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# Plant Status Control – with an Operational Focus.

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In the Nuclear industry, we have done a very good job of designing, developing, constructing, and improving our nuclear facilities. We have, however, often been inconsistent in documenting the details of our facilities, clearly addressing the rules around facility operation, and controlling and tracking the temporary, or permanent changes to our facilities.

The reality is, that once we build a facility, we then must operate the facility, for it to be viable. Further we must operate it safely and efficiently for the facility to produce its product, and be acceptable to the public. Unfortunately, when we design and build these large, complicated facilities, we cannot project all the nuances of facility operation, although we can recognize this potential gap, and prepare for it.

In order to allow for the complexities of the real world, we must provide the individuals who are tasked with operating our nuclear facilities, with the tools and processes to deal with "all the nuances" of facility operation.

This discussion will focus on the concepts behind a key process for ensuring that we meet our design and operating needs for our facilities, as well as recognizing and dealing with the potential gaps. The key process is "Plant Status Control", and the discussion will have a primary focus on the needs of the end users, that being the individuals that have the immediate and current accountability for control and safety of the facility, the equipment, the staff, and ultimately the public, that being our Operations staff, and the Shift Manager.

To lead us into our discussion, I'd like to introduce one concept or definition. This is the concept of "Operational Focus".

**"Operational Focus"** ***is the leadership, behaviors and results of the whole organization that make safe and reliable operation the core activity of the business***. Please sit back and think about the activities you have been involved in or decisions you have made in the past, or will make, and the potential impacts they may have on safe and reliable operation of our facilities.

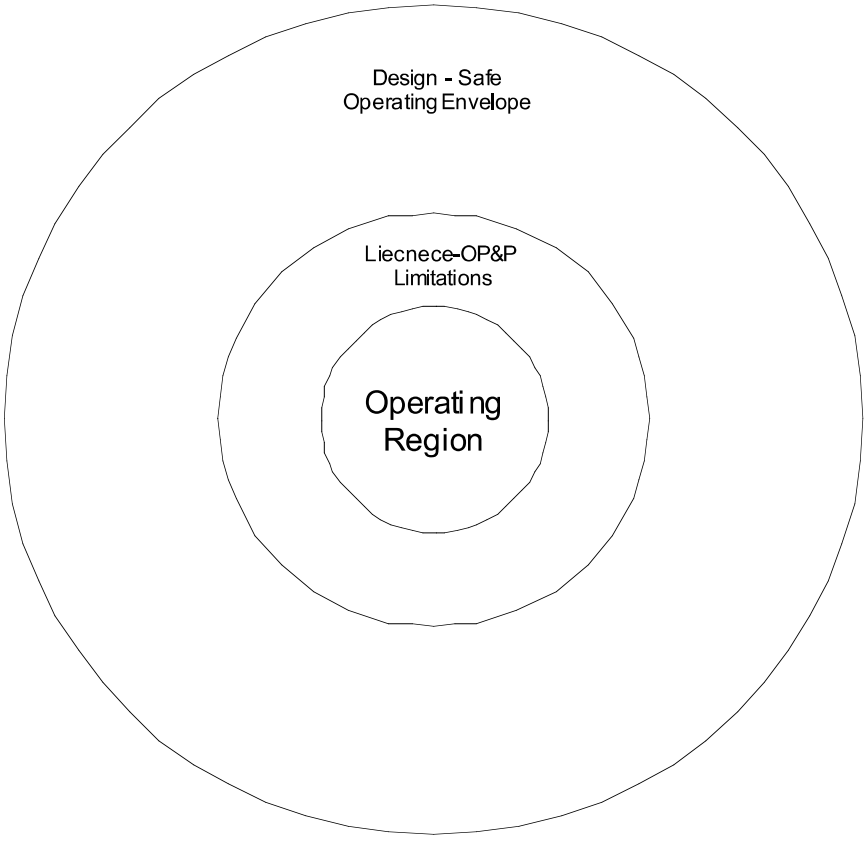
On to Plant Status Control: The ability to operate a nuclear facility safely and reliably depends on a number of criteria. Some of these are:

- Design
- Maintenance – Preventative and Corrective
- Qualified Staff – skills, knowledge, capability, Operational Focus
- Processes and Procedures – to support all business functions
- Operational Rules and Limitations
- Current State of the Facility

Plant Status Control is the process that allows our qualified staff to control the current state of the facility, and to manipulate the state of the facility within the Operational rules and limitations, laid out in our processes and procedures, as dictated by our facility design.

Within OPG-N we have addressed Plant Status Control in a piecemeal, individual process-by-process fashion in the past. We now recognize that we must clearly coordinate these different processes, i.e. Give them a cohesive Operational Focus.

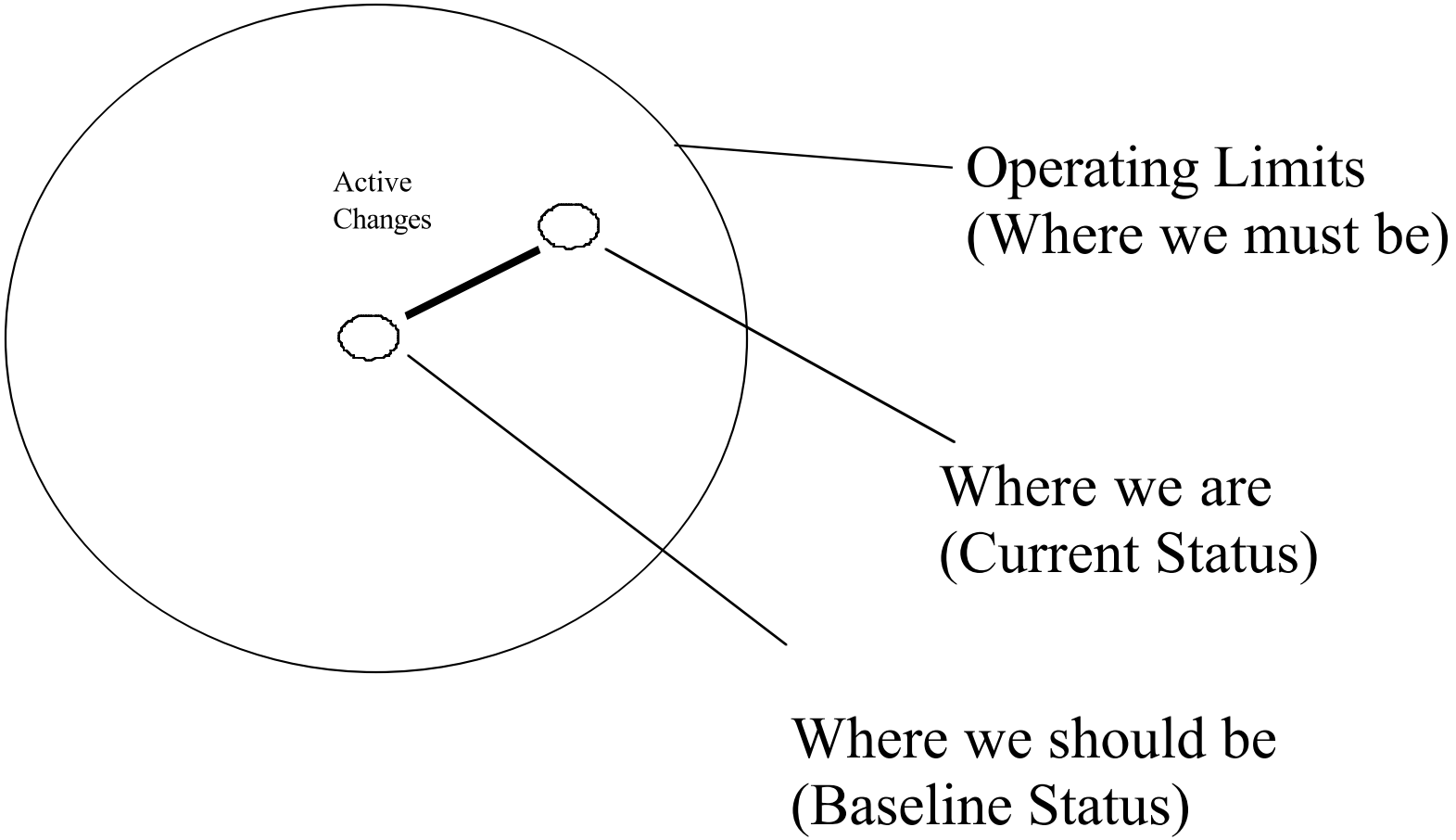
A simple model of facility operational limits will start to lay the groundwork for our process design.




Within our business, we define our operating rules and limits in this framework. In the outer ring we have the Design and analysis criteria, dictating the outer realm of safe operation.

The next ring represents our facility license, our agreement with the public, and the rules that we have put in place to ensure that we are within that boundary.

# Operational Configuration



The innermost ring represents the criteria within which normal plant operation should occur, and is dictated by our operating documentation and Operating limits.

The goal of a Plant Status Control process is to give our qualified staff the capability to ensure that the current state of the facility is within the Operating region, at all times.

Realize that the specific point at which the facility is operating, within that center ring, moves constantly, either due to controlled activities, or due to unplanned activities, such as equipment failures.

For our staff to be able to ensure that we are within that center ring, they need three things:

First**, the ring** needs to be clearly defined (Operating Limits).

Second, they need to understand **where the point is**, within the ring (Current Status).

Third, they need to control and track **what makes the point move.**

As previously stated, Operating Limits should be dictated within our facility documentation, and the plant annunciation system should support to tell us that we might encroach on the boundary.

As to where the point is, we have options.

We could track every single device position, status, and limitation all the time (a huge undertaking)

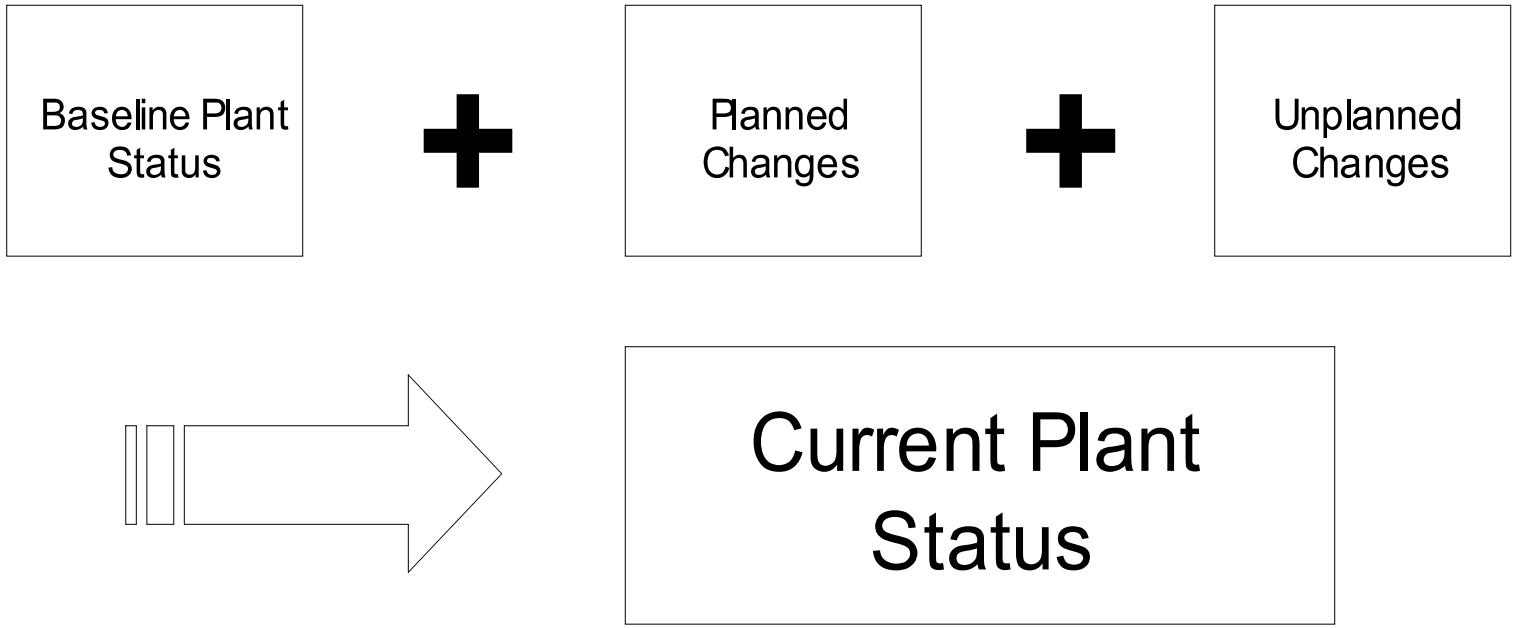
- Or –

We could establish a "Baseline Plant Status", at the center of the ring, and track any anomalies to that baseline, at any given point in time. This is the way we, within OPG-N have chosen to proceed.

We are then faced with another decision point, that being, which Plant states do we base our "Baseline" on? We could go with a basic "Cold Steel" concept, where everything is at our de-energized state, or we could go to the other extreme, which, for Generating facilities, is "High Power Operation" where everything is ideally statused to support the "High Power" state. From our perspective, since our business goal is to be an operating facility, the " High Power Operation" baseline was the obvious choice. The "Cold Steel" concept is unnatural to the facility, especially since we only ever hope to be there one more time, during final decommissioning.

Further, our Plant design and safety analysis is primarily based on an initial start from "High Power Operation".

So, now armed with an understanding of where we start, we can now consider what might cause us to move away from the "Baseline", and we can develop a simple model to represent how we can determine the current state of the facility, or the "Current Plant Status".


Baseline Plant Status
Planned Changes
Unplanned Changes
Current Plant Status

As stated, this is a very simple representation, but as we continue, you will see that it is very powerful and all encompassing.

If we now accept a Baseline Plant Status, based on High Power operation, we may then consider the types of processes, procedures, and activities that could cause us to move away from Baseline.

As you see, the changes are broken into two categories:

**Planned Changes:** changes that we have direct control and authority over, such as Power maneuvering, temporary equipment removal from service for maintenance, temporary modifications, etc.

**Unplanned Changes:** changes that we do not directly control, such as equipment breakdowns, Reactor trips, grid disturbances, human error, etc.

Each of these change processes will introduce anomalies to the baseline, and to be able to understand the "Current Plant Status" we must be able to control, track, and respond to these anomalies. It is key to realize that it is occasionally the individual anomalies that cause problems, but more often the combination of anomalies that often cause events to occur.

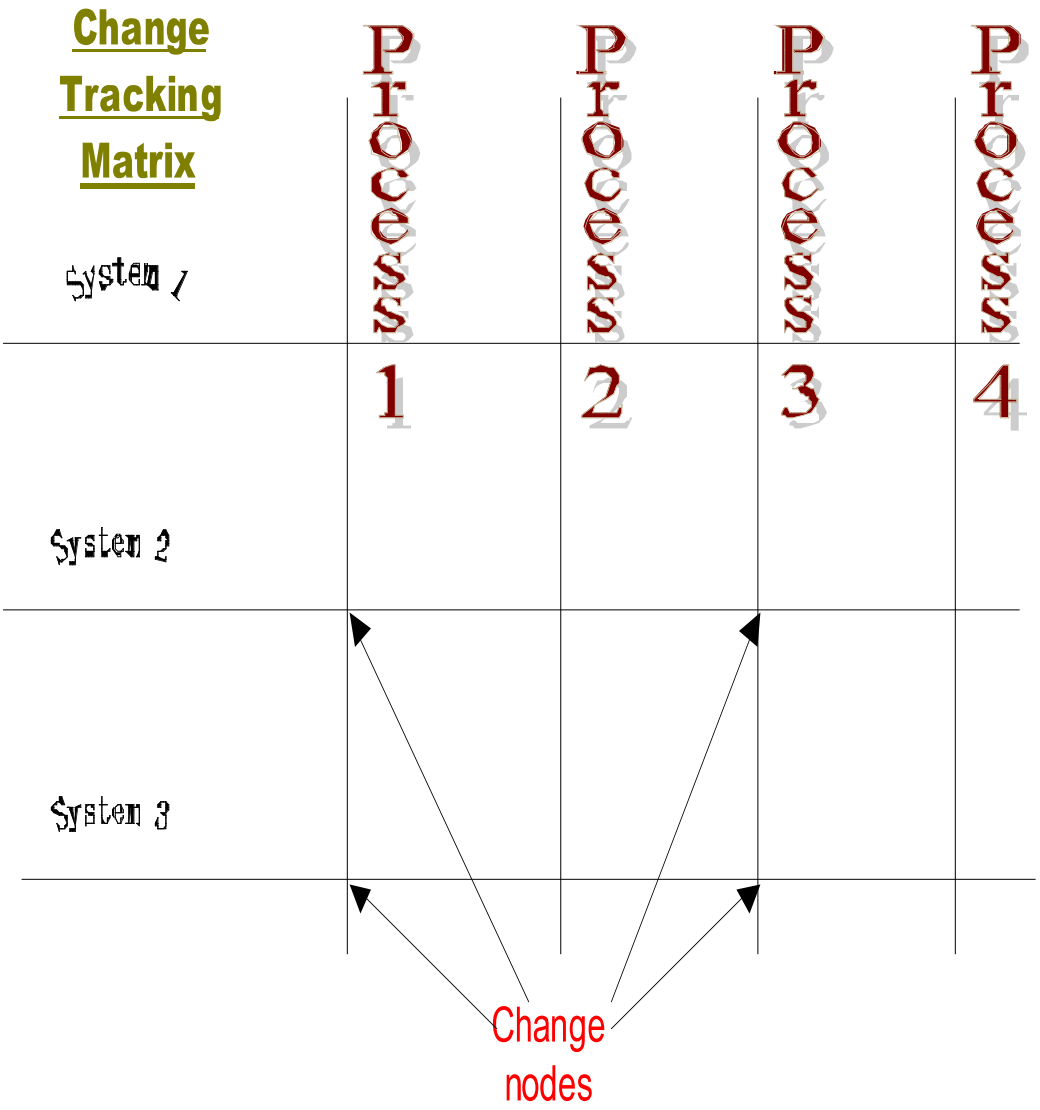
It is key to realize that every time we initiate a change to the facility, we risk losing control of our Plant Status, and increase the risk of events occurring. Also, as we increase the number of anomalies that exist, the risk continues to increase. Thus, we must be always working back towards a goal of Current Plant Status = Baseline Plant Status, by minimizing the number of anomalies that exist. However, as stated, any changes, even the changes that move us back towards baseline, increase our risk of events occurring.

If you consider any given day, including at this very moment within OPG-N there are literally hundreds of changes that are occurring, or being planned within our nuclear facilities. Most changes are of the planned variety, but some are unplanned. This large volume makes it challenging for our operations staff to control, track, and monitor change. Further complicating the issue, are the numbers of *different* processes we utilize to initiate, control, track and monitor the changes we make. In fact, in the past we have designed the way we control, track, and monitor each change, based on, and in support of, the individual processes, instead of in support of a consistent process for addressing all changes.

This then brings us to the goal of our current Plant Status Control initiative within OPG-N,

**"To provide a consistent, and efficient approach, on the shop floor, to implementing, tracking, and controlling changes to the status of our nuclear facilities, and/or the Operating Limits, that we work within."**

As previously stated, we have, in the past, we have designed the way we control, track and monitor changes on a process by process basis, to meet the individual needs of each process, often in isolation of the next process. This only comes back together, often in a disjointed fashion, as the Operator attempts to determine the current status of plant, on a component-by-component, or system-by-system basis, across a variety of change processes. Thus, considering the needs of the operator, as well as the needs of the process owner, to track and monitor changes, we have a simple matrix of change monitoring needs:




In this matrix, the process owner would obtain change data, by process, across systems, whereas the operator could obtain data by system, across processes. This dictates how we need to capture, and track our Plant Status data, such that we can sort in both planes.

The next concept to consider is the approach to how we perform, and control planned changes to the plant. The basic tenet behind this process is to make is usable, secure, and consistent, irrespective of the Change initiating process.

Two terms that I would like to introduce at this point are the "Change Request" and the "Change Order".

A **"Change Request"** is any activity that initiates a requirement to perform a change to plant equipment or plant operating limits. These could be anything from a Work Protection request, an Engineering Change (TMOD, PMOD) to an Operating Memo, or a High Sump level annunciation.

A **"Change Order"** is any direction given to perform a change to plant equipment or plant operating limits. Today this could be an operating procedure, Safety System test, a Work Protection Order to Operate, or an annunciation response procedure. Note: Each OPG-N site has between 20-30 different types of change order in use today.

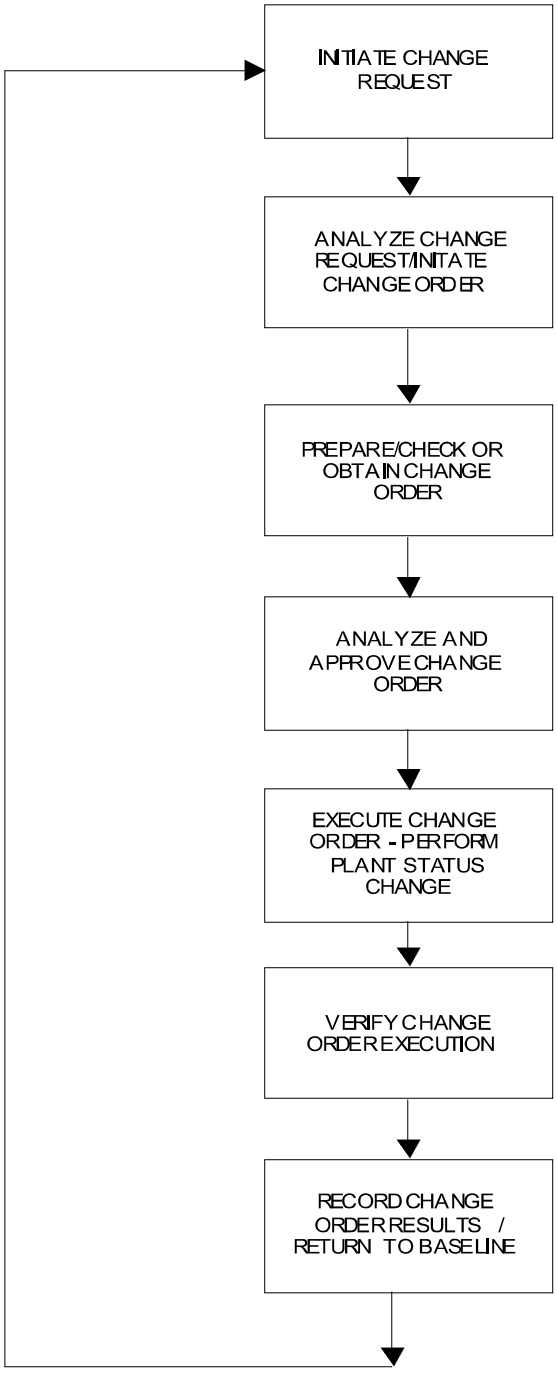
With these generic terms we can then address any business process that may affect change to the Plant Status. Irrespective of the initiating process, be it Engineering, Maintenance, Operational, or Business driven, the process must produce a request to perform a change to the Plant. This is a Change Request. Today, it may occur in many forms or shapes, and is primarily built to address the initiating process.

Again, irrespective of the initiating process, the Change Request, if valid, would result in a Change Order to actually perform the change. Today, the Change order may also take on many forms or shapes, and is also primarily built to address the initiating process.

The trick to working towards our goal is to ensure first off, that the Change Request has adequate information to clearly describe the changes required, and appropriate approvals to allow the change. There should also be some consideration of the potential "Operational Impact" of the change, if performed. This information must be provided again, irrespective of the initiating process.

The second part is, to then address the change request with a consistent approach, to first confirm its validity against the current plant status, and then to develop, or obtain a pre-prepared change order that can be approved, applied, verified, and tracked, in a consistent fashion. Realize that a key activity is to confirm the validity of a change request, and its change order against the "Current Plant Status", so that we may consider the "integration" of all the active changes, and to do this, we must be able to access all the active changes that are currently in effect, on a system or component basis. Think back to our Change tracking matrix, relative to the needs of our operator. It now becomes crucial that we have good monitoring and tracking capability.

This simplistic approach can be applied to temporary, or permanent changes to the plant, planned or unplanned changes, as well as changes away from, or back to baseline.




GENERIC CHANGE ORDER PROCESS (COP)

## Plant Status Control and Configuration Management

Endless discussions have occurred around the division between Configuration Management and Plant Status Control. The truth is that the two concepts overlap, and they need and feed off each other. In fact, from the operator's perspective, they appear as one. Even if you are making a permanent change to the design baseline, we can treat that change just as any other temporary change, until such time as the permanent change is incorporated into all of the Baseline documentation and databases.

If you consider the processes and procedures required to support an operational baseline and status control, many of the processes cross into the configuration management realm. As defined in the OPG-N Plant Status Program, procedures have been broken up into three specific areas:

### Establish and Maintain Baseline Operational Configuration of Systems, Structures and Components

- Equipment Labeling – requiring a consistent equipment list, to align field with data and documentation, spare parts, Work Management activities, etc.
- Operational Flow sheets – Engineering controlled, operational drawings that represent the Operational Baseline lineup.
- Position Assured Components – the Basic list of devices guaranteed to be in a specific position, to ensure operability, and the control of these devices
- Operator Field Aids – The control of Technical procedures, and references in the field, that are utilized to support operation.

### Monitor and Track Operational Configuration of Systems, Structures and Components

- Plant Status Indicators – use of tagging and indicators to show anomalies to baseline
- Plant Status Reporting – Reporting requirements for Plant status
- System Alignment Tracking – field confirmations, and review requirements
- Operator Narrative Logging – documentation of Plant status activities
- Operator Surveillance, Rounds and Routines – routine inspection of field equipment
- Shift Turnover – communication of current status of plant
- Control Room Panel Monitoring

### Operate Plant, Control Changes

- Generic change request, change order process – as discussed
- Shutdown Heat Sink management – control of different operational modes
- Reactor Shutdown Guarantee Management – as above
- Operational Change Control – specifics of operational change requirements.

Other key processes that are moving into alignment with the Plant Status Control process are:

- Technical Procedures Standard
- Work Protection
- Engineering Change Control / Configuration Management

## Summary

Long hours of Process design work, and process integration have gone into the development of the OPG-N Plant Status Control Program, supporting processes and procedures, and work is actively ongoing today. In parallel, there is a Configuration Management restoration initiative ensuring that our baseline is restored, documented, tracked and controlled for each site. To restate our Goal:

**"To provide a consistent, and efficient approach, on the shop floor, to implementing, tracking, and controlling changes to the status of our nuclear facilities, and/or the Operating Limits, that we work within."**

We are already having good success institutionalizing, and procedural zing the concepts presented today, although we are moving slowly, to control the cultural changes.

In support of the concepts introduced in this paper, there are electronic tools in place, and being developed, to reduce the operator loading requirements, and enhance capability and efficiency around control, operation, monitoring, and tracking of Plant Status. It is important to realize that the process design should still hold strong and still work, even if the electronic tools become unavailable.

The consideration of Operational Focus can be institutionalized through Plant Status Control, across all change processes, through the concept of "Operational Impact", and the consideration of Operational Impact as part of each and every Change Request, and eventually part of every business decision we make in the nuclear industry.

Operational Impact could be defined as such: "The potential effects of any action (or inaction) you undertake on the safe and reliable operation of our nuclear facilities." This is a natural thought process for the Authorized operator and Shift Manager every day. The real challenge is to get all of our staff thinking in this context with all of their actions and decisions. I would hope that it is something you could take away from today's session and utilize.

Thank you.

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