Energy Savers Program

An overview of energy use and cost savings in nurseries

Nursery & Garden Industry Queensland

This project was only possible due to the long term partnership between NGIQ and the Queensland Farmers Federation. Funding was provided by the Queensland Department of Natural Resources, Mining and Energy.

Everyone will know how much electricity is costing their business but do you know where that electricity is being used or how your energy use compares to other nurseries?

Most people will point to their irrigation and transfer pumps as being a major user of electricity and they would be right. Irrigation and transfer pumps are usually one of the largest electricity users in a production nursery, and we have all been told for years we need to make our pumping systems more efficient but we also need to be aware of where the rest of the electricity is being used to help improve energy efficiency across the whole nursery.

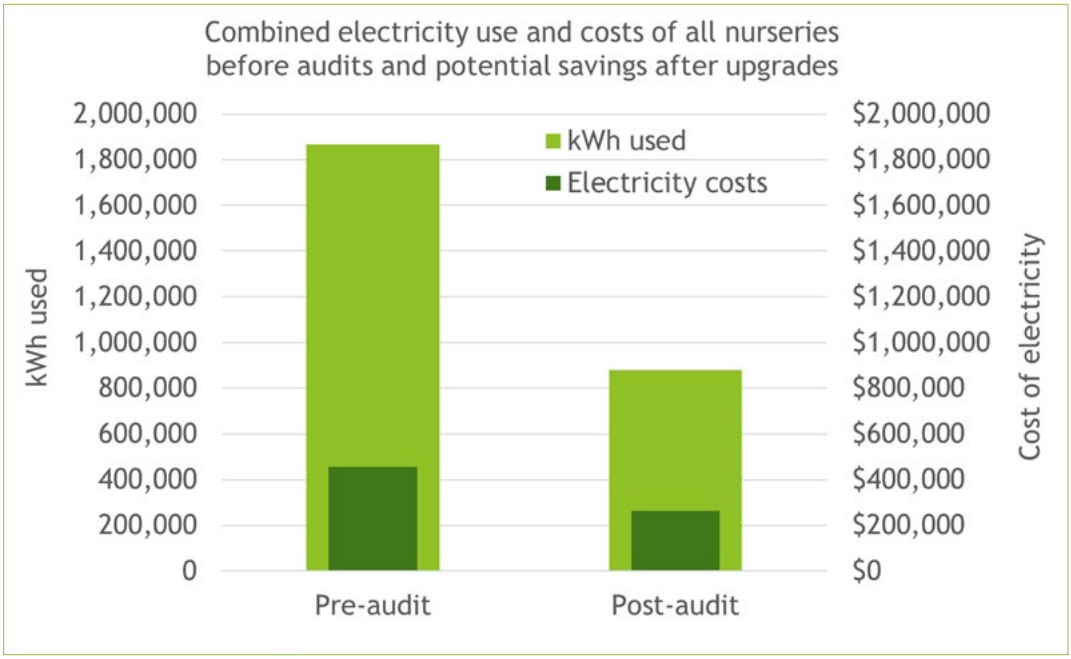
The findings from energy audits conducted by NGIQ for the QFF Energy Savers Plus Program Extension (ESPPE) funded by the Queensland Department of Natural Resources, Mines has provided an overview of where electricity is being used and what it's costing nurseries.

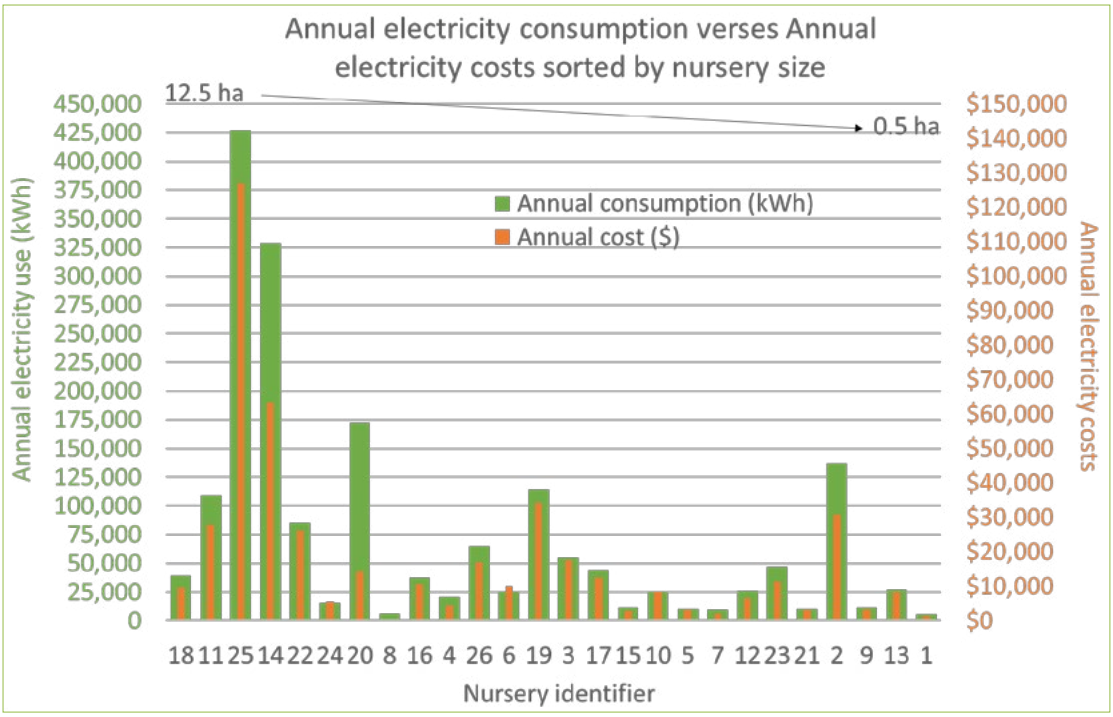
There are 26 nurseries participating in the energy savers program, covering a range of nurseries from small mum and dad nurseries supplying the local community through to large commercial producers that supply farmers. Nursery sizes range from half a hectare to 12.5 hectares with crops grown ranging from ornamentals such as potted colour and flowers to vegetable seedlings, fruit trees, large landscape plants and native plants for revegetation projects.

The combined turnover of these 26 nurseries is between 37 to 45 million per year, which accounts for about 5% of the $921 million the nursery industry contributes to the Qld economy each year.

The total combined energy use for these nurseries was 1.87 megawatts-hours of electricity costing about $455,000 per year. If this is compared to what the average Qld home of two adults and 2 children uses, approximately 10,000 to 15,000 kWh per year, these 26 nurseries are using roughly the same amount of electricity that 150 homes would use. However, the energy audits identified that savings of about 879,000 kWh costing $262,000 or roughly equivalent to 70 Qld homes can be saved.

The audits have shown that the physical size of the nursery or the type of crops produced is not a true indicator of the amount of electricity used or the energy efficiency of a nursery. Although seedling propagators do tend to have more energy intensive climate-controlled propagation houses, this technology is usually energy efficient. For example, a small vegetable seedling nursery (#6 in figure 2) produces 15 to 20 million seedlings per year but has a relatively low energy consumption, while some of the larger nurseries that produce landscape or fruit trees can have considerably higher electricity use and costs due to more extensive irrigation systems and larger pumps.

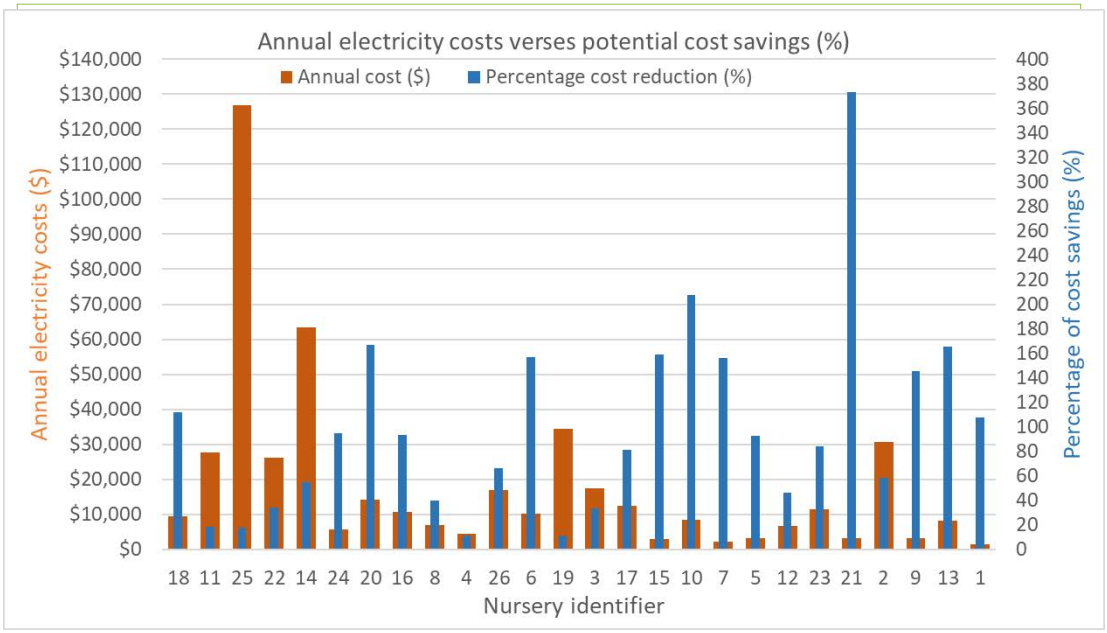


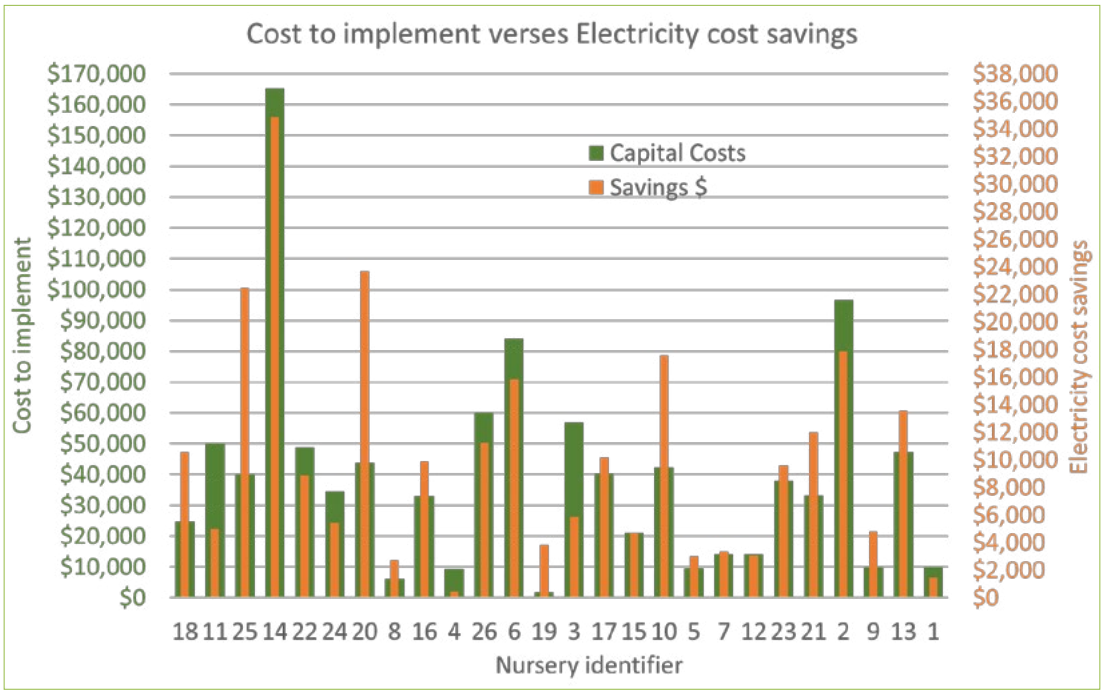


Electricity consumption and costs do not have a simple 1-to-1 relationship, that is, just because a business is a large electricity user does not mean they have an equally large electricity bill. There are several reasons for this. It is related to the different production methods for different crop types, or the level of technology used. Also, some nurseries have the benefit of spaning two or more properties and have multiple NMI's or metering points, this allows electricity use to be spread across multiple accounts to avoid attracting demand charges associated with large energy users. However, the main reason why some nurseries have a lower electricity cost is that most nursery managers regularly negotiate with their energy supplier to get the best tariff option for their business. In some regional areas there may be less choice of tariffs but it is still worth talking to your energy supplier as the Qld government are making new tariffs available for irrigators which can reduce costs.

Furthermore, the potential cost savings that can be achieved with upgrading equipment does not relate to the size of the nursery or the amount of energy used. Some production systems can have a high energy use but be extremely energy efficient, while some simple small production systems that don't appear to use a lot of energy can actually waste energy due to inefficiencies. Figure 3 shows the annual electricity costs per nursery and the potential percentage of electricity cost savings that were identified from the audits. This shows that energy cost savings are not directly related to the amount of electricity a nursery uses. Even small energy users can potentially have large cost savings from upgrading equipment to more energy efficient alternatives or implementing efficiency practices. The only way to accurately identify potential energy cost savings is to have an energy audit done. The good news is that in most cases the cost of an energy audit, and the cost to implement upgrades, will be offset by the energy cost savings.

Depending on the production system or equipment, a small cost to update equipment or to implement a new practice can actually return a far greater saving than is obvious. For 15 of the 26 nurseries the cost savings far outweighed the cost to implement with some nurseries seeing a combined electricity cost reduction in excess of 100%. The average payback for the investments was around 5 years with savings per nursery ranging from $500 to $35,000 per year. Although not all recommendations provided such an impressive return and, in some circumstances, a large cost to upgrade only provided a small cost saving or took in excess of 10 years to payback. It is worth remembering that once the upgrades are done, the savings achieved will be gained each year. If you reach the point where the cost to upgrade far exceeds the benefits then you have probably achieved the best efficiency you can for that system.

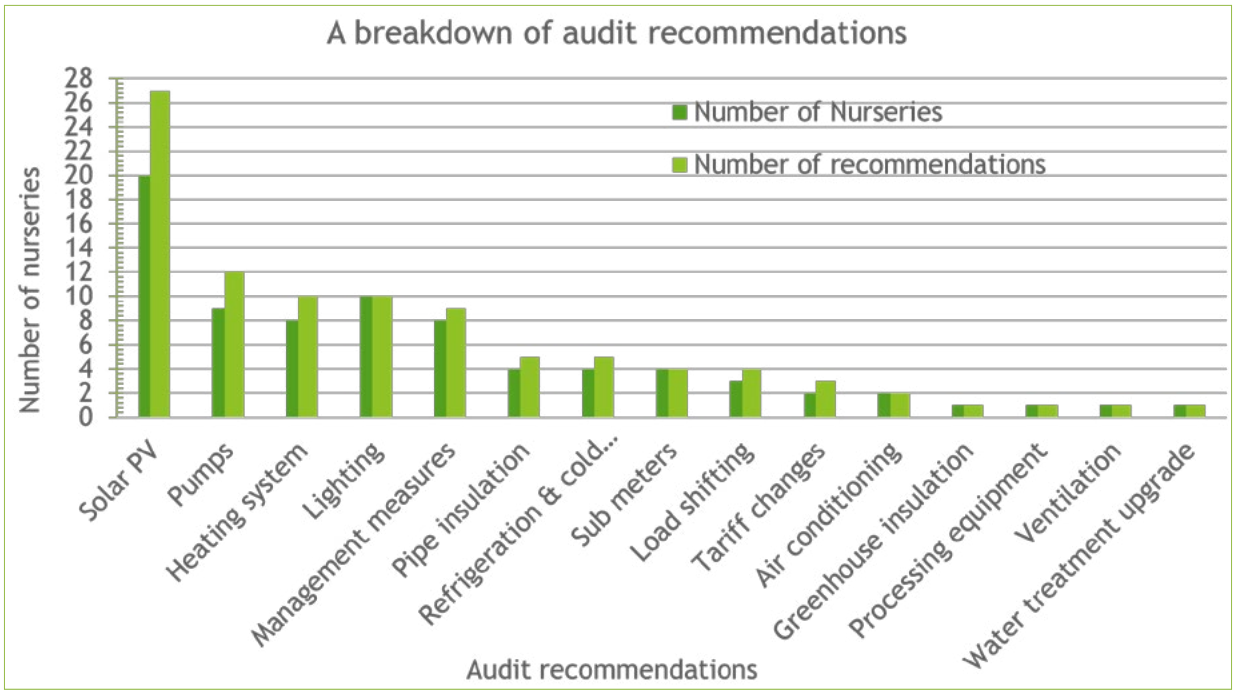

Annual electricity costs verses potential cost savings (%)
Annual cost ($)
Percentage cost reduction (%)
Annual electricity costs ($)
Percentage of cost savings (%)
$140,000
$130,000
$120,000
$110,000
$100,000
$90,000
$80,000
$70,000
$60,000
$50,000
$40,000
$30,000
$20,000
$10,000
$0
400
380
360
340
320
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
18 11 25 22 14 24 20 16 8 4 26 6 19 3 17 15 10 7 5 12 23 21 2 9 13 1
Nursery identifier


Cost to implement verses Electricity cost savings
Capital Costs
Savings $
Cost to implement
Electricity cost savings
$170,000
$160,000
$150,000
$140,000
$130,000
$120,000
$110,000
$100,000
$90,000
$80,000
$70,000
$60,000
$50,000
$40,000
$30,000
$20,000
$10,000
$0
$38,000
$36,000
$34,000
$32,000
$30,000
$28,000
$26,000
$24,000
$22,000
$20,000
$18,000
$16,000
$14,000
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$0
18 11 25 14 22 24 20 8 16 4 26 6 19 3 17 15 10 5 7 12 23 21 2 9 13 1
Nursery identifier

The audits identified a range of recommendations from installing a solar PV system to upgrading pumps and various other systems to simple low-cost management measures and minor changes to processes. The most recommended option was to install a solar PV system. These systems varied from small 4kW systems to large 100kW systems with each system being designed to suit the equipment and electricity use patterns for the nursery. However, installing a solar PV system is not a silver bullet that will improve your energy efficiency, it simply offsets the electricity you use during the day and hides the true cost of using inefficient systems, and installing the largest solar PV system you can afford may not provide the economic benefits expected. Also, the system must be approved by Energy Queensland to feed back to the grid to receive the full economic benefits but due to network limitation in some areas this is not guaranteed. A specialist is needed to assess the nursery's energy use and identify all energy saving options before sizing the solar PV system to meet the businesses energy requirements and network limitations. This will provide the best reduction in energy costs for the least amount of capital costs, while returning more money to your pocket.

The next two most recommended options were to upgrade pumps and propagation heating systems. There have been many advances to pumping systems in recent years, and low energy heating systems as well as the associated control systems. Upgrading such systems to be more energy efficient will reduce operating costs but each system must be assessed by a specialist to identify which options are best for each business. Installing simple off-the-shelf options or implementing a practice that is not suitable for your nursery could actually cost more over time.

The fourth most recommended upgrade, and the most surprising technologies still being used in nurseries was fluorescent and incandescent lighting. There are still a large number of businesses using fluorescent lighting even though using LED's is one of the cheapest and quickest ways to reduce electricity costs. For example, one nursery had 70 fluorescent lights throughout the nursery costing an estimated $3221 per year to run. If the fluorescent tubes were replaced with an LED alternative it would cost $977, but provide an immediate cost saving of $2282 per year with a payback period of less than 1 years. Considering the relatively low capital cost, upgrading lights should



be a simple quick cost reduction. Savings will depend on the number of lights and how they are used but in most cases this upgrade can be done without an electrician.

Another simple savings option is management measures such as turning off lights when not in use, activating energy savings mode on equipment, increasing the temperature set point on air conditioner by 2°C, or simply doing equipment maintenance. All of these options are quick simple and low cost, but implementing these changes can reduce each systems electricity use by 10%. If all the management measures identified from eight nursery audits are combined, electricity cost savings of $6869 could be achieved. This shows that even small changes have the potential to reduce energy costs and collectively can add up to significant savings.

Other recommendations included servicing and replacing seals on cold rooms, improving the heat retention in propagation greenhouses, or upgrading water treatment systems. These audits have shown that there is potential to reduce energy costs in all areas of a nursery. Some savings were from simple tariff assessments identifying an alternative tariff that better suited the way nurseries use electricity, but most savings were from installing a solar PV system, upgrading old inefficient production equipment, and changing management practices.

No matter how big your business is or how much energy you use there is always options to reduce energy costs, it's a matter of assessing where energy is being used and why. Unfortunately cost savings or efficiency improvements cannot be determined from electricity bills alone or by the number of plants a nursery produces it requires an energy audit to identify how, where, and when energy is being use, but when all recommendations or upgrades are considered together, businesses can save energy and reduce operating costs.

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