OSART Good Practices
OPERATIONS
Organization and functions

Mochovce, Slovakia

Mission Date; 4-20 Sep., 2006

A specially written computer system (JESETER) is used by operations day staff to support shift personnel. JESETER has become the main method of preparing, communicating and authorising daily work schedules. In addition to other information, it facilitates the rapid transfer of safety related items, such as 'Just-in-Time' information for briefing purposes and can be used as the administrative tool to confirm familiarisation with documents.

JESETER was developed to meet the exacting standards ISO 9001:2000. It enables the on-line participation of authorised persons in the development of work packages. This process includes input from the safety Engineer.

A strength of JESETER is that it incorporates the results of a detailed analysis of the actual responsibilities and interactions which take place between personnel during the preparation of work schedules. JESETER has been engineered to run on the station network and has been incorporated into the unified system for the management of operational activities. It can be readily accessed by all involved personnel. The effectiveness of the JESETER tool is monitored and confirmed on a monthly basis.

JESETER system helps to avoid unnecessary load on shift staff, to optimize staff activity, to reduce the possibility of making wrong decision.

Chinon, France

Mission Date; 27 Nov.-14 Dec., 2007

The plant has created a technical file database that contains the intricacies of current issues that are being investigated and resolved. The database is accessible to all parties involved in resolving the issue.

The practice proves beneficial for several reasons.
- Important information regarding the issue is not lost during periods of turnover.
- The information is accessible by all disciplines involved in the issue to view a running tally of issues faced and resolved with the issue
- The documents stay within the database for reference in case of repeat problems with other unit's equipment, which minimizes the "re-learning" process.

In the past 4 years, 892 equipment files have been created and are in use today, many of which have provided rich information to swiftly move through like situations with plant equipment.

Results of the database include the implementation of lessons learned on similar issues associated with:
- Air in-leakage to the Boron and water makeup tanks on Units 3 and 4. The evolution was expedited by implementing lessons found in the database from a similar occurrence on Units 1 and 2.

- Another case used was for an air system leak into the reactor building on Unit 4. This occurrence was repaired previously on another unit. The use of the database allowed input to the development of schedules, dose assessments, and trouble shooting plans to expedite the repairs.

Arkansas, USA

Mission Date; 15 Jun.-2 Jul., 2008

Worker ownership of improvement programme to enhance safety and performance of plant operations.

Human Performance is recognized as being a vital part of the successful and safe operation at Arkansas Nuclear One.

An Operations organization (Human Performance Improvement Group, "HuPIG") has been formed, significantly by individuals at the worker level in the operations organization. This group, which is led by the workers and is fully supported and trusted by the management team, has developed a series of operational focused human performance tools, designed to improve the safety and performance of Operations Department. This group also reviews condition reports, operating experience and human performance improvement forms. The results are communicated to the site leadership team and to the individual crews to use as lessons learned.

Individuals in this group have influenced their peers to make their minor errors and near misses public, so that the entire department may learn from them, but also to look for good performance and ensure that these get recognized. The results and examples of Human Performance Improvement Forms and Good Catch awards are visible on the "HuPIG web page".
The results of this group's efforts can be for example seen in the Component Status Control Performance Indicator. In August of 2007, the human performance group was asked to help resolve the degrading performance in the area of plant status control. The group developed a recommended action plan and presented it to the management. This plan was implemented and, within a short time, the degrading trend turned into an improving trend.

Cruas, France

Mission Date; 24 Nov.-11 Dec., 2008

The plant has a programme for performance of crew (comprised of a shift manager, shift supervisor, tagging officer, control room operators and field operators) team projects to improve safety, efficiency, capacity and compliance with environmental regulations. Crew projects are developed to achieve the aims of Department and site projects.

These projects enhance crew team work while providing tangible benefits to the plant. The projects are designed to involve all crew members in solving existing issues. The target for these projects is to facilitate team building and improve all crew members' skills and safety culture attitudes.

The plant benefits not only through better crew dynamics but also through enhanced plant performance, increased efficiency and an improved safety culture. When a crew project is adopted by the plant all crew members are recognized by their peers and by plant management by the use of awards and plant news releases.

As an example of a crew project the performance of the RPR (reactor protection system) surveillance test was optimized to decrease unavailability of components and systems important to safety, reduce time spent in Limiting Conditions of Operation (LCO) and save critical path time. This enhancement has already been adopted by the EDF fleet.

Fessenheim, France

Mission Date; 23 Mar.-8 Apr., 2009

Application of human factors specialist knowledge and human performance error prevention tools to shift operations.

The position of "Pilote de Tranche" was created in 2008, with a view to centralising the day-to-day operational-decision making process in a single location: the main control room. The "Pilote de Tranche" is responsible for coordinating the schedule, for setting priorities and for distributing work within the shift crew.
As part of his duties providing direction in the performance of daily activities, he incorporates nuclear safety considerations and manages the shift-manager and deputy shift manager call-up system.

During power operations, he provides technical supervision for both units. When one unit is in outage, he provides technical supervision for the operating unit and common plant, thus freeing up the deputy shift manager to deal with matters on the unit in outage.

In 2008, the position of "Pilote de Tranche" was introduced in one shift crew on a trial basis.

Since the end of 2008, 7 "Pilotes de Tranche" have successfully gone through the authorization process, making a total of 1 per shift crew.

In May 2009, a 4-week trial (2 weeks during power operations and 2 weeks during outage on unit 2) will be conducted at department level, in order to make the necessary adjustments to the creation of this new position.

The operations department has chosen to provide the "Pilote de Tranche" with specific training in human performance tools, thus enabling them to acquire specialist knowledge in this area. They will provide the reference model for the use of error reduction techniques within the crews. Their duties will include reinforcing the use of human performance practices and promoting the use of these practices both within the crews as well as within other departments. This facet is already being implemented within the shift operations crews.

Plant results demonstrating that this good practice produces the expected results:
The trial conducted in 2008 showed that the position of "Pilote de Tranche" has given deputy shift managers more time on shift for providing technical guidance, for going into the field and for supporting crew projects. This will eventually enable shift managers to take a step back from day-to-day, hands-on aspects, allowing them more time to focus on day-to-day operational safety matters and focus their attention on the management of their crews.

The "Pilote de Tranche" (Human Performance specialist) is an additional asset in terms of promoting the use of error reduction techniques. He provides strong support to shift crew management regarding the use of these techniques. The most obvious advantage is that crews are becoming more and more accustomed to using these techniques as a matter of course.

Ling Ao 3/4, China

Mission Date; 16 Nov.-3 Dec., 2009

The plant has taken a very thorough and pro-active approach to its preparations for the new digital instrumentation and control system (DCS) of Ling Ao II.

This has required a comprehensive commitment from all managers and departments. Specific good practice examples are:

Transfer of tranches of over 40 operators to DCS controlled plants in France to embed learning and experience on the control system.

Creation of a DCS human performance team to resolve the specific human performance challenges that the DCS presents.

Creation of DCS behaviour standards and practice and use of these in the simulator to re-enforce operational procedures.

Using operator experience to develop standard tailored system status display and parameter monitoring

Use of a joint working team with suppliers and DNMC to develop modifications such as 3 levels of simulator including verification and validation platform and classroom simulator.

Use of cross team competitions on the system to engender a deep understanding of the system for the operators and technical staff.

These practices will help minimise the potential for human errors during operation of the power plant which may be caused by the significant differences between traditional control systems and DCS.

Other power plants that are planned are suggested to review this approach since it would hold significant benefits in the development and training of staff.

St. Alban, France

Mission Date; 20 Sep.-6 Oct., 2010

Operations department internal control – one shift crew – one area

Every year, the department defines an internal checking plan to enforce compliance with the requirements defined by the baselines as well as to assess effectiveness of safety-related processes adapted within the Operations Department.
The fields to be checked and enhanced are defined by the Deputy Department Head, assisted by a Shift Manager. This depends on operating experience from the previous year and priorities are defined in the departmental contract.
Each shift crew is assigned to a specific topic and they are responsible for implementing control actions in the area or areas assigned to them each year and according to specification defined to allow them to meet expectations. The breakdown for 2010 is as follows:

– Team A: alarms and follow-up of monitoring means in the control room.
– Team B: surveillance testing.
– Team C: SAPHIR sheets.
– Team D: temporary modifications (DMP/MTI), temporary operating procedures and fire zoning/volumetric protection.
– Team E: tracking of the checking plan.
– Team F: line-ups, administrative lockouts and temporary safety instructions.
– Team G: work permits. Number of open work permits decreasing.

This organization allows improvement in the quality of supervisory actions, enforces the compliance with processes, allows self-assessment and enhances awareness of responsibilities.

Seabrook, USA

Mission Date; 6-23 Jun., 2011

The Operational Focus Performance Indicator

The Operational Focus Performance Indicator (OFPI) provides an aggregate assessment of operational issues that are impacting, or may impact, overall plant performance. The aggregate impact of pertinent Key Performance Indicators is assessed on a weekly basis. Additionally, Operator Rounds Deficiencies and Abnormal Alignments account for equipment deficiencies that individually may not be significant, but when viewed cumulatively could have a negative impact on Operator performance. The indicator enhances the plant's focus on equipment deficiencies and design limitations that may otherwise receive less attention due to their impacts being minimized through operator performance of compensatory measures. The OFPI is reported on weekly at the Operational Focus Meeting. The Plant Health Committee, Site Nuclear Safety Culture Committee, Operations Management, Work Management, in addition other Station Departments utilize this indicator as a tool in prioritizing work activities and evaluating the effectiveness of actions taken to address deficiencies. The overall intent of the OFPI is to ensure that conditions that challenge the reliable operation of the unit are addressed in a timely manner and that Operator response actions in Abnormal or Emergency Operating Procedures are not adversely impacted by the cumulative effect of multiple minor deficiencies.

The application of the OFPI has directly contributed to a reduction in the number of:

- operator work around deficiencies, and
- fire impairments

An additional benefit of the indicator is the engagement of the Work Management, Engineering, Maintenance and "Fix it Now" (FIN) organizations who are the owners of the majority of the OFPI indicators.

Koeberg, South Africa

Mission Date; 22 Aug.-8 Sep., 2011

Operating Observation and Coaching Programme

The Operating Observation and Coaching Programme together with Operating Work Control Group activities resulted in a significant decrease in the number of Plant Status Control (PSC) errors that occurred during Permit to Work (PTW) implementation or revocation. The Observation and Coaching programme is designed to cover 20 operating tasks to establish and reinforce management expectations for operator performance and lead to improvement in conduct of operation.

The purpose of the Operating Observation and Coaching programme is to observe operating tasks while being performed and verify the actions and conduct of the operation against operating standards and requirements as described in operations administrative procedure KSB-005 Operating Standards and Expectations. Every manager in Operating Department, including shift managers, has to perform a minimum of 6 observations in a 6 week cycle i.e. 3 observations of Main Control Room staff and 3 observations in the field with operators.

The programme consists of 20 different observations areas and each area has up to 12 different sub-areas. The observation areas are the following:

- Control Room Conduct
- Communications
- Self-Checking
- Problem Solving / Action Planning
- Log Entries
- Alarm Response
- Pre-Job Briefs
- Authorising PTW implementation
- Implementing a PTW
- Preparing a PTW
- Revoking a PTW
- Reactivity Change
- Shift Rounds
- Unit SSS (Senior Shift Supervisor) Shift Briefing
- Unit SSS command and Control
- Shift Turnover / Handover
- Work Evolutions
- Reinforcement of HP Tools by Control room Supervisors
- Procedure Usage
- Crew team Work and Oversight

Operating observations are evaluated regularly and identified more exemplary performance areas than areas for improvement.

Examples:
A total of 422 observations have been performed by Operating in 1st quarter in 2011 (previous quarter 339), 76% of these were critical observations.
The highest % of the observations for this quarter has been performed on Work evolutions on the plant 16%, Pre-Job Brief 14 %, Procedure usage 16%.
In the first 6 months of 2010, 5 of the 11 PSC events occurred during Permit-To-Work (PTW) implementation/suspension/revocation. As a result of these observations during the second half of the 2010only 1 of the 18 PSC events occurred during permit to work implementation/suspension/revocation.

Rajasthan, India

Mission Date; 29 Oct.-15 Nov., 2012

Programs to develop operations staff and enhance operational focus in support groups

The station has several initiatives that when considered in whole provide a comprehensive approach.

Examples of include:

An operation policy requiring all experienced Shift Charge Engineer qualified staff to be deputed in station simulator to instruct and coach candidate control engineers, thus supplying recent operating experience to the training environment and facilitate identification of latent simulator deficiencies by checking simulator response with their experienced station response during the course of simulator exercises.

The station has made Control Engineer operations license mandatory for new graduate engineers joining the station. They are initially deployed as field engineers and mentored by senior persons to become familiar with operational aspects of the plant. They then progress in training program to complete on the job training, simulator training and exams culminating in licensed as a control engineer. These persons are then deputed to various support groups which has positive impacts on operational focus of the plant.

The use of a “Master Coordinator” who is Shift Charge Engineer or Assistant Shift Charge Engineers qualified for all D2O related critical and infrequent jobs to act as single point of contact for the job. This concept is also used during Biennial planned shutdowns (BSD) for different systems to support shift operations staff by coordinating/interfacing with other concerned sections. Developing engineers are also attached to these job coordinators during BSDs to acquire experience and enhance operational knowledge.

Chooz, France

Mission Date; 17 Jun.-4 Jul., 2013

Self-assessment groups to discuss enhancement plans within Operations.

The Operations Department has set up self-assessment groups to discuss and resolve specific issues within Operations. Topics considered by these groups include:

- Optimizing staffing within operations,
- Improving control room serenity,
- Improving configuration management,
- Sharing operating experience,
- Improving waste management,
- Improving effective plant rounds,
- Improving documentation management

The operations department also participates in 3 cross-departmental self-assessment groups to address such topics as:

- Improving the temporary modifications process,
- Improving the work authorization process
- Improving reactivity management

Each of these groups has at least 1 member of each shift crew and the groups meet at least 4 times a year. The meetings are chaired by Operations management. To allow all members to attend, measures are taken to replace shift crew members when on duty.

These self-assessment groups benefit from sharing good practices or problems encountered between the various shift teams. The involvement of management ensures that action plans are produced as agreed in a timely manner.

The plant indicates that the creation of these self-assessment groups has empowered the Operations personnel.

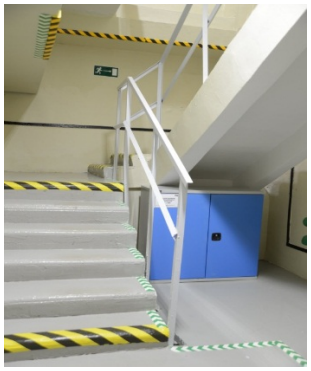
Kola, Russia

Mission Date; 10-27 Nov., 2014

Photo-luminescent system for indicating escape routes

Kola NPP has developed and implemented a photo-luminescent system (PLS) for indicating escape routes in order to provide directions to plant personnel in poor lighting conditions.

The light sensitive photo-luminescent elements store energy and after the light source is removed they stay illuminated for more than 10 hours. The PLS consists of various combinations of possible elements including guiding lines, warning signs, and additional signs which inform personnel on the escape route. The PLS is an autonomous and non-volatile system. Features of the PLS include: being visible and clearly transmitting information in complete darkness; reducing the escape time in an emergency; and, using additional signage (visual prompts) to help reduce confusion and uncertainty. These features decrease the potential for panic and thereby reduce risks to plant personnel.



Kashiwazaki 6/7, Japan

Mission Date; 29 Jun.-13 Jul., 2015

Structured requalification training period.

Any experienced operator who is rotated between any of the seven units, or any experienced operator who is rotated back to the MCR undertakes a special retraining course which covers the following:

- Unique features of the unit;
- Modifications that have been performed;
- Differences in technical specifications and documents;
- Current work in progress.

The training period is determined and prescribed based on the individual's previous Operations shift position and his/her new position. The training plan is developed by the manager of the trainee, based on the trainee's abilities and previous experience.

The trainee's manager is responsible for ensuring the trainee`s understanding of the differences between the previous and newly assigned position.

Pickering, Canada

Mission Date; 19 Sep. -6 Oct, 2016

Minimum Complement Co-ordination Program

The plant has a minimum complement of qualified staff which must be on site at all times to ensure the safe operation of the facility. Maintaining minimum complement is a license requirement. In order to ensure minimum complement is maintained at all times, a live computer program named Minimum Complement Co-ordination Program (MCCP) is used. The Minimum Complement Co-ordination Program is available on all employee computer terminals. There are also two separate kiosks located in the entrance areas of the plant. These kiosks contain computers which run the Minimum Complement Co-ordination Program badge scanners so employees can easily badge in and out, and large television screens which provide live updates of current staffing for minimum complement roles.

The Minimum Complement Co-ordination Program interfaces directly with training software to map employees only to the roles for which they meet all qualification criteria. These employees are then mapped to the minimum complement role for which they are qualified as they scan their badge at the Minimum Complement Co-ordination Program kiosk upon reporting to the plant. If an employee attempts to leave without the proper relief for their position, they will receive a warning from the Minimum Complement Co-ordination Program kiosk, and cannot leave until their replacement arrives. This ensures constant coverage of minimum complement positions.

The Minimum Complement Co-ordination Program records historical data, and as such the maintenance of minimum complement on site is readily auditable. In addition to looking back in time, the Minimum Complement Co-ordination Program can look forward to forecast which positions do not currently have coverage planned for future dates, if any. Minimum Complement Co-ordination Program automatically interfaces with the employee timesheet software to show future dates on which minimum complement employees have requested vacation. Supervisors can then easily see which adjustments are required to be made to ensure minimum complement is met.

Golfech, France

Mission Date; 10-27 Oct., 2016

The plant has introduced a visual system for identifying all valves that are used when applying emergency operating procedures, in the form of fluorescent tags.

Benefits:

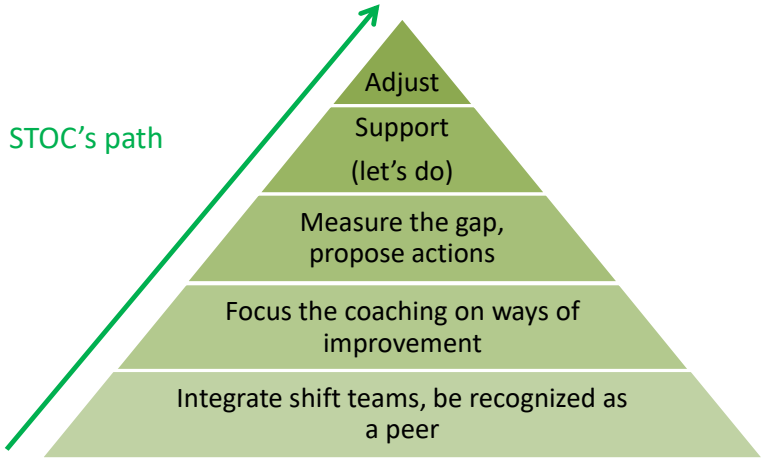
- In emergency operating conditions (requiring entry into EOPs or “APE” in French), field operators may have to operate certain valves in the field at the request of MCR staff. Depending on how serious the situation is, field operators may need to respond as a matter of urgency;
- In emergency operating conditions, these fluorescent tags can be spotted more quickly as soon as field operators enter the area. If a loss of power or lighting occurs on the unit, the tags are easier to see with a flashlight;
- Another benefit is that field operators can familiarize themselves with valves used in emergency operating conditions during their daily route tours. In the event of actual entry into emergency operating procedures, they would know which area to get to and respond more quickly. These tags are not a substitute for equipment identification tags and do not exempt operators from having to perform a self-check before operating the component;
- Plant results demonstrating that this good practice is achieving the expected outcome: during EOP practice sessions conducted during operator training, the tags have been used and their effectiveness has been proven.

Taishan, China

Mission Date; 8-26 Jan, 2017

The use of experienced Shift Team Operation Consultants to develop Shift Supervisors in leadership for safety.

The plant has developed and implemented a program to develop Shift Supervisors' in leadership for safety. Being a new plant, still under construction, the plant has recognized the importance of the Shift Supervisors' role in achieving and maintaining the required safety culture in operating shifts. The plant has decided to implement a programme to develop leadership for safety awareness, behaviour and skills of their Shift Supervisors. Each Shift Supervisor has been assigned a very experienced former Shift Supervisor (the Shift Team Operation Consultant, or STOC) to promote and develop him in leadership for safety. The program includes a structured way to periodically monitor the Shift Supervisors' progress, based on performance targets developed by the plant teams. The program has started in the construction phase and includes the first 1000 hours after first core load.



Performance monitoring by STOCs and the operations management team demonstrates good results in shift behaviour in the areas of

- the use of Operational Technical Specifications
- questioning attitude and challenging each other
- implementation of "Operator Fundamentals coaching" within the department.
- Conservative Decision Making Process and Problem Solving Methodology developed and performed
- improvement of technical skills
- development of open-minded approach within Shift and department

and has proven the effectiveness of this program.

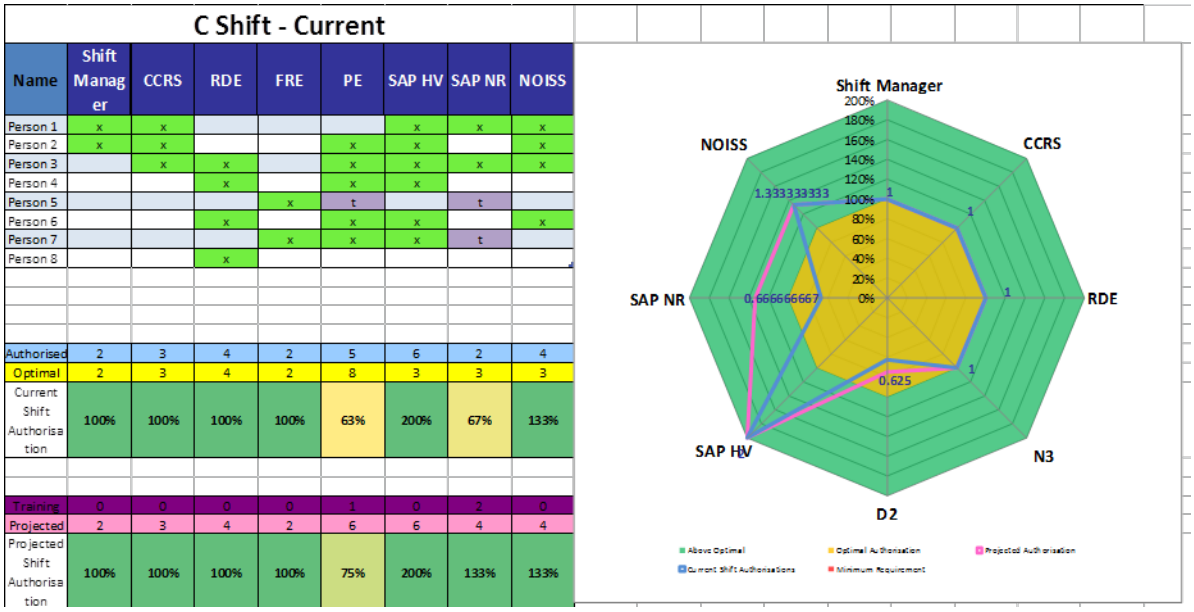
Torness, UK

Mission Date; 22 Jan. - 8 Feb, 2018

Succession planning on operations using spider diagrams.

In order to mitigate against loss of experience, monitoring and forecasting has been put in place to identify areas in which recruitment and training will need to be focussed. For the operations staff this has taken the form of Staffing Resilience Spider Charts which allow the authorisations held by each shift to be visualised in an easy to understand format. They can also be used to highlight potential future staffing shortfalls and allow proper planning to maintain compliance with site licence conditions.

Different shift structures can be evaluated against an assessed optimal authorisation level, this allows for a direct comparison between shifts and can identify any potential shortfalls or areas for improvement. The chart in figure 1 below is an example of the current "fingerprint" of shift central control room team showing which areas are in the green optimal zone, and which areas could be improved in the amber zone. It can also highlight members of staff that are currently training to show how the graph will look upon the attainment of their authorisation.

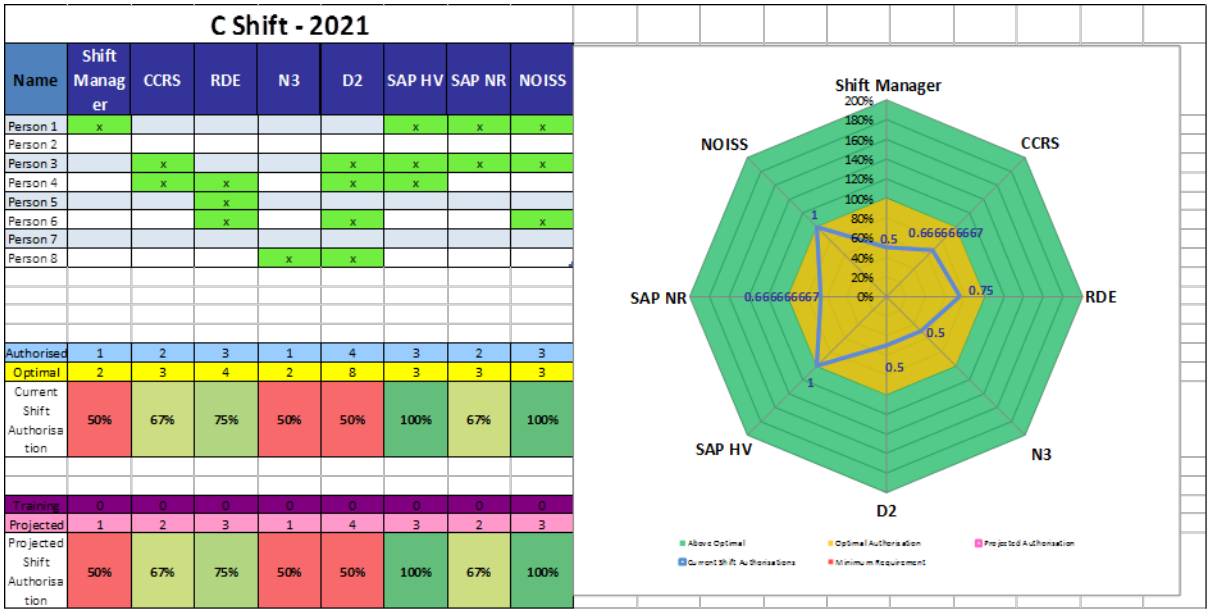


C Shift - Current

Name	Shift Manager	CCRS	RDE	FRE	PE	SAP HV	SAP NR	NOISS
Person 1	x	x				x	x	x
Person 2	x	x			x	x		x
Person 3		x	x		x	x	x	x
Person 4			x		x	x		
Person 5				x	t		t	
Person 6			x		x	x		x
Person 7				x	x	x	t	
Person 8			x					
Authorised	2	3	4	2	5	6	2	4
Optimal	2	3	4	2	8	3	3	3
Current Shift Authorisation	100%	100%	100%	100%	63%	200%	67%	133%
Training	0	0	0	0	1	0	2	0
Projected	2	3	4	2	6	6	4	4
Projected Shift Authorisation	100%	100%	100%	100%	75%	200%	133%	133%

Figure 1. Current authorisation diagram for a shift
(Acronyms: CCRS - Central Control Room Supervisor, RDE - Reactor Desk Engineer, FRE - Fuel Route Engineer, PE - Plant engineer, SAP HV - Senior Authorised Person High Voltage, SAP NR - SAP Nuclear Radiation, NOISS - Nominated Oxygen Injection System Supervisor)

This allows for the same goals all the way through the business to be visible and helps to drive operational excellence through the station. Clear and concise information and KPIs where applicable are shown to allow a common understanding of how each individual is contributing to the overall business outputs and targets for improvement.



C Shift - 2021

Name	Shift Manager	CCRS	RDE	N3	D2	SAP HV	SAP NR	NOISS
Person 1	x					x	x	x
Person 2								
Person 3		x			x	x	x	x
Person 4		x	x		x	x		
Person 5			x					
Person 6			x		x			x
Person 7								
Person 8				x	x			
Authorised	1	2	3	1	4	3	2	3
Optimal	2	3	4	2	8	3	3	3
Current Shift Authorisation	50%	67%	75%	50%	50%	100%	67%	100%
Training	0	0	0	0	0	0	0	0
Projected	1	2	3	1	4	3	2	3
Projected Shift Authorisation	50%	67%	75%	50%	50%	100%	67%	100%

Figure 2. Forecast authorisation diagram for 2021 (See Acronyms above)

The chart in figure 2 on the right shows how the shift will look in 2021 if no action is taken to maintain the current staffing levels. The forecast can be selected out as far as 2030 and automatically updates to reflect the predicted shift structure at that point in time taking into account any retirements or authorisation changes. Using these charts and other methods of analysing the Operations staff data, periods of increased recruitment can be predicted well in advance of any risk to the station, allowing the continuation of safe, reliable generation. This tool is used in succession planning workshop as the framework for shift staffing and training priority. This feeds directly into the operations staffing and succession planning.