

The World Market for Substation Automation and Integration Programs in Electric Utilities: 2011-2013

Volume 2: International Market

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Table 2. What is your estimate of probable spending for new and retrofit substation automation and integration programs at your utility between 2011 and 2013?

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Table 13. Please check your choice of communications architecture within the substation and to the substation

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Please indicate the communications switch requirements (# of switches per substation) for the following types of substations as they are now in 2010 and as they are expected to be in 2013

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Table 21. What specific equipment types are/will be part of your substation-wide automation and integration program? Please check all that apply. Also, please indicate your utility's preferred vendors for each equipment type.

Table 22. Do you have (or are you planning to have) a Vendor Security Certification Program (to certify your Substation Automation Vendor's processes and practices for integrating security into their processes?) Check all that apply.

Introduction

The summaries in this first section provide top-level views and a synopsis. In Section Three of this report, the authors have cross-tabulated survey results by world region. A five page survey form was sent out initially, followed by a reminder and a “last call” for participation. After receiving 21 responses, the decision was made to reduce the scope of the survey in order to encourage more participation. The information gathering process was repeated. The shorter survey was resent to utilities, reminders were given, and a “last call,” was provided with an extended deadline. Twenty-two additional responses were received.

Overall, 43 utilities participated in the study, with 21 answering the “long form” survey and 22 answering the “short form” survey. Accordingly, the sample size for the following questions was taken from all 43 respondents: Q2, Q3, Q4a & 4b, Q11, Q21. For all other questions, the sample size was taken from 21 respondents who answered the “long form” survey.

List of **Participating Utilities**

<i>Country</i>	<i>Utility</i>
Argentina	EDENOR
Argentina	Yacyretá
Australia	ETSA Utilities
Australia	Power & Water Corporation
Australia	Transend Networks
Bahamas	Bahamas Electric Company
Brazil	AES
Brazil	Companhia Energetica de Minas Gerais (Cemig)
China	Hongkong Electric Co. Ltd.
Colombia	Empresas Públicas de Medellín
Colombia	XM Expertos en Mercados
Cyprus	Cyprus Electricity Authority
Denmark	Dong Energy Sales & Distribution
Ecuador	Emelgur SA
El Salvador	Comisión Ejecutiva Hidroeléctrica del Río Lempa
Finland	Fingrid Oyj
Finland	Helen Electrical Networks Ltd.
Finland	Oulun Energia
Germany	Lechwerke
Grenada	Grenada Electricity Services Ltd.
Guatemala	Empresa Electrica de Guatemala SA
Hong Kong	CLP Power Hong Kong Limited
India	Tata Power Co. Ltd.
Ireland	ESB
Israel	Israel Electric Company
Jamaica	Jamaica Public Service Co. Ltd.
Japan	Kansai Electric Power Co.
Korea	Korea Electric Power Corporation
Libya	GECOL
Liechtenstein	Liechtensteinische Kraftwerke
Malaysia	Syarikat SESCO Berhad
Moldova	Moldelectrica
Netherlands	Enexis BV Netherlands (DCO)
Netherlands	TenneT
New Zealand	Transpower
New Zealand	WEL Networks Ltd.
Philippines	Manila Electric Co.
Portugal	EDP Distribuição
South Africa	Eskom Transmission
Switzerland	Axpo AG Netze
Switzerland	Centralschweizerische Kraftwerke AG
Switzerland	Swissgrid
Zambia	Zesco Limited

Long Survey

1. Please rank the significance from 1 to 5 for all of the following listed "potential obstacles" to implementing substation automation and integration for both new and retrofit substations through year-end 2013. Use: "1 = doesn't stand in our way" to "5 = formidable obstacle." (You may use the same number more than once here.)

Potential obstacles	Ranking for New Substations	Ranking for Retrofit Substations
Lack of appropriate communications technology <i>inside the fence</i>	[]	[]
Lack of appropriate communications technology <i>substation to substation</i>	[]	[]
Lack of appropriate communications technology <i>substation to master</i>	[]	[]
Not enough skilled internal staff	[]	[]
Benefits do not outweigh the costs	[]	[]
Our key substations are already automated sufficiently	---	[]
Uncertain management philosophy concerning substation automation at this time	[]	[]
Substation equipment vendor community will not have required "open" products and equipment by year end 2013	[]	[]
Economic and business justification case has not been made on behalf of substation automation programs here	[]	[]
Lack of funding	[]	[]
Lack of standard products	[]	[]
Security concerns	[]	[]
Other: (please describe) []	[]	[]

2. What is your estimate of probable spending for new and retrofit substation automation and integration programs at your utility between 2011 and 2013?

Probable spending estimate	New Substations	Retrofit Substations	No funds budgeted over this period (check box)
2011 (in US Dollars)	\$	\$	<input type="checkbox"/>
2012 (in US Dollars)	\$	\$	<input type="checkbox"/>
2013 (in US Dollars)	\$	\$	<input type="checkbox"/>

3. Approximately how many of the utility's transmission and distribution substations fit in each stage of automation**?

SUBSTATIONS	TRANSMISSION			DISTRIBUTION		
	SS# now in operation	SS# to be retrofit by YE 2013	SS# new to be built by YE 2013	SS# now in operation	SS# to be retrofit by YE 2013	SS# new to be built by YE 2013
TOTAL # OF SUBSTATIONS (ALL STAGES) →	[]	[]	[]	[]	[]	[]
SUBTOTALS - Please make sure that the # of SS in the three categories below add up to the TOTAL # directly above it.						
# with no IEDs and with No Automation	[]	[]	[]	[]	[]	[]
# at Stage 1	[]	[]	[]	[]	[]	[]
# at Stage 2	[]	[]	[]	[]	[]	[]

**STAGES OF AUTOMATION

Stage 1 - Some Automation: Some combination of RTU's, IED's & 2 way communications

Stage 2 - Full Automation: Substation based applications/platform to automate substation functions

Long Survey

4a. Please check your choice of protocol within the substation, between substations, and from the substation to the external host or network.

Protocols	Within Substation		Substation to Substation		Substation to External Host/Network	
	Current	By YE 2013	Current	By YE 2013	Current	By YE 2013
C37.118	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Data Highway Plus	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DNP 3 LAN (TCP or UDP)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DNP 3 (Serial)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ICCP/MMS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IEC 60870-5-101	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IEC 60870-5-103	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IEC 60870-5-104	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IEC 61850	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IEC 61850 Edition 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Modbus LAN (TCP or UDP)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Modbus Plus	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Modbus (Serial)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other TCP/IP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UCA 2/MMS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SEL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Common Industry Protocol (Ethernet, IP, Devicenet, Control Net)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: (name) []	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4b. Are protocols encrypted? ☐ No ☐ Yes → Method used: []

5. What are your alternate methods of communication with the remote site in the event of loss of the routine communications pathways?

[]

6a. Please indicate the approximate number of Ethernet ports *per substation* for the following types of substations as they are now in 2010 and as they are expected to be in 2013:

	2010	2013	Does not apply to us
>345kV Transmission Substations	_____ ports/sub	_____ ports/sub	<input type="checkbox"/>
110kV-345kV Transmission Substations	_____ ports/sub	_____ ports/sub	<input type="checkbox"/>
Medium Voltage Distribution Substations	_____ ports/sub	_____ ports/sub	<input type="checkbox"/>

6b. Are these ports secured? ☐ No ☐ Yes, via → ☐ port security ☐ other means (describe below)

[]

7a. Do you use *redundancy* in your Ethernet networks?

☐ No Redundancy ☐ STAR ☐ RING

7b. What protocols do you use for redundancy?

☐ Rapid Spanning Tree (RSTP) ☐ IEC 62439 (Parallel Redundancy) ☐ IEC 62439 (Hot Standby Router)
☐ Other: specify []

7c. Do you require ethernet switches/routers to meet the requirements of IEEE 1613 (Environmental and Testing requirements for substation based communications networking device) ☐ No ☐ Yes

Long Survey

8a. Indicate the various substation Ethernet LAN architectures that you use or plan to use by year end 2013

	Current	By YE 2013
Single network without failover	<input type="checkbox"/>	<input type="checkbox"/>
Single network with multiple paths/failover	<input type="checkbox"/>	<input type="checkbox"/>
Independent primary devices/primary network and backup devices/backup network	<input type="checkbox"/>	<input type="checkbox"/>
Every device connected to two independent networks	<input type="checkbox"/>	<input type="checkbox"/>
Other: Describe []	<input type="checkbox"/>	<input type="checkbox"/>

8b. What is the maximum allowed failover/recovery time (in seconds) for network reconfiguration? _____ seconds

9. What is the number of simultaneous wireless connections allowed in Transmission substations? _____ or ☐ none allowed

10. What is the number of simultaneous wireless connections allowed in Distribution substations? _____ or ☐ none allowed

11. What is your application of communication links?

Communication type	Substa. to Control Center (SCADA/EMS)		Substa. to End Device		Substa. to Substa. (Prot. Relay)	
	Current	By Year End 2013	Current	By Year End 2013	Current	By Year End 2013
Leased Line	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dialup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Frame relay	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Power Line Carrier or BPL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fiber/Synchro Optical Network	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
T-1 or Other Multiplexer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internet (IP)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Microwave	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spread Spectrum Multiple Address Radio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Licensed Radio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Satellite	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cellular (CDMA)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cellular (GSM)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cellular (UMTS)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wireless 802.11 (a, b, g)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. Does your utility use routable paths to the end devices?

☐ No ☐ Yes → Are they monitored? → ☐ No ☐ Yes

13. Please check your choice of communications architecture within the substation and to the substation.

Communications Architecture	Within substation		To substation	
	Current	By YE 2013	Current	By YE 2013
LAN (local area network)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Serial Links	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VSAT (satellite)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
WAN (wide area network)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: Describe []	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Long Survey

14. How are/will primary substation information processing tasks "inside the fence" be handled?

	Current	By YE 2013		Current	By YE 2013
"Smart" RTU	<input type="checkbox"/>	<input type="checkbox"/>	"Dumb" RTU	<input type="checkbox"/>	<input type="checkbox"/>
Separate microcomputer	<input type="checkbox"/>	<input type="checkbox"/>	Programmable Logic Controller	<input type="checkbox"/>	<input type="checkbox"/>
Communications Processor	<input type="checkbox"/>	<input type="checkbox"/>	Data Concentrator	<input type="checkbox"/>	<input type="checkbox"/>
Distributed over multiple platforms	<input type="checkbox"/>	<input type="checkbox"/>	Other substation controller	<input type="checkbox"/>	<input type="checkbox"/>
PC in substation	<input type="checkbox"/>	<input type="checkbox"/>	Device: Describe []		

15. Please check any external assistance that will be needed by your utility for the following substation automation and integration-related activities.

Substation Automation and Integration-Related Activity	Require Now	Not Yet, but by 2013	Not at all
Pre-packaged substations (SS control house arrives "on a truck")	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Installation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Control and protection design	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Commissioning and testing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Security	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Engineering drawing support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Specifications development to help define needs before RFQ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IED configuration support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Long term maintenance agreements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. Bandwidth Requirements

Please indicate the bandwidth requirements (in *kbps*) for the following types of substations as they are now in 2010 and as they are expected to be in 2013:

	2010	2013	Does not apply to us
>345kV Transmission Substations	_____ kbps	_____ kbps	<input type="checkbox"/>
110kV-345kV Transmission Substations	_____ kbps	_____ kbps	<input type="checkbox"/>
Medium Voltage Distribution Substations	_____ kbps	_____ kbps	<input type="checkbox"/>

17. Latency Requirements

Please indicate the latency requirements (in *milliseconds*) for the following types of substations as they are now in 2010 and as they are expected to be in 2013:

	2010	2013	Does not apply to us
>345kV Transmission Substations	_____ ms	_____ ms	<input type="checkbox"/>
110kV-345kV Transmission Substations	_____ ms	_____ ms	<input type="checkbox"/>
Medium Voltage Distribution Substations	_____ ms	_____ ms	<input type="checkbox"/>

18. Router Requirements

Please indicate the router requirements (# of routers *per substation*) for the following types of substations as they are now in 2010 and as they are expected to be in 2013:

	2010	2013	Does not apply to us
>345kV Transmission Substations	_____ routers/sub	_____ routers/sub	<input type="checkbox"/>
110kV-345kV Transmission Substations	_____ routers/sub	_____ routers/sub	<input type="checkbox"/>
Medium Voltage Distribution Substations	_____ routers/sub	_____ routers/sub	<input type="checkbox"/>

19. Communications Switch Requirements

Please indicate the communications switch requirements (# of switches *per substation*) for the following types of substations as they are now in 2010 and as they are expected to be in 2013:

	2010	2013	Does not apply to us
>345kV Transmission Substations	_____ switches/sub	_____ switches/sub	<input type="checkbox"/>
110kV-345kV Transmission Substations	_____ switches/sub	_____ switches/sub	<input type="checkbox"/>
Medium Voltage Distribution Substations	_____ switches/sub	_____ switches/sub	<input type="checkbox"/>

Long Survey

20. For what applications are you using or planning to use substation-based computing platforms?

	Current	YE 2013
Local HMI	<input type="checkbox"/>	<input type="checkbox"/>
Protocol conversion/data concentration	<input type="checkbox"/>	<input type="checkbox"/>
Synchrophasor archiving	<input type="checkbox"/>	<input type="checkbox"/>
Historian	<input type="checkbox"/>	<input type="checkbox"/>
Engineering access	<input type="checkbox"/>	<input type="checkbox"/>
Distribution automation	<input type="checkbox"/>	<input type="checkbox"/>
RTU	<input type="checkbox"/>	<input type="checkbox"/>
Other: Describe []	<input type="checkbox"/>	<input type="checkbox"/>

21. What specific equipment types are/will be part of your substation-wide automation and integration program? Please check all that apply. Also, please indicate your utility's preferred vendors for each equipment type.

	TRANSMISSION SUBSTATIONS		DISTRIBUTION SUBSTATIONS		PREFERRED VENDORS
	Current	Year-End 2013	Current	Year-End 2013	
Remote terminal units	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Digital fault recorders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Electro-mechanical relays	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Digital/numerical relays	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Redundant protection schemes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Sequence of events recorders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Power transformer monitors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Power transformer regulators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Programmable logic controllers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
LTC transformers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Smart meters	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Smart transducers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Substation computer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Substation security equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Phasor Measurement Units	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Phasor Data Concentrator	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Switches	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Routers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Fault Current Interrupter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]
Annunciators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[]

22. Do you have (or are you planning to have) a Vendor Security Certification Program (to certify your Substation Automation Vendor's processes and practices for integrating security into their processes?) Check all that apply.

- ☐ Yes, we have one currently in place, involving → ☐ A) Organizational processes and disciplines
☐ B) Product and service design, development and testing processes
☐ C) Commissioning and maintenance processes
☐ D) Other: Describe []
- ☐ No, but we will require vendor security certification by year end 2013
☐ No, and we have no plans for vendor security certification
☐ Other situation: Describe []

THANK YOU FOR YOUR HELP IN THIS RESEARCH EFFORT

Short Survey

1. Approximately how many of the utility's transmission and distribution substations fit in each stage of automation**?

SUBSTATIONS	TRANSMISSION			DISTRIBUTION		
	# Substations Now in operation	# Substations to be retrofit by YE 2013	# of new substations to be built by YE 2013	# Substations Now in operation	# Substations to be retrofit by YE 2013	# of new substations to be built by YE 2013
TOTAL # OF SUBSTATIONS (ALL → STAGES OF AUTOMATION	[]	[]	[]	[]	[]	[]
SUBTOTALS - Please make sure that the # of substations in the three categories below add up to the TOTAL # directly above it.						
# with no IEDs and with No Automation	[]	[]	[]	[]	[]	[]
# at Stage 1	[]	[]	[]	[]	[]	[]
# at Stage 2	[]	[]	[]	[]	[]	[]

**STAGES OF AUTOMATION

Stage 1 - Some Automation: Some combination of RTU's, IED's & 2 way communications

Stage 2 - Full Automation: Substation based applications/platform to automate substation functions

2. What specific equipment types are/will be part of your substation-wide automation and integration program? Please check all that apply. Also, please indicate your utility's preferred vendors for each equipment type.

	TRANSMISSION AND DISTRIBUTION SUBSTATIONS		PREFERRED VENDORS
	Current	Year-End 2013	
Remote terminal units	<input type="checkbox"/>	<input type="checkbox"/>	[]
Digital fault recorders	<input type="checkbox"/>	<input type="checkbox"/>	[]
Electro-mechanical relays	<input type="checkbox"/>	<input type="checkbox"/>	[]
Digital/numerical relays	<input type="checkbox"/>	<input type="checkbox"/>	[]
Redundant protection schemes	<input type="checkbox"/>	<input type="checkbox"/>	[]
Sequence of events recorders	<input type="checkbox"/>	<input type="checkbox"/>	[]
Power transformer monitors	<input type="checkbox"/>	<input type="checkbox"/>	[]
Power transformer regulators	<input type="checkbox"/>	<input type="checkbox"/>	[]
Programmable logic controllers	<input type="checkbox"/>	<input type="checkbox"/>	[]
LTC transformers	<input type="checkbox"/>	<input type="checkbox"/>	[]
Smart meters	<input type="checkbox"/>	<input type="checkbox"/>	[]
Smart transducers	<input type="checkbox"/>	<input type="checkbox"/>	[]
Substation computer	<input type="checkbox"/>	<input type="checkbox"/>	[]
Substation security equipment	<input type="checkbox"/>	<input type="checkbox"/>	[]
Phasor Measurement Units	<input type="checkbox"/>	<input type="checkbox"/>	[]
Phasor Data Concentrator	<input type="checkbox"/>	<input type="checkbox"/>	[]
Communications Switches	<input type="checkbox"/>	<input type="checkbox"/>	[]
Communications Routers	<input type="checkbox"/>	<input type="checkbox"/>	[]
Fault Current Interrupters	<input type="checkbox"/>	<input type="checkbox"/>	[]

3. What is your estimate of probable spending for new and retrofit substation automation and integration programs at your utility between 2011 and 2013?

Probable spending estimate	New Substations	Retrofit Substations	No funds budgeted over this period (check box)
2011 (in US Dollars)	\$	\$	<input type="checkbox"/>
2012 (in US Dollars)	\$	\$	<input type="checkbox"/>
2013 (in US Dollars)	\$	\$	<input type="checkbox"/>

Short Survey

4. What is your application of communication links?

Communication type	Substation to Control Center (SCADA/EMS)		Substation to End Device	
	Current	By Year End 2013	Current	By Year End 2013
Leased Line	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dialup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Frame relay	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Power Line Carrier or BPL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fiber/Synchro Optical Network	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
T-1 or Other Multiplexer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internet (IP)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Microwave	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spread Spectrum Multiple Address Radio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Licensed Radio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Satellite	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cellular (CDMA)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cellular (GSM)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cellular (UMTS)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wireless 802.11 (a, b, g)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5a. Please check your choice of protocol within the substation, between substations, and from the substation to the external host or network.

Protocols	Within Substation		Substation to Substation		Substation to External Host/Network	
	Current	By YE 2013	Current	By YE 2013	Current	By YE 2013
C37.118	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DNP 3 LAN (TCP or UDP)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DNP 3 (Serial)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ICCP/MMS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IEC 60870-5-101	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IEC 60870-5-103	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IEC 60870-5-104	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IEC 61850	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IEC 61850 Edition 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Modbus LAN (TCP or UDP)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Modbus Plus	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Modbus (Serial)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other TCP/IP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Common Industry Protocol (Ethernet, IP, Devicenet, ControlNet)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: (name) []	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5b. Are protocols encrypted? ☐ No ☐ Yes → Method used: []

THANK YOU FOR YOUR HELP IN THIS RESEARCH EFFORT!