

Innovation Failures in Energy

The dwindling supplies of global hydrocarbon resources and an ever increasing demand for clean, environmentally friendly sources of energy are driving innovation in the Renewable Energy sector. The economic, environmental, and social benefits of innovation in this sphere are unquestionable including an uptake in good paying high tech jobs and a simultaneous reduction in environmental pollution that not only raise the standard of living of societies but increases longevity. However, while there have been many successful innovations in this sector, there have also been many failures that have had devastating consequences on companies, regions, and even countries. While research shows that some failure in such an evolving industry are typical, studies also show that some of these failures could have been averted if companies had followed some fundamental innovation principles. The objective of this paper was to identify some innovation trends in six areas of the renewable energy sector with a focus on innovation failures and the lessons that can be learned from these failures. The following are the key findings.

Hydro

Over the past few decades, innovations in Hydro have been predominantly incremental including increasing dam and reservoir size and improving turbine and generator designs. Mismanagement of many of these Hydro projects has been a common theme. This issue has resulted in schedule and cost overruns and hurried production that has led to disasters. The magnitudes of some of these disasters have had major negative economic, social, and environmental consequences. It has been found that many of these projects can benefit from following a structured approach to problem solving that will help better identify and anticipate challenges up front to prevent “downstream” consequences. As well, the Hydro industry in general can benefit from better regulation to improve the safety of using this relatively cheap, clean resource.

Nuclear

Ever since the atom was split, the nuclear industry has benefited from both incremental and radical innovations that have progressively improved nuclear power performance and safety. These innovations were geography independent and were evident in the developments of many nuclear players worldwide. The devastation resulting from failures at Three Mile Island, Chernobyl, and Fukushima have had significant negative social, environmental, and economic consequences and have generally tarnished the image of the nuclear industry. These failures highlighted the need for automation, inherent safety, and a systems approach to nuclear reactor design. Additionally, there is a need to streamline and harmonize organizational and regulatory structures to reduce cost and schedule overruns.

Solar

The Solar industry grew from disruptive innovation that took place in the electronics industry and has sustained on incremental innovation for the past 30 years. An attempt at a breakthrough innovation by Solyndra caused a much publicized failure that resulted from Solyndra’s inability to compete when suppliers’ prices rose. Large companies like Siemens have also failed in this industry. The political and economic ramifications of Solyndra’s failure on the entire renewable energy sector are still being felt. Research indicates that companies need to control growth, understand the inter-relationship of the market conditions and competing technologies, and accelerate product development to capitalize early on technologies before they become defunct. Governments also have a pivotal role to play.

Wind

The Wind power industry has also benefitted from incremental innovation over the years, originating predominantly from Denmark. Denmark uses a social-based, collaborative approach to wind energy innovation (an “innovation system”) that has created a very successful industry there. In contrast, the industry in North America is stifled by negative connotations about wind energy and the inability of developers to overcome resistance to the technology. Research suggests that the North American industry can benefit from the Danish model of a more collaborative environment and knowledge sharing.

Bio-Fuels

Although there is significant innovation occurring in Bio-Fuel processing and production, bio-fuels are still not widespread since they are not competitive with traditional petroleum-based fuels. The technology also requires vast amounts of land which potentially displaces land available for agricultural products. The industry could benefit from better policies, regulations, and government support and acknowledgement of bio fuel’s positive long-term sustainability effects.

Energy Storage

The Energy Storage industry has also experienced notable incremental and radical innovations, but has also had its share of notorious failures. Despite its great potential, research indicates that many companies grossly underestimate the energy storage challenge and fail to take a holistic approach to understanding their capabilities and technologies in the context of a rapidly evolving market and regulatory environment. Others do not create appropriate business models to be able to sustain. Additionally, regulations and other non-technical issues within the energy industry itself create an environment that is hostile to innovation. To avert these problems, a solutions-based, collaborative approach to the energy storage industry is recommended.

Concluding Remarks

Generally, the regulatory environment, problems with diffusing innovation, and poor decision making are some fundamental problems that need to be corrected in the renewable energy industry. Solving these problems facing the industry require a more collaborative approach that builds upon synergies and knowledge of all stakeholders. Additionally, it should be emphasized that failure, while unpalatable, is a necessary element to innovation. Finally, the following are key recommendations for entities interested in pursuing innovation in the renewable energy sector:

- consider a more collaborative approach to the energy problem to benefit from synergies; this includes sharing of risks and knowledge
- explore and develop strategies to diffuse and deploy technologies before investing heavily in infrastructure to develop technologies
- focus on solutions to the energy problem or customer needs to be fulfilled rather than on technologies—this will enable companies to better sustain
- approach growth in a calculated and controlled way
- find ways to decouple the energy problem from politically linked funding
- develop strategies to encourage the regulatory environment to catch up with the needs of the sector