

AUTOMAÇÃO DE ENERGIA

Energy Automation

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DANGER
KEEP OUT
HIGH VOLTAGE

Centro de Operação do Sistema



Centro de Operação Regional



IHM



Protocolo (ICCP,...)

Protocolo (IEC,...)



UCS

Switch

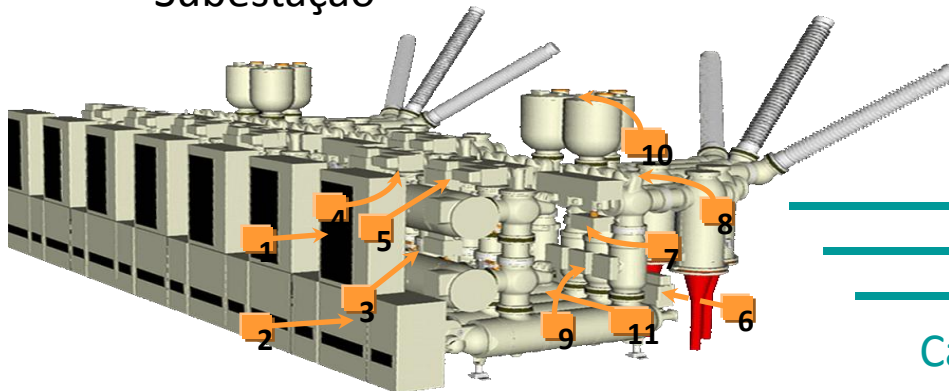


Protocolo (DNP, IEC,...)

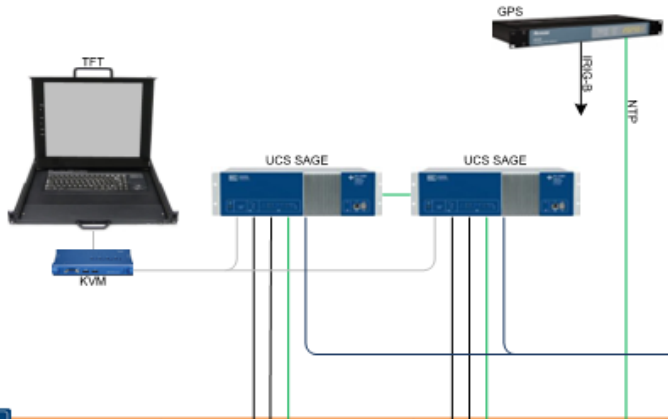
Relé de Proteção e Controle



Subestação



Cabos elétricos

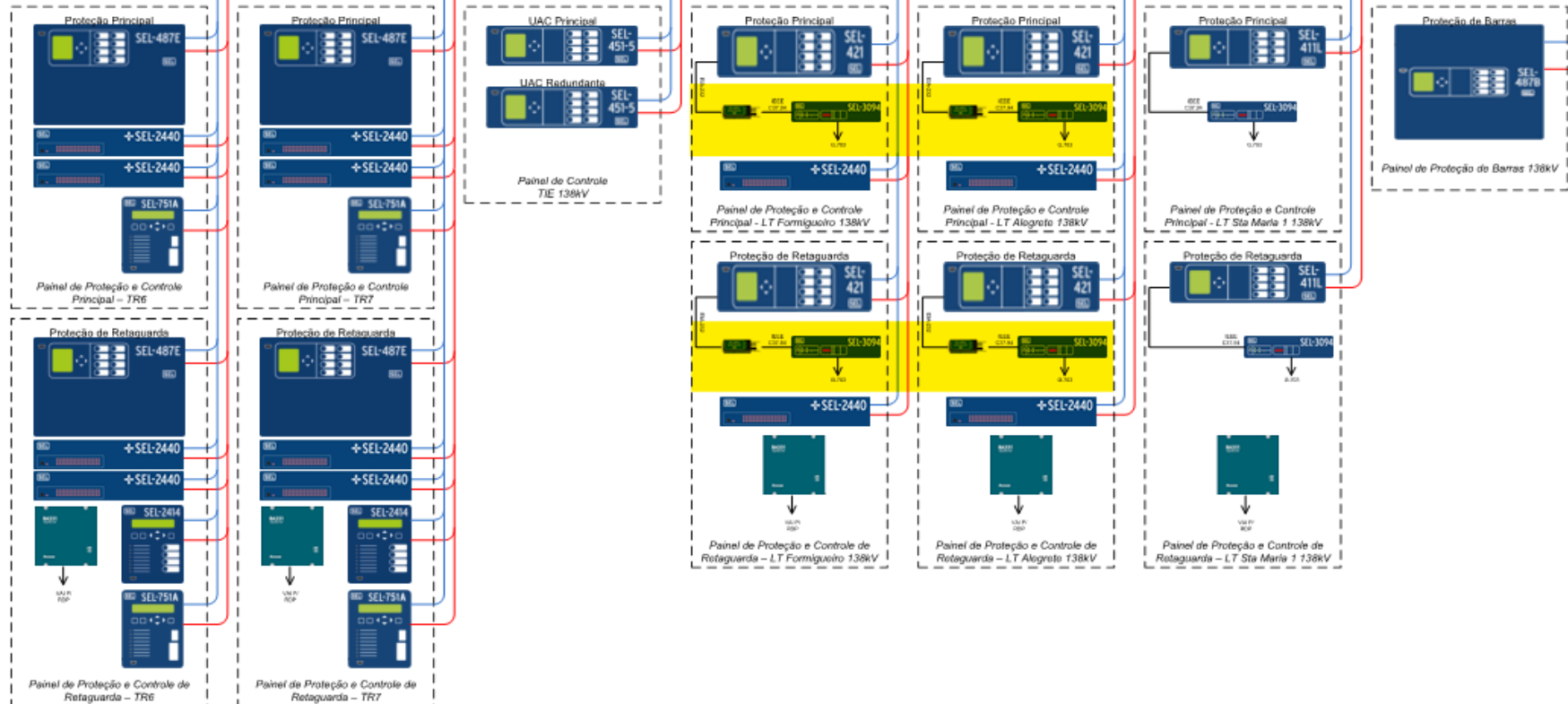


Comunicação com IHM Local existente,
(a ser definido protocolo e interface de comunicação)
(NÃO estamos prevendo software e serviços para essa
IHM Local existente)

SWITCH
SEL-2730M

Rede Ethernet

SWITCH
SEL-2730M



Proteção e Controle


- Linhas de Transmissão
- Transformadores
- Geradores
- Reatores
- Capacitores
- Barras



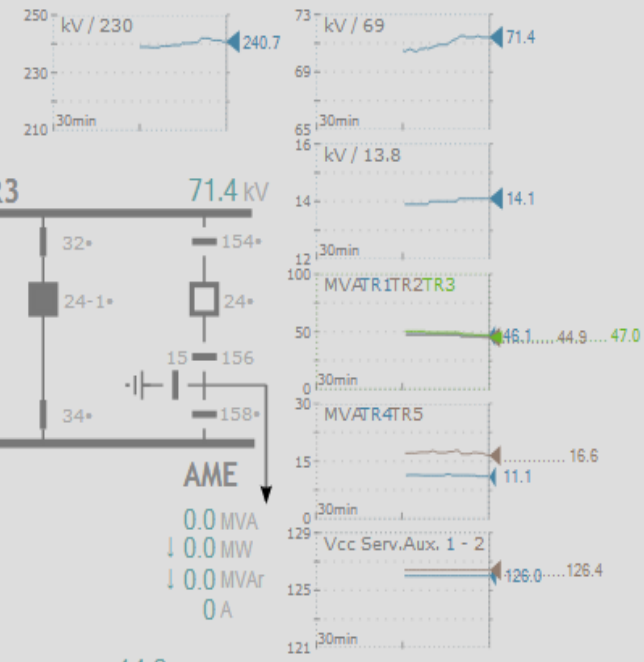
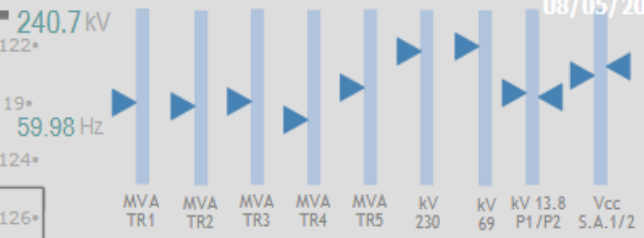
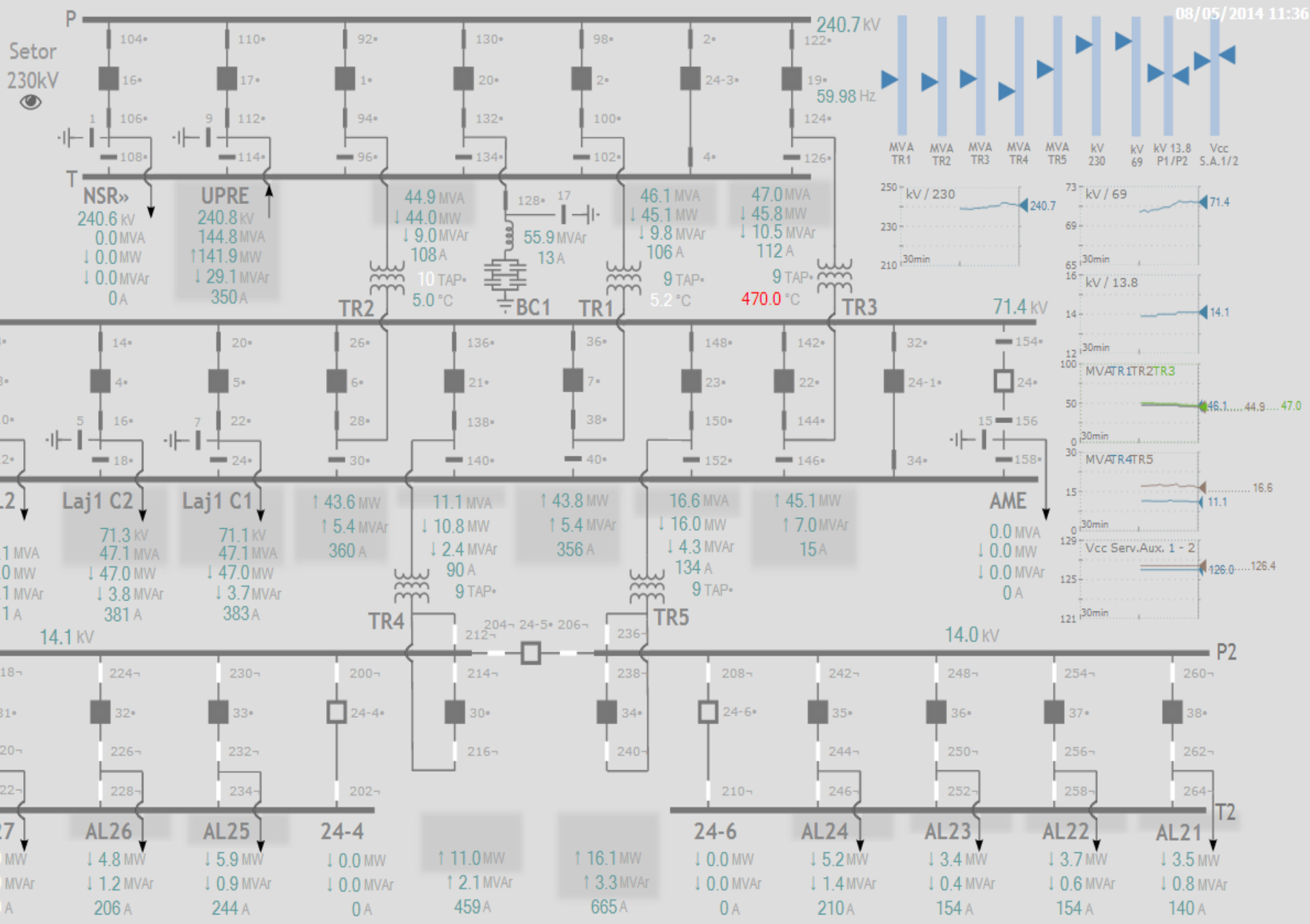
UCS/RTU

- UCS: Unidade Concentradora da Subestação
- UTR: Unidade Terminal Remota
- Aquisição e distribuição de dados
- Lógicas
- Comunicação



- IHM: Interface Humano Máquina
 - Interface amigável com diagramas unifilares
 - Medidas, estados digitais e monitoração de alarmes do sistema
 - Envio de comandos para os diversos dispositivos da subestação
 - Seqüenciamento de eventos
 - Padronização de Sistemas em Subestações
- 

Setor 230kV



NSR»
 240.6 kV
 0.0 MVA
 ↓ 0.0 MW
 ↓ 0.0 MVar
 0 A

UPRE
 240.8 kV
 144.8 MVA
 ↑ 141.9 MW
 ↓ 29.1 MVar
 350 A

44.9 MVA
 ↓ 44.0 MW
 ↓ 9.0 MVar
 108 A
 10 TAP
 5.0 °C

55.9 MVAR
 13 A
 BC1

46.1 MVA
 ↓ 45.1 MW
 ↓ 9.8 MVar
 106 A
 9 TAP
 5.2 °C

47.0 MVA
 ↓ 45.8 MW
 ↓ 10.5 MVar
 112 A
 9 TAP
 470.0 °C

71.4 kV

Laj1 C2
 71.3 kV
 47.1 MVA
 ↓ 47.0 MW
 ↓ 3.8 MVar
 381 A

Laj1 C1
 71.1 kV
 47.1 MVA
 ↓ 47.0 MW
 ↓ 3.7 MVar
 383 A

43.6 MW
 ↑ 5.4 MVar
 360 A

11.1 MVA
 ↓ 10.8 MW
 ↓ 2.4 MVar
 90 A
 9 TAP

43.8 MW
 ↑ 5.4 MVar
 356 A

16.6 MVA
 ↓ 16.0 MW
 ↓ 4.3 MVar
 134 A
 9 TAP

45.1 MW
 ↑ 7.0 MVar
 15 A

AME
 0.0 MVA
 ↓ 0.0 MW
 ↓ 0.0 MVar
 0 A

14.1 kV

14.0 kV

P2

T2

AL26
 ↓ 4.8 MW
 ↓ 1.2 MVar
 206 A

AL25
 ↓ 5.9 MW
 ↓ 0.9 MVar
 244 A

24-4
 ↓ 0.0 MW
 ↓ 0.0 MVar
 0 A

11.0 MW
 ↑ 2.1 MVar
 459 A

16.1 MW
 ↑ 3.3 MVar
 665 A

24-6
 ↓ 0.0 MW
 ↓ 0.0 MVar
 0 A

AL24
 ↓ 5.2 MW
 ↓ 1.4 MVar
 210 A

AL23
 ↓ 3.4 MW
 ↓ 0.4 MVar
 154 A

AL22
 ↓ 3.7 MW
 ↓ 0.6 MVar
 154 A

AL21
 ↓ 3.5 MW
 ↓ 0.8 MVar
 140 A

Centros de Controle


-Nos Centros de Operação Regionais -COR's ou nos Centros de Atendimento - CA's ocorrem a operação e o atendimento de subestações e usinas de uma região da área global.

- No Centro de Operação do Sistema - COS encontram-se as facilidades para a operação global centralizada do sistema e a coordenação da geração e carga.




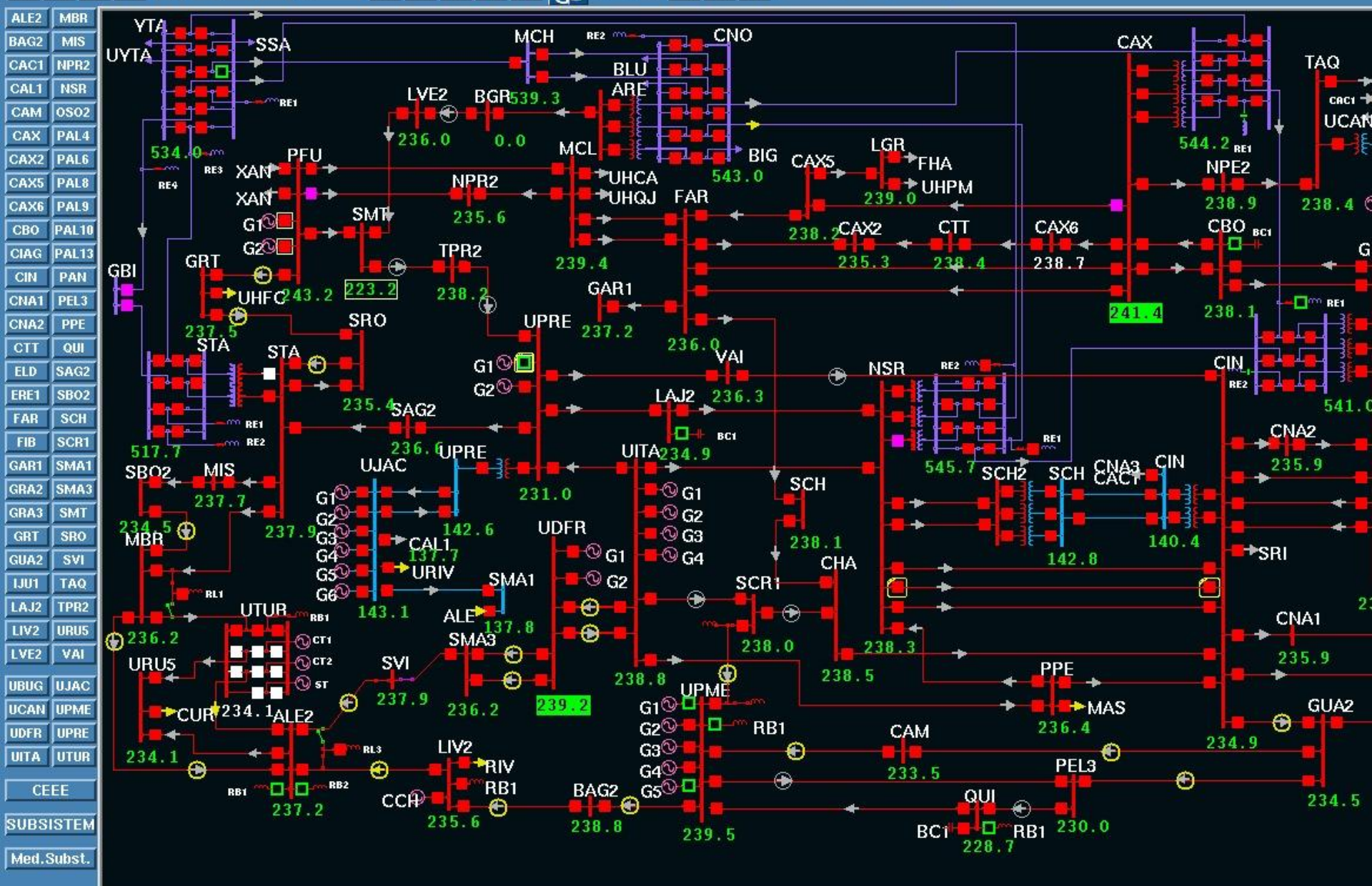
Centros de Controle

SCADA – Supervisão, Controle e Aquisição de Dados

- Aquisição de dados
 - Tratamento dos dados primários
 - Cálculo de grandezas derivadas de telemedições e/ou variações de estado
 - Verificação de limites e geração de alarmes
 - Registro de alarmes e eventos
 - Seqüenciamento de eventos (SOE)
 - Distribuição de dados
- 

SAGE Sistema Aberto de Gerenciamento de Energia

- Comunicação com vários protocolos
 - Interface Gráfica (IHM)
 - Aquisição e Processamento de Dados
 - Dados Calculados
 - Processamento de Alarmes e Eventos
 - Utilizado em SE'S (UCS) e Centro de Controle e Operação
- 

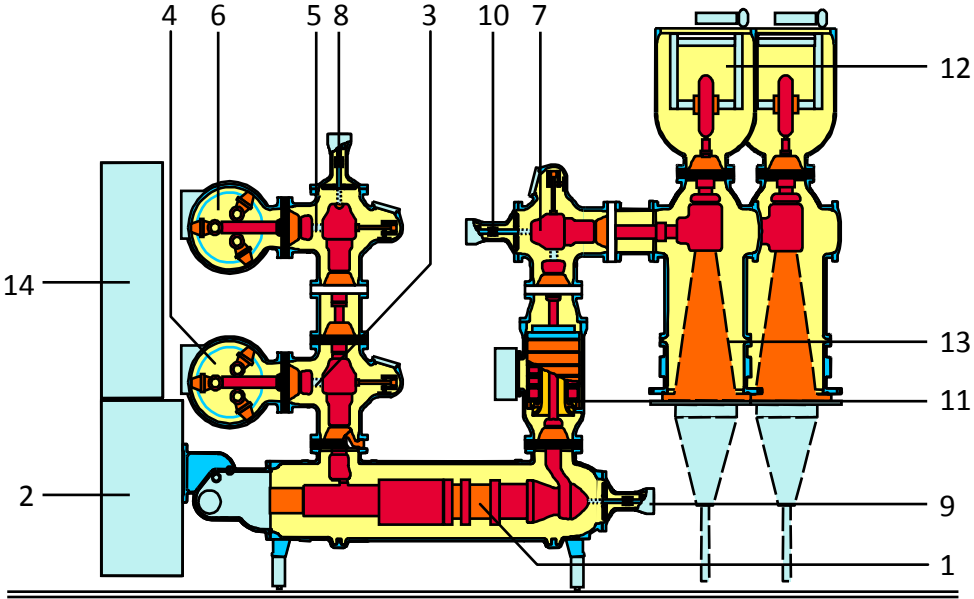


NOVAS TECNOLOGIAS

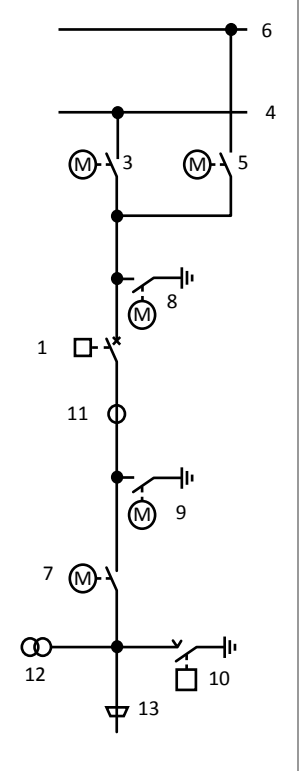
GIS - Gas-Insulated Switchgear & IEC 61850



Gas-Insulated Switchgear 245 Kv Switchgear Bay

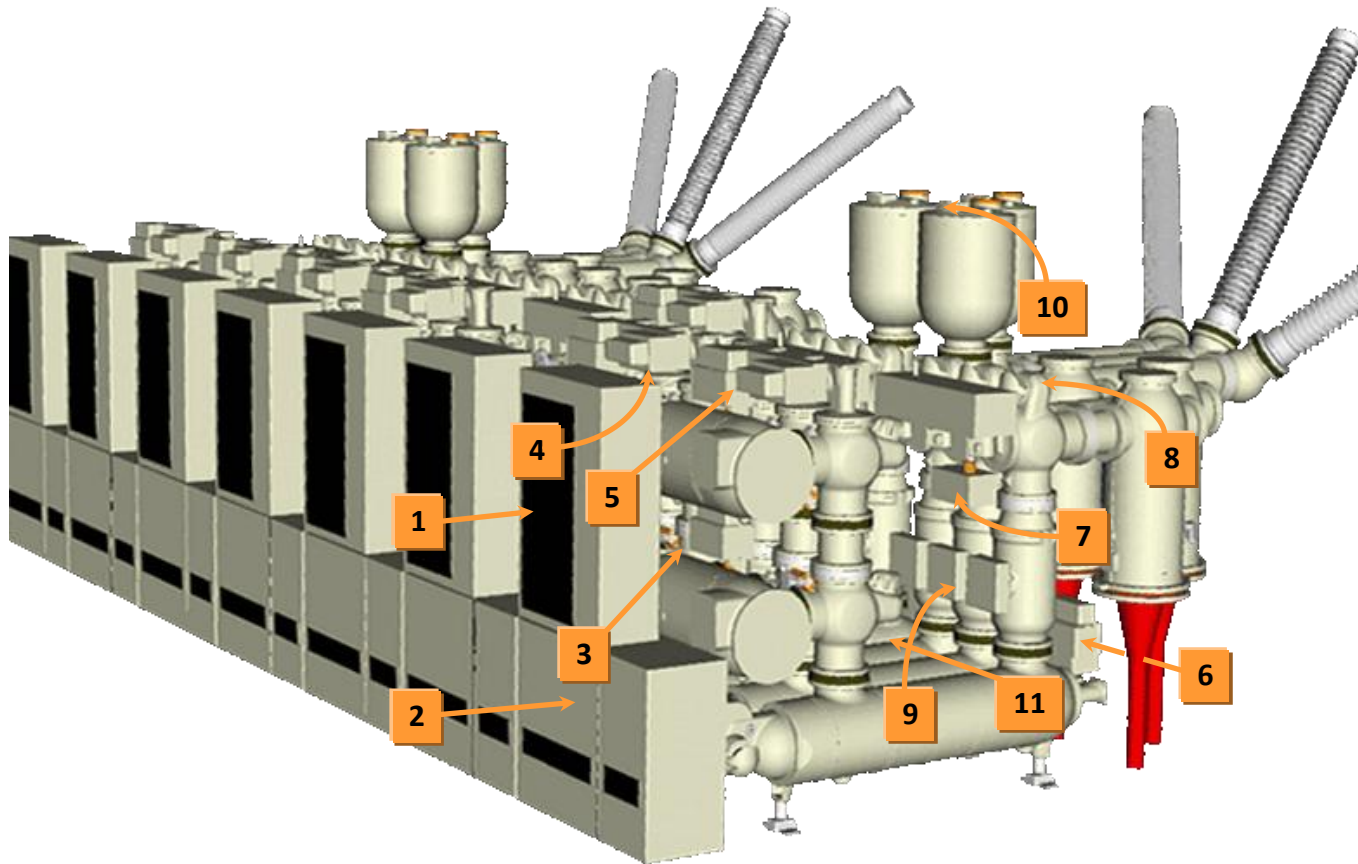


- | | |
|--|--|
| 1 Circuit-breaker interrupter unit | 8 Earthing switch (for work in progress) |
| 2 Spring-stored-energy operating mechanism with circuit-breaker control unit | 9 Earthing switch (for work in progress) |
| 3 Busbar disconnector I | 10 Make-proof earthing switch (high speed) |
| 4 Busbar I | 11 Current transformer |
| 5 Busbar disconnector II | 12 Voltage transformer |
| 6 Busbar II | 13 Cable sealing end |
| 7 Outgoing disconnector | 14 Integrated local control cubicle |



Gas-Insulated Switchgear 245 kV

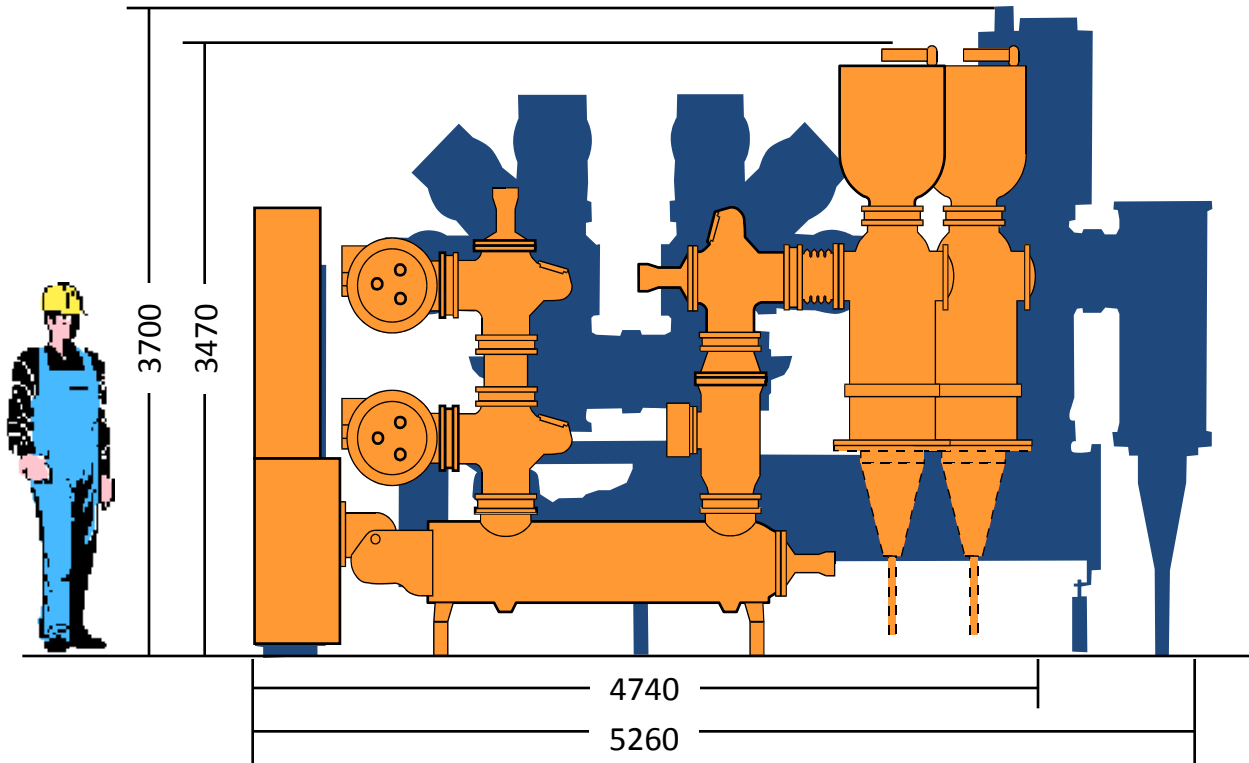
Accessibility Drives, Terminal Boxes, Control Cubicles



- 1 Integrated local control cubicle
- 2 CB-control unit
- 3 Operating mechanism busbar disconnecter I
- 4 Operating mechanism busbar disconnecter II
- 5 Operating mechanism earthing switch Q51
- 6 Operating mechanism earthing switch Q52
- 7 Operating mechanism earthing switch Q8
- 8 Operating mechanism disconnecter Q9
- 9 Terminal box current transformer
- 10 Terminal box voltage transformer
- 11 CB accessible

Gas-Insulated Switchgear 245 kV

Comparison of Dimensions



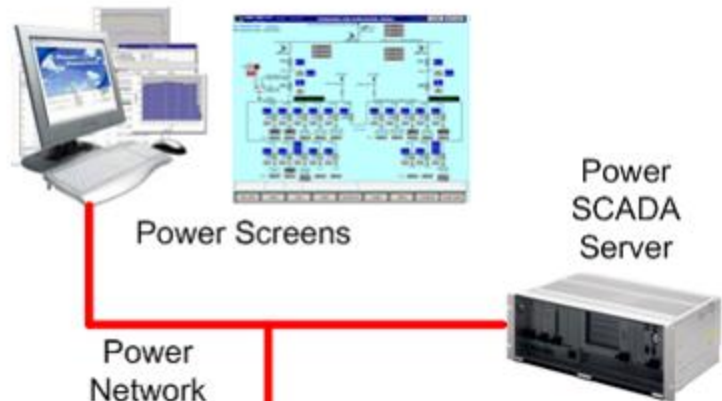




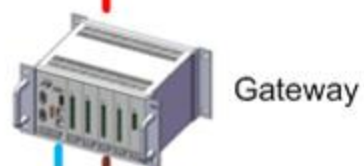
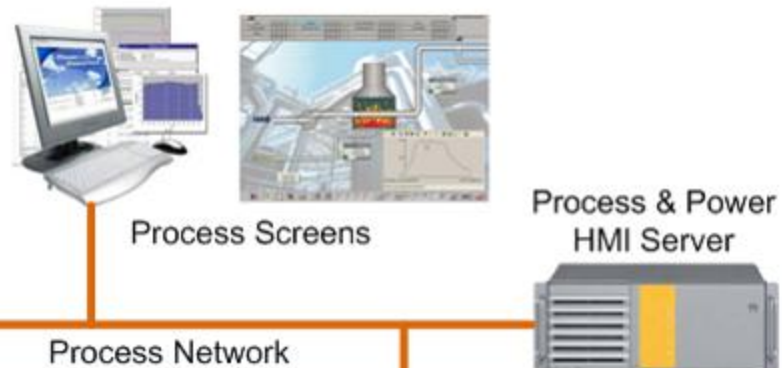
IEC 61850



Power System SCADA



Process System HMI



Protocol A

Protocol C

Protocol B

Protection & Control Relays



Controller



DCS Controller

Fieldbuses

Low Voltage Switchgear

MCCs

Drives



Serial Buses (Hardwired)

Power & Energy Management

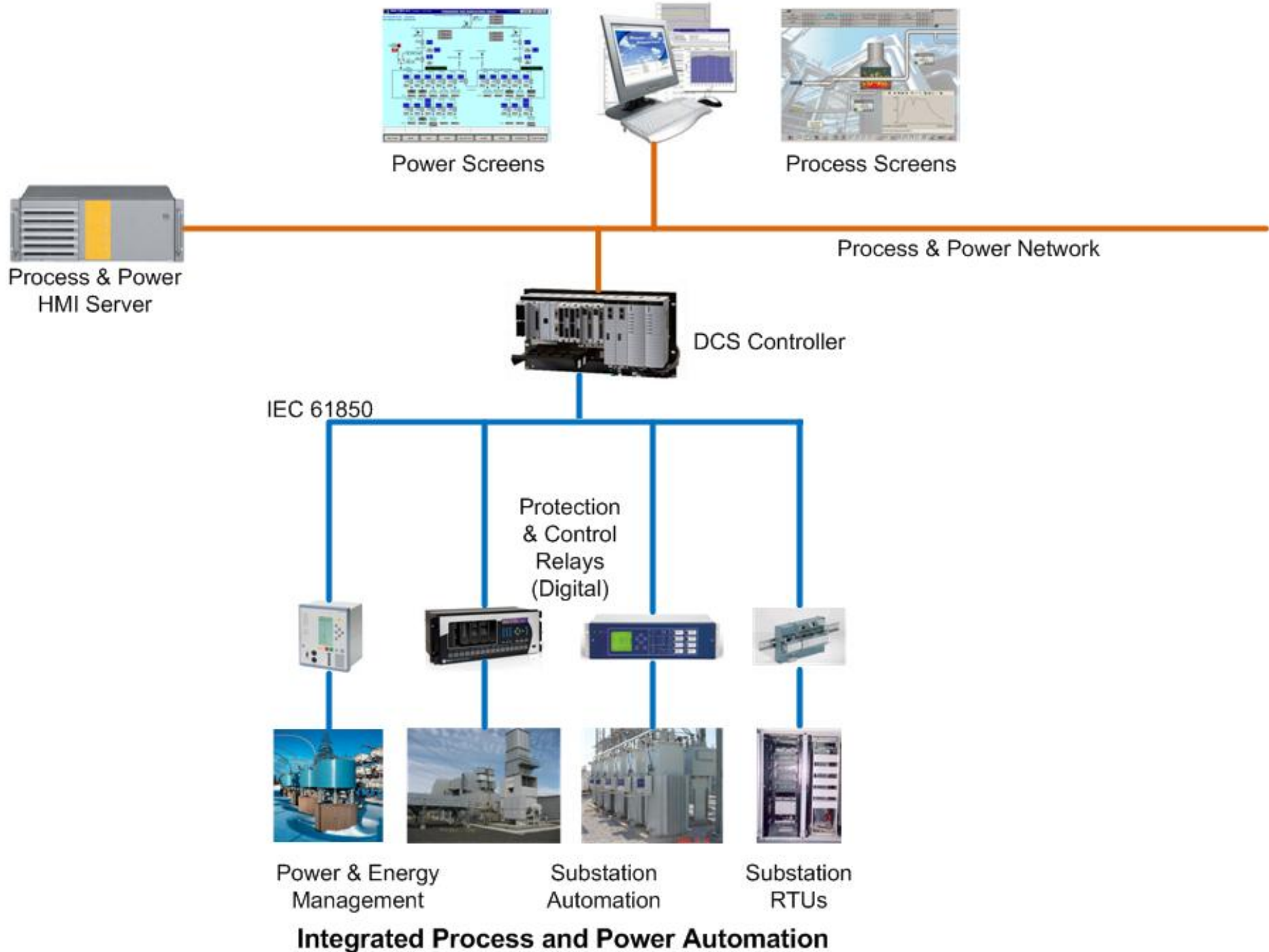
Substation Automation

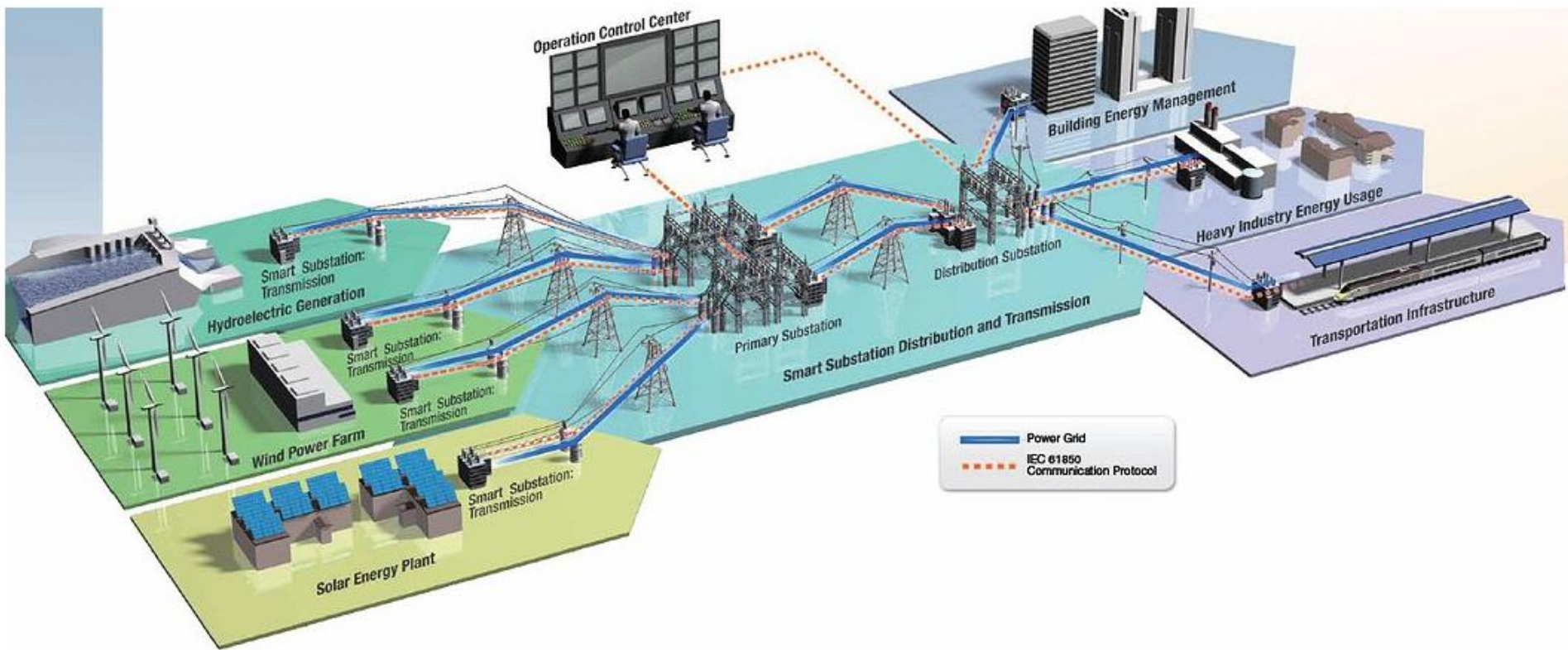
Process Electrical Equipment

Process Instruments

Power Automation

Process Automation





Norma IEC 61850
 Engenharia de software para aplicação da norma IEC 61850 em sistemas de energia

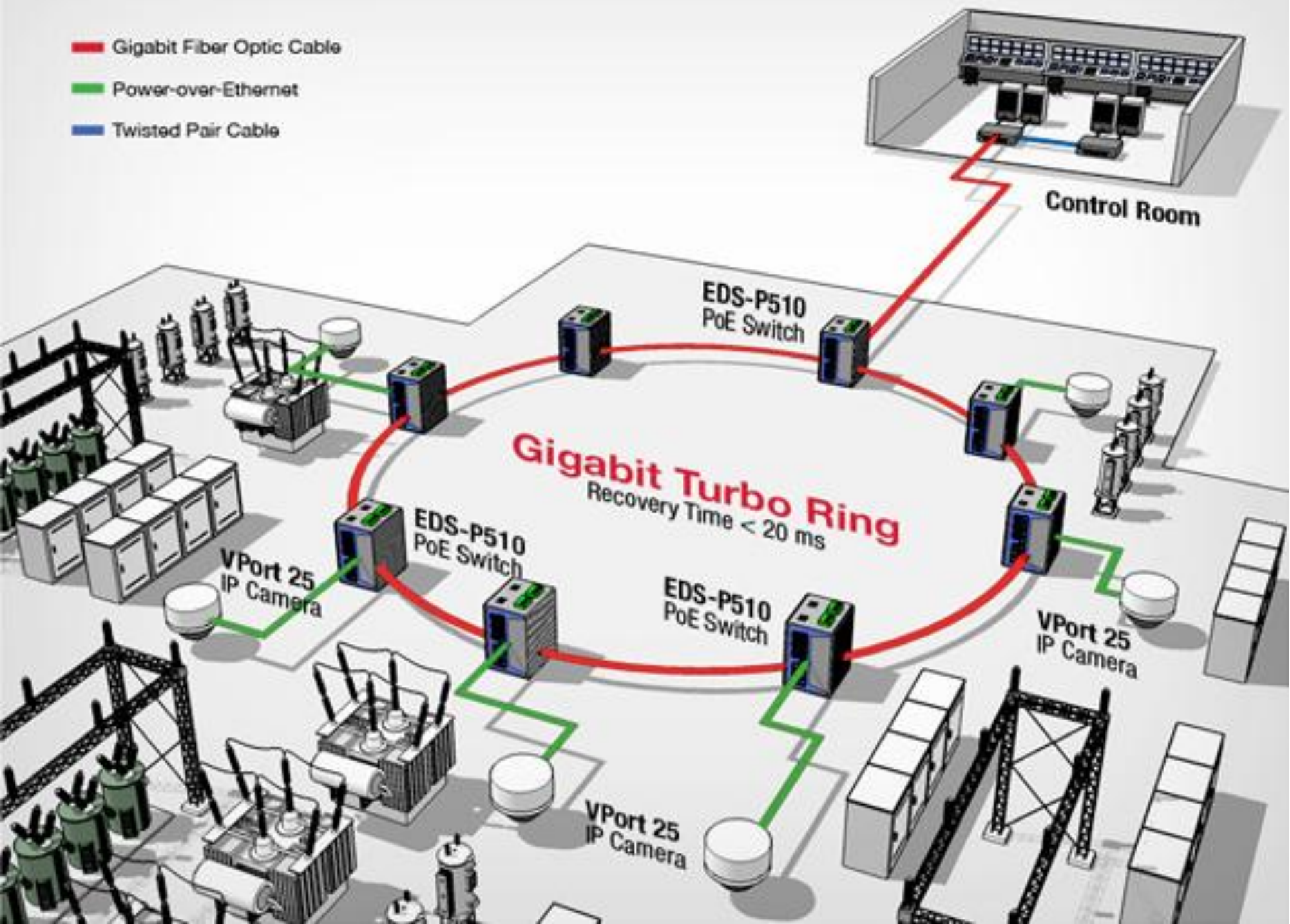
FUTURO

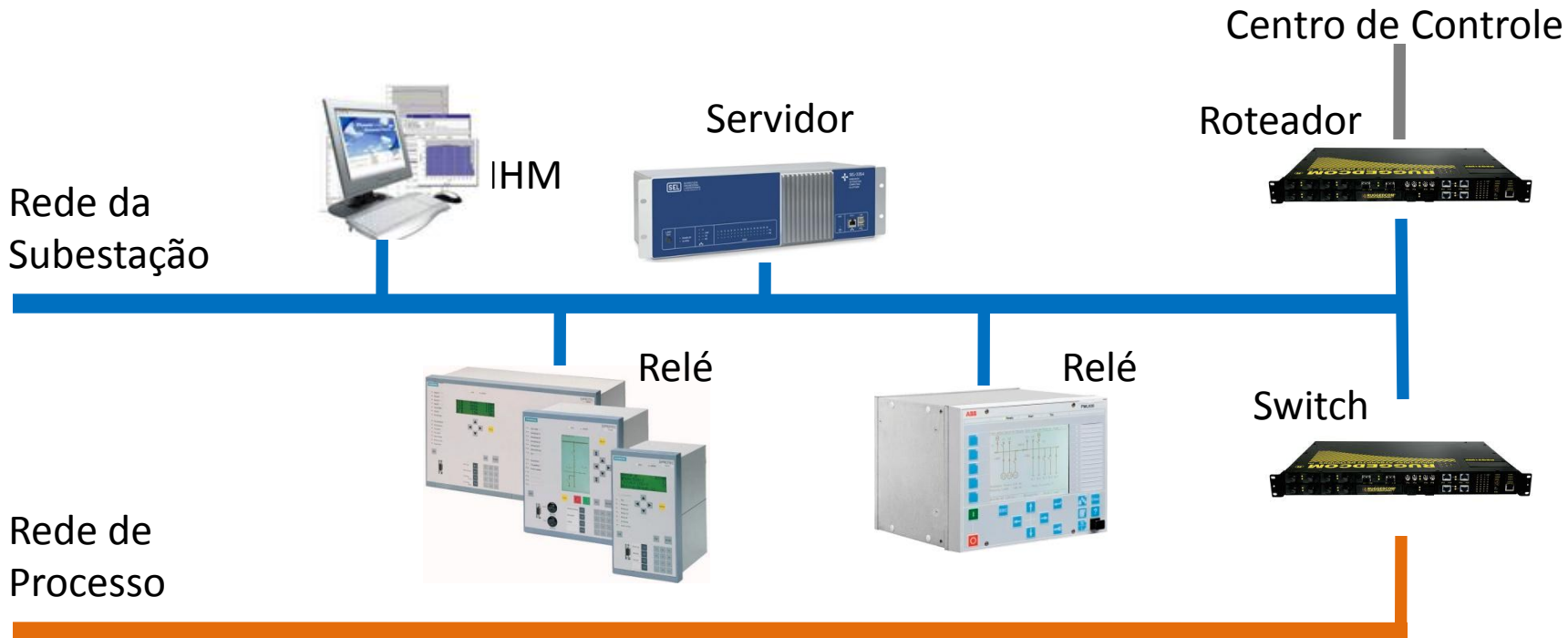


— Gigabit Fiber Optic Cable

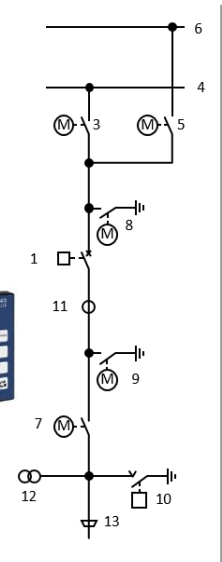
— Power-over-Ethernet

— Twisted Pair Cable





Unidade de Aquisição



LT 230kV

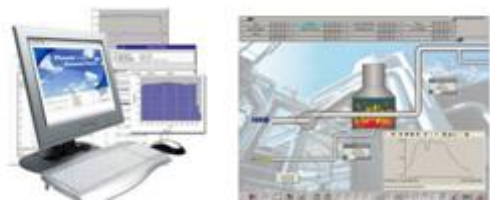
Centro de Operação do Sistema



Centro de Operação Regional



IHM



Protocolo(ICCIP,...)

UCS



Relé de Proteção e Controle

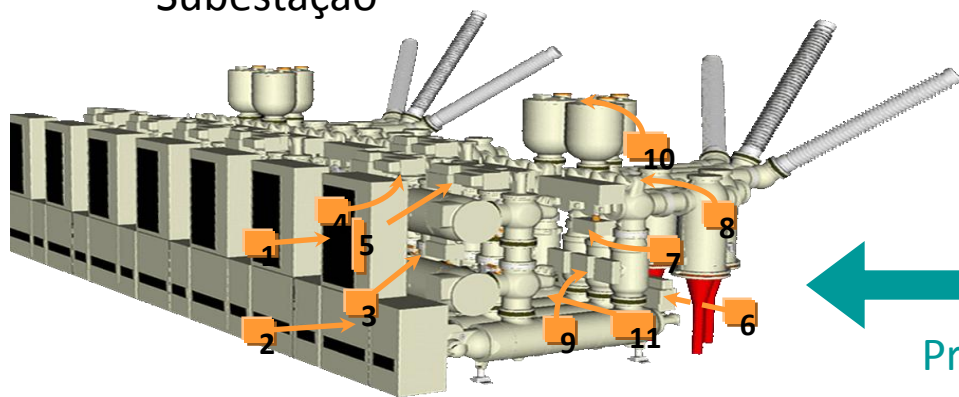


Protocolo (IEC,...)

Protocolo

Protocolo

Subestação



Protocolo

Switch

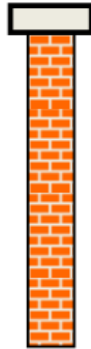


Professional

Utility
System
Operator



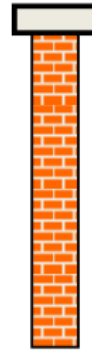
Substations
Breakers
Switching Orders
EMS, DMS User



Utility
Operations
Engineer



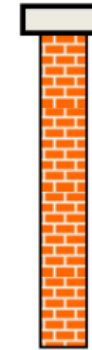
Buses
Branches
Power Flow
Transient Stability
PSSE, PSLF
System Protection



Power
System
Application
Developer



FORTRAN
MATLAB
VB
Decoupled Power Flow
Jacobian Matrix
Eigen Vectors
Transient Saliency
PSSE, PSLF
EMS, DMS Apps



Software
Developer



Java
C++
OO Programming
OO data base
Threads
Network
Cyber Security
Linux
CIM XML
EMS, DMS SW.

Automação de Energia

Energy Automation

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