

Resource Activity 2

Teaser: Renewables can generate energy in an intermittent manner, but we use energy constantly. How to match the energy demand with the available resources?

Intermittent power supply and energy storage

The power supply from renewable energy is almost always intermittent, meaning it is not available in a continuous manner. One solution would be to generate as much electricity as possible when the renewable resources are available (for example, during the day with solar power), and store that electricity until it is needed, for example, in the evening when everyone eats dinner and watches movies. But electricity storage is not simple; in fact, the lack of it is a key limitation that needs to be solved before introducing more renewable energy.

What we observe is an increasing mismatch between the possible supply and demand for electricity at a particular time. Hence the availability and the production of electricity is managed by the national grid. Their job is really challenging – you can try yourself. Power the grid in an online game <https://claudioa.itch.io/power-the-grid>

The options for the moment are to store electricity in:

- batteries, but these are costly and require rare materials (*e.g.* cobalt)
- pumped hydropower – where water is pumped to higher levels when electricity is available, and, when electricity is needed, the water is allowed to fall and power a turbine, hence, generating electricity. This is a good solution but requires access to a large amount of water.
- mechanical flywheels – here, energy is transformed into kinetic energy of a rapidly moving wheel. This is a simple and effective idea but can store energy for a relatively short time until the wheel slows down and eventually stops.
- chemicals – for example, hydrogen. We can use excess electricity for water electrolysis, hence, producing hydrogen. That hydrogen can be used as a fuel, releasing energy through chemical reactions. While this might be a rapidly developing idea, we need to figure out how to store hydrogen (it can easily escape from metal cylinders, diffusing through walls).