PVNGS Technical Requirements Manual (TRM)
Revision 59
Replacement Pages and Insertion Instructions

The following LDCRs are included in this change:

LDCR 12-R007 adds 3 credited incore instrument strings (locations J-07, R-09 and D-14) to implement new analysis of record for Inadvertent Loading of a Fuel Assembly. In addition, changes include requiring at least one operable detector string in all 4x4 arrays of fuel assemblies that contain 16 fuel assemblies. New TLCO Conditions B, C and D added to address action to be taken for inoperable detectors prior to 30 percent power and after initial power ascension above 30 percent power. Conforming changes were also made to the TRM Bases for this specification.

LDCR 13-R003 revises various TRM surveillance frequencies to reflect 18-month staggered test frequencies, consistent with Surveillance Test Risk-Informed Documented Evaluations (STRIDEs) PVN-I-0007, Revision 1 and PVN-O-0015, Revision 0. Specifically, TRM SRs 3.3.108.3, 3.3.108.4, 3.4.201.1, 3.5.200.4.2, 3.8.102.1 and 3.9.104.3 test frequencies are changed to 18-months on a staggered test basis.

Instructions

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Technical Requirements Manual

Revision 59
September 25, 2013

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PALO VERDE UNITS 1, 2, 3

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T3.3 INSTRUMENTATION

T3.3.102 Incore Detectors

TLCO 3.3.102 The Incore Detection System shall be OPERABLE with:

a. ≥ 75% of incore locations, and

b. ≥ 75% of all incore detectors with at least one incore detector in each quadrant at each level, and

c. Sufficient OPERABLE incore detectors to perform at least six tilt estimates with at least one tilt estimate at each of three levels, and,

d. All 4x4 arrays of fuel assemblies that contain 16 fuel assemblies must contain at least one OPERABLE incore location.

---NOTE---

1. The Incore Detection System contains 53 incore locations with 5 detectors in each fixed detector string.
2. An OPERABLE incore location consists of a fixed detector string with a minimum of three OPERABLE rhodium detectors.

APPLICABILITY: When the Incore Detection System is used for monitoring:

a. AZIMUTHAL POWER TILT,

b. Radial Peaking Factors,

c. Local Power Density,

d. DNB Margin

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
----------NOTE---------- The provisions of Specification 3.0.100.3 are not applicable. ---------- A. Incore Detection System inoperable per TLCO 3.3.102.a, b, or c above.	A.1 Do not use the Incore Detection System for monitoring or calibration functions.	Immediately
B. Incore Detector System inoperable per TLCO 3.3.102.d prior to initial power ascension above 30% power.	B.1.1 Evaluate the ability of the incore detector system to detect average power asymmetry of at least 10% between quadrant 4x4 groups of assemblies with the actual operable incore detector pattern. AND B.1.2 Make suitable adjustments to COLSS and CPCS to assure conservative indications of the DNBR and Peak Linear Heat Rate margins.	Prior to initial power ascension above 30% power

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Incore Detector System inoperable per TLCO 3.3.102.d after initial power ascension above 30% power.	C.1.1 Evaluate the ability of the incore detector system to detect average power asymmetry of at least 10% between quadrant 4x4 groups of assemblies with the actual operable incore detector pattern. AND C.1.2 Make suitable adjustments to COLSS and CPCS to assure conservative indications of the DNBR and Peak Linear Heat Rate margins.	Within 7 EFPD
D. Required Action and/or associated Completion Time of condition B or C not met.	D.1 Enter TLCO 3.0.100.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
TSR 3.3.102.1 Perform a CHANNEL CHECK.	Within 7 days prior to use
TSR 3.3.102.2 ----------NOTE---------- Neutron Detectors may be excluded from the CHANNEL CALIBRATION but all electronic components shall be included. Fixed incore neutron detectors shall be calibrated prior to installation in the reactor core. ---------- Perform a CHANNEL CALIBRATION.	18 months

SURVEILLANCE REQUIREMENTS

----------NOTE----------
Surveillance Requirements for RU-145 are specified in the ODCM.

SURVEILLANCE		FREQUENCY
TSR 3.3.108.1	Perform a CHANNEL CHECK on RU-31.	12 hours
TSR 3.3.108.2	Perform a CHANNEL FUNCTIONAL TEST on RU-31 to include that the setpoint is ≤ 15 mR/hr and the measurement range is 10E-1 to 10E+4 mR/hr.	92 days
TSR 3.3.108.3	----------NOTE---------- Testing of Actuation Logic shall include verification of the proper operation of each actuation relay. --- Perform a CHANNEL FUNCTIONAL TEST on required FBEVAS Actuation Logic channel.	18 months on a STAGGERED TEST BASIS
TSR 3.3.108.4	Perform a CHANNEL FUNCTIONAL TEST on required FBEVAS Manual Trip logic.	18 months on a STAGGERED TEST BASIS
TSR 3.3.108.5	Perform a CHANNEL CALIBRATION on RU-31.	18 months

T3.4 REACTOR COOLANT SYSTEM (RCS)

T3.4.201 Pressurizer

TLCO 3.4.201 Refer to PVNGS Improved Technical Specifications 3.4.9.

APPLICABILITY: Refer to PVNGS Improved Technical Specifications 3.4.9.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of TSR 3.4.201.1 not met.	A.1 Document the condition in accordance with the PVNGS corrective action program and initiate an operability determination, as necessary, to determine the impact on equipment in the technical specifications.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.4.201.1	The emergency power supply for the pressurizer heaters shall be demonstrated OPERABLE by verifying that on an Engineered Safety Features Actuation test signal concurrent with a loss-of-offsite power: The pressurizer heaters are automatically shed from the emergency power sources and; The pressurizer heaters can be reconnected to their respective buses manually from the control room.	18 months on a STAGGERED TEST BASIS

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
TSR 3.5.200.1 ----------NOTE---------- Nitrogen vent valves may be cycled as necessary to maintain the required nitrogen cover pressure in accordance with PVNGS Improved Technical Specifications 3.5.1 and 3.5.2. ---------- Verify the required safety injection tank nitrogen vent valves are closed when pressurizer pressure is ≥ 430 psia.	12 hours
TSR 3.5.200.2 ----------NOTE---------- Nitrogen vent valves may be cycled as necessary to maintain the required nitrogen cover pressure in accordance with PVNGS Improved Technical Specifications 3.5.1 and 3.5.2. ---------- Verify that power is removed from the required nitrogen vent valves when pressurizer pressure is ≥ 1500 psia.	31 days
TSR 3.5.200.3 Verify that the SIT nitrogen vent valves can be opened when the SITS are isolated.	18 months
TSR 3.5.200.4 Verify that each safety injection tank isolation valve opens automatically under each of the following conditions:	
1. Prior to exceeding an actual or simulated RCS pressure signal of 515 psia, and	18 months
2. Upon receipt of a safety injection actuation (SIAS) test signal	18 months on a STAGGERED TEST BASIS

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SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.8.102.1	Perform a CHANNEL FUNCTIONAL TEST of the bypass circuitry for those thermal overloads which are normally in force during plant operation and bypassed under accident conditions.	18 months on a STAGGERED TEST BASIS AND Following maintenance on the valve motor starter
TSR 3.8.102.2	Verify that the thermal overload protection is bypassed for those thermal overloads which are continuously bypassed and temporarily placed in force only when the valve motors are undergoing periodic or maintenance testing.	18 months AND Following maintenance on the valve motor starter AND Following any periodic testing during which the thermal overload device was temporarily placed in force.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.9.104.1	Operate each FBEVS train for at least 15 minutes.	31 days
TSR 3.9.104.2	Perform required Fuel Building Essential Ventilation filter testing in accordance with the TRM Ventilation Filter Testing Program (VFTP) (Reference TRM 5.0.500.11).	In accordance with the TRM VFTP
TSR 3.9.104.3	Verify each FBEVS train actuates on an actual or simulated signal and directs it exhaust bank through the HEPA filters and charcoal adsorber banks.	18 months on a STAGGERED TEST BASIS
TSR 3.9.104.4	Verify one FBEVS train can maintain a measurable negative pressure with respect to atmospheric pressure, during operation.	18 months on a STAGGERED TEST BASIS.

Pressure Sensor Response Time Testing Requirements," provides the basis and methodology for using allocated sensor response times in the overall verification of the channel response time for specific sensors identified in the Topical Report. Response time verification for other sensor types must be demonstrated by test. The allocation of sensor response times must be verified prior to placing a new component in operation and reverified after maintenance that may adversely affect the sensor response time.

T3.3.101 Radiation Monitoring Instrumentation

The OPERABILITY of the radiation monitoring channels ensures that: (1) the radiation levels are continually measured in the areas served by the individual channels and (2) the alarm or automatic action is initiated when the radiation level trip setpoint is exceeded.

T3.3.102 Incore Detectors

The OPERABILITY of the incore detectors with the specified minimum complement of equipment per TLCO 3.3.102.a, b, and c ensures that the measurements obtained from use of this system accurately represent the spatial neutron flux distribution of the reactor core.

The OPERABILITY of the incore detectors with the specified minimum complement of equipment per TLCO 3.3.102.a, b, and d prior to exceeding 30% power after refueling ensures that the assumptions supporting the Inadvertent Loading of a Fuel Assembly analysis are met. The provisions of TLCO 3.0.100.3 apply given that the actual detector compliment may, with specific analysis, be shown to be able to detect a misloaded fuel assembly.

As an alternative to a specific analysis, performing CEA Symmetry checks for at least one CEA group having a CEDM above the 4x4 array of fuel assemblies for each 4x4 not in compliance with TLCO 3.3.102 Condition B is an alternative method of verifying that the assumptions supporting the Inadvertent Loading of a Fuel Assembly are met. This testing is done at Hot Zero Power, xenon free conditions.

The OPERABILITY of the incore detectors with the specified minimum complement of equipment per TLCO 3.3.102.a, b, and d after exceeding 30% power after refueling ensures that the assumptions supporting the Inadvertent Loading of a Fuel Assembly analysis are met. There are misloadings that are not detectable at beginning of cycle. These misloadings become detectable over time with a slowly changing deviation from predicted power distribution. Therefore, the

(continued)

specified minimum complement of equipment per TLCO 3.3.102.a, b, and d requires monitoring during the cycle. The slow rate of change in the power distribution factors into the Completion Time and the applicability of TLCO 3.0.100.3. Specific analysis may show that a misloaded fuel assembly is detectable given the actual equipment configuration and core conditions.

T3.3.103 Seismic Monitoring

The OPERABILITY of the seismic instrumentation ensures that sufficient capability is available to promptly determine the magnitude of a seismic event and evaluate the response of those features important to safety. This capability is required to permit comparison of the measured response to that used in the design basis for the facility to determine if plant shutdown is required pursuant to Appendix A of 10 CFR Part 100. The instrumentation is consistent with the recommendations of Regulatory Guide 1.12, "Nuclear Power Plant Instrumentation for Earthquakes," Revision 2 as identified in the PVNGS FSAR.

T3.3.104 Meteorological Instrumentation

The OPERABILITY of the meteorological instrumentation ensures that sufficient meteorological data are available for estimating potential radiation doses to the public as a result of routine or accidental release of radioactive materials to the atmosphere. This capability is required to evaluate the need for initiating protective measures to protect the health and safety of the public and is consistent with the recommendations of Regulatory Guide 1.23 "Onsite Meteorological Programs," February 1972. Wind speeds less than 0.6 MPH cannot be measured by the meteorological instrumentation.

Surveillance requirement TSR 3.3.104.2 is modified by a NOTE to indicate that the windspeed sensors are excluded from the CHANNEL CALIBRATION. The device is fixed by design and no adjustments are possible.

T3.3.105 Post Accident Monitoring Instrumentation

The OPERABILITY of the post-accident monitoring instrumentation ensures that sufficient information is available on selected plant parameters to monitor and assess these variables following an accident. This capability is consistent with the recommendations of Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Plants to Assess Plant Conditions During and Following an Accident," December 1975 and NUREG 0578, "TMI-2 Lessons Learned Task Force Status Report and Short-Term Recommendations."

(continued)

TRM SPECIFICATION BASES

T3.3.106 Loose-Part Detection Instrumentation

The OPERABILITY of the loose-part detection instrumentation ensures that sufficient capability is available to detect loose metallic parts in the primary system and avoid or mitigate damage to primary system components. The allowable out-of-service times and surveillance requirements are consistent with the recommendations of Regulatory Guide 1.133, "Loose-Part Detection Program for the Primary System of Light-Water-Cooled Reactors," May 1981.

T3.3.107 Explosive Gas Monitoring System

The explosive gas instrumentation is provided for monitoring (and controlling) the concentrations of potentially explosive gas mixtures in the GASEOUS RADWASTE SYSTEM. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.

T3.3.108 Fuel Bldg Essential Ventilation Actuation Signal (FBEVAS)

The FBEVAS is an instrumentation channel that actuates the Fuel Building Essential Ventilation System (FBEVS) to minimize radioactive material released from an irradiated fuel assembly during a Fuel Handling Accident.

TLCO 3.3.108 requires one channel of FBEVAS which includes the Actuation Logic, Manual Trip, and radiation monitor to be OPERABLE. The cross-train trip function is provided as a defense-in-depth capability and is not required for FBEVAS channel operability.

During movement of irradiated fuel assemblies in the fuel building with the required FBEVAS channel inoperable, an OPERABLE FBEVS train must be immediately placed in the emergency mode of operation (i.e., fan running, valves/dampers aligned to the post-FBEVAS mode, etc.) or movement of irradiated fuel assemblies must be suspended immediately. The first action ensures that no undetected failures preventing FBEVS system operation will occur, and that any active failure will be readily detected. If an OPERABLE FBEVS train is not placed in the emergency mode of operation, this action requires suspension of the movement of irradiated fuel assemblies in order to minimize the risk of release of radioactivity that might require the actuation FBEVS. This does not preclude the movement of fuel to a safe position.

Movement of spent fuel casks containing irradiated fuel assemblies is not within the scope of the Applicability of this technical specification. The

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movement of dry casks containing irradiated fuel assemblies will be done with a single-failure-proof handling system and with transport equipment that would prevent any credible accident that could result in a release of radioactivity.

T3.3.200 RPS Instrumentation - Operating
(See the ITS 3.3.1 Specification Bases.)

If a valid CPC cabinet high temperature alarm is received, it is possible for an OPERABLE CPC and CEAC to be affected and not be completely reliable. Therefore, a CHANNEL FUNCTIONAL TEST must be performed on OPERABLE CPCs and CEACs within 12 hours. The Completion Time of 12 hours is adequate considering the low probability of undetected failure, the consequences of a single channel failure, and the time required to perform a CHANNEL FUNCTIONAL TEST.

T3.4.100 Auxiliary Spray System

The auxiliary pressurizer spray is required to depressurize the RCS by cooling the pressurizer steam space to permit the plant to enter shutdown cooling. The auxiliary pressurizer spray is required during those periods when normal pressurizer spray is not available, such as during natural circulation and during the later stages of a normal RCS cooldown. The auxiliary pressurizer spray also distributes boron to the pressurizer when normal pressurizer spray is not available.

T3.4.101 RCS Chemistry

The limitations on Reactor Coolant System chemistry ensure that corrosion of the Reactor Coolant System is minimized and reduces the potential for Reactor Coolant System leakage or failure due to stress corrosion. Maintaining the chemistry within the Steady State Limits provides adequate corrosion protection to ensure the structural integrity of the Reactor Coolant System over the life of the plant. The associated effects of exceeding the oxygen, chloride, and fluoride limits are time and temperature dependent. Corrosion studies show that operation may be continued with contaminant concentration levels in excess of the Steady State Limits, up to the Transient Limits, for the specified limited time intervals without having a significant effect on the structural integrity of the Reactor Coolant System. The time interval permitting continued operation within the restrictions of the Transient Limits provides time for taking corrective actions to restore the contaminant concentrations to within the Steady State Limits.

(continued)

TRM SPECIFICATION BASES

The surveillance requirements provide adequate assurance that concentrations in excess of the limits will be detected in sufficient time to take corrective action.

T3.4.102 Pressurizer Heatup and Cooldown Limits

The limitations imposed on the pressurizer heatup and cooldown rates and spray water temperature differential are provided to assure that the pressurizer is operated within the design criteria assumed for the fatigue analysis performed in accordance with the ASME Code Requirements.

T3.4.103 Intentionally Blank

T3.4.104 RCS Vents (Reactor Head Vents)

Reactor Coolant System vents are provided to exhaust noncondensible gases and/or steam from the primary system that could inhibit natural circulation core cooling. The OPERABILITY of at least one Reactor Coolant System vent path from the reactor vessel head ensures the capability exists to perform this function.

A vent path is the flow capability from the reactor vessel head to the reactor drain tank (RDT) or from the reactor vessel head to containment atmosphere. The four vent paths are:

1. From the reactor vessel head through solenoid operated valve (SOV) HV-101, then through SOV HV-105 to the RDT.
2. From the reactor vessel head through SOV HV-101, then through SOV HV-106 directly to containment atmosphere.
3. From the reactor vessel head through SOV HV-102, then through SOV HV-105 to the RDT.
4. From the reactor vessel head through SOV HV-102, then through SOV HV-106 directly to containment atmosphere.

The valve redundancy of the Reactor Coolant System vent paths serves to minimize the probability of inadvertent or irreversible actuation while ensuring that a single failure of a vent valve, power supply, or control system does not prevent isolation of the vent path.

The function, capabilities, and testing requirements of the Reactor Coolant System vent systems are consistent with the requirements of Item II.B.1 of NUREG-0737.

(continued)

TRM SPECIFICATION BASES

T3.4.200 RCS Pressure and Temperature (P/T) Limits
(See the ITS 3.4.3 Specification Bases.)

T3.4.201 Pressurizer

An OPERABLE pressurizer provides pressure control for the Reactor Coolant System during operations with both forced reactor coolant flow and with natural circulation flow. The minimum water level in the pressurizer assures the pressurizer heaters, which are required to achieve and maintain pressure control, remain covered with water to prevent failure, which could occur if the heaters were energized uncovered. The maximum water level in the pressurizer ensures that this parameter is maintained within the envelope of operation assumed in the safety analysis. The maximum water level also ensures that the RCS is not a hydraulically solid system and that a steam bubble will be provided to accommodate pressure surges during operation. The steam bubble also protects the pressurizer code safety valves against water relief. The requirement to verify that on an Engineered Safety Features Actuation test signal concurrent with a loss-of-offsite power the pressurizer heaters are automatically shed from the emergency power sources is to ensure that the non-Class 1E heaters do not reduce the reliability of or overload the emergency power source. The requirement that a minimum number of pressurizer heaters be OPERABLE enhances the capability to control Reactor Coolant System pressure and establish and maintain natural circulation.

T3.4.202 Pressurizer Vents
(See the ITS 3.4.12 specification Bases.)

T3.4.203 RCS Operational LEAKAGE
(See the ITS 3.4.14 Specification Bases.)

T3.4.204 RCS PIV Leakage
(See the ITS 3.4.15 Specification Bases.)

T3.5.200 Safety Injection Tanks
(See the ITS 3.5.1 and 3.5.2 Specification Bases.)

T3.5.201 Shutdown Cooling System

The OPERABILITY of two separate and independent shutdown cooling subsystems ensures that the capability of initiating shutdown cooling exists when required assuming the most limiting single failure occurs. The requirement to verify the functionality of an inoperable shutdown cooling subsystem minimizes the time exposure of the plant to an event requiring shutdown concurrent with the failure of a component on the other shutdown cooling subsystem.

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TRM SPECIFICATION BASES

The shutdown cooling subsystem operation is described in UFSAR 5.4.7. Many of the components comprising the shutdown cooling system have specific requirements during Modes 1-3 in the Technical Specifications (e.g., emergency core cooling, containment spray, and containment isolation). However, several components do not have specific operability requirements in Technical Specifications, and some components function differently in their shutdown cooling role than they do when performing the other functions required by Technical Specifications. These factors must be considered when determining the OPERABILITY and/or functionality of the shutdown cooling subsystems.

The safety analysis assumes that shutdown cooling may be placed in operation once cold leg temperature is less than or equal to 350°F and pressurizer pressure is less than approximately 400 psia. Additional information regarding the shutdown cooling system is in UFSAR Section 9.3.4. Since the subsystem is manually initiated, temporary changes in the position of shutdown cooling system valves from their normal line up do not necessarily make them inoperable with respect to their shutdown cooling safety function.

The action for one shutdown cooling subsystem inoperable requires verification that the inoperable subsystem is still functional. Functionality requires the subsystem to be capable of performing its safety function given a transient (e.g. Small Break LOCA, SGTR). Functionality will be established utilizing the Operability Determination Program. The allowed outage time is consistent with the durations permitted for those major shutdown cooling components whose operability is controlled by Technical Specifications. The specified outage time allows a reasonable opportunity to effect repairs while providing acceptable limits for the duration of intervals where the system may not be OPERABLE. In combination with the maintenance rule requirements in 10 CFR 50.65, the allowed outage times help ensure that the shutdown cooling subsystems will be functional when required.

If the subsystem cannot be restored or functionality verified within the stated time frame, the associated ACTION places the unit in Mode 4 where the steam generators are still available for heat removal and the stored energy of the NSSS is much less than it is during power operation. While in Modes 3 and 4 continued actions to restore the subsystem to OPERABLE are required.

The action for both shutdown cooling subsystems inoperable require verification of functionality of at least one subsystem within 7 hours. The shorter duration is consistent with the increased safety consequences that exist when the equipment required to establish cold shutdown conditions is

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inoperable. If at least one subsystem cannot be restored or verified functional within 7 hours, the associated ACTION again places the unit in Mode 4 where the steam generators are available for heat removal and the stored energy in the NSSS is minimized. While in Mode 3 and 4 continued actions to restore the required subsystems to OPERABLE are required.

The surveillance requirement to place each train of shutdown cooling in service every refueling interval demonstrates that the subsystems are functional. In combination with other testing performed to support Technical Specifications, including that conducted as part of the in-service testing and inspection programs, the specified surveillances provide reasonable assurance that the system will be able to perform its intended safety functions.

The SDC systems are normally in a standby, nonoperating mode. As such, flow path piping has the potential to develop voids and pockets of entrained gases. The method of ensuring that any voids or pockets of gases are removed from the shutdown cooling suction piping is to vent the accessible suction piping high points, which is controlled by PVNGS procedures. Maintaining the shutdown cooling system suction piping full of water ensures the system will perform properly by minimizing the potential for degraded pump performance, preventing pump cavitation, and preventing pumping of noncondensible gas (e.g., air, nitrogen, or hydrogen) into the reactor vessel during SDC. The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the SDC piping and the adequacy of the procedural controls governing system operation.

References:

1. UFSAR Sections 5.4.7 and 9.3.4

2. Combustion Engineering Owners Group Joint Applications Report for Low Pressure Safety Injection System AOT Extension, CE NPSD-995, dated May 1995, as submitted to NRC in APS letter no. 102-03392, dated June 13, 1995, with updates described in letter no. 102-04250 dated February 26, 1999. Also see TS amendment no. 124 dated February 1, 2000.

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