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

Overview and Meeting Objectives

Kevin Tomsovic
Center Director

2021 Summer Strategic Planning Meeting
August 19, 2021

Virtual

THE UNIVERSITY OF TENNESSEE KNOXVILLE Northeastern Rensselaer TUSKEGEE

Agenda

1:00 - 1:10 pm	**Welcome & Introductions - Kevin Tomsovic**

1:10 - 1:30 pm	**Center Update**
	• **Objectives of meeting**
	• **NSF closure – annual report, final report**
	• **Industry conference – Oct. 27-28**
	  • **Research overview from last year**
	  • **Invited presentations**
	  • **Lab tour and student posters**
	  • **Tutorial (to be discussed)**
	• **Sustainability plan update**
	• **Future research directions and initiatives**

1:30 - 2:00 pm	**Discussion on industry consortium and SAB** • **Membership structure** • **Board organization**
2:00 – 2:45 pm	**Industry input / presentations**
2:45 – 3:00 pm	**Wrap up and action items**

Meeting Objectives

- Update on the status of the Center
- Emphasis today
  - Transitioning away from ERC (remaining items)
  - Update on long term sustainability of CURENT
  - Overview longer term research directions
  - Discuss industry membership and scientific advisory board organization

2020 Site Visit and ERC Wrap-up

- Generally positive comments (most elements received high quality rating)
- No site visit this year
  - Annual report due October
  - Final report due March
- NSF/DOE ERC funding officially ends November 30

Sustainability Update

CURENT Post-Graduation

- Approximately $500K internal funding and support at UTK
  - Continue to seek state level funding
- Education programs incorporated into College
- Administrative support from College
- Strong power and energy external research funding – approximately $11M/year in recent years (including UTK $8M/yr; RPI $2M/yr; NEU, TU and Tufts – $1M)
- Industry membership program continues with no overhead

Research Roadmap

Year 1~3	Year 4~6	Year 7~10
Generation I	**Generation II**	**Generation III**
Regional grids with >20% renewable (wind, solar), and grid architecture to include HVDC lines	Reduced interconnected EI, WECC and ERCOT system, with >50% renewable (wind, solar) and balance of other clean energy sources (hydro, gas, nuclear)	Fully integrated North American system with >50% energy (>80% instantaneous) inverter based renewable resources (wind, solar) and balance of conventional (hydro, gas, nuclear)
System scenarios demonstrating a variety of seasonal and daily operating conditions	Grid architecture to include UHV DC lines connecting with regional multi-terminal DC grids, and increased power flow controllers	Grid architecture to include UHV DC super-grid and interconnecting overlay AC grid and FACTS devices
Sufficient monitoring to provide measurements for full network observability and robustness against contingencies, bad topology or measurement data	System scenarios demonstrating complete seasonal and daily operating conditions and associated contingencies, including weather related events on wind and solar	Controllable loads (converter loads, EV, responsive) and storage for grid support
Closed-loop non-local frequency and voltage control using PMU measurements	Full PMU monitoring at transmission level with some monitoring of loads	Fully monitored at transmission level (PMUs, temperature, etc.) and extensive monitoring of of distribution system
Renewable energy sources and responsive loads to participate in frequency and voltage control	Fully integrated PMU based closed-loop frequency, voltage and oscillation damping control systems, and adaptive RAS schemes, including renewables, energy storage, and load as resources	Closed loop control using wide area monitoring across all time scales and demonstrating full use of transmission capacity and rights-of-way
		Automated system restoration from outages

Broadening Research Themes

- Continuing research in modeling, monitoring, control and actuation, LTB/HTB testbeds

Expanding work into

  - Storage
  - Electrification of transportation
  - Resilience
  - Grid support with inverter based resources
  - Active distribution networks and microgrids
  - Blurring of transmission and distribution

List of Sponsored Projects
External to Core-funding of the Center

- See Word document

Industry Consortium and SAB Discussion

Fred Wang, UTK

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Outline

- Industry consortium membership
- IAB
- SAB

Membership Structure and Benefits

	Principal	Full	Associate	Small Business
Contribution	$50,000/yr	$10,000/yr	In-kind ($10,000/yr)	$2,000/yr. cash In-kind ($10,000/yr)
Focused research projects	✓			
IAB representative	✓	✓		
~~Industry/Practitioner thrust partners~~	✓	✓	✓	✓
Non-exclusive royalty free IP rights for internal and specified partner's use	✓	With IPPF		
Option for licensing to ERC's IP	1st option	2nd option		
IPPF member	Automatic	Optional		
Access to Non-IP information, including technology roadmaps	✓	✓	✓	✓
Free or discounted access to ERC conferences and short courses	✓	✓	✓	✓
Free access to industrial seminar series	✓	✓	✓	✓
Priority access to student interns and recruits	✓	✓	✓	✓

Membership Structure and Benefits – Improved Value

- Intend to keep the current membership and fee structure
- Maintain/enhance/streamline focused research for principal members
  - Maintain the focused research (member select faculty to work with and the topic to work on)
  - Timely information sharing on research topics to allow other principal members to add on/participate
  - Explore theme-oriented grouping of projects (theme to be determined by Center/members)
- Enhance annual conference
  - Continue and expand annual industry conference with focus on members (with invited keynotes, faculty research overview, student posters, lab tour/demo, and tutorials) – Fall this year. Future time TBD.

Membership Structure and Benefits – Improved Value

- Discounted short courses – so far we had offered limited short courses. Do members see values?
- IPPF? – abolish?
- More information sharing on other sponsored projects?
- Newsletters?
- Anything else?

Industry Advisory Board

- During ERC period, IAB's role centered around NSF requirements (SWOT analysis, annual spring retreat on roadmap review and summer meeting to approve the following year's project
- Future IAB roles will be on advising Center activities
  - Two or three annual meetings to provide advice on Center activities

Scientific Advisory Board

- SAB has been mainly providing technical advice. Activities include attend all center events for industry, hold monthly meetings.
- Future SAB role
  - Help networking (funding agency, partners)
- Need for an executive advisory board?

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