Aug 20th, 10:35 AM - 11:00 AM

NSHE and NIREC: Strengthening ties to increase impact

Li Han Chan
NIREC
NSHE and NIREC:
Strengthening Ties to Increase Impact

Li Han Chan
Director of Operations
lihan.chan@nirec.org
Agenda

1. Your Research and its Societal Impact

2. NIREC’s Role

3. NSHE/NIREC Collaboration
The amount of social good you create, depends on “how far” you take your technology

In your lab and research Institution
- SHORT TERM: Publication, sustain your lab
- RESEARCH FOCUSED - What we are already doing today

Research in Nevada
- MID TERM: Increase research capacity and collaboration
- COLLABORATION FOCUSED – Primary goals of the Consortium

In Nevada and the Nation
- LONG TERM: job creation and workforce development
- COMMERCIALIZATION FOCUSED – Primary, longer term goal of the Consortium

Commercialization is a natural extension of “creating social good”, and very complementary to your activities today
What is commercialization?

- “To manage on a business basis for profit, to exploit for profit, to debase in quality for more profit.”
  (Merriam-Webster)
- “Process or cycle of introducing a new product into the market”
  (Wikipedia)
- “stage in product development process where the decision to order full-scale production and launch is made”
  (Businessdictionary.com)
- “to run as a business, apply commercial methods to, to engage in or make use of mainly for profit, especially at the sacrifice of other values”
  (yourdictionary.com)

These are terrible definitions!
What we are trying to do is much more than just turn a profit

- Working definition: Technology Transfer - the movement of know-how, technical knowledge or technology from one organizational setting to another

- It sounds simple, but it is “very complex, highly risky, takes a long time, cost much more than you think it will and usually fails”
  - ~ US Congress, Committee on Science and Technology 1985

- There are myriad variables, and we require a customized approach to deal with the nuances
  - Characteristics of technology (transfer object)
  - The technology source
  - The transfer agent (culture of organization, geography)
  - The transfer media (Patent, copyright, license, information collaboration, consulting agreement)
  - The technology recipient, demand environment, object use
  - Impacts of technology transfer

Taken from Barry Bozeman’s 2000 paper on Technology Transfer and Public Policy: a review of research and theory
©2010 Nevada Institute for Renewable Energy Commercialization
What Impedes U. S. Energy Sector Innovation?

• Energy prices artificially low
• Lack of energy price transparency
• Regulatory/policy uncertainty
• Many of the benefits of long range innovative activities accrue to parties other than those making the investments
• Highly fragmented, regional markets
  – Innovation benefits that derive from geographical clustering yet to be realized (innovations tend to be isolated within research laboratories)
• Massive capital requirements to scale (next slide)
• Under-investment in federal R & D and commercialization
• Incumbents not incentivized to invest in transformative R & D
• Many good business opportunities do not fit traditional VC risk/return model
Energy Sector Innovation: Severely Underinvested

- **% of revenue spent on R & D**
  - Health care sector: 2.0%
  - Agriculture: 2.4%
  - IT: 10%
  - Pharmaceuticals: 10%
  - Energy sector: only 0.3%

- **Annual federal energy R & D expenditures (non-defense)**
  - 2010 (excl. ARRA) - $3 Billion; 1980 - $8 Billion (real dollars)
  - Less than 25% of 1980 levels when measured as % of GDP
  - One-time ARRA infusion - $13 Billion over few years
  - Health care, national defense, space exploration - $20-30 Billion/sector
Agenda

1. Your Research and its Societal Impact

2. NIREC’s Role

3. NSHE/NIREC Collaboration
NIREC’s Role

1. Work as a team with the Consortium and NSHE to
   – Overcome these challenges in the clean energy industry
   – To commercialize IP and create long term societal impact
   – Present a strong value proposition to our funders

2. Be a commercialization resource for you
NIREC’s Role in Driving Innovation

• 501(c)(3) nonprofit public-private partnership

• Mission: Transform clean energy ideas into sustainable enterprises

• Focus: Renewable energy, energy conservation and energy efficiency

• We do this through:
  1. Funding technology development and pre-commercialization activities
  2. Providing the Entrepreneur-in-Residence (EiR) Program
  3. Strengthening and leveraging the region’s Innovation Ecosystem
  4. Closing gaps in the asset deployment space
Commercialization Faces Many Challenges: Research Labs

1. Universities and national labs not incentivized to commercialize
   - Primary focus (incentivized) on publishing papers, solving basic science challenges
   - Secondary focus on filing patents

2. Tech transfer offices focused on IP protection and management, not business launch

3. Insufficient resources dedicated to commercialization

4. Common misconception that technology development and commercialization are sequential activities (see next slide)
NIREC Energy Technology Acceleration Process

<table>
<thead>
<tr>
<th>RESEARCH &amp; DEVELOPMENT</th>
<th>DEMONSTRATION &amp; COMMERCIALIZATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GATE 1</strong></td>
<td><strong>GATE 6</strong></td>
</tr>
<tr>
<td>Idea Generation</td>
<td>Commercialization</td>
</tr>
<tr>
<td>TRL 1, 2</td>
<td></td>
</tr>
<tr>
<td>Expand knowledge base</td>
<td></td>
</tr>
<tr>
<td><strong>GATE 2</strong></td>
<td><strong>GATE 5</strong></td>
</tr>
<tr>
<td>Applied Research</td>
<td></td>
</tr>
<tr>
<td>TRL 3</td>
<td></td>
</tr>
<tr>
<td>Develop lab model</td>
<td></td>
</tr>
<tr>
<td><strong>GATE 3</strong></td>
<td><strong>GATE 4</strong></td>
</tr>
<tr>
<td>Exploratory Development</td>
<td>Advanced Development</td>
</tr>
<tr>
<td>TRL 4</td>
<td>TRL 5, 6</td>
</tr>
<tr>
<td>Design and test lab prototype</td>
<td>Develop functional prototype in lab environment</td>
</tr>
<tr>
<td><strong>GATE 4</strong></td>
<td><strong>GATE 6</strong></td>
</tr>
<tr>
<td>Engineering Development</td>
<td></td>
</tr>
<tr>
<td>TRL 6, 7</td>
<td></td>
</tr>
<tr>
<td>Iterate prototype in relevant environment</td>
<td>Finalize design in operating environment</td>
</tr>
<tr>
<td><strong>STAGE 1</strong></td>
<td><strong>STAGE 5</strong></td>
</tr>
<tr>
<td>STAGE 2</td>
<td>Product Demonstration</td>
</tr>
<tr>
<td>STAGE 3</td>
<td></td>
</tr>
<tr>
<td>STAGE 4</td>
<td></td>
</tr>
<tr>
<td>STAGE 5</td>
<td></td>
</tr>
<tr>
<td>STAGE 6</td>
<td></td>
</tr>
<tr>
<td>Idea Generation</td>
<td>Commercialization</td>
</tr>
<tr>
<td>TRL 1, 2</td>
<td></td>
</tr>
<tr>
<td>Expand knowledge base</td>
<td></td>
</tr>
<tr>
<td><strong>GATE 1</strong></td>
<td><strong>GATE 6</strong></td>
</tr>
<tr>
<td>Applied Research</td>
<td>Commercialization</td>
</tr>
<tr>
<td>TRL 3</td>
<td></td>
</tr>
<tr>
<td>Develop lab model</td>
<td></td>
</tr>
<tr>
<td><strong>GATE 2</strong></td>
<td><strong>GATE 5</strong></td>
</tr>
<tr>
<td>Exploratory Development</td>
<td>Advanced Development</td>
</tr>
<tr>
<td>TRL 4</td>
<td>TRL 5, 6</td>
</tr>
<tr>
<td>Design and test lab prototype</td>
<td>Develop functional prototype in lab environment</td>
</tr>
<tr>
<td><strong>GATE 3</strong></td>
<td><strong>GATE 4</strong></td>
</tr>
<tr>
<td>Engineering Development</td>
<td></td>
</tr>
<tr>
<td>TRL 6, 7</td>
<td></td>
</tr>
<tr>
<td>Iterate prototype in relevant environment</td>
<td>Finalize design in operating environment</td>
</tr>
<tr>
<td>Scientific principles proven</td>
<td></td>
</tr>
<tr>
<td>Proof of principle experiment completed</td>
<td></td>
</tr>
<tr>
<td>Proof of technology/ product definition completed</td>
<td></td>
</tr>
<tr>
<td>Proof of technology/ working model completed</td>
<td></td>
</tr>
<tr>
<td>Engineering prototype completed</td>
<td></td>
</tr>
<tr>
<td>Production prototype completed</td>
<td></td>
</tr>
<tr>
<td>Ongoing deployment/ manufacturing scale-up</td>
<td></td>
</tr>
<tr>
<td>Potential markets/ end-users identified</td>
<td></td>
</tr>
<tr>
<td>Commercialization roadmap completed</td>
<td></td>
</tr>
<tr>
<td>Preliminary funding milestones identified</td>
<td></td>
</tr>
<tr>
<td>Business model defined</td>
<td></td>
</tr>
<tr>
<td>Competitive assessment completed</td>
<td></td>
</tr>
<tr>
<td>Business plan completed</td>
<td></td>
</tr>
<tr>
<td>Early adopter customers secured</td>
<td></td>
</tr>
<tr>
<td>Team formed</td>
<td></td>
</tr>
<tr>
<td>Private funding secured</td>
<td></td>
</tr>
</tbody>
</table>

©2010 Nevada Institute for Renewable Energy Commercialization
### 6 Ways to Facilitate Commercialization (1)

#### 1. Early-Stage Venture Capital (e.g. X/Seed, CalCef Angel Fund)

<table>
<thead>
<tr>
<th>Atom</th>
<th>+</th>
<th>$</th>
<th>$</th>
</tr>
</thead>
</table>

- **Venture capitalists take on high risk and provides seed capital to very early stage companies**
  - Assumes technologists and entrepreneurs, with varying degrees of VC guidance, come together naturally to form fundable business
  - Tends to target high-growth businesses and favors acquisition or IPO exit

#### 2. Business Push (Search Fund) Model (e.g. DOE EiR Program)

<table>
<thead>
<tr>
<th>Atom</th>
<th>+</th>
<th>Atom</th>
<th>$</th>
</tr>
</thead>
</table>

- **Identify the Entrepreneur first**
- **Entrepreneur searches for “interesting” technology, and actively seeks funding to support company formation**
  - Starts with entrepreneur’s aspirations
  - Tends to target high-growth businesses and favors acquisition or IPO exit
### 3. Researcher turned Entrepreneur Model (Entrepreneurial Separation to TT [Sandia])

**a.** Technologist has desire to commercialize his/her technology

**b.** Assumes the entrepreneur role by utilizing available entrepreneurial resources, and operating within the constraints of “day job”

- Assumes that researchers can effectively execute the entrepreneur role

### 4. IP Clearinghouse Model (iBridge, TechTransferOnline)

**a.** Provides information and transparency in the market place (through the internet) for technologists, entrepreneurs/companies, and sources of capital to meet

- Relies on any one of the 3 to reach out
- Potentially, great leverage for smaller networks to reach out beyond their immediate sphere of influence
6 Ways to Facilitate Commercialization (3)

5. Ecosystem-Enhancing Models (SARTA Clean Start, Clean Tech Open)

| a. Provide incentive for entrepreneurs/researchers to partner and develop their ideas |
| b. Typically “light-touch” levels of mentorship/education |
| ➢ Strengthens the ecosystem |
| ➢ Provides visibility to up and coming companies/opportunities |

| 6. Technology Pull Model (NIREC, Deshpande Center) |
| a. Identify the technology first and fund technology development |
| b. Bring the appropriate business expertise and capital to mature the technology and company (varying degrees of “mentor” commitment/involvement) |
| ➢ Starts with the technology and the inventor’s aspirations |
| ➢ Supports multiple forms of business models and exits (e.g. licensing, acquisitions, revenue share) |
How NIREC is different
... than government agencies and most other accelerators

• Triple bottom-line (people, planet, profit), regional
development VC model - royalties/equity returns re-
invested in non-profit mission
  • Willing to fund “non-venturable” businesses (e.g. longer
maturation cycles; size of/unclear exit)
• Focused solely on Clean Energy (EE, RE)
• “Heavy-touch” technology pull model
  ▪ 12 month EIR program
• Access to broad IP pool
  • Research partners – NV, CA, others along I-80 corridor in
  Western, U.S.
  • Early stage companies - nationwide
Board of Trustees
Technology Commercialization Advisory Board

- Jason Geddes, PhD  
  Environmental Services Administrator, City of Reno; Trustee & Chairman of TCAB

- Wil Agatstein  
  Executive Director, Center for Entrepreneurship, and Visiting Assistant Professor, University of California, Davis

- Jim Davis  
  President, Chevron Energy Solutions

- Oliver Hemmers, PhD  
  Executive Director, Harry Reid Center for Environmental Studies, University of Nevada, Las Vegas

- Kent Hoekman, PhD  
  Research Professor, Division of Atmospheric Sciences, Desert Research Institute

- Travis Johnson  
  Manager, Substation Construction & Maintenance Groups, NV Energy

- Manorjan Misra, PhD  
  Director, Renewable Energy Center and Professor, Materials Engineering, University of Nevada, Reno

- Lou Peoples  
  Former Vice Chairman of the Board and CEO, Orange and Rockland Utilities, Inc.

- Marc Wiseman  
  Vice President, Clean Technology, Ricardo
NIREC’s Core Business Process:
Focused on Technology Selection, Seed Funding, and Commercialization Assistance

**Provide R & D Guidance to Research Partners**
- National priorities
- Economic impact

**Issue RFPs**
- Research partner track
- Early-stage company track

**Proposal Selection**
- Expert Review Board
- Emphasis on near-term economic impact

**Acceleration**
**Services & Funding**
- Entrepreneur-in-Residence
- Market / competitive analyses
- Technology funding (de-risking)

**Commercialization Outcomes**
- Commercialization Roadmap
- Business Plan
- Follow-on funding secured
- Economic Impact / Jobs
The Entrepreneur-in-Residence

• Fit
  – Individually matched to your project
    • Domain interest/expertise
    • Geographical location
  – Leverages outside technical and other experts to help team solve issues and challenges

• Role
  – Is a part of your team
  – Works with all team members to develop and implement the commercialization roadmap
  – Provides business planning expertise, project leadership and guidance
  – Every team member is responsible for ensuring all milestones and deadlines are met
NIREC 2010 Request for Proposals

$150,000 in Cash and Commercialization Services

September 14, 2010 - 2:00 pm PST  Pre-Proposal

October 5, 2010 - 2:00 pm PST  Full Proposal

December 21, 2010  Applicants notified for presentation round
January 25, 2011  Project Presentations
February 1, 2011  Advance to Due Diligence Round
March 2011  Final Award Announcements

Submit documents to: http://www.nirec.org/rfpupload.html
RFP Workshops

Tuesday, August 10, 2010 10:00 am
DRI – Reno, Stout Conference Room A

Tuesday, August 10, 2010 10 am
DRI Las Vegas, Room 182

Tuesday, August 18, 2010 2:00 pm
Online Webinar

Thursday, August 19, 2010 2:00 pm
University of Nevada, Reno, 422 Joe Crowley Student Union

Friday, August 20, 2010 3:00 pm
University of Nevada, Las Vegas, Barrick Museum

Wednesday, August 25, 2010 1:00 pm
University of California, Davis, Graduate School of Management
   Gallagher Hall, Room 2310

Tuesday, August 31, 2010 10:00 am
Online Webinar
NIREC Portfolio

• 3 companies/projects completed, 2 in process
  ▪ Non-intrusive, appliance-level load disaggregation algorithm
  ▪ Nano-fin Superhydrophobic Coating
  ▪ Cellulosic Biofuels (CMF) Chemical Process
  ▪ Solar-integrated water source heat pump
  ▪ Growth of single crystal nanopillars and transfer to alternate substrates

• Finalizing due diligence in third RFP round (up to 3 additional investments)

• To date, NIREC funding has been leveraged in excess of 3x
Agenda

1. Your Research and its Societal Impact

2. NIREC’s Role

3. NSHE/NIREC Collaboration
Launching the EIR “Lite” Pilot Program

• Objective of this pilot program:

1. Work closely with Researchers, the Consortium and Technology Transfer Offices to explore the commercial potential of their technologies

2. Bring the knowledge and perspective of commercialization and domain experts, to a greater number of projects/researchers

3. Help researchers sharpen the commercial appeal of their research, in a bid to increase their chances of securing further funding opportunities
Features of the EIR “Lite” Pilot Program

1. Start with an informational meeting
2. NIREC will recruit a small panel of advisors for the project, as well as a research intern
   • Advisor Commitment
   • Intern Commitment
   • Researcher Commitment
3. Desired Outcomes:
   • Short document outlining the commercialization roadmap
   • A group of commercialization advisors
   • A noticeable cultural shift
4. 6 month engagement
Kicking off the process

1. Get in touch!
   - Reach out to us - indicate your interest
   - NIREC will also systematically reach out to researchers

2. Provide us with any thoughts and suggestions of how we can help