

Low-Cost Energy Storage Critical for Widespread Adoption of Green Energy



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The widespread availability and adoption of clean, renewable sources of energy is one of the top challenges facing humanity today. Inexpensive, clean energy not only alleviates the threat of climate change, but will also have a positive impact on development, as the world-wide demand for energy continues to increase.

Simply put, clean technology is essential to a sustainable economy.

The development and deployment of clean energy sources are receiving major attention and investment both nationally and internationally. The catch is that solar, wind and tidal power are all intermittent and require efficient, low-cost energy storage to deliver an increasing fraction of our energy demands. Since there is currently little capacity to store energy, green power is now sold when available instead of when it's most valuable, or most needed.

Atlantic Canada is in a position

to lead the development of renewable energy production and storage. Traditionally a region that has relied on high-carbon energy production, Nova Scotia has led the country in transitioning to low-carbon sources. We are home to the world's highest tides, steady winds, as well as one of Canada's major research universities. At Dalhousie University, the development of advanced materials for clean technologies is one of our strategic research priorities, including solar cells, tidal generation, heat-storage materials and metal-ion batteries. Nova Scotia has both the renewable resources and the technological expertise to lead Canada's renewable energy revolution.

Dalhousie University's Jeff Dahn is one of the top researchers in battery technologies. His research is funded by Tesla Motors (the company's first partnership with a university), through the Industrial Research Chairs program. Dr. Dahn and his

team are improving rechargeable Lithium-ion batteries, and they've already made significant progress by making cells more cost-effective. Now they're working on increasing battery lifetime and energy density so we'll all have the power to run our cars, homes and lives with clean energy.

With new energy technologies, it is critical to understand not only the benefits, but also the impacts and trade-offs associated with the choices between candidates. For instance, if we attempted to harvest the tidal energy of the Bay of Fundy to the degree that it would take to provide sufficient energy for the province of Nova Scotia, it could lower the height of the tides, creating a Catch 22. The deployment of offshore wind turbines benefits from steadier, more predictable winds, and avoids the concerns of noise pollution near residential areas, but at a substantially increased cost of electricity

compared to onshore installation. At Dalhousie, our depth in ocean research and atmospheric science, as well as energy policy, enables researchers to work together across disciplines to guide the development of future renewable energy systems that optimally meet the needs of society.

In 2015 at COP21 in Paris, Prime Minister Justin Trudeau stated that "Canada can and will do more to address the global challenge of climate change." This marked a major shift in the country's approach to climate change. It is a conscientious step towards carbon-free energy, and will lead to increased opportunities for businesses and innovation in renewable energy. Going forward, significant research and development will be needed to match ambition with action. Canada has already committed to a number of alliances, including Mission Innovation. Announced on November 30,

2015 by the leaders of 20 countries, Mission Innovation aims to reinvigorate global clean energy innovation with the objective to make clean energy not only affordable, but widely available. Each of the 20 participating countries and the European Union are aiming to double their governmental and/or state directed clean energy research and development investment over five years. For Canada, that means a \$775 million investment.

While important progress has been made in cost reduction and deployment of clean energy technologies, the pace of innovation and the scale of transformation must continue to accelerate. As intermittent renewables contribute to an increased share of our future energy needs, the demand for economical energy storage will skyrocket. Innovative research being done at Dalhousie will help meet these challenges.