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Recommendations for Certification of Switching Personnel

Part 1—Survey of Utility Certification of Switching Personnel

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Technical Update, December 2008

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Berkshire Harrison, LLC

This is an EPRI Technical Update report. A Technical Update report is intended as an informal report of continuing research, a meeting, or a topical study. It is not a final EPRI technical report.

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PRODUCT DESCRIPTION

While switching personnel are generally well skilled to perform their complicated functions, there is no general industry-wide accreditation or certification system. This report presents results of a survey of utility practices for switching personnel certification.

Results and Findings

Although only eight utilities responded to the survey to date, it is clear—at least within this limited universe—that operator certification is a widespread policy. Indeed, of the eight respondents, seven have operator certification programs, whether that certification is conducted solely by the North American Electric Reliability Corporation (NERC) (three utilities) or solely through internal company processes (two utilities), or by both (two utilities).

At the same time, certification processes differ significantly among the responding utilities, including differences in such areas as who provides the training, the content and duration of training, re-certification frequency, and others.

One major point of agreement was that all seven utilities that follow a certification program conduct written—not oral—testing, with two utilities noting that classroom training and "hands-on" field switching also are required.

Challenges and Objective(s)

All seven respondents agreed that certification reduces switching errors and related outages. However, four utilities felt that their current certification program failed to address the real training needs of personnel engaged in either writing switching orders or actually performing field switching. Several utilties listed various areas of concern, including "understanding of relay operations," "methods of voltage and VAR control," "VAR requirements of high-voltage lines," "function and types of ground protection on distribution systems," "switching problems associated with feeder voltage regulators," and "switching and safety considerations involved in underground distribution systems." One utility mentioned that "Most of the material covered (i.e., NERC reporting requirements, time error correction, etc.) is not relevant in any way to field switching."

EPRI plans to continue research in this area.

Applications, Values, and Use

EPRI plans to continue to gauge the various utility practices for switching personnel certification, and—under the guidance of the Advisory Task Force for this project—consider the merits of proposing possible future certification actions. Proposed actions could range from *status quo* (no general certification) to development of a well-defined training and accreditation program.

EPRI Perspective

Funders of the EPRI Power Switching and Reliability project include control room operators, switchmen, trainers, superintendents, troubleshooters, safety officers, and similar staff. Various technical and management levels are represented. While all are well skilled to perform their complicated functions, there is no general industrywide accreditation or certification system. To gauge the various utility practices for switching personnel certification, EPRI was requested to conduct a survey and propose possible future certification actions, which could range from *status quo* (no general certification) to development of a well-defined training and accreditation program.

Approach

The contractor retained by EPRI developed a survey of utility practices, experience, and recommendations concerning certification of switching personnel.

The survey consisted of four general areas:

1. Industry practices (12 questions)
2. Why do you feel certification is required? (5 questions)
3. What areas of system operator and switchmen training/certification are you most concerned about? (10 questions)
4. Recommendations for improving your certification process (2 questions requiring narrative responses).

The survey was sent to approximately 30 members of EPRI's Power Switching Safety & Reliability Task Force, and eight members responded. The contractor tallied responses from the eight respondents. Information that could identify the responding utility has been removed for reasons of confidentiality. The survey identified several important issues, and EPRI plans to research those issues further.

Keywords

Certification
Error prevention
Safety practices
Substations
Switching

ACKNOWLEDGEMENTS

Both EPRI and Berkshire Harrison Inc. wish to thank all those who took time from their busy schedules both to help create this survey of Utility Certification of Switching Personnel and to respond to it.

Nothing would have been possible without their efforts.

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1
CERTIFICATION OF SWITCHING PERSONNEL SURVEY

The Funders of the EPRI Power Switching and Reliability project include control room operators, switchmen, trainers, superintendents, troubleshooters, safety officers and similar. Various technical and management levels are represented. While all are well skiilled to perform their complicated functions, there is no general industry-wide accreditation or certification system. To gauge the various utility practices in the area of switching personnel certification, EPRI was requested to conduct a survey and propose possible future certification actions, which could range from *status quo* (i.e., no general certification) to the development of a well-defined training and accreditation program.

The Contractor retained by EPRI developed a survey of utility practices, experience, and recommendations concerning the certification of switching personnel (see Appendix A for full survey).

The survey consisted of four general areas:

1. Industry practices (12 questions),
2. Why do you feel certification is required? (5 questions),
3. What areas of System Operator and Switchmen training/certification are you most concerned about? (10 questions),
4. Recommendations for improving your certification process (2 questions requiring narrative responses).

The survey was sent to approximately 30 members of EPRI's Power Switching Safety & Reliability Task Force, and eight members responded.

The results are presented next.

Survey Results

The Contractor tallied responses from the eight respondents, and the results are presented below. Information that could identify the responding utility has been removed for reasons of confidentiality.

Area 1: Industry Practices

Seven utilities responded that they currently certify switching personnel in some manner. Only one said it did not. The reason: it is a municipal utility and was not required to do so by its "registering authority."

Of the seven utilities that certify switching personnel, three only use the NERC certification program, two use other certification processes, and two use both NERC and other programs. The "other" category included the following three responses:

- System Operators are NERC certified and field personnel are certified through [our] internal process
- Company developed and implemented program. This includes all field switching personnel as well as System Operators.
- Company program

Of those who use the NERC certification program, the credentials held by various operators are listed in Table 1-1.

Table 1-1
NERC Credentials Held by Various Operators

NERC Credential	Number of Holders
Transmission Operator	3
Balancing and Interchange Operator	2
Balancing, Interchange	1
Transmission Operator and Reliability Operator	5

The Number of Holders column in Table 1-1 does not necessarily indicate that individual operators hold more than one credential, although this is possible. The survey did not ask the question: "In how many areas does each operator hold NERC credentials?"

The survey asked about job titles held by certified operators. The job titles are listed in Table 1-2.

As above, the Number of Holders column in Table 1-2 does not necessarily indicate that individual operators hold more than one job title, although this is possible. The survey did not ask the question: "How many job titles does each operator hold?"

Table 1-2
Job Titles and Number of Holders of that Title

Job Title	Number of Holders
Switchman (who perform switching in the field)	5
Control room personnel (who write switching instructions)	7
Control room personnel (who write switching instructions), Distribution	3
Control room personnel (who write switching instructions), Subtransmission	7
Control room personnel (who write switching instructions), Transmission	6
Other (not identified)	2

Certification includes various components. All seven utilities require written tests. In addition, one utility requires classroom training, written examination, and field execution of a switching order, and one requires hands on field switching and classroom exercises. One utility also added that Regional Engineers are certified through written testing.

No utility that responded to the survey performs oral tests.

The tests are conducted by various staff:

- Training Personnel from Switching Steering Committee usually consisting of Regional Engineer and System Operating Training person.
- Training Specialist with certified switching and clearance certifications and journey level technician qualifications.
- NERC (2 utilities indicated this)
- Training staff
- Operations training instructors
- A third party conducts the testing on NERC's behalf.

In case a candidate fails the certification test, all seven utilities responded that he/she is retrained. No utility indicated dismissal of a candidate because of failure to pass the test. It is assumed that this is the case for the first-time failure. The survey did not probe what actions utilities take if a candidate repeatedly fails the test.

Recertification frequency for certified switching personnel varies considerably, as shown in Table 1-3.

Table 1-3
Recertification Frequency at Various Utilities

Recertification Frequency	Number of Utilities with that Frequency
Annually	2
Biannually	1
Every three years (The NERC System Operator Certification Program is a 3-year certification program)	3
Every four years	1

Also, one utility that recertifies annually added that certification involves successful execution of 10 or more orders, documented OJT, or executing an actual order or simulated switching with a Training Specialist.

The survey also attempted to probe why utilities do not certify all or some personnel. The following four responses were received:

- Operations provides the training, field supervisors certify the personnel under their supervision.
- Field switching staff are not certified. NERC certification of field switching staff would require a considerable investment. Most of the material covered (i.e., NERC reporting requirements, time error correction, etc.) is not relevant in any way to field switching.
- [Our parent company] is our registering authority, and as of now our operators are not required to be certified.

To probe further the survey asked whether utilities that certify some employees but not others have other ways to verify employee qualifications to maintain proficiency. Four utilities responded that they verify employee qualifications in some other way, as follows:

- All employees involved in switching must complete 2 1/2 day course and pass written test. Transmission control center has to NERC certify
- Hands on switching
- Field switching staff are trained and/or certified in "Electrical Awareness", "Utility Work Protection Code", and various discipline-specific certifications.
- We have a four year training program for our System Operators

This portion of the survey and responses should be reviewed since only one utility indicated that they do not certify. Hence, it is not clear what exactly is meant by these responses.

Further, the survey asked if the utilities tried and discontinued or changed certification procedures. Two utilities responded “Yes” (presumably meaning that they tried and discontinued or changed), and five responded “No” (presumably that they did not try).

When asked why they tried and discontinued or changed certification procedures, the two utilities provided the following responses:

- We recently started a formal certification program for switchmen and Regional Engineers (within the last 12 months)
- We are on version 15! We continually modify our standard for certification and maintaining certification to appease various entities. A lot of the changes are customer driven.

Area 2: Why Do You Feel Certification Is Required?

Here, several possible reasons were suggested in the survey and respondents were requested to mark all that apply. Some utilities also provided additional comments.

The responses (along with additional comments) are listed in Table 1-4.

Table 1-4 indicates that all responding utilities – including the utility that at this time does not certify switching personnel – agree that certification helps reduce switching errors and related outages. Seven utilities indicated that certification also helps reduce injury incidents and equipment damage.

Fortunately, only four utilities felt that current certification program does not fully address all training requirements.

Several utilities also provided additional comments. Perhaps the most telling comment is: "Trained personnel make fewer mistakes."

Table 1-4
Reason for Requiring Certification

Reason	Number of Responding Utilities that Marked this Reason	Additional Comments
Reduction of switching errors and related outages	8	Trained personnel make fewer mistakes. Certification would at help guarantee that a person has some minimum level of understanding.
Reduction of injury accidents	7	Knowledgeable personnel can quickly identify damaged equipment before operating the device.
Reduced equipment damage	7	Knowledgeable personnel can quickly identify damaged equipment before operating the device. Studying for standardized certification would force our Operators to think beyond just doing things the way we've always done them and to understand the utility better.
Improved understanding and appreciation of relationship between merchant and reliability and merchant function in modern electrical utility	0	None
Current certification program does not address training requirements of personnel engaged in writing or performing field switching	4	We have a training program, but there is no testing to ensure they truly understand what they are learning

Area 3: What Areas of System Operator and Switchmen Training/Certification Are You Most Concerned About?

Responding utilities were requested to mark all provided items that apply. Table 1-5 summarizes the responses. Only one additional comment was provided and is listed in Table 1-5.

Table 1-5 indicates no apparent concern for the following:

- Automatic generation control (AGC)
- Synchronizing generation units
- Function of series and/or shunt capacitors

The highest indicated concern relates to “Understanding of relay operations.” (6 out of 8 responses).

Table 1-5
Areas of Most Concern

Area of Most Concern	Number of Utilities that Marked this Area
Understanding of relay operations	6
Automatic generation control (AGC)	0
Synchronizing generation units	0
VAR requirements of high voltage lines	4
Methods of voltage and VAR control	5
Function of series and/or shunt capacitors	0
Function of and types of ground protection on distribution systems	4
Switching problems associated with feeder voltage regulators	3
Operation of fire suppression systems in shelter-clad, metal-clad or indoor substations	1 (Comment: For company qualified switch persons only)
Switching and safety considerations involved in underground distribution systems	3

Area 4: Recommendations for Improving Your Certification Process

Utilities were asked two general questions:

- What elements of your certification process do you feel are adequate?
- What is not working and why?

Received narrative responses to the first question (What elements of your certification process do you feel are adequate?) are:

- This is our initial attempt to certify switching personnel, so our initial goal was to standardize the content and delivery of the courses. Buy-in from the field and staff has been positive.
- Initial training and certification.
- Requiring Sy operators to NERC give better understanding of big picture. All employees involved in switching of any kind have to go to class and pass a comprehensive test and demonstrate proficiency in switching. Even though we do not call this certification it is required. OJT follows (normally about one year) and then supervisor has to sign off that employee is ready to implement switching.
- Hands on switching application. Equipment knowledge
- The NERC certification process for Control Room staff is adequate.

Received narrative responses to the second question (What is not working and why?) are:

- We believe it too early to judge the results
- Program for maintaining certification - what are the regulatory requirements? We may be going overboard by attempting to "recertify" all 1000 switch persons annually.
- This system works well for us, but I feel that we should have more refresher training on a regular time schedule.
- Not enough time to cover all material once a year in a 4 hour session.
- There are some areas for improvement with respect to field switching. Youth/inexperience might be a factor.

2
DISCUSSION OF RESULTS

Widespread Certification

Although only eight utilities responded to the survey, it is clear – at least within this limited universe – that operator certification is a widespread policy. Indeed, of the eight respondents, seven have operator certification programs, whether that certification is conducted solely by NERC (three utilities) or solely through internal company processes (two utilities), or by both (two utilities).

The only respondent that does not certify operators is a municipal utility that noted: "[Our parent company] is our registering authority, and as of now our operators are not required to be certified."

Who is Certified?

All listed NERC credentials are held by some of the respondents, with Transmission Operator and Reliability Operator the most popular. Workers at five utilities hold that NERC certification.

The job titles of those who are certified (whether by NERC or by internal program) is fairly evenly split: five reporting that their field Switchmen are certified and seven reporting that Control Room Personnel (who write switching instruction) are certified. Three utilities reported "other" job titles are certified, but they did not specify what those titles were.

Within the Control Room group, only three utilities reported that those working in Distribution are certified, while seven utilities reported they certified Subtransmission personnel and six reported that they certify Transmission personnel.

Certification Testing

Written – not oral – testing is conducted by all seven utilities that certify operators, with two utilities noting that classroom training and "hands-on" field switching are also required.

NERC conducts certification testing at just three of the responding utilities, while another utility reports that testing is conducted by a third party on NERC's behalf.

Three other utilities reported that training is conducted by internal operations training instructors.

All seven utilities reported they retrain all those who fail the tests.

The period for recertification varies substantially. Two utilities recertify personnel every year. One conducts recertification tests every two years. Three recertify every three years in accordance with NERC's System Operator Certification Program, and one does it every four years. (See Table 1-3)

Reasons for Not Certifying Certain Personnel

One utility reported that it does not certify field switching staff because "NERC certification of field switching staff would require a considerable investment." And further, that respondent stated bluntly that, "Most of the material covered (i.e., NERC reporting requirements, time error correction, etc.) is not relevant in any way to field switching."

The one municipal utility participating in the survey noted that "[Our parent company] is our registering authority and as of now our operators are not required to be certified."

Alternatives to Certification to Ensure Proficiency

One utility reported "a four-year training program for our System Operators."

With regard to employees involved in field switching, four utilities reported that that they engage in some sort of training, including:

- A 2 1/2 day course followed by a written test
- Training and/or certification in "Electrical Awareness," the company's "Work Protection Code," and various discipline-specific certifications
- Simple "hands-on switching"
- Station switching personnel are qualified via standardized written and performance testing.

Discontinuing or Changing Certification Procedures

Six utilities said they had not tried and discontinued or altered their certification program (this includes the one utility reporting that it does not now certify its operators). Two, however, had done so.

One reported starting a formal certification program for switchmen and regional engineers within the last 12 months. The other noted considerable activity in this area: "We are on version 15! We continually modify our standard for certification and maintaining certification to appease various entities. A lot of the changes are customer driven."

The last comment surely presents a number of questions that should be investigated further.

Why is Certification Required?

All seven respondents agreed that certification reduces switching errors and related outages. One noted that "trained personnel make fewer mistakes." Another said, "certification would help guarantee that a person has some minimum level of understanding."

Seven respondents agreed that certification reduced accidents and equipment damage. One utility noted that "knowledgeable personnel can quickly identify damaged equipment before operating the device." Another said that "studying for standardized certification would force our operators to think beyond just doing things the way we've always done them and to understand the utility better."

No one thought certification helped improve understanding or appreciation of the relationship between reliability and the sales of electricity.

Problems with Certification

Four utilities felt that their current certification program failed to address the real training needs of personnel engaged in either writing switching orders or actually performing field switching. One of the three noted that, "We have a training program, but there is no testing to ensure they truly understand what they are learning."

When asked about specific areas of concern in their certification programs, six utilities listed "understanding of relay operations." Five listed "methods of voltage and VAR control." Four listed "VAR requirements of high voltage lines," and "function and types of ground protection on distribution systems." Three listed "switching problems associated with feeder voltage regulators" and "switching and safety considerations involved in underground distribution systems."

One utility indicated concern with "Operation of fire suppression systems in shelter-clad, metal-clad or indoor substations."

No one indicated problems with either:

- Automatic generation control (AGC)
- Synchronizing generation units
- Function of series and/or shunt capacitors

Strengths and Weakness of Current Switching Certification Programs

Strengths of Certification Programs

Two respondents report that they require system operators or control room staff to undergo NERC certification, although one of those reports that, it does so "even though we do not call this certification, it is required."

That program requires all employees involved in switching of any kind to have to go to class and pass a comprehensive test and demonstrate proficiency in switching. About a year of on-the-job-training follows, after which a supervisor has to sign off that employee is ready to implement switching, all with the goal of giving that employee a "better understanding of big picture."

Another reported that "this is our initial attempt to certify switching personnel, so our initial goal was to standardize the content and delivery of the courses. Buy-in from the field and staff has been positive."

Finally, one utility noted "initial training and certification" as a strength; another cited "hands-on switching and equipment knowledge" as benefits of its certification programs.

Weaknesses of Certification Programs

Six respondents offered widly varying answers, from:

There is “not enough time to cover all material once a year in a 4-hour session.”

To:

“We should have more refresher training on a regular time schedule.”

To:

“Youth/inexperience might be a factor.”

Another respondent asks, “What are the regulatory requirements?” And he expresses concern that, “We may be going overboard by attempting to recertify all 1,000 switchpersons annually.”

One respondent indicates that improvements in field switching are needed, but he notes that the “youth/inexperience [of workers] might be a factor.”

The lack of a “NERC certification program for Distric Operators (distribution switching)” was cited by one utility as a shortcoming in NERC’s approach to operator certification.

Finally, one utility that has just begun to certify simply noted that, “We believe it too early to judge the results,”

A
CERTIFICATION OF SWITCHING PERSONNEL

A Survey of Utility Practices, Experiences & Recommendations

The following pages contain the survey that was sent to members of EPRI's Switching Safety & Reliability Task Force.

Certification of Switching Personnel
A Survey of Utility Practices, Experience & Recommendations

INSTRUCTIONS:

Please Read

This document is a Microsoft FORM intended to be completed on your computer.
When you click a checkbox ☐, an X will appear within it (click again to remove it).
When you click the text fields(_____), simply begin typing; the text fields will expand as needed so you can type in as much as you want. You can also paste text into the field. Expansion of the field may change the formatting of items that follow it.
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***Please Note**: When the form is locked, you can only type into the _____ spaces provided.*

Do NOT unlock the form: re-locking it will cause loss of material you have already entered.

We would appreciate your completing and returning the survey by October 31, 2008. Please return the completed survey by e-mail to Lee Harrison at lights.on@verizon.net, with a copy to George Gela at ggela@epri.com or by fax: (413) 499-5718.

1. Industry Practices

A. Do you currently certify switching personnel? Yes/No

B. Are your switching personnel certified by NERC? ☐ Other? ☐ If other, please name below (field expands as you type):

C. Do your switching personnel hold any or all of the following NERC credentials? Check all that apply:

- ☐ Transmission Operator
- ☐ Balancing and Interchange Operator
- ☐ Balancing, Interchange
- ☐ Transmission Operator and Reliability Operator

D. What are the job titles of those certified? Check all that apply:

☐ Switchmen (who perform switching in the field)?

☐ Control room personnel (who write switching instructions), including:

☐ Distribution (2.4 – 33 kV)?

☐ Subtransmission (33 – 138 kV)?

☐ Transmission (138 – 500 kV)?

☐ Other: Please identify: _____

E. How is certification done? Written Test ☐ Oral Test ☐ Other ☐

If you selected "Other" above, please describe (field expands as you type):

F. Who conducts the tests? (field expands as you type)

G. How do you deal with those who fail? Dismiss? ☐ Retrain? ☐

H. How often are switch personnel recertified? (field expands as you type)

I. If you do not certify, why not? Please describe (field expands as you type:

J. If you do not certify, do you verify employee qualifications in some other way to maintain proficiency? Yes/No

Please describe (field expands as you type):

K. Have you tried and discontinued or changed certification procedures? Yes/No

L. If you have tried and discontinued or changed certification procedures, please explain why you discontinued or changed certification procedures (field expands as you type):

2. Why Do You Feel Certification Is Required? (Check All That Apply)

☐ Reduction of switching errors and related outages?

If possible, please quantify (field expands as you type):

☐ Reduction of injury accidents?

If possible, please quantify (field expands as you type):

☐ Reduced equipment damage?

If possible, please quantify (field expands as you type):

☐ Improved understanding and appreciation of relationship between merchant and reliability and merchant function in modern electrical utility?

Please explain (field expands as you type):

☐ Current certification program does not address training requirements of personnel engaged in writing or performing field switching?

Please explain (field expands as you type):

3. What Areas Of System Operator and Switchmen Training/Certification Are You Most Concerned About?

☐ Understanding of relay operations?

☐ Automatic generation control (AGC)?

☐ Synchronizing generation units?

☐ VAR requirements of high voltage lines?

☐ Methods of voltage and VAR control?

☐ Function of series and/or shunt capacitors?

☐ Function of and types of ground protection on distribution systems?

☐ Switching problems associated with feeder voltage regulators?

☐ Operation of fire suppression systems in shelter-clad, metal-clad or indoor substations?

☐ Switching and safety considerations involved in underground distribution systems?

4. Recommendations for Improving Your Certification Process

M. What elements of your certification process do you feel are adequate? (field expands as you type)

N. What is not working and why? (field expands as you type)

Thank You Very Much to Taking the Time to Complete This Survey

We would appreciate your completing and returning the survey by September 15, 2008. Please return the completed survey by e-mail to:

Lee Harrison at lights.on@verizon.net

with a copy to George Gela at ggela@epri.com or by fax: (413) 499-5718.

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