



# NSW Schools Energy Productivity Program (SEPP) Project Results

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# Contents

Table of contents	2
Executive summary	3
Project overview	4
Project summary	4
Project method	4
Project outcomes	5
The energy and cost savings achieved in the pilot	5
Quantification of financial, environmental and social value of a roll-out to all NSW public schools	5
Outcomes of staff and student engagement activities	6
Analysis of the behavioural change measures and the efficacy of each measure	6
Posterboard	7
Demand tracker app	7
Energy report	8
Educational program and 'Info Hub'	9
Analysis of the effectiveness of this activity to improve the sector and increase collaboration within the industry	10
Lessons learnt report	11
Data acquisition via MDPs	11
Internet to Posterboard digital display screen	12
WiFi and phone capability prerequisites for Demand tracking app	13
Digital Screens in a school environment	14
Ability of Schools to digest information in Level 2 Energy Audit format	15
SINSW procurement process	16
Case Study engagement and pre-requisites	17

# Executive summary

In March 2018, ERM Power was engaged by School Infrastructure NSW (SINSW) in a project jointly funded by Australian Renewable Energy Agency (ARENA), with an in-kind contribution from ERM Power. The project was titled the School Energy Productivity Program (SEPP), and demonstrated the benefits of integrating energy productivity improvements and renewable energy across the NSW schools sector. This document gives a project overview, summary of project outcomes and details some of the key lessons learnt from the undertaking.

## Project Information

<b>Lead organisation:</b>	ERM Power Retail Pty Ltd, ABN 87 126 175 460
<b>Project commencement date:</b>	01 March 2018
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# Project overview

## Project summary

The targeted outcomes of the program include the following:

- Drive significant and replicable energy cost savings (~20% at a minimum) as a result of energy productivity improvements and installation of renewable technologies over the short term, and reduction of maintenance costs over the medium to long term.
- Integrate energy productivity improvements including the streamlining of SINSW existing procurement and deployment programs to catalyse and accelerate the adoption across the NSW School portfolio and create further uptake in the schools sector nationally.
- Share outcomes, data driven insights and learnings from the pilot with key policy and decision makers within NSW Government and broader industry and school networks to accelerate investment across the Australian schools sector.

## Project method

From March 2018 – March 2019 ERM Power worked with School Infrastructure NSW (SINSW) to deliver the following across the 20 selected pilot schools:

1. Level 2 Energy Audits.
2. Detailed Solar PV and LED upgrade design and advisory services, including on-site auditing of current technologies installed and electrical infrastructure across the 20 schools.
3. Installation of 20 electronic Posterboard sustainability display screens across all 20 schools, which received monthly updates to school's sustainability targets and communication of program updates and energy management advice.
4. Demand Tracker App and demand Action Plan to manage peak demand days for 17 schools who are subject to demand charges from the cohort of 20 schools. The App provided messages on days when the school was forecast to exceed peak demand, based on historical consumption patterns and temperature forecasts from Bureau of Meteorology.
5. Engagement program to promote understanding of energy concepts with key program stakeholders in schools and grow understanding of renewables in the schools context. This was delivered as a six-part education program and an 'info hub' of resources.
6. Stakeholder Committee formed of key contacts in NSW Government Schools Infrastructure, Environment, Procurement and ARNEA. 3 Stakeholder committee meetings were held to discuss NSW Government barriers to procurement of renewables and opportunities to address these.
7. Program results gathered: pre-engagement and post-engagement measurement of key metrics across all schools collated, and three schools visited for individual 'case studies'.
8. Workshop to present on key findings from school audits and the role of ERM digital tools in the execution of the schools renewables procurement process and demand management strategy.

# Project outcomes

## The energy and cost savings achieved in the pilot

SINSW and ERM agreed the pilot achieved the following metrics:

- Estimated \$651,700 (60.31%) reduction in annual electricity spend.
  - Solar accounted for 29.03% or \$189,200
  - Lighting consumption savings accounted for 49.90% or \$325,200
  - Lighting demand savings accounted for 21.07% or \$137,200
- Additional \$64,750 in maintenance savings due to LED Lighting.
- Estimated 3.55 GWH (60.7%) reduction in annual electricity consumption.
  - Solar accounted for 37.94% or 1.35 GWH
  - Lighting consumption savings accounted for 62.06% or 2.20 GWH
- Estimated reduction in greenhouse gas emissions by 3,475 metric tonnes of CO<sub>2</sub>.
- A 15-year IRR of 22.1%
  - 18.1% IRR for Solar
  - 23.7% IRR for Lighting.

Please contact ERM Power ([rhicks@ermpower.com.au](mailto:rhicks@ermpower.com.au)) should information be required regarding the assumptions and calculations from which these findings were derived.

## Quantification of financial, environmental and social value of a roll-out to all NSW public schools

### Key Metrics – Rollout to all NSW Schools

ERM Power's market sizing estimate has identified the following opportunities based on a desktop analysis.

- 817,500 lights fittings which could benefit from an LED upgrade
- 69.30 MWH of additional solar capacity which could be installed at schools across the State

Implementation of ECMs across these 2,214 schools is forecasted to;

- reduce electricity bill spend by \$43.5m. This is equivalent to a 56.93% reduction in spending across the portfolio.
- reduce electricity consumption by 185 GWH. This is equivalent to 62.08% reduction in consumption across the portfolio.
- reduce operations and maintenance costs by \$2.87m per annum
- reduce Greenhouse Gas Emissions by 154,000 tonnes of CO<sub>2</sub> per annum.

**Rollout requirements are forecast as follows:**

- There is a strong case for NSW Government investment in solar and lighting upgrades in around 2,200 NSW schools of approximately 817,500 light fittings upgraded and implementation of 69MW of additional solar capacity
- This would come at an estimated cost of a full deployment is between \$280 - \$320m dollars with a simple payback period between 6.45 and 7.35 years.
- Given the geographical spread, ERM Power recommends a concurrent multi-year phased deployment across geographical regions.

### **Key Assumptions**

Numerous assumptions have been made in order to conduct this market sizing exercise. The key assumptions are listed below:

- An average school load profile was assumed throughout all NSW schools based on a 12 hours per school day and 200 school days per year.
- Solar sizing has been based on the estimated underlying energy consumption of a school, and has been sized based on 3 key criteria; network size constraints, STC green certificate generation, and the size of any existing system on site,
- Asset registers from the 20 pilot schools were used to estimate the average number of light fittings per student. These figures were then applied to the portfolio of schools.
- Lighting product costs, labour costs, product life, energy savings and energy consumption are based on ERM Power's product knowledge. Revisions can be made to align criteria based on guidance from Schools Infrastructure.
- 100% of the estimated number T5/T8/T12 troffers & ballasts are to be replaced with a comparable LED fitting

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## **Outcomes of staff and student engagement activities**

A pre-engagement and post-engagement survey were carried out to measure energy literacy, using two metrics for gauging literacy: the participant's sense that they understand their energy bills and their comfort with the meaning of electricity demand. Strong improvements were measured in both areas:

### Understanding bills

- Pre-program: 18% of respondents reported understanding what all charges on their bills meant
- Post- program: this increased to 55%.

### Understanding demand

- Pre- program: 36% reported understanding the concept
- Post program: this had increased to 72%.

Outcomes did vary between schools as some were excited to participate but others reported similar to Nicole Henderson at Matthew Pearce Public School's note: *"We are such a busy school that at the moment we just don't have time to put something else onto the agenda"*.

However, overall in the post project survey 100% of the 20 respondents reported that they were comfortable with the program process, including their energy assessment and the information provided as a result.

## Analysis of the behavioural change measures and the efficacy of each measure

### POSTERBOARD

75% of survey participants reported finding it a useful tool for sharing energy information with the school.

As noted above under 'Difficulties', several schools had Posterboard outages due to various issues including blackouts, WiFi signal issues or external events for example one school removed the Posterboard to paint a wall and did not reinstall correctly. We recorded 5/20 schools impacted at some stage of the 1 year trial by such issues. In a broader roll out, they would be resolved by:

1. Successful utilisation of the school network instead of reliance on 4G WiFi network, for which a plan has been agreed with the Dept. of Education IT team, and
2. Setup of remote monitoring of Posterboards so that the onus didn't fall on schools to report issues, and remote troubleshooting could be carried out.

Some feedback from the schools:

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*"The Posterboard is a really good way for kids to have a look at what is going on,"*  
- Tracey Anderson, Dapto High School.

*"I didn't realise the board would go off-line so frequently when we chose its installation position" - Julie Shoesmith, Gorokan Public School.*

*"I look at the board every day and see how we compare to other schools" –*  
Joanne Tucker, Singleton Heights Public School.

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### DEMAND TRACKER APP

This has historically been a more challenging tool to embed, due to requiring installation onto a phone and understanding the concept of electricity demand. Due to these challenges, we took the step of arranging an energy consultant to visit each school to provide training.

In terms of measuring effectiveness there were limited avenues. The app is designed to remain logged in to promote usage, which means that statistics around login and usage rates are not available. It was also attempted to measure impact of tool on hot days but it was found there were too many other factors to draw conclusions, particularly seasonal changes and differing tariff structures across regions. The result is that we must instead rely on survey results to gauge uptake.

94% of the schools on demand charges said they were comfortable with the training for using the tool which would indicate a high level of uptake. However we would temper this with the fact that several case study schools, when followed up, mentioned they had forgotten their passwords after the summer holidays. We followed this discovery with an email to all schools reminding them of their login details, but cannot verify that all schools would have taken action on that reminder. One school did not have sufficient WiFi to download the tool and in one school their mobile phone was too old to allow any app download.

It is however worth noting that several schools were so excited by the technology that they wanted to also get students on-board with it. In Dapto, this extended to creating logins for each of their Green Group of students.

For further rollouts, our recommendation would be that the tool is offered on an 'opt in' basis. It's extremely valuable if a school has committed team member/s willing to implement the action plan on the necessary days, but otherwise not at all.

Some feedback from the schools:

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*"I have the app on my phone and I get the alerts every day, so I can keep an eye on what is happening," - Tracey Anderson, Dapto High school.*

*"We are really busy as teachers, we have all of these things competing for our time, so having this at the forefront and clear and having great, interactive technology that we can engage students with has been a real bonus." - Ben Surwald, Lisarow High School*

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## ENERGY REPORT

While the deliverable for the program was a 'Level 2 Energy Audit', ERM Power took steps to modify the standard output to try to make it more user friendly for schools, by adding a summary page to the front and moving some of observations and calculations that are within scope but less relevant to those stakeholders into a background excel document for SINSW.

Even taking into consideration the steps taken to simplify the report for the school stakeholder audience, uptake levels were only moderate. Of 20 respondents in the post engagement survey, 55%



found it to be a useful source of energy saving ideas and opportunities, 40% didn't fully read it, and 5% said they didn't find it useful.

Those that did make time to use the report found it useful and relevant. Feedback included:

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*"Our Energy Report gave helpful advice on areas that could reduce our electricity consumption" – Joanne Tucker, Singleton Heights Public School.*

*"We did have a look at the Energy Report for the school. There were lots of places that we could change our processes and change our usage in the school." - Tracey Anderson, Dapto High School.*

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## **EDUCATIONAL PROGRAM AND 'INFO HUB'**

Similar to the Energy Report, these materials were only fully engaged with by around half of participants, but those who engaged reported positively on them.

The post-engagement survey showed 50% of the 20 respondents reported the materials gave them a better understanding on managing energy in the school. 45% reported that they didn't fully read them, and 5% (one respondent) said they didn't find the materials useful.

Some feedback included:

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*"Unfortunately we have not had anyone take up the case at school level so the program is not being utilised at this stage." - Linda Dowling, Kincumber High School.*

*"A lot of classes have elected an environmental monitor to make sure that air conditioners are not left on and that lights are turned off\* when they are leaving the room," says Tucker. "We have also asked the whole school to look at the temperature the air conditioners are set to and the time they are turned on." – Joanne Tucker, Singleton Heights Public School.*

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*\*Note that the education included the importance of AC setpoints and turning off lights.*

## **Analysis of the effectiveness of this activity to improve the sector and increase collaboration within the industry**

The platform for sector wide collaboration has been laid. The pilot program has produced outstanding results across the board including energy, education and digital innovation. This evidence has been captured in case studies and other information products to enable the knowledge sharing to occur across the Schools Sector in order to catalyse further action.

The satisfaction rating and improvements in basic energy literacy at an individual school basis demonstrates that a holistic approach drives greater results than capital works programs by themselves. At a grass roots level, engaged school stakeholders (Principals and Business Managers, Key Staff) are more likely to share their knowledge with peers and students or tomorrow's energy consumers. Building knowledge of the benefits of investment in renewables and energy productivity can increase the speed of adoption by normalising this within the sector, reducing resistance to this type of investment and types of programs which in turn can accelerate further investment within Government.

ERM will continue to support SINSW and ARENA in sharing the outcomes of the program to targeted decision makers with the Department of Education and broader NSW Government.

# Lessons learnt report

## Data acquisition via MDPs

**Project Name:** Schools Energy Productivity Program (SEPP)

<b>Knowledge Category:</b>	Data acquisition for Demand Management tools
<b>Knowledge Type:</b>	Industry Liaison
<b>Technology Type:</b>	Demand Management
<b>State/Territory:</b>	NSW

### Key learning

Meter Data Providers (MDPs) are not an ideal source of data, because:

- They don't have any strong incentive to make the data available to third parties
- Third parties do not have the clout to get projects prioritised
- This project found them slow to respond and provide technical resources for solutions.
- When problems arose such as late/missing data, the MDP was slow to investigate and ultimately did not produce a solution.

### Implications for future projects

The issues encountered by this project should influence weighting given to other data acquisition options, including:

- Direct from client (API or other means if possible)
- Own meter (cost implication is a negative, ownership and control are a positive)

### Knowledge gap

At the beginning of the project, our knowledge gap was the assumption that receipt of data from known meters with a known ability to produce it would be straightforward.

## Background

### OBJECTIVES OR PROJECT REQUIREMENTS

Objective: Set up integration with Ausgrid to receive and process NRT data from the meter to provide 5 minute data within 30 minute latencies to schools, so that schools can see this live data via a phone app and take quick action in the event of a predicted high demand day.

### PROCESS UNDERTAKEN

1. Make contact with sales team at MDP and come to an agreement for data acquisition
2. Write the integration from ERM Power's end
3. Receive the integrated data from Plus ES
4. Complete integration and setup product access.

# Internet to Posterboard digital display screen

**Project Name:** Schools Energy Productivity Program (SEPP)

<b>Knowledge Category:</b>	Schools & technology
<b>Knowledge Type:</b>	School environment
<b>Technology Type:</b>	Posterboard
<b>State/Territory:</b>	NSW

## Key learning

While Government agencies would like technologies to run consistently from their existing IT networks/internet, it is not always technically straightforward, and in the experience of this project the support IT staff were not proactive in facilitating this process. We have identified a solution to utilise the network, but not until around 12 months after first reaching out to DoE IT.

## Implications for future projects

It is recommended that liaison with DoE IT re: solutions begins during proposal/RFT stage. Early testing should also be undertaken to allow plenty of time for liaison with IT departments. Greater weighting may also be given to other internet options, like standalone modem/WiFi, though these are also not ideal as they can be impacted by network quality at school.

## Knowledge gap

At the beginning of the project, our knowledge gap was a lack of awareness of the hurdles we would face utilising the schools internet network. We had anticipated this being straightforward as it has been at other sites including council, hospital, bank etc. but this was not the case in the school environment.

## Background

### OBJECTIVES OR PROJECT REQUIREMENTS

Objective: Set up school Posterboard Digital Display of live energy data and sustainability stories, utilising existing wired internet network.

### PROCESS UNDERTAKEN

1. Arrange network point near planned Posterboard location
2. Setup TV screen and cable into network point
3. Turn on screen and test operation
4. On internet provision failing, book IT support via SINSW
5. Liaise with IT team to try to facilitate
6. On this failing, purchase standalone modems for screens
7. Post installation, liaise with DoE IT to agree technology solution that will facilitate use of network (approach has been agreed pending testing).

## WiFi and phone capability prerequisites for Demand tracking app

**Project Name:** Schools Energy Productivity Program (SEPP)

<b>Knowledge Category:</b>	Schools & technology
<b>Knowledge Type:</b>	School environment
<b>Technology Type:</b>	ERM Power App for Demand Management
<b>State/Territory:</b>	NSW

### Key learning

The digital technology for the ERM Power Tracker App relies on schools have WiFi and phones with inbuilt internet/app store. We found this was not always the case. This left a couple of schools/stakeholders unable to benefit from the technology.

### Implications for future projects

Our recommendation would be that the Tracker App is an on request supporting tool with a simple prequalification check to make sure someone in the school is happy to own the tool, has a phone with app store technology and the school has WiFi sufficient to download. An alternative is to provide a phone to participating schools with the app pre-loaded, but this would obviously add some expense.

### Knowledge gap

At the beginning of the project, our knowledge gap was not realising that some schools may not have sufficient WiFi to download an app, or a suitable mobile phone.

## Background

### OBJECTIVES OR PROJECT REQUIREMENTS

Objective: for all schools on demand charges (18/20), arrange that the schools use their WiFi to download the ERM Power Demand Tracker App onto their mobile phone which gives them near real time school demand data dashboard, and notifications of expected times when peak demand will be reached and extra demand charges incurred.

### PROCESS UNDERTAKEN

1. Arrange Energy Consultant to visit schools
2. Have them meet key contacts and help them download the app onto their phone and use
3. Follow up any issues encountered during that visit by email to ensure the 18 applicable schools end up with the app installed.

## Digital Screens in a school environment

**Project Name:** Schools Energy Productivity Program (SEPP)

<b>Knowledge Category:</b>	Schools & technology
<b>Knowledge Type:</b>	School environment
<b>Technology Type:</b>	Posterboard
<b>State/Territory:</b>	NSW

### Key learning

The digital tools could be subject to external events like blackouts or network outages, and in one case the school took the screen down to pain the wall, did not replace it properly after the works were completed, and didn't call us to advise of the issue. We were not able to rely on the schools to report such issues.

### Implications for future projects

We would recommend remote monitoring and access of solutions be factored and costed into a broader rollout strategy for digital tools. This could be as simple as a weekly report showing the hours the screen had been online, and the ability to remotely login and carry out basic troubleshooting steps like restarting.

### Knowledge gap

At the beginning of the project, our knowledge gap was our assumption that because the Posterboards are installed in a prominent position and we have built good relationships with owners at schools, the schools would notify us of any system issue or outage. This proved not to be the case due probably to the very busy school environment and competing priorities.

## Background

### OBJECTIVES OR PROJECT REQUIREMENTS

Objective: Set up school Posterboard Digital Display of live energy data and sustainability stories.

### PROCESS UNDERTAKEN

1. Install Posterboard
2. Put a sticker on the Posterboard with a phone number to call if there are any issues with the screen
3. Have schools contact us if there are any issues with the screen being offline, connectivity, messaging etc. so that we can book a contractor to service.

## Ability of Schools to digest information in Level 2 Energy Audit format

**Project Name:** Schools Energy Productivity Program (SEPP)

<b>Knowledge Category:</b>	Schools & energy learnings
<b>Knowledge Type:</b>	School environment
<b>Technology Type:</b>	Level 2 Audit and Energy Report for Schools, energy education program
<b>State/Territory:</b>	NSW

### Key learning

40% of schools reported they did not fully read their Energy Report and 45% reported they didn't fully read educational materials. It's expected this reflects the time poor nature of educational staff and potentially also a reluctance towards further learnings around energy.

### Implications for future projects

Learnings may be derived in terms of further tailoring materials to suit the audience. It is noted that those who did have the time to engage with the materials responded to them positively.

### Knowledge gap

While we went through a process to tailor the Energy Reports to make them shorter and more likely to be engaged with, the uptake rates show that we still only had around 50% reporting that they had fully engaged with these resources. While, in our experience, that's actually a reasonably good uptake for the time-poor school environment we will always seek ways to do better.

## Background

### OBJECTIVES OR PROJECT REQUIREMENTS

Objective 1: provide Energy Reports for Schools presenting recommendations for energy savings

Objective 2: energy education program to increase energy literacy enabling schools to better manage electricity costs.

### PROCESS UNDERTAKEN

1. Carry out a level 2 energy audit and detailed solar/lighting sizing activity
2. Compile findings into Energy Reports, email and hand delivered to schools
3. Have an energy consultant talk the school through the key findings in person
4. Deliver a 6 part energy education program using emailed monthly lessons, and an 'info hub' of supporting resources

## SINSW procurement process

**Project Name:** Schools Energy Productivity Program (SEPP)

<b>Knowledge Category:</b>	Schools & energy learnings
<b>Knowledge Type:</b>	NSW Government procurement environment
<b>Technology Type:</b>	n/a
<b>State/Territory:</b>	NSW

### Key learning

The time required for the NSW Government / Department of Education Procurement process was significantly underestimated.

### Implications for future projects

A lengthier review and approval process would be built into future project schedules.

### Knowledge gap

The knowledge gap was around the time required for the NSW Government / Department of Education Procurement process.

## Background

### OBJECTIVES OR PROJECT REQUIREMENTS

Use an integrated school wide approach to identify optimum investments across 20 pilot schools for solar and LED lighting upgrade projects, and assist SINSW through barriers to the procurement process to ensure projects are undertaken.

### PROCESS UNDERTAKEN

1. ERM Power compile recommendations for Solar and LED Upgrade projects for 20 pilot schools
2. SINSW put forward recommended projects to NSW Government/Procurement for approval
3. Tender/response process
4. Successful respondents selected by SINSW
5. Projects approved, awarded and undertaken



## Case Study engagement and pre-requisites

**Project Name:** Schools Energy Productivity Program (SEPP)

<b>Knowledge Category:</b>	Schools & energy learnings
<b>Knowledge Type:</b>	School environment
<b>Technology Type:</b>	n/a
<b>State/Territory:</b>	NSW

### Key learning

While the satisfaction ratings from participating schools were high, nonetheless it was difficult to secure time in these busy environments to secure schools to take part in the case studies. Further, we had to navigate a near last minute cancellation at one of the schools as there was misunderstanding between the schools and the Dept. of Education Media team regarding necessary approvals to proceed. We also learnt a form must be signed by every photographed student and these have proven to take some time to arrange (still pending finalisation).

### Implications for future projects

We would approach schools for case study recruitment earlier, emphasise that they would be short visits and start the media approvals process earlier and with all participants cc'd in communications for good visibility and to promote comfort in the process. We would also send the signoff forms prior to the planned visit so that students intended to be involved could sign them beforehand.

### Knowledge gap

The knowledge gap was around the lack of time for any extra requests in the school environment, keeping comms short and to the point, and the process required for approvals from the DoE Media Unit for any such interactions with schools.

## Background

### OBJECTIVES OR PROJECT REQUIREMENTS

Provide case studies showing update, feedback and integration of the project deliverables including the Sustainability Posterboard, ERM Power Tracker app, Energy Report and Engagement Program.

### PROCESS UNDERTAKEN

1. Carry out program of works with schools
2. Contact the more engaged schools and ask them to take part in case studies
3. Arrange a team to visit the schools to interview key stakeholders and take photos of the technologies and participants.