



Occupational Exposure in German Nuclear Power Plants

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- Overview on occupational exposure in German NPPs
- Proposal of new EU basic safety standards on Radiation protection – potential consequences on NPPs
- Conclusions



Introduction

- Since early 1960s NPPs are in operation in Germany
 - esp. in western German NPPs contracted personnel is involved in operation of the NPPs, particularly during outage
 - to ensure an efficient and successful conduct of outages the involvement of highly qualified and competent personnel, including several specialists from contracted enterprises is necessary
 - Special attention is needed regarding the limits of occupational exposure of the contracted personnel



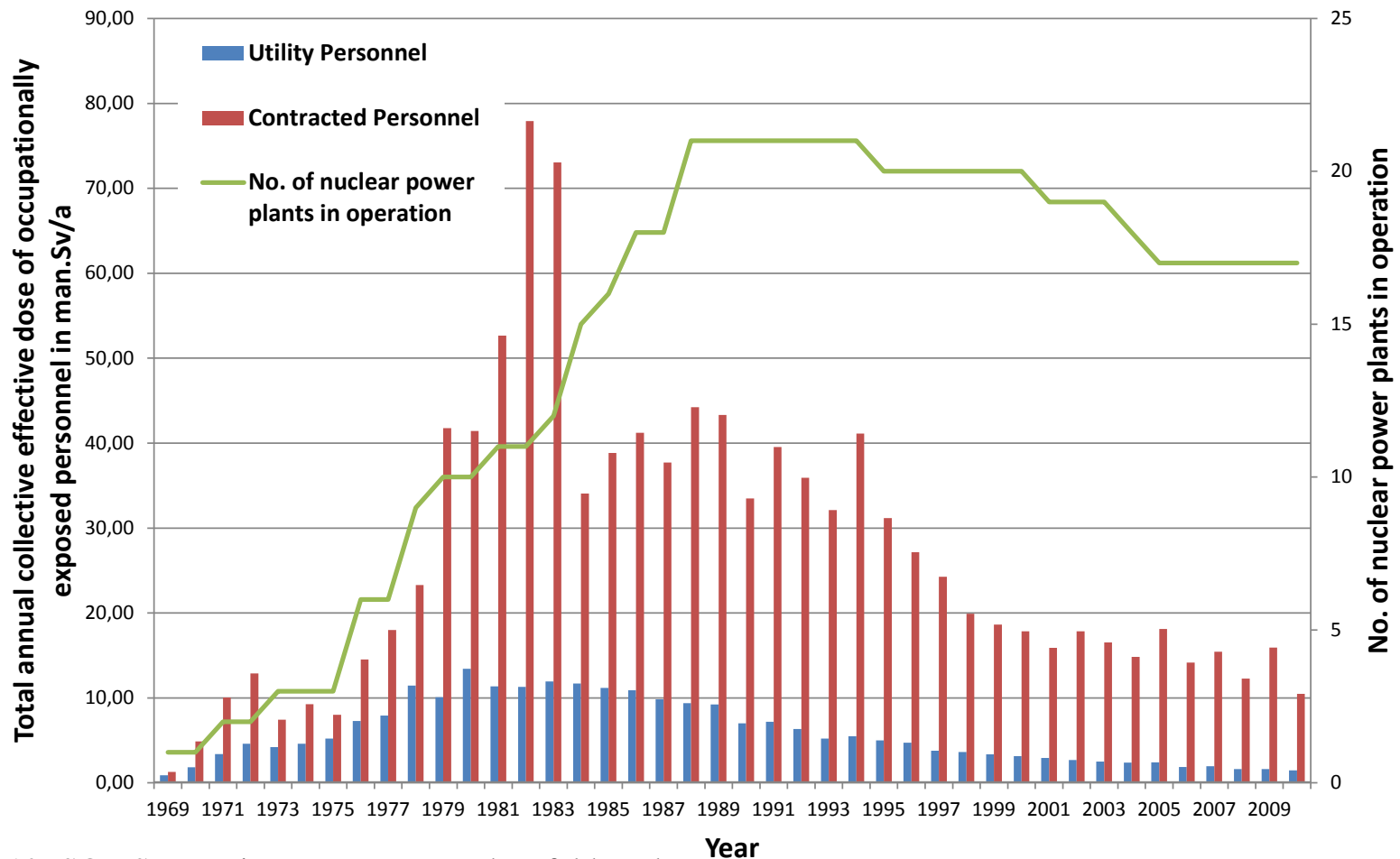
Overview on occupational exposure

- Notes on the data used
 - data based on operational dosimetry of the NPPs (the data on the operation of NPPs in the former GDR is not included)
 - especially for the contracted personnel:
 - total number of contracted personnel
 - is equal to the sum of the number of contracted personnel reported by each NPP
 - is higher than the number of real persons working
 - dose distribution shows
 - doses at the individual NPPs and at one twin-NPP site
 - not of the annual individual effective dose



NPPs in operation

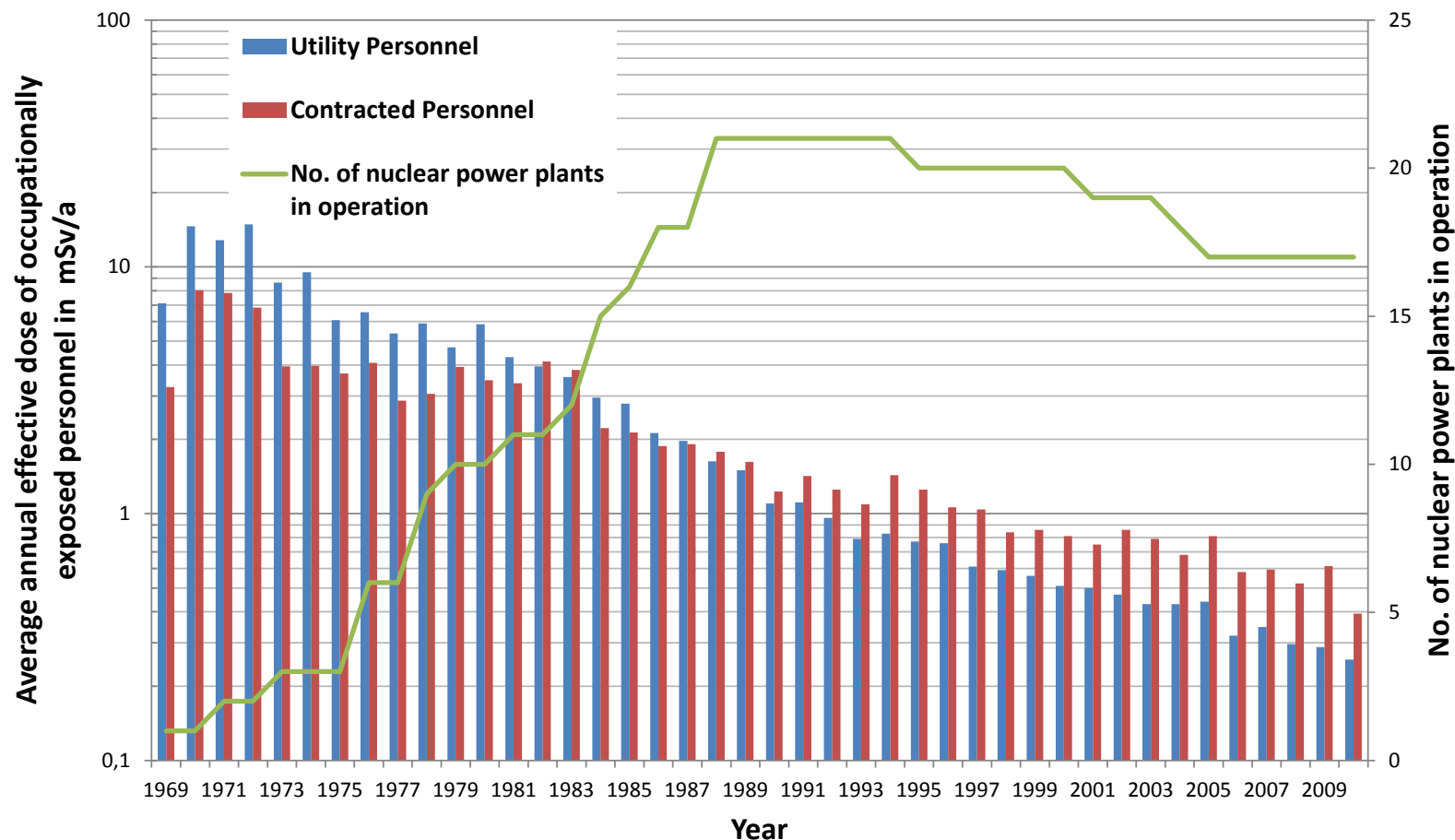
Total collective dose





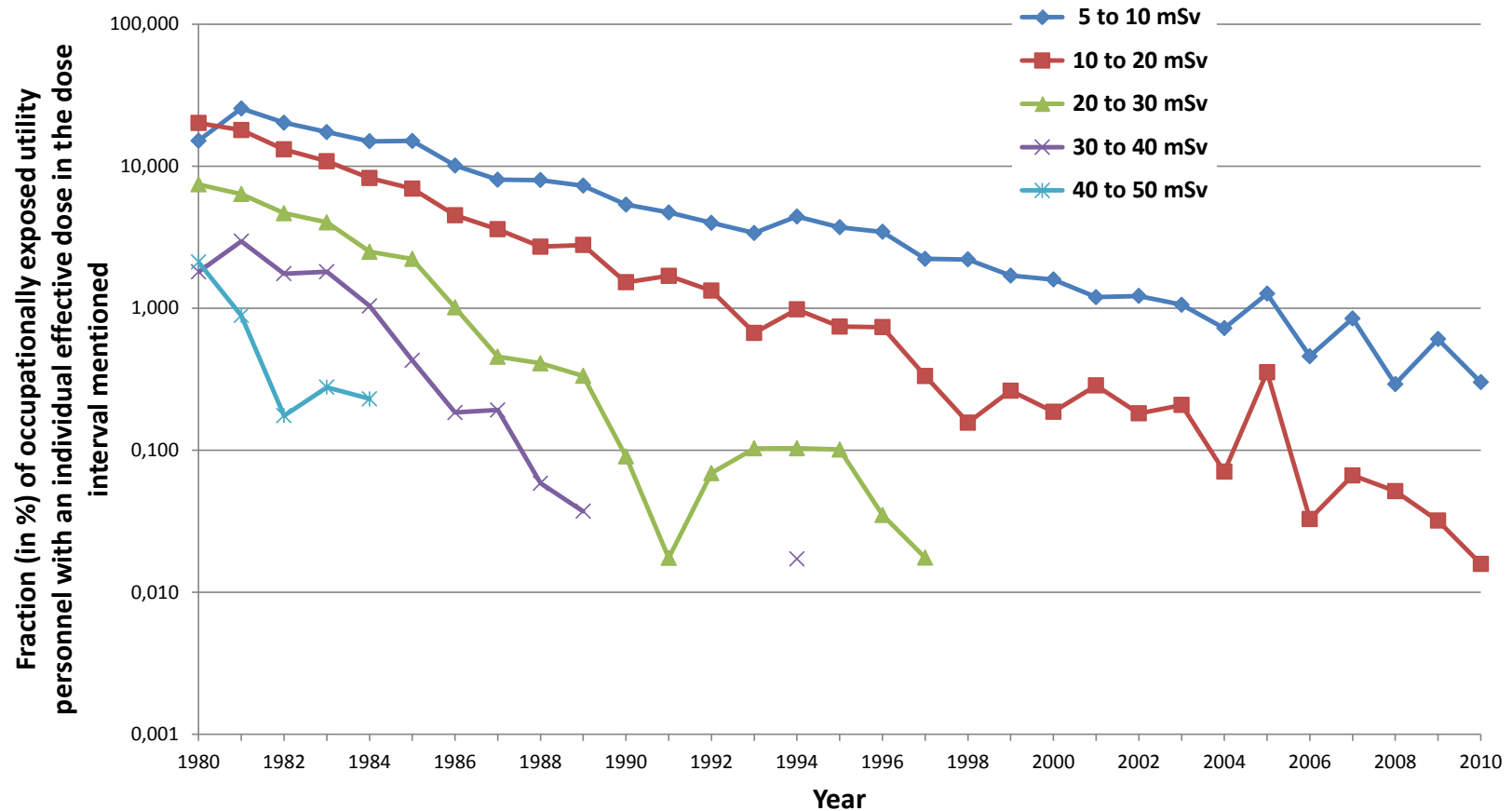
NPPs in operation

Average dose



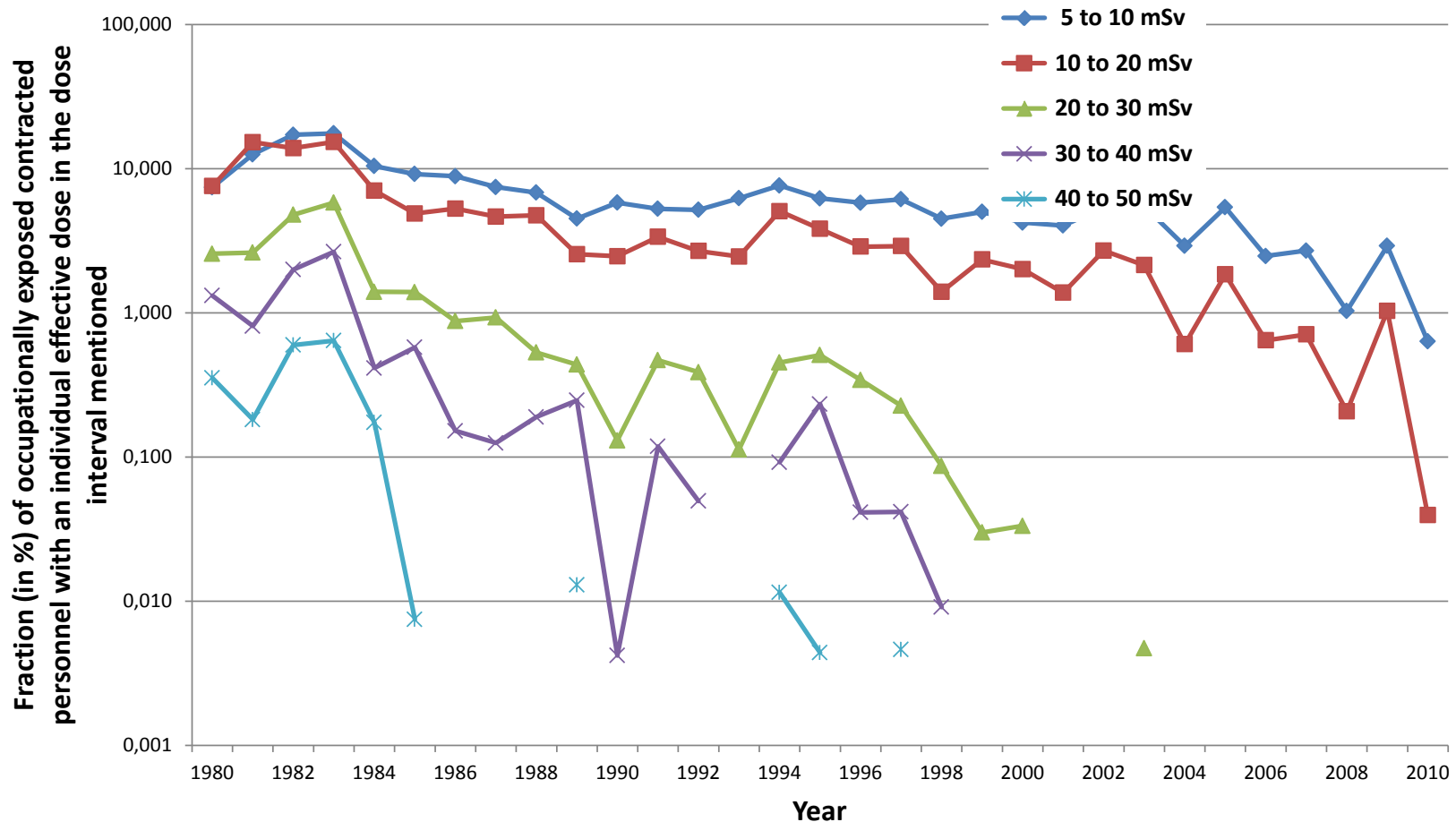


Overview on occupational exposure Utility personnel





Overview on occupational exposure Contracted personnel



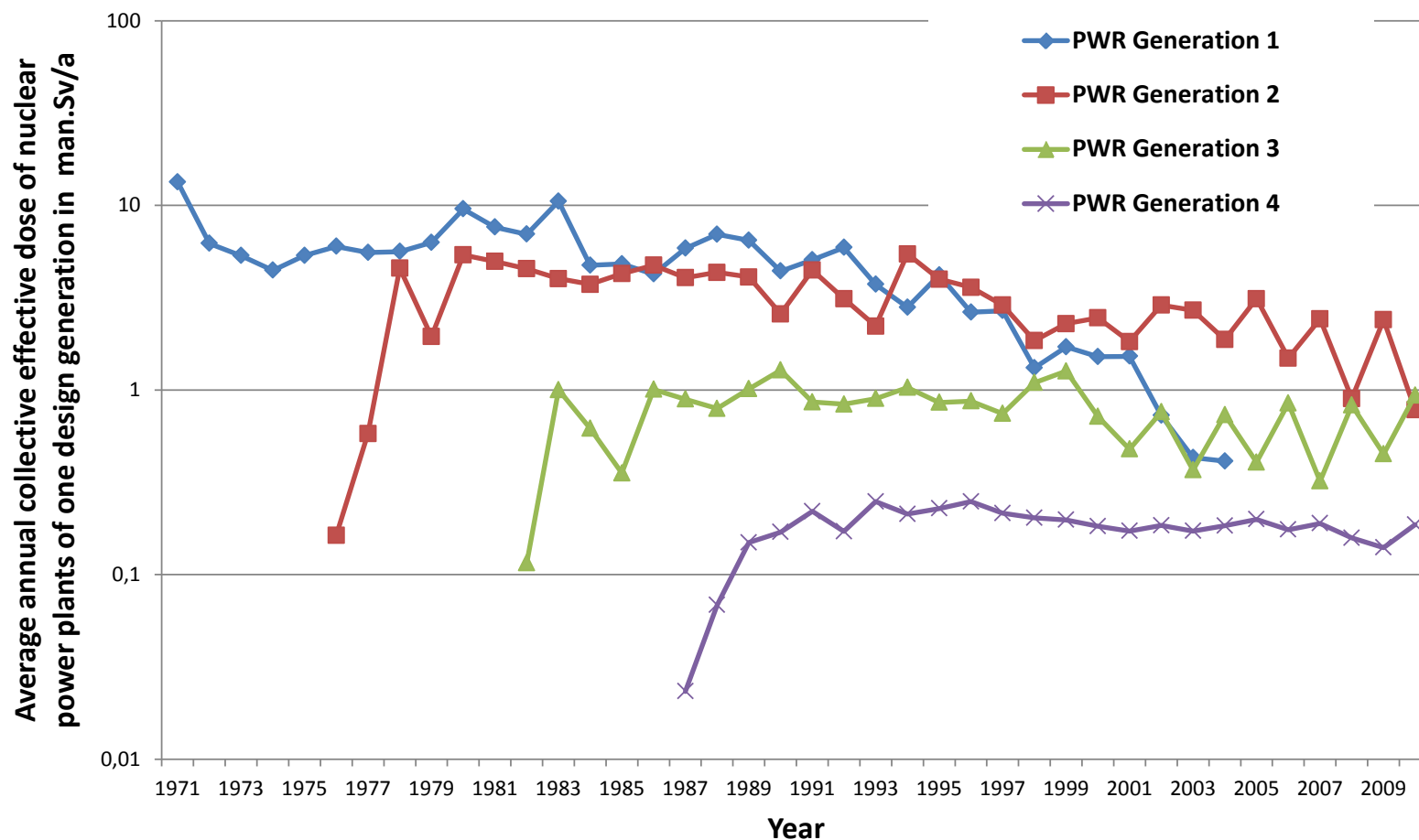


Overview on occupational exposure NPPs in operation

- Key observations on occupational exposures
 - total annual collective dose and average annual effective dose of occupationally exposed personnel decrease
 - valid for utility personnel and contracted personnel
 - highest dose values for contracted personnel
 - significant changes in the work content of outages (e.g. back fitting, replacements, periodic inspection programs) contributions of individual NPPs from year to year may significantly affect the total dose
(➔ comparison of design generations)
 - dose distributions show a decrease of higher doses



Overview on occupational exposure NPPs in operation





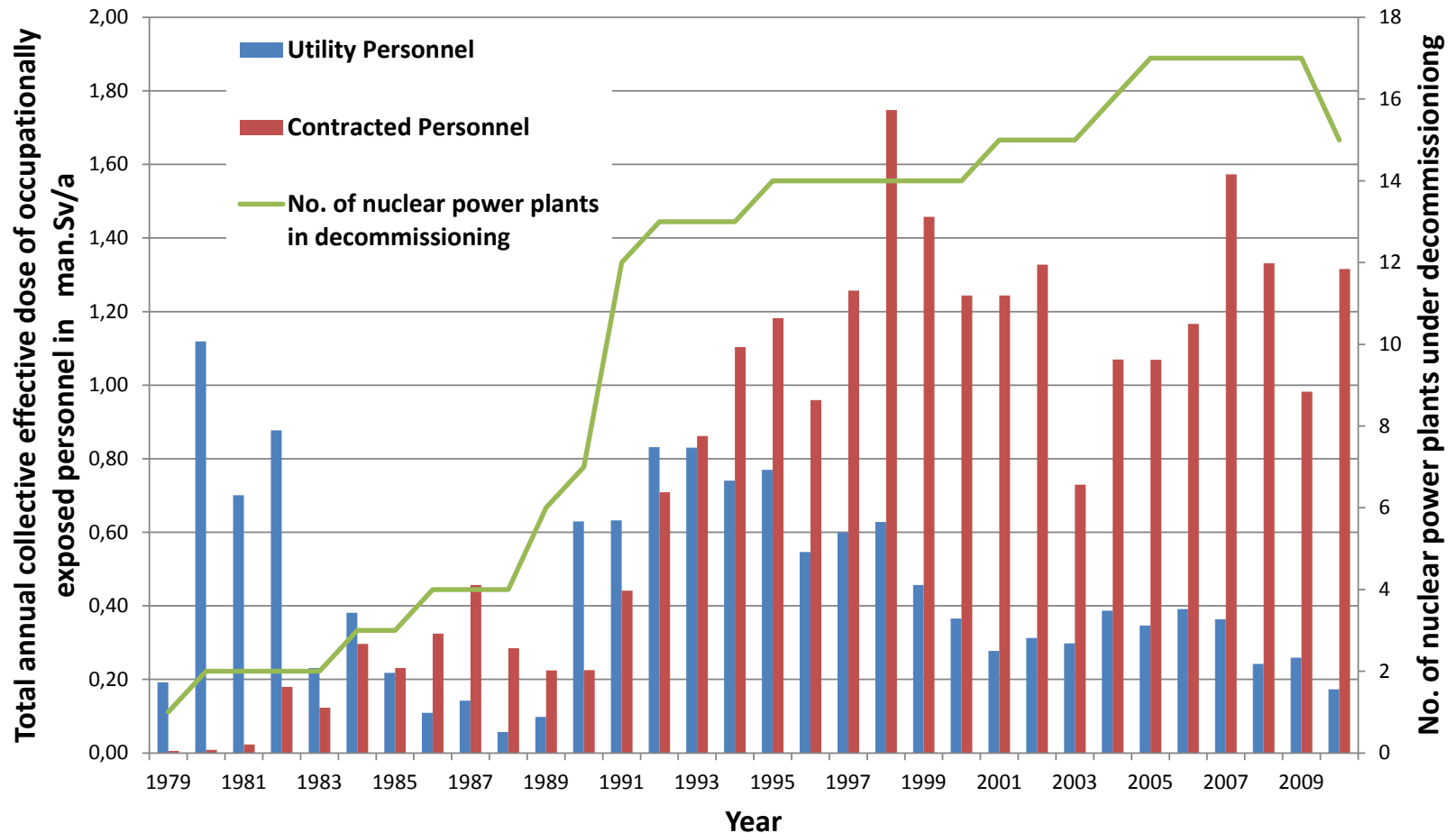
Overview on occupational exposure NPPs in operation

- Key observations for design generations
 - continuous improvements of PWR designs due to experience feedback from operation of earlier NPPs
 - clear decrease of annual doses for all designs
 - more significant for first and second generation PWRs
 - to some extent due to radiation protection technical measures
 - improvements in radiation protection management, inter alia planning
 - less significant for fourth PWR generation due to improved design (➔ doses belong to lowest worldwide)



NPPs under decommissioning

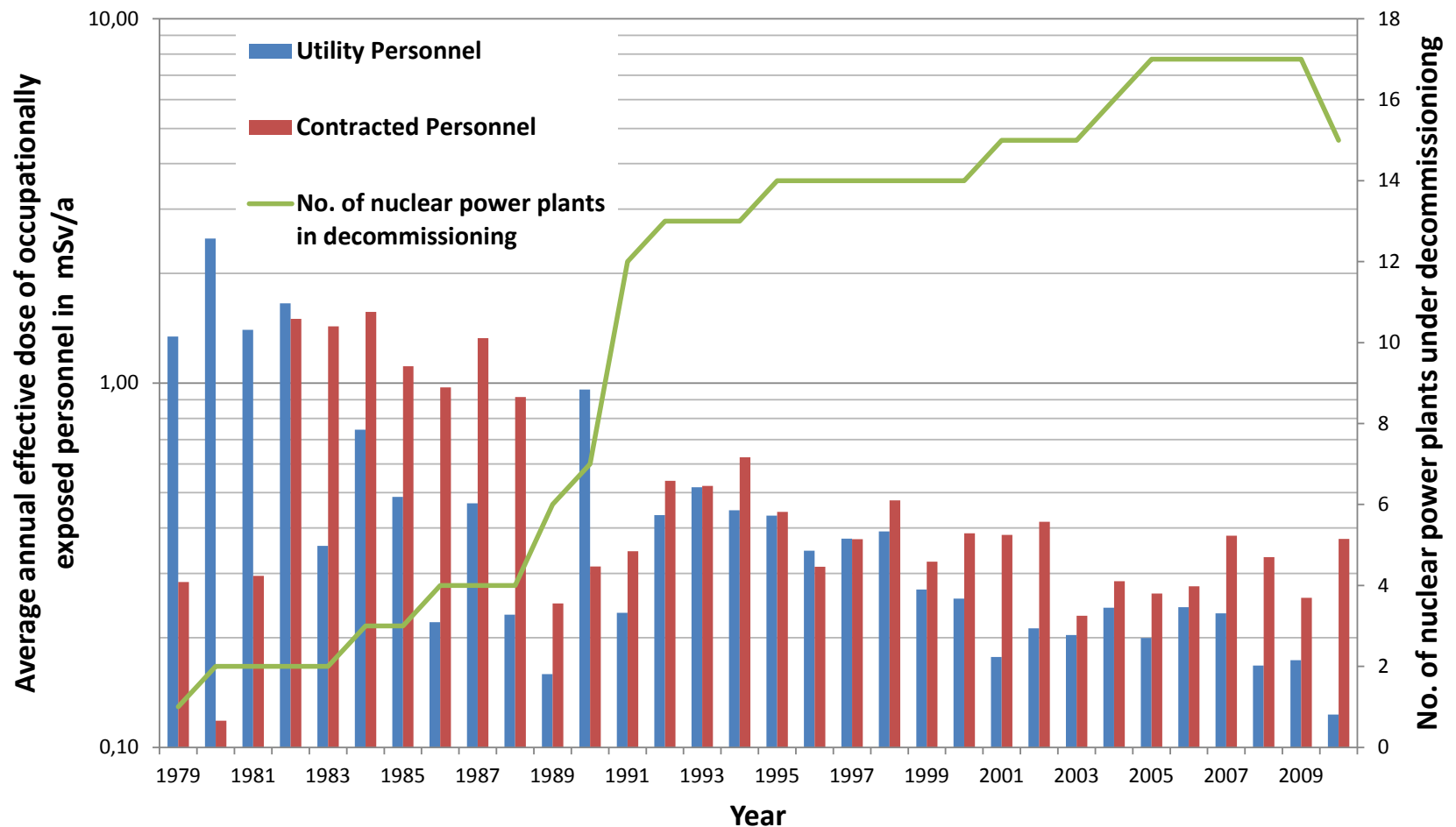
Total collective dose





NPPs under decommissioning

Average dose





Overview on occupational exposure NPPs under decommissioning

- Key observations
 - utility and contracted personnel are involved in decommissioning activities
 - the total annual dose and the average annual effective dose do not show trends as
 - the annual work programs of the individual NPPs vary significantly not allowing any recognizable dose trends
 - the total annual collective dose is significant lower than that of NPPs in operation
 - this holds also true for the individual NPP but not necessarily for each year due to the work program



New EU basic safety standard on radiation protection

- The Council of the EU proposed the
“Council directive laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation”
- It will replace
 - 96/29/Euratom – Basic safety standards
 - 90/641/Euratom – Protection of outside workers
 - other related directives



Concerning outside workers

- **Unaltered:**
The outside worker (e.g. contracted personnel) shall receive the same level of protection as utility personnel.
- **New:**
Regulations cover controlled and supervised areas.
Requirements on exchange of radiological data
- **Under discussion**, if the regulations on outside workers should be limited to Category A personnel.



Outside workers

- Radiological data on the outside workers shall be kept in a data system.
- EU member states shall facilitate the exchange of data on
 - the official dose records of the last five years
 - medical surveillance data
 - data on the employer
- Currently not included are the estimated effective dose values.



HERCA proposal: European Radiation Passbook

- Heads of European Radiation Control Authorities (HERCA) WG 1 surveyed the existing situation concerning the exchange of radiological data.
- Germany and other states currently use a centralised data system and a radiation passbooks for outside workers
- Currently these passbooks aren't standardised



HERCA proposal: European Radiation Passbook

- Steps towards a harmonization of the radiation protection systems were proposed by HERCA WG 1 “Outside Workers and Dose Passbook”
- A draft of a harmonized radiation passbook was presented
- Germany encourages the further discussion of a harmonized radiation passbook as a mean to exchange radiological data of outside workers including the estimated effective dose values.



Independent of the system used for the transfer of the data, we expect that the BSS will lead to a better and easier communication of information regarding the radiological monitoring of outside workers within the EU.



Dose limit for the lens of the eye

- Studies on cataract formation have shown an increase of the cataract rate for a radiation exposure of 0.5 Gy.
- The current limit of 150 mSv in a year could lead to a dose above 1 Gy within a few years.
- Within the proposed BSS the dose limit is lowered to 20 mSv in a year or to the same limit as the effective dose.
- Due to the exposition situations consequences for radiation protection in NPPs are only expected in individual cases.



Status of the BSS draft

- The draft of the BSS is currently discussed in the council working group.
- A partly revised draft has been published in May 2012.
- The discussions in the council group and elsewhere will continue ...



Conclusions

- Occupational exposure in NPPs
 - in operation shows
 - decreasing trends in annual data
 - differences between the different German design generations
 - under decommissioning
 - generally show lower doses than for NPPs in operation
 - do not show a clear trend due to the changing annual work content



Conclusions

- The proposed BSS will replace several existing Euratom directives
- For the radiation protection of outside workers improvements affect the exchange of radiological data.
- A better and easier communication of these data is expected.
- The reduced dose limit of the lens of the eye should in regard to NPP have only consequences in individual cases.