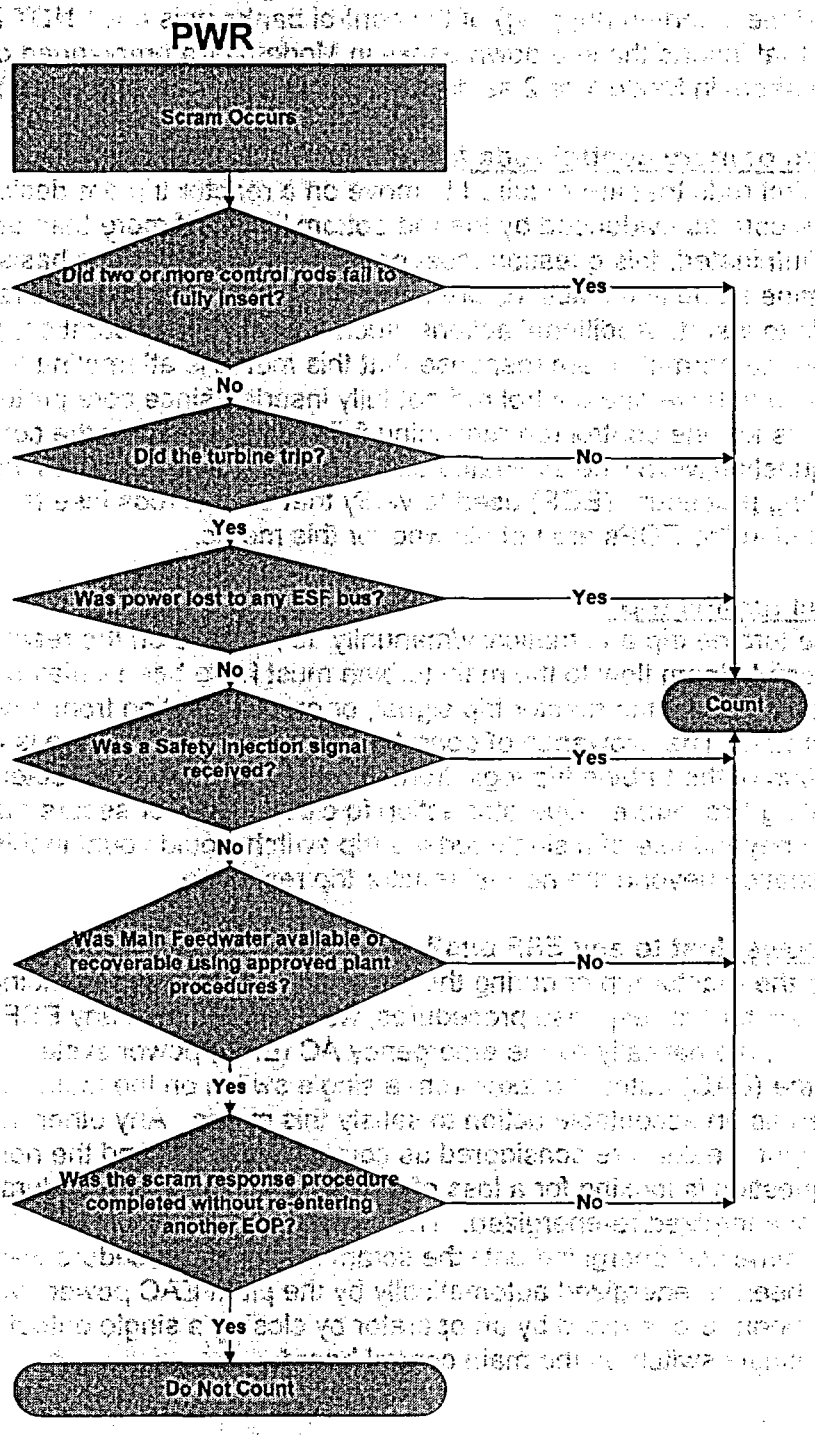
Attachment 6

Scrams with Complications (PWR)

This flow chart will provide the logic for items that count to the Indicator. A detailed explanation of each logic block is provided later in the document.



DEFFINITIONS:

Scram: (a Reactor Trip) - is any reactor trip signal which causes OR should have caused the insertion (tripping) of the control banks (this does **NOT** include a reactor trip signal that inserts the shutdown banks in Mode 3 or a preplanned opening of the reactor trip breakers in Mode 1 or 2 as directed by an approved procedure).

Did two or more control rods fail to fully insert?

All control rods that are required to move on a reactor trip are designed to fully insert into the core as evidenced by the rod bottom lights. If more than one-rod bottom light is NOT illuminated, this question must be answered "Yes". The basis of this step is to determine if additional actions are required by the operators as a result of the failure of all rods to insert. Additional actions, such as emergency boration, pose a complication beyond the normal scram response that this metric is attempting the measure. It is allowable to have one control rod not fully inserted since core protection design accounts for one control rod remaining fully withdrawn from the core on a reactor trip. This question MUST be evaluated using the criteria contained in the plant emergency operating procedure (EOP) used to verify that control rods inserted. Other means not specified in the EOPs are not allowed for this metric.

Did the turbine trip?

Did the turbine trip automatically/manually as required on the reactor trip signal? To be successful steam flow to the main turbine must have been isolated by the turbine trip logic actuated by the reactor trip signal, or operator action from a single switch or pushbutton. The allowance of operator action to trip the turbine is based on the operation of the turbine trip logic from the operator action if directed by the Emergency Operating Procedure. Operator action to close valves or secure pumps to trip the turbine beyond use of a single turbine trip switch would count in this indicator as a complication beyond the normal reactor trip response.

Was power lost to any ESF bus?

During the reactor trip or during the period operators are responding to the reactor trip using reactor trip response procedures, was power lost to any ESF bus that was not restored automatically by the emergency AC (EAC) power system. Operator action to close the (EAC) output breaker from a single switch on the main control board is allowed as an acceptable action to satisfy this metric. Any other actions beyond closing the output breaker are considered as complications beyond the normal scram response. This question is looking for a loss of power at any time for any duration where the bus was not energized/re-energized. The bus must have:

- remained energized until the scram response procedure was exited
- been re-energized automatically by the plant EAC power system (i.e., EDG)
- been re-energized by an operator by closing a single output breaker from a single switch on the main control board

The question applies to all ESF busses (switchgear, load centers, motor control centers and DC busses). This does NOT apply to 120-volt power panels. It is expected that operator action to re-energize an ESF bus would not take longer than 10 minutes.

Was a Safety Injection signal received?

Was a Safety Injection signal generated either manually or automatically during the reactor trip response? The consideration here is if the operator had to respond to abnormal conditions that required a safety injection or respond to the actuation of additional equipment that would not normally actuate on an uncomplicated scram. This question would include any condition that challenged RCS inventory, pressure, or temperature severely enough to require a safety injection. A sever steam generator tube leak that required a manual reactor trip since it was beyond the capacity of the normal at power running charging system should be counted even if a safety injection was not used since additional charging pumps were started.

Was Main Feedwater available or recoverable using approved plant procedures?

Was Main Feedwater operating and/or available during the reactor trip response? The consideration for this question is if Main Feedwater could be used to feed the steam generators if necessary. To satisfy this question the activity should be a normal "vanilla" activity that does not require unusual or extraordinary response from the operations staff. The qualifier of "recoverable using approved plant procedures" will allow a licensee to answer yes to this question if there is no physical equipment restraint to prevent the operations staff from starting the necessary equipment, aligning the required systems, or satisfying required logic using plant procedures approved for use and in place prior to the reactor trip occurring.

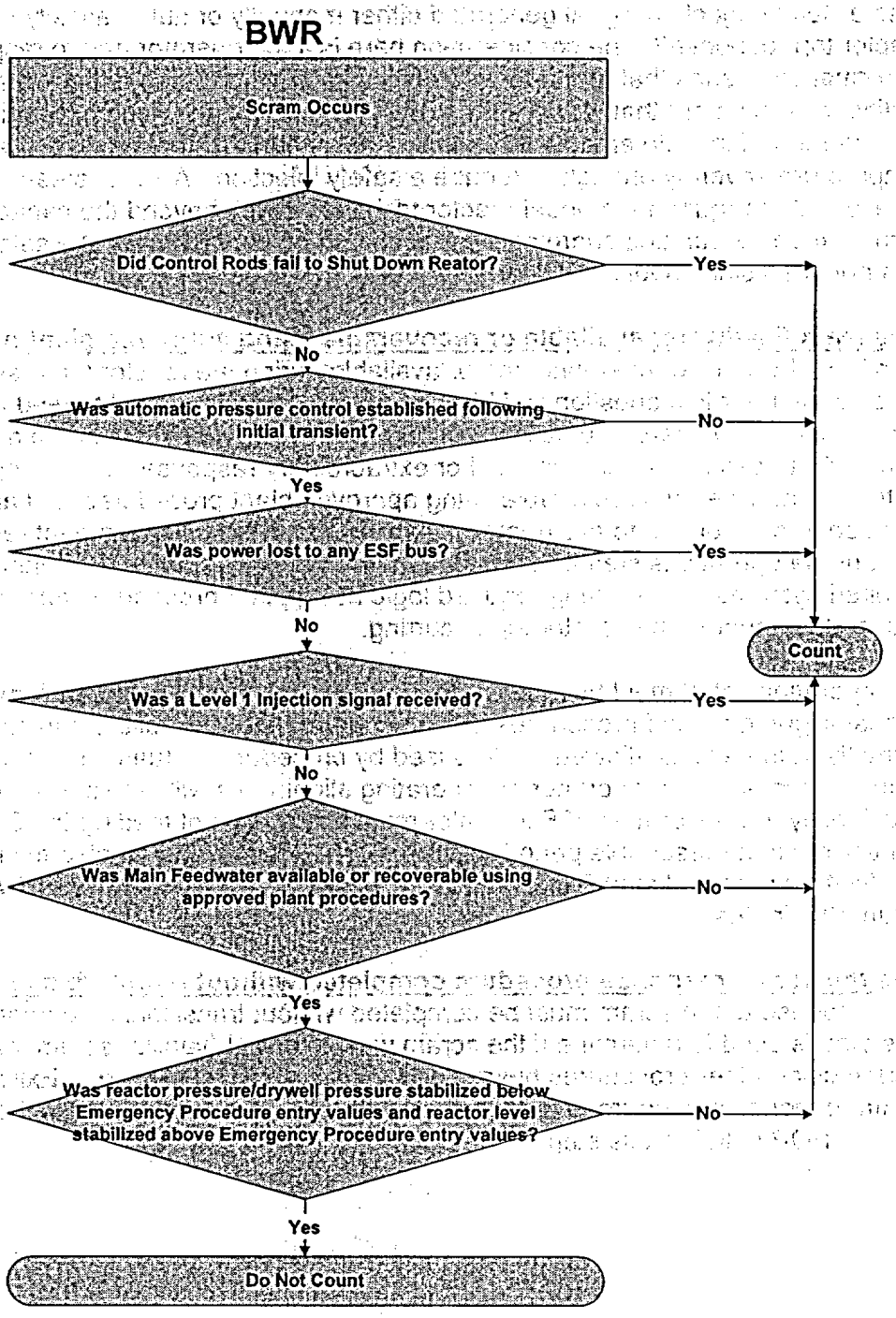
The operations staff must be able to start and operate the required equipment using normal alignments and procedures. Manual operation of controllers/equipment, even if normally automatic, is allowed if addressed by procedure. Situations that require maintenance activities or off-normal operating alignments will not satisfy this question. Additionally the restoration of Feedwater must be capable of feeding the Steam Generators in a reasonable period of time. Operations should be able to start a Main Feedwater pump and start feeding Steam Generators with the Main Feedwater System within 30 minutes.

Was the scram response procedure completed without re-entering another EOP?

The response to the scram must be completed without transitioning to another EOP. This step is used to determine if the scram was a normal "vanilla" scram that did not require using other procedures beyond the normal scram response. Exiting the normal scram response procedure to the plants normal operating procedures without using another EOP satisfies this step.

Scrams with Complications (BWR)

This flow chart will provide the logic for items that count to the Indicator. A detailed explanation of each logic block is provided later in the document.



DEFFINITIONS:

Scram: (a Reactor Trip) - is any reactor trip signal which causes OR should have caused the insertion of the control rods automatically or manually to prevent an automatic scram.

Did Control Rods fail to Shut Down Reactor ?
Withdrawn control rods are required to be inserted to or beyond position 02 or it has been determined that the reactor will remain shutdown under all conditions without boron ensure the reactor will have required shutdown margin in a cold, xenon free state.

The basis of this step is to determine if additional actions are required by the operators as a result of the failure of all rods to insert. Additional actions, such as boron injection, or requiring immediate actions to insert control rods, pose a complication beyond the normal scram response that this metric is attempting the measure. This question MUST be evaluated using the criteria contained in the plant emergency procedure (EP) used to verify that control rods inserted.

Was automatic pressure control established following the initial transient?
Did the pressure control system (turbine and bypass valves) function automatically as required? To be successful Reactor pressure must be controlled following the initial transient without the use of SRV(s). Additionally the SRV(s) cannot fail open. Failure of the pressure control system to maintain reactor pressure of failed open SRV(s) count in this indicator as a complication beyond the normal reactor trip response.

Was power lost to any ESF bus?
During the reactor trip or during the period operators are responding to the reactor trip using reactor trip response procedures, was power lost to any ESF bus that was not restored automatically by the emergency AC (EAC) power system. Operator action to close the (EAC) output breaker from a single switch on the main control board is allowed as an acceptable action to satisfy this metric. Any other actions beyond closing the output breaker are considered as complications beyond the normal scram response. This question is looking for a loss of power at any time for any duration where the bus was not energized/re-energized. The bus must have:

- remained energized until the scram response procedure was exited
- been re-energized automatically by the plant EAC power system (i.e., EDG)
- been re-energized by an operator by closing a single output breaker from a single switch on the main control board

The question applies to all ESF busses (switchgear, load centers, motor control centers and DC busses). This does NOT apply to 120-volt power panels. It is expected that operator action to re-energize an ESF bus would not take longer than 10 minutes.

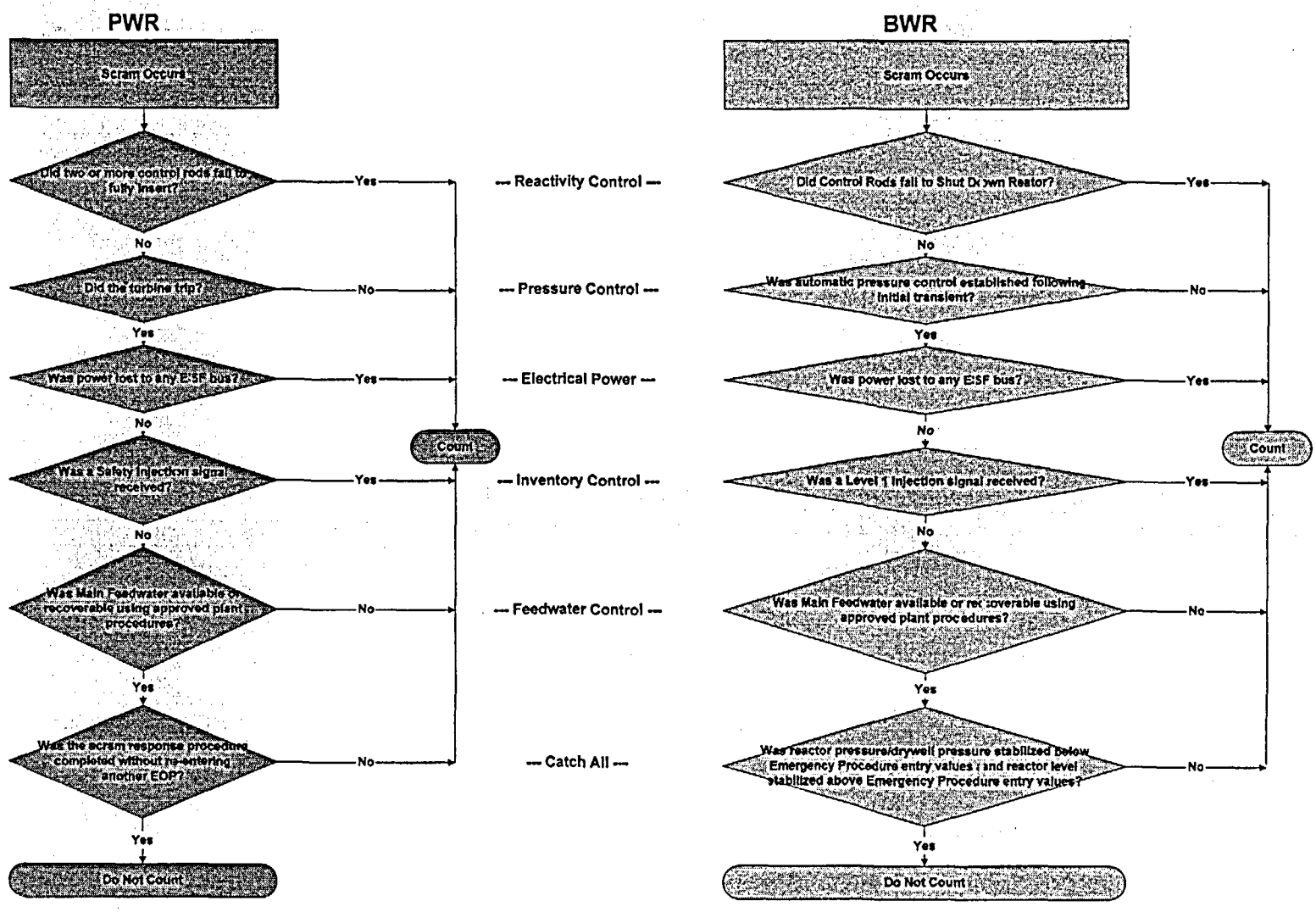
Was a Level 1 Injection signal received?
Was a Level 1Injection signal generated either manually or automatically during the reactor trip response? The consideration here is if the operator had to respond to

abnormal conditions that required a low pressure safety injection or respond to the actuation of additional equipment that would not normally actuate on an uncomplicated scram. This question would include any condition that challenged RCS inventory, or Drywell pressure severely enough to require a safety injection.

Was Main Feedwater available or recoverable using approved plant procedures?
Was Main Feedwater operating and/or available during the reactor trip response? The consideration for this question is if Main Feedwater could be used to feed the Reactor Vessel if necessary. To satisfy this question the activity should be a normal "vanilla" activity that does not require unusual or extraordinary response from the operations staff. The qualifier of "recoverable using approved plant procedures" will allow a licensee to answer yes to this question if there is no physical equipment restraint to prevent the operations staff from starting the necessary equipment, aligning the required systems, or satisfying required logic using plant procedures approved for use and in place prior to the reactor trip occurring.

The operations staff must be able to start and operate the required equipment using normal alignments and procedures. Manual operation of controllers/equipment, even if normally automatic, is allowed if addressed by procedure. Situations that require maintenance activities or off-normal operating alignments will not satisfy this question. Additionally the restoration of Feedwater must be capable of feeding the Reactor Vessel in a reasonable period of time. Operations should be able to start a Main Feedwater pump and start feeding the Reactor Vessel with the Main Feedwater System within 30 minutes.

Was reactor pressure/drywell pressure stabilized below Emergency Procedure entry values and reactor level stabilized above Emergency Procedure entry values?
This step is used to determine if the scram was a normal "simple" scram that did not require using other procedures beyond the "typical" scram response. Following the initial transient maintaining the reactor and drywell pressure below Emergency Procedure entry values while ensuring level is above Emergency Procedure entry values satisfies this step.


PWR
Scram Occurs
Did two or more control rods fail to fully insert?
Yes
No
Did the turbine trip?
No
Yes
Was power lost to any ESF bus?
Yes
No
Was a Safety Injection signal received?
Yes
No
Was Main Feedwater available or recoverable using approved plant procedures?
No
Yes
Was the scram response procedure completed without re-entering another EOP?
No
Yes
Do Not Count
Count
--- Reactivity Control ---
--- Pressure Control ---
--- Electrical Power ---
--- Inventory Control ---
--- Feedwater Control ---
--- Catch All ---
BWR
Scram Occurs
Did Control Rods fail to Shut Down Reactor?
Yes
No
Was automatic pressure control established following initial transient?
No
Yes
Was power lost to any ESF bus?
Yes
No
Was a Level 1 Injection signal received?
Yes
No
Was Main Feedwater available or recoverable using approved plant procedures?
No
Yes
Was reactor pressure/drywell pressure stabilized below Emergency Procedure entry values and reactor level stabilized above Emergency Procedure entry values?
No
Yes
Do Not Count
Count