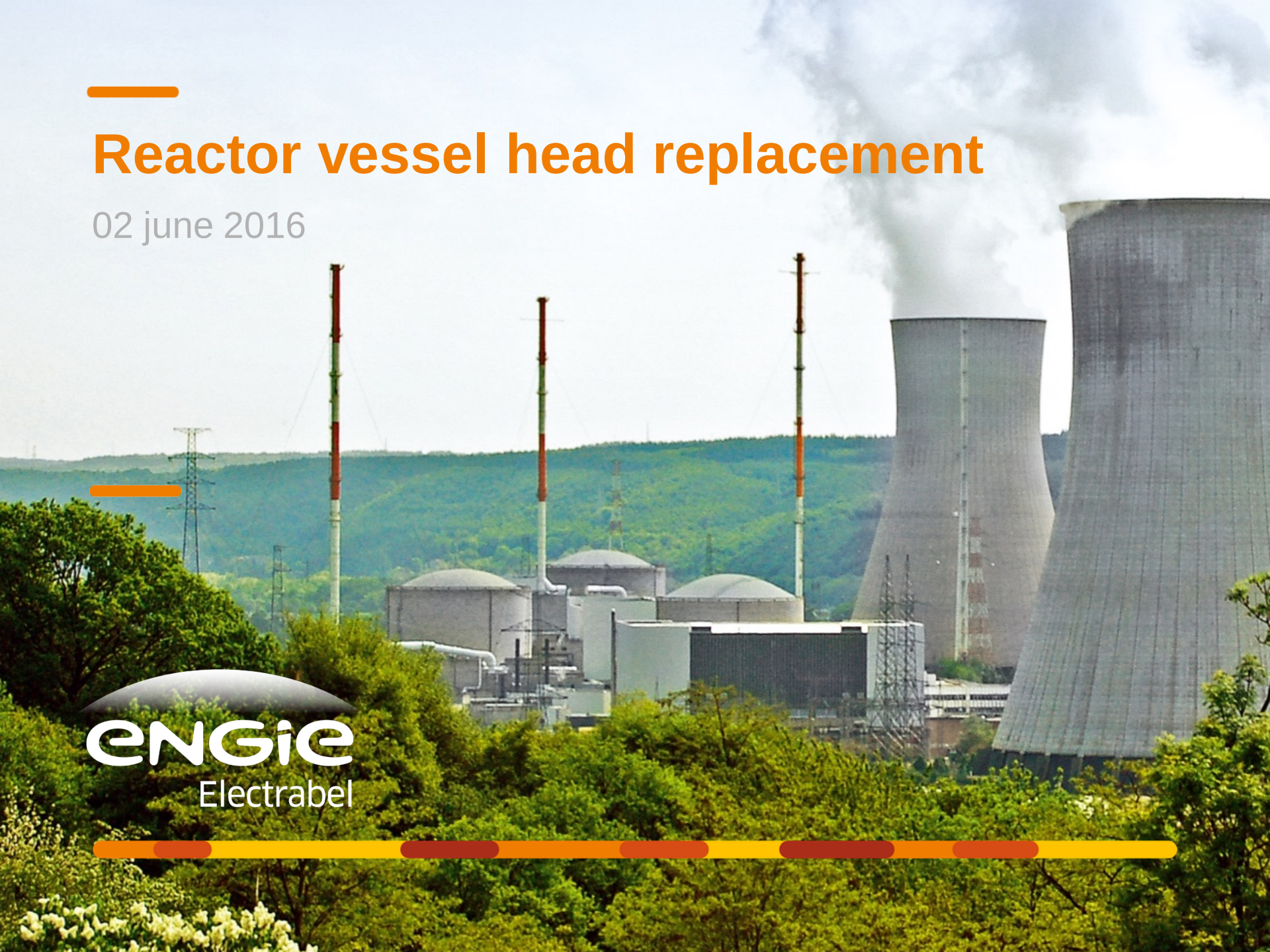
Reactor vessel head replacement

02 june 2016



Reactor Vessel Head Replacement at Tihange 3 – Transport conditions and storage of the reactor vessel head

02 june 2016

Content

Introduction

- *In April 2015, the reactor vessel head of Tihange 3 have been replaced*
- *Decision of replacement due to the risk of primary water stress corrosion cracking (PWSCC) at the level of the penetrations on the vessel head of Tihange 3*
- *Decision to store the used reactor vessel head in a storage building (SGV)*

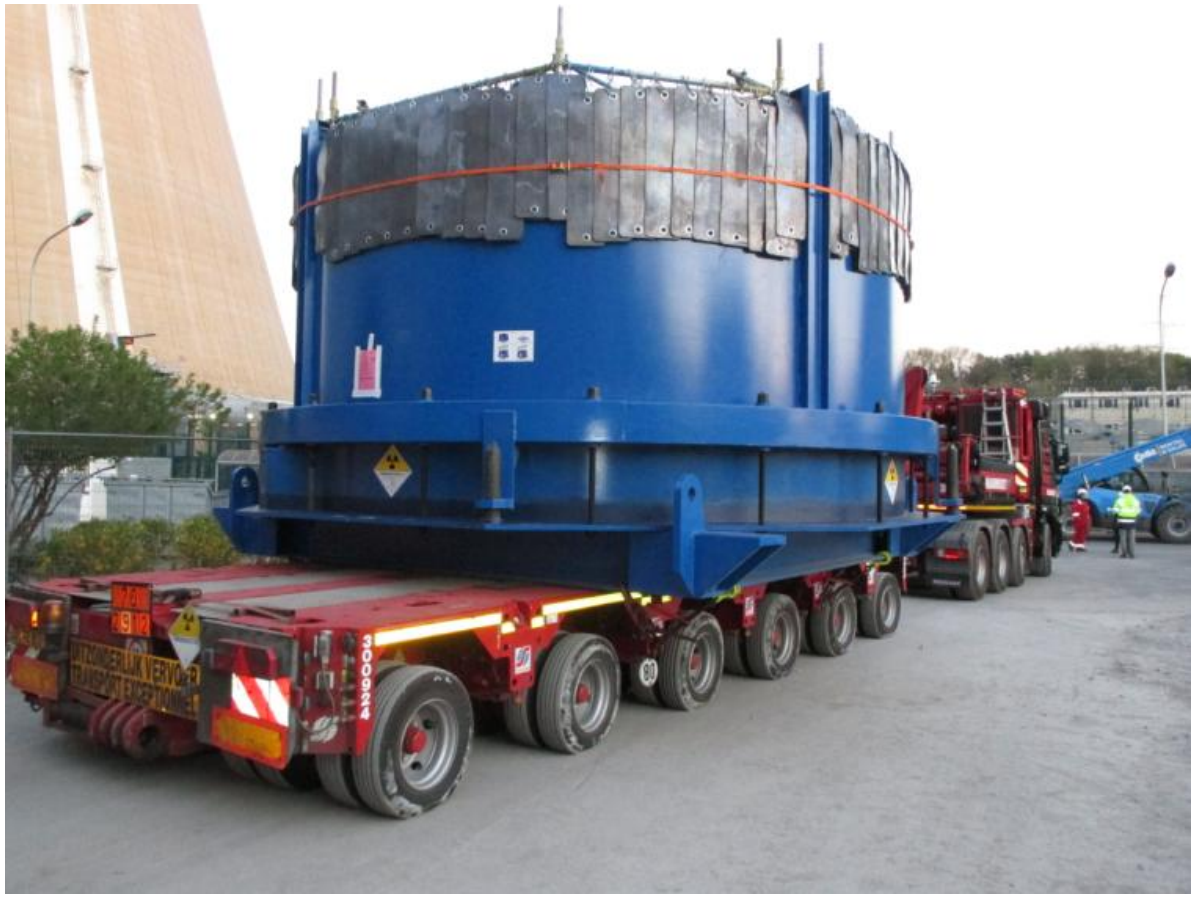
Reactor vessel head transport

- *Transport realised by an external society*
- *Even if it was a transport on site, ADR7 was applicable*
- *Transport under* UN2912 – LSA-I

Reactor vessel head transport

- *During reactor vessel head preparation, the measured dose rate was higher than expected dose rate.*
- *Decision to shield the higher dose rate area to respect LSA-I criteria*

Reactor vessel head transport



Steam generators storage building

- *In Tihange, 9 used steam generators are stored in a specific building “SGV”.*
- *The building is also used for the storage of a reactor vessel head from Tihange 1.*
- *The building is a supervised area : risk of irradiation but no risk of contamination.*

- *The reactor vessel head of Tihange 3 has been placed in this building near the main entrance door*

Steam generators storage building

- *The operating license of the SGV ask a dose rate outside the building less than 7,5 µSv/h*
- *To prevent a supervised area outside the building, Tihange has decided to limit the accepted dose rate outside the building to 2 µSv/h*

Dose rate after storage

- *After storage, the measured dose rate outside the building was between 8 and 19 µSv/h*
- *It was expected than the dose rate will ben between 2 and 7,5 µSv/h*
- *The difference is due to a observed dose rate on the reactor vessel head higher than expected*
- *The risk of non respecting the operating license was not identified before authorising the transport*
- *Authorities were immediately informed of the dose rate outside the building*

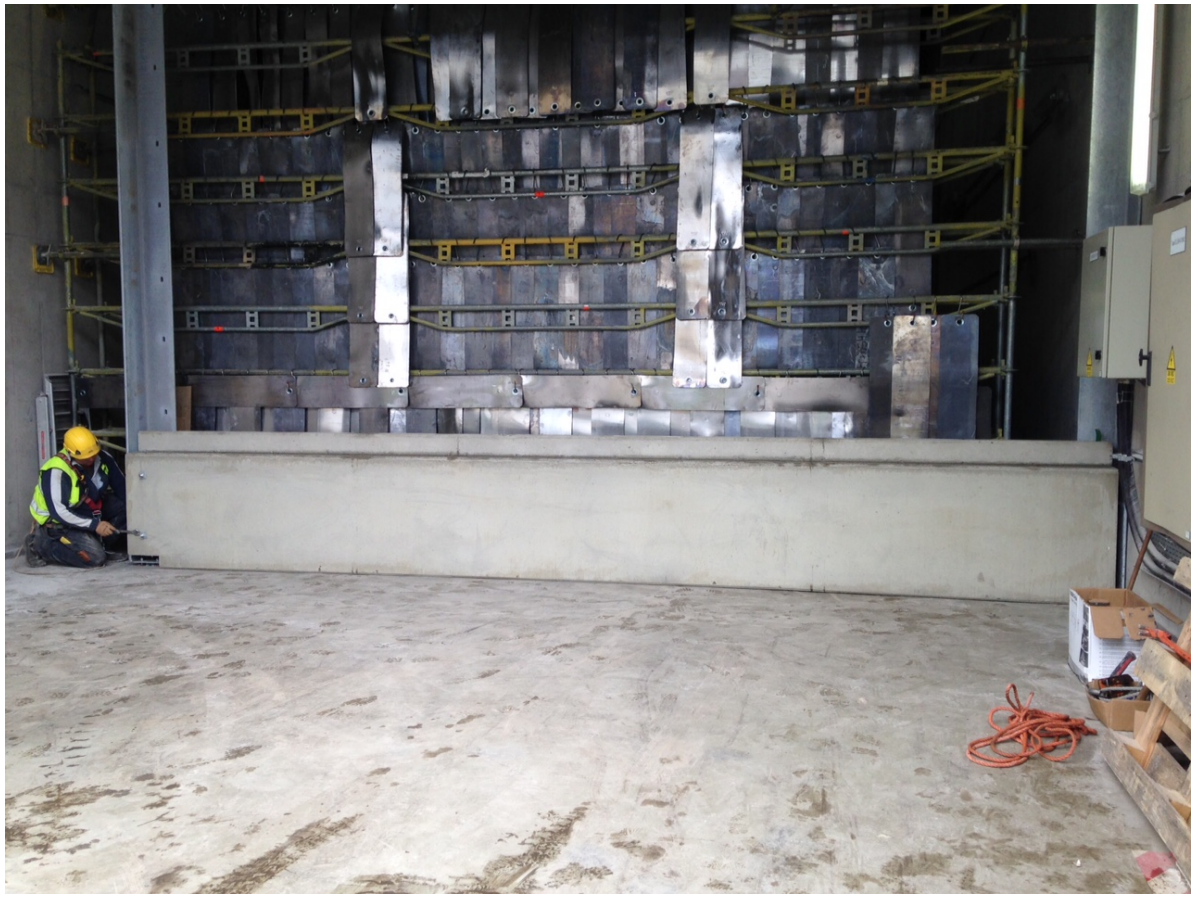
Rem. : this transport was observed by the authorities during a inspection concerning nuclear transport

Temporary solution

- *Immediately after the storage, a physical barrier was put in place to limit the access of the personnel in the area above 2 µSv/h*
- *A temporary wall with lead shielding was quickly put in place*
- *This wall permit to decrease the maximum dose rate outside the building to 2,6 µSv/h*
- *The operating licence was quickly respected*

Definitive solution

- *In the project, the construction of a wall between the reactor vessel head and the main entrance door was planned*
- *Due to the observed dose rate and to limit the risk outside the building, the wall has been build in 6 months*
- *The temporary shielding wall has been removed and the dose rate outside the building is 1,2 µSv/h max.*
- *The shielding on the reactor vessel head is still in place to limit the dose rate on the roof.*

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Conclusions

- *Importance of the good preparation of the work. A small variation in the dose rate estimated can lead to a violation of an operating license*
- *Importance of transparency with the authorities. A regular feed-back of the situation and actions in progress permit to enhance the communication with authorities*
- *Importance to put a definitive solution as fast as possible. Temporary solution permit to limit the consequences of problems but must be temporary !*