

# Licensing Hualong I NPP with Argentina as a customer

## WORKSHOP ON NEW CHALLENGES FACING NUCLEAR REGULATORS

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## **LICENSING CHALLENGES – Overall approach**

Two “models” / approaches to regulation of NPPs projects.

In a simplified view:

### **Safety Goal Oriented approach,**

- A top-down process from Safety Objectives – safety analysis - engineering requirements for SSCs

### **A prescriptive approach,**

- A framework of regulations for the industry.  
Safety Standards - Industrial C&S – procedures – guides



# LICENSING CHALLENGES – an approach

## Safety Goal Oriented approach,

- A top-down process from Safety Objectives – safety functions / safety analysis (DSA – PSA) – classification of SSCs – derivation of engineering requirements for SSCs (design / fabrication / assembling / testing / commissioning / operation / maintenance / etc.)
- These requirements are needed to keep the functional demonstration of safety (i.e. the SA). Requirements on components are focused on functional capability / reliability / robustness
- Tools to “qualify” the compliance with safety requirements on engineering (process, mechanical, I&C, Electrical,...)
  - Experimental / testing
  - Industrial C&S

When verifying safety, the regulator never gets rid of the SA



# LICENSING CHALLENGES – the other approach

## A prescriptive approach,

There is a framework of regulations for the industry.

Safety Standards - Industrial C&S – procedures – manuals, guides

- A Nuclear Regulatory Body incorporates new designs to that framework by the “accreditation” (certification) that links the demonstration of safety (compliance with safety goals and standards) with Industrial C&S (Process systems, mechanical, I&C, Electrical)
- A set of documents in which well-defined rules is produced (prescribed) for all the stake-holders, for all the stages and activities of the project.
- Safety is verified by the accomplishment of these “rules”



## LICENSING and kind of Projects

For a project implemented at a national level the distinction of the two approaches may be “theoretical”

- For any project, its design has been assessed in safety terms by the national Nuclear Regulatory Body,
- all their SSC have been classified in accordance to safety relevance
- the engineering requirements coherent with the safety standards (in turn with safety goals) have been defined
- This may be seen as “safety goal oriented”

Then the C&S that convert requirements into rules are reviewed and available for the verification of safety by all stakeholders  
Then, safety verification may be seen as by prescribed rules.



# LICENSING Turnkey Projects, in prescriptive approach

For an “ideal” project implemented as a Turnkey supply abroad

- It includes the “hardware” supply and the construction, plus project management, licensing documents preparation, etc.
- Everything is properly documented: there are complete, trackable and understandable tables of classified SSC and there are sets of technical and quality specifications for each SSC,
- There are industrial standards covering aspects on process, mechanics, I&C, electricity, etc.
- There are rules for commissioning, operating, handling, maintaining, etc.
- If looked for, there are rules for design, fabrication, assembling, testing

If the customer country adheres to a prescriptive approach, the design has a safety assessment by the national Regulatory Body of the supplier,

- The local regulatory body generally relies on the regulatory experience of the supplier country
- The design accreditation / certification is neither repeated nor reviewed
- The supplier is kept as the “Design Authority”



# ARGENTINE approach to LICENSING

Argentina had the two approaches for nuclear development

In the 50's scientific developments in particle physics, radiochemistry, neutronics, metallurgy, electronics, materials science, etc.

Reaches technology through the operation, intervention and construction of "big science" equipment and facilities,

Goes all the way to Research Reactors and fuel cycle facilities.

Safety engineering requirements are developed through the rationale, and the rules to be followed in operation, maintenance, inspection, interventions, always in relation to the "why", as derivation from goals.

Argentine approach could be seen as pure "safety goals oriented" and kept producing successfully, even world class research reactors.

Nucleo-electricity looked too far to go all the way from a scientific lab.



## ARGENTINE second approach to LICENSING

Argentina had the first two NPPs in almost pure Turnkey projects, achieving outstanding performances in safety, availability and all indicators, and began the third NPP in the same “model”.

But in 1994 Atucha II construction was halted, re-launched around 2007 under local management,

Why didn't we stick to the turnkey / prescriptive approach?  
Mainly because there was a strategic decision to develop and complete our technological capabilities.  
Or maybe because the Design Authority and Supplier (KWU, Siemens Nuclear Division) had disappeared. The suppliers country complete nuclear framework was not there anymore.

Licensing of Atucha II was completed using our regulations and standards. It was commissioned and operates successfully.



# ARGENTINE choosing approach to LICENSING

In the first two NPPs, we received, studied and mastered the complete set of rules to be followed in operation, maintenance, inspection, interventions, etc. They are plant-specific rules, including the application of standards.

Applying it since the 70s it was easy to get used to the prescriptive use of standards, defining what to do and how to do it.

Regulation for facilities in the field developed within the “**Science Model**” (medical and industrial applications, research reactors) are fixed to the “rationale” or “safety performance” approach..

Regulatory inspectors in NPPs tend to prefer the prescriptive approach, with clear instructions on what to inspect and how.

Our best inspectors are proud of explaining the safety reasons behind the requirements in every case.



# *ARGENTINE reactors regulation SCENARIO*

How to handle the several and diverse (very diverse) reactor projects?

- Construction of CAREM, integrated – advanced SMR
- Completing the implementation of LTO modification of an old CANDU
- Preparing the LTO for Atucha I
- Control of Atucha II operation
- Construction of a Research Reactor (RA-10)
  
- Setting the basis for licensing a Hualong NPP

There is a choice to make on the regulatory approach of the Hualong:

- keep the prescriptive approach in old plants and turnkey projects, while using rationale / performance approach for our national projects

**apply a single licensing approach to all projects**



# **ARGENTINE approach to LICENSING**

We are committed to the rationale / performance approach to regulation to handle the several and diverse (very diverse) reactor projects.

We are in charge of all the aspects of the approach. We tell how to:

- make a sound Safety Analysis in line with clear safety goals
- implement a Safety Classification out of the Safety Analysis
- define engineering requirements for each class, for every aspect / stage / activity (constructability / viability of the design). OLCs
- content of the SAR ensuring it covers previous information
- assess mandatory documents and how to issue facility licenses

Our approach is in line with IAEA's standards, and in general we share the ideas of IAEA's guides and TECDOCs



# **ARGENTINE approach to LICENSING Hualong I**

Our licensing process is essentially between ARN and the Utility NA-SA (the only legal – mandatory actors). Suppliers just support

The **Safety Standards** to comply with, are Argentinean ones, plus some “international” standards, being signatories of Conventions and a IAEA Member State. These cover most of the Plant design

**Industrial C&S** have a role in the qualification of the compliance of engineering requirements. There isn't a mandatory one in argentine approach. Foreign C&S can be proposed by the Utility under proper justification.

We have a shared understanding of the approach with NA-SA

We have discussed the approach with NA-SA and CNNC (Hualong I NPP Supplier for the Argentine project) in the frame of pre-licensing meetings

We have met and discussed with NNSA (Chinese Nuclear Regulator)



# Questions on LICENSING Hualong I

Which is the role of Chinese Safety Standards?

Do they have an impact on the Hualong I design ?

On the engineering of the reference plant of Fuqing 5&6?

On the engineering to be included in the Technical Annex of the contract ?

Might it be reasonable to expect design adjustments between suppliers local project and the export project?

Do we need to assess if the supplier national safety standards are updated?

Do we need to assess if the design complies with updated international safety standards?

Do we need qualified counterparts for discussing about Safety Standards?

And about Industrial C&S?



# More questions on LICENSING Hualong I

Interesting discussions  
(when you find a qualified counterpart)

HAF 101 Safety in siting of NPPs

HAF 102 Safety in design of NPPs

China's      HAF 102 (2004) (2016)  
IAEA's      NS-R-1 SSR-2/1 (rev 0)

HAD102 / 03 - SSCs classification in NPPs (1986)

HAF J0066-1997, Technical Document on classification

GB / T 17569-2013 guide

IAEA's      50-SG-D1  
                SSG 30

HAD under review



# More questions on LICENSING turnkey projects

Let's go back to the broad picture

The Hualong I - HPR 1000 – is and will be a Turnkey supply

Perhaps we can discuss a bit deeper this idea of a Turnkey project in a prescriptive framework from the point of view of a qualified customer

Let's recall slide 6



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# REGULATING Turnkey Projects

Regulation does not end in licensing

Licensing basis (the basis of the demonstration of safety) has to be kept along the whole life of a Plant.

Modifications and updates are needed. A design Authority is needed.

Having a turnkey plant as a customer in a prescriptive approach is still ok, if in the supplier country there is still a healthy / growing nuclear industry,

That is:

1. A seasoned nuclear regulatory body capable of issuing sound safety standards and capable of certifying the design of new NPPs.
2. A national infrastructure to keep an updated framework of industrial C&S coherent with the certified designs
3. A driving force to the updates, by a growing fleet with new plants and new design certifications
4. A certain prospective of a DA for the plant lifetime (¿60 years?)

How is the scenarios of international suppliers today in these items?

Wouldn't a qualified customer rather go for a goal oriented approach?



**Thanks for your time**  
Autoridad Regulatoria Nuclear



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