BOISE STATE UNIVERSITY

Idaho State University

INL Idaho National Laboratory

University of Idaho

Other Initiatives and Investments

Ray Grosshans
Program Manager, CAES

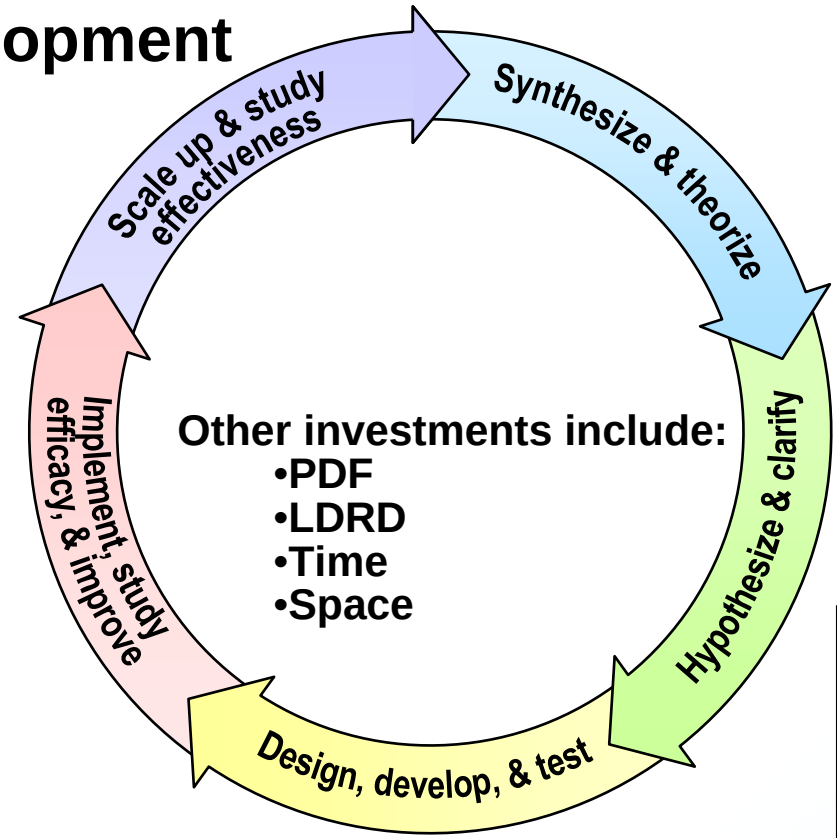
October 19, 2009

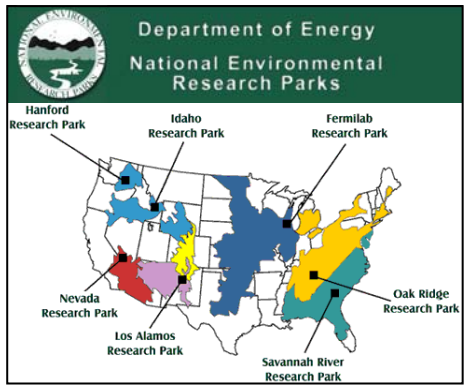
CAES

Center for Advanced Energy Studies

CAES advances energy security and technology-based economic development

CAES integrates partnership resources





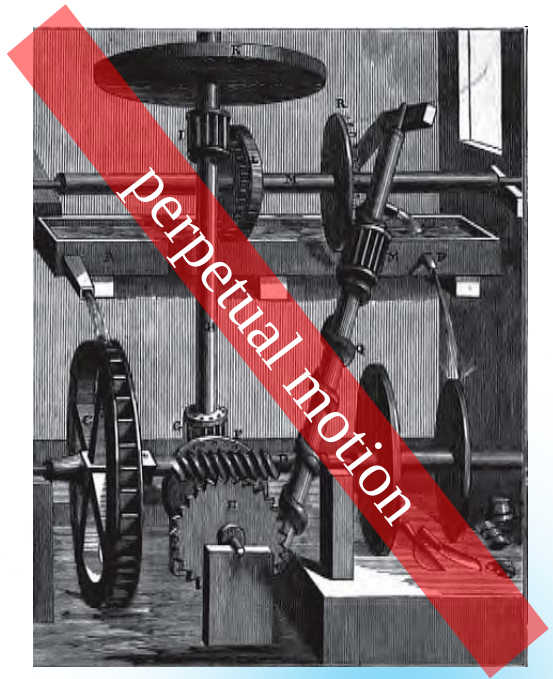
Industry collaborations provide opportunities

WIND IS POWER
BLACKHAWK
PROJECT

Center for Advanced Energy Studies
CAES

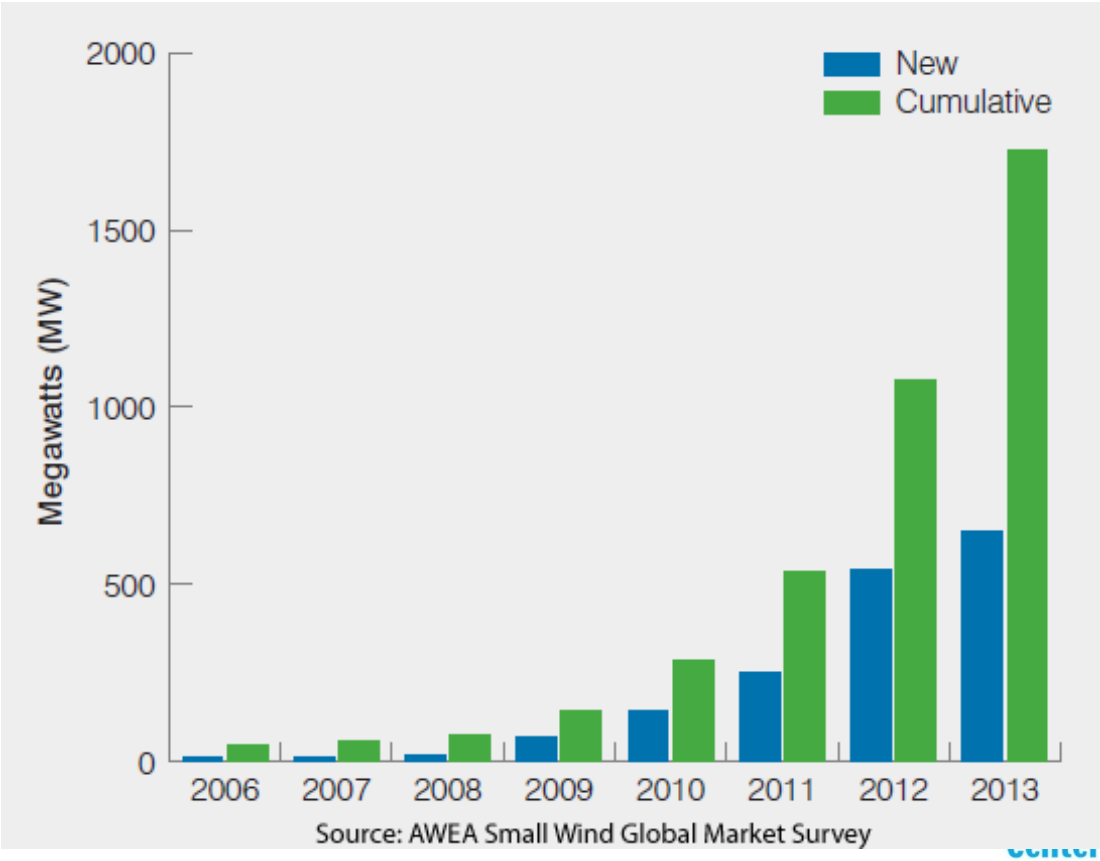
CAES "Other": Flirting with Success

- Branding campaign: intentionally manufactured a certain notoriety, public perception, and expectation
- DOE, Idaho, CAES partner constituents, other stakeholders, the public turn up with projects, proposals, and requests
- Partner with CAES:
  - Access university talent
  - Bolster credibility
  - Execute research
  - Host industry funded research
  - Pursue commercialization
  - Support Proposals



Blackhawk Project VAWT

- Blackhawk's "transformative" proprietary design: vertical vane articulating rotor yields an extremely durable light weight generating system with a small foot print and high output-to-wind speed ratio that readily produces useful quantities of electricity



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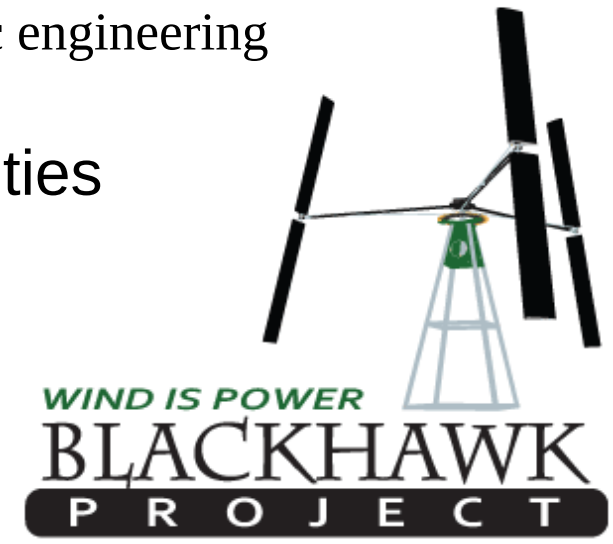
Blackhawk Project

Value Proposition:

- Engage students in operating, maintaining and modifying VAWT
- Execute well-defined research program that includes:
  - Measurement and testing
  - Mathematical modeling
  - Materials engineering
  - Power engineering
  - Aerodynamic engineering
- Pursue commercialization opportunities
- Develop small-wind testing and certification program
- Explore additional BHP IP

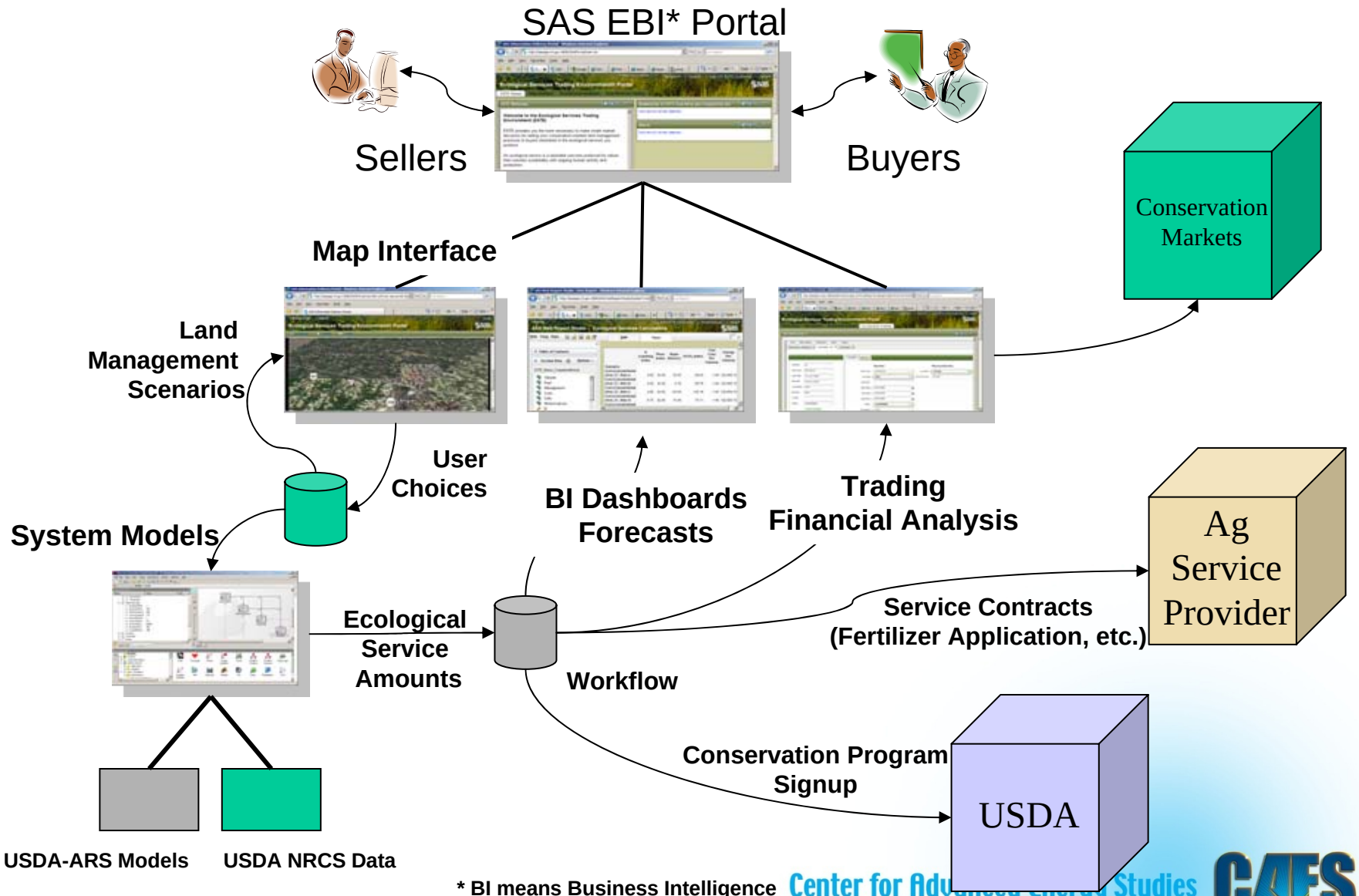


Conservation Markets

- An INL and SAS (’08 revenue $2.2B) joint project: a web-based computational/decision tool to commoditize and trade ecosystem assets and liabilities in multiple regulatory contexts
- Customers: agricultural producers, fertilizer producers, resource extractors, federal agencies, international organizations (World Bank and the United Nations)
- Partner with CAES to:
  - Access university talent
  - Host the development team
  - Commit and coordinate resources to bring this tool to market

John Tracy, UI, development of market structure
Sian Mooney, BSU, economics of carbon trading
Dan Ames, ISU, GIS applications

Conservation Markets Technical Architecture



* BI means Business Intelligence

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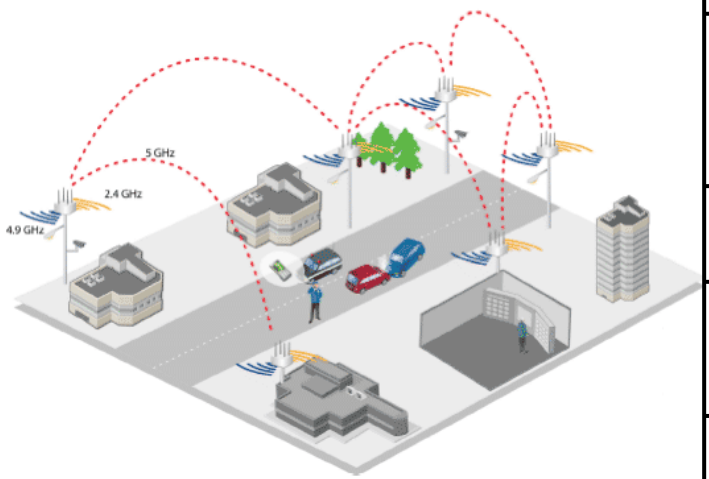
Resilient Control Systems (RCS): Securing the "Smart Grid"

Work is under way across the partnership



Craig Rieger	INL	Instrumentation, controls, and intelligent systems (ICIS)
Subbaram Naidu	ISU	HVAC and Wind Energy control system development, including optimal and intelligent systems
Milos Manic	UI	Wireless and wired security and application, data mining and cyber security
Murali Medidi	BSU	Wireless system robustness
Jason Wright	INL	Cyber security
Charles Tolle	INL and South Dakota School of Mines and Technology	System Identification of HVAC systems
Kevin Moore	Colorado School of Mines	Control systems, automation, robotics, and distributed intelligence
Lawrence Beaty	ISU	Large-scale test beds for instrumentation and control technology applications
Inanc Senocak	BSU	Airflow and thermal management mechanisms
John Buttles	INL	Wireless sensor test bed
Akira Tokuhiro	UI	Ultrasonic and remote diagnostics

Resilient Control Systems (RCS)

- Proposals out the door to DoD, NHS, DOE, NSF, NERC:
  - Thermal and Air Flow Management Towards Energy Efficient Data Centers Using a Multi-GPU Computing Paradigm
  - Development of Smart Design Renovation Technology for Existing HVAC Systems Based on Tailored Energy Efficiency Improvement with Incorporation of Renewable Technologies
  - Critical National Need: Smart is Not Enough—Resilience and Securing the Power Grid
  - Smart Design Technology for Onsite Evaluation of HVAC Systems and Tailored Energy Efficiency Improvement
- Additional Opportunities
  - Academic Red/Blue Team Resilience Workshop
  - Development of an RCS certificate program

Idaho BluePrint for Success

- A Response to Battelle Technology Partnership Practice 2006 document: "Idaho's Technology Platforms: Building on the State's Core Competencies"
- Team: Senior executives with experience in technology transfer, operations, management, and venture investing
- Goal: Accelerate Idaho's innovative technologies into meaningful commercial products by aligning research with capital and industry and attracting and retaining talent
- Value Proposition:
  - Bolster credibility, i.e. MOU
  - Drive industry-funded research to Idaho universities via CAES

Technology Platforms for Idaho

(Based on research from Battelle Technology Partnership Practice - November, 2006)

Vertical Industries

Energy | Environment | Transportation | Agriculture/ Food | Defense | Healthcare

Idaho Companies Benefit

- Broader IP Portfolio, Differentiation
- Influence on Focused Research
- Faster Time to Market
- Longer-term Technology Roadmaps
- Today's Investments Have a Future
- Adjacent Market Opportunities

Idaho Technology Platforms - Industry Driven

	Energy •Clean •Alternative •Advanced	Materials & Nanotech	Imaging & Sensors	Agriculture/ Biosciences	Software & Algorithms
Bio.	X	X		X	X
Material	X	X	X	X	X
Optical			X		X
Electrical	X		X	X	X
Mech.	X	X	X	X	X
Chemical	X	X	X	X	X

Idaho Research Competency Areas

Wireless Sensor Networks (WSN)

- Ongoing CAES project:
  - Design, deploy, and analyze several COTS WSN
  - Determine WSN weaknesses and vulnerabilities to both interference and attack
  - Improve next generation designs and develop approaches and solutions to resolve system degradation and failures resulting in improved reliability of WSN

University Partners?

Geothermal

- Idaho's other natural resource base: Great Basin and the Yellowstone-eastern Snake River Plain hotspot track, Raft River
- Intermountain West Geothermal Consortium includes BSU, UI, UU, DRI, and INL
- ISU team: SBOE-HERC Research Center Pre-proposal "Center for Idaho Research in Geothermal Energy (CIRGE)"
- Telecon with renascent INL geothermal team

National Environmental Research Parks

- Outdoor laboratories for environmental studies on lands that buffer DOE sites

Site	Year Designated	Acres	Ecoregion
Savannah River	1972	198,000	Southern Mixed Forest
Los Alamos	1973	28,400	Juniper-Pinyon and Grassland
Idaho	1975	568,000	Shrub-steppe
Oak Ridge	1980	21,500	Eastern Deciduous Forest
Hanford	1983	366,000	Shrub-steppe
Fermilab	1989	6,800	Tallgrass Prairie
Nevada	1992	865,000	Desert Shrub

Partnership ?

Energy Efficiency

- Consumer preference and legislation will constrain carbon and drive a technological revolution across the generating, transmitting and distributing infrastructure—and perhaps most importantly at the consumption end
- CAES web of interconnections includes scientists, scholars, and students whose work will shape this revolution as well as stakeholders who are now seeking assistance coping with it.

What is CAES role?

R&D?

Tech deployment?

Education?

LEED leader?

Outreach?

Discussion Points

- As the partnership evolves:
  - Achieve and maintain mission alignment
  - Link ideas and people effectively
  - Invest strategically to move ideas forward
  - Transition investments to initiatives
  - Transition initiatives to sustaining programs (or not)