

Kaveh Abhari  
Hana Bowers  
Robert Brewer  
Greg Burgess  
Caterina Desiato  
Philip Johnson

Michelle Katchuck  
Risa Khamsi  
George Lee  
Yongwen Xu  
Alex Young  
Chris Zorn

### The Virtual World

Online environment supporting education & competition

#### Go Low page



- Real-time power
- Energy scoreboard
- Energy goal visualization
- "Wall" for player discussion

#### Get Nutz page



- Smart Grid Game
- Earn points by completing activities
- Point scoreboard
- List of upcoming events

#### Prizes page



- Prizes for top players
- Prizes for top lounges
- Raffle game: chance for anyone to win

#### The Canopy



- Only top players invited
- Another "level" of game
- More complex quests
- More in-depth energy visualizations



# Lights Off. Game On. The 2011 Kukui Cup



### Motivation and Approach

#### State of Hawai'i Clean Energy Initiative

- 70% clean energy by 2030
- 30% from conservation

#### Improve energy-use behavior

- How to support *sustained* conservation?
- How to improve energy literacy?

#### Kukui Cup: combine competition with energy literacy

- Individual & group competition
- Hawai'i-specific literacy content
- Real-time energy feedback
- Both real world and virtual activities

#### Evaluated in university student housing

- 3 week competition
- 1030+ residents

### Playing the Kukui Cup

#### Energy competition

- Metered by pairs of floors (20 "lounges")
- Which lounge can use the least energy?
- Data sampled every 15 seconds

#### Energy Goal Game

- Energy conservation goal set (5-10%)
- If daily goal is met, lounge players get points
- Links energy & point competitions



#### Point competition

- Who can learn the most about energy?
- Earn points by learning about energy
  - Watch short educational videos (10 available)
  - Make public commitments (21 possible)
  - Attend events & excursions (24 available)
  - 52 other activities
- Earned by individuals, aggregated by lounge

#### Other ways to earn points

- Social bonus for completing activities with others
- Referral bonus for getting others to play
- Creative activities: writing poems, painting & more

#### Raffle Game: motivating non-elite players

- Every 25 points earns virtual raffle ticket
- Dynamically assign tickets to prizes
- Anyone has chance of winning

### Early Results from 2011 Kukui Cup

#### Participation

- 415 residents earned points (38.6%)
- 3 of 20 lounges had participation > 50%
- but 10 lounges had participation ≤ 16%
- Most time spent on activities

#### Energy conservation

- Best lounge reduced by ~15%
- Further analysis required
- Collecting base load data in Dec 2011

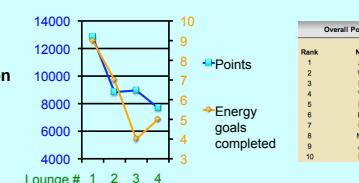
#### Energy education

- Points correlated with conservation?
- Based on lounges with > 40% participation
- Anecdotal evidence of improvement
- Before/after assessment in progress

#### Time spent in game



#### Education & Conservation



#### Overall Energy Scoreboard

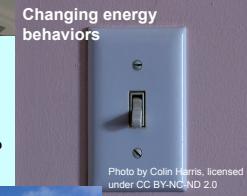
Rank	Name	Points
1	A.J.	2010
2	V.J.	2010
3	F.B.	1279
4	Y.N.	1268
5	D.T.	1164
6	P.S.	1154
7	C.L.	1098
8	M.M.	1084
9	J.W.	1043
10	R.T.	992
11	Lokelani-A	2294
12	Mokihana-B	2368
13	Lehua-E	2424
14	Lehua-D	2507
15	Lehua-C	2600
16	Mokihana-A	2604
17	Lehua-O	2655
18	Lehua-N	2719
19	Lehua-P	2757
20	Lokelani-E	2790
21	Lokelani-D	2795
22	Lehua-M	2899
23	Lokelani-B	3081
24	Ilma-B	3241
25	Ilma-C	3255
26	Ilma-E	3259
27	Mokihana-D	3345
28	Lokelani-A	3559
29	Lehua-B	3560
30	Lokelani-C	4878

Collaborative Software Development Lab  
Information and Computer Sciences  
University of Hawai'i at Manoa  
<http://kukucup.manua.hawaii.edu>  
kukucup@hawaii.edu

### The Real World



- How much power does my stuff use?
- Developing energy intuition



- Turning off lights
- Turning off fans when not in use
- Configuring laptop sleep settings

- Visit to 30 MW Kahuku wind farm
- Beach cleanup
- Visit to Reppun farm powered by PV & hydro



- Recycled Fashion Design
- Energy efficient eating
- Slam poetry
- Kickoff party
- Round 1, 2, 3 awards parties
- Lounge awards (energy & points)

### Support

- Center for Renewable Energy and Island Sustainability, University of Hawai'i
- National Science Foundation grant IIS-1017126
- University of Hawai'i Housing Services
- University of Hawai'i Facilities Management
- Hawaii State Department of Business, Economic Development, and Tourism
- University of Hawai'i Dept. of Information and Computer Sciences