The ***Sustainable Energy Now*** project

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INTRODUCTION

Sustainable Energy Now (SEN) is a non-profit organization that promotes practical, sustainable and affordable strategies for adopting renewable energy. One important aim is to work out scenarios for Western Australia that will reduce CO_2 emissions in fixed electricity generation, using sustainable energy technologies. Our definition of "Sustainable Energy": energy that is renewable within a human lifetime, can be produced safely, equitably, and perpetually with minimal impact on the environment and future inhabitants.

Members of SEN are all volunteers. They have widely ranging backgrounds: Business, Engineering, Geophysics, Graphic Design, Information Technology, Law, Physics, Renewable Energy Technology, Sociology and Teaching.

OVERVIEW

The SEN project has the following stages:

1. Research renewable energy resources in general. Then make this information available concisely and clearly, along with examples of technologies to harness those renewable resources.

2. Research electricity generation technologies that can greatly reduce greenhouse gas emissions, concentrating on technologies that are economical and available now, or will become available soon.

3. Create a mathematical renewable-energy electricity generation model for Western Australia. It will account for variability in supply and demand, costs, transmission losses, and other practical factors and will simulate the electricity network using real-time input data (eg, wind speeds, wave data) for a number of scenarios. The model will make it possible to calculate the energy mix that yields the greatest reduction in greenhouse gas emissions at the lowest cost. It will also show the amount of other low-carbon energy sources (such as gas) that are required to "top-up" the supply.

4. Develop a 3D simulation using the mathematical model (possibly including Google Earth). The simulation will give users the option to see graphs of the power that can be generated at each location and time, what the costs and emissions are, and how this compares with WA's real-time electricity demand. The simulation may include an option for users to vary the power mix, select locations for power plants and see what effects this would have on electricity supply, greenhouse gas emissions and cost.

Additional refinements:

Other factors could be modelled as well, such as storage technologies and gains from improvements in energy efficiency. These can be used to further optimise the technology mix.

Further scope:

Once the model of Western Australia is complete, it can be extended to include other parts of Australia.

TECHNICAL PROJECT PLAN

The project is to simulate the WA electricity grid with maximum use of sustainable energy and in that way offer a vision of what is feasible.

The project has ten steps:

1. Identifying and investigating sustainable energy technologies, with an emphasis on their availability in WA, potential for large-scale application and economic viability. These technologies include:

   - biomass
   - geothermal
   - solar thermal
   - solar photovoltaic
   - wave
   - wind

   Each technology will be researched for:

   - Technical configuration
   - Capital costs, amortisation and lifespan
   - Installation costs and scheduling
   - Variability, maintenance costs and downtime
   - Energy payback period, allowing for embodied energy
   - Ramp-up for large scale installation

2. Obtaining data for variable energy resources such as wind and solar (preferably real-time data). Investigating locations and availability of non-variable resources such as biomass and geothermal. Looking into potential sites for sustainable power plants.
3. Creating a basic model that sums the output of any combination of sources in order to calculate total power output at a given time.
4. Comparing the total renewable power output with demand fluctuations of the WA Southwest Interconnected Grid System (SWIS) and in that way determine the maximum proportion of electrical power that can be generated by sustainable energy sources.
5. Analysing each suitable technology in detail and building that technical data into the model. The result: the total cost of power for any particular energy mix.
6. Optimising the energy mix in order to supply the maximum energy at the lowest cost.

7. Refining the model by including transmission line losses, reactive power matching, etc.
8. Working out a time line for deployment, considering availability of resources, labour, etc.
9. Investigating additional approaches, such as energy efficiency improvements and storage technologies and building those into the model.
10. Developing a 3D simulation using the mathematical model (possibly including Google Earth). The simulation will give users the option to see graphs of the power that can be generated at each location and time, what the costs and emissions are, and how this compares with WA's real-time electricity demand. It will also include visual detail of virtual wind-farms, wave-farms, and other power plants, showing where they could be located, how much area they would use and what they may look like. Additionally, the simulation may include an option for users to vary the power mix, select locations for power plants and see what effects this would have on electricity supply, greenhouse gas emissions and cost.

PROMOTIONAL CAMPAIGN

The simulation will be a vivid way to show how to maximize the contribution of sustainable energy technologies to WA's electricity generation.

The simulation results will be presented to the public by:

- the media
- participating in public events in WA
- presentations to schools and institutions

As our own SEN resources permit, we also intend to lobby industry and government to promote the use of these technologies.

RESOURCES

In addition to using published literature as a resource, we will ask a variety of organizations, industries and consultants to help in developing and reviewing SEN's project:

- Universities
- Commercial companies involved with the development and operation of electricity production and renewable technologies
- Other non-government organizations (for example, the WA Sustainable Energy Association and Conservation Council of WA)
- Organizations, businesses, individuals and the Government through sponsorship, donations and grants to fund the project

BUDGET

SEN is a voluntary organization, so our budget requirements will be relatively small: mainly purchasing materials and equipment, and where possible, paying for services of key persons in SEN whose work will require considerable time.

These costs include:

Administration, marketing and promotion

- Insurances: Public Liability, Volunteers Private Accident Insurance
- Photocopies, laminating, supplies, report printing and binding
- Fees: affiliation, bank
- Website hosting development and maintenance
- Display stand including, heading and laminating
- Posters, placards, flyers, banners
- Merchandising: bumper stickers, T-shirts
- Community News Classifieds, public notices
- DVD and documentation materials

Technical materials or information

- Model Development Coordinator (1-2 days a week)
- Raw energy data
- Simulation software
- Peer and consultant scientific review