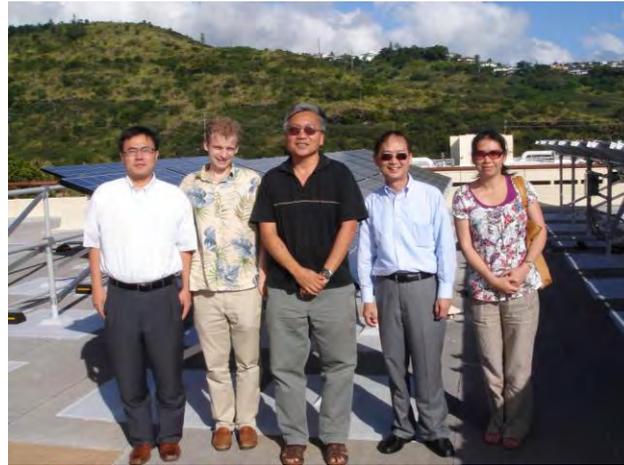


# Renewable Energy and Island Sustainability Hawaii Sustainability and Pollution Prevention Partnership



**Tony Kuh**  
**April 27, 2011**

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# Outline

- **Why workforce training?**
- **Renewable Energy and Island Sustainability Center**
  - **Introduction**
  - **Education**
  - **Research**

# Energy Workforce

- **Aging workforce in utility companies**
- **New energy paradigms**
  - Integration of renewables to grid
  - Incorporating sensing, communications, and information technology for monitoring the grid
  - New fuel sources and electric vehicles
  - Distributed generation and control
  - Cyber security
- **New energy technology companies**
- **New energy jobs (energy managers): tourism, military, medical, retail**

# Energy workforce training

- Training needed at all levels (Undergraduate, Masters, Doctoral)
- Need to educate more students and academic institutions need to develop more energy and sustainability programs
- Programs need to adapt to current workforce needs (multidisciplinary, new energy paradigms)
- Need for lifelong learning: collaboration between academia, industry, and military to develop continuing education programs
- Need to make program sustainable: recruitment and outreach, funding and support

# REIS Goals

- **Develop REIS program to educate students in renewable energy and sustainability and provide work force for Hawaii, USA, and globally**
- **Multidisciplinary team formed to conduct cutting edge renewable energy and island sustainability research**
  - **Obtain sustained funding from (NSF, DOE, military)**
  - **Become internationally recognized program**
- **Work with state of Hawaii and industry to help with renewable energy and energy efficiency goals**
- **Work with other UH energy groups on joint education and research projects**
- **Develop experimental lab: Green Holmes Hall Initiative**
- **Recruit undergraduates, K-12 students, underrepresented students into REIS program**

# Current Focus

**Started Dec. 2008 to establish integrated graduate education and research program in renewable energy and island sustainability**

- Federal funding**
- Multidisciplinary education program (certificate in renewable energy and island sustainability)**
- Establish partnerships with industry and other academic organizations**

# REIS Members

- O. Boric-Lubecke- EE
- M. Burkett - Law
- B.-H. Chao- ME
- M. Coffman- RUP
- D. Garmire- EE
- M. Ghasemi Nejhad-ME
- R. Ghorbani- ME
- P. Johnson- ICS
- A. Kavcic- EE
- D. Konan- Econ
- S. Khanal- MBBE
- A. Kuh - EE
- B. Y. Liaw- HNEI
- E. Miller- HNEI
- D. Nakafuji - HECO
- A. Ohta- EE
- W. Qu- ME
- D. Rockwood – Arch.
- N. Tarui- Econ
- M. Teng- CEE
- S. Turn- HNEI
- S. Yamada- Business
- X. Zhou- EE
- R. McGehee- Admin. Asst.

**Members from 8 schools/ colleges and 11 units**

# Funding Support

- **Internal: \$1M Sustainability Grant from UHM VCRGE Gary Ostrander (6/9-5/11)**
- **External: \$2.5M DOE workforce training (STEPS) (DOE FOA 152, April 2010, 3 years, 11 STEPS awards nationally) HECO is a partner.**
- **NSF TCUP IKE: Kapiolani CC is lead**
- **Other: NSF, DOE, DOD, ARPA E, NASA, NIST, State, Industry and private**

# REIS DOE workforce training goals

- **Form new interdisciplinary graduate education and research program in renewable energy, energy efficiency, smart grids, and sustainability**
  - A major focus on Hawaii energy problems
- **Students will obtain broad education in engineering, technology, and social science with depth in one of several areas**
- **Fundamental and applied research will be conducted**
- **Recruit and retain underrepresented students**
- **Work with energy and sustainability companies in Hawaii and state government to help provide workforce**

# Educational Curriculum

- **Course Breadth and Depth: Students will take two core courses in RE and sustainability (one with engineering focus, one with social science focus) and have depth in one of several areas:**
  - **Materials, devices, and manufacturing**
  - **Systems, integration, and smart grid**
  - **Sustainable infrastructure**
  - **Biofuels and bioenergy**
  - **Energy economics**
- **Several new graduate courses plus existing courses on RE, energy efficiency, smart grids, and sustainability. Background courses will be weaved into curriculum**

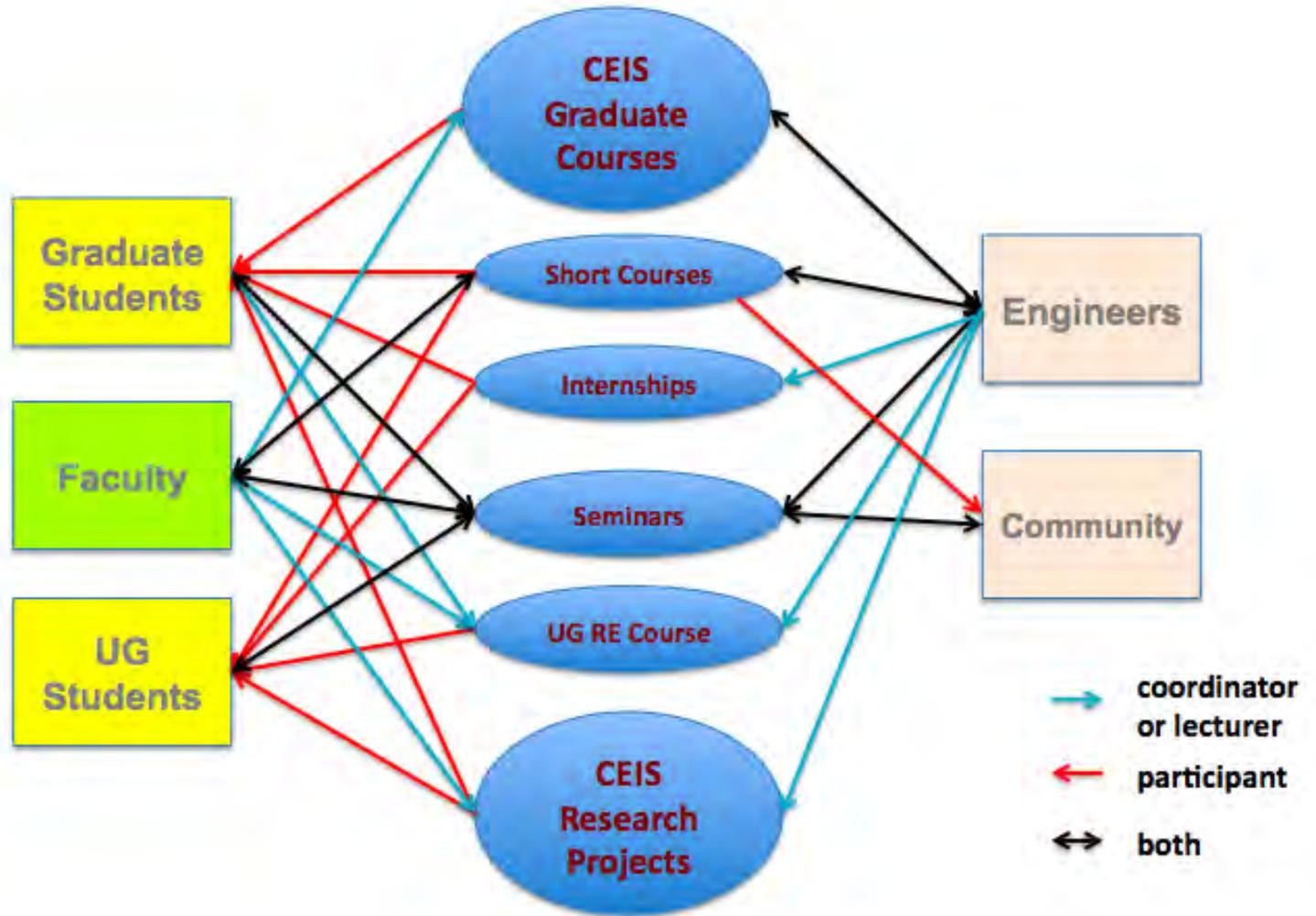
# REIS Graduate Certificate (submitted ATP)

## Requirements

- Taken and passed two required REIS courses
- Taken and passed REIS specialization course
- Taken 15 units in approved courses, 9 at 600 level
- Have conducted research and passed thesis / dissertation research in REIS area
- Have completed one advanced short course or attended energy or sustainability conference
- Taken REIS seminar course

# Educational Activities Continued

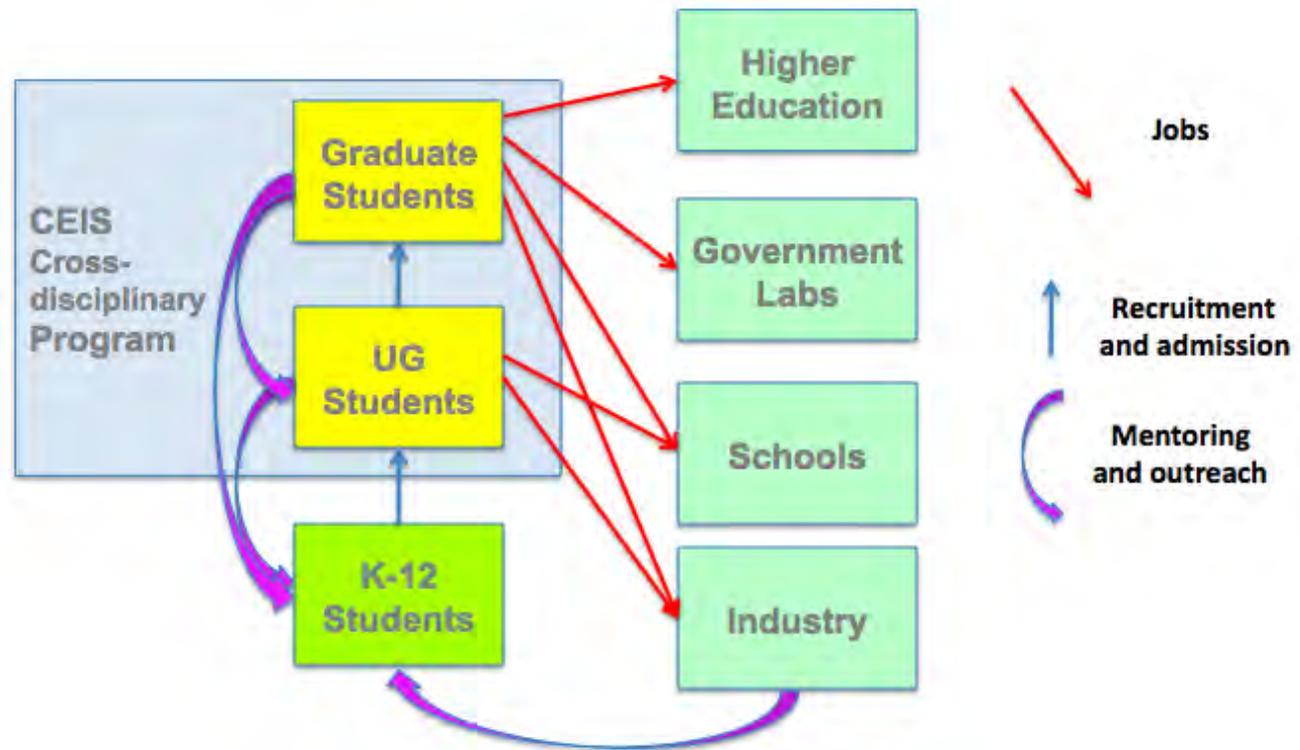
- Student would obtain (MS, PhD) in department plus REIS certificate
- Industry experience: students encouraged to work in Hawaiian energy and sustainability companies (summer interns, Coop students)
- Collaborations with other institutions and international experience: we will set up faculty and student exchanges with our academic partners (including international institutions)
- Multidisciplinary research: Projects will be group oriented requiring multiple disciplines
- Undergraduate RE course (offered this semester)
- Undergraduate research projects
- Develop short courses with HECO (first course on wind energy on April 30<sup>th</sup> through outreach college)
- Seminar series



# Recruitment, Retention, & Outreach

- **Recruit UG students through design projects and Green Holmes Hall Initiative**
- **Special attention given to underrepresented students**
  - **Native Hawaiian Science and Engineering Mentorship Program (NHSEMP)**
  - **Society of Women Engineering (SWE), Women in Technology**
- **Retention through a sense of academic community, mentorship, and cultural knowledge**
- **Outreach: REIS faculty and students interface with community and recruit K-12 students into STEM**

# Recruiting, Outreach, and Workforce Training



# Research Proposal Structure

- **Large: Center grants and proposals**
  - **UHM Internal: Sustainability grant**
  - **DOE Workforce Training (WFT)**
- **Targeted Research Proposals: Group**
- **Target Research Proposals: Small proposals**

# Research Clusters

- Smart micro-grids: A. Kavcic, P. Johnson, X. Zhou, P. Santhanam, A. Kuh, R. Ghorbani, N. Tarui, D. Nakafuji
- Energy Sustainable Buildings: D. Rockwood, W. Qu, D. Garmire
- Nanotechnology Production and Storage: M.Ghasemi Nejhad, A. Ohta, D. Garmire, B. Liaw, E. Miller
- Wave Energy: R. Ghorbani, M. Teng
- Human Energy Harvesting: O. Boric-Lubecke, A. Ohta, V. Lubecke, E. Miller
- Biofuels: S. Turn, S. Khanal
- Energy economics and sustainability: D. Konan, N. Tarui, M. Coffman
- RE applications: R. Ghorbani, W. Qu

# External Collaborations and Events

- **Anjan Bose, WSU (NAE member), he visited, worked on joint proposal, student teaching course and collaborating at UHM**
- **Felix Wu, Jin Zhong, HKU, exchanged visits, worked on joint proposals, possible sabbatical exchanges**
- **Marija Ilic, CMU, exchanged visits, joint NSF grant**
- **Seri Lee, NTU Singapore, exchanged visits, looking for joint collaborative opportunities**
- **Toshihisa Tanaka, Tokyo Univ. of Ag. and Tech., exchanged visits, will be a visiting scholar**
- **Danilo Mandic, Imperial College London, exchanged visits**
- **Tongji Univ. Shanghai, exchanged visits**
- **Ryukus Univ. Okinawa, they visited**
- **Industrial Advisory Council Meeting on March 4, 2011**

# Other Activities

- **One of 20 teams funded for DOE 2011 Solar Decathlon**
- **Working with facilities, HNEI, HECO on implementation of UH smart grid campus**
- **Outreach: COE open houses, HECO Bishop Museum, SWE WOW Kalakaua Middle School**
- **Participation in local conferences: APCESE, WCZEI, 2011 HECO PCEA**

# UH COE Energy Programs

- **Develop sustained energy program**
- **EE will hire in power and energy areas**
- **ME will hire person in energy area**
- **Working with HNEI, Social Science, Natural Science, and Architecture on cluster hire proposals**
  - **State energy analysis and policy**
  - **Smart communities**
- **2011 UHM Sustainability Initiative (REIS faculty members are finalists on different proposals)**

# Future Activities

- Continued proposal writing
- Push focused group research
- Planning to make REIS program permanent
  - Consult with industry and academic leaders
  - Met with Industry and State Advisory Council (March 4)
- Plan for REIS graduate certificate (submitted ATP)
- Work with industry and state government
  - Continue to work with HECO on education and research activities
  - Develop relationships with other industries and institutions
- Continued Outreach and Recruitment

# Contact information

- REIS homepage: <http://reis.manoa.hawaii.edu>
- Tony Kuh: 956-7527, [kuh@hawaii.edu](mailto:kuh@hawaii.edu)



*Mahalo!!*