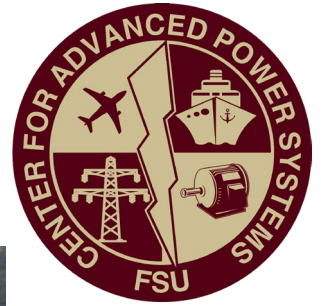




Florida State University Center for Advanced Power Systems

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Offices, Student Labs, and Superconductivity Labs

High Bay Rotating Machinery and MVAC/LVDC PHIL Lab

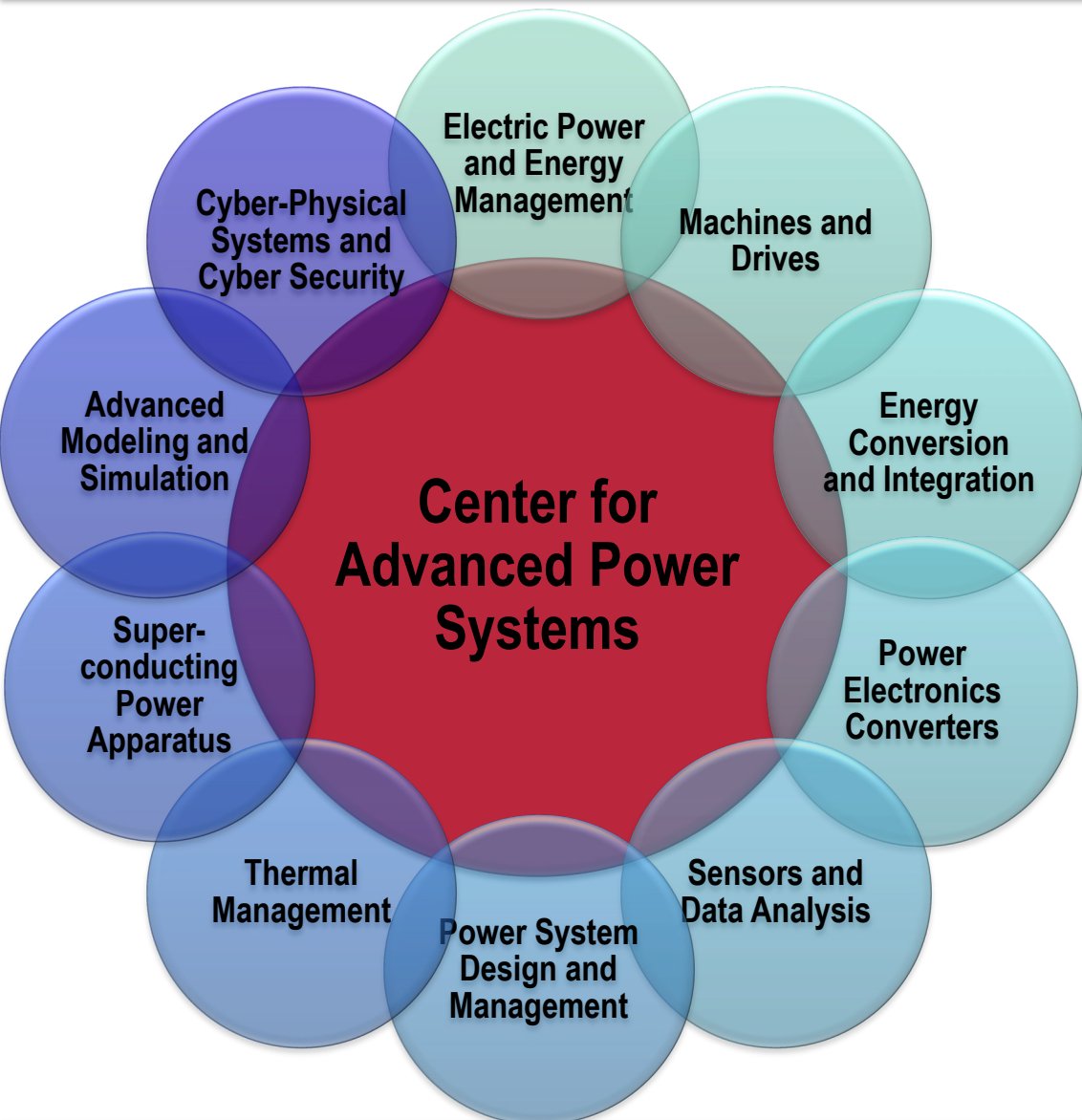
National High Magnetic Field Lab (NHMFL)

MVDC and MVAC PHIL Lab

Power Electronics & HV labs

NEW

Research Areas and Contacts



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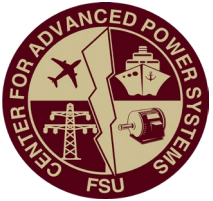
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NEW

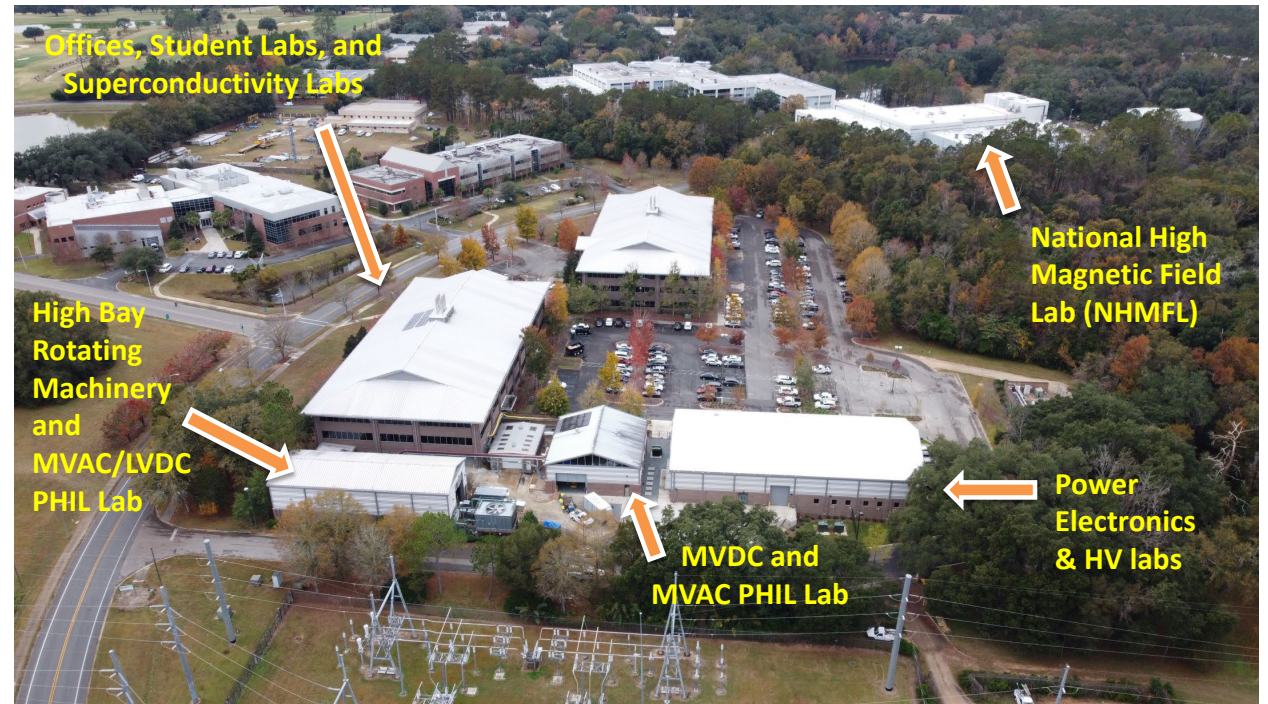
FSU Center for Advanced Power Systems - CAPS



Established in 2000

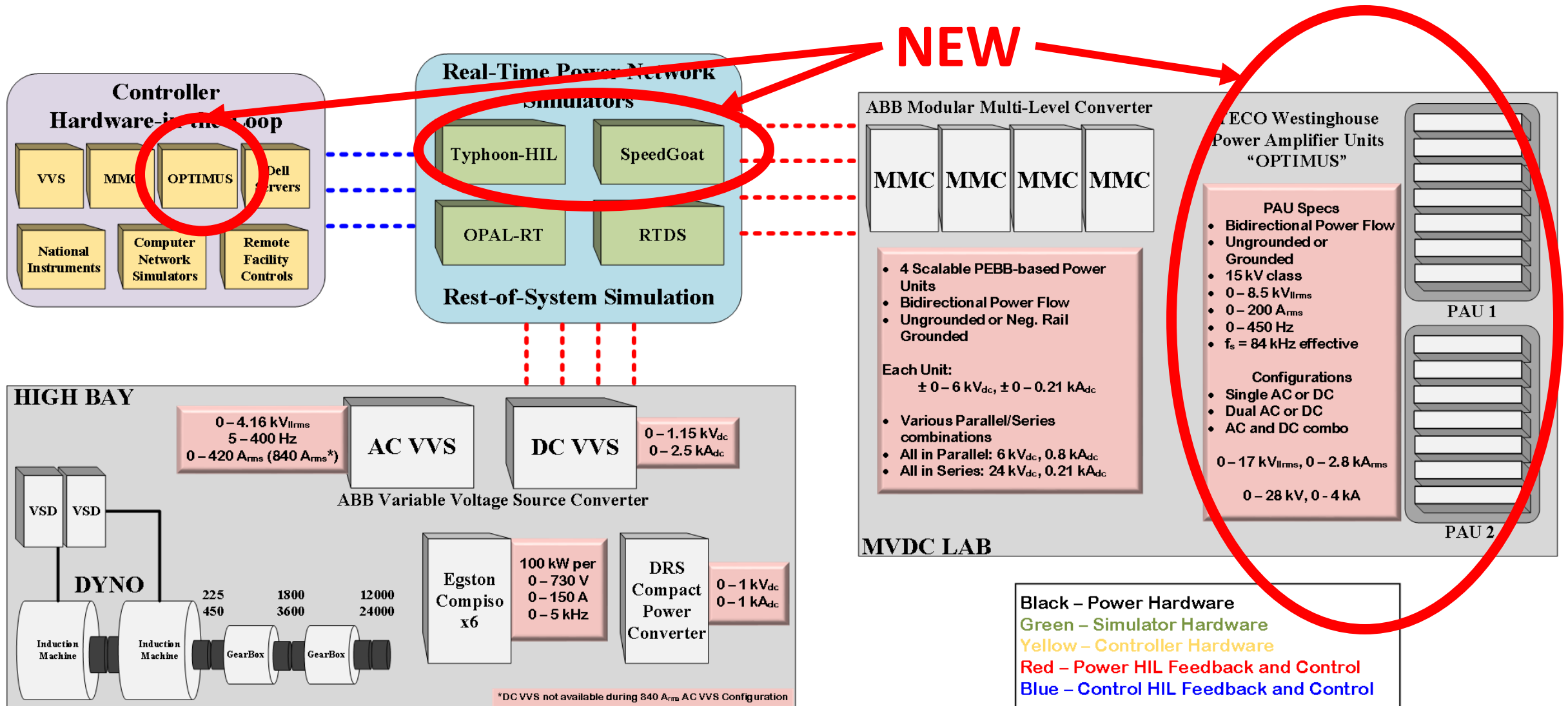


- **Research and education** related to application of new technologies to electric power systems
- Closely affiliated with **FAMU-FSU College of Engineering**
- 56,000 ft² laboratories/offices; CUI data **security compliant**
- Tenure/Non-tenure track **faculty, Ph.D./M.S./B.S. students, staff researchers and post-doctorial associates and facility support**
- Over **\$45 million** specialized **power and energy capabilities** funded by ONR, DOE, NSF and Industry
- **Lead university** of the ONR funded Electric Ship Research and Development Consortium (**ESRDC**)
- Contracted by **NAVSEA-PMS460** to conduct HIL based demonstrations of advanced P&E technologies
- Also funded from DOE-EERE, ARPA-E, and **industry partners** (e.g. STTR/SBIR, others)



NEW

FSU-CAPS 5 MW Facilities



NEW – RT Simulator Upgrades

8 new RTDS NovaCor systems totaling 8 fully loaded NovaCor chassis

- IBM Power 8 processors (10 cores/processor)
- 3 PB5 (processor) racks also present
- Additions enable
 - Simulations with 4,800 nodes
 - Multi-rate simulation capable
 - Improved CHIL performance (e.g., MMC CHIL)



NEW – RT Simulator Upgrades

2 SpeedGoat Performance Real-Time Target Machines

- Dedicated hardware for running MathWorks Simulink models in real-time
- Tandem operation with other simulators and controllers for PHIL and CHIL testing
- Intel Core i7 4.2 GHz 4 core processor
- Integrated FPGA modules for low-timestep simulations and high-speed communication



2 Typhoon HIL404 RTS

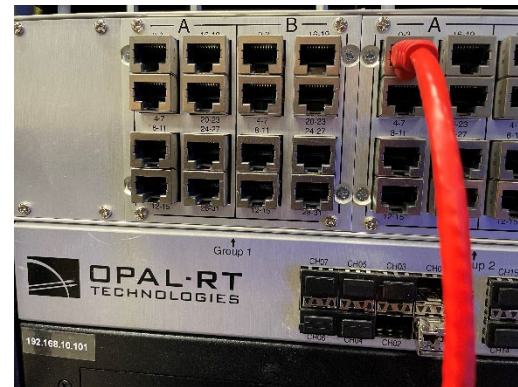
- Four cores/system, can be paralleled for larger simulations
- 96 analog and digital I/O
- Simulation timesteps as low as 200ns for low-latency simulations (e.g., buck/boost converter)



NEW – RT Simulator Upgrades

Opal-RT Real-Time Target Machines

- CPU and high-end reconfigurable FPGA
 - 256 I/O lines and 16 high-speed SFP ports
- CPU time step $\geq 20 \mu\text{s}$
- FPGA-based Power Electronics Tool box (eHS128) supports up to 144 switches and 344 states, with time step as low as 210 ns



PE Expert

- Digital platform for advanced power electronics
- TI6657 DSP + FPGA architecture enables high-speed control system, over 300 kHz carrier frequency
- Over 144 PWM control and sensor inputs
- PSIM SimCoder PE-Expert4 target option enabling advanced RCP (Rapid Control Prototyping)
- Automation and run-time debugging with full visibility of inside of the control



NEW – Reconfigurable MW Class PHIL Amplifier



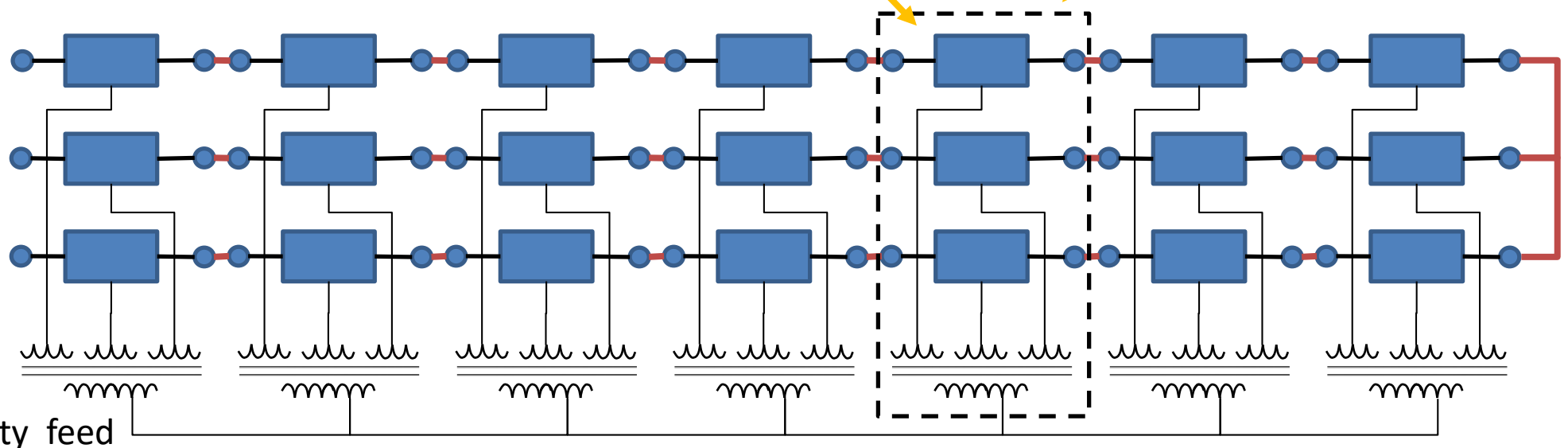
2 x Power Amplifier Units (PAUs) in CAPS MVDC Lab



Cube
In: 600V AC, 3-ph, 60 Hz
Out: 0...800 Vrms 1-ph

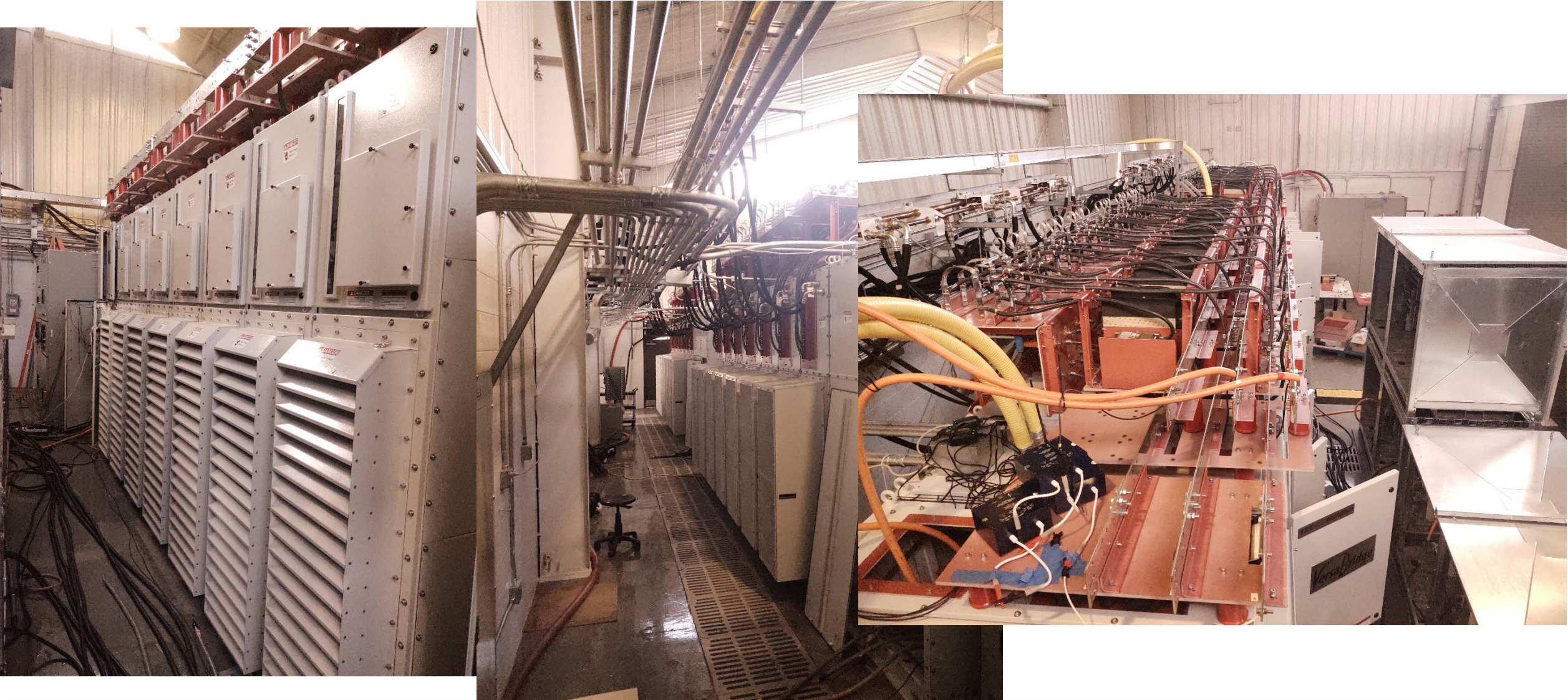


15 kV class
0...8.5 kV_{rms} L-L
0...200 A_{rms}
0...450 Hz
Bi-directional power flow
 $f_s = 7 \cdot 12 = 84$ kHz

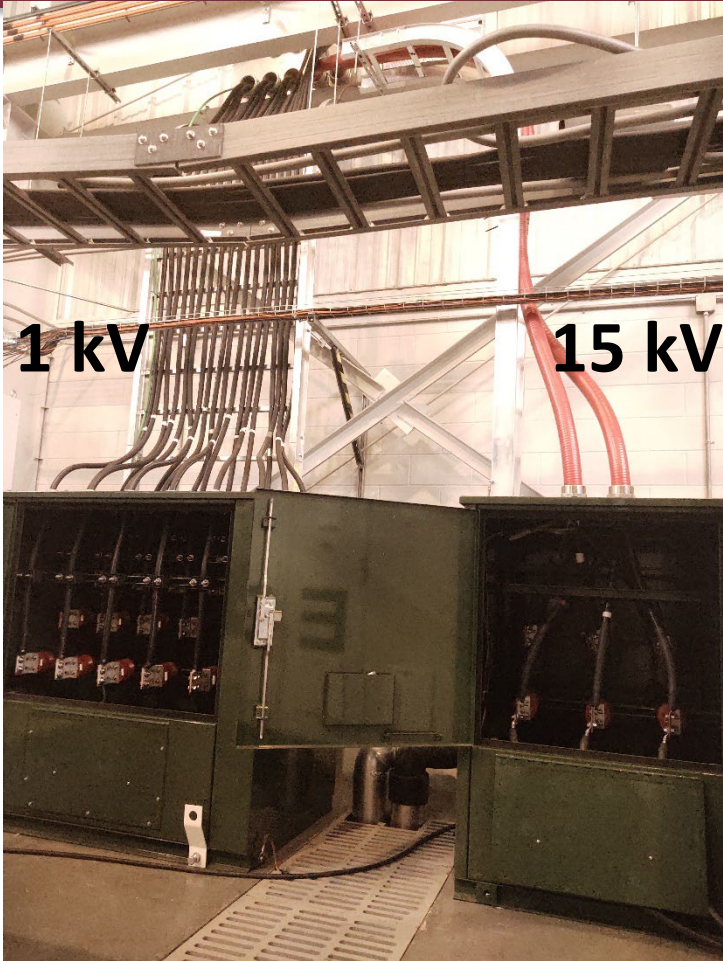


grounded or ungrounded

NEW – Reconfigurable MW Class PHIL Amplifier



NEW – Inter-Lab Connectivity and Cooling Capacity



2 x 5 MW connection between MVDC lab and high bay



70 Ton Chiller

NEW – CHIL of Reconfigurable MW Class PHIL Amplifier

