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Project Title: MIT Clean Energy Prize Competition

Final Technical Scientific Report

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The MIT Clean Energy Prize (MIT CEP) is a venture creation and innovation competition to encourage innovation in the energy space, specifically with regard to clean energy. The Competition invited student teams from any US university to submit student-led ventures that demonstrate a high potential of successfully making clean energy more affordable, with a positive impact on the environment. By focusing on student ventures, the MIT CEP aims to educate the next generation of clean energy entrepreneurs. The competition is a year-long educational process that culminates in the selection of five category finalists and a Grand Prize winner and the distribution of cash prizes to each of those teams. Each entry was submitted in one of five clean energy categories:

1. Energy Efficiency and Infrastructure

Technologies or products in the energy efficiency and infrastructure domain. This includes but is not limited to consumer end-use energy efficiency, conservation, demand management, supply chain infrastructure, architectural products and building design, and other stationary infrastructure development.

2. Renewables

Technologies or products in the renewable energy domain. This includes but is not limited to the use of solar, wind, hydro, biomass and geothermal energy.

3. Non-Renewables

Technologies or products in the non-renewables domain. This includes but is not limited to the use of coal, natural gas, petroleum oil, fuel cells, waste to energy, and nuclear fuel.

4. Transportation

Technologies or products in the transportation domain. This includes but is not limited to vehicles and system designs in road, rail, air, and marine transportation and transportation fuels.

5. Deployment

Entries falling under any of the domains described above, but limited to services and processes.

All the scientific development was done by the student-led teams. The MIT CEP did not participate in the development of any technology.

The entries in each category are named below, along with a brief public description submitted by the team and the respective universities of the students that composed the teams.

Energy Efficiency and Infrastructure Category

- Advanced Battery Control – University of Michigan

Advanced Battery Control offers an intelligent, reliable battery management system, which will radically enhance battery utilization in electric vehicles.

- Carbon Perks – University of Michigan

Carbon Perks is a service that encourages homeowners to reduce the amount of electricity they consume by rewarding them with points, which are redeemable for products at local, online, and national retailers, such as iTunes and Home Depot.

- C-Crete Technologie – MIT

A nanoengineered concrete not only reduces CO2 emissions worldwide but also it can be tuned to be much stronger than typical concrete.

- EEsensor- MIT

EEsensor provides customers with a low-price, easy-to-install home energy meter that integrates consumption into their daily life through online social networks.

- Ganimede – Stanford University

- Gold Rush: Converting abandoned land to bio-fuel crop land by 10X water storage material

- Green Earth Aerogel Technologies – UCLA

Producers of eco-friendly, energy efficient super insulators from rice and rice hulls. Potential applications in superheated steam insulation and cryogenic insulation.

- Green Silane – University of Michigan

Green Silane produces silane gas for customers on-site in a manner that is flexible, low-cost, and environmentally benign, completely revolutionizing the supply chain for this critical input to flat-screen display and photovoltaic panel makers.

- GS Development – Mississippi State University

- GeoSolar makes zero energy buildings affordable NOW! Imagine: never pay another dime for heating and cooling!

- LEDStorm – MIT

LEDStorm brightens your streets

- LiveFree – MIT

We are Developing a Residential Demand Response System that Consumers will finance instead of the utilities. This will lead to rapid deployment of demand response systems

- Nanocel Inc. - University of Washington

Heat kills electronics; We've got one word for you: plastics. Nanocel unleashes electronics performance and radically reduces energy demands with liquid cooled, plastic heat sinks: Cooler, Faster, Cheaper and Quieter.

- Near Zero – UC Berkeley

Near Zero's minimal-loss flywheel battery provides a reliable solution to today's need for an eco-friendly and efficient uninterruptible power supply.

- Qisol, LC – Wayne State University, Oakland University, Eastern Michigan University

Supporting the creation of New Business Models for utilities by metering the energy production of Solar Water Heaters, and verifying the associated Renewable Energy Credits, so that the utilities can meet their states Renewable Portfolio Standards.

- repaper solutions – UC Berkeley

repaper develops reusable paper products and services. for knowledge workers who print several documents a day, repaper lets readers print, clean + reprint on the same paper. repaper addresses the financial and environmental cost of transient paper.

- SmartSense - UC Berkeley

SmartSense commercializing a new, ultra-low cost current sensor for use on electric transmission lines. SmartSense's patent-pending microelectromechanical systems (MEMS) sensors will reduce the cost of transmission sensors up to 90%.

Renewables Category

- AeroTech – Washington University in St. Louis

AeroTech manufactures and supplies large-scale metal oxide semiconductor coated sheets for applications in clean energy

- Altaeros Energies – MIT, Harvard University

Altaeros Energies is developing an Airborne Wind Turbine that will redefine renewable energy and eliminate the need for compromise between cost and sustainability by producing clean power at a cost that is competitive with non-renewable resources.

- AxiSol – Dartmouth College

Solar Simplified

- C3Nano, Inc. – Stanford University – **Final Award Recipient**

C3Nano, Inc. has developed a proprietary transparent electrode that will beat the current leading transparent electrode in a number of specifications and ultimately become a cross-cutting technology that will increase the efficiency of PV by 1%.

- Element 14 – MIT

Element 14 is a technology to produce 9N solar grade polysilicon at \$15/kg Our product cost so little because: – CAPEX and OPEX are much lower – Modularity allows us to react quickly on market demands (easy to scale-up or down) – No toxic wastes

- Enercube – Wayne State University

Meeting energy needs in remote locations.

- Enertia- University of Michigan

Enertia brings to market a breakthrough energy scavenging technology that supplies life-cycle power to wireless sensor networks. The Enertia E2C Energy Converter generates renewable electrical energy from ambient kinetic vibrations.

- FemaGold – MIT

FemaGold is developing a roof mounted solar thermal unit that would generate heat and electricity directly. Initial application is to convert FEMA trailers into luxury home

- Nuru Light – University of Massachusetts, Columbia University

We created the Nuru Light to replace the use of expensive, polluting, and dangerous kerosene in rural households. Charged by the world's first commercially available pedal generator, our light is the most affordable and efficient light in the world.

- OORMIE – Caltech

Blue is the New Green

- PortableEnergy – MIT

PortableEnergy is developing a 1000 watt-hour a day energy source, and a high quality heat source that is portable, is based on solar and wind, and could be set up in 15 minutes.

- Ramped Energy Group – University of Washington

Turning traffic problems into renewable energy.

- Renewable Energy and Ecotourism – Houston University

Waterpower for ecotourism to finance the regional growth center, regional market, and education center for villages. Melt water – renewable energy with waste biogas.

- Solar Engineering Solutions – Harvard University, MIT

Solar Air conditioning Target market- building cooling and heating

- Solavicta – University of Texas

Solavicta is developing a solar technology that can be manufactured for less than \$0.50 per watt. This will allow the creation of fully-installed, grid-ready power systems for 25% less than the leading utility-scale solar power technologies.

- SoluPower – Stanford University

SoluPower provides an affordable and novel solar home solution to off grid individuals and households in developing countries.

- Stem Design Technologies – University of Chicago

Stem Design Technologies is an emerging alternative energy company dedicated to rapid and cost effective solutions utilizing renewable energy sources for sustainable electricity production.

- SpringGen - Pennsylvania State University – Erie, Mercyhurst College – Northeast

SpringGen's purpose is to develop an affordable, clean, and renewable source for electrical generation.

- WinBlade Composite – UC Berkeley, Ventura Community College

WinBlade Composites has a revolutionary new method for producing composite wind turbine blades better and faster than previous techniques allow.

- Winduction- MIT

Winduction provides next-generation small wind power. Our turbines are robust, low-cost and offer industry-leading efficiency.

Non-Renewables Category

- Ancora Energy – MIT

Ancora Energy aims to make significant impacts on people's lives through scientific innovations, and is working to alleviate the world's largest problems: too much waste and not enough clean energy.

- Carbon Capture Synthetic Fuels - Louisiana Tech

CC Synfuels utilizes innovative nanostructured catalyst design in a system of reactors to efficiently produce synthetic diesel fuel from reformed carbon dioxide and natural gas.

- OsComp Systems – MIT, Harvard University

OsComp will commercialize a revolutionary gas compressor developed in conjunction with MIT that offers a low initial and operating cost, high efficiency, small weight and footprint, easy serviceability, and high reliability.

- ReGreen Technologies – Georgia Institute of Technology, University of Southern California

ReGreen Inc. has developed a heat exchanger that is inexpensive, regenerates the heat from exhaust

gases in industries (with 90-99% efficiency), along with the absorption of harmful gases like SOx and NOx, and their conversion into useful byproducts.

Transportation Category

- Agavenol – Arizona State University

Agavenol is a biotechnological venture that provides agave plants as an alternative ethanol feedstock for the Western USA, avoiding transportation of feedstock from the Corn Belt states.

- Ammonia Engine Center, LLC – Iowa State University

Advanced carbon-free fuels for a better future.

- Bio-re -University of Illinois Urbana Champaign

Bio-re, Thinking for the future...A future where renewables are the norm.

- IRIS Engines, Inc. – Johns Hopkins University

The Internally Radiating Impulse Structure (IRIS) Engine is an advanced internal combustion engine (ICE) design with thermal, volumetric and cycling efficiencies superior to those currently available or under development in ICEs.

- VECARIUS – MIT

VECARIUS is a seed-stage company that seeks to leverage advanced materials, power electronics, energy harvesting, and energy storage technologies to increase the energy efficiency of vehicles.

- ViaCycle – Georgia Institute of Technology

ViaCycle creates advanced bicycle sharing technology that allows easy deployment of affordable, sustainable transportation.

Deployment Category

- Carbonetrics LLC – MIT

Carbonetrics was founded to develop high-precision CO2 emission monitoring to lower the reported emission by >2% and eventually to set up emission data network globally to provide data service to financial trading firms or research institutes.

- CarbonLighthouse – Stanford University, Harvard University

CarbonLighthouse will enable its clients to profitably, and with little to no upfront cost, eliminate their carbon footprints.

- CityFlow – Stanford University

Cityflow, Improving Quality of Life

- Deep Sea Wind – Ohio State University

Deep Sea Wind is a floating wind turbine tower manufacture and installer serving turbine manufacturers, wind farm developers, and utility companies.

- Enertaq - University of Maryland

We have developed an innovative and novel algorithm to manage electricity consumption from large commercial energy users to provide 100% efficient short-term virtual energy storage to the grid, without affecting commercial operations or comfort.

- Drishtant Energy Services - Boston University

The first demand response company in India.

- em[POWER] Energy Group, Inc. - Princeton University

em[POWER]: using trash to fuel landfill community development. em[POWER] seeks to apply inexpensive waste-to-energy technology in landfill slums in order to improve existing revitalization efforts and facilitate new vocational opportunities.

- Greenapartments.com – UC Berkeley, Harvard University

Greenapartments.com is an online destination for perspective renters to compare properties based on energy consumption.

- Industrial Energy Software – MIT

IES brings energy auditors, equipment suppliers & facilities manager onto a common software platform creating a single transparent market for energy efficiency. Proprietary analytics and sensor allow precise monitoring of energy intensive equipment.

- Nalu Solar Software - University of Michigan

Nalu Solar Software (Nalu) provides a complete, end-to-end software solution for solar photovoltaic (PV) contractors that allows them to sell, design and install PV systems easily and accurately regardless of their level of expertise.

- NCE2 – Boston University

NCE2 is an energy service company that delivers cost savings and carbon footprint reduction at no capital cost to the customer, thereby overcoming the biggest hurdle to the adoption of CHP systems.

- SolMeter – Santa Clara University

SolMeter provides the benefits of solar ownership to people who live in an apartment by hosting the panels at a remote location and sharing the revenue from the sale of the power.

- Tenergy – MIT

An Energy Efficiency Model for the Landlord Tenant Market

- ThinkLite – Babson College
Efficiency Costs Nothing
- Tradelectron – Yale University
Tradelectron installs and operates batteries on large commercial properties to generate electricity savings for its customers.
- Virebo – MIT, Harvard University
Virebo slashes the cost and environmental impact of information technology. Its first product targets printing, an enormous expense that remains unaudited in many organizations. Virebo's software tracks down wasteful use and inefficient equipment.
- Virtual Electric Vehicle Co. (VEV Co.) – UC Berkeley
Get the app. Get on the road. Get on-line. See the future: your life in an electrified, carbon- and cash-saving vehicle. VEV Co.