NON-PUBLIC?: N
ACCESSION #: 9410130105
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Catawba Nuclear Station, Unit 2 PAGE: 1 OF 6

DOCKET NUMBER: 05000414

TITLE: Reactor Trip Due to Closure of a Main Steam Isolation
Valve
EVENT DATE: 09/13/94 LER #: 94-006-00 REPORT DATE: 10/04/94

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Dan P. Kimball, Safety Review
Group TELEPHONE: (803) 831-3743
Manager

COMPONENT FAILURE DESCRIPTION:
CAUSE: F SYSTEM: SB COMPONENT: RLY MANUFACTURER: C770
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On September 13, 1994, at 1854 hours, Unit 2 was in Mode 1, Power
Operation at 100% power, when an automatic Reactor/Turbine Trip occurred
on Over Power Differential Temperature after the Main Steam Isolation
Valve (MSIV) for "C" Steam Generator closed unexpectedly. Following the
trip, a main feedwater system isolation occurred as a result of a Reactor
Trip with low Reactor Coolant System average temperature. Auxiliary
Feedwater (CA) System motor driven and turbine driven pumps autostarted
as expected, due to lo-lo Steam Generator levels. Letdown isolation
occurred due to Pressurizer level decreasing below 17% as a result of
cooldown caused by CA system operation. The root cause of this event is
equipment failure. The MSIV closure was caused by the failure of an
auxiliary relay in the control circuit for the MSIV. A short circuit
occurred in a normally energized coil in a Series D26 Cutler Hammer

relay. Corrective actions included replacing the relay and evaluating the failure rate of these types of relays to determine if similar relays needed to be replaced. Engineering concluded that this failure was a random failure. During the event, the control room operators entered the correct emergency response and abnormal procedures and performed the required steps to maintain the plant in a safe shutdown condition. All safety systems responded as designed to shutdown the Reactor and maintain it in a safe shutdown condition.

END OF ABSTRACT

BACKGROUND

Main Steam Isolation Valves EIIS:V! (MSIV) provide steam isolation for the Steam Generators EIIS:SG! (S/Gs) during shutdown and accident conditions.

The Power Operated Relief Valves (PORVs) provide a flow path for Reactor Coolant System EIIS:AB! (NC) heat removal when the MSIVs are closed. The PORVs also minimize the operation of the S/G safety valves. There is one PORV per S/G providing 10% Main Steam EIIS:SB! (SM) flow capacity.

The Main Steam Vent to Atmosphere System EIIS:SA! (SV) S/G safety valves provide over pressure protection for SM. There are five valves per steam line that provide 100% steam relief capacity.

The Main Feedwater EIIS:SJ! (CF) system consists of two steam driven feedwater pumps EIIS:P!, two stages of high pressure feedwater heaters EIIS:HTR! (A and B), piping EIIS:PSP!, valves, and instrumentation. Normally, both feedwater pumps will be operating with each pump handling half the feedwater flow. Downstream of the feedwater pumps, the feedwater passes through two stages of high pressure heaters to a final header where the temperature is equalized. The feedwater is then admitted to the steam generators through four steam generator feedwater lines, each of which contains a control valve and a flow nozzle EIIS:NZL!.

The purposes of the feedwater isolation signal are to initiate isolation of each steam generator and rapidly terminate feedwater flow and steam blowdown inside containment following a main steam or feedwater line break in containment, and to prevent overfilling the steam generators if for some reason the normal means of controlling steam generator level malfunctions. Feedwater isolation is activated by any one of the following signals: Safety Injection, Reactor Trip plus low average

reactor coolant temperature (T-ave less than 564 degrees F), or Hi-Hi Steam Generator level. A feedwater isolation signal closes the Feedwater Isolation Valves, Feedwater Purge Valves, Feedwater Control Valves, Feedwater Control Bypass Valves, Feedwater Preheater Bypass Valves, and Feedwater Bypass Tempering Flow Valves.

The Auxiliary Feedwater EIIS:BA! (CA) System assures sufficient feedwater supply to the steam generators in the event of loss of the CF System, to remove primary coolant stored and residual core energy. The system is designed to start automatically in the event of loss of offsite electrical power, trip of both CF pumps, Safety Injection signal, or lo-lo steam generator water level; any of which may result in, coincide with, or be caused by a Reactor Trip. In addition, the CA System will supply sufficient feedwater flow to maintain the Reactor EIIS:RCT! at hot standby for two hours followed by cooldown of the NC System to the temperature at which the Residual Heat Removal EIIS:BP! (ND) System may be operated.

The purpose of the Pressurizer EIIS:PZR! is to control the NC System pressure. In the Pressurizer water and steam are maintained in equilibrium by electrical heaters and water spray. Steam can be formed (by the heaters) or condensed (by the spray) to reduce pressure variations due to contraction and expansion of the Reactor Coolant. The liquid level in the Pressurizer is maintained by level transmitters EIIS: LT! which provide signals for use in the Reactor Coolant and Protection System, the Safety Injection EIIS:BQ! (NI) System and the Chemical and Volume Control EIIS:CB! (NV) System. Each transmitter provides an independent high water level signal that is used to actuate an alarm EIIS:ALM! and, upon 2 out of 3 coincident alarms, will cause a Reactor Trip. The transmitters also provide independent low water level signals that will activate an alarm. If the liquid level falls to a fixed low level alarm setpoint, it will trip the Pressurizer heaters "off" and close the letdown line isolation valves.

The Over Power Differential Temperature (OPDT) trip setpoint protects against excessive fuel centerline temperature. The OPDT is continuously calculated by analog circuitry for each loop and depends on the temperature in the loop and the neutron flux distribution in the Reactor.

The Reactor Protection System EIIS:JC! (IPX) is designed to trip the Reactor or actuate appropriate safeguards equipment in time to prevent violating any plant safety limits. A Reactor Trip signal is generated when 2/4 NC system loops have exceeded their calculated OPDT setpoint.

EVENT DESCRIPTION

September 13, 1994 Unit 2 was in Mode 1, Power Operation, at 100% power.

1854:02 hours S/G "C" MSIV began going closed.

1854:04 hours S/G "C" MSIV was completely closed.

1854:12 hours An automatic Reactor Trip occurred on Unit 2 due to two out of four NC System loops exceeding OPDT setpoint. Main Turbine EIIS:TRB! tripped as a result of the Reactor Trip.

1854:24 hours CA System Motor EIIS:MO! Driven Pumps autostarted due to lo-lo level in two out of four channels in one S/G.

1854:30 hours CA System Turbine Driven Pump autostarted due to lo-lo level in two out of four channels in two S/G's.

1854:37 hours CF System isolation occurred due to Reactor Trip with low T-ave (below 564 degrees Fahrenheit)

1900:46 hours Letdown isolated due to Pressurizer level decreasing below 17% as a result of the cooldown caused by CA System operation.

1905:26 hours Pressurizer level returned to above 17% level.

1906 hours S/G levels had stabilized.

September 14, 1994 Instrument and Electrical(IAE) determined the unexpected closure of the MSIV was caused by the failure of an auxiliary relay EIIS:RLY! in the control circuit for the MSIV. A short occurred in a normally energized coil EIIS:CL! in a type Series D26 Cutler Hammer relay. IAE replaced the faulty relay and successfully tested the control circuit.

CONCLUSION

The Reactor Trip was due to OPDT setpoints being exceeded as a result of the unexpected closure of MSIV for "C" S/G. The closure of the MSIV was due to the failure of an auxiliary relay in the control circuitry for the MSIV. A short circuit occurred in a normally energized coil in a Series D26 Cutler Hammer relay. Engineering conducted an evaluation of the relay failure and concluded that it was a random failure based on trending that Engineering has been performing on these types of Cutler Hammer relays. The trending (data from Duke Power and Industry events) indicated that these types of relays did not have a high failure rate which resulted in Engineering deciding not to replace any similar type relays. Engineering performed a thermography scan on identical relays in other cabinets and no problems were identified. The relay failure is NPRDS reportable.

During this event, Control Room Operators (CROs) entered the correct emergency response and abnormal procedures and performed the required steps to maintain the plant in a safe shutdown condition. All safety systems responded as designed.

A review of the Operating Experience Program database for the 24 months prior to this event did not identify any Reactor Trips that were attributed to relay failures; therefore, this event is considered not to be recurring.

CORRECTIVE ACTION

IMMEDIATE

1) CROs entered procedure EP/2/A/5000/E-0, Reactor Trip or Safety Injection, to verify the plant responded properly and to assess plant conditions.

2) CROs entered procedure EP/2/A/5000/ES-0.1, Reactor Trip Response, per EP/2/A/5000/E- 0.

SUBSEQUENT

1) IAE investigated why the MSIV unexpectedly closed. IAE discovered the cause of the failure was a faulty relay. IAE replaced t
e faulty relay and successfully tested the control circuit. The work was performed under W/O 94070368-01.

2) Engineering conducted an evaluation of the relay failure and concluded that it was a random failure based on trending that Engineering performed on these type relays.

3) Engineering performed a thermography scan on identical relays in other cabinets and no problems were identified.

SAFETY ANALYSIS

This event was initiated due to an unexpected closure of main steam isolation valve 2SM3 which resulted in a Reactor/Turbine trip on Over Power Differential Temperature. These events are bounded by the Safety Analysis documented in the FSAR Sections 15.2.4, Inadvertent Closure of Main Steam Isolation Valves, and 15.2.3, Turbine Trip.

An automatic Reactor/Turbine Trip occurred on OPDT after MSIV for "C" S/G closed unexpectedly. Safety valves and the PORV on main steam line for "C" S/G opened to control pressure. Following the trip, CA system motor driven and turbine driven pumps autostarted due to lo-lo levels in " A " and " C " S/G. CF Isolation occurred due to Reactor Trip with low NC system T-ave. Letdown Isolation occurred due to Pressurizer level decreasing below 17% as a result of cooldown caused by CA system operation. S/G and pressurizer levels returned to normal. The cooldown portion of the NC system experienced during this event is bounded by the Safety Analysis in Section 15.1.5, Steam System Piping Failure.

After a review of this event, all systems responded as designed to shutdown the reactor and maintained it in a safe shutdown condition. There were no unusual releases of radioactive material.

The health and safety of the public were not affected by this event.

Duke Power Company (803)831-3000
Catawba Nuclear Station
4800 Concord Road
York, SC 29745

DUKE POWER

October 4, 1994

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Catawba Nuclear Station
Docket No. 50-414
LER 414/94-006

Gentlemen:

Attached is Licensee Event Report 414/94-006 concerning REACTOR TRIP DUE TO CLOSURE OF A MAIN STEAM ISOLATION VALVE.

This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

D. L. Rehn

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