



Prepared for H2 PACE

Controller Hardware In the Loop (CHIL) for Grid Modernization

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Typhoon HIL – Power Electronic and Control MBSE

services

Expert consulting by application engineers
On-site and off-site training
HIL software, firmware and hardware customization

software

Vertically integrated system
Graphical modeling of power circuits
Custom test interfaces
Test automation with open-source
Python
Technical support from product developers

hardware



HIL 604

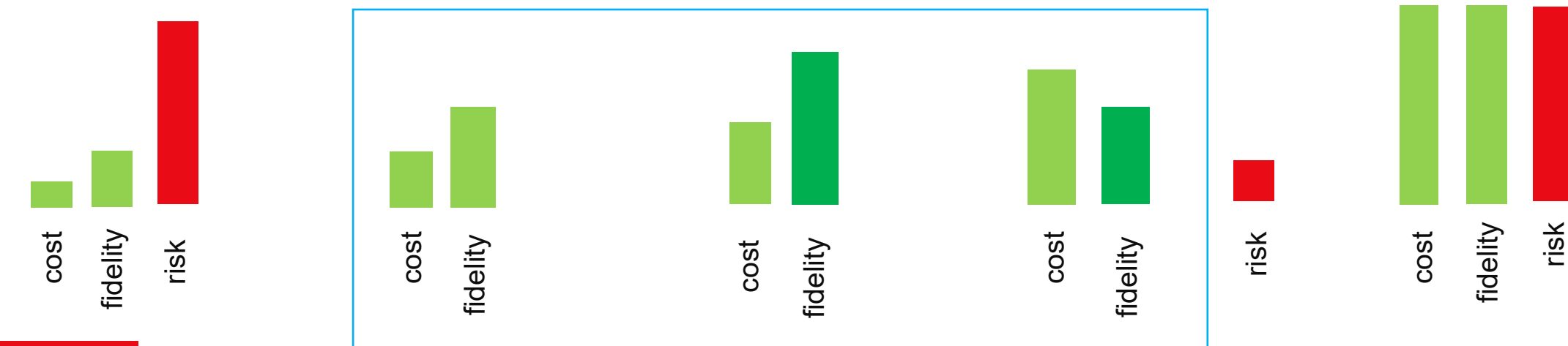
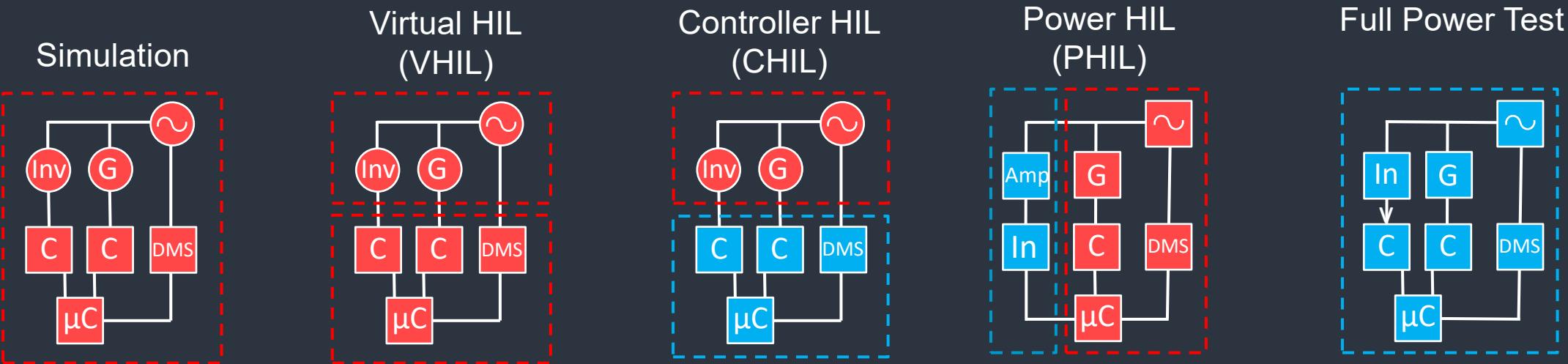


HIL-Controller
interfaces



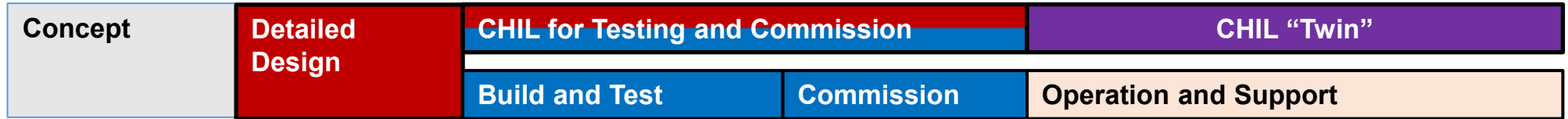
Large scale
simulators

Model Based Testing Methodologies



System Development Lifecycle

Acquisition Process



Project



IMBDP

0- Collect & Interface

1- VHIL (Generic)

2- VHIL (Design)

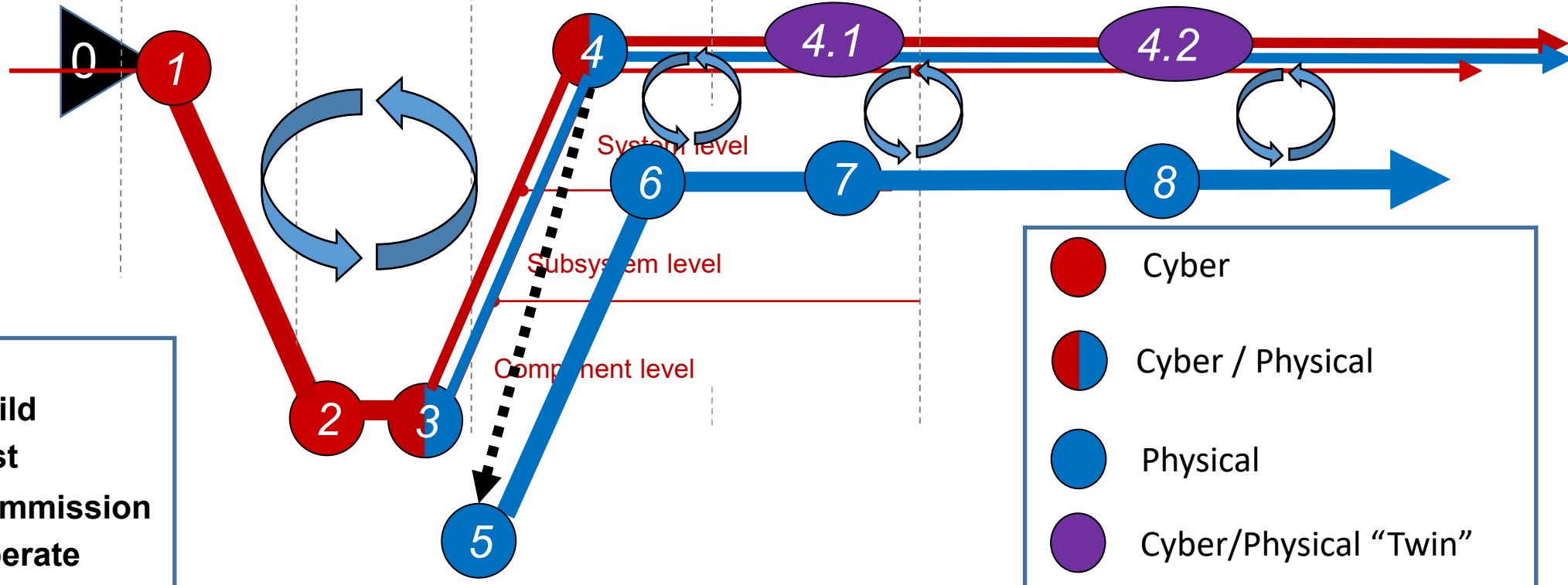
3- CHIL (Build)

4- CHIL (Test)

Future

CHIL (Twin)

- 5- Build
- 6- Test
- 7- Commission
- 8- Operate



Typhoon HIL – Impact on Commercialization of H2

HIL Compatible Packages

Distribution

ABB	615	Relay
Beckwith	M2001D	Tap Changer
Beckwith	M-6283A	3 Phase Digital Capacitor Controller
Eaton	CBC-8000	Capbank Contoller
Eaton	CL-7	Voltage Regulator
S&C	Intellicap	Automatic Capacitor Controls
SEL	300	Generator Relay*
SEL	311	Line Current Differential Protection
SEL	351	Protection, Automation and Bay Control System
SEL	421	Protection, Automation and Control System*
SEL	451	Protection, Automation and Bay Control System
SEL	487	Transformer Protection Relay
SEL	651R	Advanced Recloser Control
SEL	700G	Generator Protection Relay
SEL	735	Power Quality and Revenue Meter
SEL	751	Feeder Protection Relay
SEL	787	Transformer Protection Relay
SEL	2240	Axion - Real Time Automation Controller
SEL	3530	Real Time Automation Controller

* In development

Microgrid (System)

Eaton
ABB
ETAP
ComAp
Fractal

Genset

Woodward
Deif
ComAp

Wind Turbine

Woodward

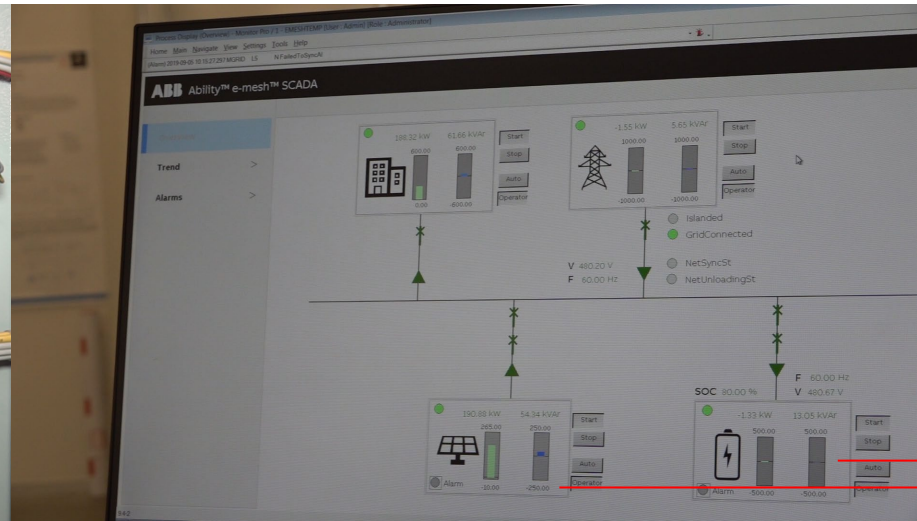
H2 Systems

Inverter / Drive

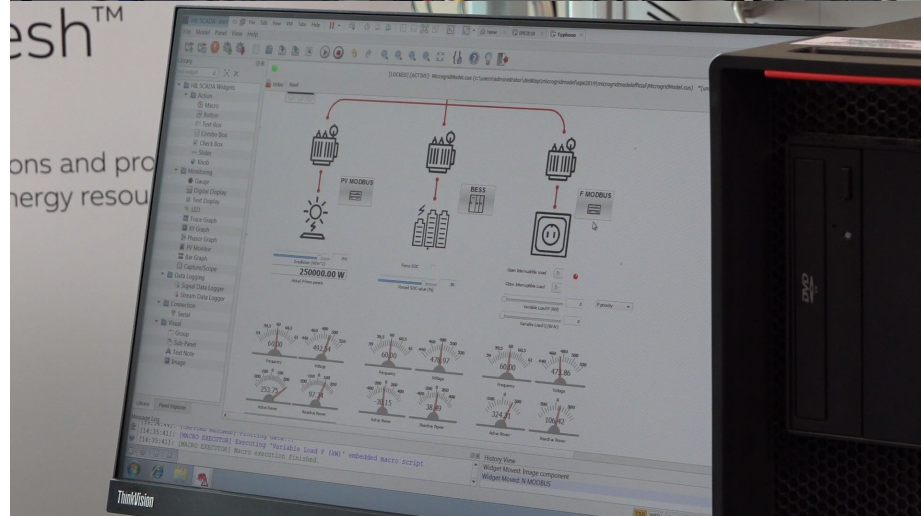
Fronius
Rolls Royce
Schneider
Fimer
EPC Power
Dynapower
ABB
Hitachi Power Grid
Danfoss
Solar Turbines
AIT

Hitachi Energy Powerstore HIL Testbed

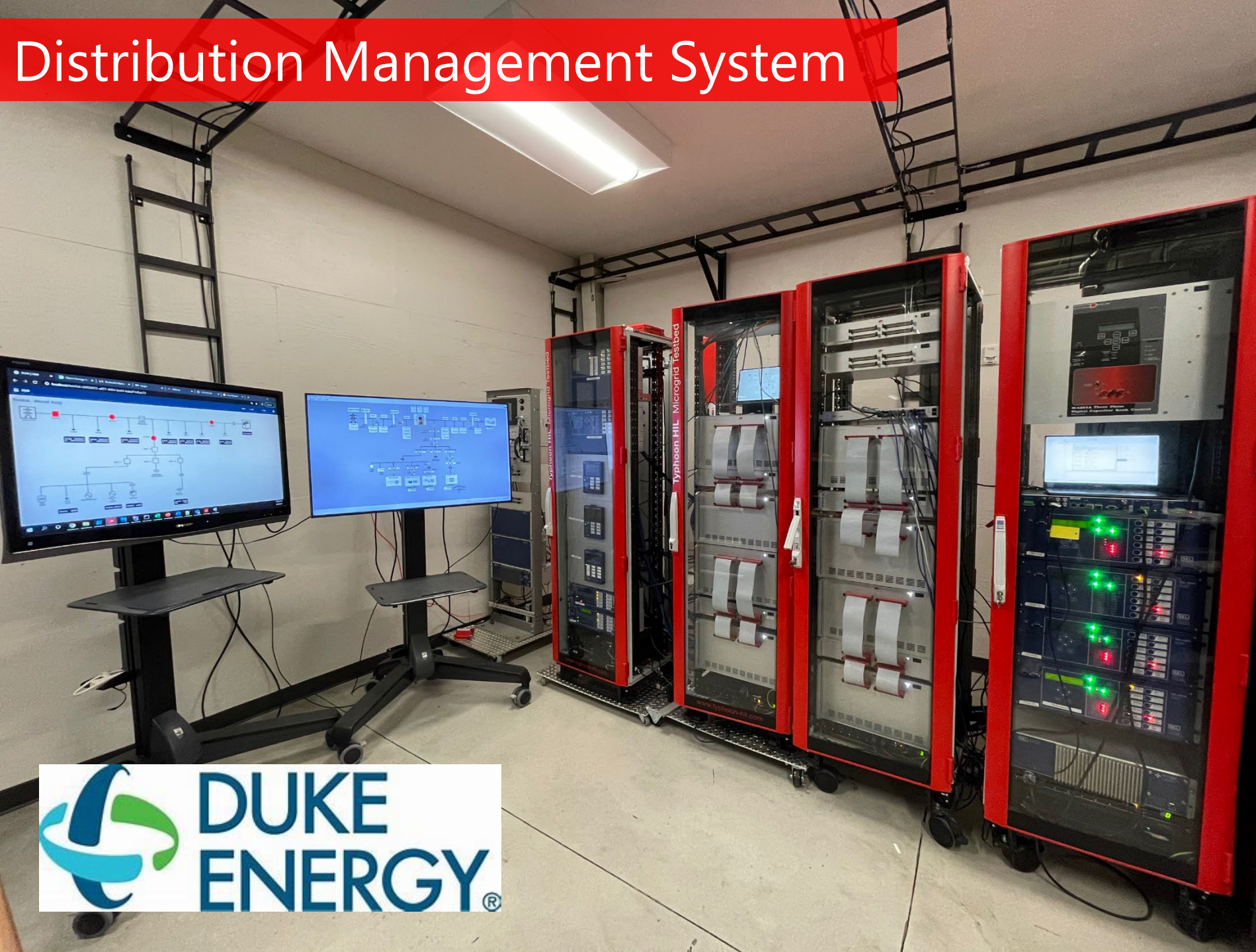
From control development, and pre-commissioning, to software regression testing and lifecycle maintenance.



HILCompatible
Components



Distribution Management System



Controllers in the Loop

- ABB PCS100
- SEL RTACs X 4
- SEL751
- SEL787
- SEL700G
- SEL651RX3
- SEL351
- SEL451
- Beckwith Capbank
- Beckwith Tap Changer
- EATON CL7
- EATON CBC8000
- Hitachi Powerstore *

Real Time Emulators

- 6 X Typhoon HIL604

Signal Conditioning

- 7 X HILConnects

TyphoonTest -- Standardization

Sunspec, IEEE, BDEW, etc

<https://www.typhoon-hil.com/videos/learn-to-use/learn-to-use-typhoontest-framework-for-test-automation/>





Thank you for your attention!

Typhoon-HIL.com

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