



HVDC (High Voltage Direct Current) + 12V Server Rack System

Sept. 18, 2014

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HVDC-WG, OCPJ

This material includes the information prepared by companies of HVDC-WG members, CTC Techno-Solutions, NTT Data Intellilink, NTT Facilities, Panasonic & Yutaka Electronics Industry. When referring to the content on this, please consult with each company.



OCP-J HVDC-WG

HVDC((High Voltage Direct Current) is one of technology reducing Power Loss between commercial power and IT equipment, and improving reliability in data centers.

HVDC-WG

- (1) Promotion Activity of HVDC + 12Vdc technology & solutions
- (2) Standardization Activity with GUTP(Green University of Tokyo project) DCIM-WG
HVDC-SWG

Action Plan

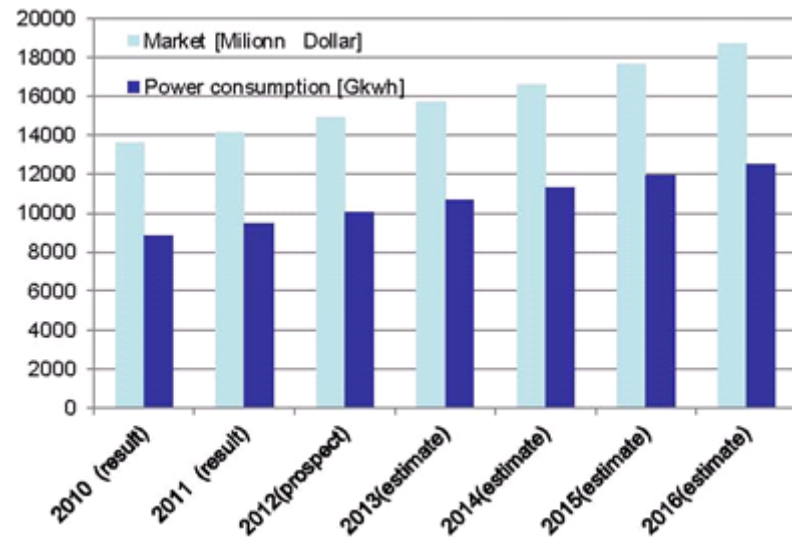
Based on Standardization activities w/ GUTP & JDCC(planned),

- conduct the HVDC+12Vdc validation & Verification of inter-connectivity & performance on OCP OpenRack.
- study the feasibility with rack-mount & in-chassis battery
- promote the product lineup including 12Vdc IT equipment & 12Vdc pass through box

mail

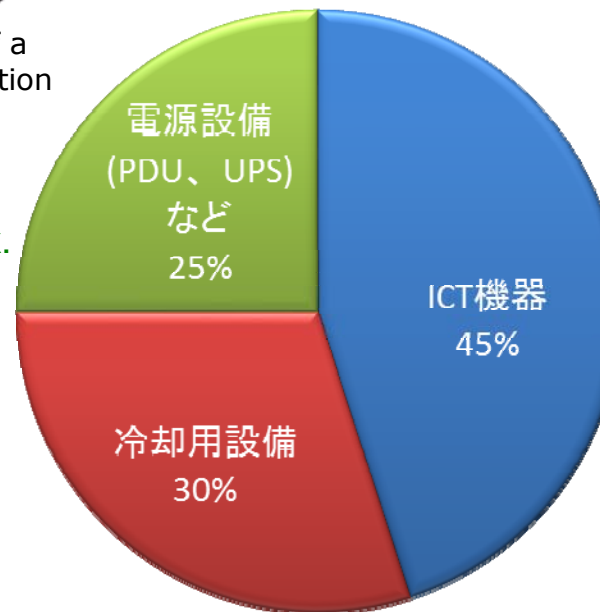
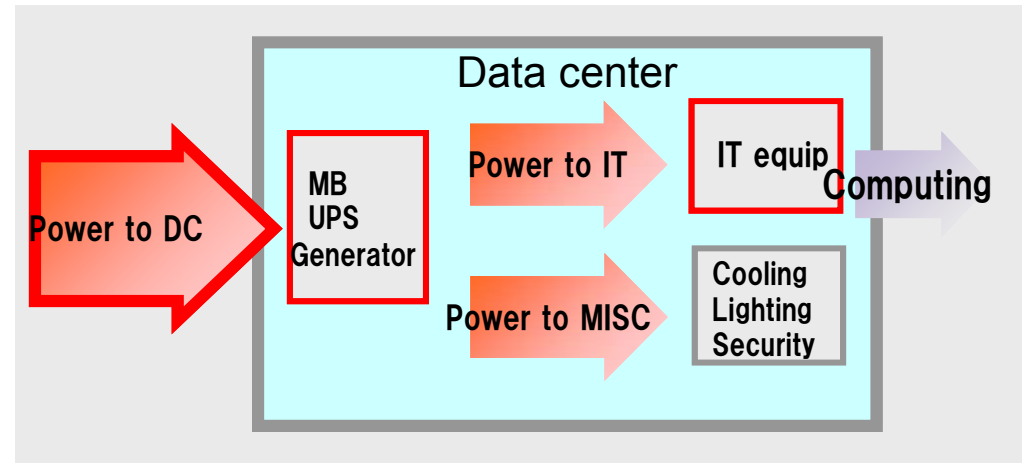
hvdc@opencomputejapan.org

Background



Exhibition: Fact-finding 2012 version of a datacenter market and power consumption

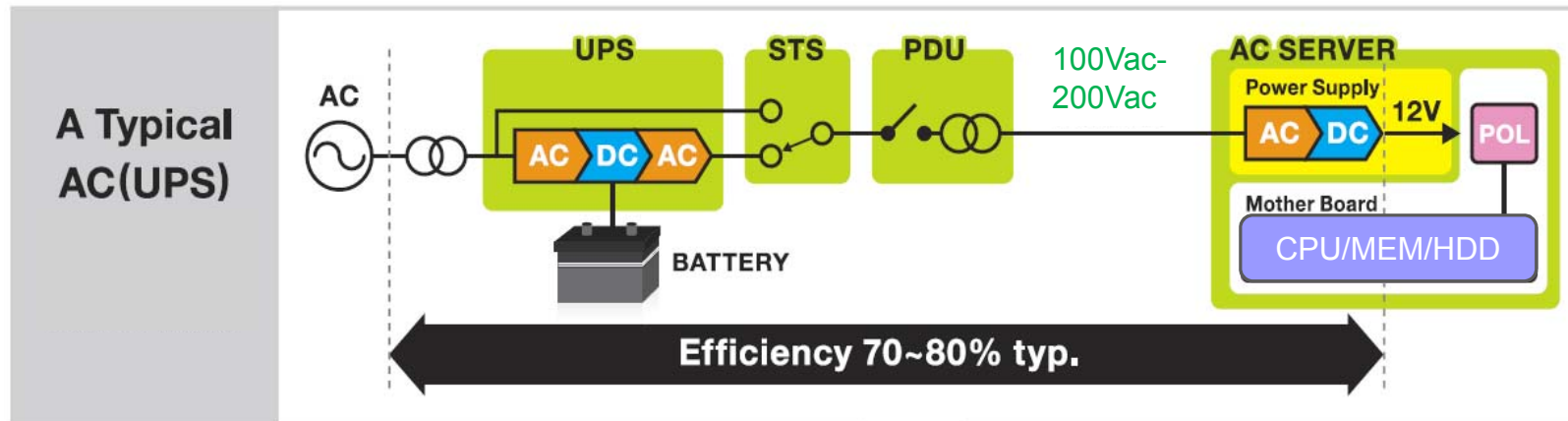
Power loss of AC/DC, DC/AC conversion in power feeding is approx. 20-30%
HVDC



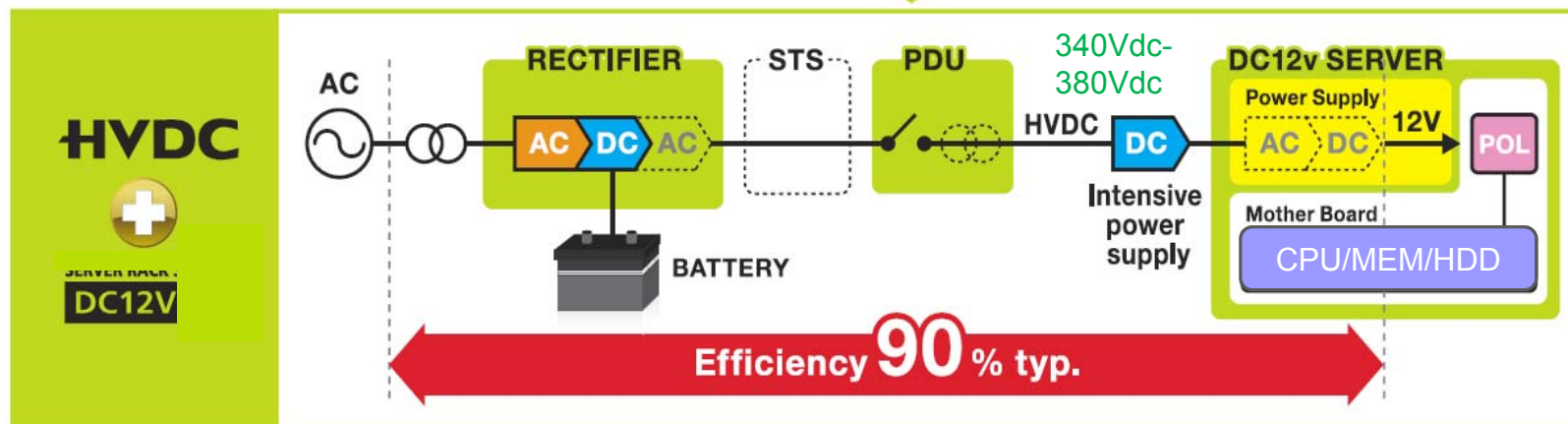
Power consumption of AC/DC, DC/DC conversion in servers is approx. 30-35%
12Vdc

Energy Saving

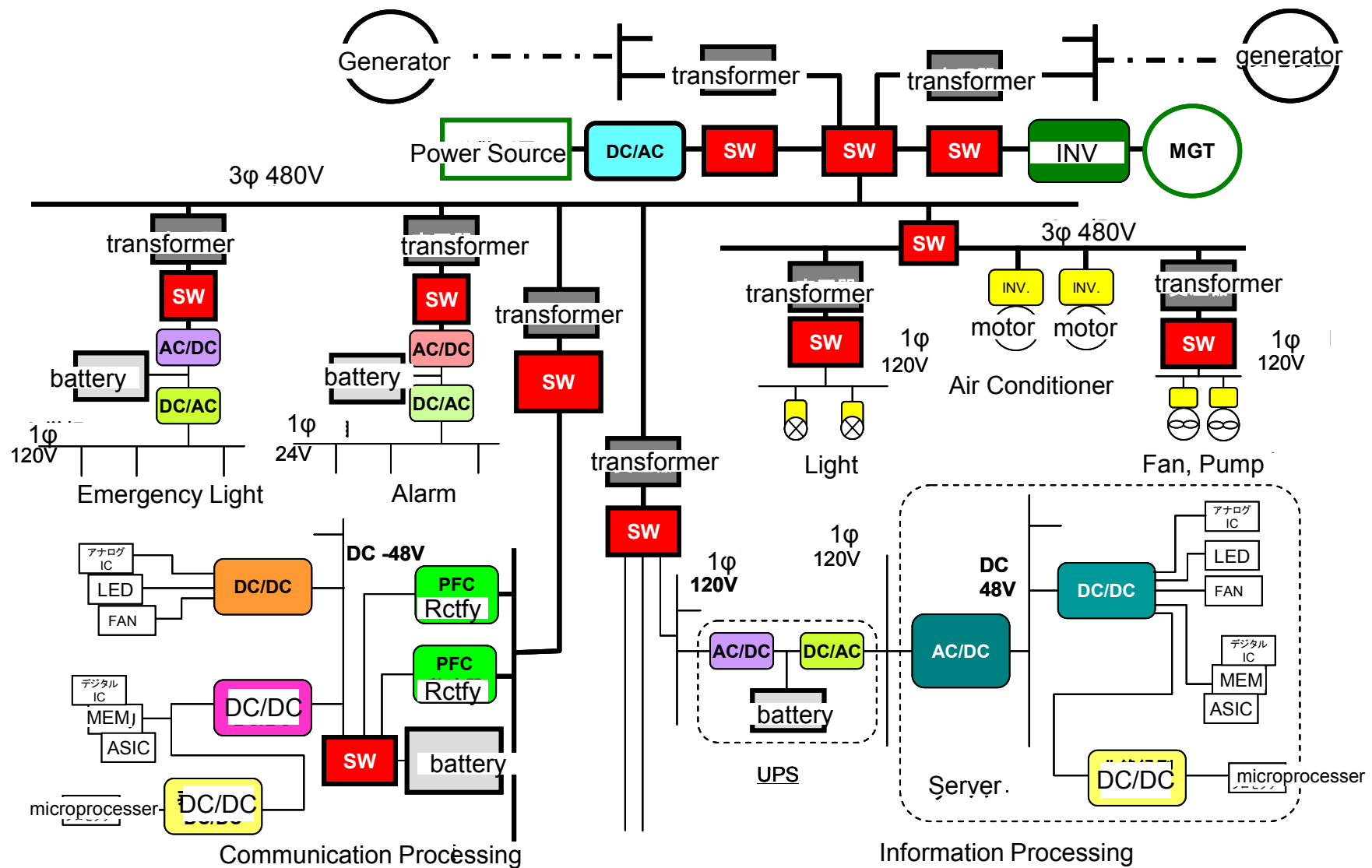
HVDC DC12V Power Supply System reduces AC/DC conversions between commercial power and IT Equipment. Power loss is reduced by 10-20%.



Approximately 10-20% electric energy reduction

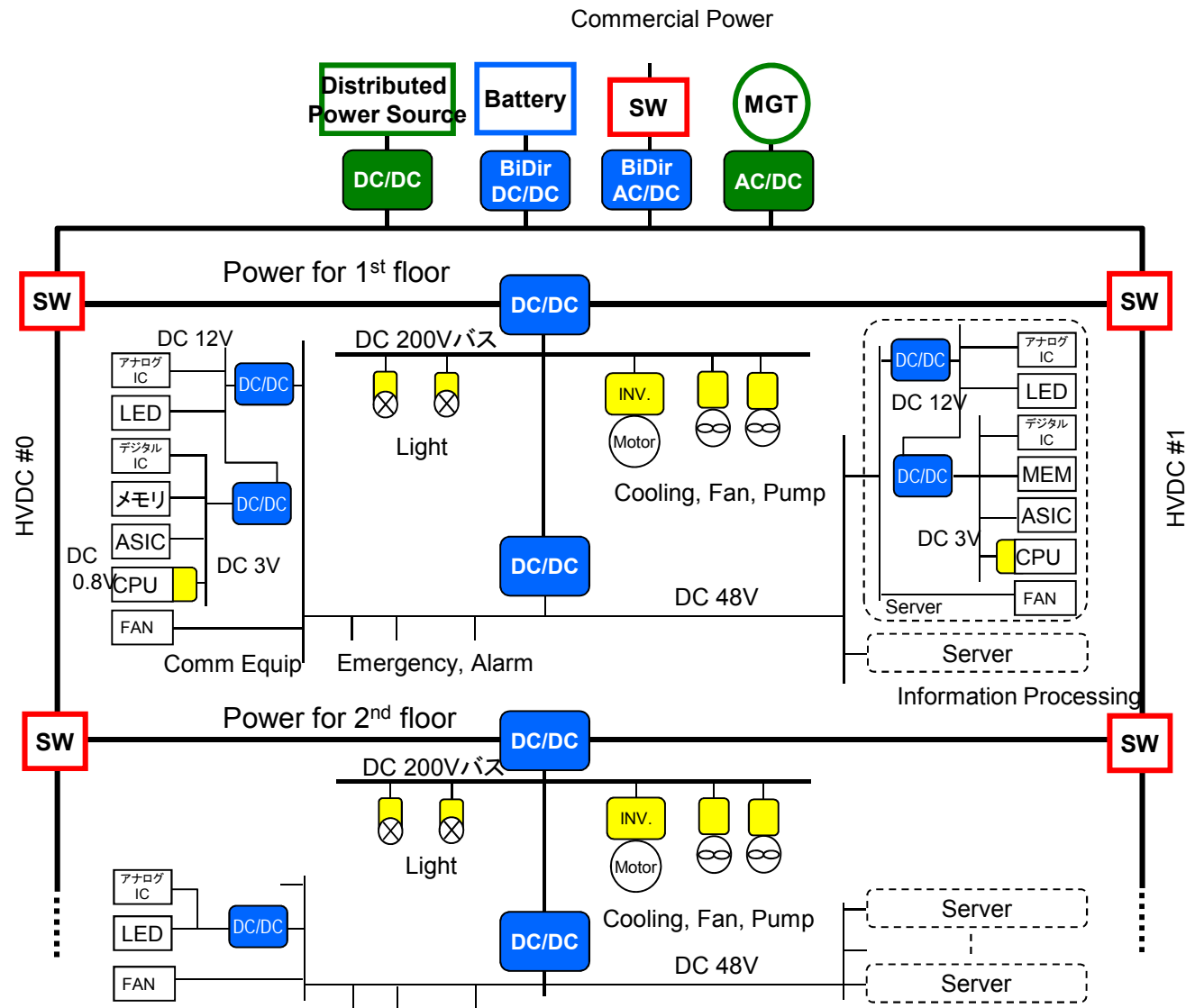


Power Feeding inside Data Center - Virginia Tech



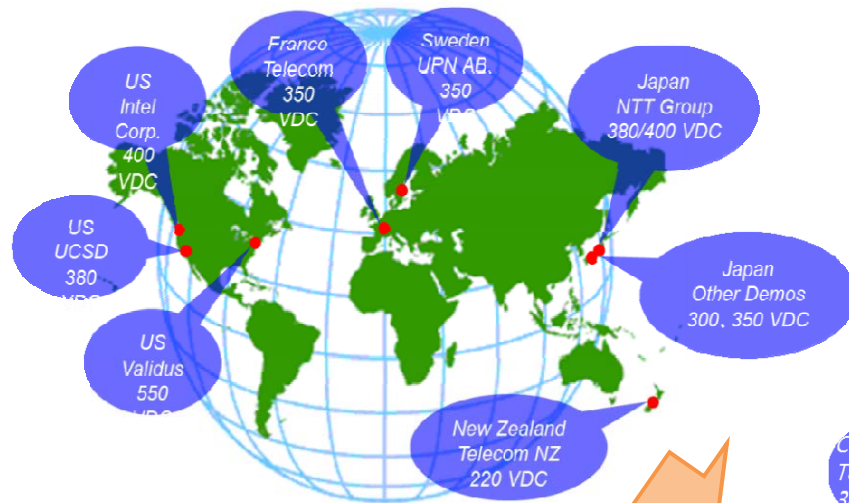
Reference: Virginia Tech Institute

Simplified HVDC Power Feeding – Virginia Tech

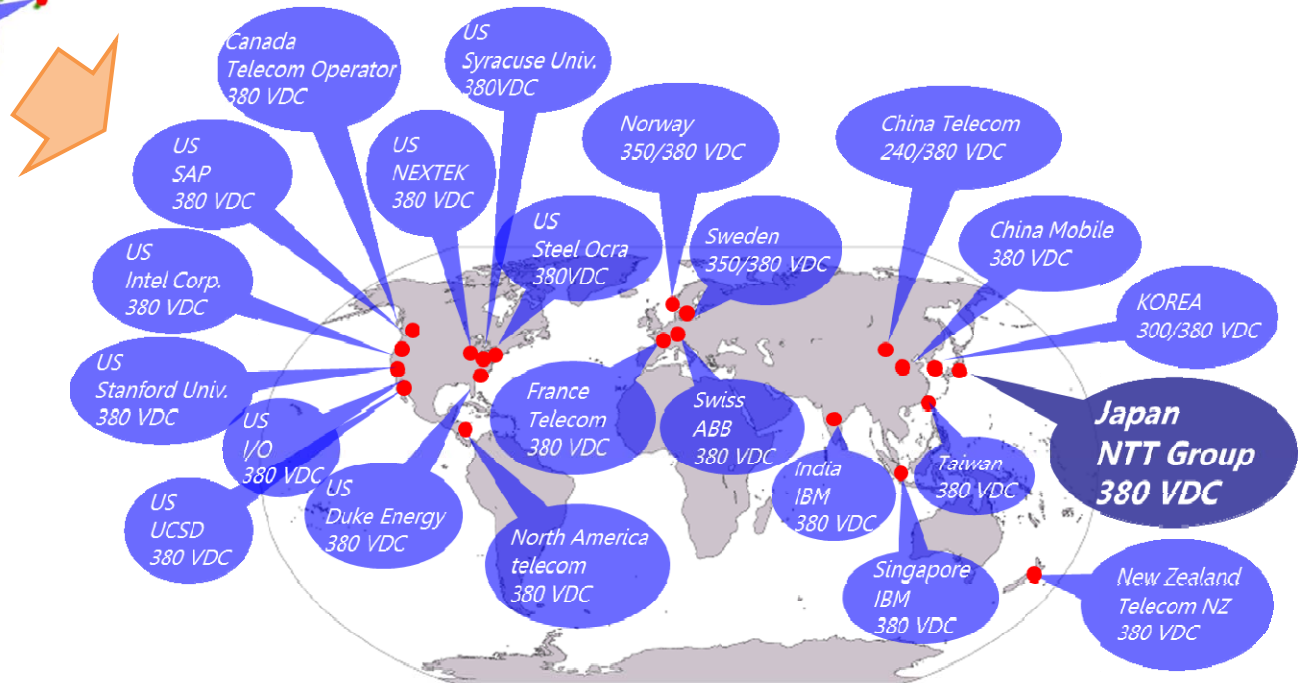


Reference: Virginia Tech Institute

Prevailing HVDC

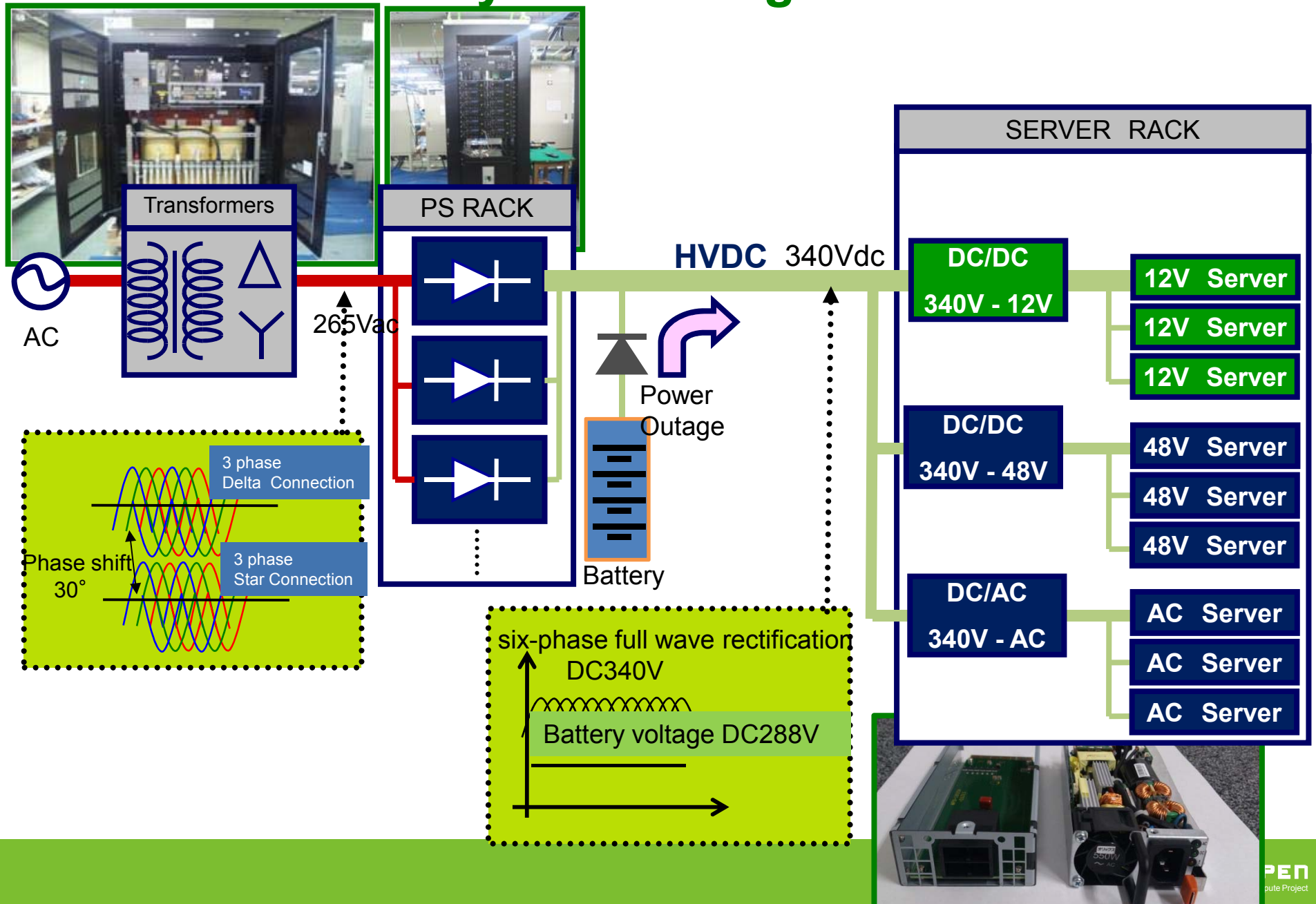


2009年



2014年

HVDC - Basic system configuration



dcDC(direct current Data Center) Advantage

- 90+% Power-feeding Efficiency
- Incremental Rack-Mounting of Centralized Power Unit
- Space Saving

Green

w/ Safe Technology

- Arc Suppression
- Fluctuation Suppression
- Mid-point grounding with high resistances
- 12Vdc IT equipment

- Simple Architecture
- Maintenance w/o Shutdown
- No Switching at Blackout
- Few Power Components
(no electrolytic capacitor, no fans)
- No PSUs on IT equipment

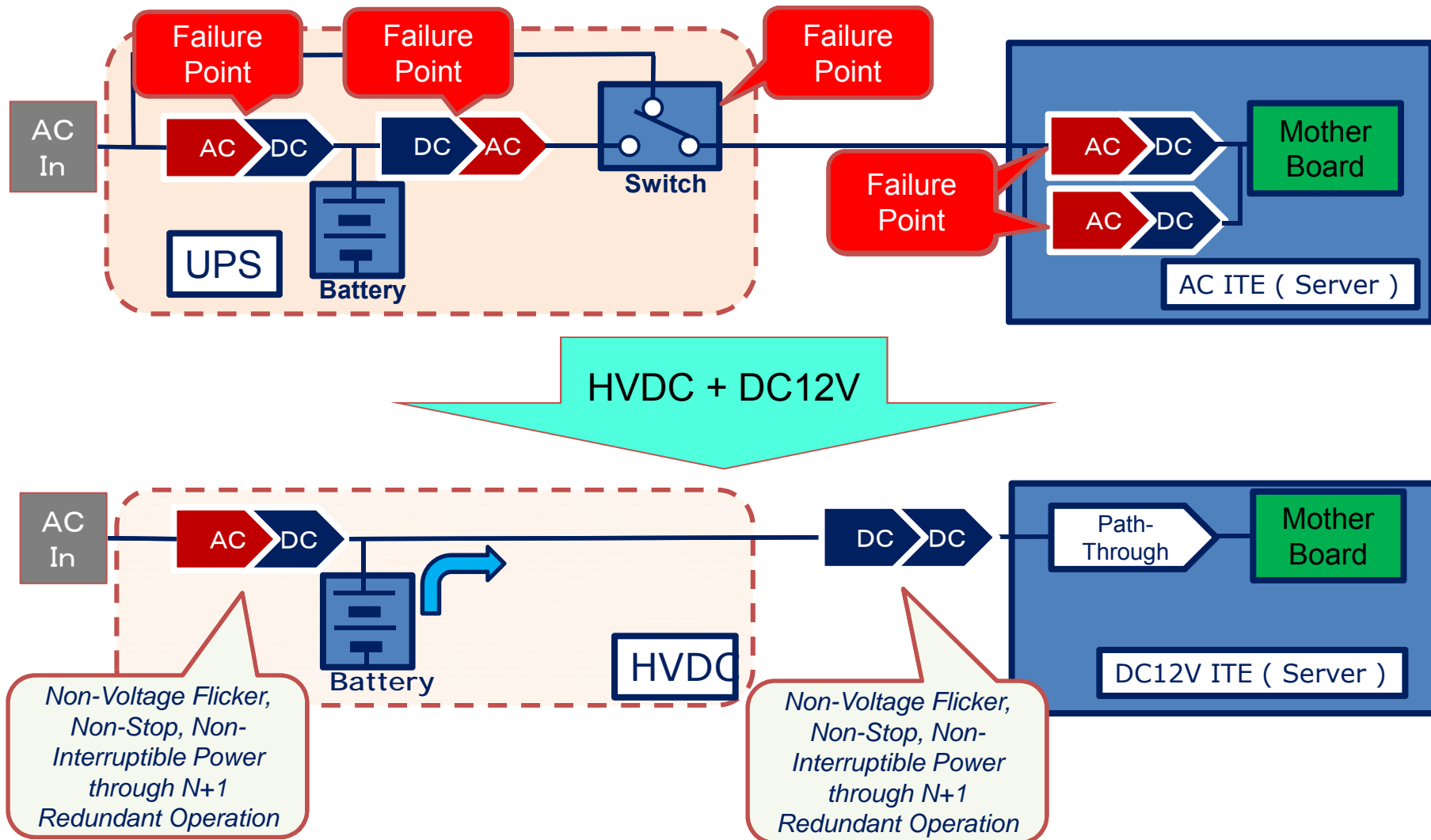
Higher Reliability

for DC future Technology

- Photovoltaic Generation(Solar Power)
- Fuel Cell
- Super Conductor Feeding
- LED light (Trouble Indication)
- LED communication

Reliability

Simple Architecture = less component & failure points

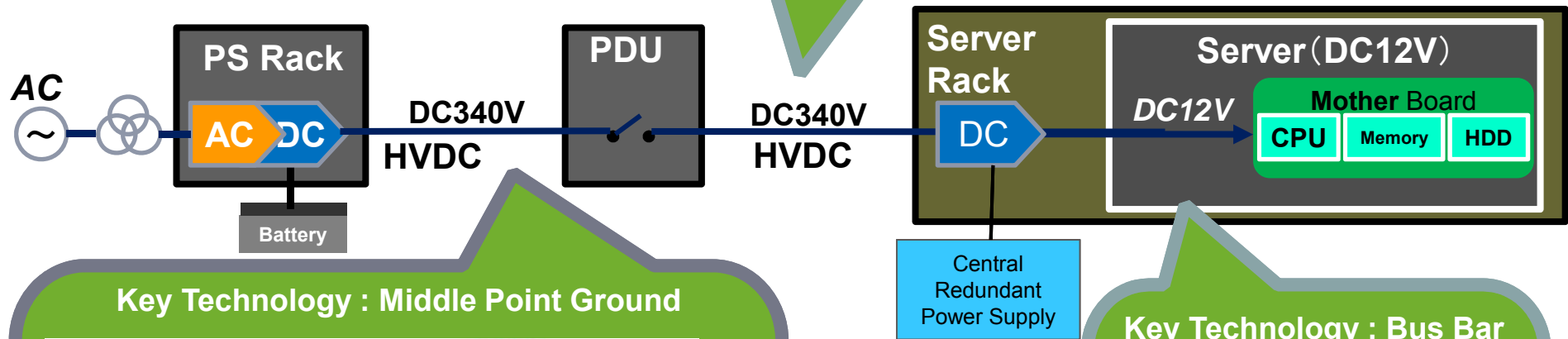


High Voltage Arc

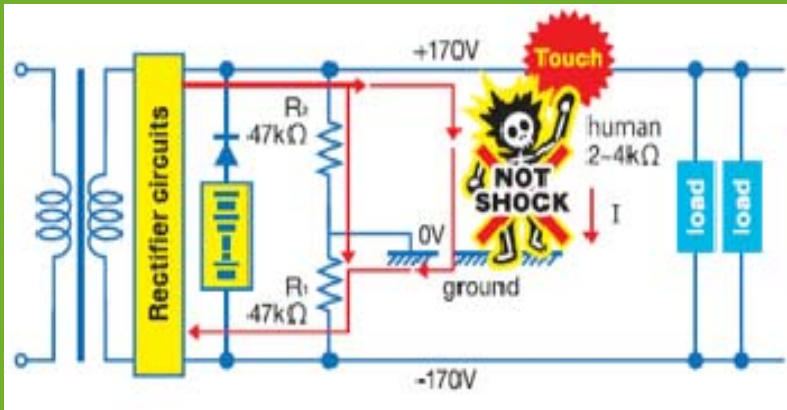


Safety Technology

Key Technology :
Arc Suppression Circuit (video)
Plug & Receptacle



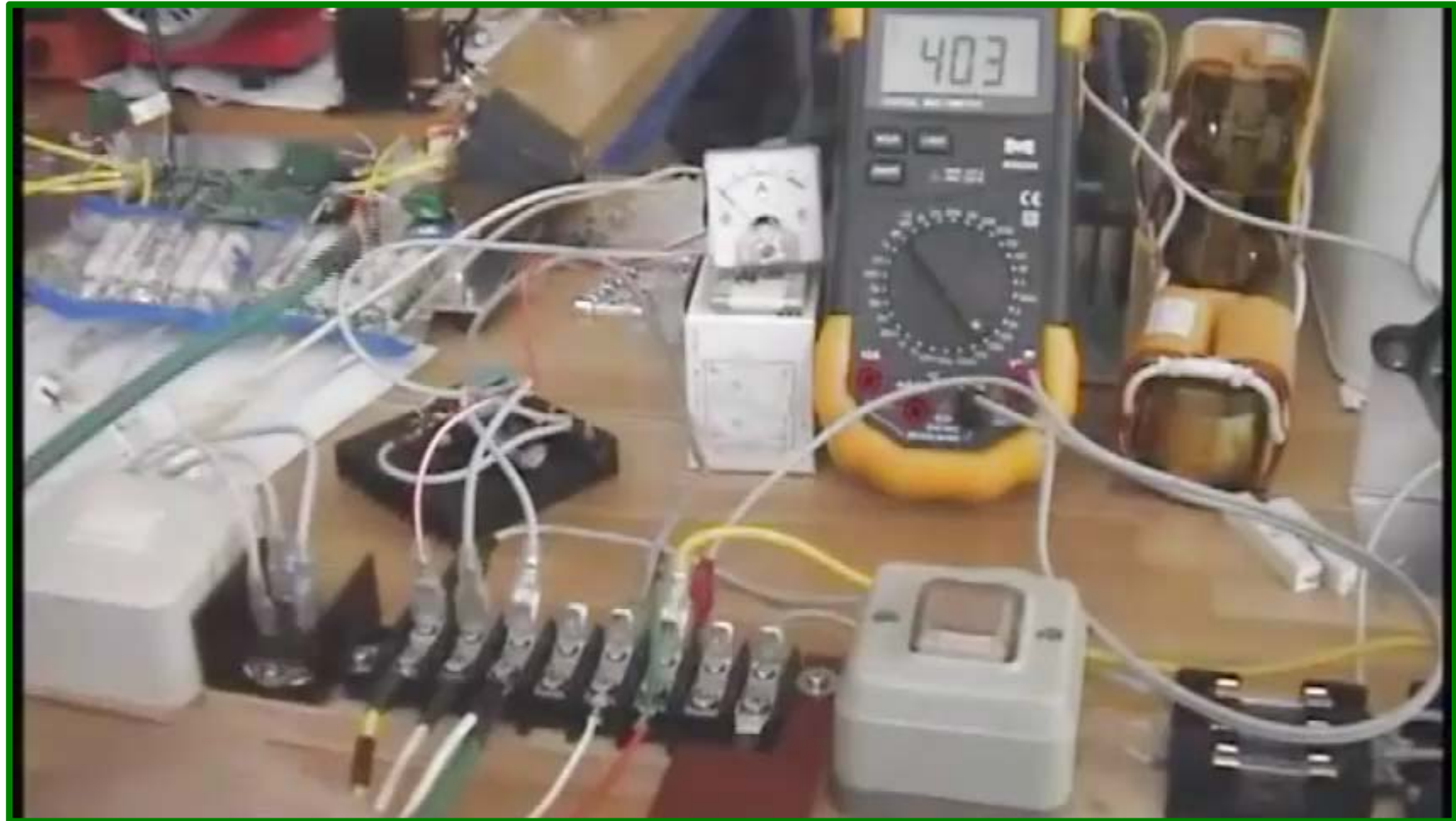
Key Technology : Middle Point Ground



Key Technology : Bus Bar



Arc Suppression

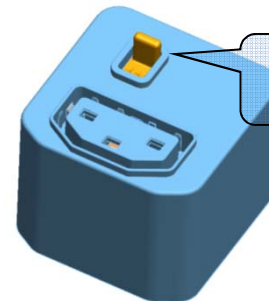
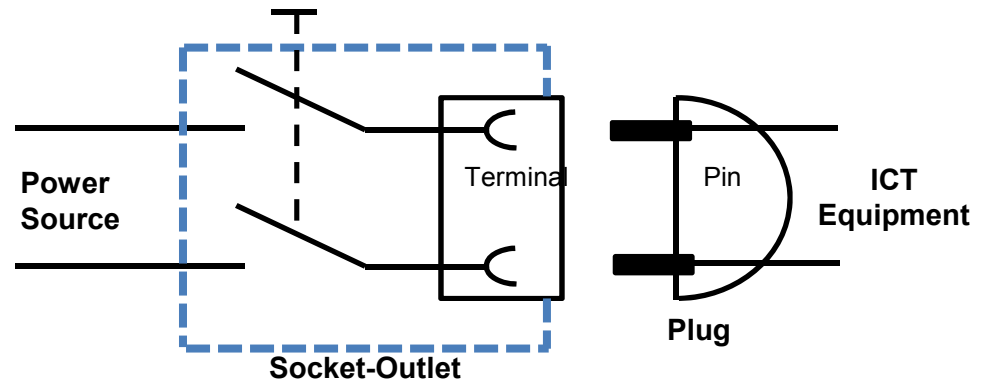


Safety (HVDC Plug & Receptacle)

Electrical Shock



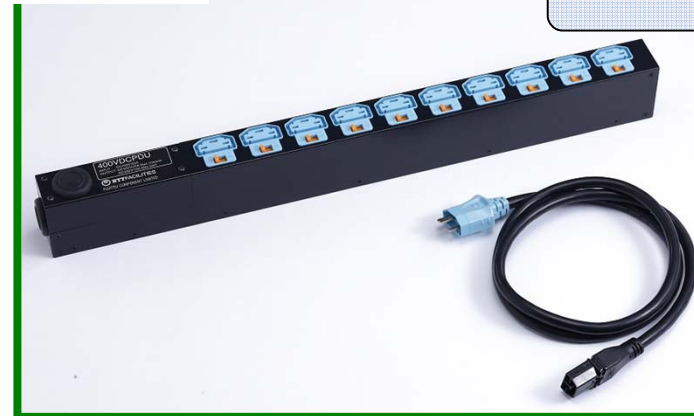
Undesired or unintended DC arcing



switch



interlock

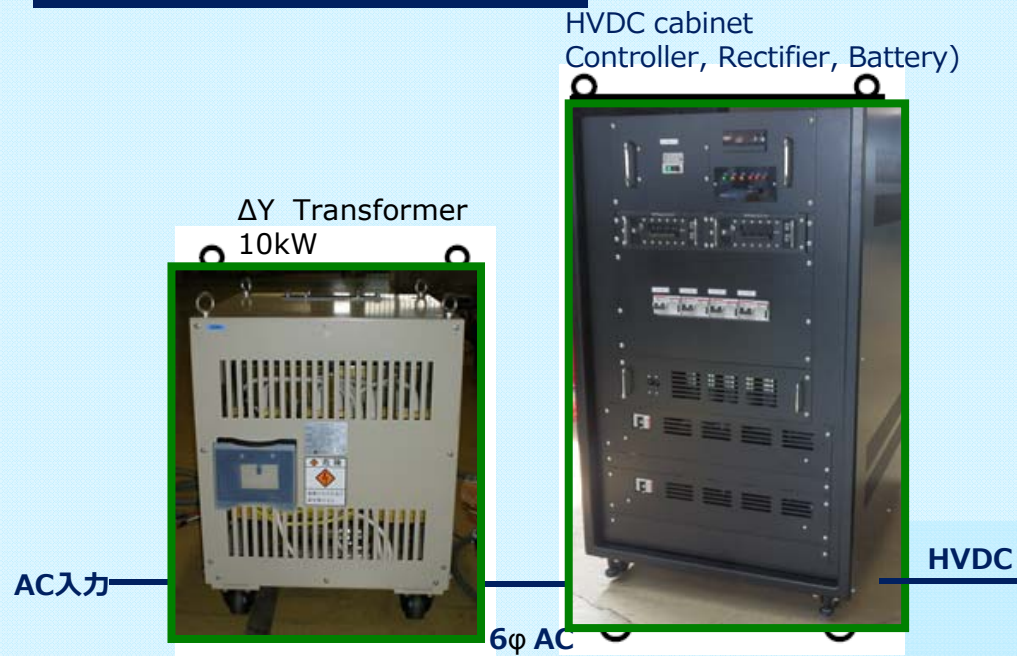


HVDC trial w/ Openrack

From Sept. to Dec., 2014
CTC TSC, Kudan, TOKYO

Rack-Mount LiB will be installed in Nov.

HVDC Power Source



OCP Openrack @CTC TSC lab

AC (UPS)



dc12V
OCP
Servers

ACtoDC converter

LiB

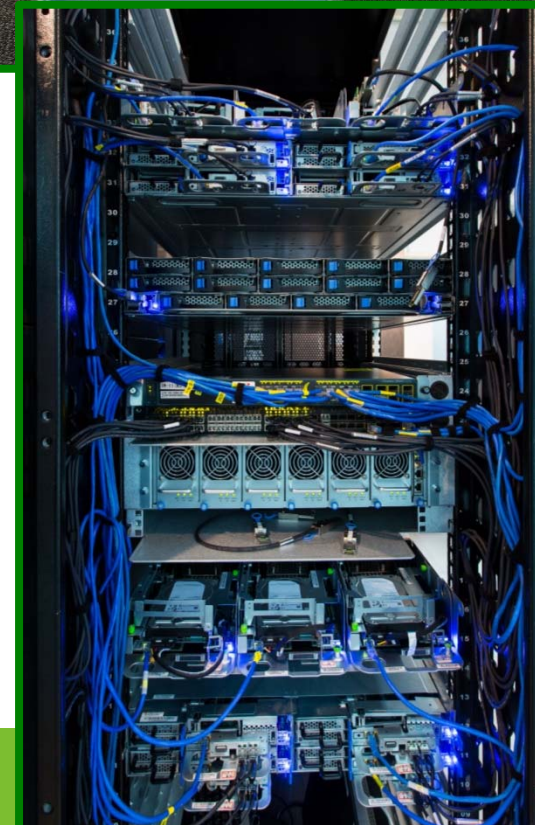
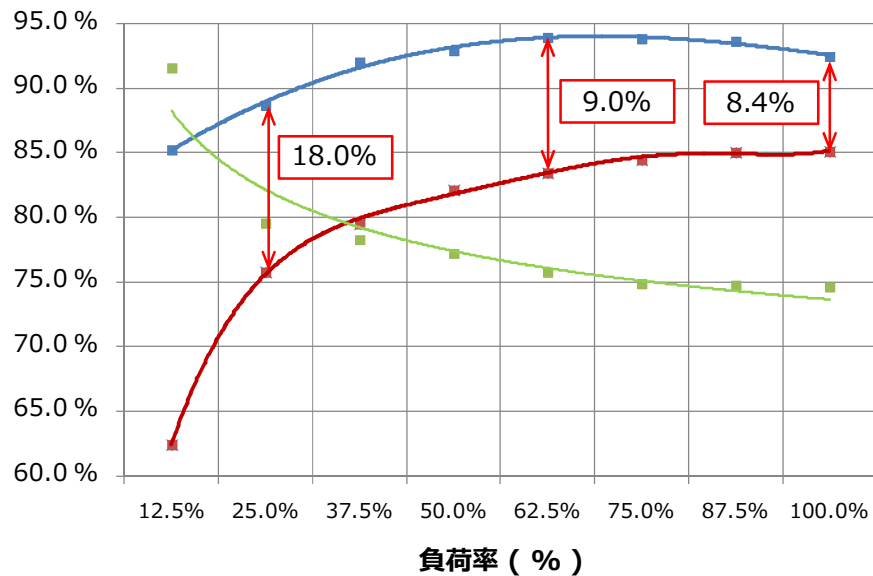
dc12V
OCP
Servers

HVDCtoDC
converter

Validation, Verification & Demonstration

- Efficiency
 - HVDC+12Vdc vs 200Vac
- Safety
 - Electrification
 - mid-point ground & leak detector
 - Arc measures
- Reliability
 - Trouble incl. Blackout Features
 - Maintainability (Rectifier, PSU)

効率



Sept. 19, 2014 Lab Tour

Time

Round 1 14:00 pm - 15:10 pm

Round 2 15:30 pm - 16:40 pm

Place

CTC TSC(Technical Solution Center)
Kurita-Kudan bldg., Fujimi 1-11-5,
Chiyoda, TOKYO

http://www.ctc-g.co.jp/about/corporate/access/tsc_kudan.html

Agenda - Round 1(Round 2)

14:00 pm(15:30pm)

welcome - Onishi, NTT Comware

14:10 - 14:30(15:40 - 16:00)

TSC overview - Koizumi-san, CTC

HVDC trial Overview - Mura-san, NTT Data Intellink

14:30 - 15:00(16:00 - 16:30)

Lab tour & demonstration

- Thakur-san & Koizumi-san, CTC

- Mura-san, NTT Data Intellink

15:00 - 15:10(16:30 - 16:40)

Wrap Up

