Dose reduction actions for the exposed workers with highest individual Doses in EDF NPP

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CHANGER L'ÉNERGIE ENSEMBLE

Context

- The collective dose received on EDF NPPs has decreased for several years with slight increase in 2009 and 2011 where the workload was particularly high. In the mean time, the mean individual dose has decreased at 1.19 mSv in 2010 and increased at 1.31 mSv in 2011

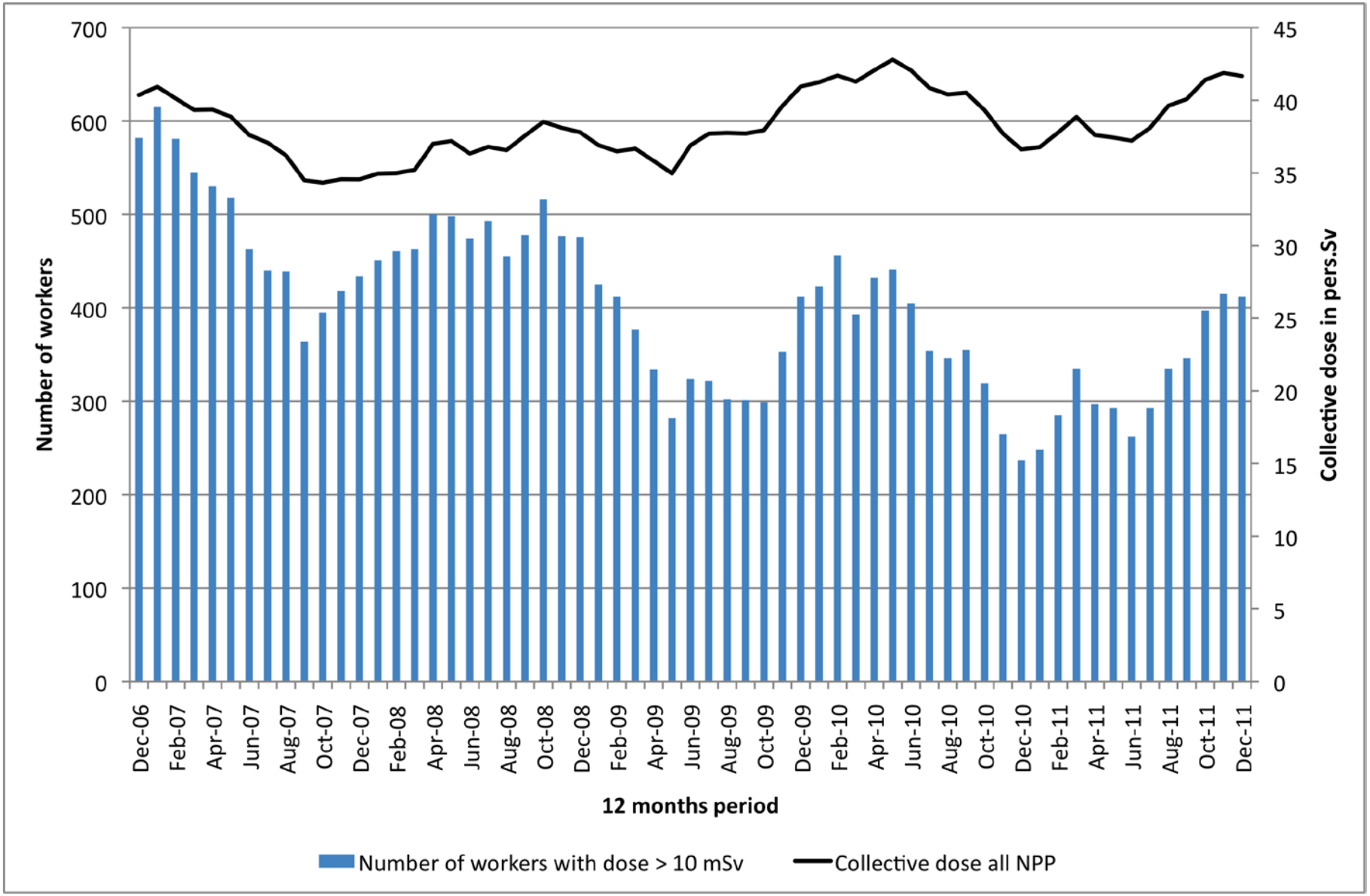
- At the end of December 2011, 412 workers have an individual dose greater than 10 mSv.
  - These workers represent 1% of the total number of exposed workers
  - They integrated 11% of the 2011 collective dose

- Moreover to make sure the NPPs durations reach 60 years, the maintenance works will significantly increase

Methodology

- Analysis of the database of every dose movements recorded in the French NPPs between January 2006 and December 2011.
- A dose movement corresponds to the dose taken by one person between access and exit from a radiation controlled area.
- Apart from the dose, the database indicates the worker's occupational category, his employer, the date, the duration of the stay in the radiation controlled area, the task code, etc.
- Objective: Focus on the individuals whose 12-rolling-month dose was greater than 10 mSv, their occupational category, employer and the tasks leading to high dose.

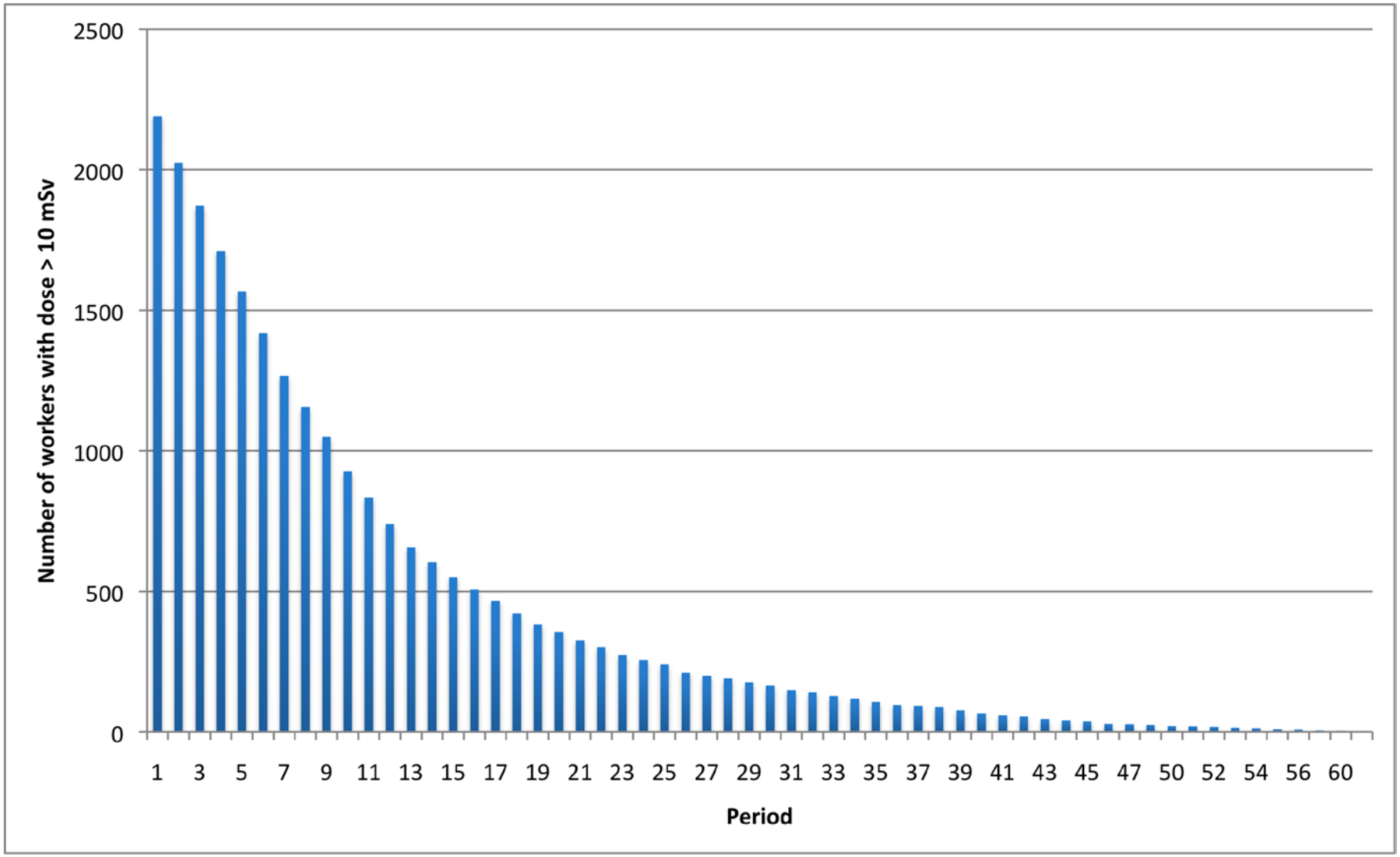
Evolution


Number of workers
Collective dose in pers.Sv
12 months period
Number of workers with dose > 10 mSv
Collective dose all NPP

Results on the individuals whose 12-rolling-month dose was greater than 10 mSv

- From January 2006 to December 2011:
  - **61** periods of 12 months
  - **2,191 persons** (total of 73,353 workers)
  - **15 occupational categories -** 4 most concerned: mechanic, logistic: decontamination & shielding, Pose/removal of thermal insulations and valves maintenance
  - More than **100** employers - 5 particularly concerned (more than 20% of the total number of workers): Endel, Kaefer Wanner, Techman, AREVA NP, SRA Savac

Number of 12-month rolling periods where workers received an individual dose greater than 10 mSv



Analysis of the dose movements > 1 mSv for the individuals receiving an individual dose > 10 mSv/ 12 r-m

- Aim: **identify the main activities leading to high individual doses**:
  - Differences between NPP
  - 4 activities
    - Steam generator preparations (primary side) (task code 210) : 36% of movements,
    - Closing of the vessel head (task code 114) : 8% of movements,
    - Pose/removal of thermal insulations (task codes 316 and 762)
    - Vessel head opening (task code 110)
  - Steam generators and reactor vessel maintenance are the main activities leading to high individual doses

Meetings with contractors

- Methodology
  - Meetings with each contractor: staff specialized in radiological protection and in charge of technical tasks

- Aims
  - Identification of tasks producing high individual doses
  - Analysis of the efficiency of previous best practices to decrease the exposure: are there applied nowadays?
  - Issues met in the field and contractors proposals to improve the protection against radiation, specially for the most exposed workers
  - Organization to supervise their most exposed workers

- **At the end of the meetings with contractors, elaboration of a guide for meetings with NPPs**

Meetings with NPPs

- Methodology: meetings between experts in charge of radiation protection, the supervision of contractors and logistics (decontamination, tools)
  - 10 surveys on NPPs
  - 9 other NPPs answered directly to the questions in the guide

- Aims
  - Validation of task producing high individual doses identified by contractors
  - Analysis of the efficiency of previous best practices to decrease the exposure: are there applied nowadays?
  - Opinions about problems encountered by contractors and their proposals
  - Organization of the NPP to supervise workers who receive high individual doses
    - Are there any contacts between contractors and site radiation protection departments?
    - Are there administrative individual dose limits?
    - …

Synthesis of the meetings

- Administrative individual dose limit
  - Contractors
    - Yearly limit (from 12 to 17 mSv)
    - Quarterly limit (from 4 to 10 mSv)
    - Monthly limit (from 1 to 4 mSv)
  - Several NPPs
    - Outage limit (from 2 to 5 mSv)

- High individual dose tasks
  - Tasks at the bottom of reactor cavity
  - Tasks in the vessel head stand

- Previous best practices
  - Some are implemented in all NPP, others are no more relevant because of new process, components…

Problems encountered by contractors

- Frequently
  - Imprecise mapping at the working place
  - Very different decontamination efficiency results of the reactor cavity, depending on the NPP
  - Internal lifting rig not enough maintained and not decontaminated
  - Restricted zoning of area at the bottom of the cavity reactor not always justified

- Sometimes
  - Thermal insulations of the vessel head damaged
  - Lack of biological shields at the bottom of the cavity reactor
  - Waste drum not always available on the operating floor
  - Lack of presence of radiation protection workers and technical experts of the NPP in the field

Contractors Proposals

- Technical
  - New machines/components
    - Machine to control the cleanness and to assess the joint face
    - Machine to clean the vessel flange
    - New thermocouples leaktightness
  - Decontamination
    - Transfer tube decontamination with rotation spray nozzles
    - A more efficient reactor cavity decontamination with the same process in all NPP
  - Biological shielding
    - Biological shielding in the bottom of the reactor cavity where workers can be protected when they are waiting
- Organisational
  - Use of teledosimetry associated with communication system

Conclusions

- To boost and generalize to all NPPs the efficient former best practices which are still not implemented
- To assess the efficiency of new best practices proposed by the contractors or NPPs using criteria such as economics, exposure gain, influence on the outage schedule…
- Creation of administrative individual exposure limits for each outage by NPPs to supervise the contractors' individual doses

- **Every year each NPP will have to report on the implementation of the identified good practices**

Thank you for your attention