

Taiwan Power Research Institute



IEC 61850相關標準之應用計畫

廖政立

於電腦公會B102會議室

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台灣電力公司



內容大綱

1. 前言
2. 已完成及進行中之先導計畫
3. 規劃中之先導計畫
4. 結論

IEC 61850標準相關

已公布新資訊

已公布之IEC 61850其他相關IS/TR/PAS

| | | |
|------------------|------------|------------------------------------|
| 2012-03 | -7-510 | 水電廠LNs功能建模之使用 |
| 2008-12 | -80-1 | CDC資料模型資訊交換使用IEC 60870-5-101,104指引 |
| 2015.11 | -80-3 | Web協定的映射-需求及技術選擇 |
| 2015.6 2016.5 | -9-3 (PAS) | IEC 61588 PTP profile |
| 2010-03 | -90-1 | 變電所之間通信 |
| 2013-08 | -90-4 | 變電所網路工程指南 |
| 2012-05 | -90-5 | 依IEEE C37.118之IEC 61850同步相量資訊傳輸 |
| 2013-02 | -90-7 | PV、儲能和其他DER 電力轉換器的IEC 61850物件建模 |
| 2015-07 | -90-12 | 廣域網路應用指南 |

IEC 61850標準相關

即將(或發展編定中)的新資訊(2/2)

正在發展中之IEC 61850其他相關IS/TR

| | |
|--------|------------------------------|
| -7-5 | IEC 61850建模概念 |
| -7-500 | 變電所自動化系統LNs功能建模之使用 |
| -7-520 | DER LNs功能建模之使用 |
| -8-2 | IEC 61850變電所外對Web Service的映射 |
| -80-2 | IEC 61850與DNP3.0 Mapping |
| -80-4 | 轉換AMI COSEM(IEC 62056) |
| -80-5 | Modbus與IEC 61850之間的資料轉化 |
| -10-3 | IEC 61850系統功能測試 |
| -90-2 | 變電所與控制中心之間通信 |
| -90-3 | 設備狀態監測診斷與分析 |

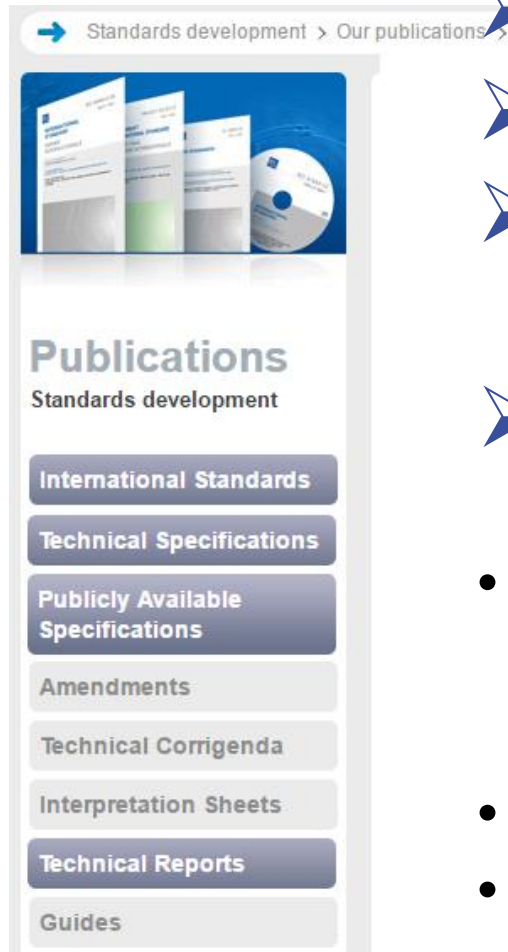
IEC 61850標準相關

即將(或發展編定中)的標準新資訊(1/2)

正在發展中之IEC 61850其他相關IS/TR

| | |
|---------|-------------------------------------|
| -90-6 | 配電自動化系統應用 |
| -90-8 | 電動汽車物件模型 |
| -90-9 | 電力儲能物件模型 |
| -90-10 | 調度物件模型 |
| -90-11 | IEC 61850應用的邏輯建模方法論 |
| -90-13 | Steam/Gas Turbines IEC 61850資訊模型及擴展 |
| -90-14 | FACTS物件模型 |
| -90-15 | DER系統整合 |
| -90-16 | 系統管理 |
| -90-17 | 電力品質 |
| -90-... | |

IEC標準及相關出版區分



- **International Standards(IS)**
 - **Technical Specifications (TS)**
 - **Publicly Available Specifications (PAS)**
 - **Technical Reports(TR)**
- IEC NATIONAL COMMITTEES (NC) - TECHNICAL COMMITTEE (TC), SUBCOMMITTEE (SC),
 - WORKING GROUP (WG),
 - PROJECT TEAM (PT),
 - MAINTENANCE TEAM (MT)

摘自 : <http://www.iec.ch/standardsdev/publications>

IEC 61850標準基本核心之一

From IEEE 1588 To IEC 61850-9-3

Communication networks and systems for power utility automation –Part 9-3: Precision time protocol profile for power utility automation
(電力公用事業自動化之通訊網路及系統 - 第9-3部:電力公用事業自動化之精確時間協定剖繪)

The diagram illustrates the lineage of the precision time protocol standard. On the left is the IEEE 1588 cover, titled "IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems", published in 2008. To its right are three IEC covers: IEC 61588 (Edition 2.0, 2009-02), IEC PAS 61850-9-3 (Edition 1.0, 2015-06), and IEC/IEEE 61850-9-3 (Edition 1.0, 2016-05). A red box highlights the IEEE Std 1588™-2008 cover and the IEC/IEEE 61850-9-3 cover, with a red arrow pointing from the IEEE version to the IEC/IEEE version, indicating the transition of the standard to the international level.

短中長程規劃

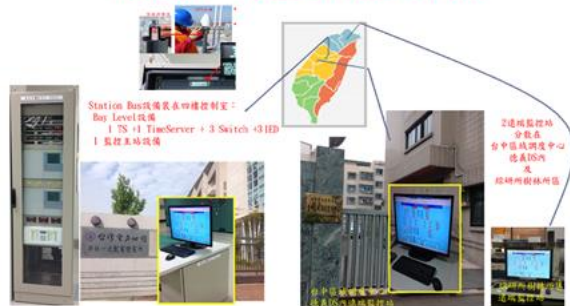
| 具體做法 | 功能說明 | 第一階段現況說明(迄2015現況) | 第二階段目標(負責單位規劃目標 2016~2020年) | 2016年工作目標規劃 | 2017年工作目標規劃 | 2018年工作目標規劃 | 2019年工作目標規劃 | 2020年工作目標規劃 | |
|------|-------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| A7 | 引進IEC 61850標準通訊協定 | 先引進IEC 61850標準已穩定並公布之重要基礎部分(part 10之前相關標準)·再逐步引進標準擴展部分(如part 80.xx, 90.xx相關標準) | ~ 2015年：已完成IEC-61850數位化變電所建置評估研究-新社會先導型IEC 61850變電所之建置案。2015-2016預定完成現行數位電驛 IED與RTU校時系統與事故資料整合研究。 | 2016預定完成現行數位電驛 IED與RTU校時系統與事故資料整合研究。2016 ~ 2020年預定完成引進IEC 61850標準擴展部分(如part 80.xx, 90.xx相關標準) | 2016預定完成現行數位電驛 IED與RTU校時系統與事故資料整合研究。 | 引進IEC 61850標準擴展部分(如part 80.xx, 90.xx相關標準)-本公司既有DNP3變電所與IEC 61850變電所過渡之調適 IEC 61850-80-2/IEEE 1815.1 | 引進IEC 61850標準擴展部分(如part 80.xx, 90.xx相關標準)- IEC 61850-90-3 (狀態監視) | 引進IEC 61850標準擴展部分(如part 80.xx, 90.xx相關標準)-IEC 61850-90-6 DA(配電自動化)-配電SCADA/饋線故障位置檢出故障隔離與服務恢復/饋線電壓無效功率控制/... | 引進IEC 61850標準擴展部分(如part 80.xx, 90.xx相關標準)-IEC 61850-90-8電動車充電系統模型 |

106年度配合公司智慧電網A7短中長程規劃

先導型智慧變電所系統之建置

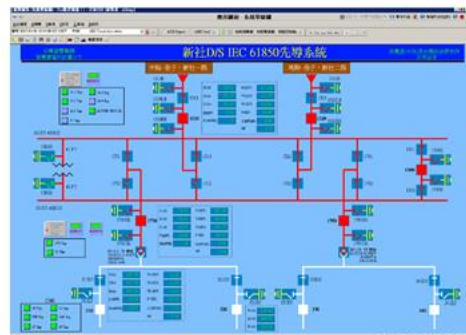
3. 先導型智慧變電所之規劃與建置
 3.(3)新社先導型IEC 61850智慧變電所建置情形

Station Bus現場設備建置及應用標準統一不同廠商設備整合容易



3. 先導型智慧變電所之規劃與建置
 3.(3)新社先導型IEC 61850智慧變電所建置情形

SCADA監控畫面整合不同廠商設備資訊



- ▶ 開關櫃程序與使用管理
- ▶ 監視功能操作說明
- ▶ 報表功能
- ▶ 警報列表
- ▶ 事件列表
- ▶ 趨勢
- ▶ Relay 參數讀取、數據讀取功能
- ▶ 事故警報波形功能
- ▶ 模擬控制點

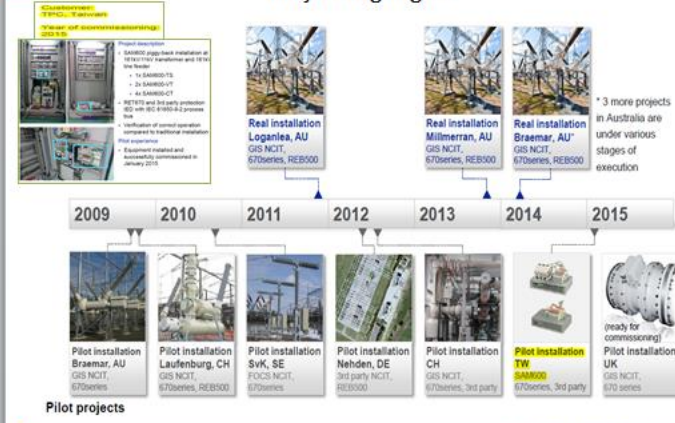
3. 先導型智慧變電所之規劃與建置
 3.(3)新社先導型IEC 61850智慧變電所建置情形

Process Bus現場設備建置簡化接線降低施工及維護成本

IEC 61850-9-2 之MU、及IEC 61850-8-1之Breaker IED靠近現場設備(盤)以光纖網路線接到Bay Level Switch上, 大大減少電訊號銅線接線, 施工及維護成本, 縮短工期。



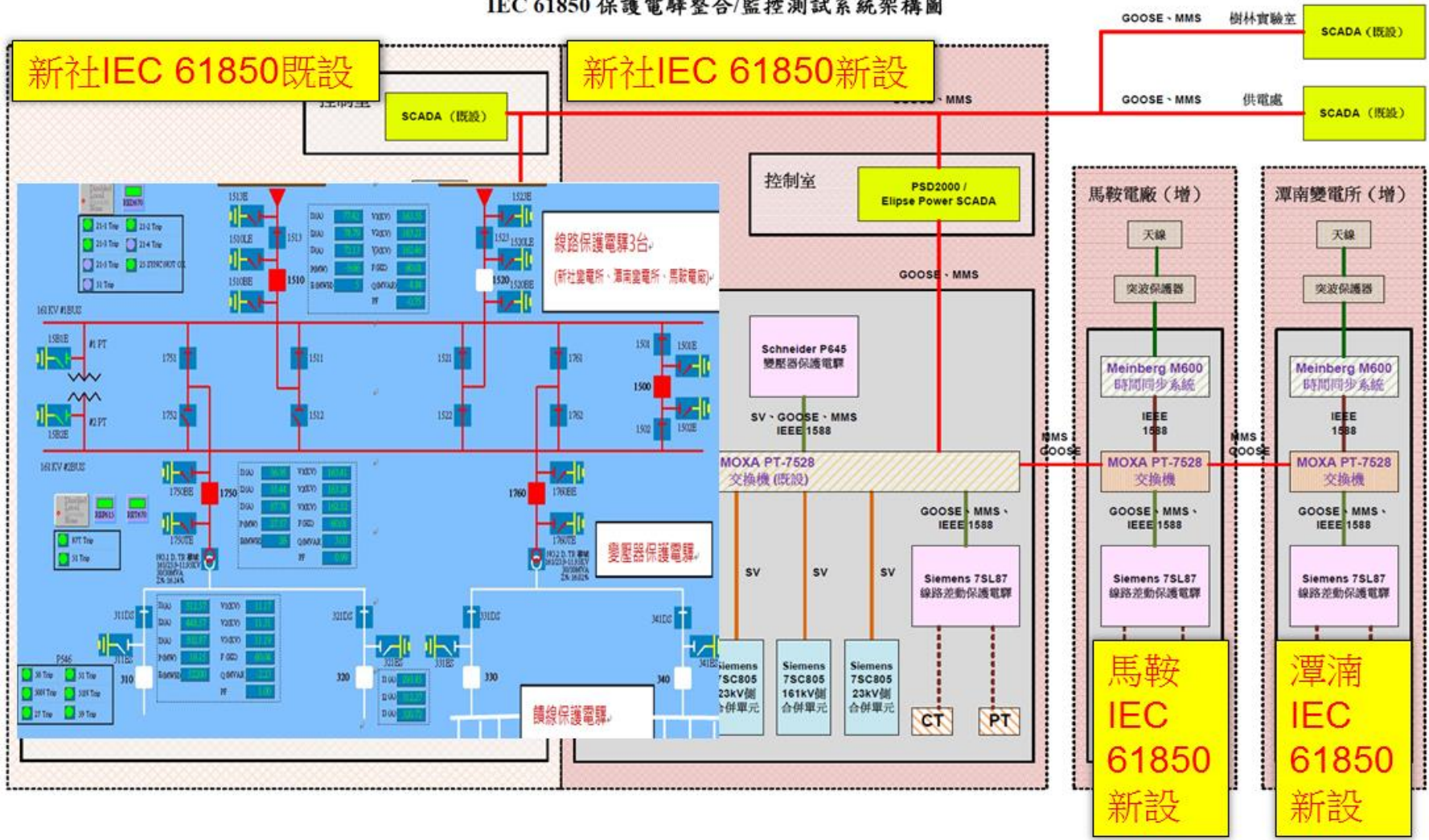
ABB's experience with IEC 61850-9-2 process bus Project highlights



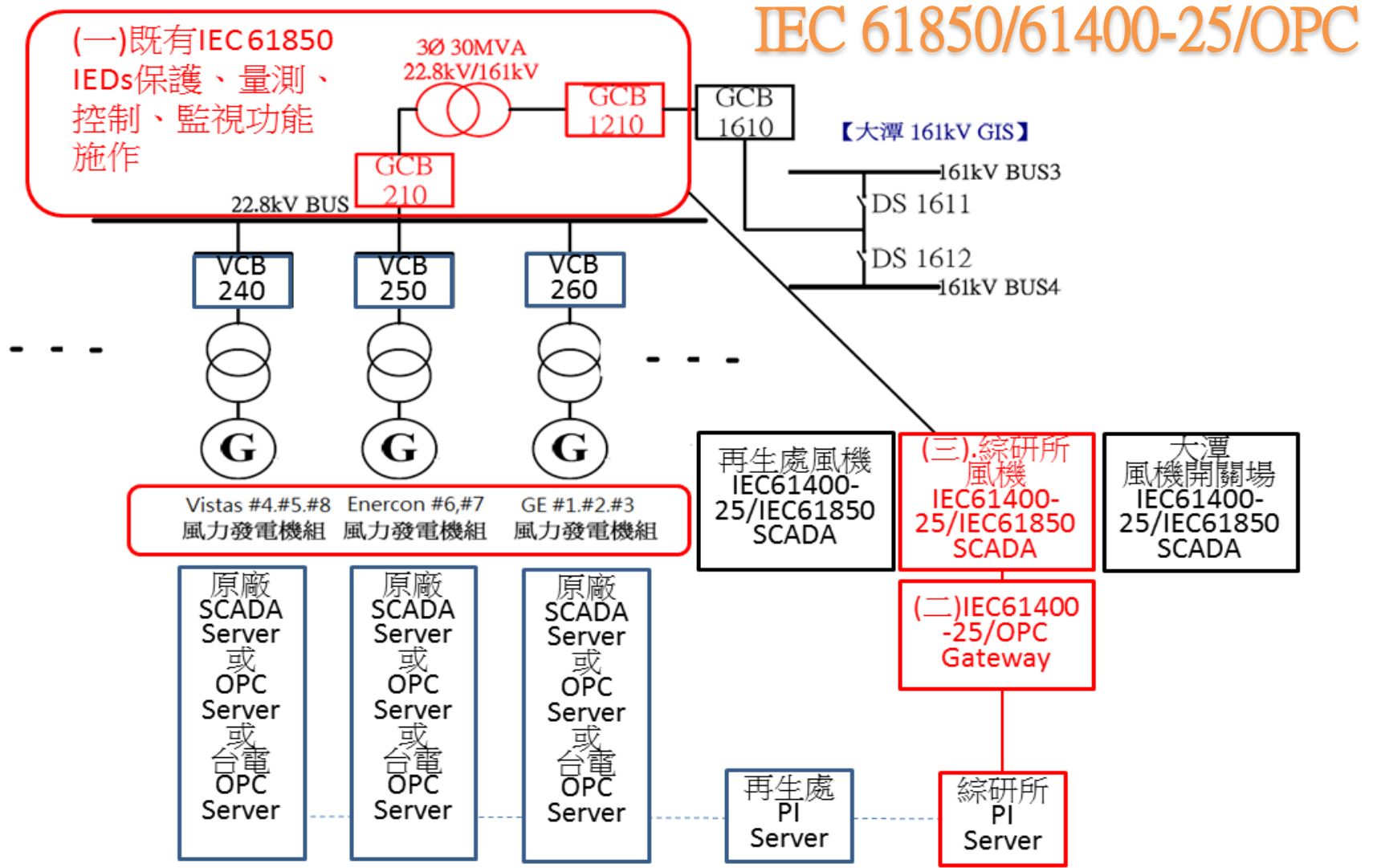
2. 已完成及進行中之先導計畫

先導型新既設IEC 61850系統擴充與整合

IEC 61850 保護電驛整合/監控測試系統架構圖



先導型智慧風電場系統之建置



IEC 61850/61400-25計畫行重點

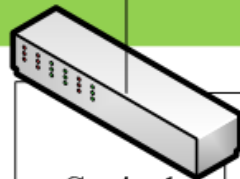
- 整理分析補充現有大潭廠內既設IEC 61850標準設備及系統。
- 整合實作IEC 61850方式線路保護、變壓器保護及饋線保護機制。
- 新版IEC 61400-25標準內容整理與分析。
- 新版IEC 61400-25標準設備調查與應用。
- **整合實作IEC 61850 SCADA系統。**
- 配合再生處大潭IEC 61400-25標準風力資訊建構智慧化風力變電站應用。
- 整合系統擴充。
- 依大潭風場既有之PI系統、OPC系統現況，結合IEC 61400-25標準，建置**先導型大潭風場IEC 61400-25監控伺服系統。**
- 結合IEC 61850智慧化風力變電站整合應用與建置計畫(發電處大潭電廠)構成完整的先導型智慧型風力系統監控系統。
- 分析風力資訊智慧化可提高再生能源源在智慧電網佔比技術議題。

IEC 62351資安計畫

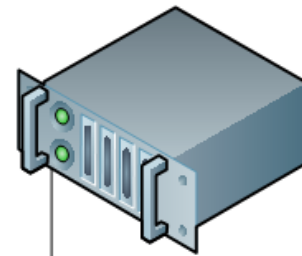
- 分析IEC 62351、NERC CIP 002-009、NISTIR 7628等資安規範與規定內容適用項目。
- IEC 62351對IEC 61850及DNP 3.0 over TCP/IP之應用對應作法

產品及資安驗證與認證。
電力公司實施程控系統滲透測試方式評
資安測試平台軟體
提出IEC 61850先導變電所可能面臨的資安威脅或攻擊事件與有效的防範措施

監控主站

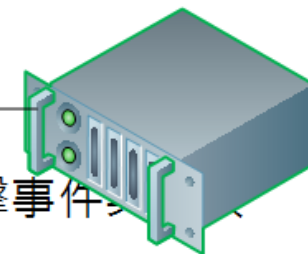


Switch



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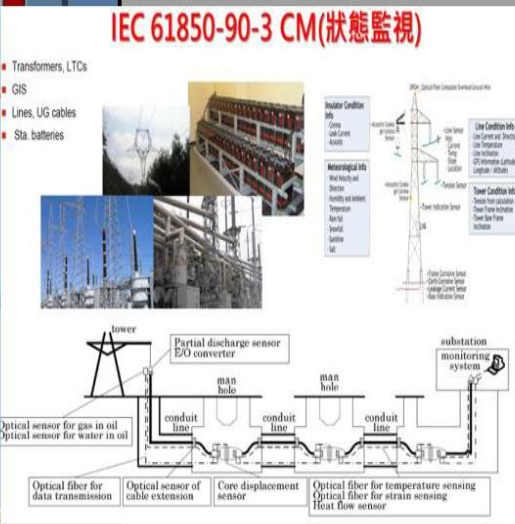
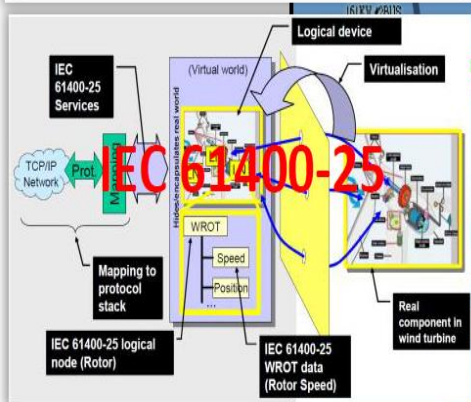
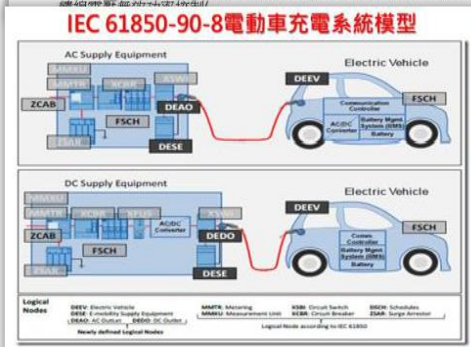
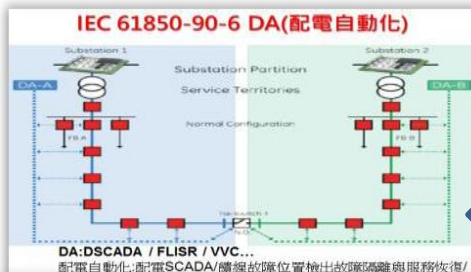


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- (一) 研究智慧電網資通安全相關標準與法規。
- (二) 蒐集用於驗證程控系統資通功能之標準。
- (三) 蒐集美國電力公司實施程控系統滲透測試方式。
- (四) 建立資安測試平台軟體，供IEC 61850變電所測試。
- (五) 提出目前本公司IEC 61850變電所可能面臨的資安威脅及攻擊事件與有效的防範措施。

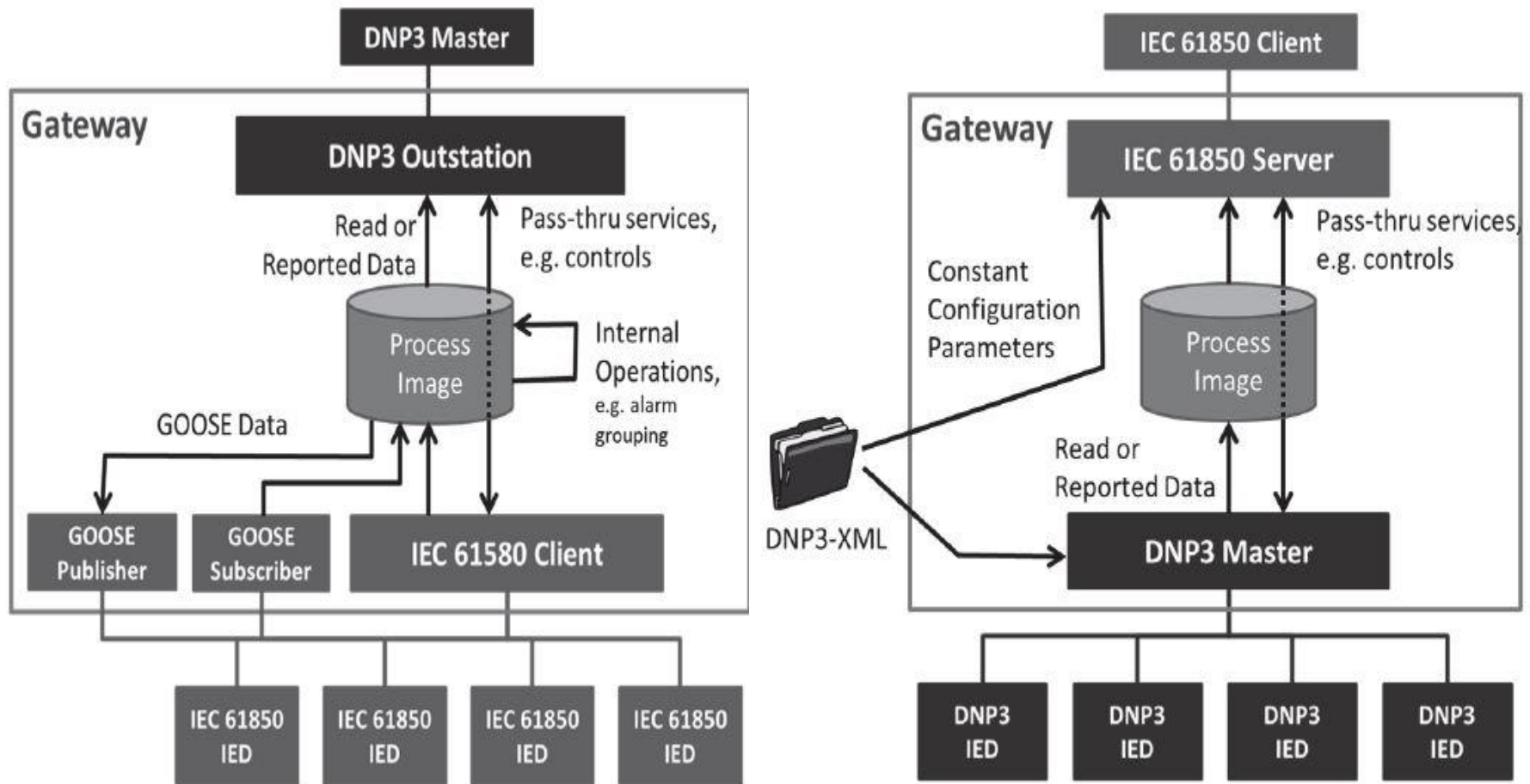
筆記型電腦(測試平台軟體)(由受委託單位提供)

既有計畫延伸



DNP <-> IEC 61850

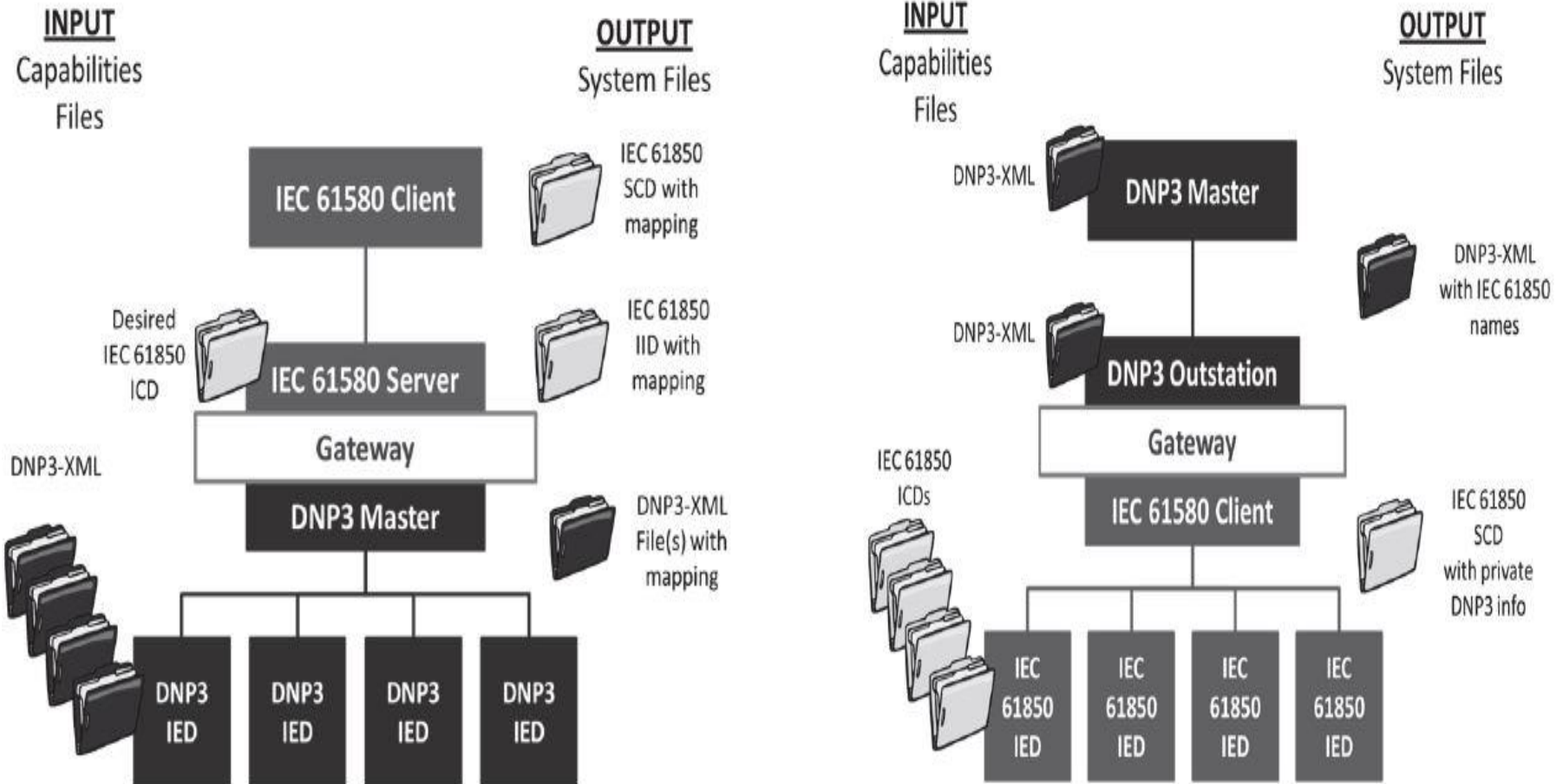
Gateway功能型態



摘自: IEEE P1815.1/D4.00

DNP <-> IEC 61850

Data Mapping



摘自: IEEE P1815.1/D4.00

IEC 61850涵蓋許多PA領域

| | | | | | | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| ANCR | MSQI | PTUV | YPSH | ANCR | DPST | GAPC | ISAF | MMDC | PTF | RDRS | TLEV | WTOW | ZREA | | | | |
| ARCO | MSTA | PUPF | YPTR | ARCO | DPVA | GGIO | ITCI | MMET | PTHF | RFLD | TLVL | WTRF | ZRES | | | | |
| ATCC | PDIF | PVOC | ZAXN | ARIS | DPVC | GLOG | ITMI | MMTN | PTOC | RMXU | TMGF | WTRM | ZRRC | | | | |
| AVCO | PDIR | PVPH | ZBAT | ATCC | DPVM | GSAL | ITPC | MMTR | PTOF | RPSB | TMVM | WTUR | ZSAR | | | | |
| | | | | | DRAT | HBRG | KFAN | MMXN | PTOV | RREC | TPOS | WYAW | ZSCR | | | | |
| | | | | | DRAZ | HCOM | KFIL | MMXU | PTRC | RSYN | TPRS | XCBR | ZSMC | | | | |
| | | | | | JRCC | HDAM | KPMP | MPRS | PTTR | SARC | TRTN | XFUS | ZTCF | | | | |
| | | | | | CILO | DRCS | HDLS | KTNK | MSQI | PTUC | SCBR | TSND | XSWI | ZTCR | | | |
| | | | | | CPOW | DRCT | HGPI | KVLV | MSTA | PTUE | SIMG | TTMP | YEFN | | | | |
| | | | | | CSWI | DREX | HGTE | LCCH | DIF | PTUV | SIML | TTNS | YLTC | | | | |
| | | | | | GAPC | FCV | PKRS | ZLIN | CSYN | DSCC | HITG | LGOS | PDIR | PUPF | SLTC | TVBR | YPSH |
| | | | | | GGIO | PMRI | RFLD | ZMOT | DCCT | DSCH | HJCL | LLNO | PDIS | PVOC | SOPM | TVTR | YPTR |
| | | | | | GSAL | PMSS | RPSB | ZREA | DCHB | DSFC | HLKG | LPHD | PDOP | PVPH | SPDC | TWPH | ZAXN |
| | | | | | IARC | POPF | RREC | ZRRC | DCHC | DSTK | HLVL | LSVS | PDUP | PZSU | SPTR | WALG | ZBAT |
| | | | | | IHMI | PPAM | RSYN | ZSAR | DCIP | DTRC | HMBR | LTIM | PFRC | QFVR | SSWI | WALM | ZBSH |
| | | | | | ITCI | PSCH | SARC | ZTCF | DCRP | FCNT | HNDL | LTMS | PHAR | QITR | STMP | WAPC | ZBTC |
| | | | | | ITMI | PSDE | SIMG | ZTCR | DCTS | FCSD | HNHD | LTRK | PHIZ | QIUB | SVBR | WCNV | ZCAB |
| | | | | | LLNO | PTF | SIML | | DEXC | FFIL | HOTP | MENV | PIOC | QVTR | TANG | WCON | ZCAP |
| | | | | | LPHD | PTOC | SPDC | | DFCL | FLIM | HRES | MFLK | PMRI | QVUB | TAXD | WGEN | ZCON |
| | | | | | MDIF | PTOF | TCTR | | DFLV | FPID | HSEQ | MFLW | PMSS | QVVR | TCTR | WMET | ZGEN |
| | | | | | MHAI | PTOV | TVTR | | DFPM | FRMP | HSPD | MFUL | POPF | RADR | TDST | WNAC | ZGIL |
| | | | | | MHAN | PTRC | XCBR | | DGEN | FSEQ | HUNT | MHAI | PPAM | RBDR | TFLW | WREP | ZINV |
| | | | | | MMTR | PTTR | XSWI | | DOPA | FSPT | HWCL | MHAN | PRTR | RBRF | TRFQ | WROT | ZLIN |
| | | | | | MMXN | PTUC | YEFN | | DOPM | FXOT | IARC | MHET | PSCH | RDIR | TGSN | WRPC | ZMOT |
| | | | | | MMXU | PTUF | YLTC | | DOPR | FXUT | IHMI | MHYD | PSDE | RDRE | THUM | WLSG | ZRCT |

IEC 61850-7-4

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IEC 61850-7-3 CDC

| Name | Description | Status |
|------|-----------------------------------------|--------|
| SPS | Single Point Status | |
| DPS | Double Point Status | |
| INS | Integer Status | |
| ENS | Enumerated Status | |
| ACT | Protection Activation | |
| ACD | Directional Protection Activation Info. | |
| SEC | Security Violation Counting | |
| BCR | Binary | |
| HST | Histogram | |
| VSS | Visible String Status | |

| Name | Description | Controls |
|------|----------------------------------------|----------|
| SPC | Controllable Single Point | |
| DPC | Controllable Double Point | |
| INC | Controllable Integer Status | |
| ENC | Controllable Enumerated Status | |
| BSC | Binary Controlled Step Position Info. | |
| ISC | Integer Controlled Step Position Info. | |
| APC | Controllable Analogue Process Value | |
| BAC | Binary Controlled Analog Process Value | |

| Name | Description | Settings |
|-------|---------------------------|----------|
| SPG | Single Point Setting | |
| ING | Integer Status Setting | |
| ENG | Enumerated Status Setting | |
| ORG | Object Reference Setting | |
| TSG | Time Setting Group | |
| CUG | Currency Setting Group | |
| VSG | Visible String Setting | |
| ASG | Analogue Setting | |
| CURVE | Setting Curve | |
| CSG | Curve Shape Setting | |
| DPL | Device Name Plate | |
| LPL | Logical Node Name Plate | |
| CSD | Curve Shape Description | |

| Name | Description | Measurands |
|------|----------------------------------------------------|------------|
| MV | Measured Value | |
| CMV | Complex Measured Value | |
| SAV | Sampled Value | |
| WYE | Phase to ground measured values for 3-phase system | |
| DEL | Phase to phase measured values for 3-phase system | |
| SEQ | Sequence | |
| HMV | Harmonic value | |
| HWYE | Harmonic value for WYE | |

| Name | Description | Control Block Service Tracking |
|------|--------------------------------------------------------------|--------------------------------|
| CTS | Common Service Tracking | |
| BTS | Buffered Report Tracking Service | |
| UTS | Unbuffered Report Tracking Service | |
| LTS | Log Control Block Tracking Service | |
| GTS | GOOSE Control Block Tracking Service | |
| MTS | Multicast Sampled Value (9-2) Control Block Tracking Service | |
| NTS | Unicast Sample Value (9-1) Control Block Tracking Service | |
| SGCB | Setting Group Control Block Tracking Service | |

| Name | Description | Descriptions |
|------|-------------------------|--------------|
| DPL | Device Name Plate | |
| LPL | Logical Node Name Plate | |
| CSD | Curve Shape Description | |

<https://ideology.atlassian.net/wiki/x/ZQBv>

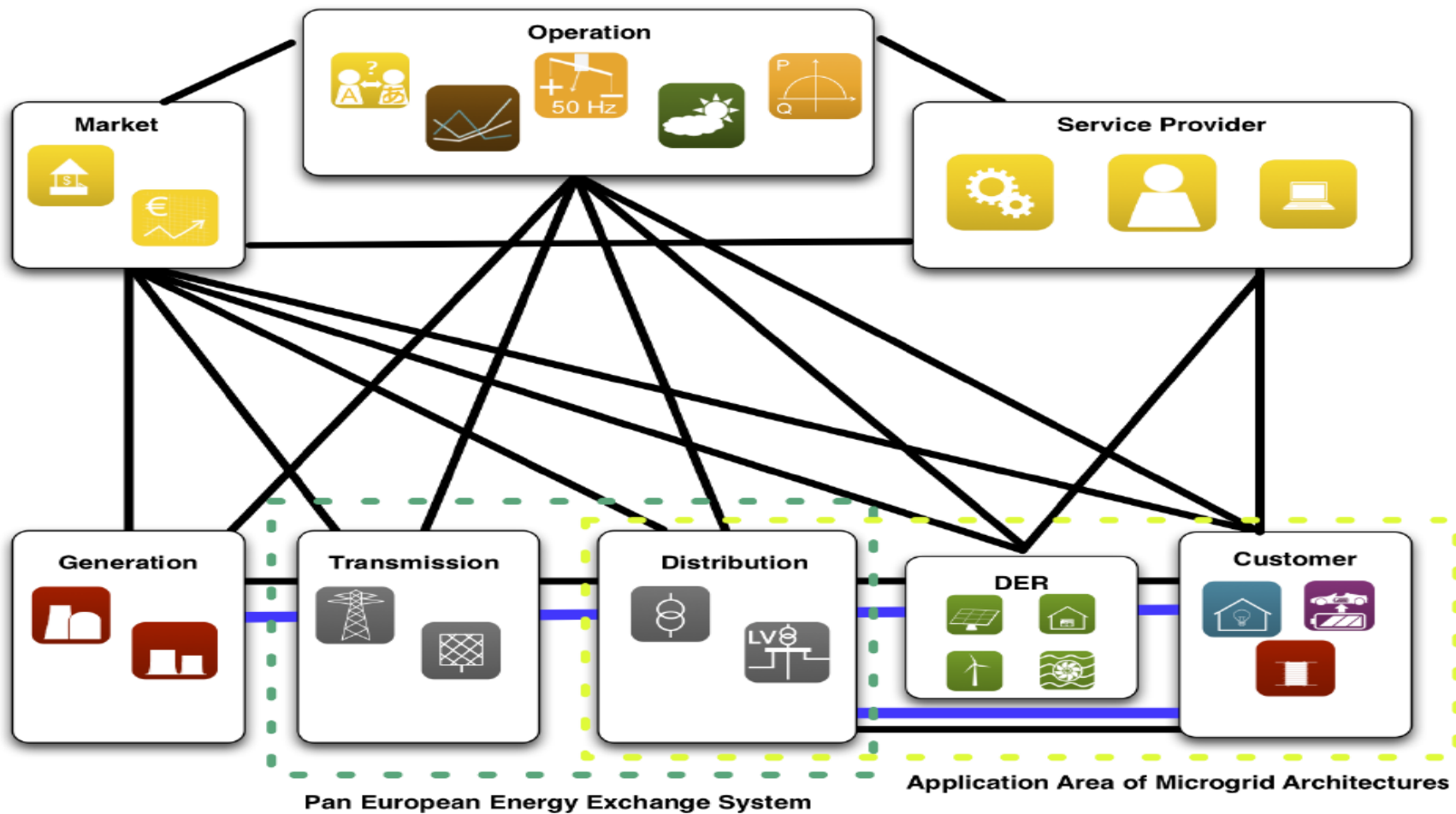
Storage Battery



| | | | | |
|--------------------|------|--------------|-----|-----------------------------|
| Measurement: | MMXU | PhV | WYE | Phase to ground voltage |
| | | A | WYE | Currents |
| | | TotW | MV | Power |
| | | TotVAr | MV | Reactive power |
| Metering: | MMTR | SupWh | MV | Energy supply |
| | | SupVArh | MV | Reactive energy, ind supply |
| | | DmdWh | MV | Energy demand |
| | | DmdVArh | MV | Reactive energy, ind demand |
| Battery Management | DBMS | WhRtg | ASG | Installed energy |
| | | AvalDschWh | MV | Available discharge energy |
| | | AvalChaWh | MV | Available charge energy |
| Battery | DBAS | BatTyp | ING | Battery type |
| | | EEName.manTm | DPL | Date of manufacturing |
| | | EEName.actTm | DPL | Date of installation |

PA是SG重要一環

EU extension of the NIST Model

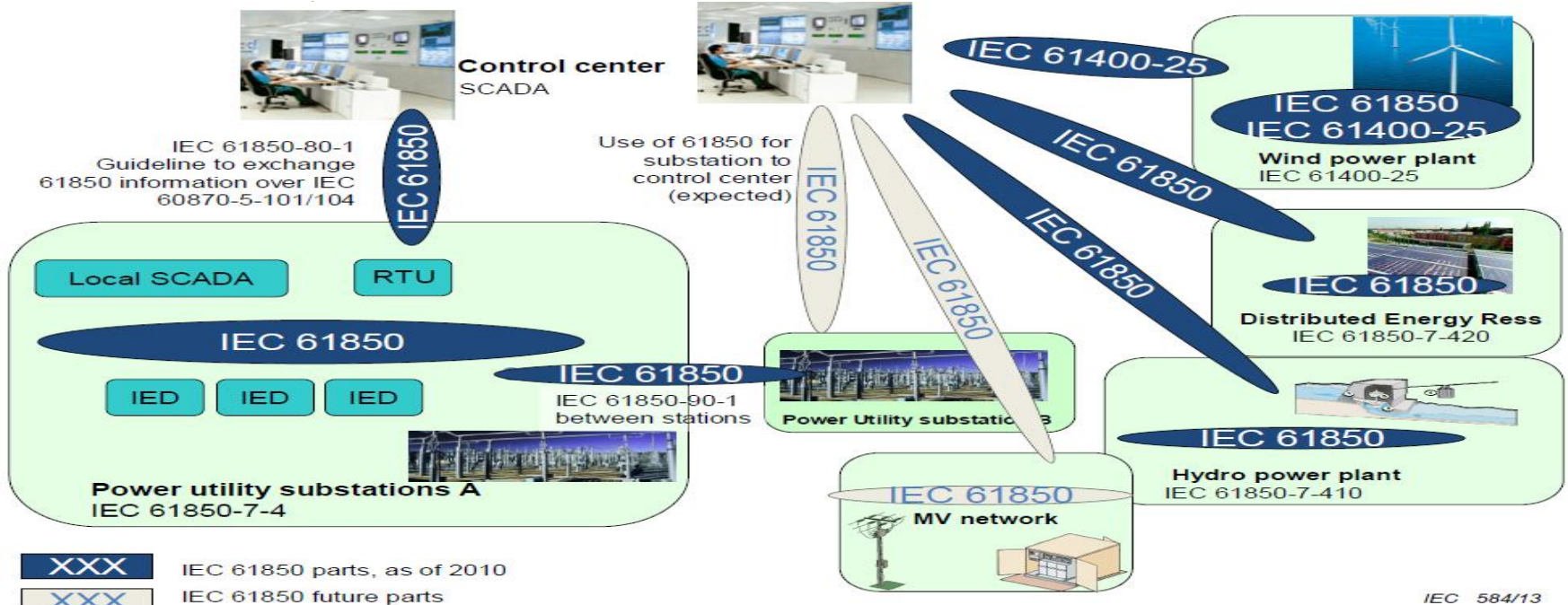


摘自: Domain Specific and Model Based Systems Engineering in the Smart Grid as Prerequisite for Security by Design, 2016

先導系統多廠家設備系統互通

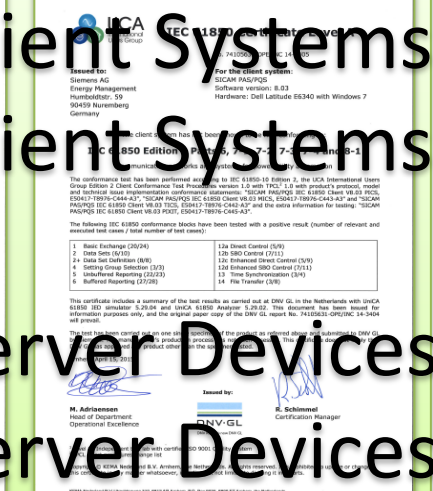
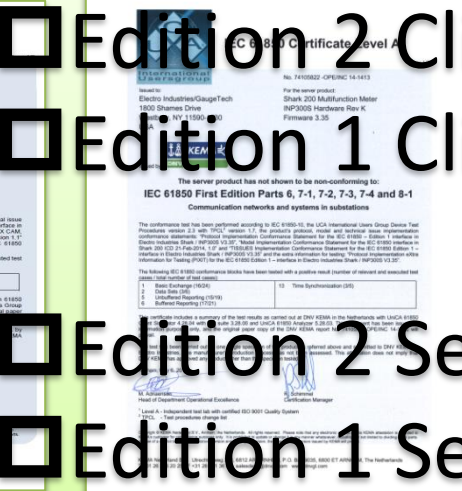
Equipment for On-site and Lab.

| | | |
|----------------|-------------------------------|------------------------------------------------|
| Comm. & Timing | Time Server & Ethernet Switch | Moxa, Otime, Meinberg, Symmetricom |
| Process Level | MU & Breaker IED | ABB, Siemens, Alstom, Schniewindt, NR, ... |
| Bay Level | IED , Gateway | Siemens, ABB, Alstom, GE, SEL, NR, Beckoff ... |
| Station Level | SCADA/HMI | ABB, Elipse |

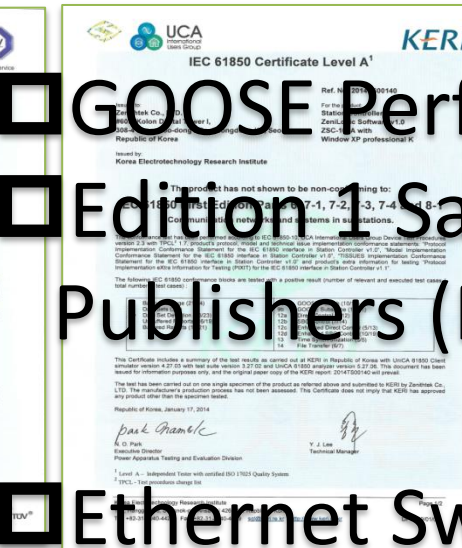
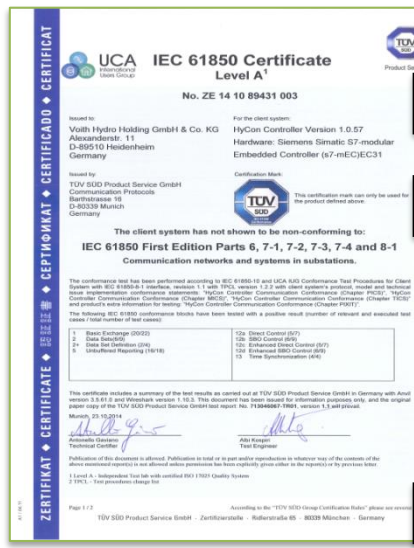


希望未來有ETC認證書

Edition 2 Client Systems
 Edition 1 Client Systems
 Edition 2 Server Devices
 Edition 1 Server Devices



GOOSE Performance
 Edition 1 Sampled Value Publishers (Merging Units)



Ethernet Switches

期待 IEC 61850-8-2 IS (2/2)

TC 57 Power systems management and associated information exchange

- Scope
- Structure
- Projects / Publications
- Documents
- Votes
- Meetings
- Collaboration Tools

Projects / Publications > [Project: IEC 61850-8-2 Ed. 1.0](#)

Log in En Fr

Detail

| Committee | Working Groups | Project Leader | Current Status | Frcst Pub Date | Stability Date |
|-----------|----------------|----------------|----------------|----------------|----------------|
| TC 57 | WG 17 | B. Bony | ACDV | 2017-04 | |

History

| Stage | Document | Downloads | Decision Date | Target Date |
|----------------------|-----------------------------|-------------------------|---------------|-------------|
| PNW | 57/1181/NP | 434 kB | 2011-10-07 | |
| ANW | 57/1221/RVN | 233 kB | 2012-03-09 | 2012-02-29 |
| 1CD | 57/1583/CD | 5019 kB | 2015-06-05 | 2015-02-28 |
| ACDV | 57/1642/CC | 319 kB | 2015-11-06 | 2015-10-15 |
| CCDV | | | | 2015-12-31 |

Project

IEC 61850-8-2 Ed. 1.0
Communication networks and systems for power utility automation - Part 8-2: Specific communication service mapping (SCSM) - Mapping to Extensible Messaging Presence Protocol (XMPP)

Remark:
 - SMB/5347/DL: CDV 2015-04 - Project plan: CDV 2012-09
 FDIS 2013-09 - IECs 61400-25, all parts of 61850, 62351, 62357, 61970-451, 61968-100 to be considered - Liaison org: OASIS - OPC foundation - Coord. with: TC57/WGs: 10, 13, 14, 15, 18, 19; TC65, SC65C, SC65E, TC69, TC88

Associated Documents:

- [SMB/4881/DL](#)
- [348 kB](#)
- [SMB/5256/DL](#)
- [186 kB](#)
- [SMB/5347/DL](#)
- [220 kB](#)
- [57/1584/DTR](#)
- [2951 kB](#)
- [57/1585/INF](#)
- [1560 kB](#)

期待 IEC 61850-8-2 IS (1/2)



已公布

IEC TR 61850-80-3

Edition 1.0 2015-11

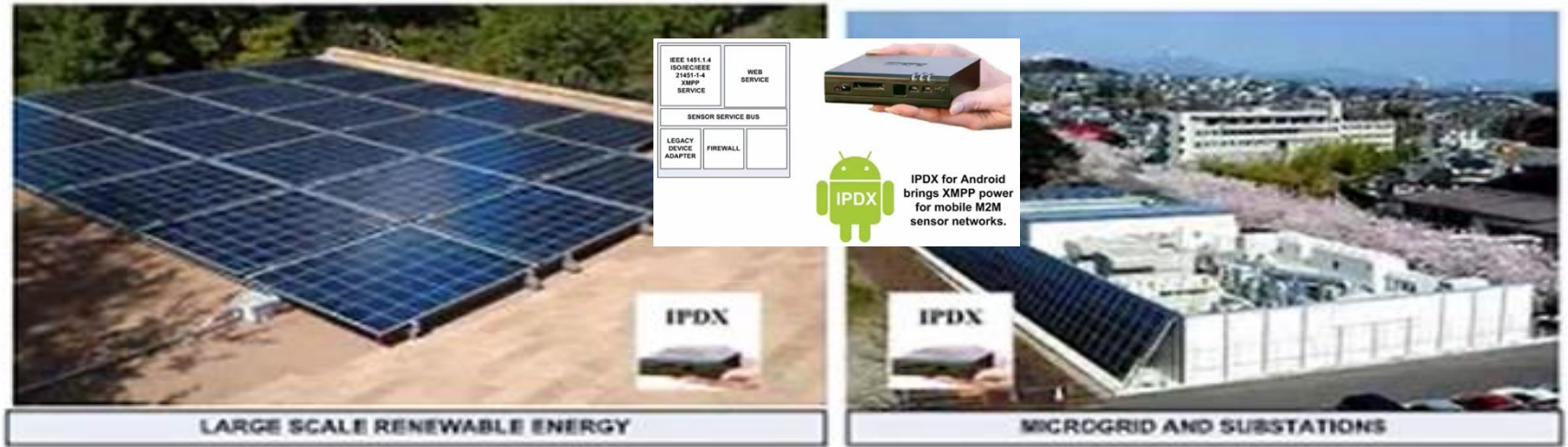
TECHNICAL REPORT

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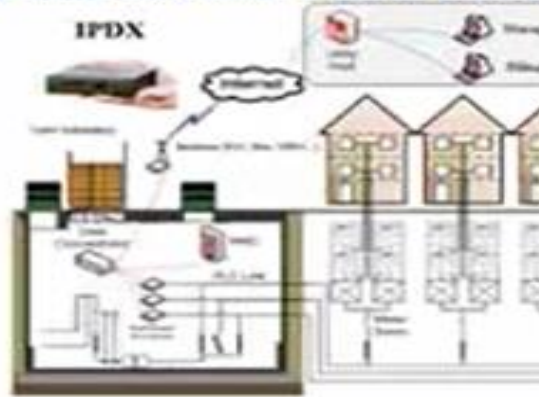
Colour inside

Communication networks and systems for power utility automation – Part 80-3: Mapping to web protocols – Requirements and technical choices

再生能源調控運用



Microgrid Automation Broadband over Power Lines (BPL)



IPDX is the first to offer capabilities based upon the use of XMPP to offer an event driven messaging system for enterprise integration of large scale heterogeneous sensor networks. IPDX offers a distributed decentralized client-server architecture which includes registration, policy administration and management including directory services, data sharing, and security. IPDX provides a reference implementation for the ISO/IEC/IEEE 21451-1-4 standard.



摘自: MaCT USA

簡報完畢
敬請指教