ADEPT Buckinghamshire Live Labs Programme
Solar, Wind & Kinetic Energy

Key statistics

The trial involves installation of the following hardware:

- 4 x lighting columns with solar PV generation
- 4 x wind turbines mounted on columns
- Kinetic Road prototype consisting of 20 harvesters which convert the energy of the traffic over the road into electrical energy which is stored in batteries to be used by lighting columns at night.

Overview of trial

Timeline and progress

All technologies have been installed by May 2022 due to an extension of the trials, originally due to end in November 2021. The trial has provided up to some data for analysis.

Kinetic Road and Wind Turbine

The devices can produce voltage outputs but require further work on their mechanical durability and electrical setup in order to demonstrate their ability to charge the batteries in the harvesters.

Solar PV columns

Remote monitoring will be in place to evaluate the output of the solar PV columns, however this information was not available at the time of the completion of the report.

Successes

Facilitation of better decision-making by Buckinghamshire Borough Council will improve the quality of life for residents in several ways.

- **Innovation**: Partnered with Lancaster University to provide kinetic road technology prototype, the proof of concept for which has been proven during the course of the trial as voltage was produced when driven over.
- **Procurement:** Identified suitable suppliers for solar PV columns and wind turbines.
- **Trial locations:** Found suitable location to install solar PV columns in Gawcott and access road locations for wind turbine and kinetic road installations. Kinetic road and wind turbine moved from original planned location which resulted in reduced monitoring as mesh network not available in new location.

Lessons

We identified a number of lessons to be taken forward for future implementation.

- **Reliability of supply** – This is key for providing lighting solutions for roads or paths where renewable energy generation is involved. Batteries can store the renewable energy generated to ensure that energy is available at the required times. A mains electricity connection can also be used to guarantee supply, if possible.
- **Prototypes** – The kinetic road technology consists of a university-developed prototype. This raises challenges around durability and standardisation of the technology produced, as well as the question of where responsibility lies for design. The trials have identified possible improvements in electrical design and reducing the height of the button above the road surface to improve durability.
- **Procurement** – The wind turbine supplier has since gone out of business. Therefore, it will be necessary to find a new supplier if a wider rollout is pursued. This also highlights the need to vet suppliers and supply chains, especially for more significant technology deployments.
- **Visual impact** – One future consideration raised was the visual impact of having wind turbines on columns which could be a point of contention in more rural or picturesque locations.

Business case

Benefits

The energy trial helped Buckinghamshire Borough Council achieve several objectives. These include:

- **Cost saving and environmental**: Renewable energy generated from the solar PV columns will reduce the amount of grid electricity required, producing measurable decrease in energy bills and carbon emissions for the council.
- **Innovation**: Trialling these technologies will increase the knowledge base within council of using these technologies and developing innovative solutions. Multiple generation sources feeding batteries can provide a more reliable energy supply than a single renewable energy generation source which can be variable.
- **Communication:** Produces visible story for the public of solar panels producing energy for lighting.

Costs

Trial costs:

- c.£47,500 total cost for solar, wind and kinetic road. This includes an estimated commercial cost for the kinetic road given that it is currently a prototype.

Annual ongoing fees:

- Operational cost for all technologies, estimated: £2k - £4k (estimated based on small renewable energy installations)
- Contingency (estimated based on knowledge of similar products)
    - Solar PV: £20-25k replacement every 10 years & £5k for unknowns
    - Wind turbines: £10-15k replacement every 3 years
    - Kinetic Road: £3-6k, incl. install - replace half of harvesters every year (due to novel technology)

Next Steps

All recommendations and next steps are subject to business case being proven and approval from the project Board

- Complete monitoring of technologies
- Assess wider appetite for installation and funding options
- Find new supplier for wind turbines
- Make improvement to kinetic road prototype – Action for University of Lancaster