中广核 CGN

善用自然的能量
Natural Energy Powering Nature

Centralized Monitoring and Management Practice of Occupational Exposure in CGN



Yu enjian
Radiation Monitoring Center of CGN

About CGN

History: A Path towards Innovative Development

1979

High starting point

Guangdong Province was chosen to be the site for building the **Daya Bay NPP**, which marks the starting point for China' s nuclear power sector
Innovative model: Relying on loans to finance the construction, repaying the loans by power sales, and operating a joint venture.

1994

Growing the nuclear sector through circular development

The Daya Bay NPP went into operation; the Ling' ao Phase I project was launched; According to international standards to achieve **independence and develop tech and equipment by ourselves.**

In 1994, the **China Guangdong Nuclear Power Group** was founded.

2004

Nuclear power grew in scale; numerous clean energy were developed

We operated NPPs nationwide, including the Ling' Ao Phase II, Hongyanhe, Ningde, Yangjiang, Taishan, Fangchenggang projects.

Clean energy was developed, such as the wind, hydro and solar power.

2011

Operating specialized segments by following the market rules; promoting technological innovation and joining the international market

The Company is now operating **4+X specialized sectors**; we have developed the HPR1000 and join the international market.

2018

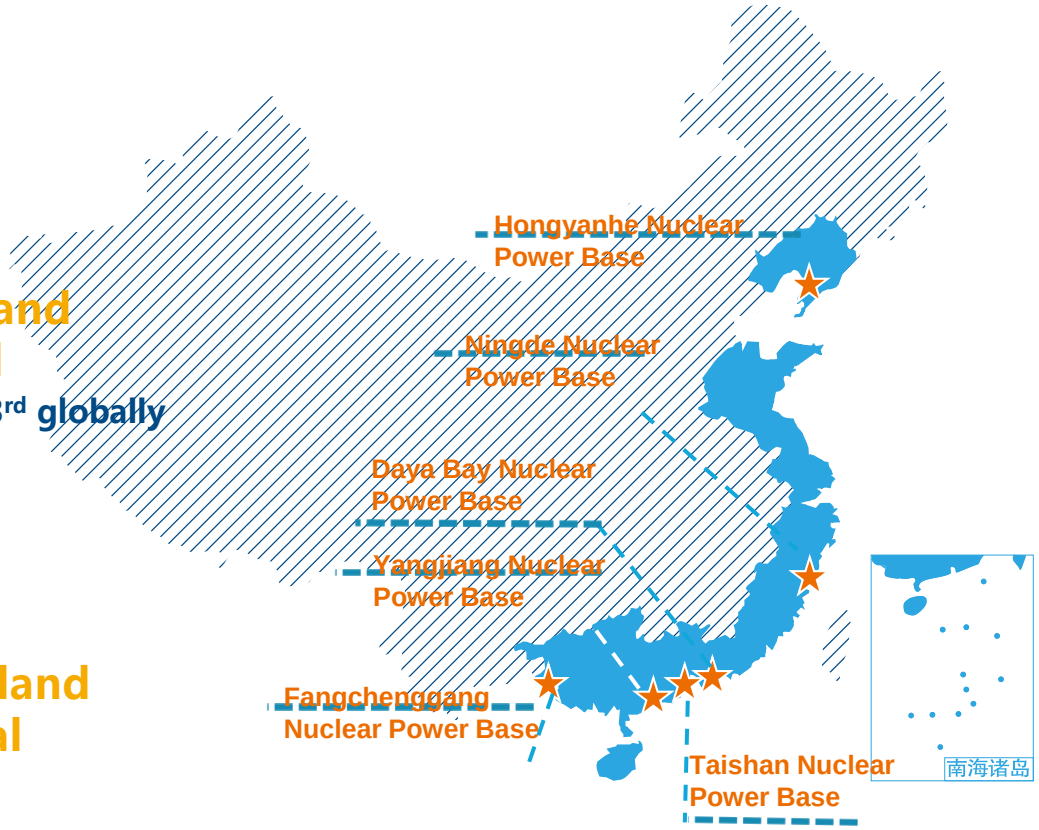
In 2013, the Company was renamed as the **CGN Group**.

Nuclear Power Sector

x 24 27.14 GW 56% of mainland China’s total

Capacity in Operation: 1st largest in China and 3rd globally

x 4 4.60 GW 41% of mainland China’s total



Nuclear Power O&M Services

- Maintenance Service
- Training Service
- Spare Parts Management
- Production Preparedness

Nuclear Power Engineering & Construction Services

- Engineering Design
- Engineering Procurement
- Construction Management
- Testing & commissioning

Regulatory Basis

Statutes



- Nuclear Safety Law
- Prevention and Control of Occupational Diseases
- …

Regulations

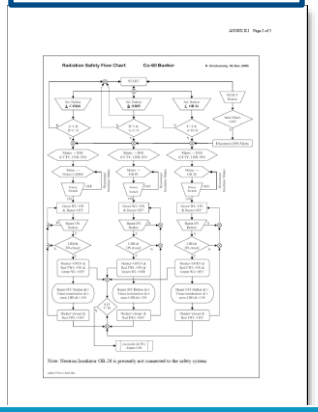
- HAF103/HAD103…(National Nuclear Safety administration)
- Decree No. 55 of the Ministry of Health /Measures for Occupational Health Management of Radiation Workers
- …

Standards



- Basic Standards for Protection against ionizing radiation …
- Specification for individual Monitoring of Occupational internal/External exposure
- …

Programs

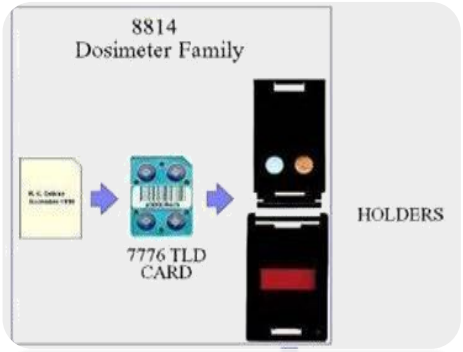


- RP Programme
- Emergency Plan
- Monitoring &Management Produce
- Work instructions
- …

Dosimetry

External Dosimetry

- Whole-body thermoluminescence dosimeter (TLD)
  - BGN (beta/gamma/neutron) dosimeter with appropriate filtration
- Extremity thermoluminescence dosimeter (DXT-RAD)
  - Adjustable finger ring carrying TLD pellet







- Whole-body electronic personal dosimeters (EPD)

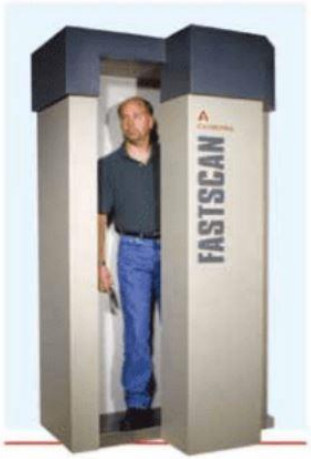






Internal Dosimetry

- Whole-body Counter
  - NaI & HPGe

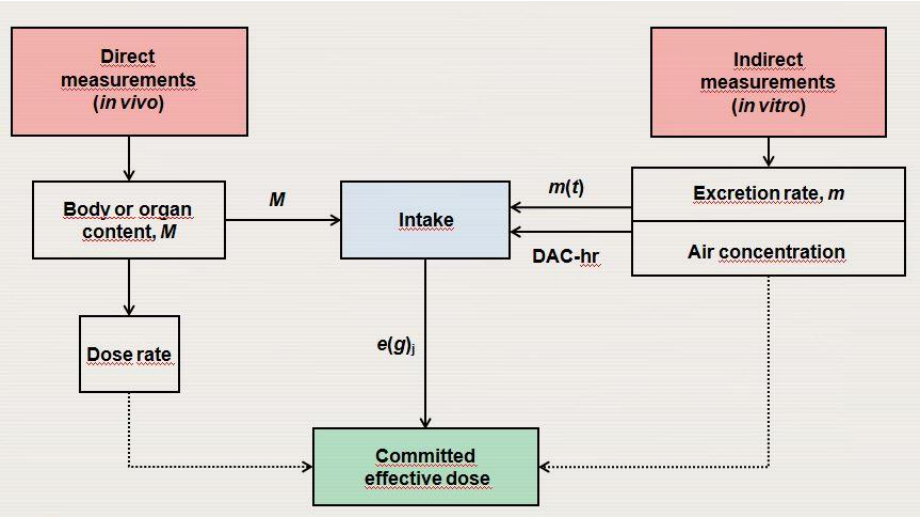


FASTSCAN™:



ACCUSCAN II™:

Interpretation of Measurements



- Urine/Faecal Analysis(under building)
- PAS(personal air sampler)/SAS (static air sampler)

Accredited Laboratory

- CMA: China Metrology Accreditation
  - RBT214-2017 (Competence assessment for Inspection body and laboratory mandatory approval -General requirements for Inspection body and laboratory)
  - GB/T27025（Base on ISO/IEC17025:2017）


检验检测机构
资质认定证书

证书编号：201519243IS

名称：中广核（深圳）辐射监测技术有限公司

地址：深圳市福田区华强北街道深南中路2010号东风大厦5楼511房

经审查，你机构已具备国家有关法律、行政法规规定的基本条件和能力，现予批准，可以向社会出具具有证明作用的数据和结果，特发此证。资质认定包括检验检测机构计量认证。

检验检测能力及授权签字人见证书附表。

许可使用标志 CMA

发证日期：二〇一五年十二月三日

有效期至：二〇二一年十二月二日

发证机关 广东省质量技术监督局

- Qualification of Radiological Health Technical Service


放射卫生技术服务机构资质证书

粤放卫技字（2016）第031号

单位名称：中广核（深圳）辐射监测技术有限公司

法定代表人（负责人）：上官志洪

地　　址：广东省深圳市大鹏新区大亚湾核电站基地

技术服务范围：个人剂量监测

有效期限：2016年04月26日　至　2020年04月25日

发证机关（公章）

二〇一六　年　月　日

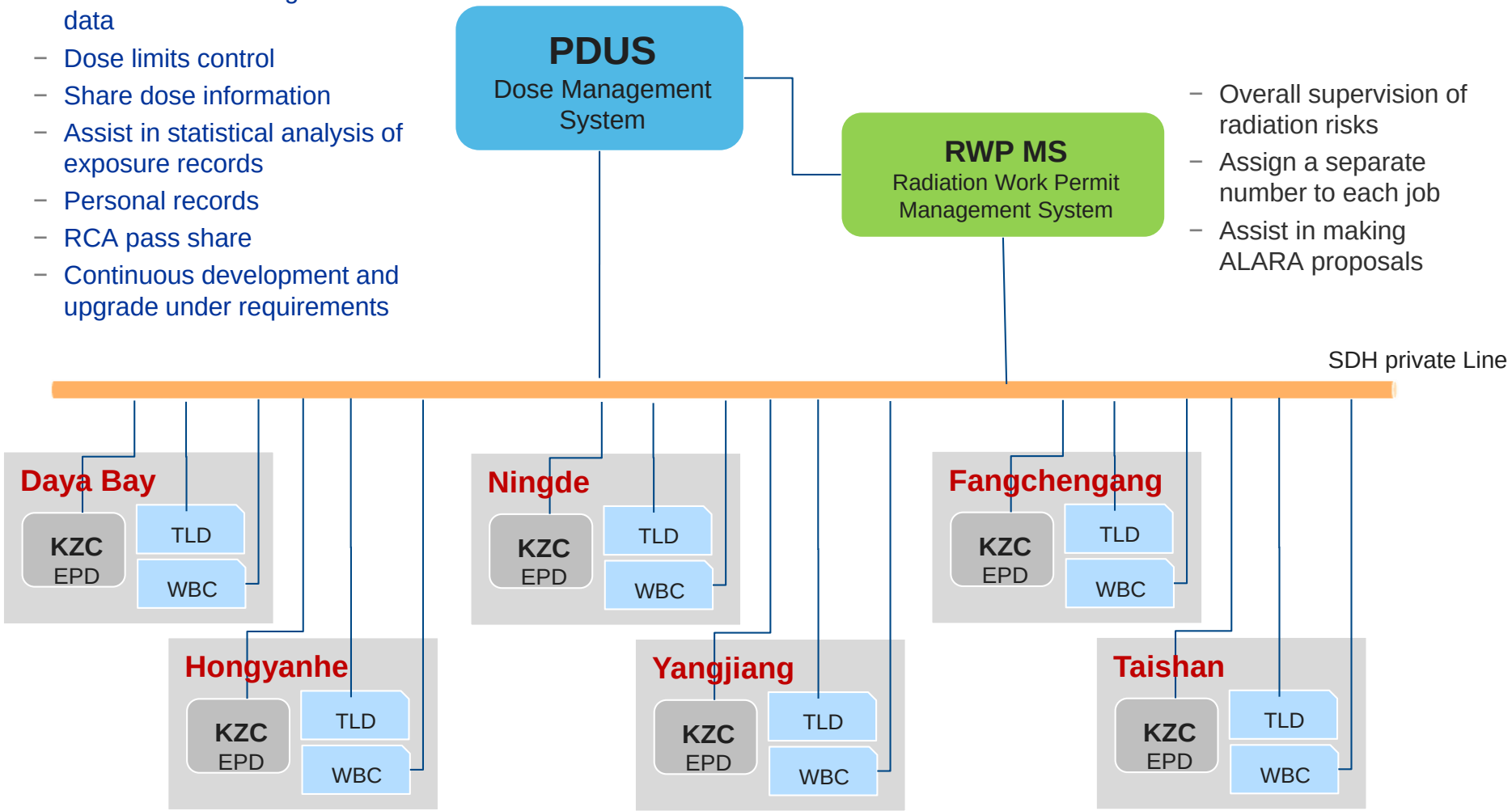
（批准的具体技术服务项目见副本）

- Located in 6 Nuclear Power Plant sites.

Information Systems

Information Systems

- Manage, process and store individual monitoring services data
- Dose limits control
- Share dose information
- Assist in statistical analysis of exposure records
- Personal records
- RCA pass share
- Continuous development and upgrade under requirements



Daily Dose Control

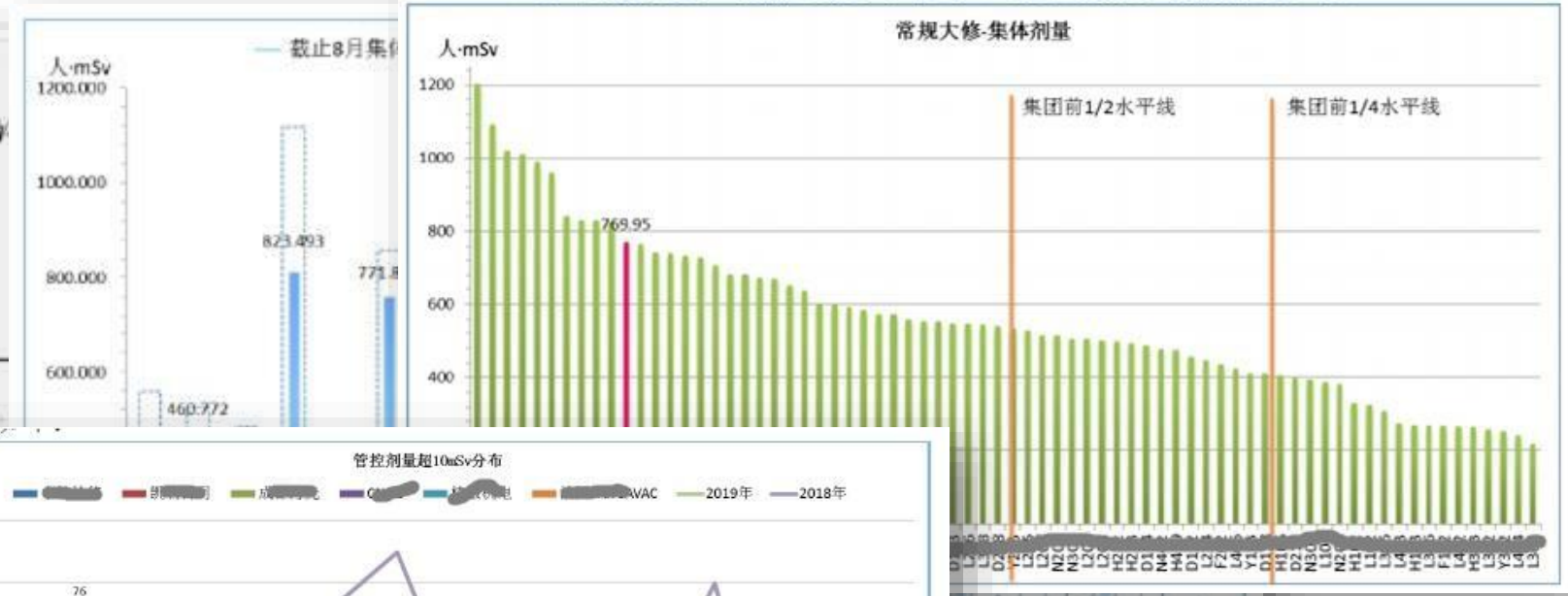
Daily dose control

- Reference level

Plant Control Target	•Do not exceed this value as far as possible
Intervention Level	•Close the access authorization for RCA of the worker intervened.
Investigation Level	•The daily and monthly cumulated dose should be investigated in time to confirm its authenticity.

- Statistical methods
  - Dose Value includes max (EPD&TLD), and internal exposure
  - Both in-plant and off-site exposure (contractor's declaration)
  - 365 Days rolling calculating

Monthly Report





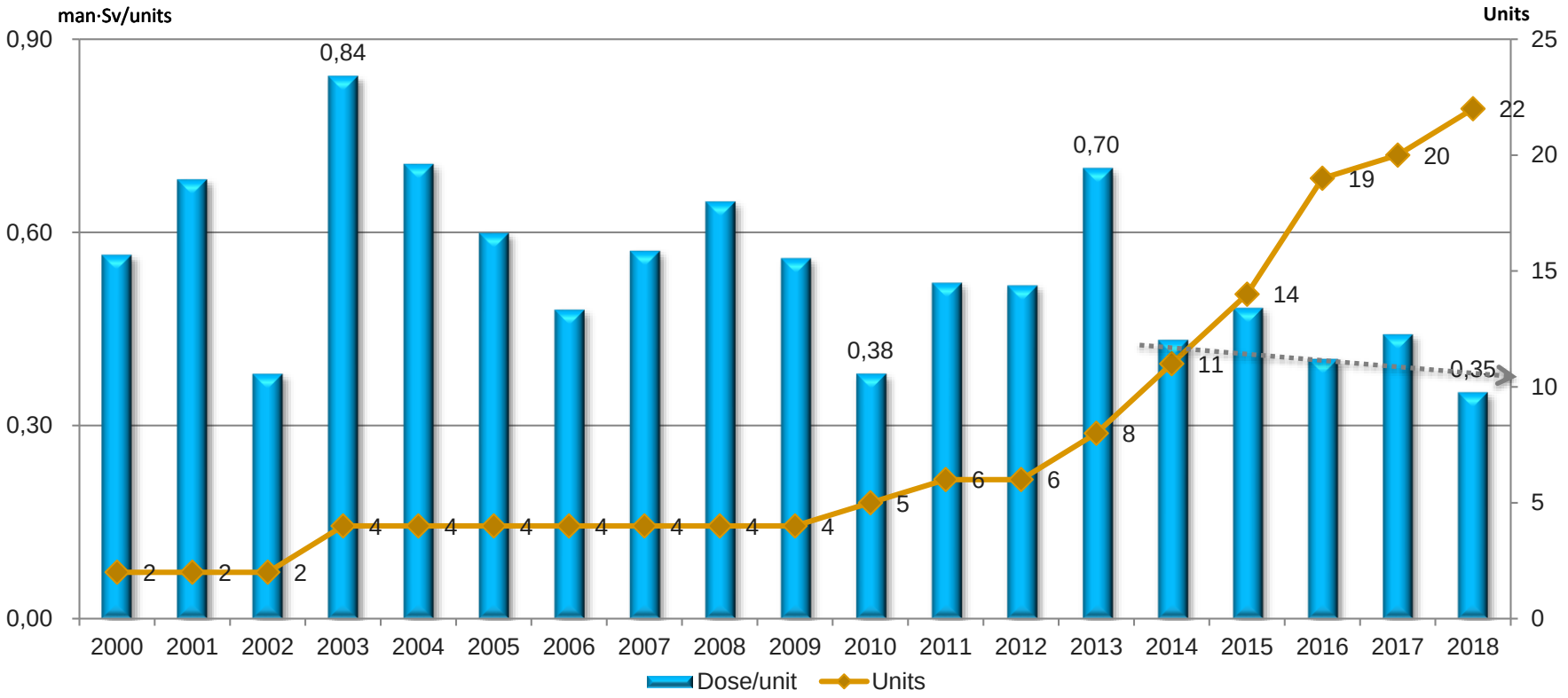
4.1 异常事件汇总

异常类型	大亚湾	宁德	红沿河	防城港	台山
超管理水平照射事件（预警水平）	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
超管理水平照射事件（调查水平）	[redacted]	[redacted]	0 / 0	0 / 0	0 / 0
超管理水平照射事件（干预水平）	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
内污染剂量估算	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
内污染事件	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
其他异常	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0

说明：

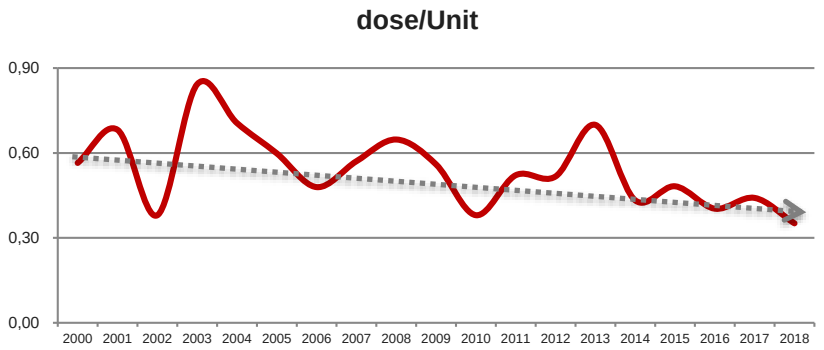
Collective Dose

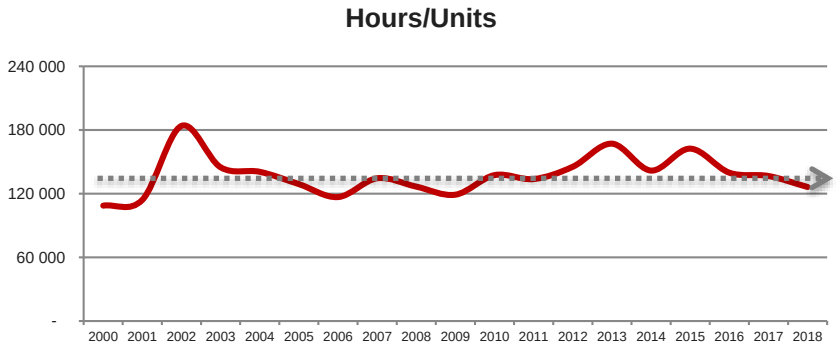
PROGRESSION OF THE CGN FLEET COLLECTIVE DOSE

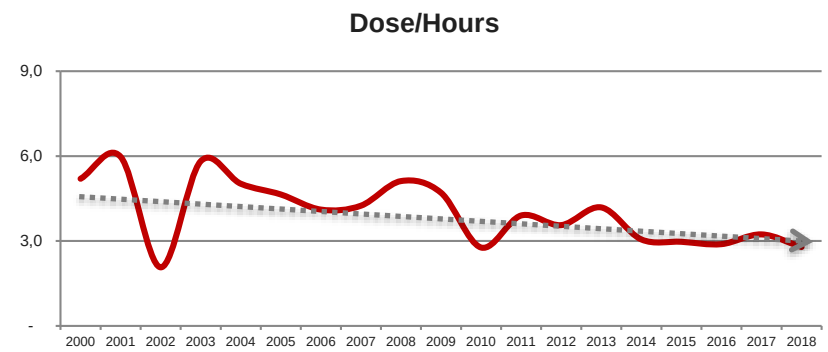


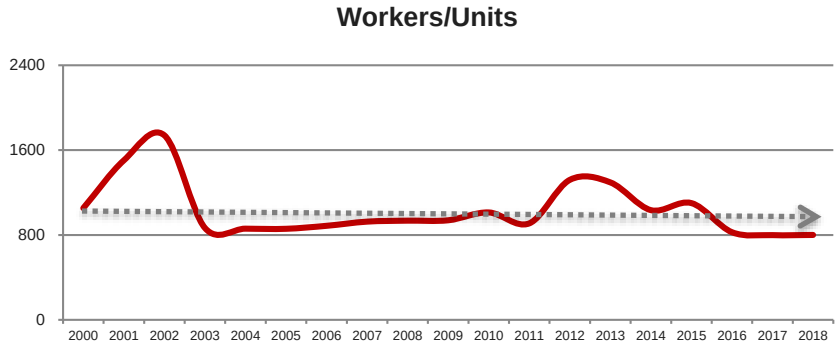
In the early stage, for the small number of units, the fluctuation mainly comes from outage type and outage arrangement.
With the increasing of the units number, the average dose in the past five years is about 0.4man·Sv/unit.

SPOTLIGHT ON THE COLLECTIVE DOSE SINCE THE 2000s





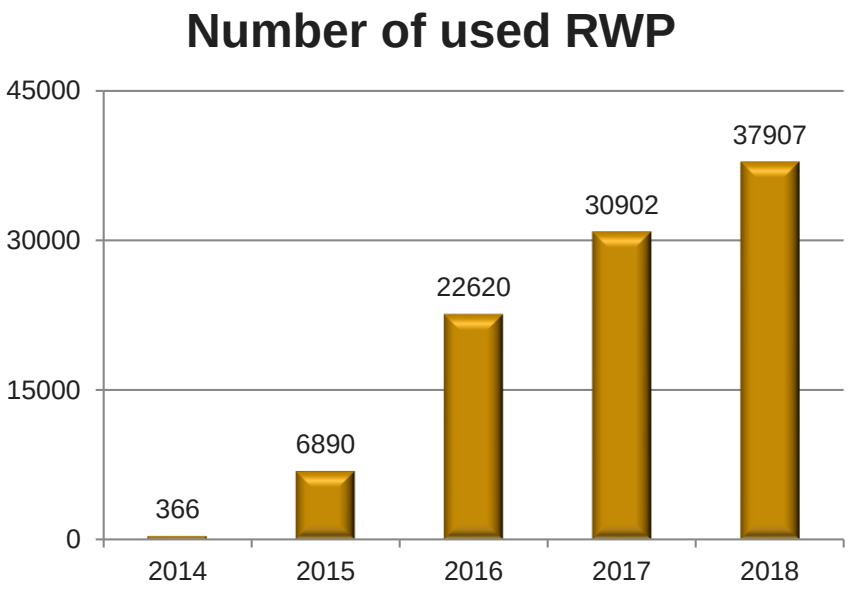


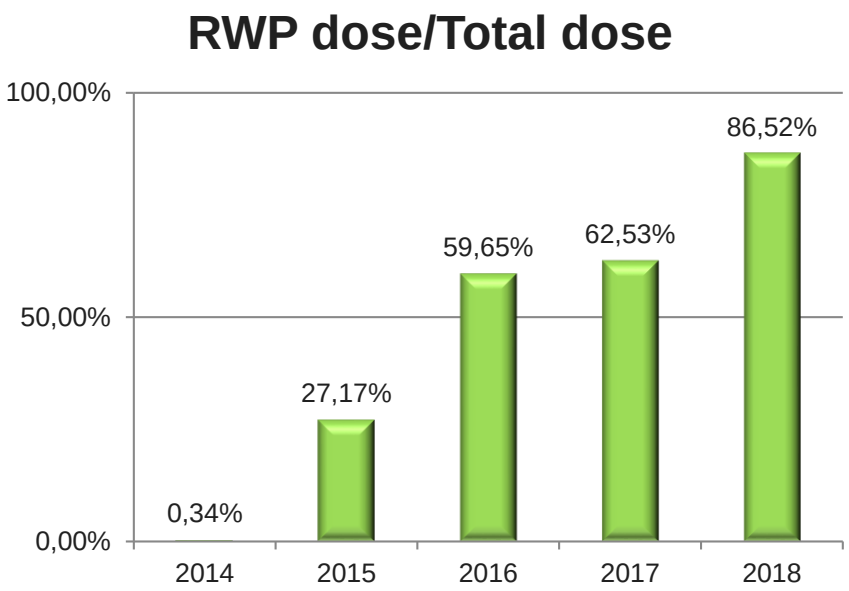


The collective dose per unit and the collective dose per hour show an overall downward trend in past years

The working hours per unit and the worker number per unit Fluctuate above and below the same value in past years

Radiation Work Permits (RWP) Usage Since 2014

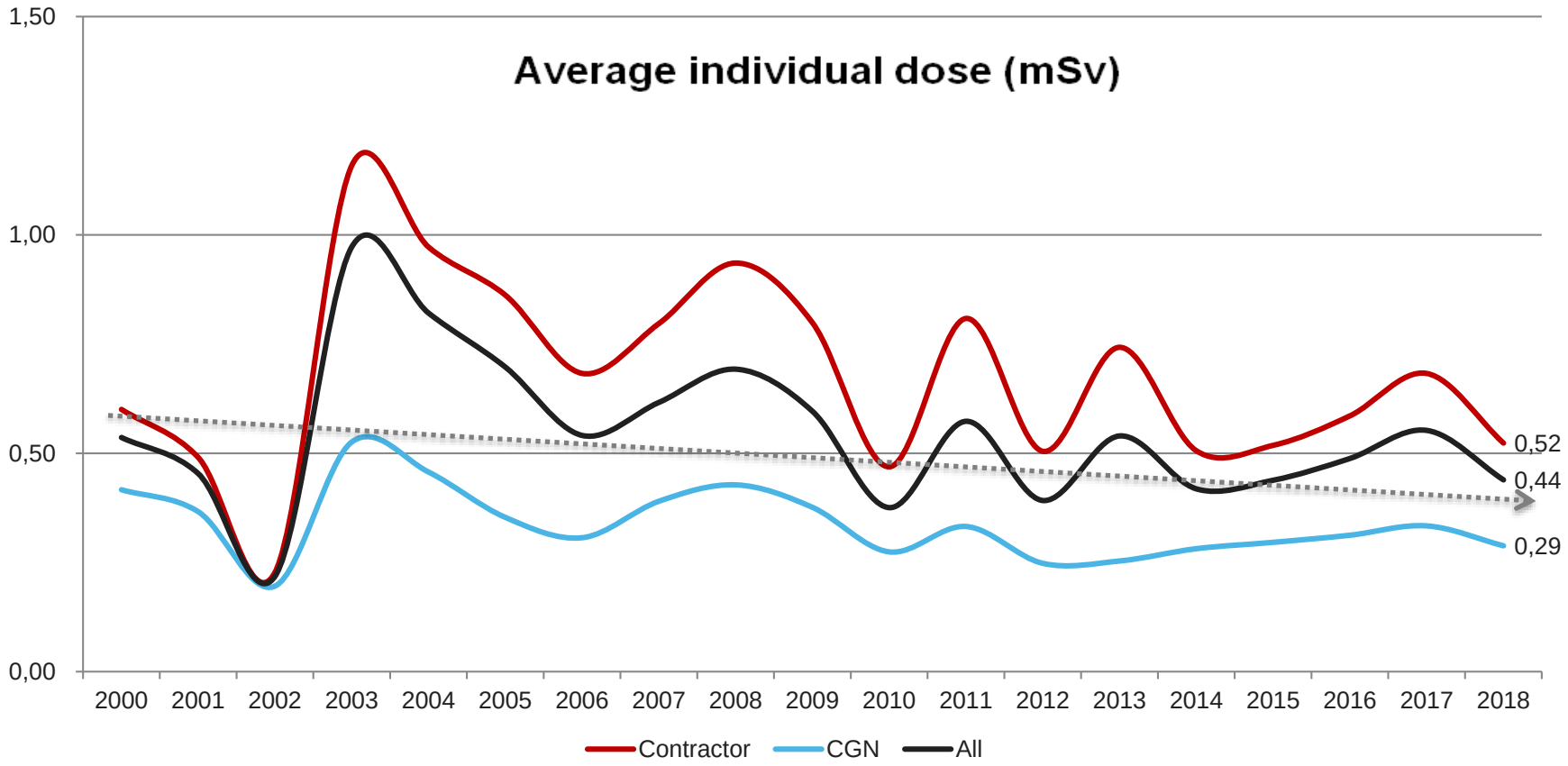




From 2014,CGN Fleet start to using RWP system with Significant increasing in number of used RWP by years

By the end of 2018, most of the power plants have run RWP system, and the proportion of RWP dose to total dose is higher than 85%

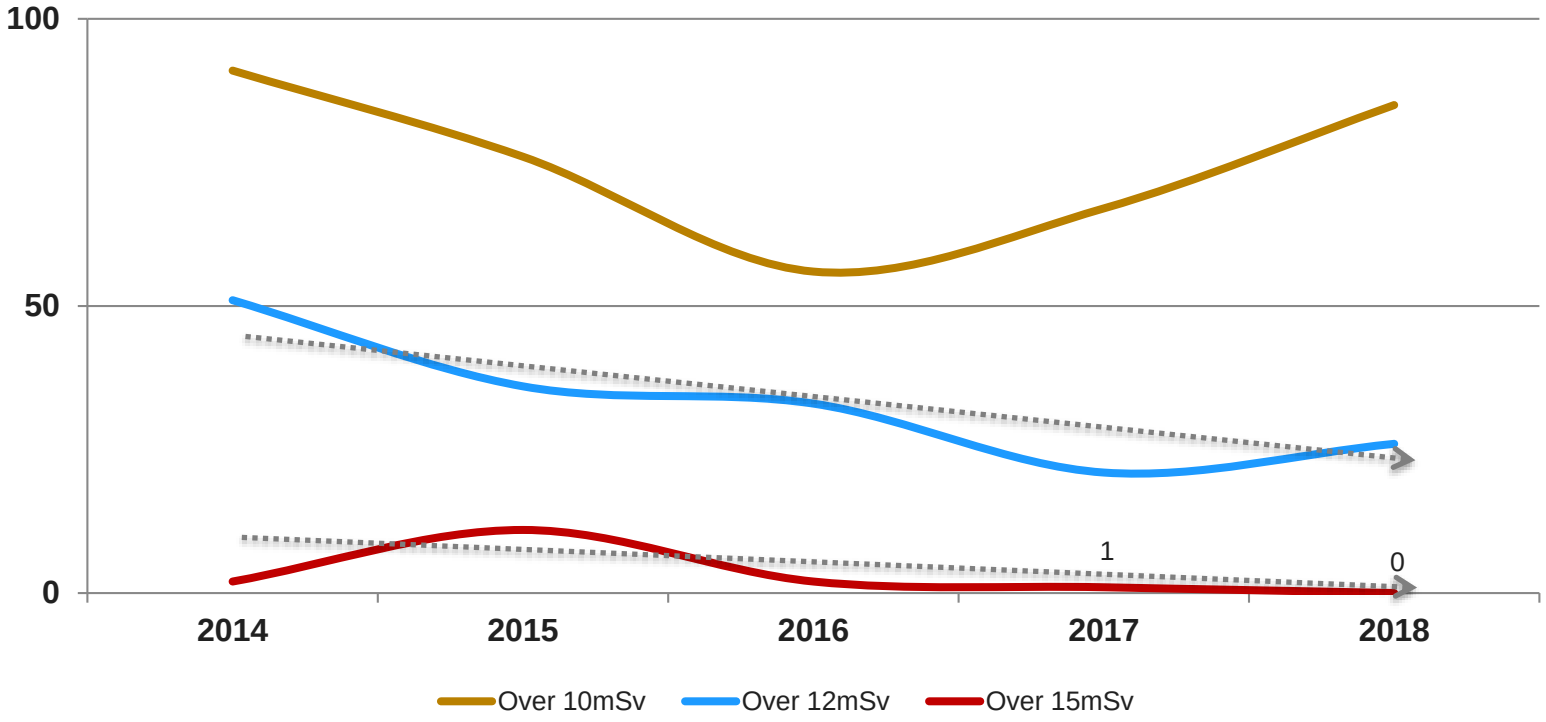
Individual Dose



From 2000 to 2018, there is a slight downward trend for the average individual dose for all workers.

As the average worker number per unit is basically the same amone years, the average individual dose is mainly affected by outage type and outage arrangement.

NUMBER OF WORKERS > 10 mSv



In past 5 years, the number of workers over 12mSv Reduce by half, while the number of workers over 15mSv Gradually reduce to 0.

SUMMARY

Centralized Monitoring and Management of Occupational Exposure in CGN, including:

- External exposure &Internal exposure Monitoring
- Standardized Programme/Procedure/ instructions
- Real-time networked control CGN fleet dose data
- Periodic analysis and evaluation report

With the commissioning of the new units, the average unit dose of CGN has generally decreased year by year;

Centralized management helps control the individual dose limits, and the number of individual doses over 15mSv is controlled at a lower level.

Future Activities

- To Improve the capability of dosimetry (eye lens, biological sample，alpha nuclide monitoring)
- With new technologies such as wireless / intelligent monitoring to assist collective / individual dose control
- To enhance RWP system function of predicting and evaluating outage/task dose

Thank You!

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