St Helena Government

St Helena Energy Strategy

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Introduction and overview

1. Small-island states face a unique challenge. Their natural beauty, an asset as a tourist attraction, hides the fact that they have fragile ecosystems, vulnerable to climate change. They often rely on imported fossil fuel, even if they may have the potential for producing their own renewable energy.

2. St Helena is no different and the issue of energy on the Island is a risk to social mobility, fuel poverty, economic growth and the environment.

3. Through partnership work with Connect Saint Helena Ltd good progress has been made in terms of renewables with 28.8% of all energy used in 2015/16 coming from renewables. This is favourable when considering small Pacific Islands. (Appendix table 1).

4. However, more can be done and to achieve a future state where we are 100% renewable St Helena Government must lead and drive this objective with the support of existing and new stakeholders learning from other successful developments.

5. An example of this is the Island of Bonaire (pop.14,500), a small Island off the coast of Venezuela, famous for its beautiful marine reefs, which are visited by 70,000 tourists every year. What many of the tourists don't realize is that the majority of the electricity powering their needs comes from renewable energy.

6. Like many Caribbean islands, Bonaire originally relied on diesel fuel to generate electricity for residents, with a peak demand of 11 megawatts (MW). This fuel had to be shipped in from other nations, resulting in high electricity prices for Bonaire residents, along with uncertainty about when and how much prices might increase with changing fuel costs.

7. The Island is now home to 12 wind turbines with a total of 11 MW of wind power capacity, which contribute up to 90 percent of the Island's electricity at times of peak wind, and 40-45 percent of its annual electricity on average. Battery storage (6 MWh) is included in

order to take advantage of available power in times of excess wind, and provide that stored electricity in times of low wind. The battery also boosts the reliability of the overall system - it is capable of providing 3 MW for over two minutes, allowing time for additional generation to be started when there is a sudden drop in wind.

8. Another example of success is the Island of Aruba. The Prime Minister has pledged that the government will seek a transition to 100% renewable energy sources by 2020. In recent years Aruba invested US$300m to build a 20-turbine wind farm rated at 30mw that meets 20% of the Island's power needs. It replaced its old electric turbine with more efficient models, and is building a solar panel park. Between 2006 and 2013 Aruba reduced its imports of heavy fuel oil from 3,000 barrels per day to 1,700 barrels, saving some US$50m a year. The construction of a second wind park due for completion in 2016 will mean renewables will provide half of the Island's energy needs.

9. In April 2014, the government signed a partnership agreement with the international lighting company, Royal Philips, to revamp the Island's entire public lighting system by completing an in-depth assessment and providing solutions for public buildings and outdoor lighting systems. As part of the agreement, public buildings will be retrofitted with LED lighting to realize the benefits of energy efficiency. Philips will design a tailored solution for outdoor living that allows Aruba to maximize energy efficiency and improve current lighting levels to international standards. Philips estimates sustainable lighting could result in initial energy savings of 50-80% and lower annual CO2 emissions by 3,000 – 4,000 tons.

10. To demonstrate its commitment to the development of sustainable tourism, the authorities have entered into an agreement with the KLM airline to demonstrate the viability of aviation biofuel. For six months from May 2014, 20 KLM flights between Amsterdam and Aruba and the neighbouring island of Bonaire will be powered by biofuel this has been expanded in 2016 with 80KLM flights between Amsterdam and Oslo. The airline declared that the flights represent an important step towards proving that more sustainable aviation is possible.

Strategy intention

11. It is the intention of this strategy to become 100% self-sufficient on the national grid through renewable energy by 1st April 2022. Achieving this will significantly reduce the cost of electricity on the Island which is a key priority for SHG. This will be achieved through the following;

- To reduce energy costs for the community including all public, private and NGO entities
- A mixed model of energy production and storage
- A targeted strategy to reduce demand through greener more efficient products and practices which will include hybrid/electric vehicles
- To contribute to the global drive on climate change and the reduction in fossil fuel use
- To communicate the benefit and opportunities of renewables and efficient energy use which can reduce costs and emissions considerably
- Establish St Helena as a leader in this field and enhance our tourism credentials. Based on World Bank data St Helena is already achieving more renewables than most nations.

Strategy Statement

St Helena's energy strategy will aim to improve the social and economic well-being of its population, and minimize the impact on the environment. It will increase the production of energy through renewable sources, and reduce the island's reliance on imported fuels, increase fuel security and prize stabilization

Deliverables of the strategy

12. A coordinated implementation plan to cover the five year period will be produced to incorporate all stakeholders, including technical expertise, funders and innovative solutions based on evidence based success in similar locations as outlined above.

13. A range of incentives that will encourage the use of the following:

- Production and storage of a renewable energy strategy to reduce the end users utility costs
- Use of energy efficient technology strategy
- Phasing out of technology that is reliant on fossil fuels and harms the planet through legislation and Government support

Supply and demand

14. This strategy is concerned with both the renewable supply of energy and its use on the Island as well as ensuring a positive impact socially, economically and environmentally.

15. Both elements will be delivered by a project group which will have local and international experience and be accompanied by a robust media campaign to maximise exposure and understanding.

Supply – please see separate section

16. The supply element of this strategy will have three aspects, namely:

1. Accessing technical assistance to complete business cases and technical support based on achieving the maximum energy return for St Helena based on cost, location and natural resources – to be led by Corporate Services with input from stakeholders

2. Funding - source funding globally to deliver the business cases and the overall objectives of this strategy –this will be done in partnership with an NGO

3. On-Island delivery work coordinated with the major project teams and stakeholders

Demand – please see separate section

17. The demand element will have three sections, namely:

1. Incentivising the community, public, private and NGO entities to switch to or use greener more efficient technology through a range of financial and practical Government led support

2. Work with all stakeholders to inform, educate and celebrate as the Island moves to sustainability

3. Work to ensure St Helena is meeting her International obligations in terms of climate change

Finance

18. To achieve the strategy objective the project team will use evidenced-based business cases built on sound technological, social , economic and environmental studies to access funding that is available not just from HMG but across the globe. This will be undertaken by a specialist consultant in partnership with SHG.

19. SHG's strategic approach to providing incentives will be one based on the opportunity costs and longitudinal positive impact of achieving the strategy objectives opposed to the immediate short-term gains from import duty for example. This will support green building materials, white goods, lower emissions vehicles including hybrid/electric cars, lighting and renewable energy equipment across the Island.

20. With the aged and aging population on the Island SHG will provide practicable support to elderly residents and vulnerable people to deliver the strategy objectives.

21. The below table will consider potential sources that could be implemented on St Helena. The list considers both current and potential sources.

Supply

Potential Source	Positive outputs	Evidence	Potential for St Helena	Cost
Anaerobic Digestion (diagram1) is a series of biological processes in which microorganisms break down biodegradable material in the absence of oxygen. One of the end products is biogas, which is combusted to generate electricity and heat, or can be processed into	Successful applications of anaerobic digesters have proven that these systems provide valuable financial, environmental, social, and health benefits. This will be dependent on a cheap and easily accessible fuel supply	AD systems help reduce GHG emissions, control water pollution, and manage waste streams. Additionally, the systems lead to the production of alternative and renewable energy, which can improve quality of life in many areas of the world. The added revenue streams and financial	Work with the EU has been confirmed to take forward this project for the Island with a technical assessment and feasibility study	**TBC – Consultant to be appointed to consider viability on St Helena**

renewable natural gas and transportation fuels		savings from the production of biogas and commodities also create social, health and financial benefits for communities		
Solar Power/Photovoltaic (diagram 2)refers to the process to absorb the sun's rays as a source of energy for generating electricity or heating. It is clear that the costs of such technology are becoming affordable	Solar Photovoltaic panels constitute the solar array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications. The life span of solar panels is around 25 years and most will still produce 80% of original energy levels produced after 20 years	Italy generates more of its energy from solar than any other nation, with 7.8 percent of its energy coming from solar, compared to 6.2 percent for Germany. Italy has become a world leader in solar energy and South Africa have also invested in solar farms	St Helena already has both ground and roof mounted solar panels in operation. Land on the Island is at a premium and consideration should be given to roof mounted panels on the Islands 1,750 houses. Whereas some may be problematic in some rural locations, high density areas such as Half Tree Hollow should be prioritised. It is noted that not all roofs are suitable, with north facing roofs been more productive	The price of solar power, together with batteries for storage, has continued to fall so that in many countries it is cheaper than ordinary fossil fuel electricity from the grid. Based on international data a home may require up to 41,000 square inches of solar panels to function as well as the battery/link to the grid
Wind energy (diagram 3) uses an aerofoil powered generator to convert the wind's kinetic energy into electrical power. Consideration will be given to the best solution for the Island based on specification and deliverability	Wind energy has been used for decades and as a result of over a millennium of windmill development and modern engineering, today's wind turbines are manufactured in a wide range of vertical and horizontal axis types	As of the end of 2015, worldwide, total cumulative installed capacity from wind power amounted to 432,883 MW and increased by 17% compared to the previous year (369,553 MW). Denmark produces 39% of its energy through wind power and as of 2014	St Helena has already embraced wind power and there is scope for further development of wind power with the right investment and storage technology	Modern large scale wind turbines have rotor diameters in excess of 100 metres, tower heights in excess of 300 feet and are substantial structures weighing hundreds of tonnes. These projects require very large capital investments and lengthy periods of planning

		3.1% of the global energy production comes from wind with China leading the investment in 2015		approval including local consultation and impact assessment on the environment, aviation, aesthetics and wildlife
Bio fuel is a fuel that is produced through contemporary biological processes, such as agriculture and anaerobic digestion, rather than a fuel produced by geological processes such as those involved in the formation of fossil fuels, such as coal and petroleum, from prehistoric biological matter.	Biofuels can be derived directly from plants, or indirectly from agricultural, commercial, domestic, and/or industrial wastes. Renewable biofuels generally involve contemporary carbon fixation, such as those that occur in plants or microalgae through the process of photosynthesis	Biofuel is used globally in a variety of ways including to power cars and trucks. This use of biofuels is increasing year on year through biodiesel and ethanol for example which is very common in the USA , Brazil and in Europe most diesel is already mixed a % of bio-diesel	Bio fuels could be introduced to St Helena and would be able to provide an alternative to fossil fuels. Plants can be used in the production of bio fuels and this could help the Island in terms of conservation and recycling	As biofuel uses a combination of waste products and natural matter the cost would initially be a capital investment in plant, expertise and logistics
Tidal Power Tidal power, also called tidal energy, is a form of hydropower that converts the energy obtained from tides into useful forms of power, mainly electricity. However, the average tide on St Helena would not deliver this form of renewable energy.	Tidal power is regarded as a future key technology in delivery renewable energy. However, the relatively high costs have hindered its progress.	Tidal systems are in place around the globe and for example Construction of a 320 MW tidal lagoon power plant outside the city of Swansea was granted planning permission in June 2015 and work is expected to start in 2016. Once completed, it will generate over 500GWh of electricity per year, enough to power roughly 155,000 homes	There is potential for tidal power for St Helena but this will need to be considered with environmental concerns and the cost of the technology and the lack of tide.	The cost to the Island is a barrier for example, The Scottish Government has approved plans for a 10MW array of tidal stream generators near Islay, Scotland, costing 40 million pounds, and consisting of 10 turbines – enough to power over 5,000 homes

Conclusion and actions for the duration of this plan

22. As demonstrated in other small island states achieving 100% renewable energy is possible. To enable this to happen the following needs to take place on St Helena.

- A project team needs to be developed
- The type of source must fit the Island's capability
- Funding is central to this development and should be the key focus

23. The project team should have an on-Island presence and be able to draw in expert support. The focus should be on the generation and storage of energy based on Anaerobic Digestion, Wind Power, Solar Power and Bio Fuel. A mixed model supply is recommended and feasibility studies should be completed with business cases. Work around sourcing funding should start immediately. Consideration needs also to be given to private and public funding to make energy an investment opportunity for Islanders and investors.

Demand

24. As well as producing renewable energy we also need to encourage green technology and practices on the Island to enhance our green credentials, reduce the use of fossil fuels and help the fight against climate change. SHG will take a lead role in this area and will work to make being greener much easier and cost effective through incentivising and investing in energy efficient products. While it is acknowledged that some of the proposals may see revenues reduced, this needs to be weighed against the wider social, economic and environmental benefits that would be realised.

Proposed intervention	Objective	Examples	Impact on St Helena
Green taxation on goods that	Encourage the community and	Environmental taxes encourage	Positive impact reduced energy

have a low/zero carbon footprint and low energy consuming goods	business to buy green and low energy consuming products. Make these products financially attractive. To include building materials, white goods, light bulbs and explain the cost savings to the community	people/business to live in a more environmentally friendly way. They are common in many countries and are seen as a tool to encourage change	use and a greener and cleaner Island
SHG to launch a home solar panel scheme that links to the grid or powers individual homes- this will be led by SHG having solar panels on all of its buildings where appropriate	Encourage home owners to purchase and install solar panels with financial incentives	Solar panel grants are common in Europe and a scheme exists in the UK. It is also common for Public Sector buildings to have solar panels feeding into the grid	Renewable energy generated on buildings across the Island and fed into the grid
SHG to introduce a zero-duty rate for hybrid/electric vehicles and further review the rates for all vehicles	Support the importation of low emission vehicles to the Island	The UK has 25,000 electric powered cars. These are not subjected to car tax.	Lower emissions on the Island
SHG to introduce biofuel and electric vehicles to their fleet and use bio fuel in current existing diesel vehicles	SHG leading by example and also reducing costs on fuel	Biofuels are commonly used in a wide range of vehicles globally and the public service in the UK has used electric cars for a considerable period of time	Lower emissions on the Island and reduced cost to SHG
SHG to radically improve public transport so that it is cheap, reliable, flexible and encourages use of schemes like park and ride	This will have not only a dramatic impact on the community and mobility, but also provide a greener form of transport	Governments around the world invest in public transport infrastructure to improve the economy, mobility and the environment	Supports social, economic and environmental development

Conclusion and actions for the duration of this plan

25. As well as leading the way in terms of renewables SHG should also lead the way in terms of demand and use of energy. SHG should undertake the following;

- Create a working group consisting of an Chair of the Environment and Natural Resource Committee , Chief Secretary, Financial Secretary, Assistant Chief Secretary, Government Economist, ESH representative, Connect St Helena CEO, Enviromental Risk Manager, Private Sector representative and the Director of the St Helena National Trust to develop progressive taxation and support for the Island
- SHG should commit to using biofuel, investing and improving public transport and having solar panels on all of their buildings
- A robust, inventive and continuous communications strategy should be produced and implemented to incorporate all of the developments around energy

Appendix

Table 1 – Reliance on fossil fuels small Pacific Island 2015 Renewable Energy Development in Small Island - Matthew Dornan published July 2015

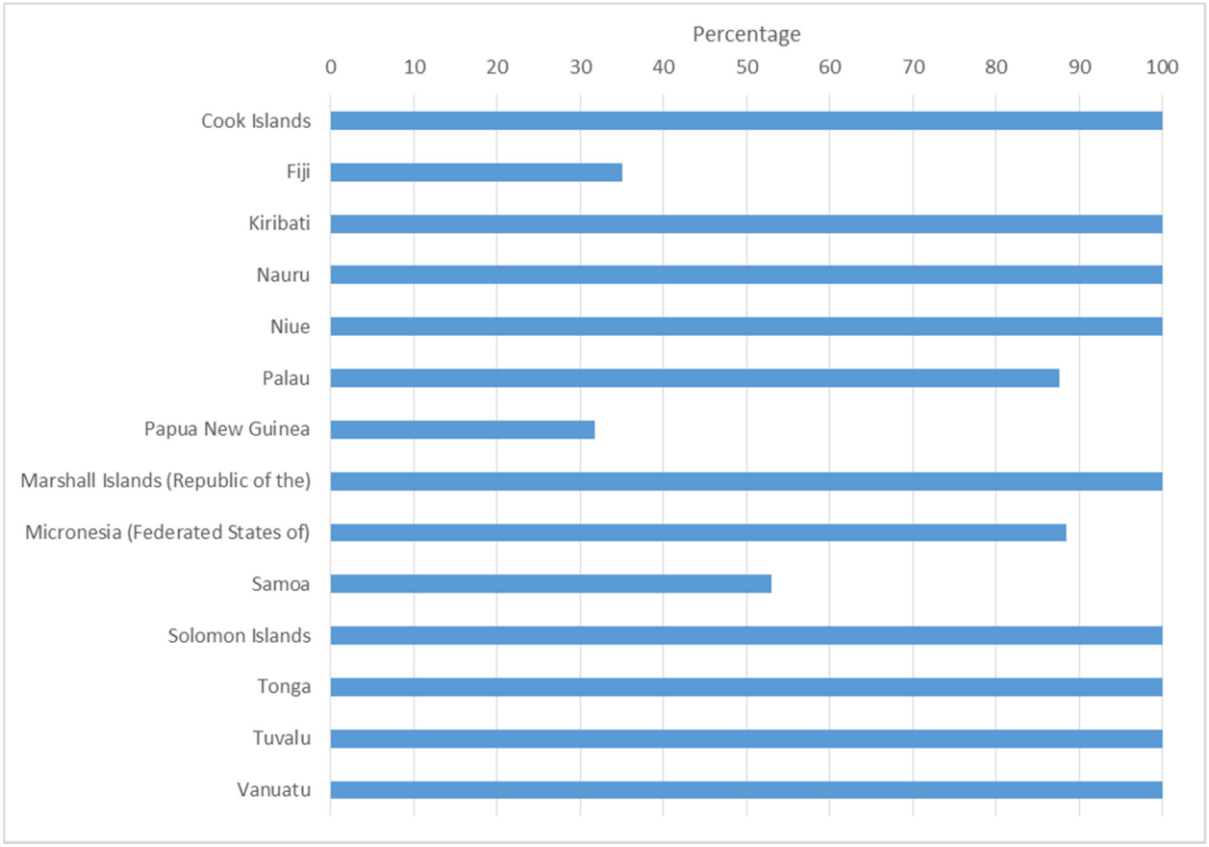


Diagram 1

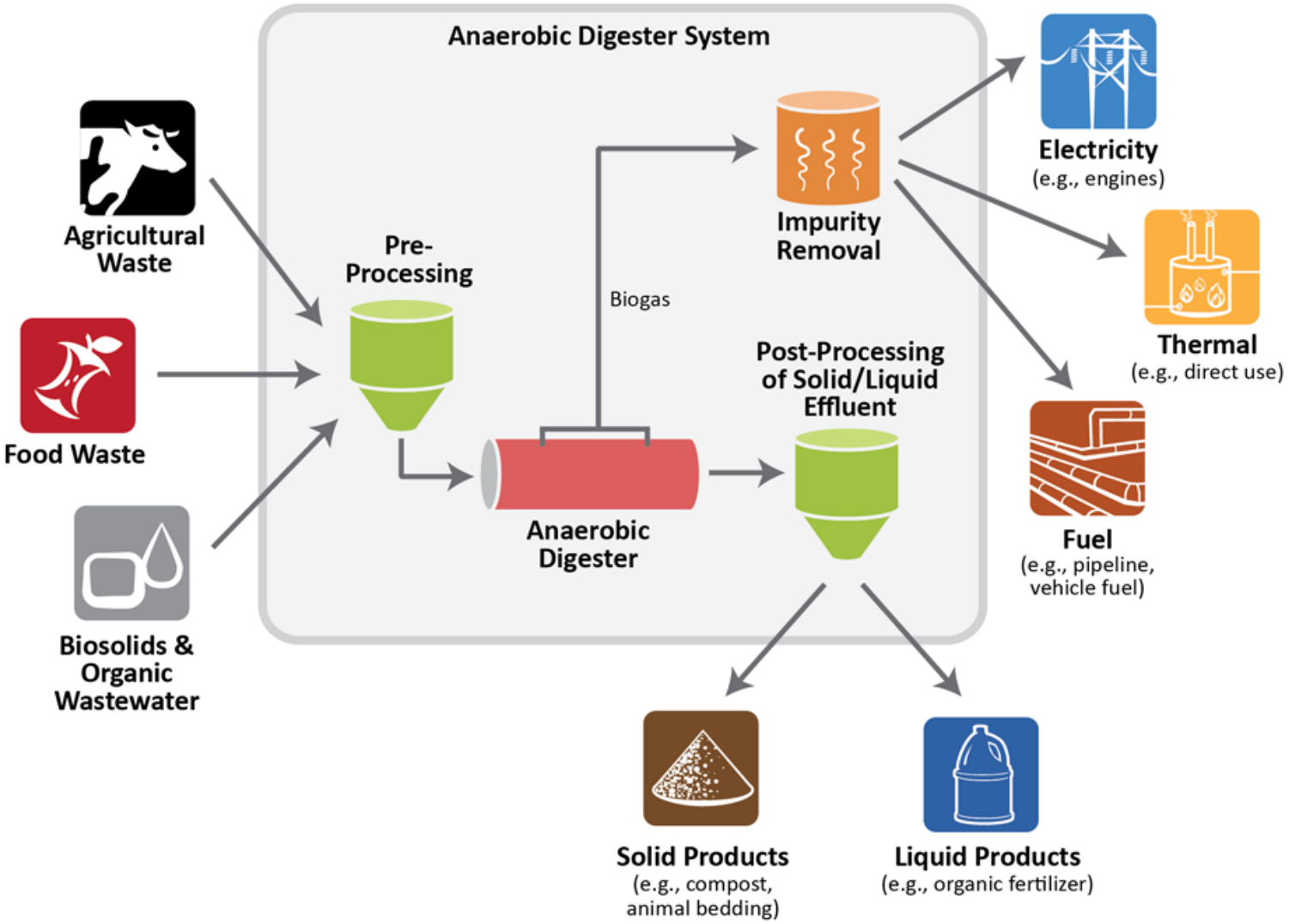

Anaerobic Digester System
Agricultural Waste
Food Waste
Biosolids & Organic Wastewater
Pre-Processing
Biogas
Impurity Removal
Post-Processing of Solid/Liquid Effluent
Anaerobic Digester
Electricity
(e.g., engines)
Thermal
(e.g., direct use)
Fuel
(e.g., pipeline, vehicle fuel)
Solid Products
(e.g., compost, animal bedding)
Liquid Products
(e.g., organic fertilizer)

Diagram 2

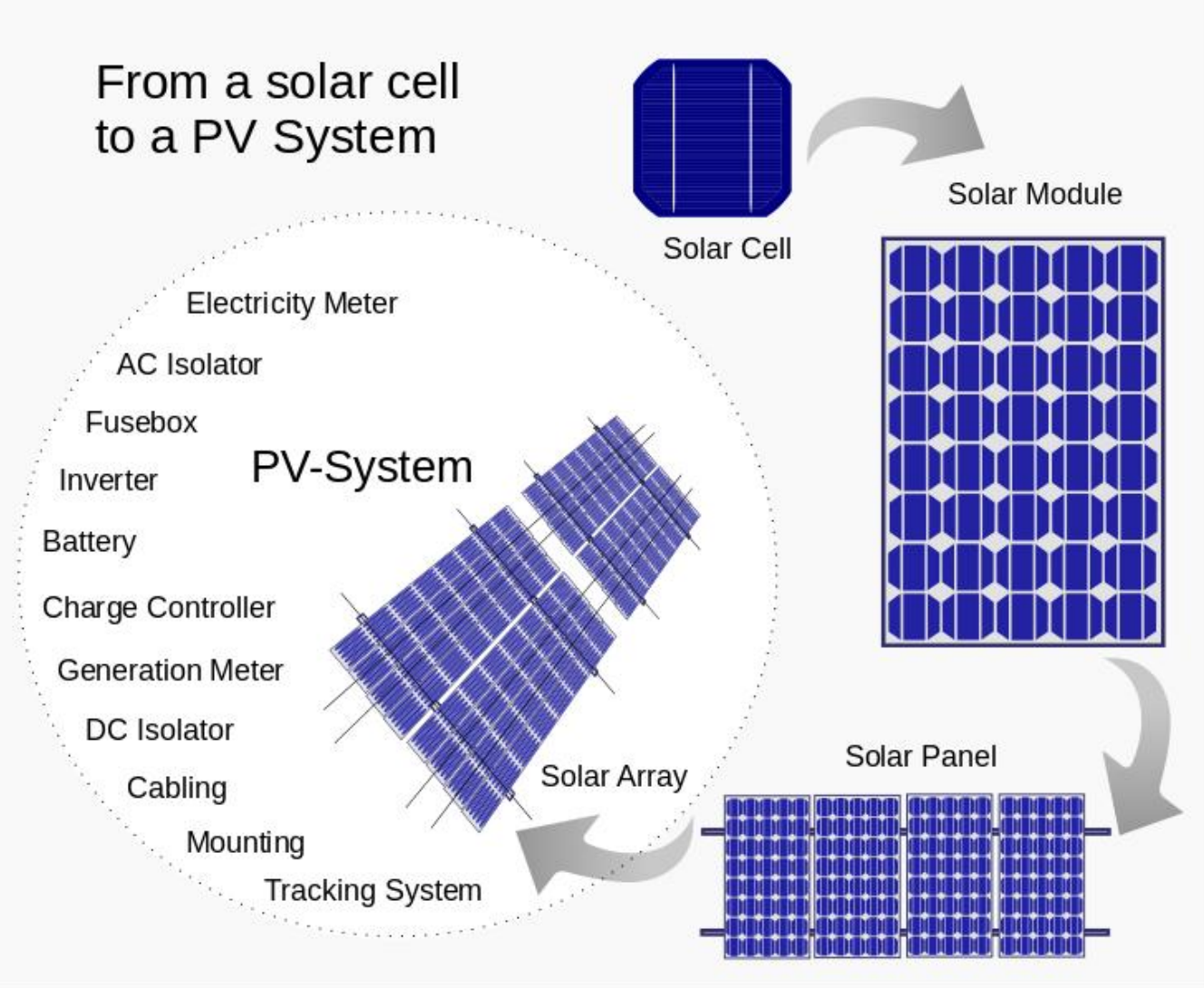
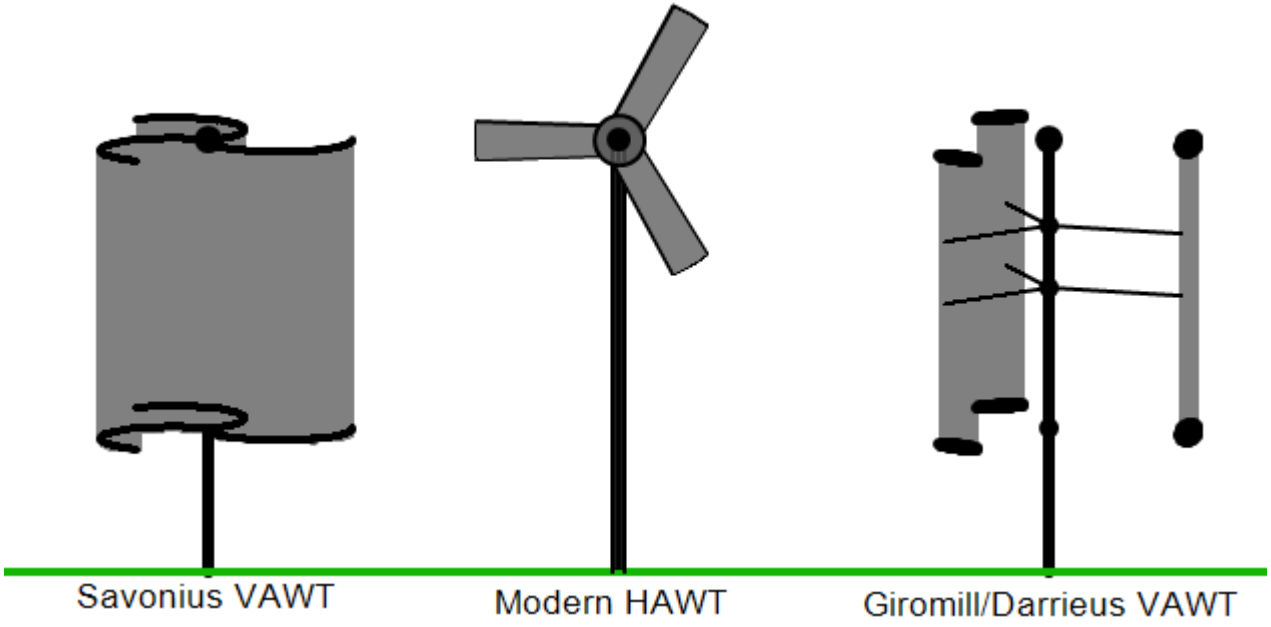

From a solar cell
to a PV System
Solar Cell
Solar Module
Electricity Meter
AC Isolator
Fusebox
Inverter
PV-System
Battery
Charge Controller
Generation Meter
DC Isolator
Cabling
Mounting
Tracking System
Solar Array
Solar Panel

Diagram 3


Savonius VAWT
Modern HAWT
Giromill/Darrieus VAWT