMC and TVA that provides engineering and technical services promoting the efficient use of electrical energy for commercial and industrial members. Some of the services provided by CSP are Energy Audits, Power Quality Studies, Electrical Metering, Lighting Recommendations, HVAC Sizing/Replacement Analysis, Infrared Studies, Power Factor Studies, and Ultrasonic Testing/Compressed Air Leak Scans. Our mission is to serve the people of the Tennessee Valley to help the region thrive and grow.

Electric Billing

The electric bill for commercial members consists of several charges. These are primarily the customer charge, demand charge (based on peak kilowatts), energy charge (based on used kilowatt-hours) and fuel cost adjustment.

- **Customer Charge:** The customer charge is fixed and covers the utility's administrative expenses. Grid access and facilities charges cover utility fixed costs.
- **Demand Charge:** The demand is the average electrical load (measured in kW) measured over 30 minutes. The demand charge is the charge for the highest kilowatt demand recorded during the billing period.
- **Energy Charge:** The energy charge is the charge for the use of energy during the billing cycle (measured in kilowatt-hours).
- **Fuel Cost Adjustment:** A fuel cost adjustment charge is added to the energy rate and is based on the cost of fuel purchased to generate electricity such as coal and natural gas.

Most poultry houses are billed based on either the GSA-1 or GSA-2 rate structure. Constraints for the following GSA-1 and GSA-2 rate classes for DREMC members are listed below:

GSA-1 rates are applied to members when the contract demand or actual demand is less than 60 kW and the energy takings for one month are less than 15,000 kWh.

GSA-2 rates are applied to members when the contract demand or actual demand is greater than 60 kW and less than 1,000 kW or the energy takings for one month are greater than 15,000 kWh.

Billing examples showing how the member, demand, energy, and fixed charges apply are shown for the GSA-1 and GSA-2 rate structures in the following examples.

Electric Billing Examples

The following examples are based on the current rate structures and statement of amounts for DREMC for May 2020. The rate structures and statement of amounts are subject to change and are shown here to provide an understanding of how an electric bill is currently determined by the GSA-1 and GSA-2 rate structures.

GSA-1 Billing Example

GSA-1 member with an energy consumption of 5,000 kWh and 30 kW.

Charge Type	**$ Amount**				
Customer Charge	$42.98	x	1	=	$42.98
Grid Access Charge	$1.02	x	1	=	$1.02
First 1,000 kWh	$0.09863	x	1,000	=	$98.63
Next 2,000 kWh	$0.09874	x	2,000	=	$197.48
Over 3,000 kWh	$0.09249	x	2,000	=	$184.98
				Total	$525.09

GSA-2 Billing Example

GSA-2 member with an energy consumption of 16,000 kWh and 75 kW with a 12-month demand maximum of 90 kW.

Charge Type	**$ Amount**				
Customer Charge	$103.00	x	1	=	$103.00
Facilities Charge	$1.00	x	90	=	$90.00
kW, 0-20	$6.00	x	20	=	$120.00
kW, 21-1,000	$14.07	x	55	=	$773.85
1st 7,500 kWh	$0.07851	x	7,500	=	$588.83
Additional kWh	$0.05523	x	8,500	=	$469.46
				Total	$2,145.13

Energy Saving Opportunities

- The replacement of existing lighting with lower wattage LED lamps/fixtures is typically one of the easiest and most cost-effective ways to reduce energy costs. Over the past few years, LED lighting prices have decreased, while LED lighting has become more reliable in terms of operation and lifespan.
- Stagger the use of electrical equipment with high electrical loads when possible to reduce demand costs.
- Turn off any equipment that is not necessary to reduce electrical consumption.
- Clean fans, louvers, shutters and dampers regularly to ensure proper ventilation, which allows for the proper airflow and helps conserve energy. Dirty ventilation fans are far less efficient to operate and use more energy per volume of airflow.
- Replace standard fan belts with cogged V belts, which are more efficient and allow for less belt slippage to occur.
- When replacing ventilation fans, it is recommended to compare the efficiency ratings of the fan. The efficiency ratings are typically listed in CFM/Watt. The higher the ratio the more efficiently the fan will operate.
- When replacing motors, select premium-efficiency motors.
- If the poultry house is a non-seal curtain sidewall type, consider investing in solid sidewalls. Arguments against closing a house entirely include fear of not being able to regulate bird temperature during catastrophic power failures, an inability to air houses out between flocks and supposed difficulty in decaking houses. However, it has been shown that solid walls help increase efficiency, both in regulating the birds' environment and the farmer's energy use. In most cases, these problems have clear solutions. For example, always ensure that backup generators are in working order. If committing to install solid side walls, energy savings will vary depending on the type of house being renovated. Old 5-foot curtain-sided houses might see a savings of up to 40%, while modern curtain-sided houses with 24-inch openings, flaps and insulation above and below the curtains may see a savings of around 15%.[1]
- Maintain backup generators by providing preventative maintenance and proper testing.
- Insulate the poultry house to the optimum insulation level that is appropriate for your house. Check with your contract holder to provide you with minimum insulation values. Use insulation materials that are appropriate for your facility that will not degrade or deteriorate quickly. Use an appropriate vapor barrier to decrease the likelihood of the insulation becoming wet, which diminishes the insulation effectiveness and lifespan. Ensure the house is airtight except for the

[1] Connecticut Farm Energy, Energy Best Management Practices Guide pg. 29-30, ctfarmenergy.org

use of ventilation equipment. This will allow less heat to escape during the winter months.

- Regular preventative maintenance is recommended for the evaporative cooling pads to reduce clogging. The pads should be sealed during cool weather to reduce the amount of dusty air that can potentially exhaust through them.
- Select radiant heaters instead of forced air convention-type heaters. Radiant heaters include radiant tubes, quads and circular heaters. Radiant tubes are metal and run lengthwise down the building or poultry house, and each section is generally 40- to 50-feet long. They are very efficient at emitting radiant heat over a large area. Quads and circular radiant heaters provide heat in a more localized fashion, and more of these heaters are installed in a poultry house to provide uniform heating. In poultry farms, one distinct advantage of radiant heating is that it does a better job of heating the litter pack. Since the heat is transferred directly to the floor of the house, this prevents the birds' body heat from being drained into the floor from their feet. The result is warmer birds and drier litter. Another advantage is that they can be mounted much higher in the house, so they do not need to be raised or lowered. Radiant heaters also heat the floor evenly, preventing the hot spots typically seen with pancake or radiant brooder heaters. The warmth spreads farther towards the side walls, meaning there is a larger comfort zone for the birds.[2]
- Use attic inlets for ventilation supply air. Ceiling (or attic) inlets are an effective way of keeping the flock warm during cooler months without increasing heating costs. They work similar to sidewall inlets but are placed in the ceiling of the poultry house and draw heated air in from the attic.
- Hot air rises, and the hottest air in the poultry house will be near the ceiling. Ensure that there are enough circulation fans to more evenly distribute the heat inside the house during winter months. This could improve the health of the flock while reducing the amount of electrical energy or fuel required for heating.
- Ensure thermostats are calibrated on a routine basis. Today's poultry houses require constant temperature management to maximize bird growth. Thermostats can often drift out of calibration in the house environment, allowing for over (or under) heating of the house.
- As an alternative measure beyond using thermostats, system controllers can coordinate heating, ventilation, cooling and lighting systems so they work in an integrated fashion. The house environment remains constant, allowing the birds to realize their maximum potential. Also, such precision controls can help reduce energy costs by eliminating overheating and overcooling. Controllers are also PC-compatible, so regular reports on temperature, feed and water conditions, and even bird weights, can be sent directly to the office computer. The data can then be analyzed for trends and trouble areas.

[2] Connecticut Farm Energy, Energy Best Management Practices Guide pg. 30, ctfarmenergy.org

- Emerging technologies for waste heat recovery in poultry farms are now in use in many parts of the world. These systems have shown between 40% to 50% fuel savings from less heater use.

  Please see the additional resource:

  "Propane Saving in Poultry Farm through Waste Heat Recovery System," by Dr. Shawn Yunsheng Xu, Tingsheng Xu and Dr. Robert Reed; College of Engineering, University of Missouri, Columbia, MO 65221; Phone: (573) 999-6279; Email: xuyu@missouri.edu

  Available online at http://midwestpoultry.com/wp-content/uploads/Xu-Yun-Sheng-Propane-Saving-in-Poultry-Farm-Through-Waste-Heat-Recovery.pdf

Disclaimer

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