The Cape Peninsula University of Technology was established on the 1st of January 2005, when Cape Technikon and Peninsula Technikon merged. This merger was part of a national process that transformed the higher education landscape in South Africa.

Today, this institution is the only university of technology in the Western Cape and is the largest university in the region, boasting more than 30 000 students, several campuses and service points and more than 70 programmes.

CDPES research areas include energy efficiency, renewable and alternative energy technology, distributed energy system technology, predictive control of power converters and electrical drives and MEMS energy sensor technology.

Challenge:

Real-Time Simulation Laboratory
for Teaching and Academic Research

- Allow students to work with OPAL-RT real-time simulators to learn how Rapid-Control-Prototyping and Hardware-in-the-loop can accelerate control development and testing.
- Provide microgrids and power electronics models examples to create exercises
- Develop and improve control schemes for power converters and drives.
- Provide a product able to perform verifications throughout the project

Advantages:

OPAL-RT provides flexible and powerful real-time simulators that enable several students to work on power electronics and power systems teaching modules. Instead of working on real devices, they are simulated in real-time using MATLAB/Simulink® models.

For CPUT, OPAL-RT provided three OP4200 and three OP4510 real-time simulators.

Each real-time simulator includes:

- Processor with CPU cores
- FPGA board
- Input and output boards: 16 AI, 16 AO, 32 DI and 32 DO

OP4200 #1 real-time simulator
- *Simulation on FPGA*
- 16AI, 16AO, 32DI, 32DO

OP4510 #1 real-time simulator
- *Simulation on CPU core*
- 16AI, 16AO, 32DI, 32DO

OP4200 #2 real-time simulator
- *Simulation on FPGA*
- 16AI, 16AO, 32DI, 32DO

OP4510 #2 real-time simulator
- *Simulation on CPU core*
- 16AI, 16AO, 32DI, 32DO

OP4200 #3 real-time simulator
- *Simulation on FPGA*
- 16AI, 16AO, 32DI, 32DO

OP4510 #2 real-time simulator
- *Simulation on CPU core*
- 16AI, 16AO, 32DI, 32DO

Solutions:

Powerful and Game Changing Simulation Systems

POWER ELECTRONICS REAL-TIME SIMULATOR

- Compatible with SimScape Power Systems, PLECS and PSIM models
- Real-time simulation on FPGA
- Power Electronics applications
- Generic Power Converter solver on FPGA
- No FPGA expertise required
- Visualisations & fault analysis
- Typical time step: 200 ns

POWER SYSTEMS / SMARTGRIDS REAL-TIME SIMULATOR

- Compatible with MATLAB/Simulink and SimScape Power Systems models
- Real-time simulation on CPU cores
- Power Systems / Power Electronics applications
- OPAL-RT solvers with Simulink environment
- Visualisations & fault analysis
- Typical time step: 50 us