

Control Systems Security and Test Center

A Comparison of Electrical Sector Cyber Security Standards and Guidelines

Prepared by the Idaho National Engineering and Environmental Laboratory



October 28, 2004





A Comparison of Electrical Sector Cyber Security Standards and Guidelines

October 28, 2004

Control Systems Security and Test Center Idaho Falls, Idaho 83415

Prepared for the U.S. Department of Homeland Security Under DOE Idaho Operations Office Contract DE-AC07-99ID13727

ABSTRACT

This paper presents a review and comparison (commonality and differences) of five security standards and guidelines in the electrical distribution and control area. The comparison identifies security areas that are covered by each standard and/or guideline and reveals where the standards/guidelines differ in emphasis. By identifying differences in standards the user can evaluate which standards best meet their needs. For this paper, only standards applicable to the electrical sector were reviewed.

CONTENTS

| ABS | TRACT | . 11 |
|------|---|------|
| ACR | ONYMS | iv |
| 1. | INTRODUCTION | 1 |
| 2. | PROBLEM | 2 |
| | 2.1 Applying Standards and Guidelines to Improve Security | 2 |
| 3. | STANDARDS | 3 |
| 4. | DISCUSSION - COMPARISON OF STANDARDS/GUIDELINES | 5 |
| 5. | CONCLUSIONS | 6 |
| 6. | REFERENCES | 7 |
| Appe | ndix A Security Standards Comparison | 8 |
| | | |
| | TABLES | |
| 1. | Major security sections in electrical sector standards | 4 |

ACRONYMS

CAC Cyber – Access Control

CBP Continuity of Business Processes

CID Cyber Intrusion Detection

CIF Cyber IT Firewalls

CRM Cyber – Risk Management

EBS Employment Background Screening

EP Emergency Plans

FY Fiscal Year

HSPD Homeland Security Presidential Directive

IEC International Electrotechnical Commission

ISO International Organization for Standardization

IT Information Technology

NERC North American Electric Reliability Council

PPSI Protecting Potentially Sensitive Information

PS Physical Security

SRA Securing Remote Access to Electronic Control and Protection Systems

TIR Threat and Incident Reporting

TR Threat Response

VRA Vulnerability and Risk Assessment

A Comparison of Electrical Sector Cyber Security Standards

1. INTRODUCTION

This white paper compares five standards and guidance documents aimed at improving security for the electrical industry. It includes a review of existing control system security standards and identifies potential guidelines for control system users. The Idaho National Engineering and Environmental Laboratory coordinated efforts with the Department of Energy's Critical Infrastructure Security Standards working group and academic partners at the University of Idaho to prepare this white paper.¹

Security in this context is more than safety and reliability. It encompasses both the physical and cyber protection of critical infrastructure. Cyber security standards, when followed, can provide increased security to control systems. There are distinct differences in the topics considered by the current standards. Currently, the North American Electric Reliability Council (NERC) standards and guidelines focus on cyber security, while other industry standards, such as the IEEE 1402 are more focused on physical security. However, there are many sections in each of the compared standards and guidelines that are similar. The task of this white paper is to promote an understanding of the security requirements, and application of the appropriate control system security standards and guidelines for that area of concern, as an FY 2004 deliverable under the task "Promoting Existing Control System Security Standards and Guidelines." The purpose of this document is to compare the five standards and guidance documents listed. There are other standards and guidelines relevant to physical and cyber security of electrical utility assets (such as IEC 61850) that have not been addressed here. It is recognized that standards and guidance documents are living documents that will continually evolve to meet the dynamic needs of industry and stay current with changing technology. While not enforceable, these documents represent industry best practices.

2. PROBLEM

Much of the critical infrastructure in the United States is at risk due to increasing cyber intrusions that may impact normal operations. This critical electrical infrastructure depends on electronic control systems for its operation. In response to this risk, the President of the United States issued Homeland Security Presidential Directive (HSPD)–7 on December 17, 2003, which stated in part, "it is the policy of the United States to enhance the protection of our Nation's critical infrastructure." In addition, HSPD-7 states "The Department and Sector-Specific Agencies will collaborate with appropriate private sector entities and continue to encourage the development of information sharing and analysis mechanisms."

Physical and cyber attacks are increasing against the control systems used in our critical infrastructures.³ Physical attacks are very visible to the public and industry. There is usually property damage or personal injury involved with the physical attack and the news media will publicize the event. Cyber attacks on the other hand, are not as easily identified and many companies do not report the events and publicize their cyber vulnerabilities. Many of the cyber attacks go unnoticed or attacks may go unnoticed for long periods of time. However, the resources and tools for cyber attacks are becoming more commonplace and readily available. Many companies that make up the critical infrastructures of the United States are largely unaware of the problem and hence have poor cyber security designs and weak protection.

Electronic intrusions and attacks may come from inside or outside a company. From within, intrusions may be innocent mistakes made by an operator, or deliberate attacks by disgruntled employees. Externally, intrusions come from former employees, computer viruses, and from hostile external attackers. HSPD-7 states, "While it is not possible to protect or eliminate the vulnerability of all critical infrastructure ... strategic improvements in security can make it more difficult for attacks to succeed and can lessen the impact of attacks that may occur." Cyber intrusions are costly to industries, and many could be prevented by applying cyber security standards.

2.1 Applying Standards and Guidelines to Improve Security

Standards and guidelines can be used to help identify problems and reduce the vulnerabilities in a cyber security system. By knowing the problems and vulnerabilities, standards can be applied to cyber security systems and to minimize the risk of intrusion. This white paper presents a comparison of some of the electrical sector cyber security standards and requirements. Using the proper standard for a particular industry's application can reduce vulnerabilities in our nation's critical infrastructure. For the electrical sector, this document helps identify which standard most closely matches that industry's cyber security needs, and provides a tool for standards committees to consider the approach taken by other standards and guidelines.

3. STANDARDS

This section provides a brief description of the electrical sector security standards and guidelines used in this study. Table 1 shows the major sections of each standard. The scope of one standard may be focused on cyber security, while the scope of another standard may be physical security, or communications. This study can help identify the similarities and differences between standards and guidelines, which can contribute to selecting the best security practices and help strengthen sections of the standards and guidelines in future revisions.

- 1. The International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC) 17799, Information Technology—Code of Practice for Information Security Management (ISO 17799) is a detailed security standard, organized into ten major sections.⁵
 - Although it was not written specifically for the electrical sector, ISO 17799 may be regarded as a starting point for developing organization guidance. It offers guidelines and voluntary directions for information security management and is meant to provide a general description of the areas currently considered important when initiating, implementing, or maintaining information security in an organization.⁶
- 2. IEEE 1402, IEEE Guide for Electric Power Substation Physical and Electronic Security⁷ is a guide sponsored by the Power Engineering Society/Substations of IEEE. It was approved June 7, 2000. The guide identifies and discusses security issues related to human intrusion at electric power supply substations. Various methods and techniques that are being used to mitigate physical and electronic intrusions are presented.
- 3. The NERC Security Guidelines for the Electricity Sector⁸ is published by the North American Electric Reliability Council. Version 1.0 was released June 14, 2002. The guideline consists of 14 sections addressing physical and cyber security.
 - These guidelines describe general approaches, considerations, practices, and planning philosophies to be applied in protecting the electric infrastructure systems. The guidelines are advisory in nature and it is left to each company to determine how they will be used.
- 4. NERC 1200, Urgent Action Standard 1200 Cyber Security. 10 is a temporary standard published by the North American Electric Reliability Council (NERC) to establish a required set of defined security requirements relative to the energy industry and to reduce risks to the reliability of the bulk electric systems from any compromise of critical cyber assets. This standard was adopted August 13, 2003, for a one-year period. It has received an extension, until August 2005, at which time a permanent Cyber Security Standard (NERC 1300) is expected to be released. 11
 - This standard, organized into 16 major sections, applies to entities performing various electric system functions, as defined in the functional model approved by the NERC Board of Trustees in June 2001. NERC is now developing standards and procedures for identifying and certifying such entities. Until that identification and certification is complete, these standards apply to the existing entities (such as control areas, transmission owners and operators, and generation owners and operators) that are currently performing the defined functions.¹²
- 5. NERC 1300, Cyber Security¹³ is proposed to replace the NERC 1200.¹⁴ NERC 1300 is being prepared by the North American Electric Reliability Council. Draft 1 of the Cyber Security Standard was posted for comment September 15 through November 1, 2004. This standard is expected to cover essentially the same material as NERC 1200, but in more detail. It is currently organized in eight major sections.

Table 1. Major security sections in electrical segment standards and guidelines.

| ISO 17799 82 pages | IEEE 1402 24 pages | NERC Security Guidelines for the Electricity Sector 73 pages | NERC 1200 24 pages | NERC 1300 Draft 1.0 September 15, 2004 35 pages |
|--|---|---|---|--|
| Security Policy | Intrusions | Vulnerability and Risk Assessment | Cyber Security Policy | Security Management Controls |
| Organizational Security | Criteria for Substation Security | Threat Response | Critical Cyber Assets | Critical Cyber Assets |
| Asset Classification and Control | Security Methods, Barriers, Electronic, Other | Emergency Plans | Electronic Security Perimeter | Personnel and Training |
| Personnel Security | Effectiveness of Security Methods | Continuity of Business Processes | Electronic Access Controls | Electronic Security |
| Physical and Environmental Security | Substation Security Plan | Communications | Physical Security Perimeter | Physical Security |
| Communications and Operations Management | | Physical Security | Physical Access Controls | Systems Security Management |
| Access Control | | Cyber – Risk Management | Personnel | Incident Response Planning |
| Systems Development and Maintenance | | Cyber – Access Control | Monitoring Physical Access | Recovery Plans |
| Business Continuity Management | | Cyber – IT Firewalls | Monitoring Electronic Access | |
| Compliance | | Cyber – Intrusion Detection | Information Protection | |
| | | Employment Background Screening | Training | |
| | | Protecting Potentially Sensitive Information | Systems Management | |
| | | Securing Remote Access to Electronic Control and Protection Systems | Test Procedures | |
| | | Threat and Incident Reporting | Electronic Incident Response Actions | |
| | | | Physical Incident Response Actions | |
| | | | Recovery Plans | |

4. DISCUSSION - COMPARISON OF STANDARDS/GUIDELINES

Appendix A is a matrix that compares the five standards/guidelines considered in this paper. By examining Appendix A, it is possible to see which section of a particular standard or guideline addresses which requirements. This comparison of the security standards was done by identifying similar requirements.

The standards were examined and the requirements that were stated in the standard were noted. Currently, the standards are based on industry processes and requirements.

International standard ISO 17799 was used as the baseline because it appears to have the broadest coverage. Since all of the standards do not address the same requirements, it is recognized that there will be areas where there are no comparisons. For example, IEEE 1402 is geared more toward physical security, while the NERC standards and guidelines focus on the cyber security aspect. The ISO standard considers the network, operating system, and application separately, and looks at requirements such as passwords for each of these individually. The other standards consider passwords and then assume that any item that could use password protection is covered. This leads to difficulty in comparing standards and leaves the comparison open to personal interpretation.

5. CONCLUSIONS

This white paper reviews and compares the requirements and recommendations for five security standards used in the electrical sector. There are distinct differences in the topics considered by some of the standards. Therefore, a careful examination of this comparison, and of the standards presented here, should be made before attempting to use any given standard.

Cyber security standards can provide increased security to control systems by giving an understanding of areas of concern and how they can be addressed.

6. REFERENCES

- 1. Schmidt, J. and Nair, Visakh, A Taxonomy of Security Standards for Real-Time Control Systems, 2004.
- 2. December 17, 2003 Homeland Security Presidential Directive/Hspd-7, Critical Infrastructure Identification, Prioritization, and Protection, http://www.whitehouse.gov/news/releases/2003/12/print/20031217-5.html
- 3. Poulsen, Kevin, "Shifting Cyber Threats Menace Factory Floors," *Security Focus Printable NEWS* 9671, October 7, 2004, http://www.security focus.com/printable/news/9671
- 4. ISO17799 Made Easy, ISO/IEC 17799 Security Resources, http://www.iso-17799-security-world.co.uk/]
- 5. ISO/IEC 17799:2000, "Code of Practice for Information Security Management, Frequently Asked Questions," *What is ISO/IEC 17799:2000*?, November 2002, http://csrc.nist.gov/publications/secpubs/otherpubs/reviso-faq.pdf
- 6. IEEE Standard 1402-2000, *IEEE Guide for Electric Power Substation Physical and Electronic Security*. IEEE, Inc. 3 Park Avenue, New York, NY 10016-5997.
- 7. NERC Security Guideline, Securing Remote Access to Electronic Control and Protection Systems, June 12, 2003, Version 1.0, www.esisac.com/publicdocs/Guides/secguide_pcs_final.pdf (5 March 2004).
- 8. Security Guidelines for the Electricity Sector, Overview, Version 1.0, http://www.esisac.com/publicdocs/Guides/SecurityGuidelinesElectricitySector-Version1.pdf
- 9. NERC 1200 Cyber Security, ftp://ftp.nerc.com/pub/sys/all_updl/standards/Urgent-Req-CyberStnd-3-3121.pdf
- 10. NERC Approves Extension of Urgent Action Cyber Security Standard, NERC News, September 8, 2004, http://www.nerc.com/~filez/nercnews/news-0804c.html
- 11. "Key Energy and Utility Security Questions," What is the NERC 1200 Urgent Action Cyber Security Standard?, Breakwater Security Associates, http://www.breakwatersecurity.com/energy/key_questions.html?id=2
- 12. NERC 1300, Draft 1.0, ftp://www.nerc.com/pub/sys/all_updl/standards/sar/Draft_Version_1_Cyber_Security_Standard_1300_091504.pdf
- 13. NERC Standards Development Bulletin, September 2004, http://www.nerc.com/~filez/standards/standards-bulletin-0904.htm

Appendix A Security Standards Comparison

Appendix A

Security Standards Comparison

| Requirement | ISO 17799 | IEEE 1402 | NERC Security Guideline for the Electricity Sector * | NERC 1200 | NERC 1300 Draft 1.0 September 15, 2004 |
|---|-----------|------------------|---|-----------|---|
| SECURITY POLICY | 3 | 8, 8.1, 8.3, 8.5 | | 1201 | 1301 |
| Information security policy. | 3.1 | | PPSI | 1201.1.1 | 1301.a, 1301.b |
| Information security policy document. | 3.1.1 | | | | 1301.a.1, 1301.a.2, 1301.b.1.i |
| Review and evaluation of information security policy. | 3.1.2 | | Overview. P2, TR.TC-N.10, SRA.P3.1 | 1201.2.2 | 1301.b.1.ii, 1301.b.1.iv, 1301.b.2.i, 1301.b.2.iv, 1301.b.3.iv, 1301.b.4, 1305.b.1 |

| Requirement | ISO 17799 | IEEE 1402 | NERC Security Guideline for the Electricity Sector * | NERC 1200 | NERC 1300 Draft 1.0 September 15, 2004 |
|--|--|-----------|---|-----------|--|
| VULNERABILITY AND RISK ASSESSMENT | | | VRA | | 1302 |
| Vulnerability and risk assessment. | | | VRA | | 1302 |
| Conduct a risk assessment. | 7.1.1, 7.1.5, 7.2.5, 7.2.6, 9.4.3, 9.7.2.1, 10.2, 10.3.1, 10.3.2, 11.1.2 | 5 | VRA | 1212.1.11 | 1302.a, 1302.b.2, 1306.a.5, 1306.b.5 |
| Risk management process. | | | VRA, CRM | | |
| Mitigation program. | | 5 | VRA.P4, EP.P2, CRM | | |
| Equipment backup | | | TR.TC-N.12, TR.TC-M.8, EP.P2 | | |
| General considerations for conducting a risk and vulnerability assessment. | | | VRA.P3-4 | | |

| Requirement | ISO 17799 | IEEE 1402 | NERC Security Guideline for the Electricity Sector * | NERC 1200 | NERC 1300 Draft 1.0 September 15, 2004 |
|---|-----------|-----------|---|---------------------------------|--|
| ORGANIZATIONAL SECURITY | 4 | | | | 1301 |
| Information security infrastructure. | 4.1 | | | | 1301.a |
| Management information security forum. | 4.1.1 | | | | 1301.a.3 |
| Information security coordination (within the organization). | 4.1.2 | | | | 1301.a.4 |
| Allocation of information security responsibilities (for assets and processes including leadership and management). | 4.1.3 | 8.2 | VRA.P3 | 1201.1.2, 1201.2.3, 1201.2.4 | 1301.a.3, 1301.a.4 |
| Authorization process for new information processing facilities. | 4.1.4 | | | | |
| Specialist information security advice. | 4.1.5 | | | | |
| Cooperation between organizations. | 4.1.6 | | VRA.P4, C.P2.1-7 | | |
| Restrict exchanges of sensitive information. | 4.1.6 | | C.P3.9, PPSI.P3 | | |
| Respond to disclosures of sensitive information. | | | PPSI.P4 | | |
| Independent review of information security. | 4.1.7 | | | | |
| Security of third party access. | 4.2 | | | | |
| Identification of risks from third party access. | 4.2.1 | | | | |
| Types of access (physical or logical). | 4.2.1.1 | | | | |
| Reasons for access. | 4.2.1.2 | | | | |
| On-site contractors. | 4.2.1.3 | | | | |
| Security requirements in third party contracts. | 4.2.2 | | | | |
| Outsourcing. | 4.3 | | | | |
| Security requirements in outsourcing contracts. | 4.3.1 | | | | |

| Requirement | ISO 17799 | IEEE 1402 | NERC Security Guideline for the Electricity Sector * | NERC 1200 | NERC 1300 Draft 1.0 September 15, 2004 |
|------------------------------------|-----------|-----------|---|--------------------------------|--|
| ASSET CLASSIFICATION AND CONTROL | 5 | | | 1202 | 1302 |
| Accountability for assets. | 5.1 | | | | |
| Inventory of assets. | 5.1.1 | | | 1202.1, 1202.2.1-2.2, 1205.2.1 | 1302.a, 1302.b, 1305 |
| Information classification. | 5.2 | | | | |
| Classification guidelines. | 5.2.1 | | | | |
| Information labeling and handling. | 5.2.2 | | | | |

| Requirement | ISO 17799 | IEEE 1402 | NERC Security Guideline for the Electricity Sector * | NERC 1200 | NERC 1300 Draft 1.0 September 15, 2004 |
|---|--------------|--------------|--|--|--|
| PERSONNEL SECURITY | 6 | | | 1207 | 1303 |
| Security in job definition and resourcing. | 6.1 | | | | |
| Including security in job responsibilities. | 6.1.1 | 6.3.6.1 | | | |
| Personnel (background) screening and policy. | 6.1.2 | | EBS.P1-2 | 1207.2.3 | 1303.a.3-4, 1303.b.3-4 |
| Confidentiality agreements. | 6.1.3 | | | | |
| Terms and conditions of employment. | 6.1.4 | | | | |
| Identify personnel granted physical or electronic access. | | | | 1207.1, 1207.2.1, 1207.2.2 | 1303.a.3, 1303.b.3 |
| Department employees and contractors | | | | | 1303.a.4, 1303.b.4 |
| User training. | 6.2 | | | 1211 | 1303 |
| Information security education, training, and awareness. | 6.2.1 | 6.3.6.1 | Overview.p4, TR.TC-N.8, TR.TC-L.3, TR.TC-M.2, TR.TC-H.3, EP.P2, PPSI, C.P3.8-9, PS.P3, PPSI.P4 | 1211.1, 1211.2.1-2.1.5 | 1303.a.1-3, 1303.b.1-3, 1308.a.4, 1308.b.4 |
| Responding to security incidents and malfunctions. | 6.3 | | EP | 1214.1 1214.2.1-2.2, 1215.1, 1215.2.1-2.2 | 1307.a, 1307.b |
| Reporting security threats, incidents, and weaknesses. | 6.3.1, 6.3.2 | 8.2, 6.3.6.2 | TR.TC-N.7, TR.P2- 7, TIR | 1214.2.2 | 1307.a.4, 1307.b.3 |
| Timely reporting. | 6.3.1 | | TR.P2-7, TIR.P3 | | |
| Information to report. | | | TIR.P4 | | |
| Incident reporting mechanisms. | 6.3.1 | 6.3.6.2 | TR.P2-7, TIR.P6 | 1214.2.2 | 1307.a.4, 1307.b.3 |
| Reporting software malfunction. | 6.3.3 | | | | |

| Requirement | ISO 17799 | IEEE 1402 | NERC Security Guideline for the Electricity Sector * | NERC 1200 | NERC 1300 Draft 1.0 September 15, 2004 |
|---|-----------|-----------|---|-----------|--|
| Learning from incidents. | 6.3.4 | 6.3.6.1 | EP.P3&P4 | | |
| Disciplinary process. | 6.3.5 | | | | |
| Threat response (enhanced security) related to announced threat levels. | | | TR | | |
| Threat response level suggested elements (four Threat Con alert levels: normal, low, medium, high). | | | TR | | |

| Requirement | ISO 17799 | IEEE 1402 | NERC Security Guideline for the Electricity Sector * | NERC 1200 | NERC 1300 Draft 1.0 September 15, 2004 |
|---|-----------|--|---|----------------------|--|
| PHYSICAL AND ENVIRONMENTAL SECURITY | 7 | | PS | 1205 | 1305 |
| Secure areas. | 7.1 | | | | |
| Physical security perimeter. | 7.1.1 | 6.1.1, 6.1.2, 6.1.3 6.1.4, 6.2, 6.2.1 | TR.TC-N.12, PS.P2- 3 | 1205.1, 1205.2.1-2.2 | 1305.a.2, 1305.b.2 |
| Monitoring physical access. | 7.1.1 | 6.2.2, 6.2.3 | PS.P2-3, CAC.Monitoring | 1208.1, 1208.2.1-2.2 | 1305.a.4, 1305.b.4-5 |
| Physical entry controls | 7.1.2 | | TR.P2-7, PS.P2-3 | 1206.1, 1206.2.1-2.2 | 1305.a.3, 1305.b.3 |
| Securing offices, rooms, and facilities. | 7.1.3 | | TR.P2-7, PS.P2-3 | | |
| Working in secure areas. | 7.1.4 | | TR.P2-7, PS.P2-3 | | |
| Isolated delivery and loading areas. | 7.1.5 | | TR.P2-7, PS.P2-3 | | |
| Intruder detection | 7.1.3.e | | PS.P2-3 | | 1305.a.6 |
| Other physical security methods. | | 6.3.1, 6.3.2, 6.3.3, 6.3.4, 6.3.5, 6.3.7 | PS.P2-3 | | |
| Equipment security. | 7.2 | | PS.P2-3 | | |
| Equipment siting and protection. | 7.2.1 | | | | |
| Power supplies. | 7.2.2 | | | | |
| Cabling security. | 7.2.3 | | | | |
| Equipment maintenance. | 7.2.4 | | | | |
| Security of equipment off-premises. | 7.2.5 | | | | |
| Secure disposal or re-use of equipment. | 7.2.6 | | | | |
| General controls (information and information processing facilities). | 7.3 | | | | |
| Clear desk and clear screen policy. | 7.3.1 | | | | |
| Removal of property. | 7.3.2 | | | | |
| COMMUNICATIONS AND OPERATIONS MANAGEMENT | 8 | | | | |

| Requirement | ISO 17799 | IEEE 1402 | NERC Security Guideline for the Electricity Sector * | NERC 1200 | NERC 1300 Draft 1.0 September 15, 2004 |
|---|-----------|-----------|---|-------------------------|--|
| Operational procedures and responsibilities. | 8.1 | | | | |
| Documented operating procedures. | 8.1.1 | | | | |
| Operational change control. | 8.1.2 | | | | 1306.a.7, 1306.b.7 |
| Incident management procedures. | 8.1.3 | | TIR.P3, TIR.P4, TIR.P6, TR.P2-7 | | 1307.a, 1307.b |
| Segregation of duties. | 8.1.4 | | | | |
| Separation of development and operational facilities. | 8.1.5 | | | | |
| External facilities management. | 8.1.6 | | | | |
| Testing and documentation procedure | | | | 1213.1, 1213.2.1-2.2 | 1306.a.1, 1306.b.1 |
| System planning and acceptance. | 8.2 | | | | |
| Capacity planning. | 8.2.1 | | | | |
| System acceptance. | 8.2.2 | | | 1213.1, 1213.2.1-2.2 | 1306.a.1, 1306.b.1 |
| Protection against malicious software. | 8.3 | | | | 1306.a.4 |
| Controls against malicious software. | 8.3.1 | 6.2.4.4 | CIF.P1, CID.P1 | 1212.1.9 | 1306.b.4 |
| Operating status monitoring | | | | | 1306.a.10, 1306.b.10 |
| Vulnerability assessment (controlled penetration testing) | | | | | 1306.a.5, 1306.b.5 |
| Housekeeping. | 8.4 | | | | |
| Information back-up. | 8.4.1 | | | | 1306.a.11, 1306.b.11 |
| Operator logs. | 8.4.2 | | | | |
| Fault logging. | 8.4.3 | | | | |
| Network management. | 8.5 | | | | |
| Network controls. | 8.5.1 | | | | |
| Media handling and security. | 8.6 | | | | |

| Requirement | ISO 17799 | IEEE 1402 | NERC Security Guideline for the Electricity Sector * | NERC 1200 | NERC 1300 Draft 1.0 September 15, 2004 |
|--|----------------------------|-----------|---|----------------------|--|
| Management of removable computer media. | 8.6.1 | | | | |
| Disposal of media. | 8.6.2, 7.2.6 | | | | |
| Information handling procedures. | 8.6.3 | | | | |
| Information protection. | | | | 1210.1, 1210.2.1-2.2 | 1301.a.2, 1301.b.2 |
| Security of system documentation. | 8.6.4 | | | | |
| Exchanges of information and software. | 8.7 | | C.P3.9, PPSI.P3 | | |
| Information and software exchange agreements. | 8.7.1 | | | | |
| Security of media in transit. | 8.7.2 | | | | |
| Electronic commerce security. | 8.7.3 | | | | |
| Security of electronic mail: security risks and policy on electronic mail. | 8.7.4, 8.7.4.1, 8.7.4.2 | | | | |
| Security of electronic office systems. | 8.7.5 | | | | |
| Publicly available systems. | 8.7.6 | | | | |
| Other forms of information exchange. | 8.7.7 | | | | |

| Requirement | ISO 17799 | IEEE 1402 | NERC Security Guideline for the Electricity Sector * | NERC 1200 | NERC 1300 Draft 1.0 September 15, 2004 |
|---|-----------|-----------|--|--------------|--|
| ACCESS CONTROL | 9 | | CAC | 1204, 1206 | 1304 |
| Business requirements for access control. | 9.1 | | CAC Authorization | | 1304 |
| Access control policy. | 9.1.1 | | CAC. Guideline Statement | | |
| Policy and business requirements. | 9.1.1.1 | | CAC. Authorization, SRA.P3-4 | | 1304.a |
| Access control rules. | 9.1.1.2 | | CAC. Authorization, SRA.P3-4 | | 1304.a.2 |
| User access management. | 9.2 | | CAC | 1204, 1206 | 1306.a.2, 1306.b.2 |
| User registration. | 9.2.1 | | CAC .Authorization, SRA.P3.6 | 1212.1.2-1.3 | 1301.a.5, 1301.b.5, 1306.a.2, 1306.b2 |
| Privilege management. | 9.2.2 | | | | |
| Authentication. | | | CAC. Authentication, SRA.P3.3 | | 1306.a.2 |
| User password management. | 9.2.3 | | CAC. Authentication, SRA.P3.4, SRA.P3.7, SRA.P4.11 | 1212.1.1 | 1306.a.2, 1306.b.2 |
| Review of user access rights. | 9.2.4 | | CAC. Authorization, SRA.P3.6 | 1212.1.2 | 1301.a.5.iii, 1301.b.5 |
| User responsibilities. | 9.3 | | CAC | | |
| Password use. | 9.3.1 | 6.2.4.1 | CAC.Authentication, SRA.P3.7, SRA.P4.11.B | | |
| Unattended user equipment (protection). | 9.3.2 | | | | |
| Network access control. | 9.4 | | | | |
| Policy on use of network services. | 9.4.1 | | | | |
| Enforced path. | 9.4.2 | | | | |

| Requirement | ISO 17799 | IEEE 1402 | NERC Security Guideline for the Electricity Sector * | NERC 1200 | NERC 1300 Draft 1.0 September 15, 2004 |
|---|-----------|-----------|--|----------------------|--|
| Selective access | | 6.2.4.3 | | | |
| Securing remote access. | | 6.2.4.2 | SRA | 1212.1.4-5 | 1306.a.8-9, 1306.b.8-9 |
| User authentication for external connections. | 9.4.3 | | SRA.P3.2-4, SRA.P2.GS, SRA.P4.11 | | |
| Node authentication. | 9.4.4 | | SRA.P4.11.C-D | | |
| Remote diagnostic port protection. | 9.4.5 | | SRA.P3.2, SRA.P4.11 | 1212.1.5 | 1306.a.9 |
| Segregation in networks. (Cyber – IT Firewalls) | 9.4.6 | | CIF | 1212.1.6 | |
| Network connection control. | 9.4.7 | | | 1212.1.4-5 | 1306.a.8-9, 1306.b.8-9 |
| Network routing control. | 9.4.8 | | | | |
| Security of network services (description of services security attributes). | 9.4.9 | | | | |
| Identify electronic security perimeter. | | | | 1203.1, 1203.2.1-2.2 | 1304.a.1, 1304.b.1 |
| Electronic access controls. | | | | 1204.1, 1204.2.1-2.2 | 1304.a.2-3, 1304.b.2-3 |
| Operating system access control. | 9.5 | | CAC, SRA | 1204 | 1304, 1306 |
| Automatic terminal identification. | 9.5.1 | | | | |
| Terminal log-on procedures. | 9.5.2 | | | | |
| User identification and authentication. | 9.5.3 | | CAC. Authentication, SRA.P3.3 | | 1306.a.2 |
| Password management system. | 9.5.4 | | CAC. Authentication, SRA.P3.4, SRA.P3.7, SRA.P4.11 | 1212.1.1 | 1306.a.2, 1306.b.2 |
| Use of system utilities. | 9.5.5 | | | | |

| Requirement | ISO 17799 | IEEE 1402 | NERC Security Guideline for the Electricity Sector * | NERC 1200 | NERC 1300 Draft 1.0 September 15, 2004 |
|--|-------------------|-----------|---|----------------------|--|
| Duress alarm to safeguard users. | 9.5.6 | | | | |
| Terminal time-out. | 9.5.7 | | | | |
| Limitation of connection time. | 9.5.8 | | | | |
| Application access control. | 9.6 | | CAC, SRA | 1204 | 1304, 1306 |
| Information access restriction. | 9.6.1 | | | | |
| Sensitive system isolation. | 9.6.2 | | | | |
| Monitoring system access and use. | 9.7 | | | | |
| Event logging. | 9.7.1 | | CAC.Monitoring, CID.P1 | 1212.1.10 | 1306.a.6, 1306.b.6, 1306.a.10, 1306.b.10 |
| Monitoring system use/access. | 9.7.2 | | CAC.Monitoring, CID.P1 | 1209.1, 1209.2.1-2.2 | 1304.a.3, 1304.b.3 |
| Procedures (for monitoring use including intrusion detection systems) and areas of risk. | 9.7.2.1 | | | 1212.1.7 | 1304.a.3, 1304.b.3 |
| Review results of monitoring activities based on risk factors. | 9.7.2.2 | | | | |
| Logging and reviewing events (emphasis on review). | 9.7.2.3 | | CIF.P1, CID.P1 | 1212.1.10 | |
| Clock synchronization. | 9.7.3 | | | | |
| Mobile computing and teleworking considerations. | 9.8, 9.8.1, 9.8.2 | | | | |

| Requirement | ISO 17799 | IEEE 1402 | NERC Security Guideline for the Electricity Sector * | NERC 1200 | NERC 1300 Draft 1.0 September 15, 2004 |
|--|-----------|-----------|---|-----------|--|
| SYSTEMS DEVELOPMENT AND MAINTENANCE | 10 | | | | |
| Security requirements of systems. | 10.1 | | | | |
| Security requirements analysis and specification. | 10.1.1 | | | | |
| Systems management policies and procedures. | | | | 1212.1 | 1306.a, 1306.b |
| New systems and significant changes to existing systems must use information security test procedures. | | | | | 1306.a.1, 1306.b.1 |
| Security in application systems. | 10.2 | | | | |
| Input data validation. | 10.2.1 | | | | |
| Control of internal processing. | 10.2.2 | | | | |
| Areas of risk. | 10.2.2.1 | | | | |
| Checks and controls. | 10.2.2.2 | | | | |
| Message authentication. (see 10.3.2) | 10.2.3 | | | | |
| Output data validation. | 10.2.4 | | | | |
| Cryptographic controls. | 10.3 | | | | |
| Policy on the use of cryptographic controls. | 10.3.1 | | | | |
| Encryption. | 10.3.2 | 6.2.4.5 | SRA.P3.5 | | |
| Digital signatures considerations. | 10.3.3 | | | | |
| Non-repudiation services. | 10.3.4 | | | | |
| Key management. | 10.3.5 | | | | |
| Protection of cryptographic keys. | 10.3.5.1 | | | | |
| Standards, procedures, and methods. | 10.3.5.2 | | | | |

| Requirement | ISO 17799 | IEEE 1402 | NERC Security Guideline for the Electricity Sector * | NERC 1200 | NERC 1300 Draft 1.0 September 15, 2004 |
|---|-----------|-----------|---|-----------|--|
| Security of system files. | 10.4 | | | | |
| Control of operational software. | 10.4.1 | | | | |
| Protection of system test data. | 10.4.2 | | | | |
| Access control to program source library. | 10.4.3 | | | | |
| Security in development and support processes. | 10.5 | | | | |
| Change control procedures. | 10.5.1 | | | | 1306.a.7, 1306.b.7 |
| Technical review of operating system changes. | 10.5.2 | | | | 1306.a.1, 1306.b.1, 1306.a.3, 1306.b.3 |
| Restrictions on changes to software packages. | 10.5.3 | | | | |
| Covert channels and Trojan code considerations. | 10.5.4 | | | | |
| Outsourced software development considerations. | 10.5.5 | | | | |
| Security patch management. | | | | 1212.1.8 | 1306.a.3, 1306.b.3 |

| Requirement | ISO 17799 | IEEE 1402 | NERC Security Guideline for the Electricity Sector * | NERC 1200 | NERC 1300 Draft 1.0 September 15, 2004 |
|--|-------------------------------|-----------|---|------------------|--|
| BUSINESS CONTINUITY MANAGEMENT | 11 | | | | 1308 |
| Aspects of business continuity management. | 11.1 | | | | |
| Business continuity management process. | 11.1.1 | | VRA.P4, EP.P2-4, CBP | | |
| Business continuity and impact analysis. | 11.1.2 | | | | |
| Writing and implementing continuity plans. | 11.1.3 | | СВР | 1216.1, 1216.2.1 | 1308.a 1308.b |
| Business continuity planning framework (consistency of plans). | 11.1.4 | | СВР | | |
| G. G. | 11.1.5, 11.1.5.1- 11.1.5.2 | | EP.P2-4, CBP.P3 | 1216.2.2 | 1308.a.1, 1308.a.3, 1308.b.1, 1308.b.3 |

| Requirement | ISO 17799 | IEEE 1402 | NERC Security Guideline for the Electricity Sector * | NERC 1200 | NERC 1300 Draft 1.0 September 15, 2004 |
|--|-------------------------------|-----------|---|-------------------|--|
| <u>COMPLIANCE</u> | 12 | | | | |
| Compliance monitoring process (compliance with standard). | | | | 1201-1216.4.1-4.3 | 1301-1308.d-f |
| Inspection of facilities. | | 8.2 | | | |
| Compliance with legal requirements. | 12.1 | | Overview.P4 | | |
| Identification of applicable legislation. | 12.1.1 | | | | |
| Intellectual property rights: copyright, software copyright. | 12.1.2, 12.1.2.1- 12.1.2.2 | | | | |
| Safeguarding of organizational records. | 12.1.3 | | | | |

| Requirement | ISO 17799 | IEEE 1402 | NERC Security Guideline for the Electricity Sector * | NERC 1200 | NERC 1300 Draft 1.0 September 15, 2004 |
|---|-------------------------------|-----------|---|-----------|--|
| Data protection and privacy of personal information. | 12.1.4 | | | | |
| Prevention of misuse of information processing facilities. | 12.1.5 | | | | |
| Regulation of cryptographic controls. | 12.1.6 | | | | |
| Collection of evidence: rules for evidence, admissibility of evidence, quality of evidence. | 12.1.7, 12.1.7.1- 12.1.7.3 | | | | |
| Reviews of security policy and technical compliance. | 12.2 | | TR.TC-N.10 | | 1301-1308.d |
| Compliance with security policy (auditing) | 12.2.1 | | TR.TC-N.9, SRA.P3.8 | | 1301-1308.d.1 |
| Technical compliance checking. | 12.2.2 | | | | 1306.a5, 1306.b.5 |
| System audit considerations. | 12.3 | | | | |
| System audit controls. | 12.3.1 | | | | |
| Protection of system audit tools. | 12.3.2 | | | | |

Key to Abbreviations for Security Guidelines for the Electricity Sector:

| VRA | Vulnerability and Risk Assessment V1.0 June 14, 2002 | CAC | Cyber – Access Control V1.0 June 14, 2002 | |
|-----|---|------|--|--|
| | , | CIF | Cyber IT Firewalls V1.0 June 14, 2002 | |
| TR | Threat Response V1.0 June 14, 2002 | CID | Cyber Intrusion Detection V1.0 June 14, 2002 | |
| EP | Emergency Plans V1.0 June 14, 2002 | EBS | Employment Background Screening V1.0 | |
| CBP | P Continuity of Business Processes V1.0 June 14, | | June 14, 2002 | |
| | 2002 | PPSI | Protecting Potentially Sensitive Information | |
| C | Communications V1.0 June 14, 2002 | 1101 | V1.0 June 14, 2002 | |
| PS | Physical Security V1.0 June 14, 2002 | SRA | 8 | |
| CRM | Cyber – Risk Management V1.0 June 14, 2002 | | and Protection Systems V1.0 June 10, 2003 | |

TIR Threat and Incident Reporting V1.0 June 10, 2003