



# VIZIMAX Products Overview

# Our Mission

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**To optimize how we generate, move and distribute ENERGY  
protecting as much as possible the assets of our CUSTOMERS  
by focusing on innovation, quality, and customer service.**

# Utility Grade Solutions

## Measure



## PMU / AMU

- IEEE C37.118 / IEC 61850-9-2LE compliant, IEC 61850 , IEC 60870-5-10x and ModBus TCP/UDP with RightWON companion product
- Resilient to harmonics, high-performance in stressed power systems
- Ultra-fast ROCOF calculation: 1.2 to 2 cycles typical, 3 cycles max
- For local control, single phase, Micro-Grid, islanding, PMS, power quality

## Control



## RightWON Satellite/Plus/Engine : Smart Substation Controller

- Automation + Monitoring + Alarm/Event management + Data gateway
- Full support of industrial, energy, power gen and utility protocols
- Integrated web HMI + local SCADA functionality

## Switch



## SynchroTeq Plus/MV

- Controlled switching and monitoring for All HV & MV circuit breakers
- Inrush Current Limiters for power transformers & reactive loads
- Advanced switching of reactive loads for VAR compensation, PFC, FACTS, in SVC, STATCOM and standalone applications

# Applications and Markets

## Power Generation



**Grid Connection of RES  
Wind, Solar & more  
Energy & Battery Storage**

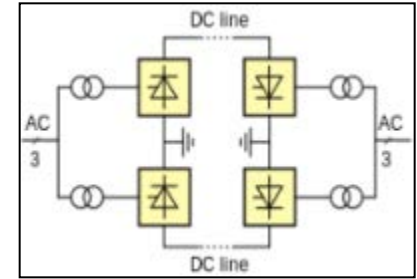


**Power Generation:  
Hydro, CCGT,  
Coal, Genset**



**TSO & DSO: Grid Stability,  
Efficiency, Power Quality,  
Clean Connection of  
Consumers/Generators**

## Power Grids



**HV/MV Transfo & FACTS  
HVDC Substations**

**HV/MV Switchgears  
Power Transformers**

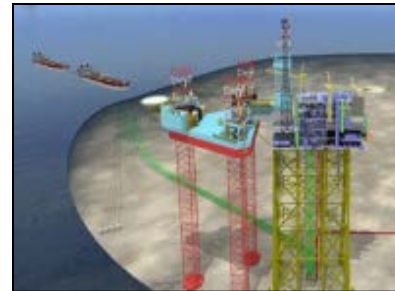


**HV - MV Equipment**

**Power Electronics  
SVC/Statcom, Rectifiers,  
Inverters, Drives**



**Oil & Gas  
On-shore/Off-shore**



**Industry**

**Metal, Mining,  
Cements, Furnaces  
AC-DC Railways, HST**







Crompton Greaves



# SWITCH – HV-MV Switchgear Controllers

## Measure



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## Switch

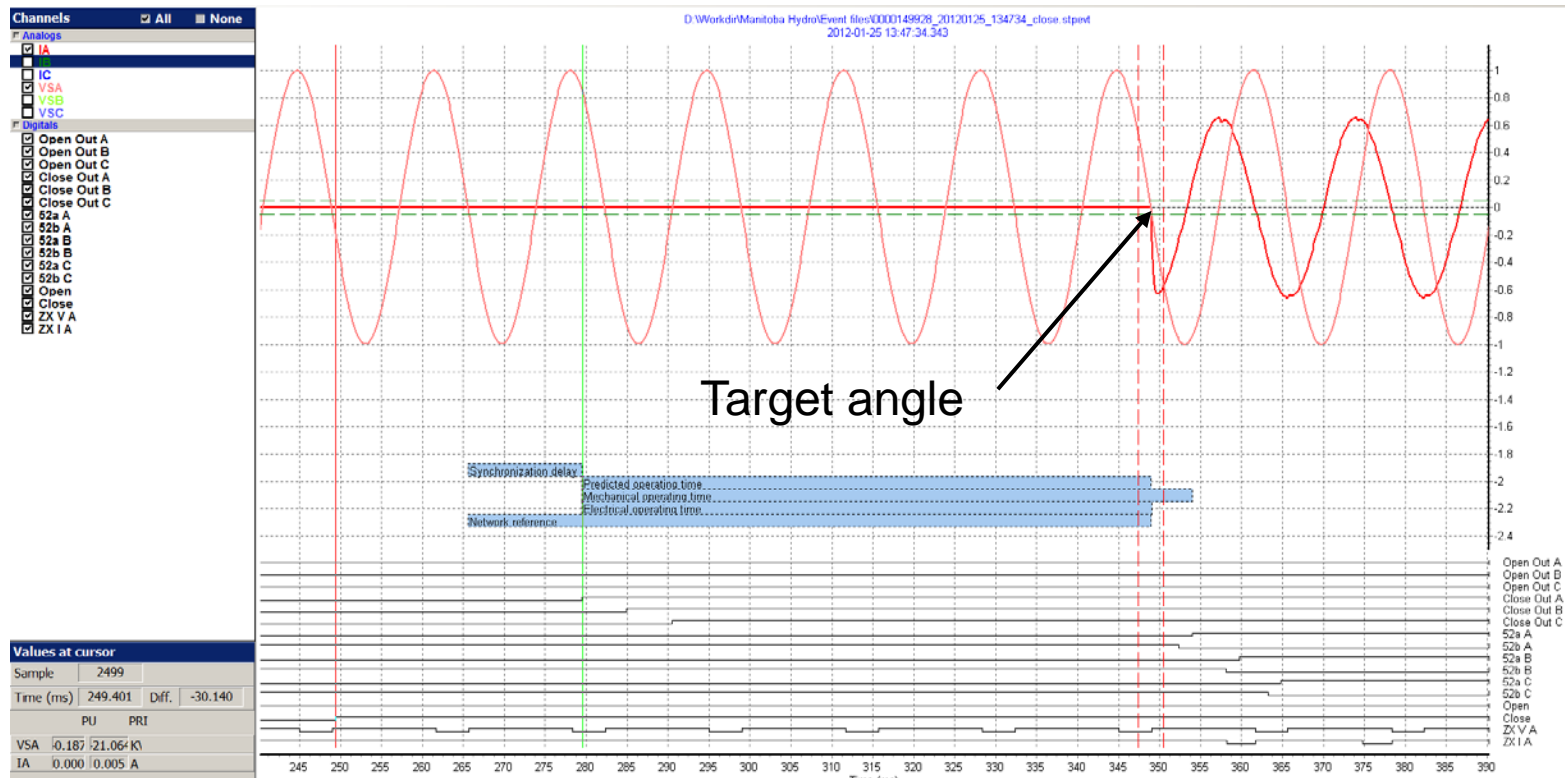


### SynchroTeq™ Plus/MV

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- Inrush Current Limiters for power transformers & reactive loads
- Advanced switching of reactive loads in VAR compensation, Volt/VAR control, PFC, FACTS, in SVC, STATCOM and standalone applications

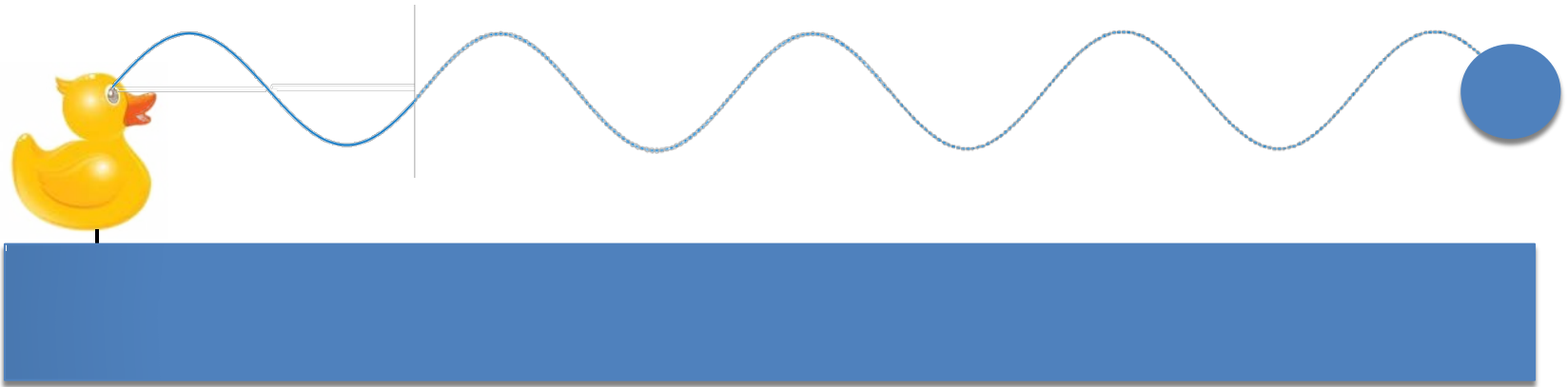
# SynchroTeq™ : What Is Controlled Switching?

- Additional capability added to a standard circuit breaker
- Operate the circuit breaker at a precise electrical moment



# How Does It Work? Ball Shooting Stand

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# Why Use Controlled Switching?

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Improvements of :

- The **power network stability**
- The **reliability of the service** supplied to customers
- The **power quality** delivered to the customers: **Grid Code compliance**

Reductions of :

- Electric **switching transients**
- Equipment **failures**
- **Maintenance costs** on the apparatus
- **Capitalization** : lower investments

# How Does It Improve The Situation?

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Controls the exact moment the circuit breaker is operated:

- Mitigates **inrush currents**
- Mitigates **high voltage switching transients**

Eliminates pre-insertion resistors:

- Reduce the circuit breaker **maintenance costs**
- Improve the **circuit breaker reliability**

Asset monitoring:

- Detection of **C/B degradation of performance**
- Detection of **mechanical/electrical problems**

***The circuit breaker becomes a smart device!***

# SynchroTeq™ Product Line

Controlled Switching and Monitoring Devices for all HV & MV  
Circuit Breakers

## SynchroTeq™ Plus



MV & HV applications  
All types of CB

## SynchroTeq™ MV



MV applications  
Spring & vacuum

# SynchroTeq™ Plus – Controlled Switching Device

- For new or existing circuit breakers of all brands, types, voltages
- Ultimate inrush current limiter
- For control, monitoring, and asset management)
- -40°C to +75°C



# SynchroTeq™ MV – Controlled Switching Device

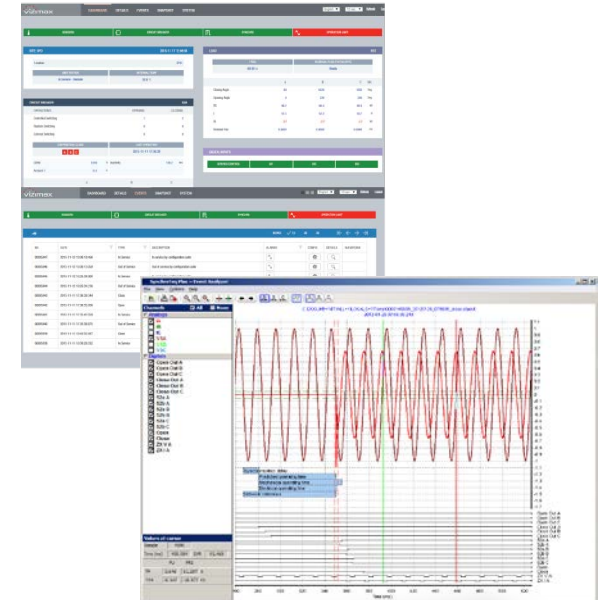


- Ultimate inrush current limiter
- For transformers and reactive loads up to 66kV



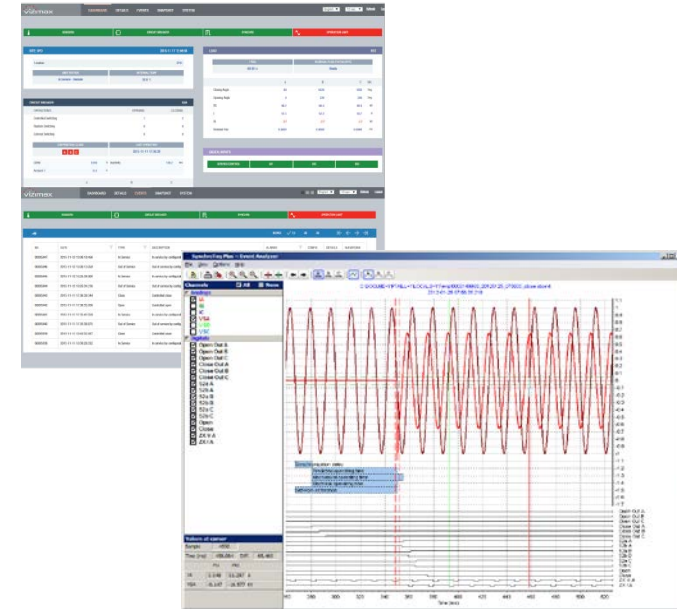
# SynchroTeq™ Plus – Controlled Switching Device

- For new or existing circuit breakers
- CPU-demanding apps and complex models
  - Transmission lines
  - Numerous compensation channels
  - Fast-switching of reactive loads
- Strong engine, web-based operation
  - Stores 2,000-events and waveforms
- Best-in-class HV transformer energization:
  - Residual flux calculation modules
  - Bushing sensors for transformer
  - Voltage measurements
- Additional modules and tools:
  - Bypass / Redundancy module
  - Dual SPSBO : dual supply DC outputs
  - Re-Energization Advisory System (TRAS)
- OPC Server, data transfer for SCADA/DC in substations and Central Sites



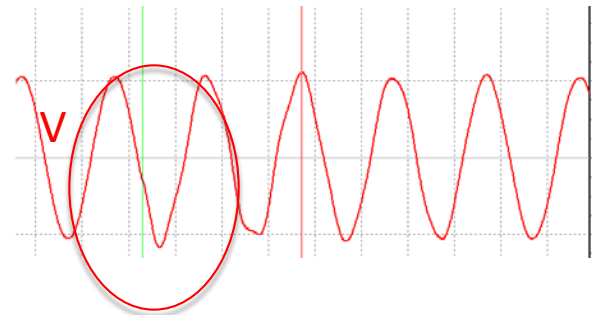
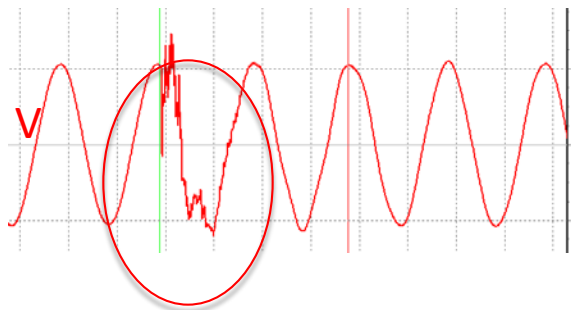
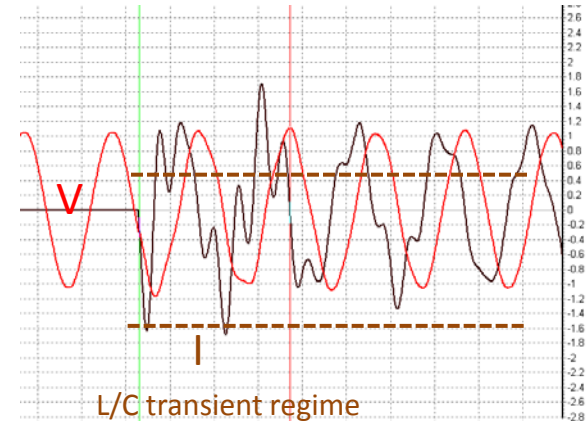
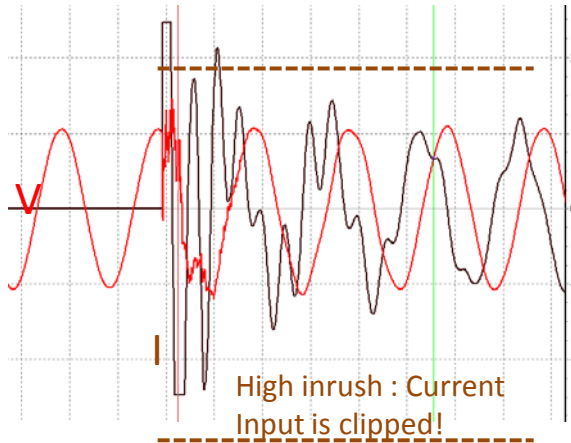
# SynchroTeq™ MV – Controlled Switching Device

- For All MV switchgears up to 66kV:
  - 3-p operated, w/ and w/o pole staggering
  - 1-p operated
- Various apps and loads:
  - Reactive loads, single-phase transformers,
  - Three-phase transformers
  - Advanced switching of reactive loads
- Strong engine, web-based operation
  - 500-events and waveform storage
  - Supports partially charged reactive loads
  - Fast-switching of capacitor banks and filters
- Best-in-class MV transformer energization:
  - MVX version w/ residual flux calculation
  - For 1-p and 3-p operated switchgears
- OPC Server, data transfer for SCADA/DCS in substations and Central Sites



# Cap Bank Controlled Switching Benefits

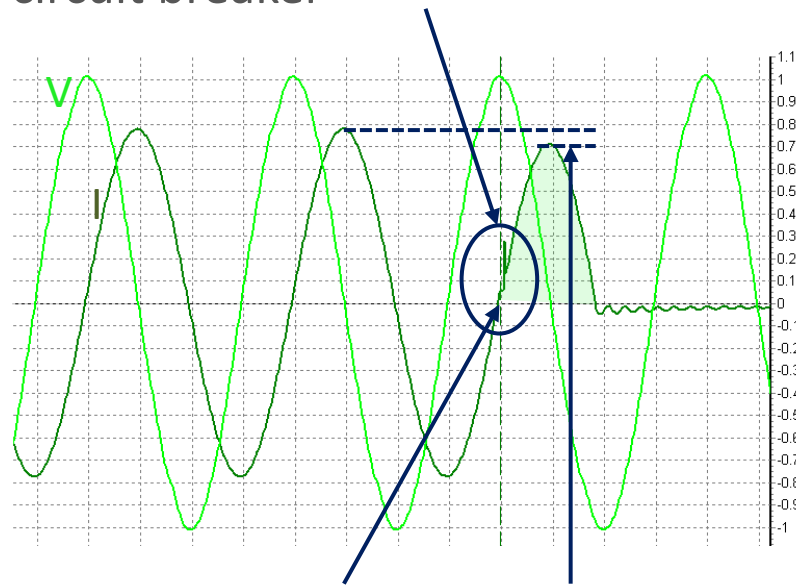
## Mitigation/elimination of inrush current



Mitigation/elimination of voltage transients propagated on the grid

# Shunt Reactor: CB Re-ignition Prevention

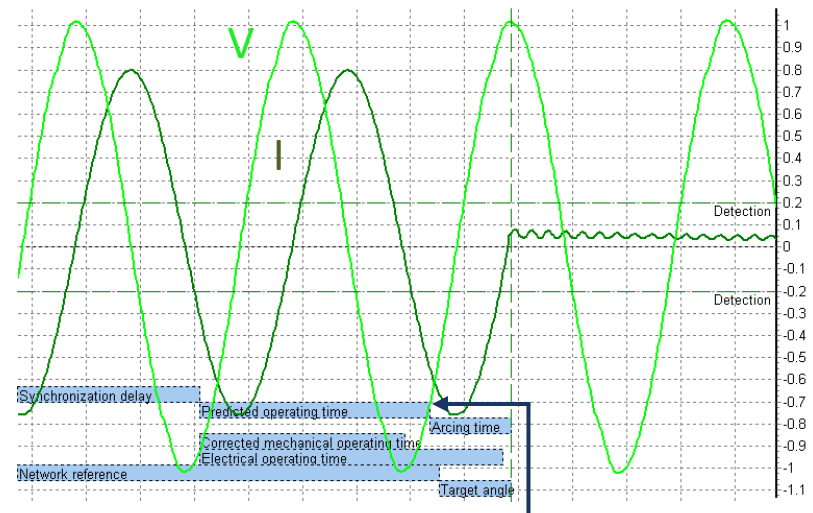
Re-ignition, leading to excessive wear and catastrophic failures of the circuit breaker



Ideal current interruption moment

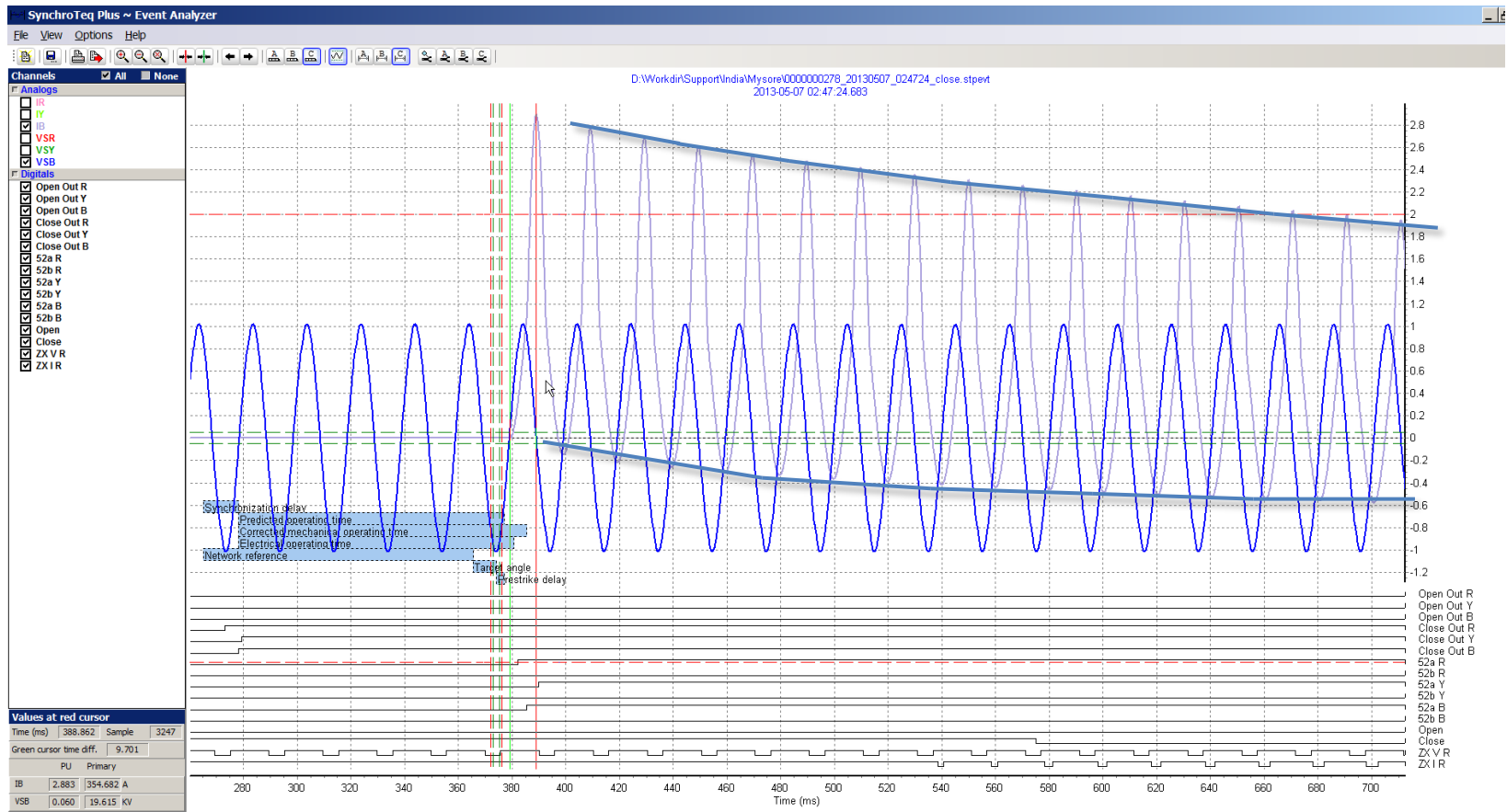
Load current is decreased: excessive energy is dissipated in the circuit breaker

SynchroTeq protects the circuit breaker against re-ignition



Ideal current interruption moment

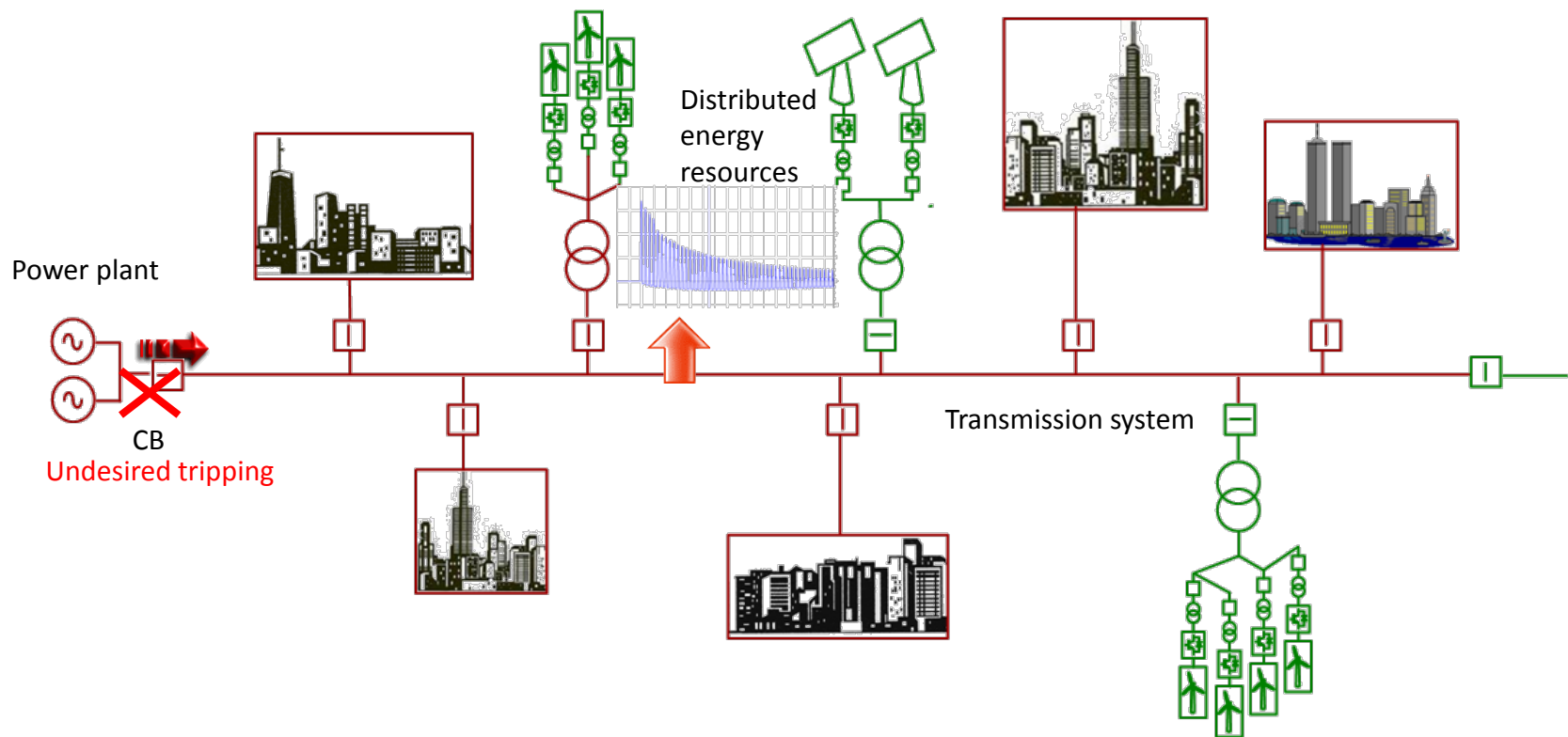
# Shunt Reactor Energization : DC Asymmetry





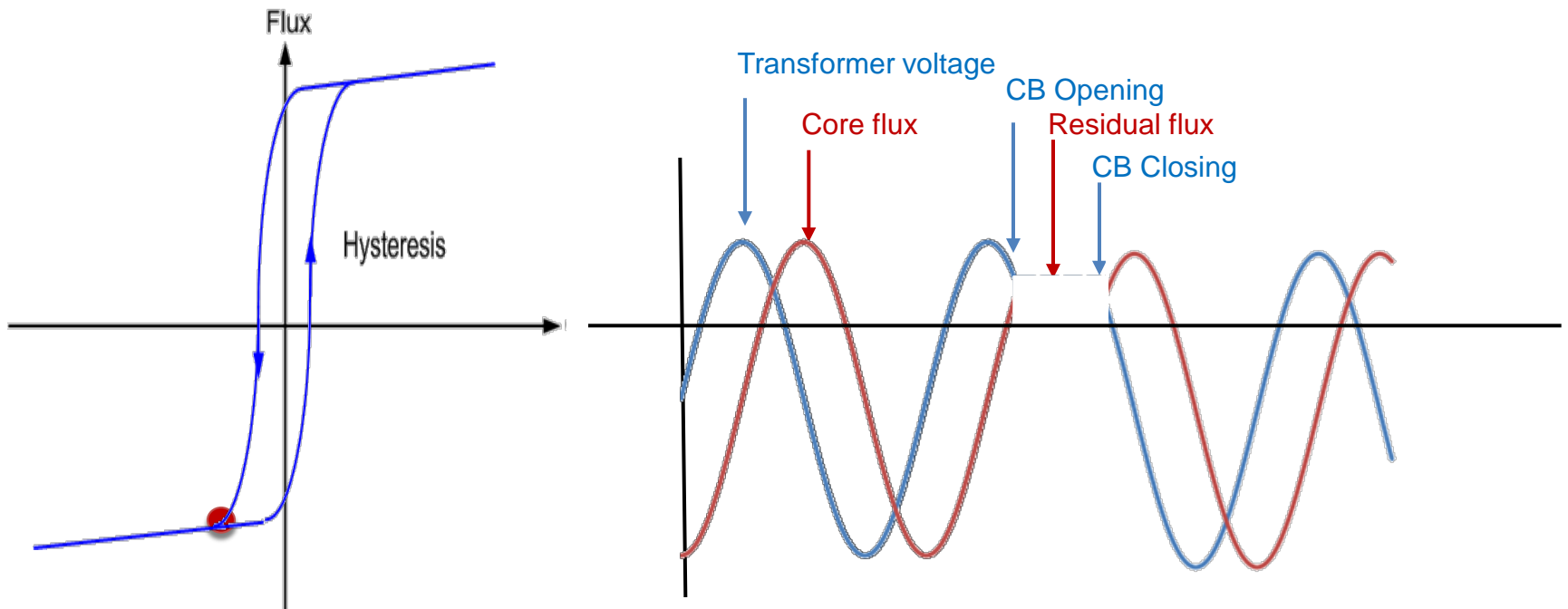
# Transformer Energization Inrush Current Effects

- Voltage dip/flicker/overvoltage (grid code violation)
- Undesired blackout due to misoperation of protection relays (tripping)



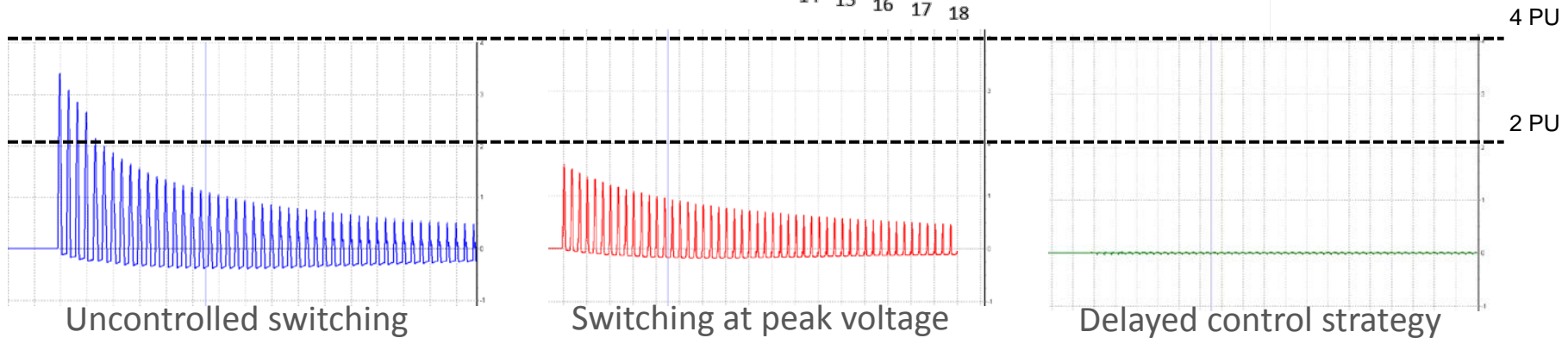
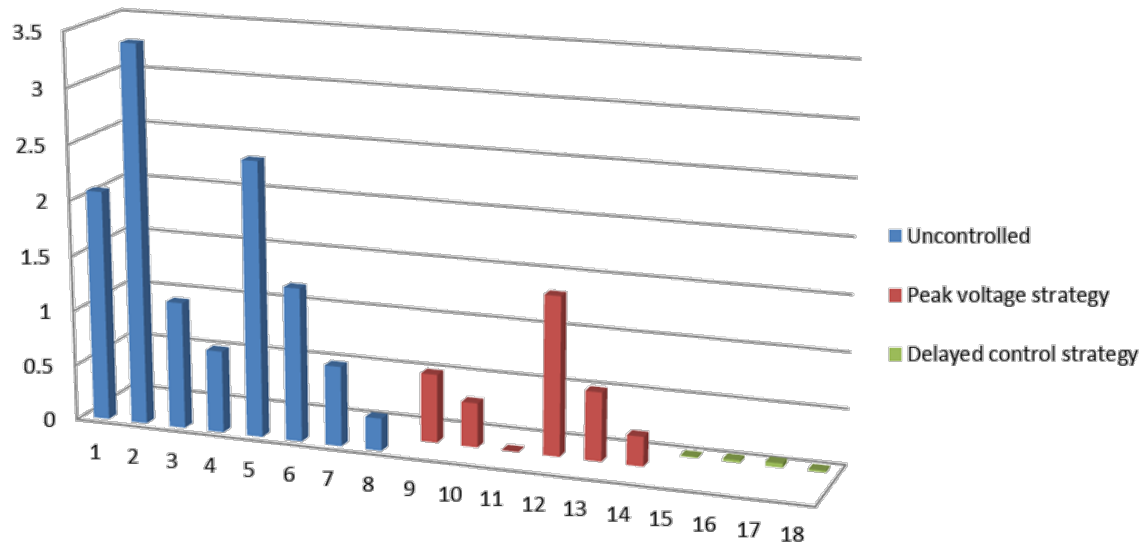
# Example : Power Transformer

As if there was no interruption!



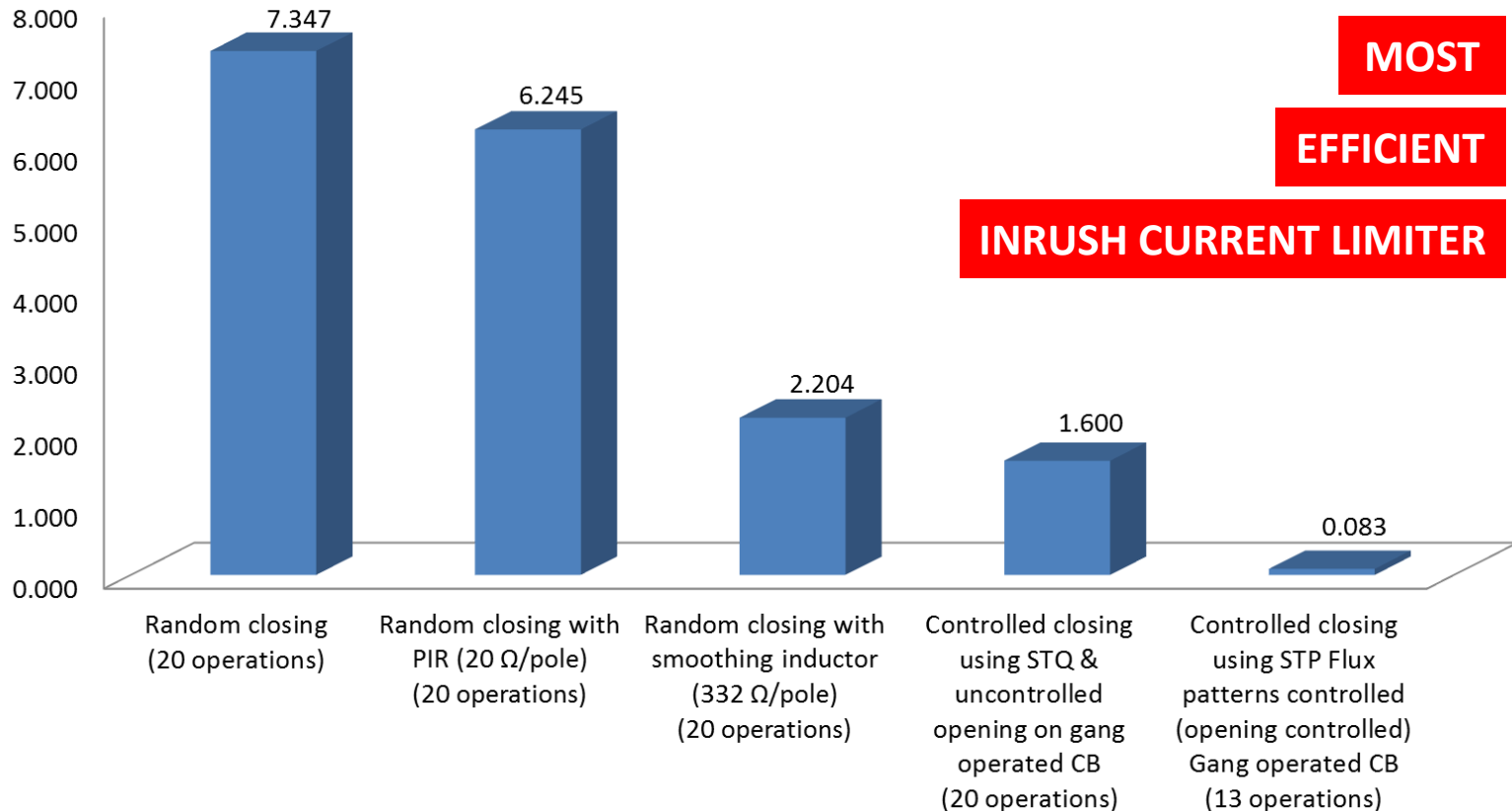
# Transformer Energization Techniques BC Hydro

Transformer inrush current (PU)



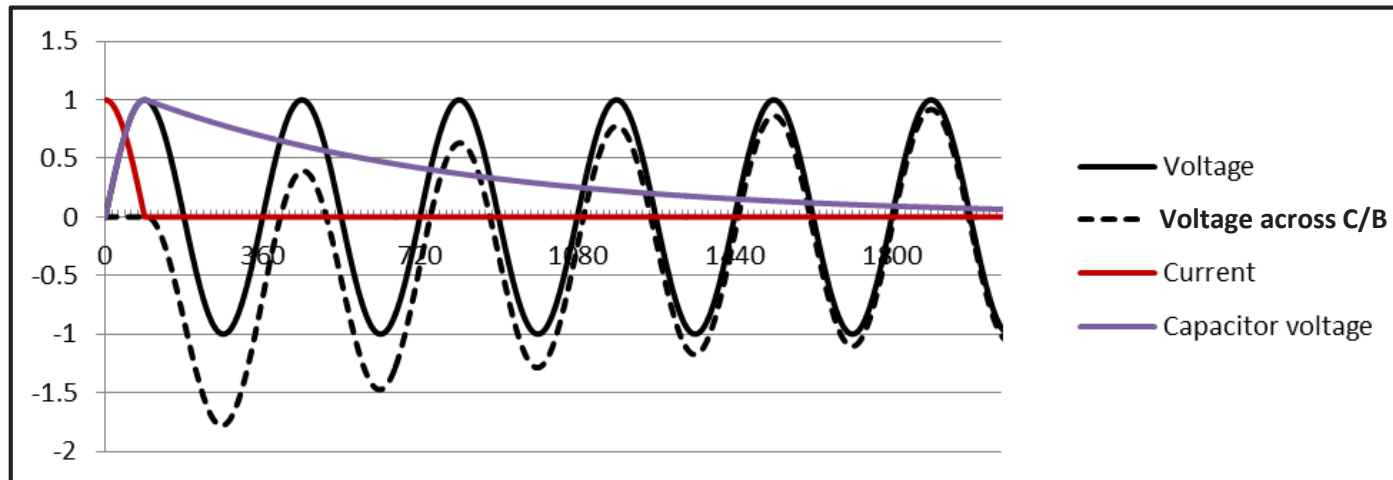
# MV Transformers & MV Gang Operated CB (HQ\_IREQ)

Average of the maximum measured inrush currents over tested operations, in PU Power transformer, 25 kV/0.6 kV – 0.75 MVA, YGyO



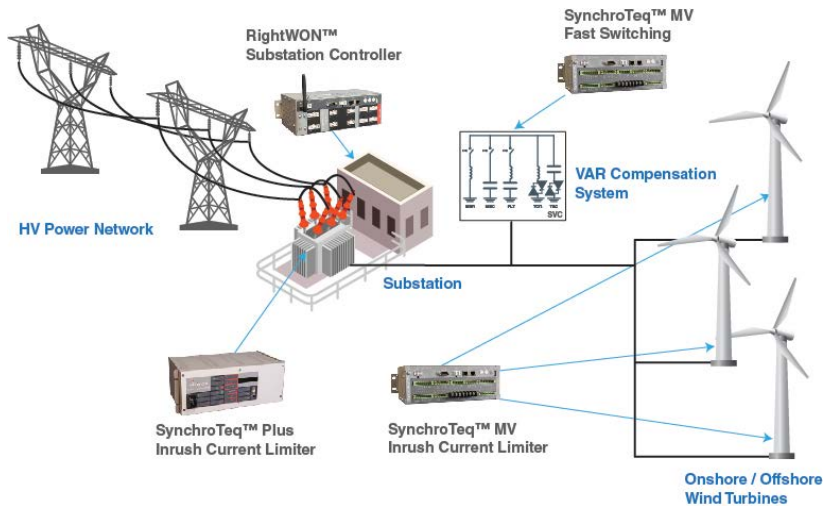
# VAR Compensation Availability (National Grid)

- Using a patent pending method, SynchroTeq is the only product on the market capable of evaluating the capacitor trapped charge resulting from C/B opening
- The C/B is closed at a variable angle calculated according to the capacitor residual voltage that eliminates the inrush current
- The capacitive VAR compensation is always available, no matter the time from the previous de-energization



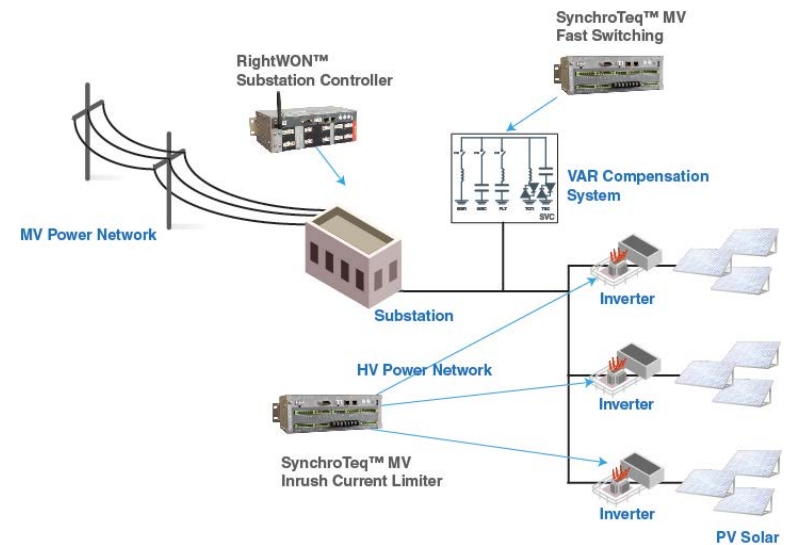


# Renewable Energy – Wind and Solar



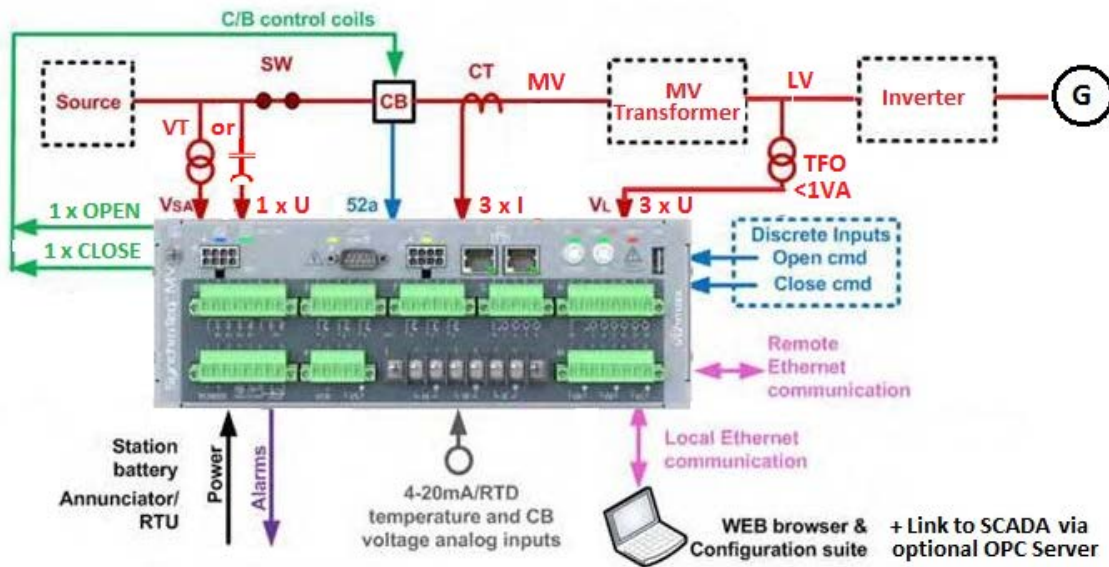
- Seamless connection to MV-HV grids
- Advance VAR compensation techniques
- Avoid risks of voltage depression

- Secure data aggregators and gateways
- Substation automation
- Remote operation, monitoring



# SynchroTeq™ MVX for WTG, Solar Inverter

Clean Connection to MV Grids - No Inrush Current , No Voltage Disturbance



- 3p switchgear as per IEC 62271-200/100
- MV transformer
- Residual flux management

Ideal for :

- Wind turbine
- PV solar inverters
- MV energy storage
- Containerized substations

# Web-based Events, Alarms & Monitoring

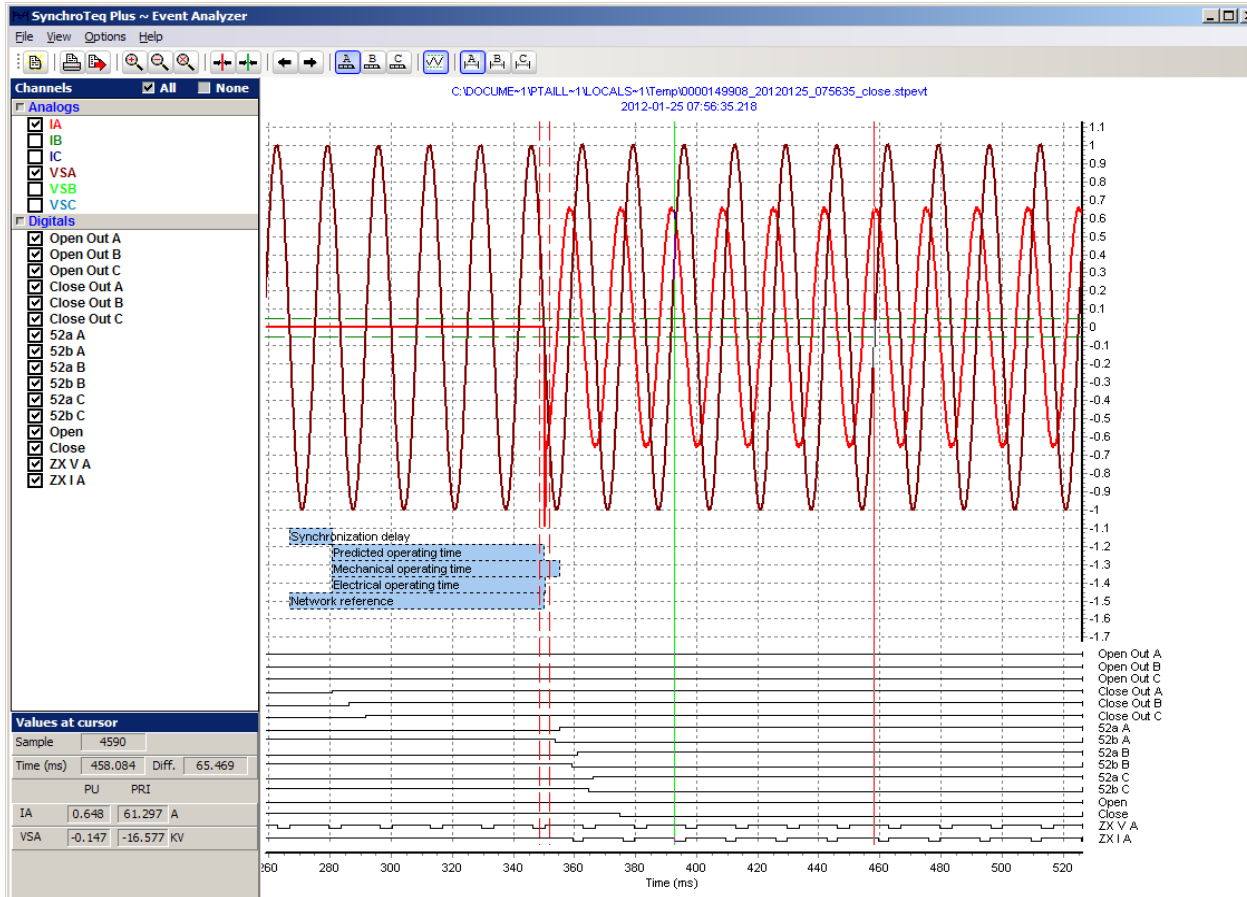
The screenshot displays the Vizimax Energy 3.0 web-based monitoring interface. The top navigation bar includes 'DASHBOARD', 'DETAILS', 'EVENTS', 'SNAPSHOT', and 'SYSTEM'. The main content area is divided into several sections:

- SENSORS:** Includes 'SITE SPD' (2015-11-17 12:48:58) with location 'OP41' and unit status 'In Service - Remote'. It also shows 'CIRCUIT BREAKER' (CB) status with 'OPERATIONS' for opening and closing, and 'C/B POSITION: CLOSE' (A, B, C).
- LOAD:** Shows 'FIELD' (60.00 Hz) and 'PHASOR FLUX STATUS (PF)' (Ready). It includes a table for 'Closing Angle', 'Opening Angle', 'VS', 'I', 'W', and 'Residual Flux' across phases A, B, and C.
- DIGITAL INPUTS:** Shows 'SERVICE CONTROL' (DI1, DI2, DI3).
- EVENTS:** A table listing events with columns for NO., DATE, TYPE, DESCRIPTION, ALARMS, CONFIG, DETAILS, and WAVEFORM.

NO.	DATE	TYPE	DESCRIPTION	ALARMS	CONFIG	DETAILS	WAVEFORM
0000547	2015-11-12 10:26 19.456	In Service	In service by configuration suite				
0000546	2015-11-12 10:26 13.059	Out of Service	Out of service by configuration suite				
0000545	2015-11-12 10:25 39.500	In Service	In service by configuration suite				
0000544	2015-11-12 10:25 34.316	Out of Service	Out of service by configuration suite				
0000543	2015-11-11 17:36 39.344	Close	Controlled close				
0000542	2015-11-11 17:36 35.558	Open	Controlled open				
0000541	2015-11-11 17:35 47.158	In Service	In service by configuration suite				
0000540	2015-11-11 17:35 38.875	Out of Service	Out of service by configuration suite				
0000539	2015-11-11 10:43 33.187	Close	Controlled close				
0000538	2015-11-11 10:39 28.532	In Service	In service by configuration suite				

# Waveform Recorder & Analyzer

Up to 2,000 Events & Waveforms



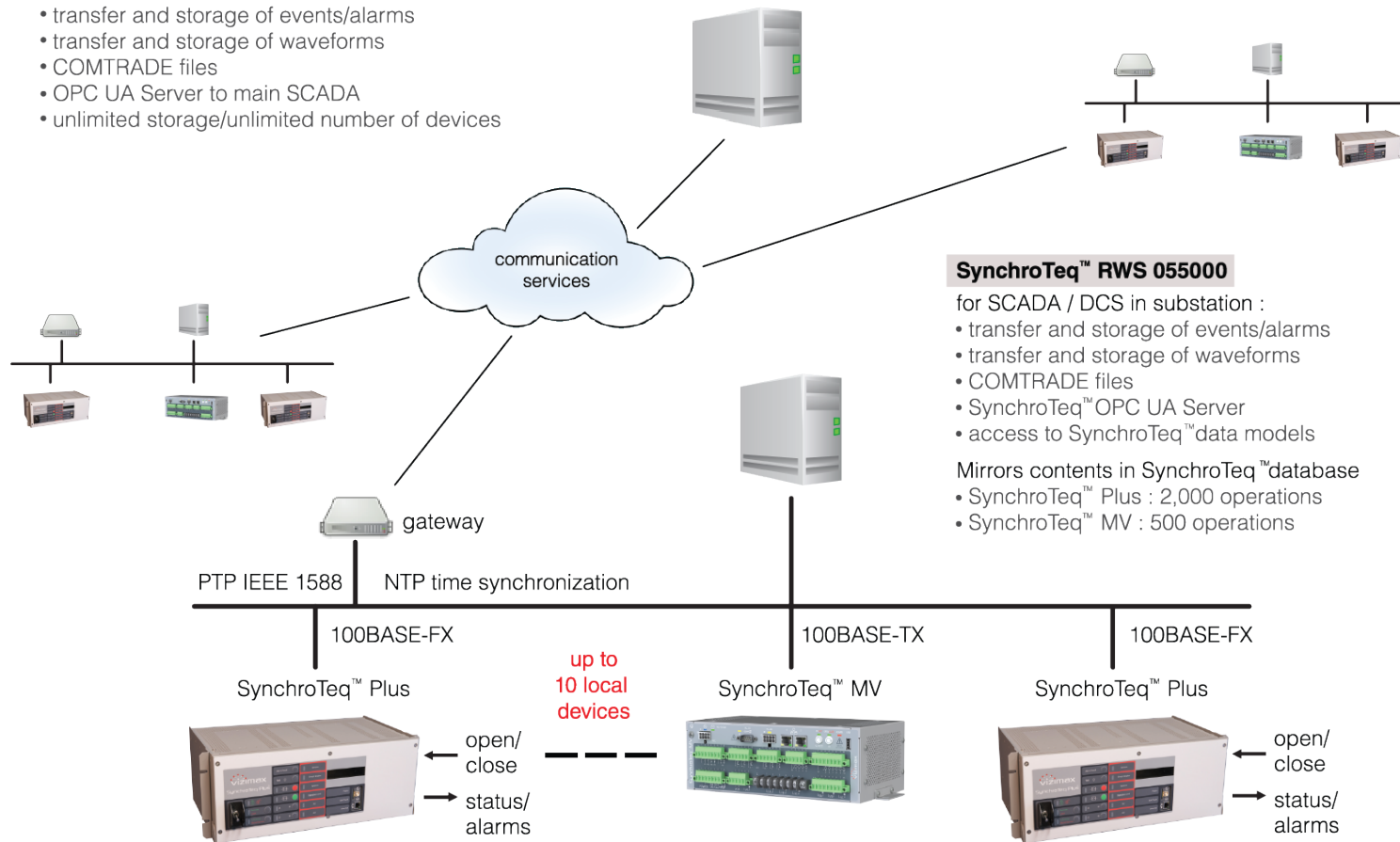
# Automatic Data Transfer + OPC Interface

## SynchroTeq™ RWS 065000

for server in central site :

- transfer and storage of events/alarms
- transfer and storage of waveforms
- COMTRADE files
- OPC UA Server to main SCADA
- unlimited storage/unlimited number of devices

central site



## SynchroTeq™ RWS 055000

for SCADA / DCS in substation :

- transfer and storage of events/alarms
- transfer and storage of waveforms
- COMTRADE files
- SynchroTeq™ OPC UA Server
- access to SynchroTeq™ data models

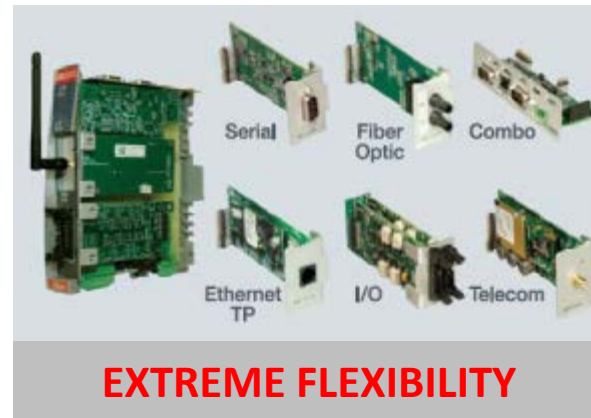
Mirrors contents in SynchroTeq™ database

- SynchroTeq™ Plus : 2,000 operations
- SynchroTeq™ MV : 500 operations

# RightWON™ Product Line

- Modular
- Programmable
- Key functions into one single platform

## RightWON Satellite



## RightWON Plus



## RightWON Engine





# RightWON™ Programmable Platform

## Fully IEC 61131-3 compliant PLC

Five programming languages: IL, ST, FBD, LD, SFC  
Local or remote programming  
IEC 61850 integrated SCL editor

## Human-Machine Interface

Web operating interface  
Display and monitor remote facilities  
Pure Web graphic synoptic with PC Editor



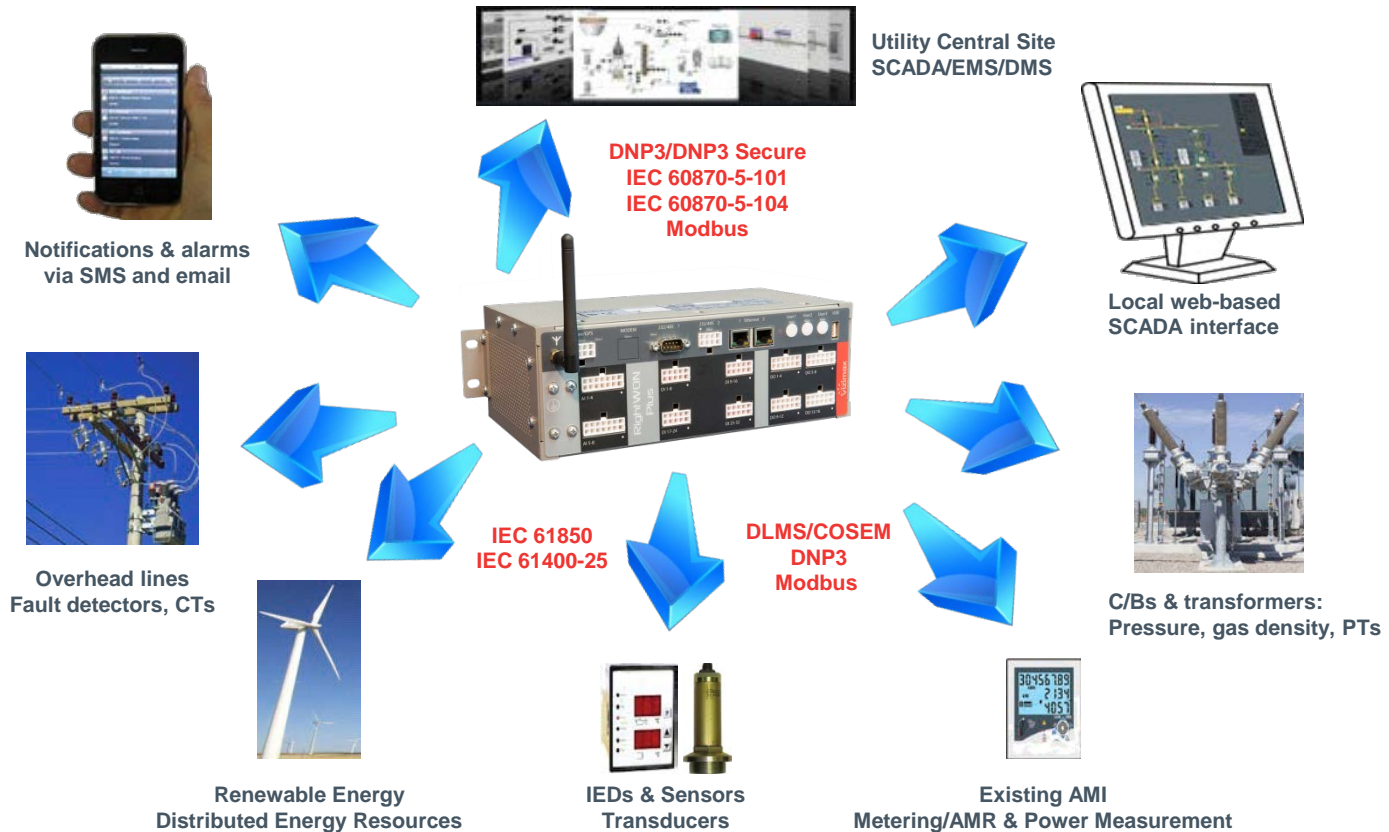
## Protocol Management

IEC 61850 Client, GOOSE, Server interfaces  
IEC 60870-5-101/104, SDI-12, Modbus  
DNP3, IEC 61400-25

## Management and Monitoring Functions

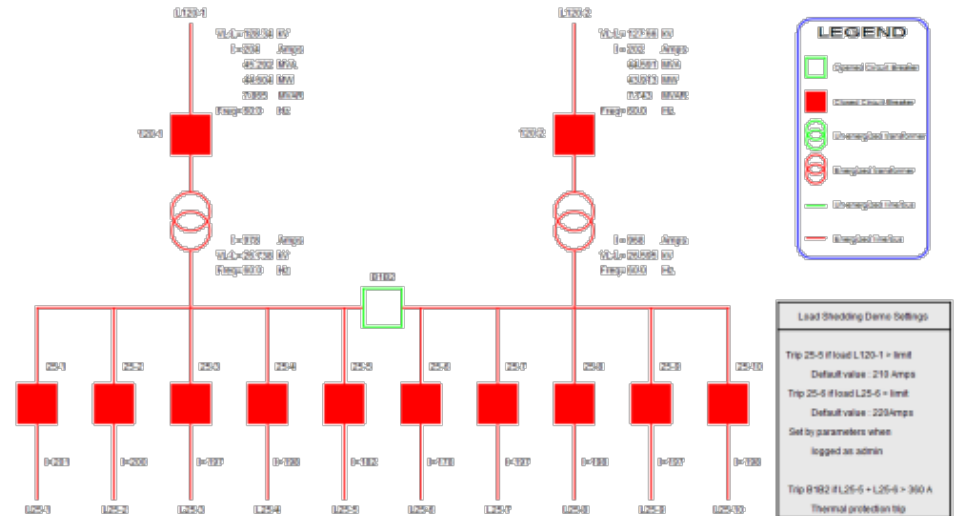
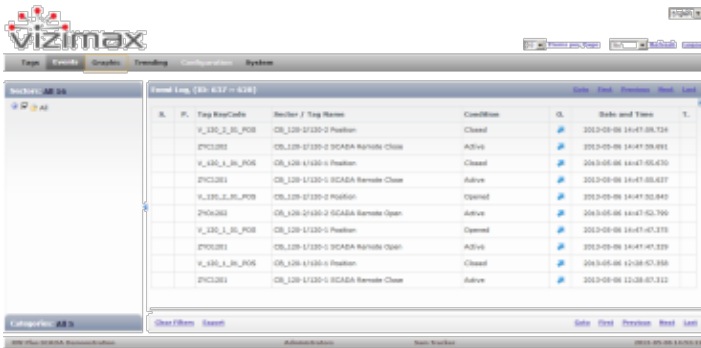
Diagnose and anticipate failures  
Event journals, alarms and trending  
Event notifications by email, SMS and pager

# Data Concentrator/Protocol Converter

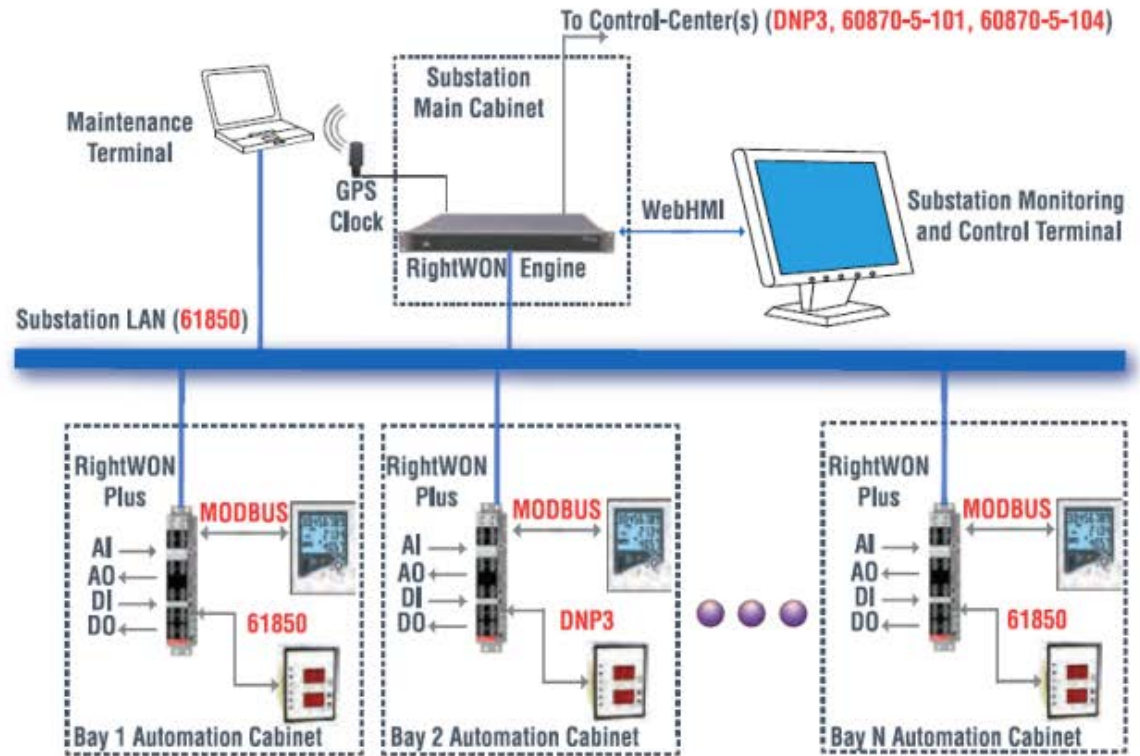


# Smart Substation Controller With Local SCADA

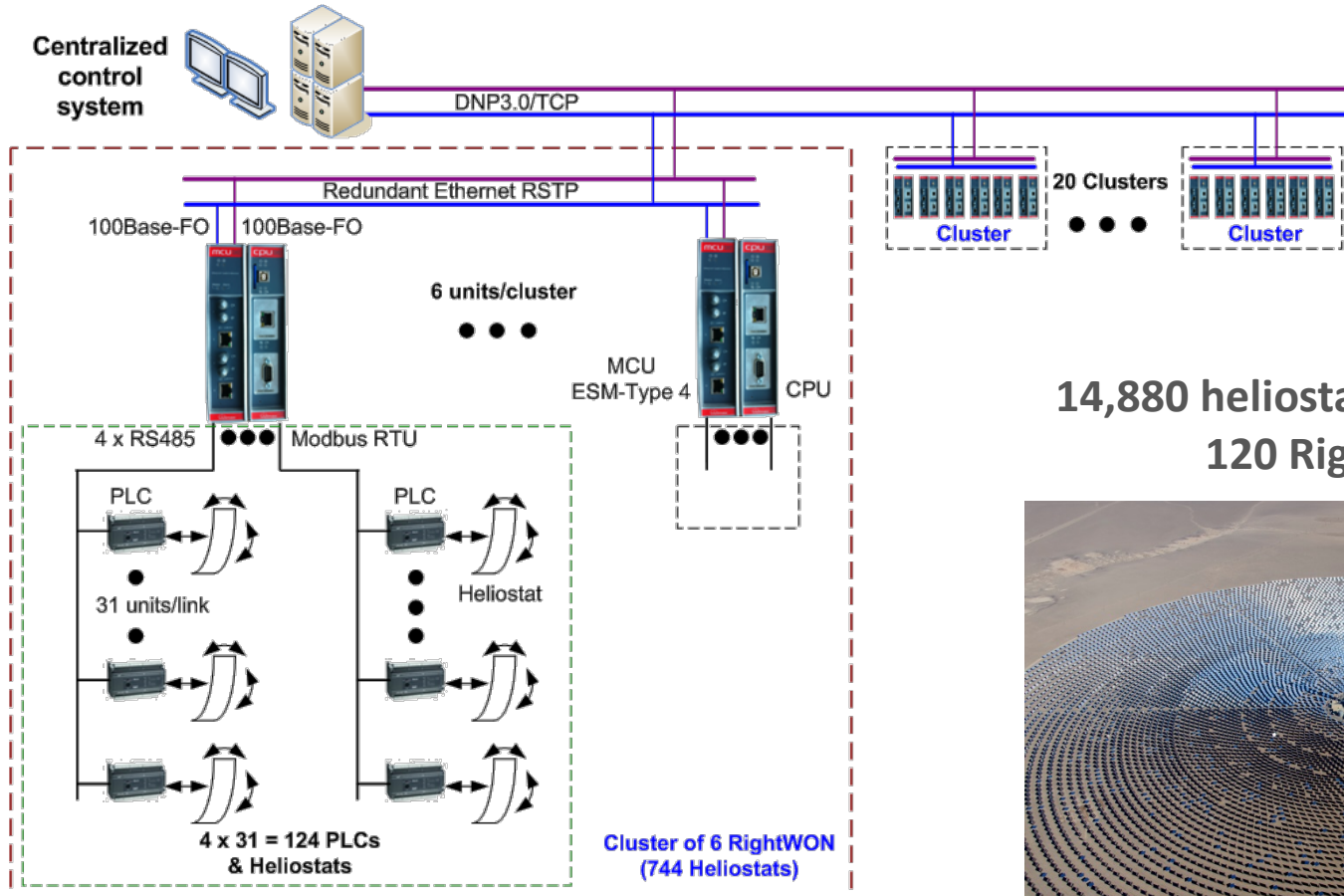
Local interface - including HMI - without specialized software.  
Only requires a web browser !



# Smart Substation Controller



# Data Concentrator/Protocol Converter



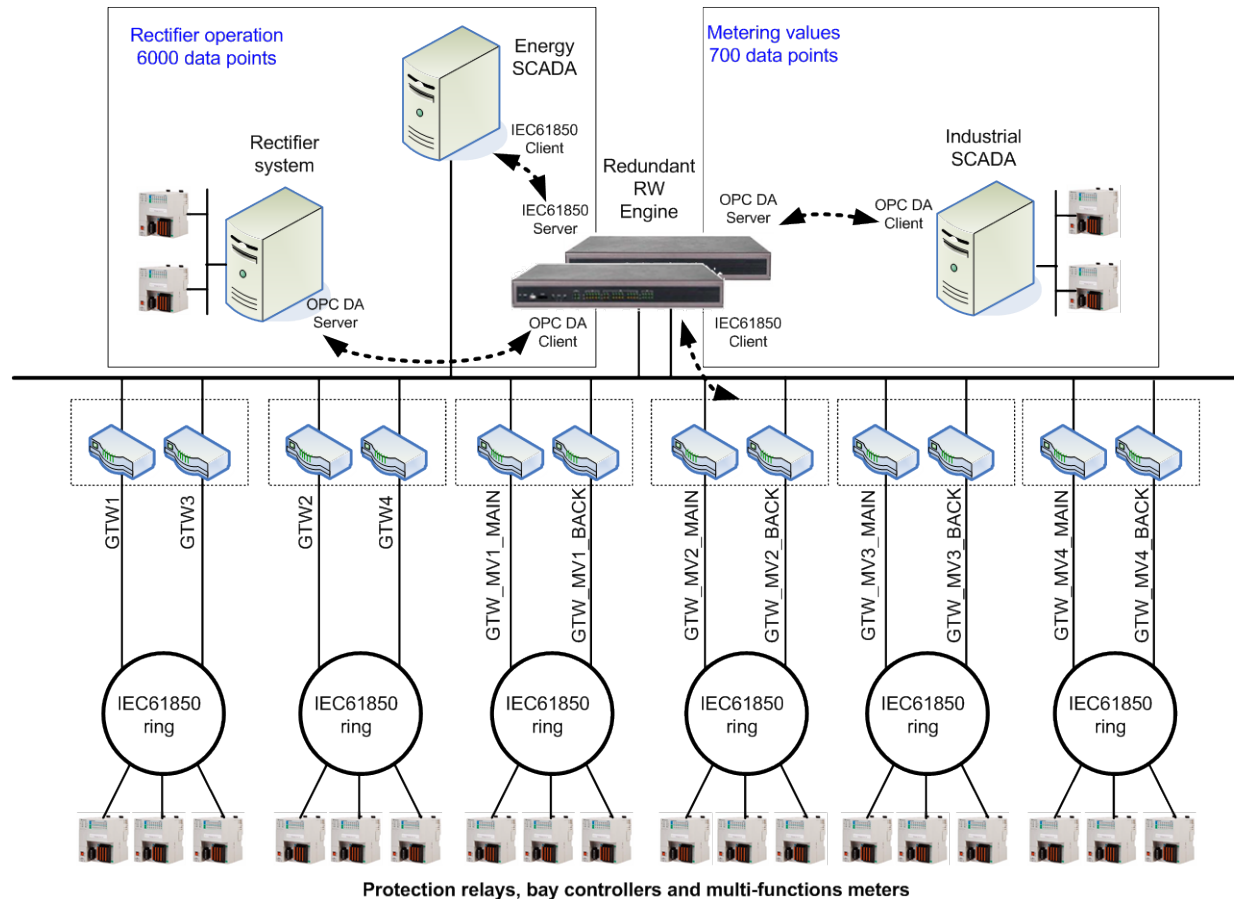
**14,880 heliostats controlled by 120 RightWON!**



Source : Crescent Dunes Solar Energy Project

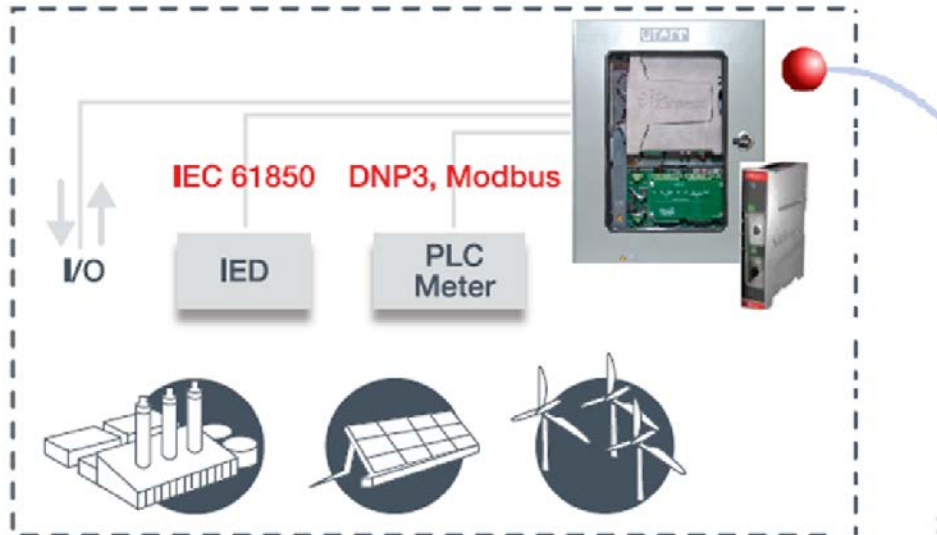


# Data Concentrator/Gateway Application





# Renewables : Monitoring & Control



## INDEPENDENT POWER PRODUCERS



- Secure IPP interconnection
- Remote lock/unlock of circuit breaker
- Data acquisition, reporting and transmission
- IEC61400-25 / IEC61850 / IEC60870-10x / DNP3
- Access to metering over DLMS

# PMU - Phasor Measurement Unit

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What can it measure or estimate ?

- Voltage and current phasors (3 Phases)
- Voltage and current sequence components
- Frequency
- Rate Of Change Of Frequency (ROCOF)
- Circuit breaker status

Reporting rate

- 50Hz 10, 25, 50, 100, 200
- 60Hz 10, 12, 15, 20, 30, 60, 120, 240

Standards

- Exceeds the requirements of C37.118.1 for both M Class (precise reporting) and P class (Fast Response) also providing a wider linearity range than what is specified in the standard

# Comparison SCADA vs PMU Technology

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SCADA Technology	Synchrophaser Technology
Universal time synchronization is not available	Available
Phasor angle cannot be estimated locally (at the substation level)	Estimated locally
Reporting time once every 4 -6 seconds	Up to 240 samples per second (4.2 msec)

PMU technology provides a wide area time synchronized picture of a power system at high reporting rates capturing its dynamics very efficiently and enabling improved monitoring (near real time) and faster control to prevent a Power Outage.

# Synchrophasor Technology Applications

Off- line Applications	On-line Applications
Model validation	Real-Time monitoring & control
Post-disturbances analysis	State estimation
Data mining-searching for past events with provided parameters	Used in real time, operators/dispatchers can respond
Event analysis-analyse known past events	Visualization and display tool Oscillation/Angle/Frequency monitoring
Typically not time sensitive	Time sensitive, may require higher processing capability
	Voltage stability monitoring
	Power system restoration
	DG/IPP applications

**Better monitoring can facilitate better control**

“You can't control what you can't measure” Tom DeMarco

# VIZIMAX PMU Benefits



- Very strong in rejecting harmonic components
- Performs very well in stressed power systems
- Unique capabilities for use in power quality applications
- The output of the algorithms can also be used in intelligent protection and control schemes, special protection schemes, etc.
- Because of its resilience to harmonics, provides an ideal approach that can be used for single phase applications, microgrids and power islands

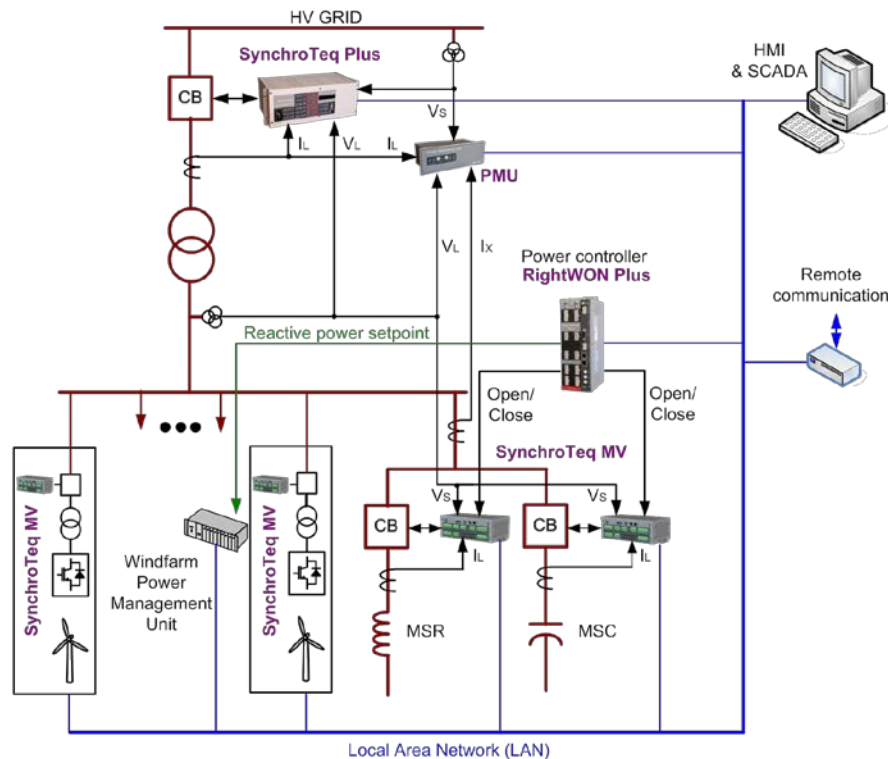
# PMU Features

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- IEEE C37.118 (2005 and 2011) & IEC 61850-90-5 compliant
- From 1 to 240 messages per second
- 2 clients IP transport: UDP, TCP, TCP/UDP or UDP spontaneous
- GOOSE messaging for DI & DO
- Extended Kalman Filtering for 10% to 20% improvement on time response compared to competitive products
- Improved rejection of harmonics, inter-modulation, sub and hyper-synchronous resonance for stressed networks
- Exceed requirements for both M and P measurement class accuracy



# PMU Application : GRID VOLTAGE REGULATION



- Grid voltage, windfarm power and MSR/MSC reactive power are measured with the **PMU**
- The HV grid voltage is regulated with the **RightWON Plus**. It controls both the reactive power produced by the wind turbines and by the MSR/MSC
- **SynchroTeq Plus** eliminates the windfarm power transformer energization inrush current/voltage dip (**grid code compliance**)
- **SynchroTeq MV** minimizes the voltage disturbances and inrush current when switching the MV MSR/MSC
- **SynchroTeq MV in the wind towers** minimize the inrush currents and the sympathetic interaction between the transformers when energized

# AMU Features

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- IEC 61850-9-2LE compliant
- From 80, 240, 256 and 288 samples per cycle at 50 or 60Hz
- GOOSE messaging for DI & DO
- Exceed requirements for both M and P measurement class accuracy

# AMU : Analog Merging Unit

## AMU Communication Features

- 3 Ethernet ports (one RJ-45 for maintenance - 2 others can be fiber or metallic)
- Sampling frequency 80 per cycle (for protection) or 256 per cycle (measurements)
- Supports PRP for redundancy
- Supports 61850-9-2LE
- Configurable to receive/send GOOSE messages when input/output hardware option selected

## AMU Characteristics

- 4 CT inputs (20 bit accuracy)
- 4 PT inputs (16 bit accuracy)
- Sampling rate up to 19,200/sec. per channel
- Power supply 24, 48, 125 & 220VDC
- Built-in Web based configurator and viewer
- Time synch via IEEE PTP 1588 or PPS signal, GPS or from NTP from time server
- 4 signalling outputs (one reserved for health status)
- Can have optionally 6 high speed outputs and 10 digital inputs



# VIZIMAX Solutions & Platforms (recap)



**SynchroTeq™**  
Controlled Switching  
Device for HV&MV C/Bs



**RightWON™**  
Rugged & Scalable, full  
IEC61850 automation  
platforms



**AMU**  
Analog Merging Unit  
IEC 61850-9-2LE  
compliant device



**PMU**  
Phasor Measurement  
Unit IEEE C37.118 (2011)  
compliant

- **CSD Intelligent & Fast Switching + CB Monitoring**
- **Software-Controlled Energy Device Mgt.**
  - Configure and Send Commands to Breakers, Switches, Reclosers, etc.
  - Railways Transport - Signaling & CSD Energy Management
- **Data Capture and Communication**
  - Roads & Bridges - Environmental Data Capture & Communication
  - Water & Waste Treatment - Key Data & Environmental Measurement
- **Smart Substation Controller\_FDIR\_VVO\_Tap Changer Control**
- **Pole-Top Intelligent RTU (ITU)**
- **IPP Intelligent Control for Utilities**
- **Offload the SCADA & Communication Network**
- **Communication Protocol Conversion Gateway**
- **Converts conventional PT, CT, PVT in sample values to the process bus**





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