CURENT
CENTER FOR ULTRA-WIDE-AREA RESILIENT
ELECTRIC ENERGY TRANSMISSION NETWORKS

Sustainability Planning
For Post Graduation

Presented by:
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And Liaison Officer

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THE UNIVERSITY OF TENNESSEE KNOXVILLE

Northeastern

Rensselaer

TUSKEGEE

Sustainability Overview
CURENT Post-Graduation Planning

Purpose

•Transition strategy for CURENT to move from a NSF/DOE jointly funded ERC to a self-sufficient organization
•Secure additional support/funding for continuation beyond year 2020
•Four-year business plan/roadmap to outline necessary steps for implementation
•Engage stakeholders in planning process

What is needed to transition to self-sustained institute

•Leadership of the management team
•Broad engagement of faculty, staff, industry partners, and university administration, which allows for both ownership in the plan and commitment from all stakeholders
•High degree of University commitment
•High education program value to faculty, students and industry
•Commitment of core group of faculty
•Active industrial support, contribution of membership fees and guidance
•Effective implementation of a transition plan that builds on Center's strengths

Sustainability Planning Process

- Initiated discussions with potential partners and funding sources
  - Reviewed other successfully graduated center's sustainability plans
  - Conducted one-on-one meetings with principal and key members
  - Ask for input during IAB workshops and retreats
  - Held Internal discussions with Leadership across Universities to gain institutional support
  - Developed action plan to procure resources including State Funding, Endowments
    e.g. NYSERDA, UT Center of Excellence, Gov. Chair
    e.g. Gates Foundation
- Formed the CURENT Industry Sustainability Working Group (CISP)
- Met with NSF ILO Consultants at UTK in April 2017 to discuss Center Sustainability Planning and Tech Transfer
- Presented and discussed CISP progress with IAB/SAB during July 2017 summer retreat
- Establish cooperative efforts with multi-disciplinary partners at CURENT Universities
- Working with two, small, start-up companies for technology transfer (option to license)
- Launch Core projects during Years 9 and 10
- Seek support to continue beyond Year 10
- Develop Plan for Education and Outreach Continuation

CURENT Industry Sustainability Planning Group (CISP)

- **Team Purpose**
  - determine methods to retain and grow relationships with current members and explore other opportunities to help sustain the center.
  - help center build a sustainable model by providing guidance for financial support and facilitation of its programs.
- **Mission and Objectives**
  - increase the likelihood of a successful transition so Center is able to sustain itself (both its mission and budget) and continue to operate after graduation.
  - anticipated that several key changes can be expected for the Center. The goals of the plan is to positively manage those major changes and develop creative approaches to augment the core programs of the Center in other ways.

CURENT Sustainability team

CURENT Sustainability Team	
Name	Affiliation
Industry	
Tom King (chair)	UT/ORNL
Hongming Zhang	Peak Reliability
Dejim Lowe	Tennessee Valley Authority
Xiaoming Feng	ABB/IAB Co-chair
Dave Bertagnolli	Scientific Advisory Board
Matthew Gardner	Dominion/IAB Chair
Phil Overholt	Department of Energy
Faculty	
Ali Abur	NEU Campus Director
Joe Chow	RPI Campus Director
Fran Li	UTK Campus Director
Greg Murphy	TU Campus Director
Bill Dunne	College of Engineering, Associate Dean & Professor
Staff	
Lisa Beard	Industry Outreach Director

Sustainability Plan
Four Key Components

1. **Programmatic**
   - Define Post-Graduation Mission & Goals
2. **Financial**
   - Secure University Support
     - Institutional Support (financial)- written commitments from 4 Deans
     - Interdisciplinary research grants obtained from Federal and State agencies
     - Innovation Partnerships – education grants and start-up companies
   - Continue to Increase Industry Engagement
     - 14 on-site visits to industry sites in 2016 and 8 in YTD in 2017
     - 35 members 5/30/2017 – goal is 40 or less
     - Consider modifying cost structure
   - Capitalize on Technology transfer
3. **Cultural**
   - Develop future workforce by educating students who are prepared to work as teams, to become entrepreneurs, and are cross-trained in power electronics and power systems;
   - Build a cross-section with public-private partnerships and leverage both public and private funding;
   - Seek technology innovation through research, development and application;
4. **External**
   - Marketing/Action plan
   - Conduct Outreach/Workshops

Mission and Goals

CURENT's mission is to be a critical catalyst for the technical evolution of the power industry. Several key changes expected for the Center:

- Goal of the sustainability plan is to positively manage those major changes and develop creative approaches to augment the core programs of the Center in other ways. The plan will address the following areas: 1) financial, 2) programmatic, 3) cultural and 4) external.
- Metrics of success include the ability to maintain the core Center characteristics of system driven approaches and the core elements of industry engagement, research and education.

Key Challenge will be balancing scope and availability of resources

Activities Across Different Time Dimensions

Innovation (Long-Term, 10-20 yr)

- Identify and research top technology trends (ten to twenty year timeframe) with emphasis on enabling scalable, power-industry positive impacts
- Develop and publish a series of high-priority technology white papers for Members
- Develop attractive proposals and experiments in an effort to support long-term industry innovation and assure future investment
- Build a strategic technology portfolio (patents, licenses, etc.) to provide incremental independent funding while also providing value to Members

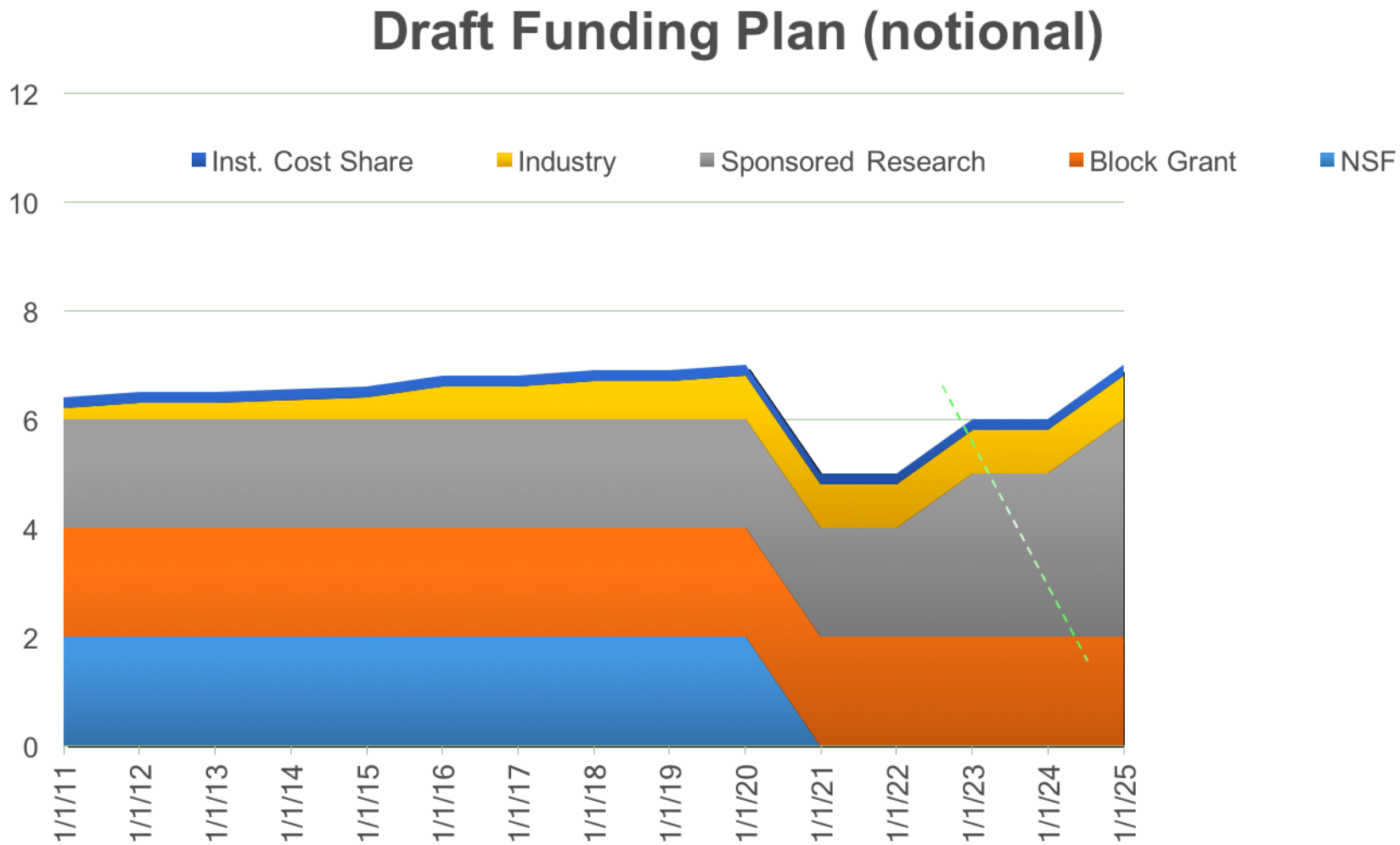
Research and Development (Mid-Term 3-5yr)

- Grow core competence in technology areas such as Ultra-Wide-Area Management, Monitoring and Measurement, Cyber Security, Large Scale Modeling, Analytics and Visualization
- Working closely with top tier Members Power

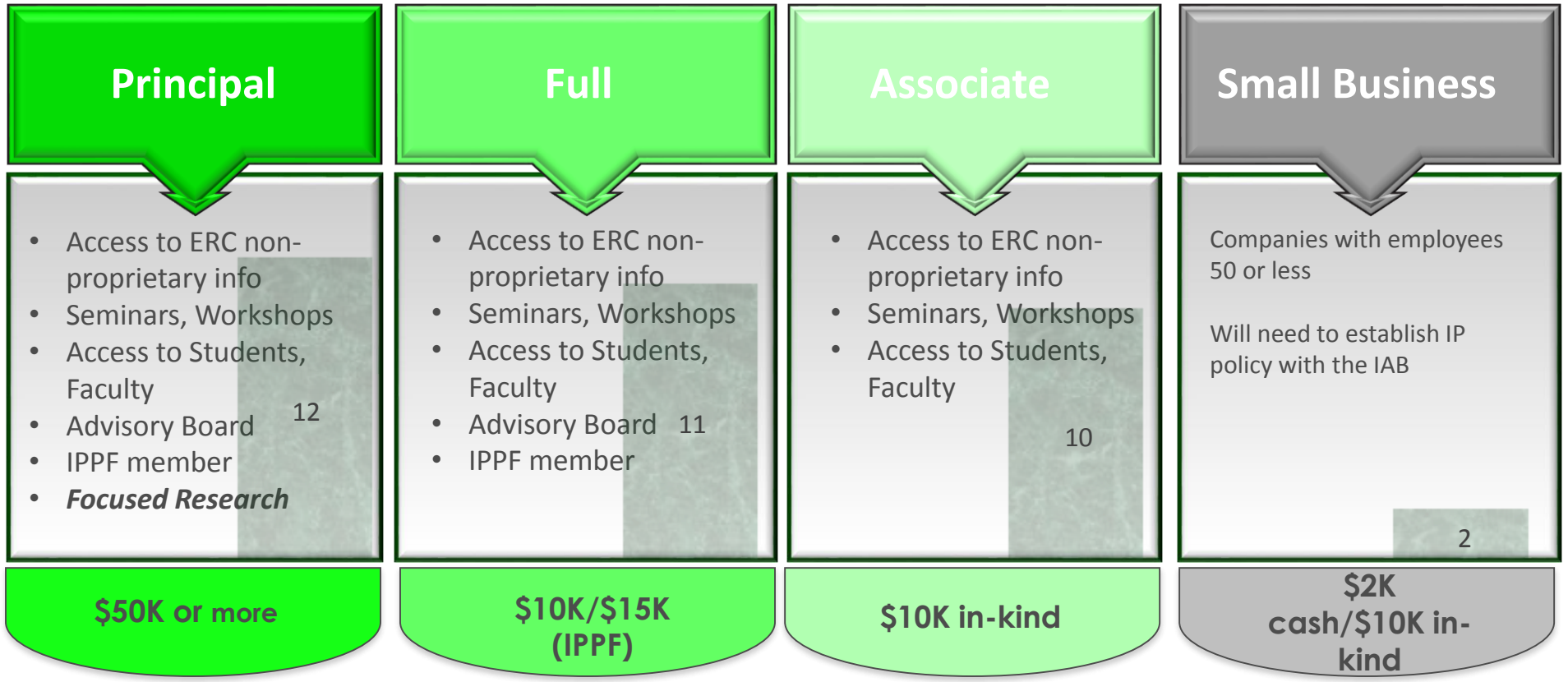
Technology Transfer (Short Term 12-24 months)

- Technology Testing/User Group(s)
- Software tool development and prototype design
- Annual Industry Conference
- Communications

Post-Graduation Business Plan



Membership Structure



Our Sustainability Plan will focus on Principal and Full Memberships

- Increase principal/full membership participation
- May consider modifying membership fees
- May consider developing focused membership groups/projects

Sustainability Plan

Innovative Stakeholder Partnership – States, Federal opportunities

Cherokee Farms Innovation Campus, adjacent to UT campus, is being considered as a location for a multi-institutional collaborative that could leverage CURENT research activities

- Continue to pursue State and Federal funding opportunities
  - NYSERDA
  - Massachusetts
  - Alabama
  - Tennessee
- Innovative Stakeholder Partnership: e.g. Cherokee Farm Innovation Campus is a collaborative effort of The University of Tennessee and Oak Ridge National Laboratory.
- Aggressively pursue opportunities with DOD, DHS, DOE

CURENT

Capitalize on Technology Transfer & Intellectual Properties

Commercialization paths

- Continue strong partnerships and collaboration with industry
- Increased financial assistance from each of the partner Universities and industry,
- Transfer of technologies to industry, business and marketing plans being implemented utilizing research expertise of the center's faculty, testbeds and research facilities.

Technology commercialization roadmap

Commercialization paths

FEATURES	EXAMPLES	COMMERCIALIZATION PATHWAYS	TECHNOLOGY APPROACH
Component & Devices	• Next Generation Monitoring • Actuation Systems • Power Electronics	• Generate Intellectual Property & Collaborate with Innovation Partners • Member Co. License • Small Business License • Start-up Company	• Device development • Modeling system impacts • Hardware test-bed demo • Field trial • Full deployment
Software	• Control Algorithms • MOVARTI –Volt/Var • Situational Awareness		• Algorithm development • Modeling system impacts • Incorporate into commercial product or open-source • Field trial and full deployment
User Facility	• Hardware Test-bed	• ERC Consulting • Start-up company	• Define problem with client • Develop scenarios for HTB • Results communicated to client

CURENT

I-CORP Program – Develop Business Model Canvas

Participated in UAB Regional ICORP Process – June 2017
4 weeks, 19 interviews, no additional funding

Focused on left side of canvas

The Business Model Canvas

Key Partners
Eaton – CYME
ABB, GE, Hitachi and other inverter Manufacturers, national labs

Key Activities
- Scale emulation platform into service atop hardware testbed
- ID and develop functional requirements document, how are CURENT testing services unique;
- Develop Use Cases
- Determine base cost and resources needed for running

Key Resources
- User Test Facility Manager and support staff
- Separate, controllable space for commercial

Value Propositions
VP 1 – Inverter disconnects cost lost revenue to VER owners, distribution and transmission companies. Testing services for inverters, could help avoid grid system disconnects
VP 2 – lab testing of inverters less costly and more timely than testing in field
VP 3 – lab testing allows for a greater number emulated field testing conditions

Customer Relationships
Look for partners like Eaton, ABB, etc. that are responsible for analysis of re-neweables and vendors that have proprietary models.

Channels
How do our Customers want to be reached?

Customer Segments
Senior Engineers, Transmission Engineers, Consulting Engineers,
Vice Presidents of Strategic Research
Senior Product Manager
Interconnection Planners
Transmission and Distribution Planners
Inverter manufacturer engineers

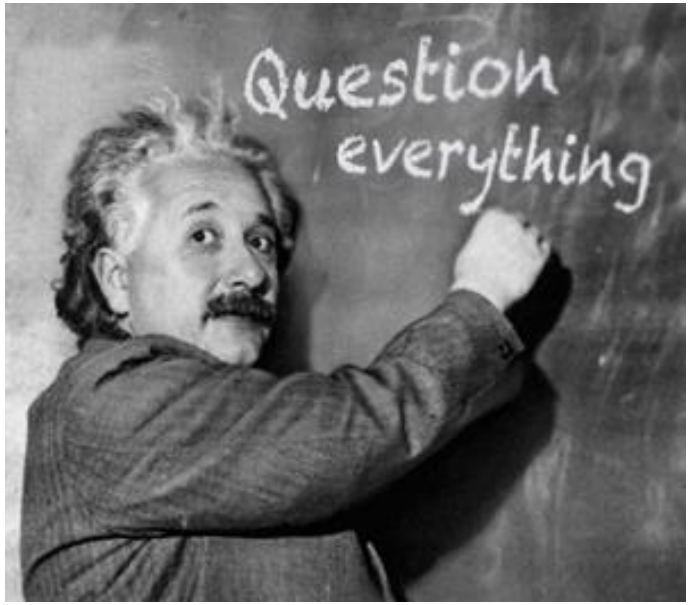
Cost Structure
User Space, Lab Director

Revenue Streams
What is our revenue model? What are our pricing tactics? For what value are our customers willing to pay? - look at NREL and other non-profit service model

Action Plan

- CURENT Industry Sustainability Plan Working Group/Plan
- Continue CURENT Research Outside of NSF/DOE ERC
- Extend CURENT Roadmap for Post Graduation
- Develop Business Plan (operating expenses/projected revenue)
- Work with three “technovators” for technology transfer
- Measures of Success
  - Secured financial assistance
  - Interdisciplinary research grants obtained from Federal and State agencies
  - Adopted technology developed business and marketing plans
  - Re-defined scope of the research portfolio
  - Fee structure established and being used for outside use of testbeds and research facilities transfer models
  - Continue Education Outreach Efforts

Discussion



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