



ICAES

Isothermal Compressed Air Energy Storage

2010 Energy Storage Systems Research Program Update Conference

Dax Kepshire
Co-Founder & Vice President

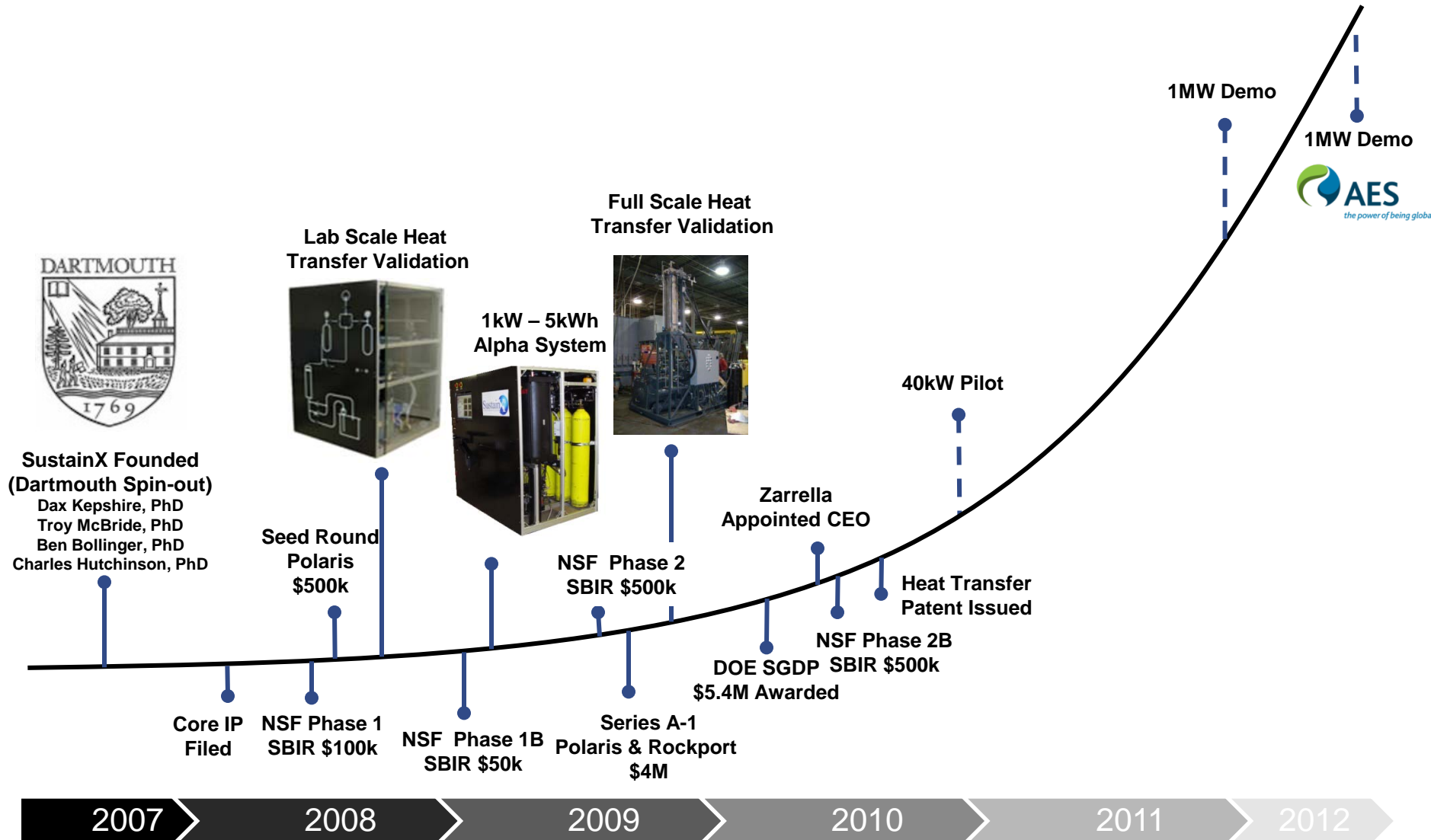
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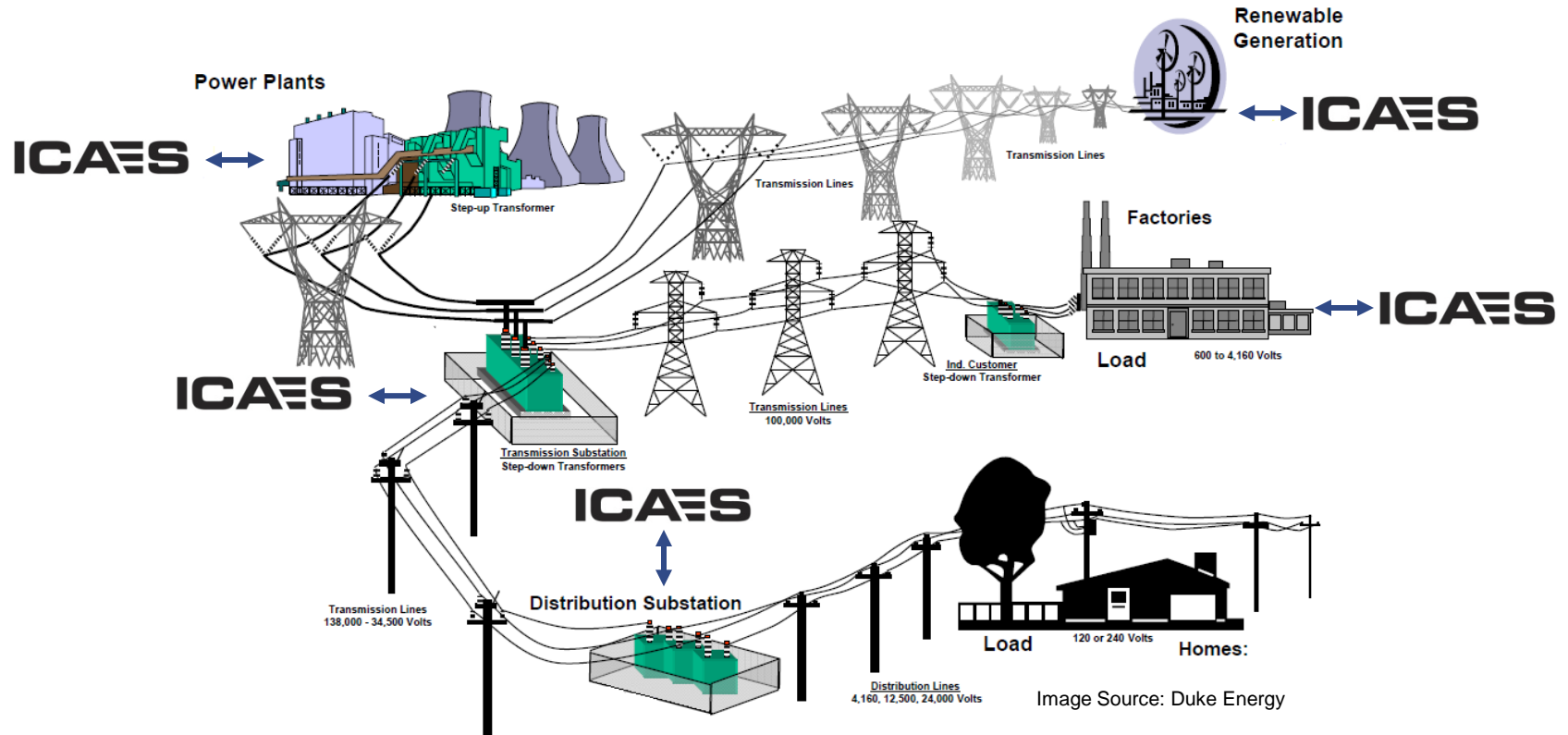
SustainX's transformative Isothermal Compressed-Air Energy Storage (ICAES™) technology uses electrical energy to compress air near-isothermally (i.e., at approximately constant temperature), stores the resulting high-pressure air aboveground in commercial pressure vessels, and expands it near-isothermally to generate electricity. No fuel is involved.

SustainX ICAES is targeting the emerging market for bulk (grid-scale) energy storage being created by the growth in renewable generation and aims to disrupt costly "peaker" plants that burn natural gas or other polluting fuels.

SustainX has successfully demonstrated its core technological innovations and is backed by top tier venture investors






The SustainX solution has the potential to add value to every component of the electricity market value chain



Generation	Renewables	Transmission	End User
Electric Energy Time-Shift Electric Supply Capacity Load Following Area Regulation Electric Supply Reserve Capacity	Renewables Energy Time-shift Renewables Capacity Firming Wind Generation Integration	Voltage Support Transmission Support Transmission Congestion Relief T&D Upgrade Deferral Substation On-Site Power	Time-of-use Energy Management Demand Charge Management Electric Service Reliability Electric Service Power Quality

Incumbent technologies suffer from high capital and levelized costs, high emissions, and extreme siting restrictions

Sodium Sulfur (NAS)		Simple Cycle Peakers		Pumped Hydro (<40 MW)	
					
SustainX's Key Advantage	CAPEX / Life	SustainX's Key Advantage	Fuel / Green	SustainX's Key Advantage	Siting
Siting Restrictions	Comparable	Siting Restrictions	High	Siting Restrictions	Extreme
Lifetime (years)	12	Lifetime (years)	20	Lifetime (years)	30+
System CAPEX (\$/kW)	\$3,750	System CAPEX (\$/kW)	\$1,300	System CAPEX (\$/kW)	\$2,800
Levelized cost (¢/kWh)	31-35¢	Levelized cost (¢/kWh)	43¢	Levelized cost (¢/kWh)	26.3¢
Lifetime highly dependent on operating conditions		Low efficiency use of fossil fuels has high emissions and high fuel costs		Capital costs vary greatly with location	
Capital costs holding steady		Costly start-up limits flexibility		Like traditional CAES, it has significant geographic constraints	
Hazardous chemicals		Vulnerable to natural gas price fluctuations		Lengthy regulatory and environmental review process (~5 years)	
High operating temperature		Power increment is large, ~50MW		Extensive construction effort	
Insufficient manufacturing capability					

Pumped Hydro numbers from Maui Electric Company, Ltd. Integrated Resource Planning Advisory Group, November 1, 2005

LCOE model incorporates CAPEX and financing, insurance, property tax, fixed and variable O&M, fuel costs (off-peak electricity), efficiency, lifetime, and capacity factor.

Technology Roadmap

