



Pakistan Atomic Energy Commission

**RP Management
At CNPGS**

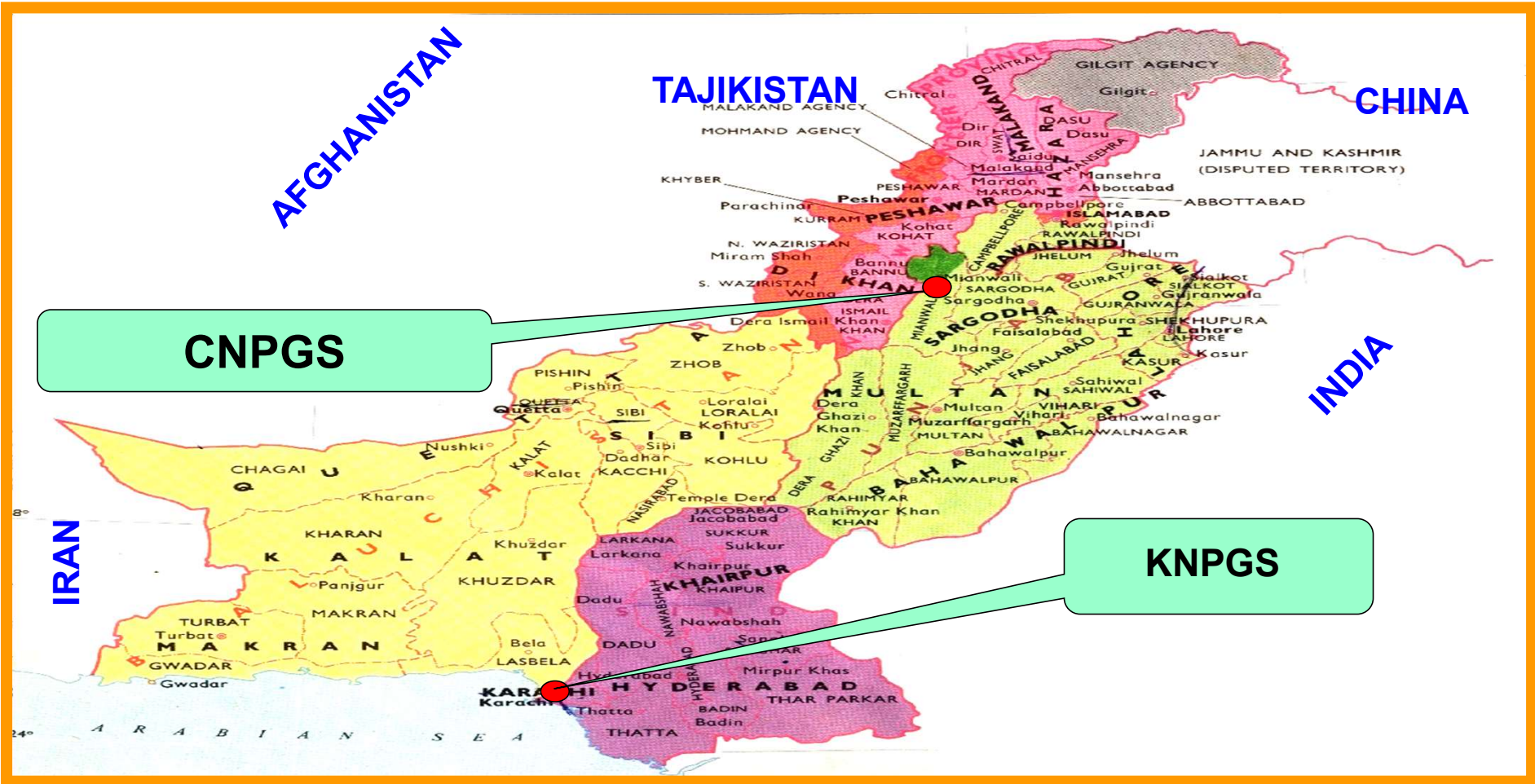
Rana Iftikhar Ahmad
Manager – HSE & EM

Our Mission



“To Generate Electricity in a Demonstrably Safe, Environment Friendly, Reliable, Secure and Cost Effective manner over long term for the Benefit of our Society and Stakeholders”

Location of NPPs in Pakistan



Nuclear Power Program

Description	C-1/C-2	C-3/C-4	K-2/K-3
Reactor Type	PWR, 2 Loop	PWR, 2 Loop	PWR, 3 Loop
Rated Thermal Power, MW	998.6	998.6	3300
Gross Electrical Output, MWe	325	340	1100
Net Electrical Output, MW	300	315	1017
Operating Pressure, MPa	15.2	15.2	15.5
Operating Temperature, °C	302	302	311
Fuel Cycle Length	14 month		18 months
Design Life, Year	40	40	60



340 MWe
Sep 2017

C4

C3

340 MWe
Dec 2016

C2

325 MWe
May 2011

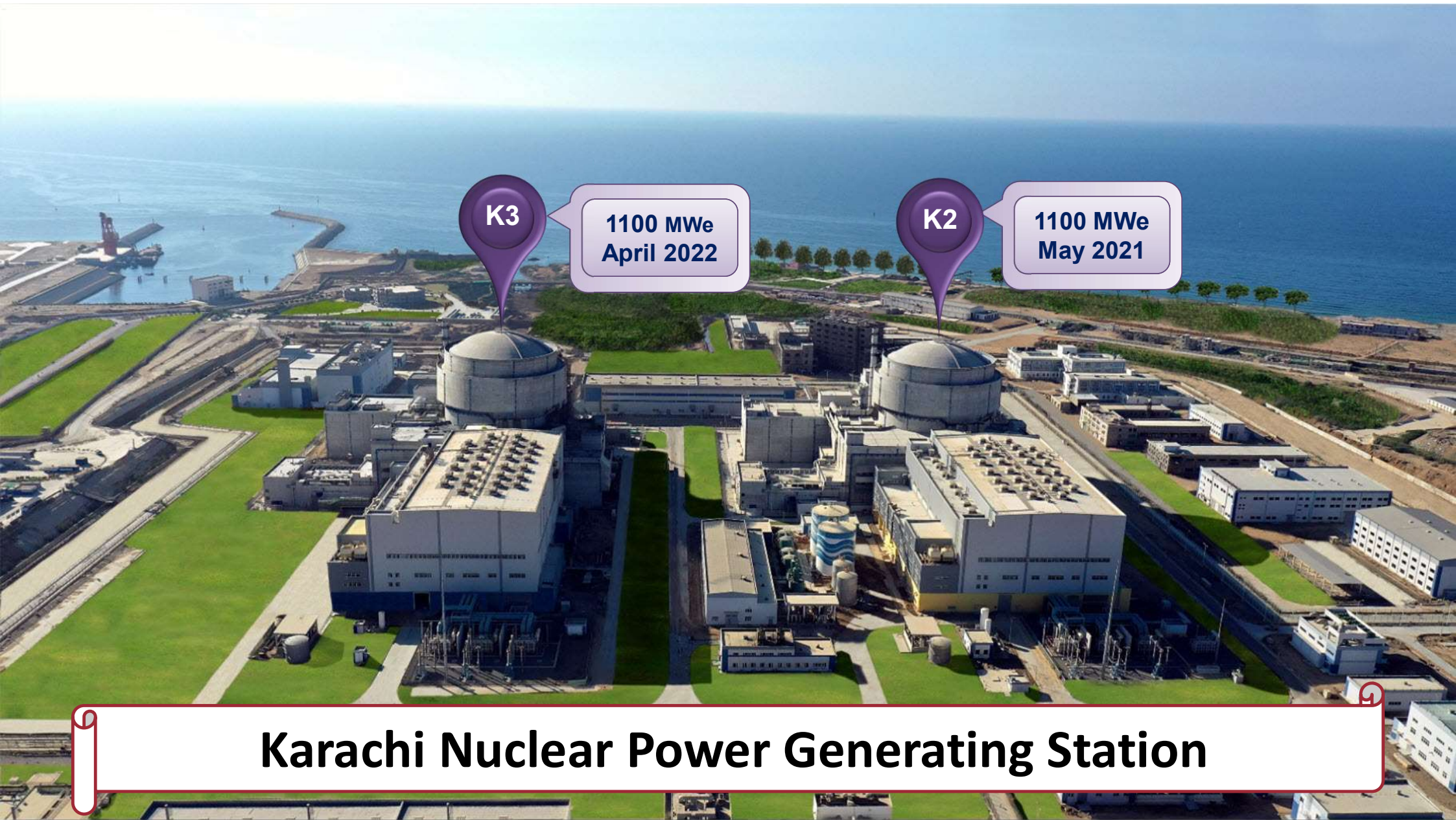
C1

325 MWe
Sep 2000

C5

1200 MWe

Chashma Nuclear Power Generating Station



K3

**1100 MWe
April 2022**

K2

**1100 MWe
May 2021**

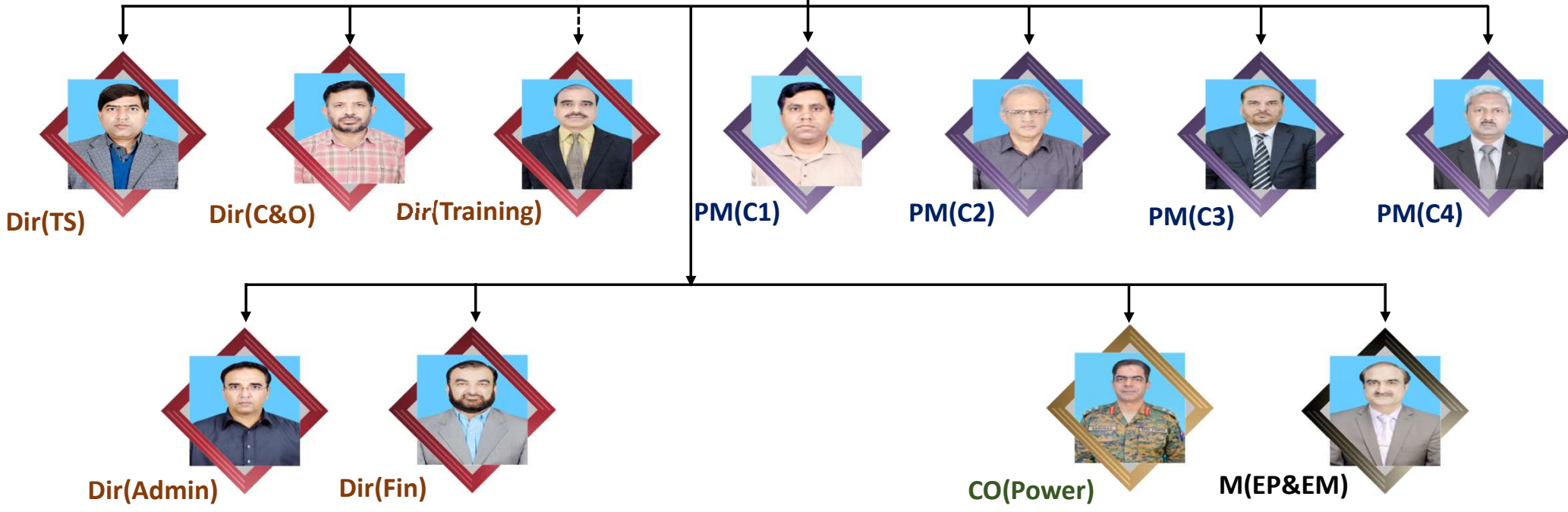
Karachi Nuclear Power Generating Station

CNPGS Organization

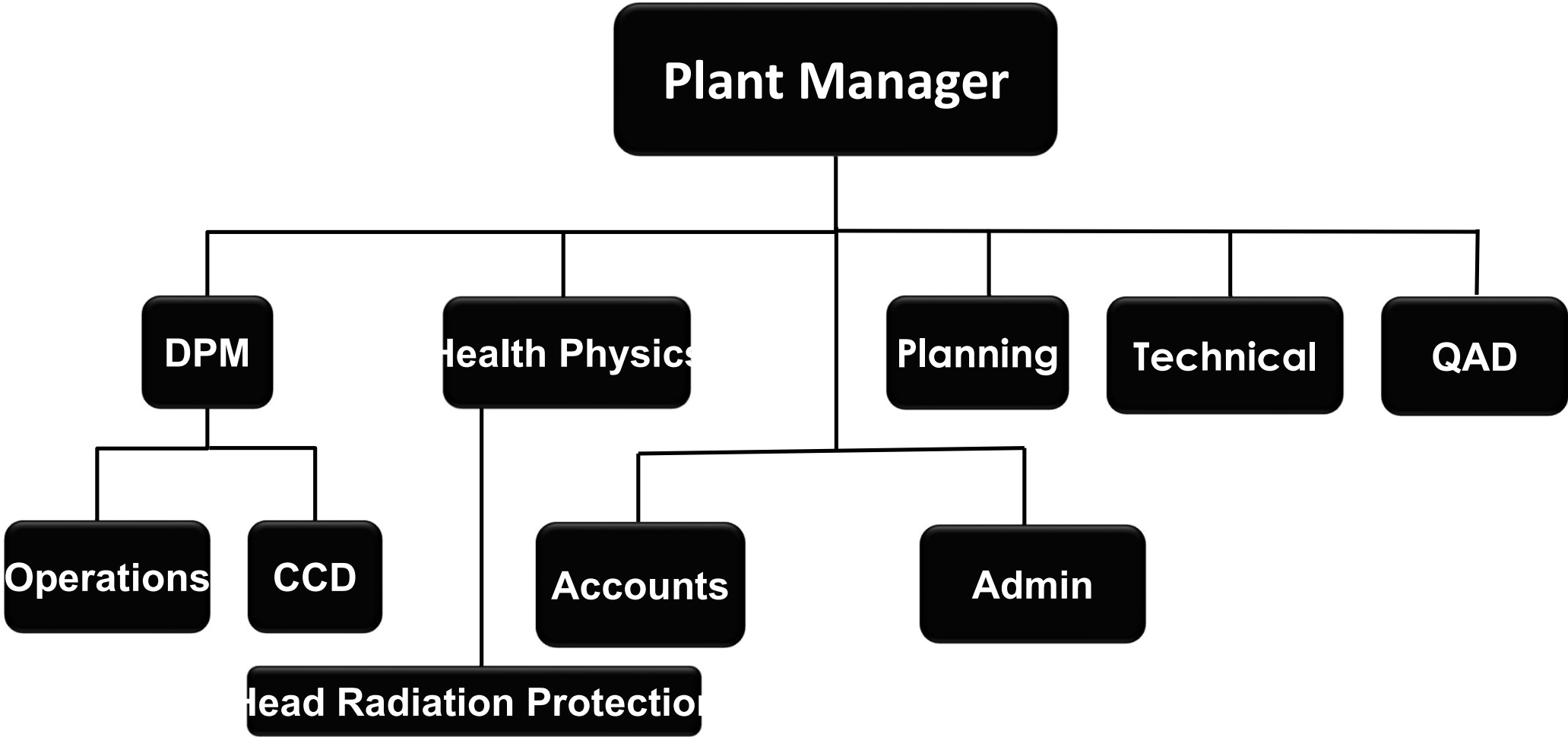


GM(CNPGS)

GM(C-5)

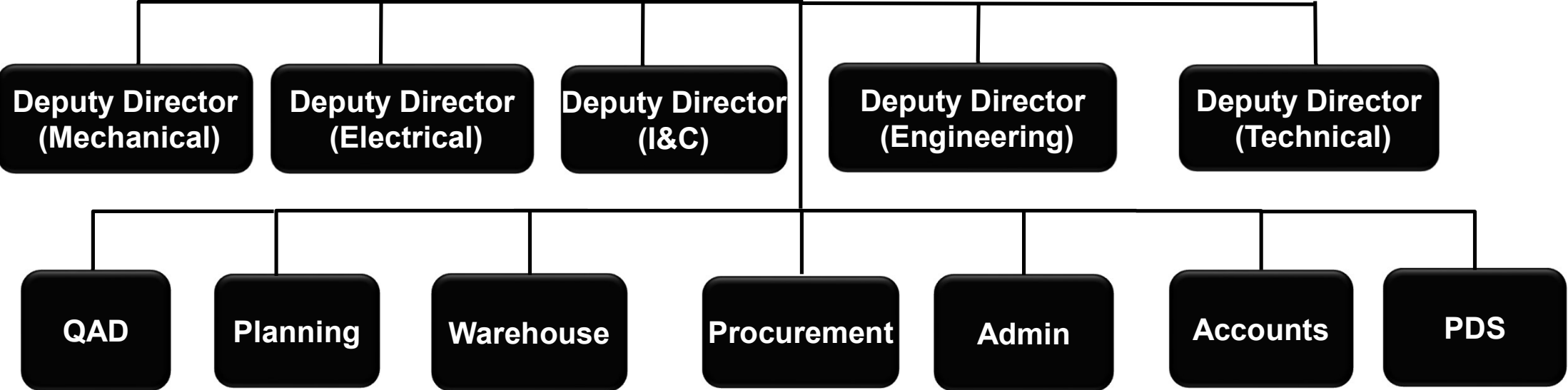


Plant Organization



DTS Organization

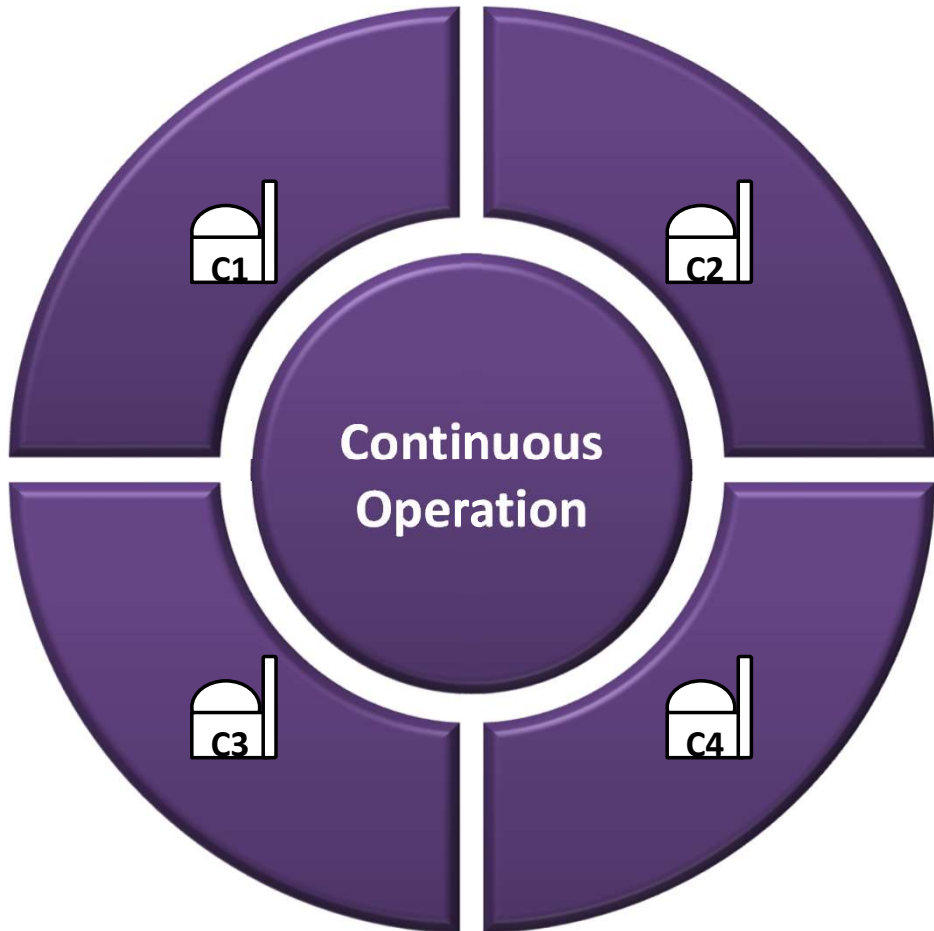
Director DTS



CNPGS Longest Continuous Operation

400 Days

425 Days



382 Days

374 Days

Major Achievements of CNPGS

- 1** Full Score **100** in WANO Index (Q2-2021) – **1st Position** Worldwide
- 2** Full Score **100** in WANO Index (Q1 & Q2-2025) – **1st Position** Worldwide
- 3** WANO PWR CRE (Q4-2022) – **2nd Position** Worldwide
- 4** RFO Completion in **20.5 Days**
- 5** **1st National Radiation Emergency Exercise** (Oct, 2024)

Major Achievements

Year	Corporate Social Responsibility (CSR)	Health Safety Environment (HSE)
2021-22	SILVER MEDAL	GOLD MEDAL
2022-23	GOLD MEDAL	BRONZE MEDAL
2023-24	GOLD MEDAL	GOLD MEDAL

Manager Radiation Protection

- **Reports to Plant Manager – Unit wise**
- **Develop, Implement & Monitor Compliance of RP Program**
- **Arrange Radiation Monitoring Equipment**
- **Arrange Protective Equipment**
- **Arrange RP Training of Plant Personnel**
- **Establish & Monitor Performance Indicators Related to RP Activities**
- **Organize & Perform Self-assessment within Division**
- **Promote Safety Culture within Division**
- **Minimize & Control Collective Radiation Exposure to Plant Personnel**

Regulatory Dose Limits

Organ or Tissue	Dose Quantity	Dose Limits (mSv/y)	
		Radiation Workers	Public
Whole Body	Effective Dose	20	1
Lens of Eye	Equivalent Dose	20	15
Extremities or Skin	Equivalent Dose	500	50

Administrative Dose Limits

Organ or Tissue	Dose Quantity	Dose Limits (mSv/y)	
		Radiation Workers	Public
Whole Body	Effective Dose	16	0.8
Lens of Eye	Equivalent Dose	16	12
Extremities or Skin	Equivalent Dose	400	40



Our Slogan

**“Save $1\mu\text{Sv}$
To Save 1mSv ”**

CONSISTENCY is key



To SUCcess

Plant Area

Plant Area is divided as:

1) UNCONTROLLED AREA:

(expected effective dose $< 2\text{mSv/y}$)

2) RADIATION SUPERVISED AREA:

(expected effective dose $\geq 2\text{mSv/y}$ but $< 6\text{mSv/y}$)

3) RADIATION CONTROLLED AREA (RCA):

(expected effective dose $\geq 6\text{mSv/y}$)

Radiation Controlled Area (RCA)

RCA is divided into five Zones:

- It mainly includes NX, RX, FX, LR, SR, RS, MHW and SCATF
- Access to RCA is controlled for the purpose of protection of the individuals
- To enter in these areas RWP/SRWP is required.

Radiation Areas

- **Radiation Area**
- **High Radiation Area**
- **Very High Radiation Area**

Radiation Areas

The radiation area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of **50 μ Sv in 1 hour at 30 centimeters** from the radiation source or from any surface that the radiation penetrates.

RCA (ZONES)

RCA is Divided into 5 Radiation Zones Based on Dose Rate

ZONE	Zone-I	Zone-II	Zone-III	Zone-IV	Zone-V
COLOR CODE	GREEN	YELLOW	ORANGE	BROWN	RED
DR(μ Sv/hr)					
Range	≤ 8	$8 < DR \leq 25$	$25 < DR \leq 100$	$100 < DR \leq 1000$	> 1000

High Radiation Areas

An area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving a dose equivalent in excess of **0.1 rem (1 mSv) in 1 hour at 30 cm** from the radiation source or 30 cm from any surface that the radiation penetrates.

Very High Radiation Areas

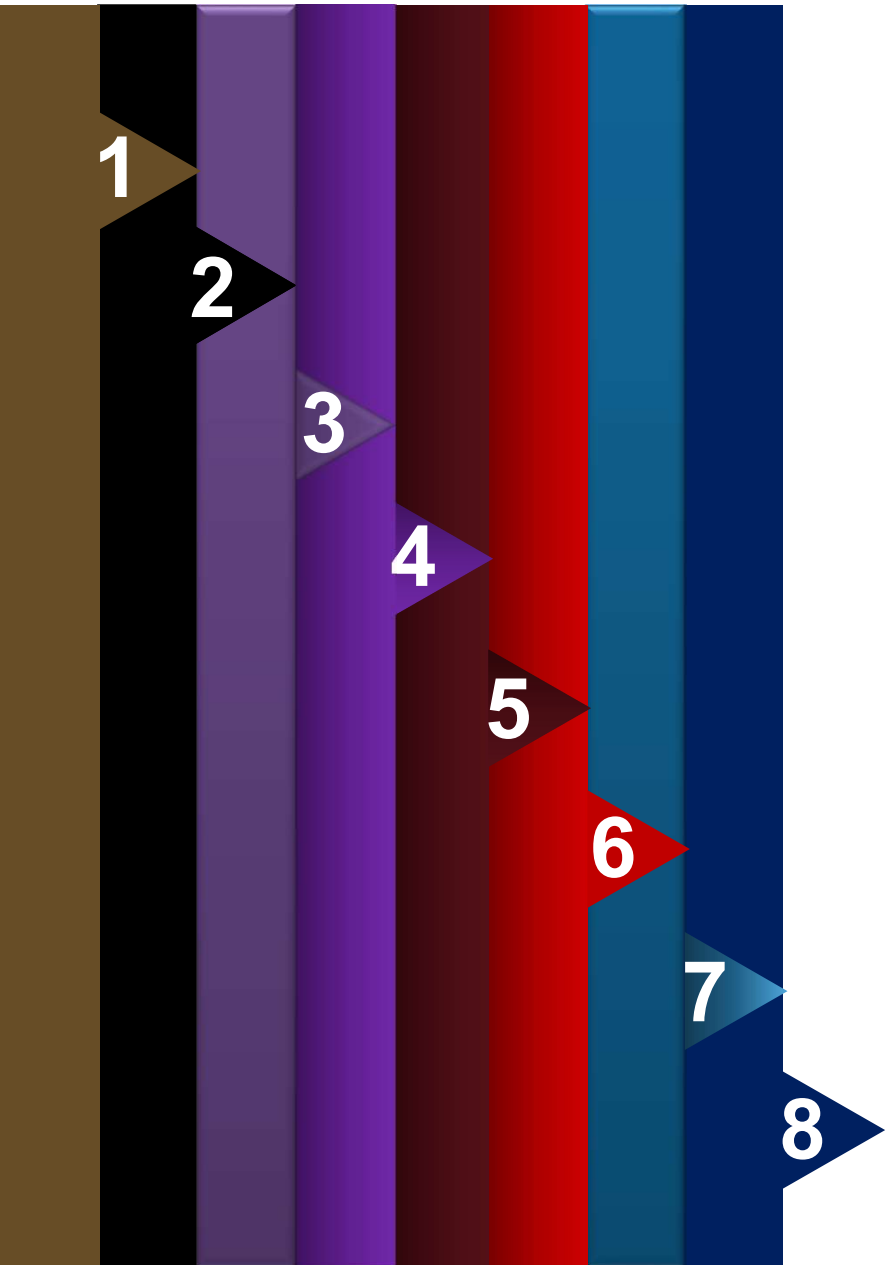
An area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving an absorbed dose in excess of **500 rads (5 grays) in 1 hour at 1m** from a radiation source or 1m from any surface that the radiation penetrates

ALARA Committee

- **ALARA Committee Provides Oversight to Radiological Control**
- **Review and Set Station , Unit and Outage Dose Targets**
- **Management has Strong Commitment Towards ALARA**

ALARA Committee Members

PM , Chairman ALARA Committee	Director, TS
DPM	DD(M)
M(HSE&EM)	M(O)
M(QA)	M(MMD)
M(HPD) , Secretary ALARA Committee	M(T)



RP Training Program

- **Radiation Protection Orientation**
- **Radiation Protection Qualification**
- **Radiation Protection Re-training**
- **RP Training/re-training of Op. Crews**
- **RP Training For RFO Workers**
- **RP Training to Onsite Responders**
- **RP Training to Offsite Responders**
- **Just in Time RP Training/OEF**

Factors In Strengthening RP Training

1

Operating Experience Feedback

2

Management Expectations & Management Coaching

3

Training As Focused Area

4

Just in time Operating Experience

5

WANO SOERs

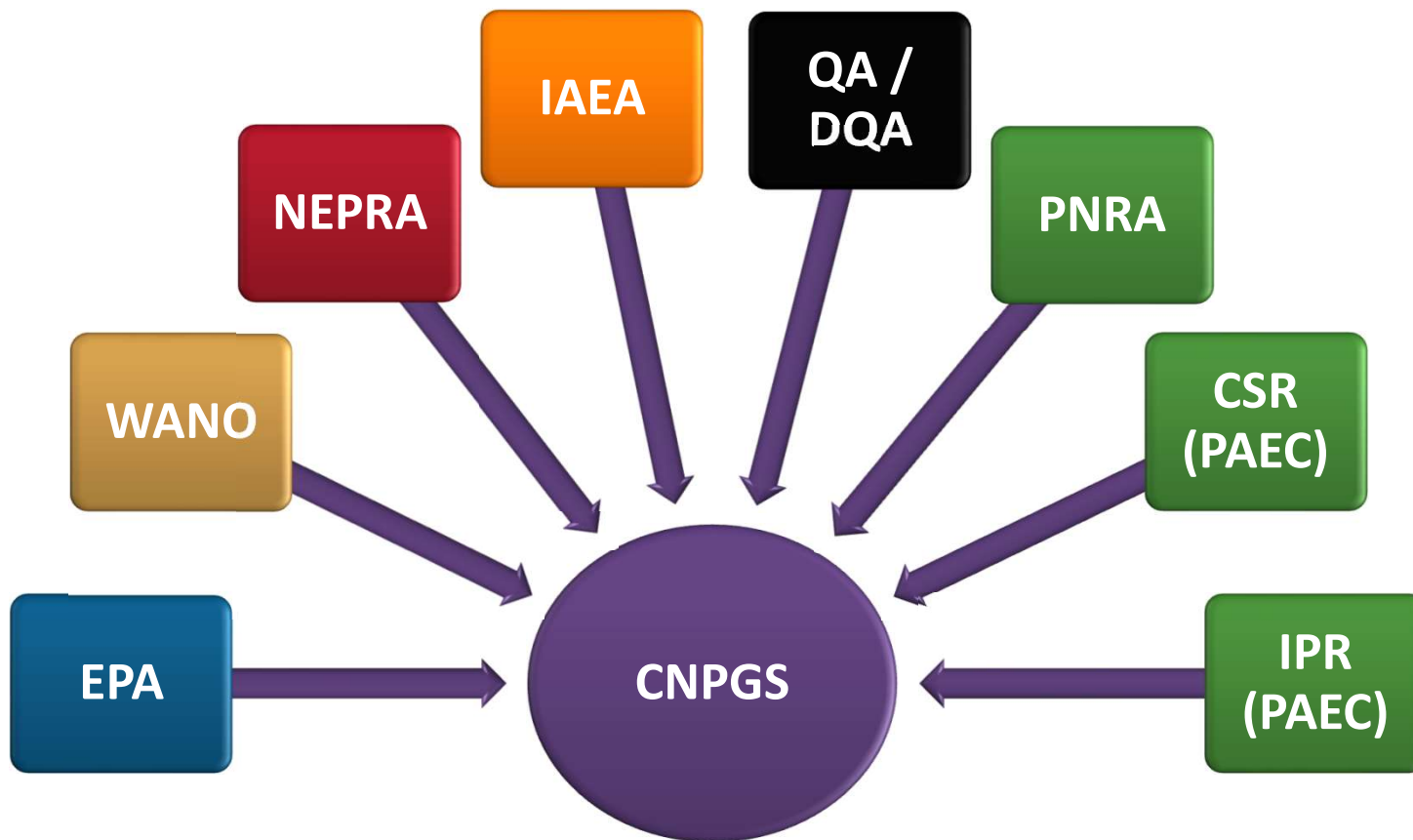
Performance Indicators

- **Collective Radiation Exposure in man-Sievert (CRE)**
- **Maximum Radiation Dose Received by an Individual in mSv (MID)**
- **Total Number of Personnel Radiation Contamination Events (PRC)**
- **Total number of PPE Contamination Events (PPR_R)**
- **No. of Persons whose Dose Exceeds Regulatory Annual Limit (DEL)**
- **SRC Gross Gamma Activity in Reactor Coolant (CAG)**
- **SRC Dose equivalent Iodine Activity in Reactor Coolant (CAI)**
- **Activity of Liquid Effluents Released into the Environment (ALE)**
- **Activity of Gaseous Effluents Released into the Environment (AGE)**

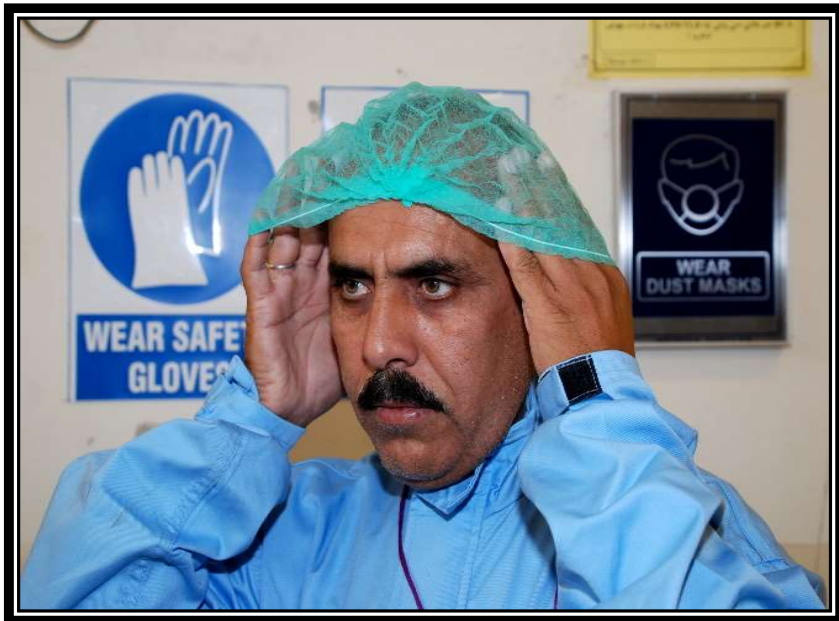
Fleet Management System

- **CFAM is Identified for Monitoring at Corporate Level**
- **SFAM is Designated at each Unit at each Station**
- **CFAM Ensures Harmonization of RP Practices at Station**
- **CFAM Ensure Compliance of Corporate Expectations at Station**

National & International Organizations









DATA

External Dosimetry

- **Electronic Dosimetry is Available at each Unit**
- **TL Dosimetry is Available at each Unit**
- **Nobody is Allowed to RCA without RWP/SRWP**
- **Nobody is Allowed to RCA without Dosimeter**
- **To manage dose record at multi-unit site, a consolidate data base is maintained for dose record of each personnel**

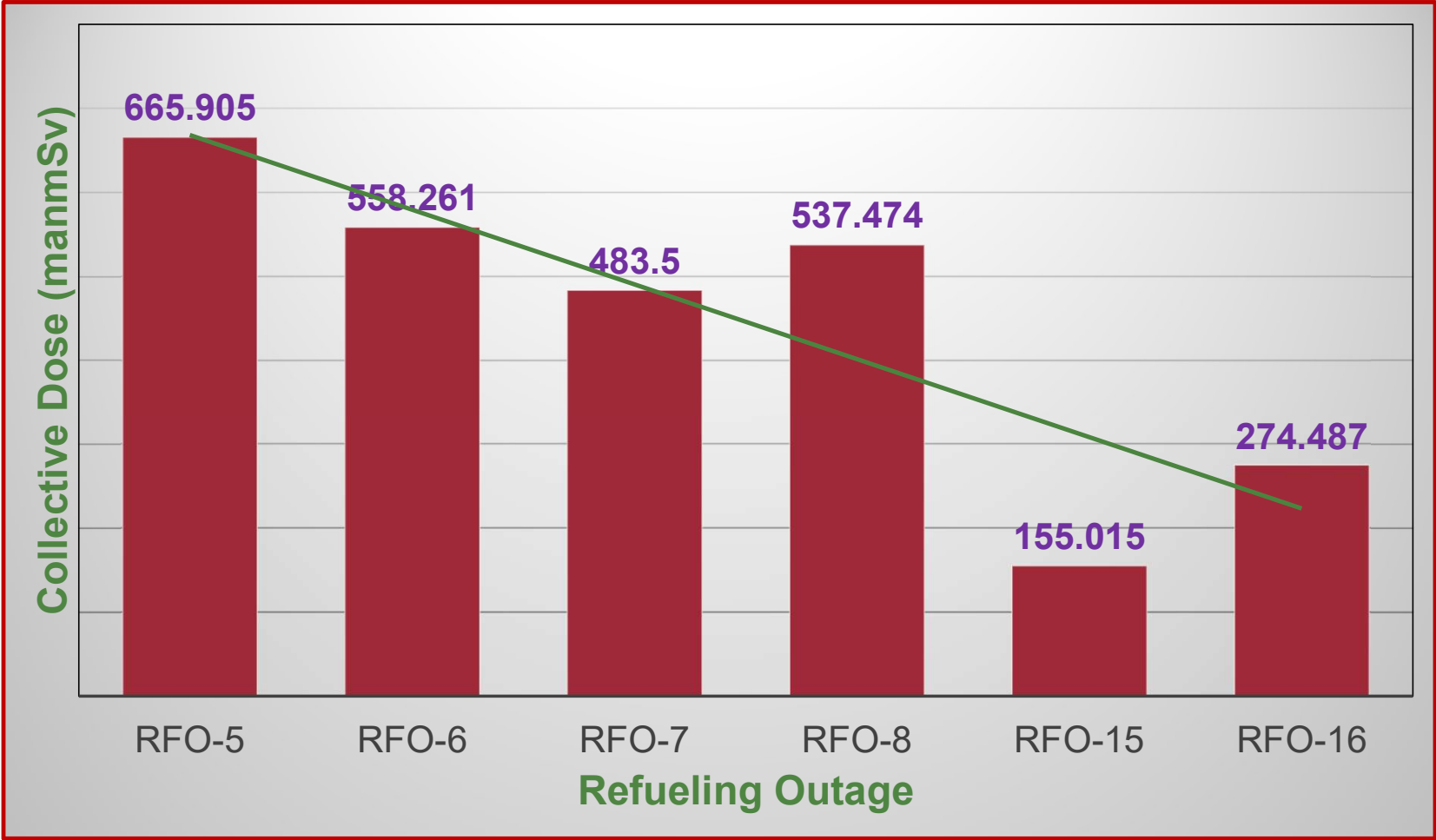
External Dosimetry



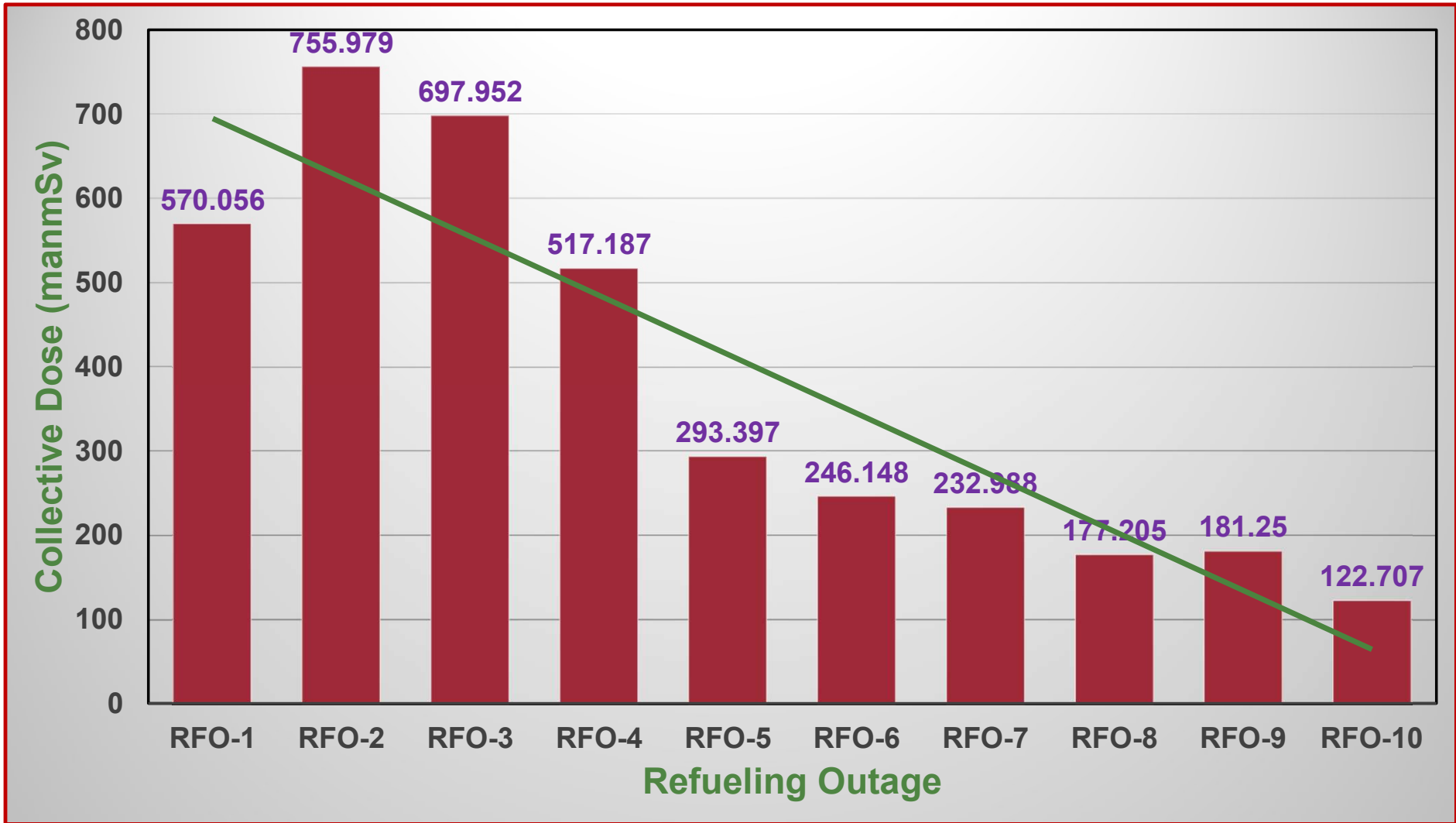
Internal Dosimetry

- **Whole Body Counting System is Available at Site**
- **Before & After each Hot Job with Airborne Risk, Whole Body Counting is Performed**
- **Data Base is being Maintained for WBC Results**

RFO Total Collective Doses Data (Unit-1)



RFO Total Collective Doses Data (Unit-2)



RFO Total Collective Doses Data (Unit-4)

RFO	Collective Doses (man- mSv)
RFO-3	164.97
RFO-4	85.78
RFO-5	87.393

Conclusion



- ❖ **With Active Utilization of Above Mentioned RP Tools / Techniques we have achieved lower values of CRE.**
- ❖ **We are Committed to Reduce CRE further by Utilizing Emerging Techniques of RP (AI etc.)**

Thank You

