Lt. Gov. Presentation

Side #8:

Introduction by Prof. John Kidder – 1 min / 30 sec

David Zuckerman is the 84th Lt. Governor of the State of Vermont.

David served as a State Legislator for 14 years (1997-2010) in the Vermont House representing the City of Burlington. For six of those 14 years he served on the Natural Resources and Energy Committee.

As a State Senator (2013‑2017), David worked on developing and expanding renewable energy in Vermont. For his work on renewables, David was named the 2013 Legislative "Climate Champion" by Renewable Energy Vermont.

As Lieutenant Governor (2017‑2021), David was nationally recognized for his leadership in 2019. David was appointed to the leadership committee for the National Lieutenant Governors Association, the nonpartisan, professional association supporting lieutenant governors.

David's Keynote address is titled ***Reflections on Vermont's Energy Economy***. Let's give a warm welcome to Lt. Governor David Zuckerman

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Slide #9:

Opening Statement, Script – 1 min / 30 sec

Thank you, Professor Kidder. Thank you all for the warm welcome. And thank you Renewable Energy students for inviting me to speak at this Capstone project event.

My brief keynote address today will offer "reflections" on the Vermont energy economy. It will highlight a few emerging technologies that that need more emphasis in Vermont's Clean Energy Plan.

But first, the economy. Yes, Vermonters spend more than $2.3 billion on energy services, especially with the recent price increases in transportation fuels and heating oil. And, yes, more than $1.7 billion leaves the state.

We need to keep those dollars working for the Vermont economy, especially the $1.3 billion, or more, that Vermonters now pay for imported petroleum products.

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Reference: Energy Information Agency (EIA) – State of Vermont
http://www.2023mec4722.online/uploads/1/4/4/4/144457539/vermont_energy_profile.pdf

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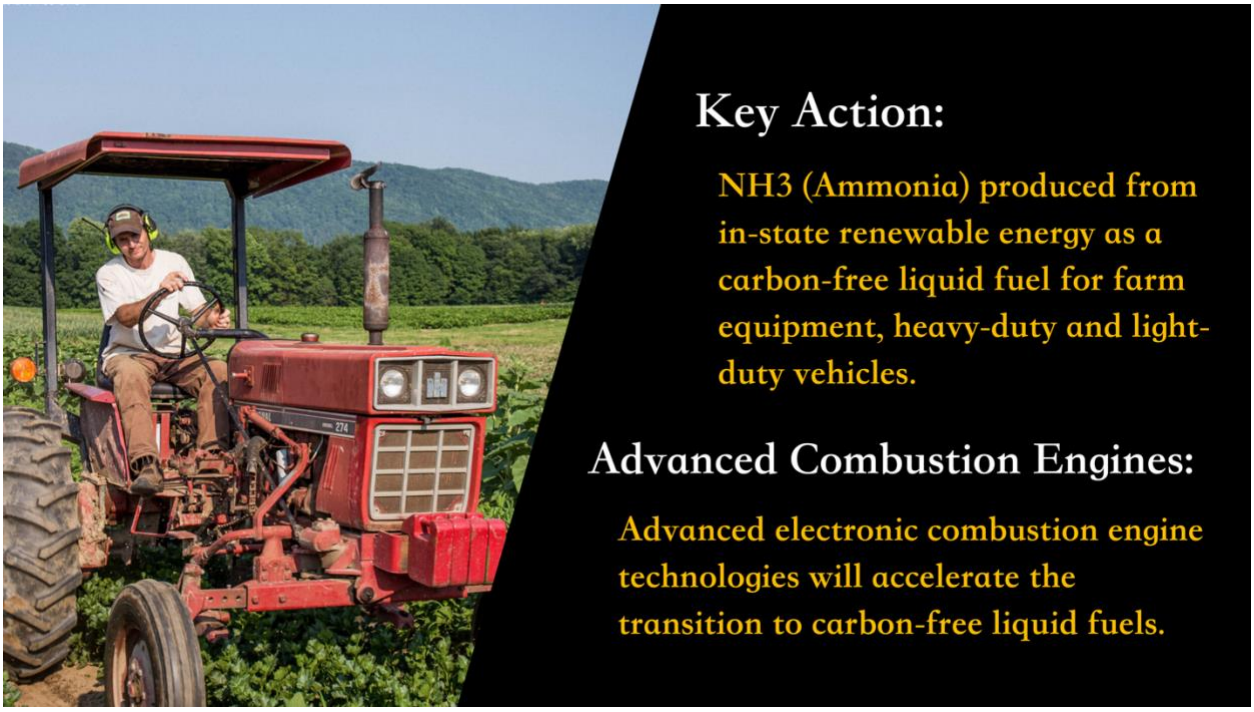

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The Vermont Clean Energy Plan needs greater emphasis on diversifying alternative liquid fuels. NH3 (ammonia) produced from renewables is emerging as a viable carbon-free alternative liquid fuel for farm machinery, heavy-duty and light duty vehicles, and automobiles.

With minimum engine modification, today's combustion engines can be converted from mechanically actuated pistons and valves to advanced electronically actuated pistons and valves (with power transferred hydraulicly) at a relatively low cost.

The Ammonia Energy Association (AEA) is a multi-sector trade organization. AEA membership consists of major chemical producers, energy service companies, investment firms, engine manufacturers, oil companies, and utilities, etc. Over 200 members, including such well-known brands as BASF, Black and Veatch, BP, Cummins, Eastman Chemical, EDF Renewables, Maersk, Mitsubishi, Nebraska Public Power District, Shell, Total Energies, and Vestas.

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References:

https://www.ammoniaenergy.org/ https://www.ammoniaenergy.org/paper/
https://www.ammoniaenergy.org/members/

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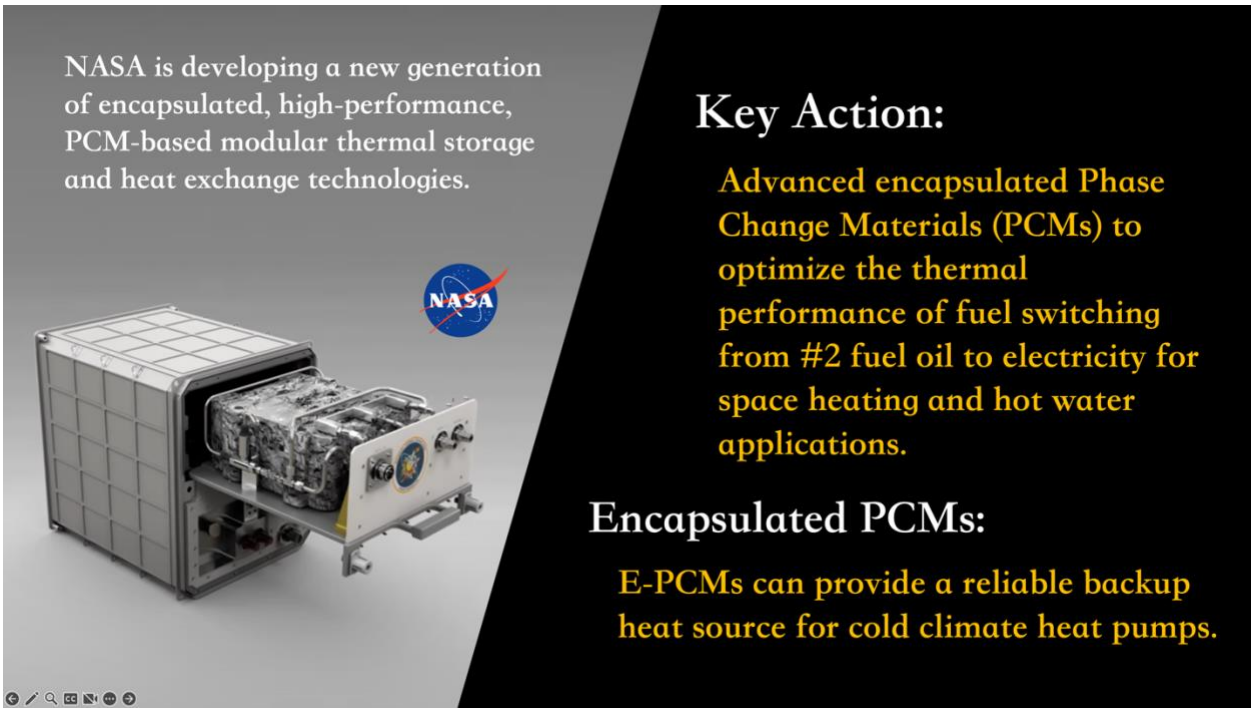

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As Vermont seeks to achieve the installation of 300,000 cold climate heat pumps by 2050, as referenced in the 2022 Vermont Clean Energy Plan, heat storage will become increasingly critical to manage electric grid stability and reliability during the coldest days of the year when heat pump efficiency is reduced.

NASA is developing a new generation of encapsulated, high-performance, PCM-based modular thermal storage and heat exchangers that can provide a reliable backup heat source for cold climate heat pumps.

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References:

https://www.nasa.gov/feature/nasa-to-begin-testing-next-generation-of-spacecraft-heat-exchangers

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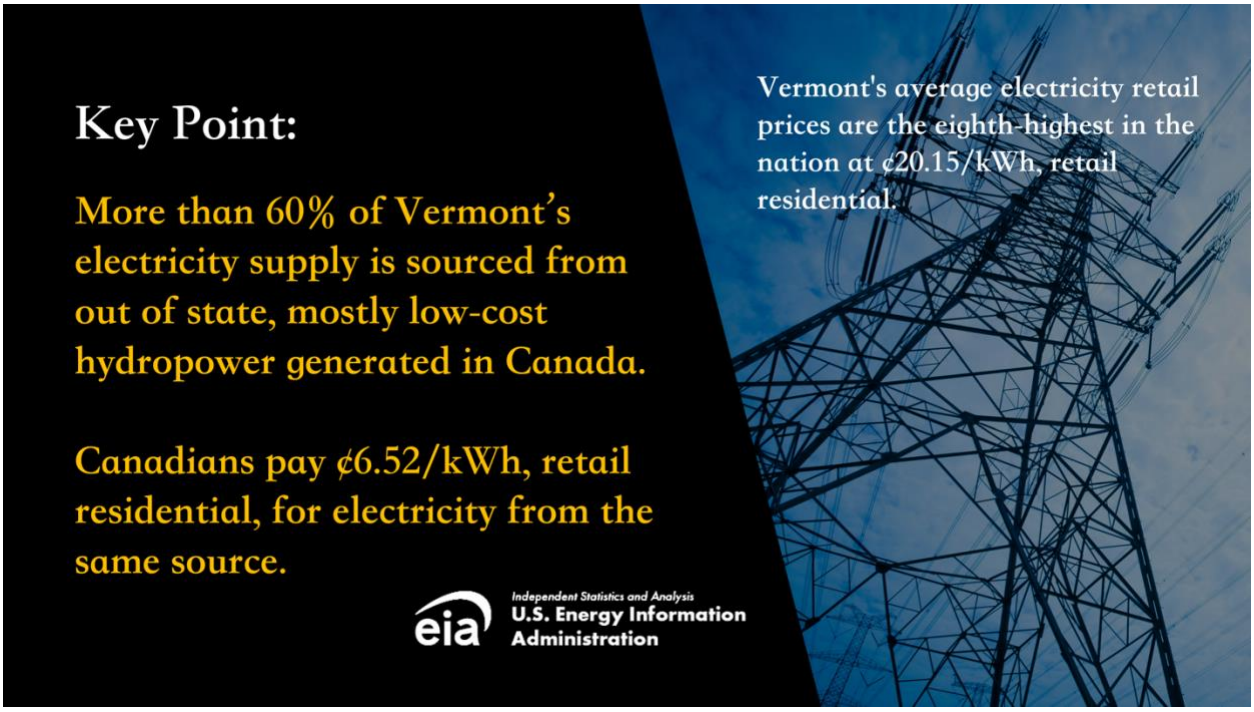

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Again, as in the petroleum sector, more than half of Vermont's electric power is sourced from out-of-state. Today, Hydro-Québec alone provides 25% of our electricity.

Canadians pay ¢6.52/kWh (retail residential) for their electricity from Hydro-Québec, while Vermonters in the residential sector on average pay ¢20.15/kWh.

One reason for the high price of electricity in Vermont is the cost of maintaining our aging power grid.

In the words of Chad Farrell, founder and CEO of Burlington-based Encore Renewable Energy, "Grandpa's grid has got to go."

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References:

http://www.2023mec4722.online/uploads/1/4/4/4/144457539/hydro_quebec.pdf

https://www.sevendaysvt.com/vermont/grid-block-vermonts-aging-transmission-network-cant-keep-pace-with-green-power-projects/Content?oid=32560538

Slide #13:

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Vehicle to Grid technology, or V2G, allows energy to flow from the grid to the vehicle when charging the vehicle, and vice-versa, to provide additional power to the grid.

This allows V2G-equipped electric vehicles to act as Energy Storage Systems (ESS) when they are parked and connected, which can help improve the efficiency and value of intermittent renewable energy like solar and wind.

And . . . V2G technology promises to provide revenue for the consumer to offset the expense of purchasing an electric vehicle. Vermont is now demonstrating V2G technology with EV school buses at South Burlington High School.

However, the automotive industry is resisting cooperation on the V2G solution due to battery warranty issues. Will Vermont require legislation mandating that all electric vehicles sold in the state be equipped with bi-directional charging capacity to advance this solution?

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References:

http://designer-b309d1194836.loginportal.site/uploads/1/4/4/4/144457539/pecan-street-v2g-case-study-may-2020-final.pdf
https://www.power-grid.com/der-grid-edge/vermont-follows-mass-with-ev-school-buses-that-support-the-grid/#gref

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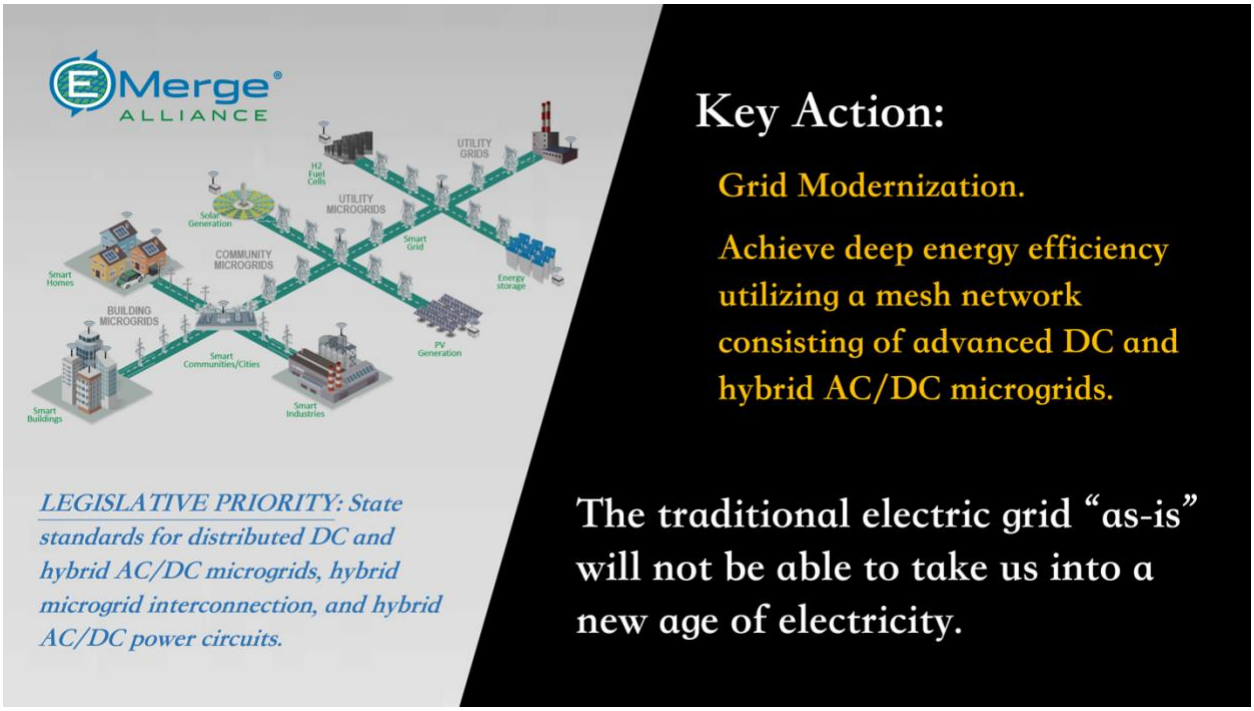

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To quote the American Society of Engineers: "All three major components of the electric grid (generation, transmission, and distribution) have an investment gap. To meet the latest state-driven Renewable Portfolio Standards in generation infrastructure, the gap is projected to grow to a cumulative $197 billion by 2029."

This investment shortfall is causing great economic harm. For example, the 2018 California wildfires season, caused by a combination extreme drought and faulty grid infrastructure, resulted in $148.5 billion in economic damage nationwide, and bankrupted PG&E, the Pacific Gas and Electric Company.

The transition to a distributed DC and hybrid AC/DC microgrids, hybrid microgrid interconnections, and hybrid AC/DC power circuits, as shown in this slide, will be complex and expensive, and will require unprecedented cross-sectoral cooperation.

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References:

https://www.emergealliance.org/
https://infrastructurereportcard.org/cat-item/energy-infrastructure/

https://wfca.com/articles/cost-of-wildfires/#:~:text=Currently%2C%20there%20is%20no%20standardized,%24148.5%20billion%20in%20economic%20damage.

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As Interim President Mike Smith stated in his welcome message, the Vermont Tech campus of Vermont State University (VTSU) has been the leading higher education institution in the state for workforce development in the clean energy sector.

Vermont needs the capacity of the Vermont Tech campus to address the climate crisis and to grow a robust in-state energy economy with thousands of high paying clean energy jobs.

If we do not seize the opportunities before us at this historic transformation of the Vermont State College system, the economic benefits of high paying jobs in the energy efficiency and renewable energy sectors will leave the state as well.

Thank you, and congratulations Capstone students!