

Energy and Cost Savings With Dimmable Compact Fluorescent Lighting



The new dimmable compact fluorescent light bulbs (DCFLs) have the potential to reduce poultry farm electricity use by over 40% and save thousands of dollars a year. Many growers are uncertain about this lighting, however, because of its high initial cost. Equipping a typical barn with DCFLs can easily cost over \$500, compared to less than \$30 for standard incandescent bulbs. However, because of the long-life of the DCFLs and their energy savings, they pay back their first cost very quickly, and then continue to generate major savings for the next few years.

A recent study by the Center for Energy and Environmental Sustainability (CEES) at James Madison University analyzed the energy use of DCFLs compared to standard incandescent bulbs in a local poultry operation (see box at right). The cost analysis is summarized in tables 1 and 2 on the back of this sheet.

It is clear that a grower with operations similar to that of Delta Springs Farm stands to save thousands of dollars per year in electricity costs by investing in DCFLs. These light bulbs use a fraction of the energy that incandescent lights do, and because they usually have an average life of over 15,000 hours (compared to 750 or 1500 for a typical incandescent bulb), their savings accrue for many years.

The CEES study shows that DCFLs should last for about 25 flock production cycles, just over 3-1/2 years for a standard broiler operation. Over this period of time, a grower with a 50 x 520 foot barn could expect to save about \$5900 for a single barn by using DCFLs. This is a savings of about \$1600 per year per barn in electricity.

Growers are cautioned that safe disposal of these bulbs is important. Because they contain mercury, growers should use safety precautions with broken bulbs, and ideally dispose of them with an appropriate recycler. At present, there is no free public recycling service for compact fluorescent bulbs in the area.

This study was supported by a grant from the Shenandoah Resource Conservation and Development Council and in collaboration with George's Inc. We would like to thank the owners of Delta Springs Farm for the generous use of their property and for their invaluable assistance on this project.

The Delta Springs Farm Study...

CEES conducted a study at Delta Springs Farm, a George's broiler operation in northern Augusta County. The grower has two identical 50 x 520 foot poultry barns, so we conducted a controlled experiment that measured the difference in energy use by dimmable compact fluorescent lights (DCFLs) compared to standard incandescents. We left one barn as is on its dimming lights, which was 56, 100-watt standard incandescent bulbs. In the other barn, we replaced the 56 incandescents with 8-watt DCFLs.

We metered the electricity use for each of these sets of lights and calculated their total energy consumption for a full flock cycle of 36 days. We then calculated the electricity costs associated with each lighting system.

The results were eye-popping. The standard incandescent lights used **10 times** more electricity than the DCFLs—2,993 kwh compared to only 295 kwh. At today's electricity rates, that equates to a payback period of just less than 2 flock cycles, or 3-1/2 months, to recoup the higher cost of the DCFLs.

If Delta Springs Farm installed these lights in all three of its barns, the farm would save more than \$17,500 (after adjusting for inflation) over the life of the DCFL bulb, which is about 25 flocks or 3-1/2 years. This is equivalent to an annual energy savings of about \$5,000 per year for the farm.

For more information about this study, please contact Dr. Maria Papadakis at 540-568-8142 or at papadamc@jmu.edu.

Table 1. Total Purchase, Installation, and Variable Costs of Dimmable Lighting for the Initial Flock Cycle

	DCFL Barn	Standard Incandescent Barn
Initial Purchase and Installation		
Cost of 56 light bulbs	\$501.00	\$29.25
Labor	\$0.00	\$0.00
Total, Purchase and Installation	\$501.00	\$29.25
Net P&I Cost of DCFLs	(\$471.75)	
Variable Electricity Charges		
Total electricity consumption (kWh)	295	2,993
Power charge @ \$0.04850 per kWh	\$14.31	\$145.14
Fuel adjustment charge @ \$0.03648 per kWh	\$10.76	\$109.17
Variable distribution charges		
a) Demand charge @ \$6.71 per KW	\$0.00	\$13.42
b) Energy charge @ \$0.00493 per kWh > 4200	\$1.45	\$14.75
Virginia consumption tax @ \$0.001 per kWh	\$0.30	\$2.99
Total, Variable Electricity Costs	\$26.82	\$285.47
Net Electricity Cost Savings of DCFLs	\$258.65	

Assumes that (a) farm electricity use will exceed 4200 kWh from other equipment, (b) DCFLs reduce peak demand by 2 kilowatts per barn, and (c) incadescent bulbs are double life 100 watt Sylvania bulbs retailing at \$3.98 per 8-back. DCFLs are LiteTronics Microbrite 8 watt lamps. The fuel adjustment charge is the lower of the most recent 2 months billing rates.

Table 2. Discounted Total Life Cycle Costs of Dimmable Lighting

	DCFL Barn	Standard Incandescent Barn
Initial Purchase and Installation		
Cost of 56 light bulbs	\$501.00	\$29.25
Labor	\$0.00	\$0.00
Total, Purchase and Installation	\$501.00	\$29.25
Replacement Costs	\$0.00	\$300.97
Maintenance and Repair	\$0.00	\$0.00
Variable Electricity Costs	\$626.33	\$6,667.14
Salvage Value	\$0.00	\$0.00
Disposal Costs	\$0.00	\$0.00
Total Life Cycle Costs	\$1,127.33	\$6,997.36
Net Life Cycle Savings from DCFLs	\$5,870.03	

The life cycle is 18,000 hours, the average rated life of the DCFL. Double life incadescent bulbs are rated at 1500 hours. Each flock cycle uses 693 hours of lighting. DCFLs will therefore last 25 flocks, or just over 3-1/2 years. This life cycle cost analysis makes the same assumptions as the payback analysis. Present values were calculated by discounting 3% for inflation. In addition, it assumes that electricity and bulb costs remain constant throughout the life cycle, and that there are no salvage, labor, maintenance, repair, or disposal costs associated with either lighting system.