

ATTACHMENT 11
Commitment and Support Letters

Letter of Commitment/Support # 5 of 6 for Wind Harvest International	
Type of Letter	<input type="checkbox"/> Commitment <input checked="" type="checkbox"/> Support
Commitment Letter Subject Matter (select one or more as appropriate)	<input type="checkbox"/> Match Funding <input type="checkbox"/> Project Partner <input type="checkbox"/> Pilot Test/Demonstration/ Deployment Site
Type of Match Funding (if applicable)	<input type="checkbox"/> Cash in hand <input type="checkbox"/> Travel <input type="checkbox"/> Equipment <input type="checkbox"/> Subcontractor costs <input type="checkbox"/> Materials <input type="checkbox"/> Contractor/project partner in-kind labor <input type="checkbox"/> Information technology costs services <input type="checkbox"/> Advanced practice costs
Author of Letter (name and title)	Harry Halloran, Founder, Chairman and CEO, Energy Unlimited, Inc.
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ENERGY UNLIMITED, INC.

June 5, 2017

Dear California Energy Commission and grant reviewers,

I have been involved in California's wind industry from the 1980s as an operator and owner of wind farms, the owner of a turbine maintenance and repair business and a wind energy technology company and a past President of AWEA. I speak from this deep knowledge of and involvement in the US wind industry in supporting Wind Harvest International's proposed research and development project "Improving VAWT Capacity Factors and Proving the Applicability for Use in Existing Wind Farms to Reduce Renewable Energy Costs for CA Ratepayers".

Energy Unlimited Inc., the company that I own that is based in the San Geronio Pass, owns and operates wind turbines totaling approximately 45 MW. EUI has long been interested in how to increase the Capacity Factors of its assets. We understand that the WHI's technology provides wind farms with the ability to access strong winds at 10m above ground level where it is otherwise an untapped resource.

We further understand that the key to doing this is to prove that VAWTs do not harm HAWTs by creating problematic turbulence and wake. The research proposed by WHI will help determine what size, solidity and other attributes VAWTs should have to safely incorporate into a HAWT wind farm. Once it is shown that wind farms can add a double layer of VAWTs, we anticipate many other companies to compete with WHI to provide the VAWTs to this market opportunity

The possibility that VAWTs could increase the wind speeds reaching HAWT rotors is additional upside to the WHI technology. My wind technology company, Frontier Wind, has long explored ways to increase the capacity factors of wind turbines through active load management. Its pre-commercial product, VariLoad, holds great promise for extending the length of HAWT rotors to better capture low wind speeds while being able to also withstand high wind events. Because of our work on VariLoad I know that the concept of adding VAWT arrays beneath a HAWT to cause winds to speed up into the HAWT rotors may offer further promise for increased capacity factors. It may be that different sizes, heights and solidities of VAWTs will create better results for different sizes and models of HAWTs. The CFD modeling work needed to prove this can come from WHI's research. Frontier Wind, with its technical skills, intellectual property and experience would be in a unique position to collaborate with WHI on any breakthroughs represented by the VAWT technology.

Energy Unlimited's 30 years of experience in maintenance and operation of wind turbines leads us to believe WHI's contention that HAWTs will have a significantly longer life if they are "rested" during high wind events. Wind farms have been known to operate their turbines at or above the name-plate capacity. When high-energy wind gusts burst through a wind farm while the turbines are operating in such conditions, they have a much greater tendency to require significant repairs and to require these repairs earlier than anticipated by the OEM. A partial understory of VAWTs may allow the most problematic HAWTs to rest during high wind events.

If this is the case, the VAWTs addition can be sized not to exceed the capacity of the wind farm's substation. The first step to determining the economics of this is to verify that VAWTs can safely operate in a field of HAWTs.

I have been interested in the VAWT research done by Dr. John Dabiri but have had concerns over the small sized rotors he was using in his research. For VAWTs to be successfully installed in CA wind farms, they will need to pass IEC 61400 certification for Class II wind resources. Bigger, more robust turbines like WHI has developed provide the rotor size and fatigue life that will be needed to build out the thousands of MWs of understory potential that exists in California. Based on my understanding of vertical mixing and the turbulator effect that WHI's counter-rotating VAWTs create in the downwind environment, these VAWTs should also bring higher speed wind down closer to the ground and into the rotors of HAWTs and act in a similar way as Dabiri predicts with his theory of "planform kinetic flux." I very much look forward to seeing the results of this part of WHI's proposed research.

We are currently undergoing a repowering program for our San Geronio wind farms. When that is completed, and if the research WHI conducts with the help of the CEC grant shows that their VAWT arrays would not harm our wind farms' HAWTs, we would consider recommending to our repowering partners that additional research be conducted under the modern HAWTs. Eventually the research will need to be done in wind farm field conditions here in California to produce the proof that wind farm owners will need to add VAWTs into their understories. We would be happy to help advance that research if we can.

As a final note, I have known Bob Thomas, the inventor and founder of the original Wind Harvest Company for over 30 years having met him when I began investing in the wind industry and he was the manager of California's wind energy program under Governor Jerry Brown. I have followed his work and the advancement of this VAWT technology since then. I have also had a chance to work on a project with Kevin Wolf, a cofounder of WHI and their Chief Operating Officer. I admire both these individuals and WHI's efforts, determination and resourcefulness. I am optimistic that their years of efforts, especially with the help of this grant, will lead to an enormous increase in the MWs of wind energy produced from the existing wind farms in California and throughout the world. I encourage you to support this grant and help realize the potential of WHI's VAWT technology.

Best regards,

A handwritten signature in black ink, appearing to read "Harry R. Halloran". The signature is fluid and cursive, with a large initial "H".

Harry Halloran

Founder, Chairman and CEO
Energy Unlimited, Inc.
and
Founder, Chairman and CEO
Frontier Wind LLC