

Specialist Level Certification Examination

On

Power System Reliability

January, 2024



**National Power Training Institute
Power Systems Training Institute
(Ministry of Power, Govt. of India)
(An ISO 9001: 2015 & ISO 14001: 2015 Organization)
Bangalore- 560070**



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1. INTRODUCTION:

The committee set up by the Ministry of Power under the Chairmanship of Shri. G.B. Pradhan, the then Addl. Secretary, MoP recommended setting up of a system of certification of System Operators by an independent Central body and National Power Training Institute has been entrusted with the responsibility of conducting the certification exams. Thereafter, the combined committee for training and certification under the Chairmanship of Shri S. M. Dhiman, the then Member, Central Electricity Authority, suggested three levels of certification viz. 'BASIC LEVEL', 'SPECIALIST LEVEL' and 'MANAGEMENT LEVEL'. It recommended that the certification authority may conduct the online examination for all the three levels of certification on periodic basis.

In the last decade significant changes have taken place in the Indian Power Sector, these have evolved, catalyzed by Policy and Regulatory reforms. Policies and regulations have played a pivotal role in promoting investment in the sector and have put the Indian Power Sector on the right trajectory towards promoting competition, economy and efficiency in the sector.

There have been several new regulatory and policy initiatives in the last five years which continue to define and shape the sector. Lead from the front by the Electricity Act 2003, these have been the winds of change. These are not only the framework, structure and guidelines for the sector but also the environment and the spirit. With increase in number of participants, complexities in the sector have also grown manifold. These are quintessential knowledge and skills for any professional in the sector.

Therefore, Capacity Building in Power System Reliability is essential for all personnel in Power Sector. This is recognized as the next step forward in the continued Capability Enhancement of System Operators and an area of specific specialization. Hence, a Specialist Certification Exam has been planned on Power System Reliability. The first specialist level exam on Power System Reliability was organized in February 2015. The second online exam on Power System Reliability was organized on 2nd July, 2017. The third online exam on Power System Reliability is planned for **07th January, 2024**.

The System Operators from Load Despatch Centres who have cleared the basic level certification examination and have put up at least 05 years of service in Power Sector, OR System Operators, are eligible to appear in the upcoming Specialist Level Certification Examination.

FRAMEWORK FOR SPECIALIST LEVEL CERTIFICATION EXAM ON POWER SYSTEM RELIABILITY:

- a. **Certifying Agency-** The National Power Training Institute will be the Certification Agency and to award Certificates to successful candidates.
- b. **Examination Committee-** An Examination Committee comprising of experts in the various fields representing a balanced mix of industry and academia is to be constituted. The committee will be responsible for setting of Examination Paper, consolidating and moderating the same. The examination committee shall also fix the criteria for award of a particular grade on the basis of performance of the candidates in the examination. There would be total of five grades from A to E and grade C shall be the minimum benchmark for award of certification.
- c. **Registering Agency-** Power Systems Training Institute, Bangalore a unit of NPTI will be the registering agency and will issue the admit cards to all Candidates.
- d. **Eligibility-** The eligibility criteria is as follows:-
 - i). The System Operators from Load Despatch Centres who have cleared the basic level certification examination and have put up at least 05 years of service in Power Sector, OR System Operators, are eligible to appear in the upcoming Specialist Level Certification Examination.
 - ii). The candidate is a resident citizen of India
 - iii). The candidate is a regular employee of any of the following- National Load Despatch Centre, Regional Load Despatch Centre, State Load Despatch Centre, Area Load Despatch Centre or Sub-Load Despatch Centre on the 1st day of the month in which the certification examination is scheduled to be conducted.
- e. **Fees-** A fees of **Rs. 15000+GST@18%** per participant will be charged.
- f. **Syllabus-** The syllabus of the exam is given in Annexure-I.
- g. **Pattern of the Examination in Brief-**
 - In line with the recommendation of the committee the examination will be conducted online.
 - The certification examination question paper shall comprise of total One Hundred Twenty (120) objective-type multiple-choice questions. The total time allowed for answering would be One Hundred and Twenty (120) Minutes.

- h. **Locations-** The specialist level certification exam is proposed to be conducted in six centres across India with at least one centre in each region.
- i. **Timelines**
 - i. Registration open : 01.11.2023
 - ii. Last date for receipt of completed registration form at PSTI : 15.12.2023
 - iii. Certification Exam : 07.01.2024
 - iv. Declaration of result : 24.01.2024
- j. **Validity-** the Certificate will be valid for three years from the date of award of the certificate. The duration of validity of the certificate will be clearly mentioned on the certificate
- k. **Other Terms and Conditions** – Remain the same as those applicable for Basic Level System Operator Certification Exam.

PATTERN OF EXAMINATION:

The exam shall be conducted in a paperless mode. Each candidate would be provided with a separate computer terminal at the designated test centre. The candidate would appear in the exam through the interface provide on the respective computer screens. A fifteen-minute tutorial on operating instructions for the computer-based examination will be provided before the start of each examination. The tutorial would be self-explanatory, and no prior computer knowledge is needed.

The certification exam question paper shall comprise of total 120 objective-type multiple-choice questions spread over four sections. The total time allowed for answering would be Hundred and Twenty (120) Minutes. There shall be equal number of questions in all the four sections and all the questions shall carry equal marks without any negative marking. Computer-based testing would allow candidates to skip questions, mark, and return to them at a later time. During the examination, candidates may change their answer to any question. A clock would be displayed on the screen at all times indicating the time remaining. Before exiting the examination, the computer will indicate any question(s) that the candidate might have marked for review or those that remain unanswered.

PAYMENT:

Payment should be done through SBI Collect. Kindly follow the below steps:

1. Go to SBI Collect: <https://www.onlinesbi.sbi/sbicollect/>
2. Select Category: **Educational Institutions**
3. Search for **National Power Training Institute Haryana**
4. In the Payment Category, select '**Miscellaneous Payment to NPTI**'
5. Fill all the mandatory fields
6. In the Purpose of Payment, select '**Other Purpose**'
7. Other Purpose: **PSR Exam 2024**
8. Remarks: **Name of the Organization along with number of examinee**
(E.g: SLDC, KPTCL-4); for 4 examinee (say)
(SRLDC, Grid-India-6); for 6 examinee (say)
9. Print the Receipt of the payment.

REGISTRATION:

- i). Download blank registration form from the website of NPTI or take a photocopy of the blank registration attached with this document.
- ii). Fill the necessary details and paste your recent photograph.
- iii). Get the completed registration form endorsed by the head of the respective Load Despatch Centre.
- iv). Send the endorsed registration form along with the demand draft/pay order for registration fee. In case the fee has been paid through ECS, then the copy of the confirmation receipt obtained from the bank may be sent along with the registration form.
- v). Post the completed registration form along with the enclosures to Principal Director, Power Systems Training Institute, Banashankari II Stage, Bangalore 560070.

EXAMINATION CENTRES:

The certification exam shall be conducted at the following centres subject to a minimum of 15 participants.

- 1) Guwahati / Shillong (North-eastern region)
- 2) Kolkata (Eastern Region)
- 3) New Delhi (Northern Region)
- 4) Mumbai (Western Region)
- 5) Baroda (Western Region)
- 6) Bangalore (Southern Region)

ACCESS TO EXAMINATION CENTRE:

The access to the examination centre shall be through a valid photo admit-card for the certification exam issued by the Examination Coordinator (a designated officer of NPTI). The admit card should be duly endorsed by the stamp and signature of the Examination Coordinator. In case an applicant had received the admit card but is not carrying the admit card at the examination centre designated to the applicant due to some reason then he/she would be allowed to take the exam only if he/she shows the photocopy of the exam registration form along with the valid photo identity card issued to the candidate from the respective organization. A duplicate admit card shall be issued to such candidates at the examination centre by the examination centre in-charge.

Identification(s) that have been altered or damaged will not be accepted at the test centre. If there is any discrepancy between the name on the identification presented to the test centre staff and the examination registration form, the candidate will not be admitted to test and will be marked as a 'no-show'. A report of list of no-show candidates shall be forwarded to the concerned organizations. No refunds shall be provided in case of no-show.

A photograph and finger printing of all the candidates reporting for the exam shall be taken at the test centre for the purpose of record. The candidates are therefore advised to reach the respective test centre at the scheduled reporting time.

After completion of the exam proceedings, an acknowledgement slip will be issued to all the candidates. The slip shall state that the candidate has appeared for the certification exam at the designated centre at the allotted date/time. The applicants are also advised to get their admit card's endorsed by the in charge of the respective examination centre.

EXAMINATION CENTRE REGULATIONS:

The candidates shall comply with the following examination centre regulations:

1. Candidates who arrive late (Half an hour after the beginning of the exam) shall not be allowed access. Late arrivals that are not permitted to take the examination will be considered a no-show and must reapply. No refunds shall be allowed.
2. No reference materials other than the prescribed ones, calculators, cell phones, or recording equipment may be taken into the examination.
3. No test materials, documents, notes, or scratch paper of any sort may be taken from the examination.
4. Visitors are not permitted during the examination.
5. Testing centre staff is instructed to answer questions about testing procedures only. They cannot respond to inquiries regarding the examination's content.
6. During the examination, candidates may use the rest rooms for a biological break; however, the examination clock will continue running during such times.
7. Candidates may not leave the testing centre until they have finished the examination.

8. Smoking is not permitted in any testing centre.
9. Any candidate giving or receiving assistance, or making a disturbance, will be required to turn in their examination materials, exit the examination room, and leave the testing centre. The test would be scored as is whether they have completed it or not. A report of such candidates shall be sent to their respective organizations and such candidates shall be barred from appearing in the certification exam for one year.
10. Any instances of cheating or attempts to impersonate another candidate will be reported to the respective organization where the candidate is employed and such candidates shall be barred from appearing in the certification exam for one year.

WITHDRAWAL FROM THE EXAM:

A candidate may cancel and reschedule an examination appointment either by submitting a written request to the Principal Director, Power Systems Training Institute as directed in the time line schedule of the exam. The candidate is allowed to re-appear in the next certification examination without paying an additional fee. If a candidate is late in withdrawing from the certification exam, does not appear for it, or arrive late, the candidate will be considered as no-show. All no-shows and candidates who have withdrawn will have to reapply to take the examination. No refunds shall be allowed.

EXAMINATION QUESTION PAPER:

As recommended in the combined committee for training and certification of system operators the examination paper will be set after taking input from experts in various fields and then consolidating and moderating the same. Experts of the exam committee shall be selected in such a manner that they represent a good mix of the industry and academia. The questions will be of multiple choice and the candidate would be expected to mark the most appropriate choice in his/her judgment.

AWARDING OF SPECIALIST LEVEL CERTIFICATE:

In line with the recommendations of the combined committee for training and certification of System Operators, there would be a total of five grades from A to E and grade C shall be the minimum benchmark for award of certification. The examination committee shall fix the criteria for award of a particular grade on the basis of performance of the candidates in the examination. Results of the certification examination shall be declared by the National Power Training Institute after grading and analysis. The results will be displayed in the website. All candidates acquiring grade A or grade B or grade C shall be awarded Specialist Level certificate for Power System Reliability signed by Director General, National Power Training Institute. The date on the certificate shall be considered as the reference date for the purpose of computing the validity period of the certificate.

Candidates awarded grades D and E in the examination may re-appear in the certification exams conducted subsequently. Such candidates would have to re-register for the exam by again paying registration fee applicable at the time of re-registration.

Disputes related to award of certificate, if any, shall be resolved through the dispute resolution process.

MAINTAINING 'ACTIVE' CERTIFICATION STATUS:

The Specialist level certificate will have to be renewed every three years. At the end of three years, the LDC executive will have to appear in the examination for re-certification.

CONFIRMATION OF CREDENTIAL TO THIRD PARTIES:

National Power Training Institute shall maintain a record of all the candidates who have appeared for the certification examination in a particular year along with their grades. It shall also maintain a record of the candidates possessing 'active' specialist level certificates for Power System Reliability. National Power Training Institute (NPTI) will confirm to the sponsoring organization that an individual holds a valid/'active' system operator certificate (including releasing the certificate number and the issuance date) in response to a written request, on the employer's letterhead (or official e-mail), providing the name of the individual and the grade acquired. No further information will be provided. NPTI will forward the certificate numbers and issuance dates for individuals holding a current system operator certificate to the respective State/Central Electricity Regulatory Commissions if requested. NPTI will confirm to an employment search firm, or a potential employer, whether an individual holds a valid Specialist certificate (including releasing the certificate number and the issuance date) if the search firm has a release from the individual. No further information will be provided.

DISPUTE RESOLUTION PROCESS:

Any dispute arising under the System Operator Certification Program or from the establishment of rules, policies, or procedures dealing with any segment of the certification process, or as a result of disciplinary action shall be subject to the System Operator Certification Dispute Resolution Process (hereafter called the "Process"). The Process is only for the use of persons who hold a system operator certification or persons wishing to be certified to dispute the validity of the examination, the content of the test, the content outlines, or the registration process. The dispute resolution process consists of two steps.

1. Write to the examination coordinator (a designated officer of NPTI) explaining the nature of dispute. The candidate shall attach the photocopy of the valid admit card along with the letter. It is expected that most of the disputes shall be resolved at this first step. If the issue is not resolved to the satisfaction of the parties involved in the first step the matter may be brought to the notice of Director General, NPTI.
2. Director General, NPTI may constitute a committee to examine the dispute. The candidate shall be given an opportunity to present his/her case before the committee at a specified place, date and time. The committee shall give its recommendations to the DG, NPTI within fifteen days of the meeting with the candidate. DG, NPTI shall communicate the final decision to the concerned person within thirty days (30) of the meeting of the aggrieved person with the committee. The decision of DG, NPTI shall be treated as final.
3. The committee set up for dispute resolution may use a simple majority vote of the committee members to decide all issues. The vote will be taken in a closed session.

DISCIPLINARY ACTION:

This disciplinary action procedure is necessary to protect the integrity of the system operator credential. Should an individual act in a manner that is inconsistent with expectations, this procedure describes the process to investigate and take action necessary to protect the credential. The following shall serve as grounds for disciplinary action:

1. Intentional misrepresentation of information provided on system operator certification exam registration form
2. Intentional misrepresentation of identification in the exam process. This includes, but is not limited to, a person identifying himself or herself as another person to obtain certification for the other person.
3. Violation of one or more examination centre regulations (as prescribed in this document) by a candidate.
4. Any form of cheating during a certification exam. This includes, but is not limited to, bringing unauthorized reference material in the form of notes, study material or other methods of cheating into the examination centre.

The in-charge of the examination centre shall report incidents fit for disciplinary action to the certification examination coordinator. The examination coordinator may discuss with the candidate involved and submit the preliminary findings and communicate the decision to the concerned candidate. The candidate may have the right to appeal through the dispute resolution process.

Annexure

Annexure – I: Syllabus- Specialist Level Certification on Power System Reliability

Basics of Power Systems – I, II & III	Circuit Fundamentals, Types of Circuit Elements, Sources, KVL, KCL, Theorem, Types of Circuits, Star and Wye Connection, PU Systems, Operating States
Steady State Power System Analysis – I & II	Per Unit System, Introduction to Power Flow Solution, Y-Bus Matrix formation, Types of Load Flow Analysis, PV QV Analysis
EHV AC Transmission	EHV Transmission, Concepts, Planning & Design, Power Loss, Voltage Drop, Resistance, Regulation, Efficiency, Limits, Grid Code, Advantage and Disadvantage, Types of Towers, Substation Layout, Impulse, Network Models, Conductors, Insulators, Earthwire, Survey and Design of Transmission Lines, National and International Statistics
HVDC Transmission	Advantages and Disadvantages, HVAC Vs HVDC Comparison, Types of HVDCs, Survey and Design, HVDC S/s Details, Modes of Operation, National and International Statistics
Fault Analysis – I & II	Transmission Fault Types, Equipment Modeling for Faults, Types of Faults, Z-Bus Formation, IEEE and Other Standards, National and International Standards on Fault Analysis
FACTS and Power Transmission Control	Types of Facts Devices, STATCOM, VSC, Types of Compensation, Characteristics, Power Transfer Graphs, FACTS in RE Sources, National and International Statistics
Power System Study Lab – I & II	In-depth Analysis on Power System Solution Methods for Steady State Power Flow, Construction of Base Cases for conducting Studies regarding Planning, Real-Time and Post Event Studies in Appropriate Software.
Power System Planning – I & II	Principles of Planning, Types of Planning, Planning Process & Procedure, Types of Studies Conducted, Designing of Base Cases, Planning Committees, Transmission Planning Criteria, Relevant Regulations

Power System Protection I & II	Philosophy of Protection, National and International Standards of Protection, Bus Bar Protection, Transmission Line Protection, Zones, Relay Characteristics
	Generator Protection, HVDC, FACTS Devices, Renewable etc, Post Despatch Analysis using Disturbance Recorder, Fault Signature Analysis
Power System Stability – I & II	Stability Definition, Types of Power System Stability, Operating States, Power-Angle Relationship, Stable vs Unstable Systems, SPS, Islanding Schemes, National and International Practices
Utilization of PMUs I & II	Fundamentals of PMUs, Phasor Estimation Techniques, Signature of Fault and other grid events, Basics of data analytics and Mathematics based on PMU signals, Oscillations
	Application of PMU data for System Analysis, Case - Studies, Oscillation Source Location identification with Modal Analysis, National and International Statistics
Power System Operation – I, II, III & IV	Power Flow Concepts, System Frequency Concepts, Steady State Power Flow Concepts, Steady State Voltage Control, Economic Despatch-I, Hydro Scheduling, Hazards & Safety
	Frequency Control, National and International Best Practices, Resource Optimization, Unit Commitment, Economic Despatch, Area Control Error
Dynamic Studies – I, II, III & IV	Dynamic Simulation Overview and Tools, High Level Overview of Dynamic Systems
	Modeling of Power Plant Components, HVDCs, FACTs etc.
	Modeling of Renewable Resources
	Power System Model Validation Concepts, Tuning of Various Equipment Parameters viz. Governor, Exciter, PSS etc.
Transient Studies I & II	Importance of Transient Studies, Preparation of Base Cases, Discussion on Modeling of Equipment, Electromagnetic Transient Studies, Transformers, Faults and Protection, Induction Machines, Power Electronic & FACTS Devices, Generators, Power Quality etc.
	Case Studies, Hands-on Training on Appropriate Software, National and International Standard on Transient Studies
Power System Resiliency I & II	Difference between Reliability and Resiliency, Enhancing Resiliency, Cost Benefit Analysis for Resiliency, Disaster Management, Emergency Restoration Systems, National and International Standards for Resiliency, Case Studies

Power System Restoration – I & II	Philosophy of Power System Restoration, Restoration Approaches, Assessment, Islanding and SPS Design, Automatic Load Restoration, Hunting, Limitations, Black Start, Grid Disturbance Case Studies, Do's and Don'ts in Power System Restoration, National and International Standards
Resource Adequacy Framework & International Practices	Resource Adequacy Planning and Reserve Estimation, Best National and International Practices, Methodology, Technology and Human Resource Requirement
Optimization Techniques & Tools	Optimization Techniques, Different Types of Mathematical Methods, Tools such as PLEXOS, GAMS, MATLAB, Python etc, Case Studies

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REGISTRATION FORM

Paste your recent self attested passport size colour photograph

1. NAME OF THE CANDIDATE : _____
(IN BLOCK LETTERS) _____
2. DESIGNATION : _____
3. ORGANISATION : _____
4. FATHER'S NAME : _____
5. DATE OF BIRTH(dd/mm/yyyy) : ____/____/____
6. GENDER (Male / Female) : _____
7. HIGHEST QUALIFICATION :

Sr. No.	Diploma / Graduate / Postgraduate	Year	Name of Institute

8. CONTACT NUMBER : _____
9. EMAIL ADDRESS : _____
10. POSTAL ADDRESS : _____

11. EXAMINATION CENTRE : Please select from the twelve centers listed in the brochure
 Preference 1..... Preference 2.....

12. DETAILS OF THE REGISTRATION FEE

a. Reference number and date of the payment through SBI Collect:
 _____ / _____

(Note: Attach the print-out of the receipt along with the application form for reference)

I agree to abide by the rules and regulations of the power system operator certification program.

(Signature of the candidate)

Certified that the candidate is employed in _____ Load despatch.

PLACE : _____ DATE : _____ Signature of LDC in-charge

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ADMIT CARD

- 1. NAME OF THE CANDIDATE : _____
(IN BLOCK LETTERS) _____
- 2. DESIGNATION : _____
- 3. ORGANISATION : _____
- 4. FATHER'S NAME : _____
- 5. DATE OF BIRTH(dd/mm/yyyy) : ____ / ____ / ____
- 6. GENDER (Male / Female) : _____

Paste your recent self attested passport size colour photograph

DATE OF EXAMINATION : 07.01.2024

ADDRESS OF THE EXAMINATION CENTRE:

(EXAMINATION COORDINATOR)

NAME:

ADDRESS:

It is certified that the above candidate appeared in the examination for Specialist level certification conducted on **07th January, 2024.**

(EXAMINATION CENTRE IN-CHARGE)