

Green Energy Projects and the Circular Economy: A Project Manager's Perspective

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Abstract

An accelerated need for appropriate measures to minimize climate change, cut down on carbon emissions, and shift away from fossil fuel usage has contributed to flooding growth into providing a solution for green energy on a global level. As green energy sector continues to grow, the calls for more sustainable practices go beyond just producing renewable energy. The principles of the circular economy when introduced to green energy projects can boost their sustainability, efficiency, and the long term impact. This article investigates the circular economy concept, its relevance to green energy projects, and the participation of project managers in enhancing a more sustainable future.

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1. Understanding The Circular Economy

The circular economy reduces waste and improve resource use. In this regard, the approach of the circular model differs from the traditional linear economic path of take-make-dispose, in that it would retain, as much as possible, the use of products, materials, and resources via ways such as recycling, repurposing, refurbishing, and reuse. In essence it deals with making closed-loop systems in which waste becomes a valuable input to the production process, hence minimizing demand for new raw materials and minimizing environmental degradation (MacArthur 2015; Geissdoerfer et al. 2017).

2. The Importance of Circular Economy in Green Energy Projects

Solar, wind, and bioenergy projects naturally contribute to sustainability due to the clean generation of energy. However, each of their developments, operation processes, and decommissioning still can create a significant amount of waste, deteriorate the environmental condition, and use natural resources. The circular economy in such projects could lead to better environmental and economic performances (Haas et al. 2015; Kirchherr et al. 2017). Certain key areas where circularity could create an impact in critical ways:

2.1 Resource Efficiency and Materials Management

Constructing renewable sources of energy such as solar panels and wind turbines uses huge amounts of metals, minerals and other materials. The concept of using a circular method can be understood from the point of making design of components that can be used for recycling. This will in turn help reduce dependence on natural resources.

In construction and manufacturing of equipment, recycled or sustainable materials can be used when promoted by project managers in order to make sure that suppliers comply with circular economy principles (Haas et al. 2015; Kirchherr et al. 2017).

2.2 Waste Reduction and Recycling

From construction to operation to decommissioning, green energy projects create waste during their lifetime. Circularity makes it possible to recycle and repurpose waste materials. For example, metals from decommissioned wind turbines can be recycled and used in new projects, and waste biomass can be used for generating bioenergy.

This would also allow project managers to facilitate collaboration between different industries in such a way that waste in one particular industry could become a resource for another, hence developing a more holistic and integrated approach to resource management (Haas et al. 2015; Kirchherr et al. 2017).

2.3 Extending the Life Cycle of Equipment

The principles governing the circular economy encourage the reusing of products. Regarding green energy projects, this involves maintaining and repairing solar panel systems and wind turbines, including other components, so that they may function for an extended period rather than being replaced.

Project managers can also facilitate maintenance schedules, monitor equipment health, and work with companies that refurbish renewable energy equipments. It helps ensure that equipment can operate well into old age, limiting waste and minimizing the carbon footprint associated with making new components (Haas et al. 2015; Kirchherr et al. 2017).

2.4 Energy Storage and Efficiency

While balancing demand and supply in renewable projects is crucial, efficient storage of energy is also vital. The principles of the circular economy encourages reuse of used batteries and also points to new, more sustainable, and recyclable storage technologies.

Project managers can ensure that all energy storage solutions which the project will be adopting are fully compatible with recycling programs in order to minimize waste and increase energy efficiency (Haas et al. 2015; Kirchherr et al. 2017).

3. The Role of Project Managers in Driving Circularity

As project managers, they have strategic positions to influence and drive the adoption of the circular economy across projects of green energy. The following are some of the strategies they can use in that direction:

3.1 Incorporating Circularity in Project Design

From the early planning stages, project managers can collaborate with engineers and designers to embed circularity into the project design. It can include choosing recyclable materials, designing for modularity or including features that will make it easier to disassemble and recycle at the product's end-of-life (Silvius & Schipper 2014; Ghisellini et al. 2016).

3.2 Establishing Partnerships and Supply Chains

Collaboration with suppliers and partners who share in the commitment of circular practices is important. Project managers can make sure that suppliers are vetted to verify their use of recyclable or sustainable materials and follow environmentally friendly practices.

If the stakeholder network is to be built with recyclers, refurbishers, and other industrial players, one can imagine it bringing into being a closed-loop system in which materials could be constantly cycled (Silvius & Schipper 2014; Ghisellini et al. 2016).

3.3 Setting Performance Metrics and Monitoring

Applying the circular economy principles in a project involves establishing goals and metrics on the reduction target of waste, improved rate of recycling, and resource efficiency benchmarks. A project manager should track these metrics over the lifecycle of the project as a way of measuring progress against set goals.

Regular audits and assessments can make sure that all rules are followed and make it easier to report the benefits that the environment gets from taking a circular approach (Silvius & Schipper 2014; Ghisellini et al. 2016).

3.4 Advocating for Policy Support

The effectiveness of circular economy practices usually relies on supportive policy and regulation. Project managers can also play an advocacy role in liaising with industry bodies to urge governments to adopt policies that will advance recycling, sustainable sourcing, and circularity in green energy projects (Silvius & Schipper 2014; Ghisellini et al. 2016).

4. Examples of Circular Economy in Action

4.1 Wind Turbine Blade Recycling

Canvus works on recycling wind turbine blades, which are normally manufactured with non-recyclable composite materials. Canvus repurposes retired blades into long-lasting public furniture such as benches, tables, and playground structures. These upcycled furniture pieces can be durable, accessible according to ADA requirements, and placed in community areas across the nation. This process eliminates waste while providing value to public spaces through the creation of artistic and serviceable structures. Canvus continues doing this via community installations such as at the Great Lakes Science Center in Cleveland (Markham, 2024).

4.2 Solar Panel Repurposing

Companies like Solara, for example, have taken programs on the recycling of old or slightly degraded solar panels to create low-cost renewable sources of energy in remote or developing areas. Instead of landfills, these can be taken out and treated to give power to those places that otherwise may not have electricity, thus extending their useful life and reducing electronic waste. This is in connection with sustainable development goals by offering energy access without further environmental issues (Simmons, 2024).

4.3 Bioenergy from Organic Waste

Organic waste from either food processing by-products or crop residues undergoes conversion to bioenergy in many agricultural facilities. These processes break down organic matter through anaerobic digesters into biogas and, therefore, offer a renewable energy source. In Europe, countries such as Germany are able to provide energy derived from bio-waste to power both industrial and residential areas. This is a very good example of a closed-loop system, whereby waste that would otherwise be considered worthless material becomes a highly valued energy source and organic material disposed of at minimal environmental consequence (Energy from Biogas, n.d.).

The following examples show the enactment of circular economy thinking in green energy projects. Canvus recycles wind turbine blades into durable public furniture-materials otherwise non-recyclable. This should, therefore, be a function of the project manager in leading innovative and sustainable solutions capable of reducing waste and creating value. In a similar vein, allowing old solar panels to be converted into sources of energy for remote areas enables Solara to stress the importance of material lifecycle extension-the central issue of sustainable project management. This is not only vital in terms of reducing electronic waste but also in terms of key sustainable development goals. The European bioenergy example shows a closed-loop system wherein farm waste is transformed into a form of energy of real value. It is also an example of how project managers can incorporate within projects processes that minimize environmental impact and get the greatest efficiency out of resources. These types of initiatives underpin the important work that a project manager does in driving projects within a circular economy whereby green energy projects are made sustainable, economically viable, and socially beneficial. By delivering such projects, project managers play their part in making a better future.

5. Conclusion

Incorporating the principles of the circular economy to renewable energy projects is a huge area of potential, increasing sustainability, reducing costs, and minimizing environmental impacts. At the core of driving this transformation are project managers, taking circular economic principles from the outset of planning and design through to implementation and decommissioning. By adopting resource-efficient strategies, reduction of waste, and partnership, a project manager will be certain that the transition towards green energy is a step towards clean power and not just towards a truly greener future.

This also befits the holistic approach to a sustainable economy and underlines the importance of systems thinking in project management, where each stage and component of a project will be playing its role in one large, circular ecosystem.

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