Virtual conference of "Users of neutron codes for calculation of nuclear reactors"

WES (Westinghouse Electric Spain)

Main calculation codes

- ADVANTG 3.2.1
  - MSX
  - RADIANT
- **MCNP®** 6.1
- SCALE 6.1.2 & 6.2.4
- SERPENT 2.1.31

- DOORS 3.2
  - DORT (2D)
  - TORT (3D)
  - RAPTOR-M3G (3D paralel)

    +
    - BOT3P 5.2 (geometries)
    - GIP/OSCAR (cross sections)
    - SORCERY (source term)
  - ACT2(Activation)

- **RadTrack™ system** 3.2 (flux, radiation capsules, etc.)
- www.westinghousenuclear.com-RadTrack

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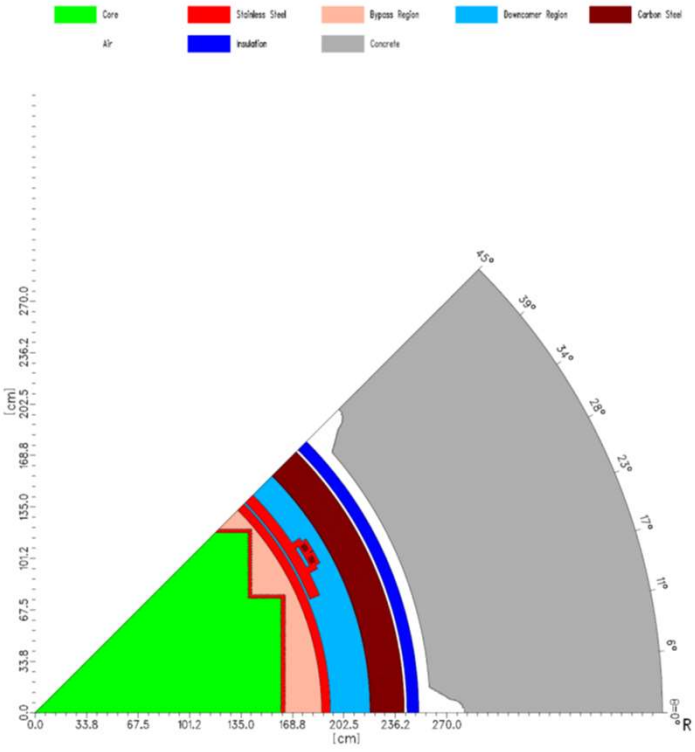
Examples of applications. Fluence in vessel.



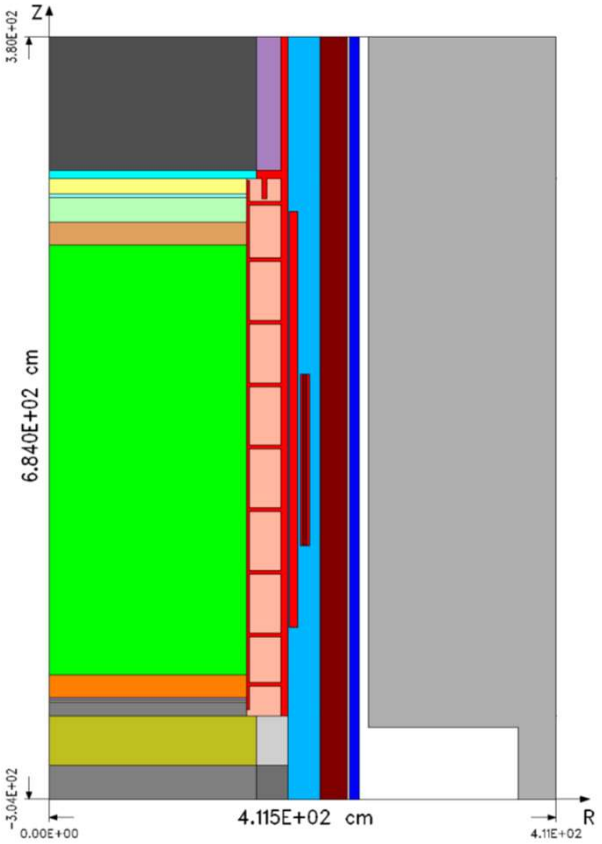
Section R-θ

3D synthetic fluence from 2D fluence using methodology approved by the NRC.

1.WCAP-14040-A, Revision 4

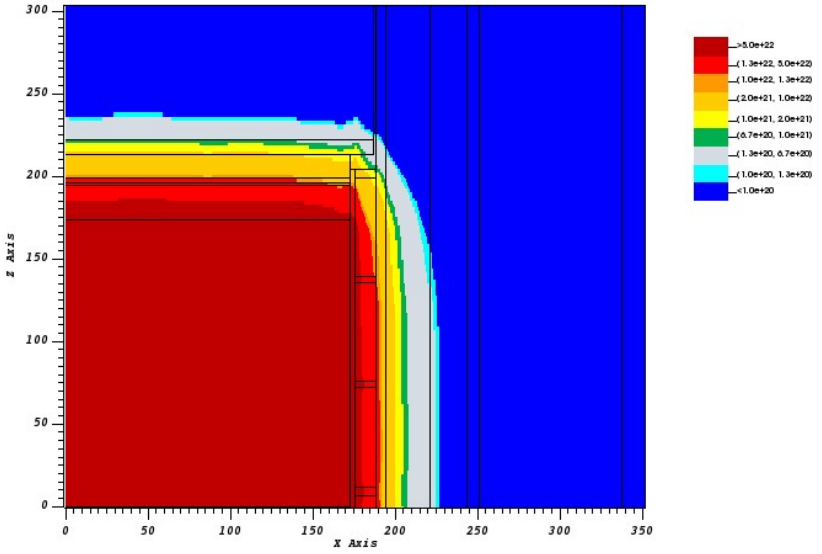
2.WCAP-16083-NP-A, Revision 0

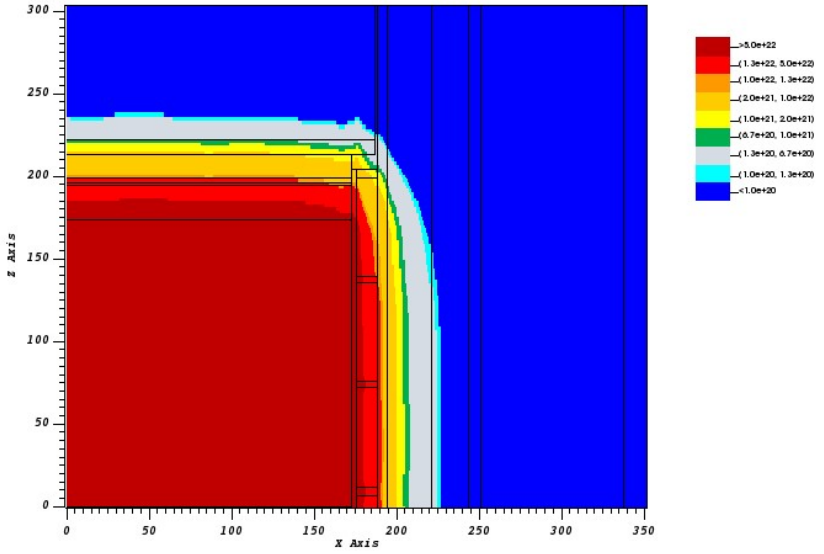
Last examples: Salem Unit 1, Catawba Unit 1 y 2, **Asco Unit 1 y 2**, H.B. Robinson Unit 2, **Almaraz (1 y 2)**



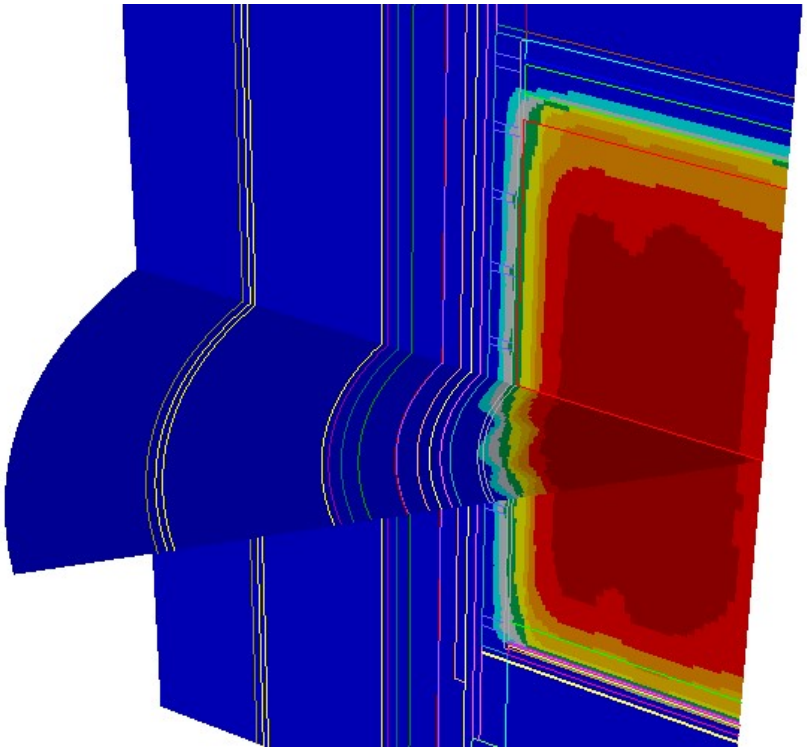
Section R-Z

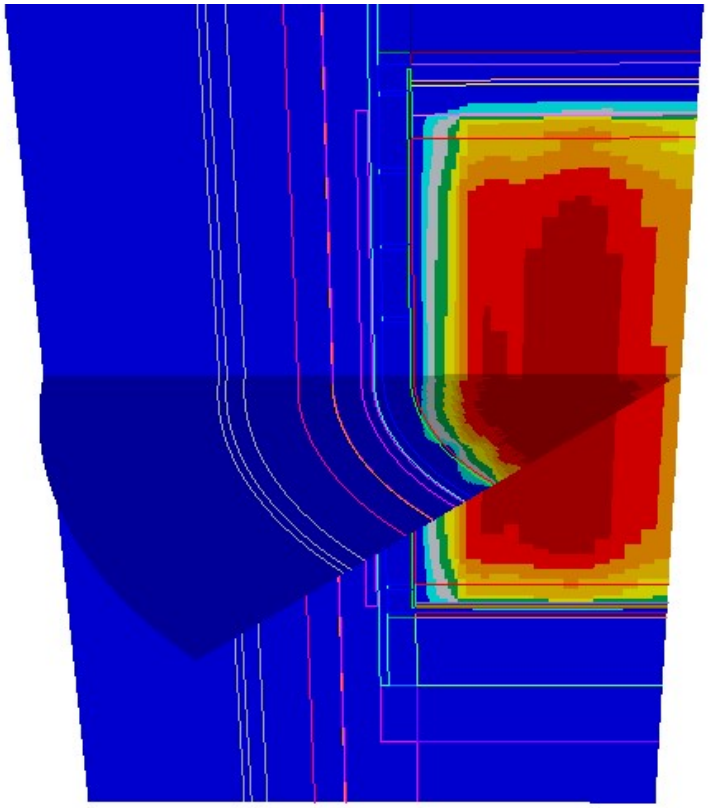
Examples of applications. Fluence in vessel. 2D.





Examples of applications. Fluence in vessel. 3D.





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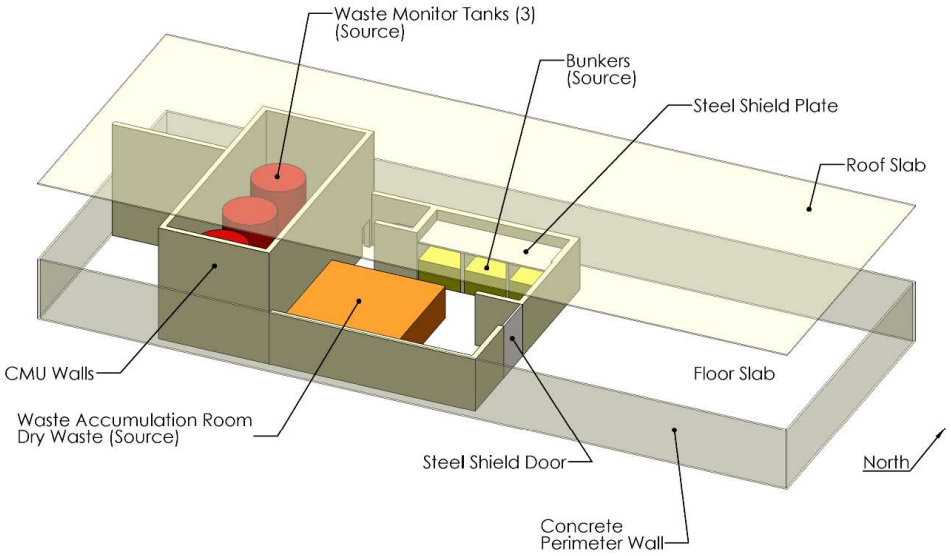
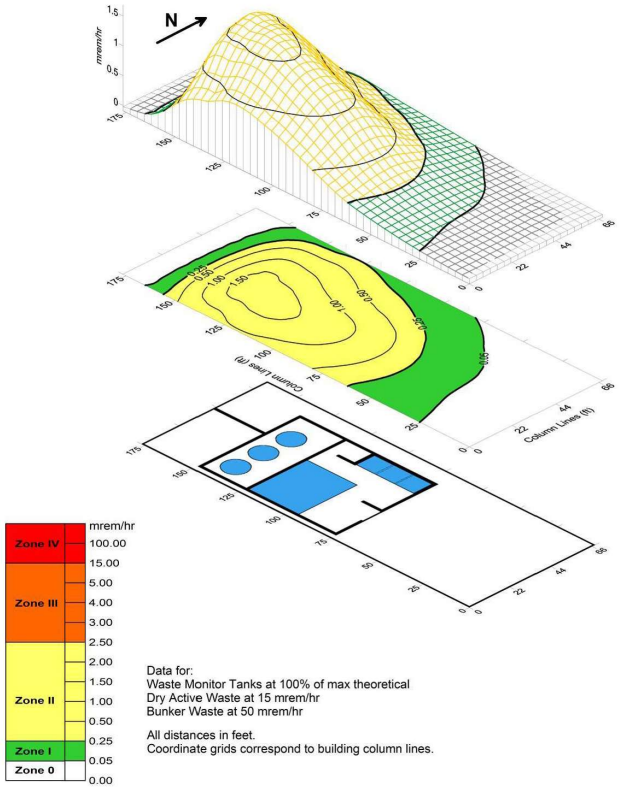
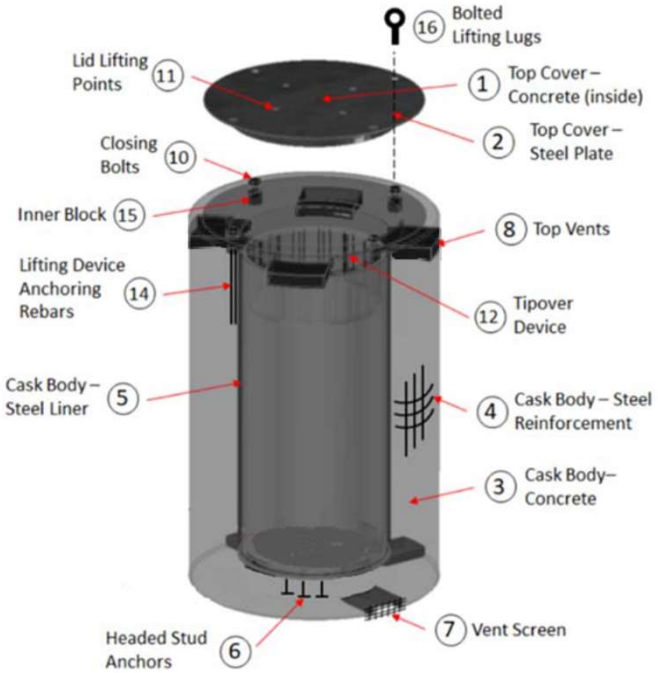
Examples of applications. Waste Treatment Building **AP1000® Plant.**



MCNP®
Code



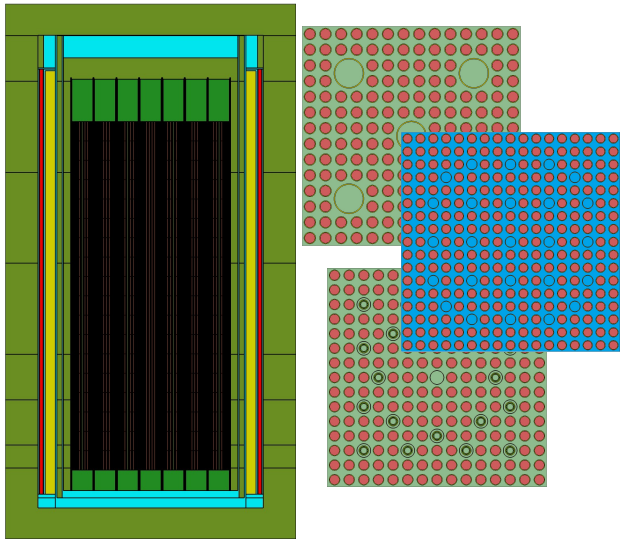
Examples of applications. **SENTRY™ cask.**

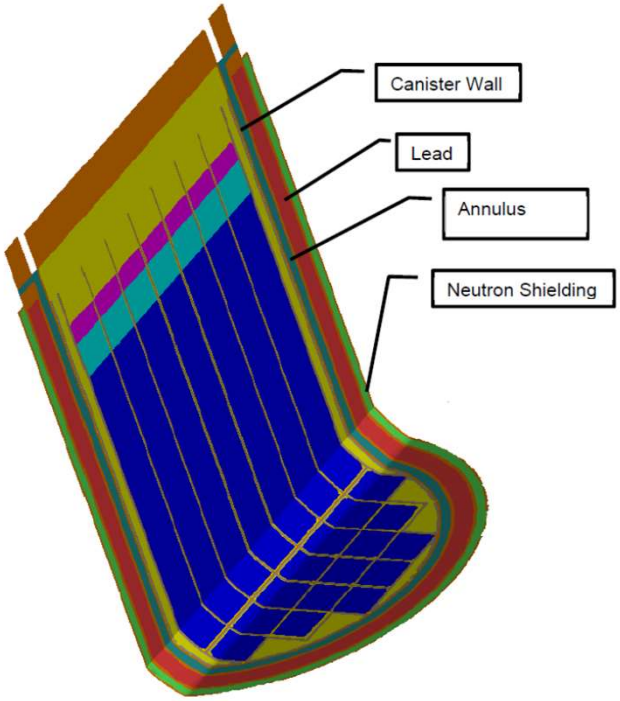


Storage cask

Shielding with **MCNP®**, Criticality with SCALE

www.westinghousenuclear.com-SENTRY

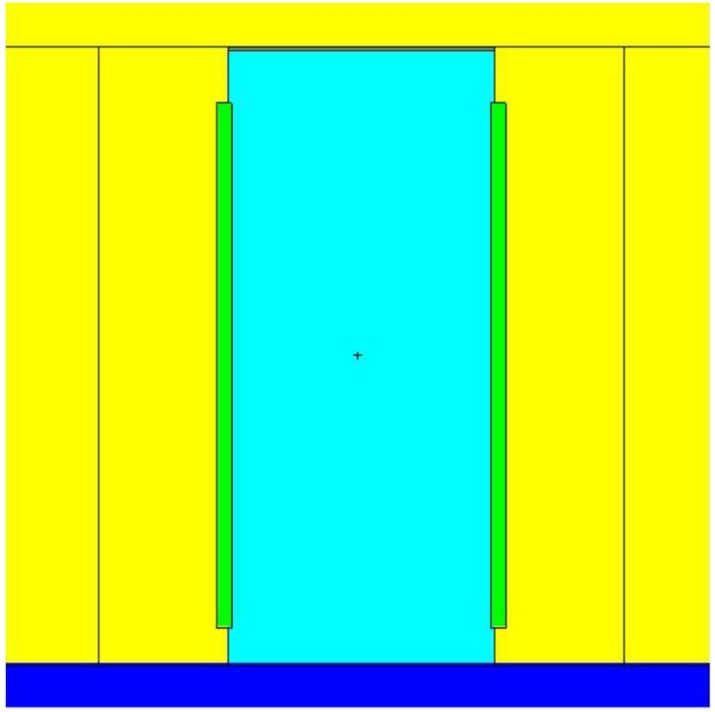




Transfer cask

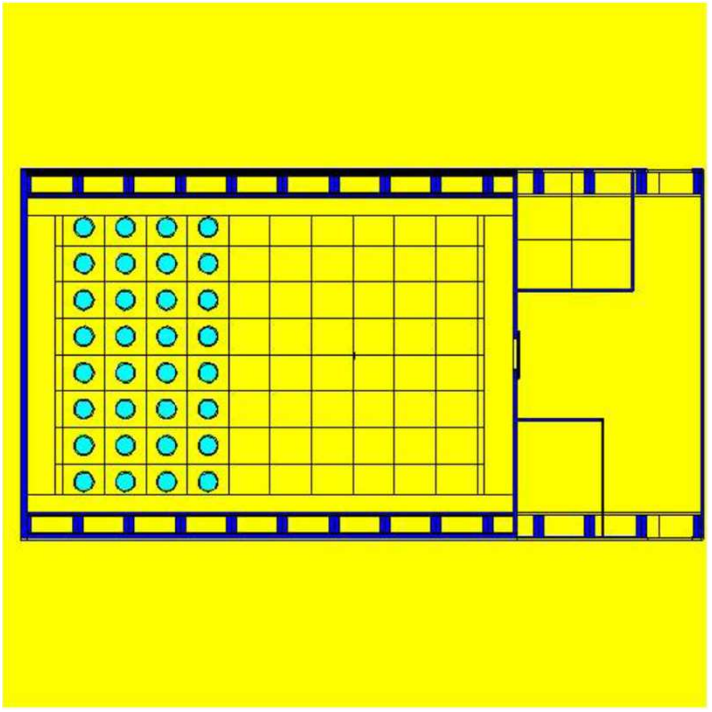
Westinghouse

Examples of applications. TRILLO ISFSI, ENSA-DPT cask.



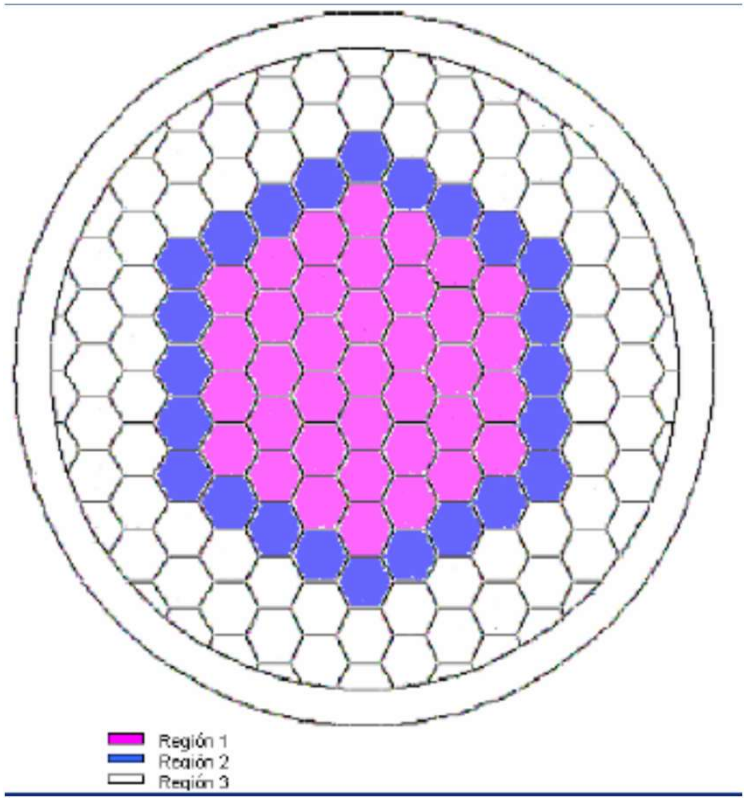
Simplified model of ENSA-DPT cask

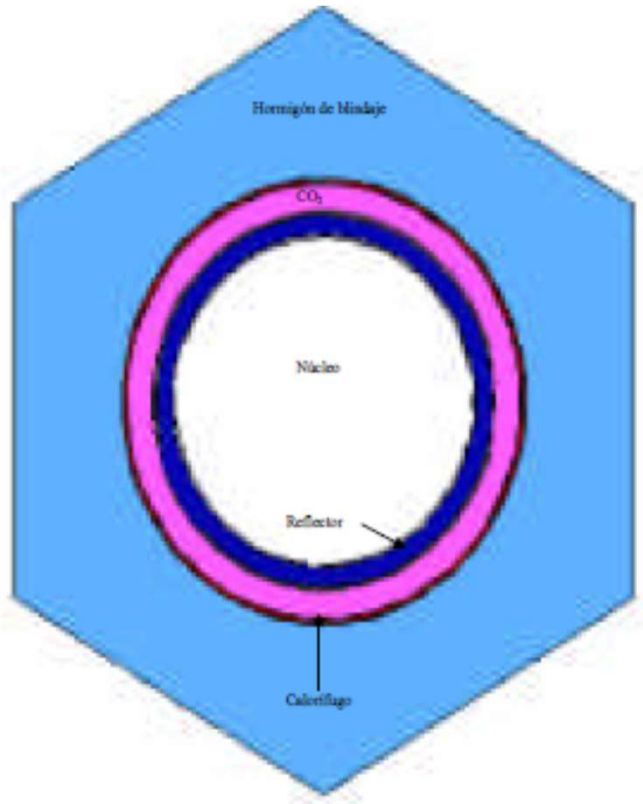
Modeled with **MCNP®**

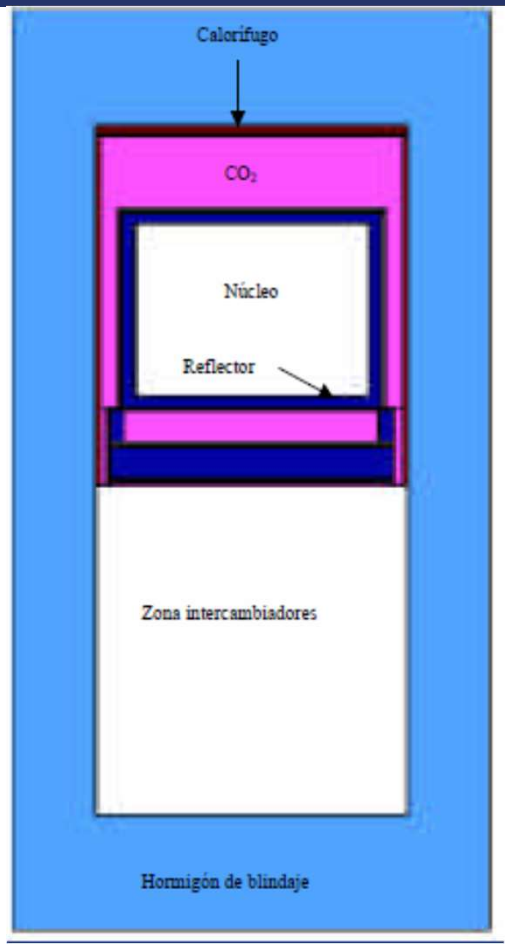


Plan view

Examples of applications. Vandellòs I Activation.







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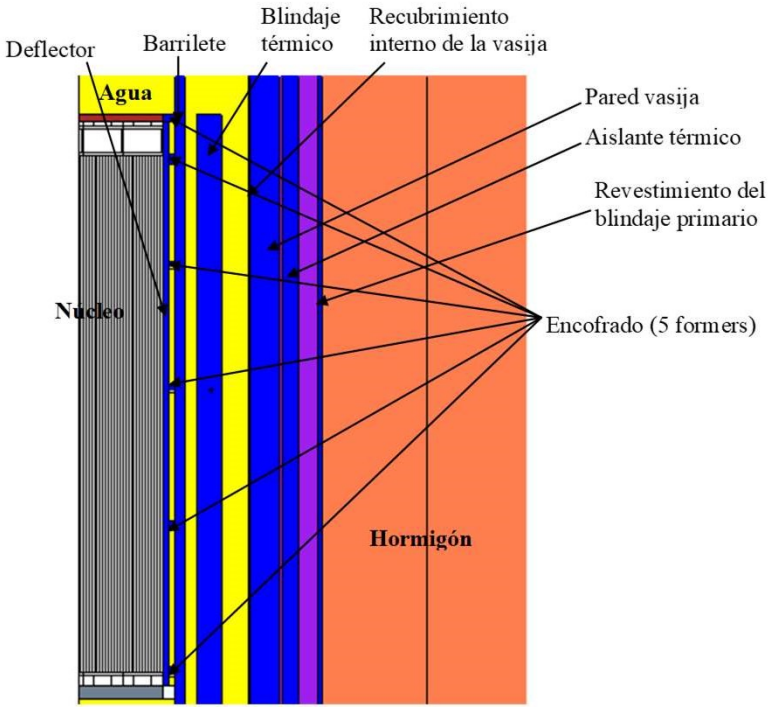
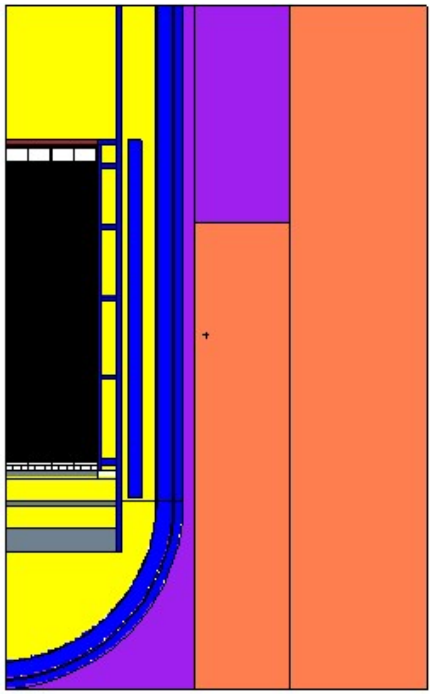
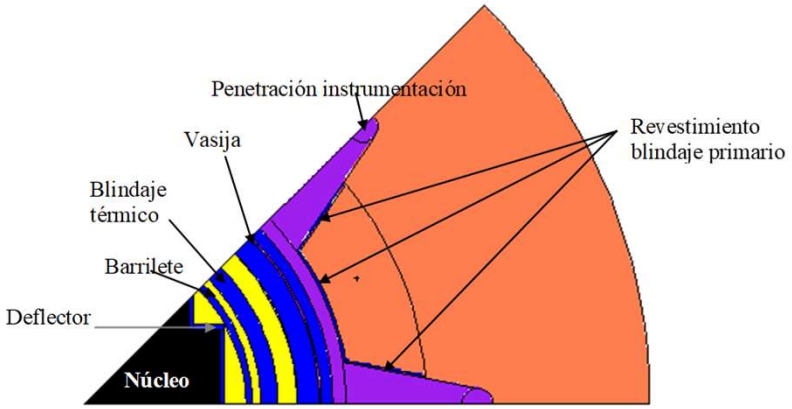
Examples of applications. Zorita vessel activation.







Examples of applications. LFR and **eVinci™**.

- LFR Reactor
  - Burnup and neutronic fluences calculated with SERPENT
  - Neutronics fluences coupled to ORIGEN-S via COUPLE for source term and residual decay heat calculation.
  - https://www.westinghousenuclear.com/new-plants/lead-cooled-fast-reactor
- **eVinci™** micro-reactor
  - Neutronic fluences calculated with SERPENT
  - Ar-41 production in the heat exchanger with **MCNP®**
  - https://www.westinghousenuclear.com/new-plants/evinci-micro-reactor

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Questions?

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Jornada virtual de “Usuarios de códigos neutrónicos para cálculo de reactores nucleares”

WES (Westinghouse Electric Spain)

Códigos de cálculo principales

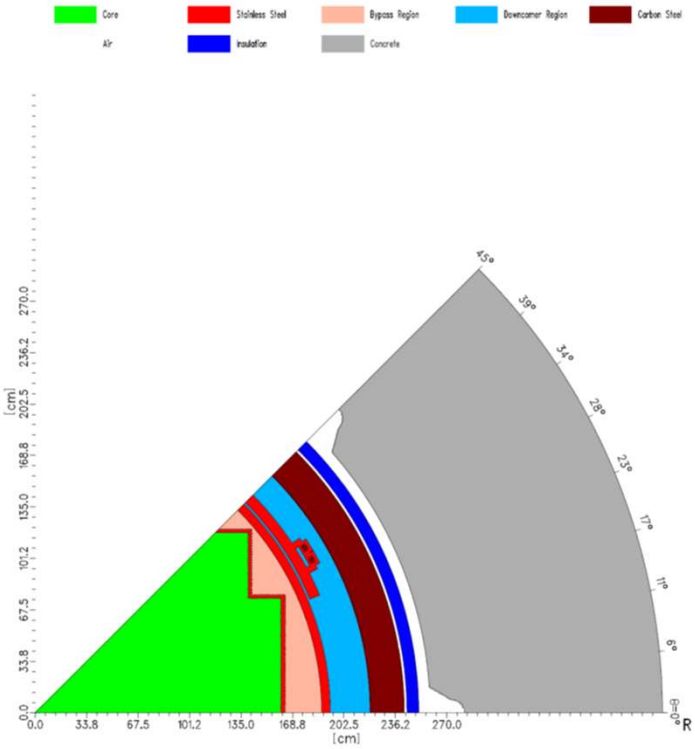
- ADVANTG 3.2.1
  - MSX
  - RADIANT
- **MCNP®** 6.1
- SCALE 6.1.2 & 6.2.4
- SERPENT 2.1.31

- DOORS 3.2
  - DORT (2D)
  - TORT (3D)
  - RAPTOR-M3G (3D paralelo)

    +
    - BOT3P 5.2 (geometrías)
    - GIP/OSCAR (secciones eficaces)
    - SORCERY (término fuente)
  - ACT2(Activacion)

- **RadTrack™** system (analizador de flujos, cápsulas de radiación, etc)
- www.westinghousenuclear.com-RadTrack

Ejemplos de aplicaciones. Fluencia en vasija.



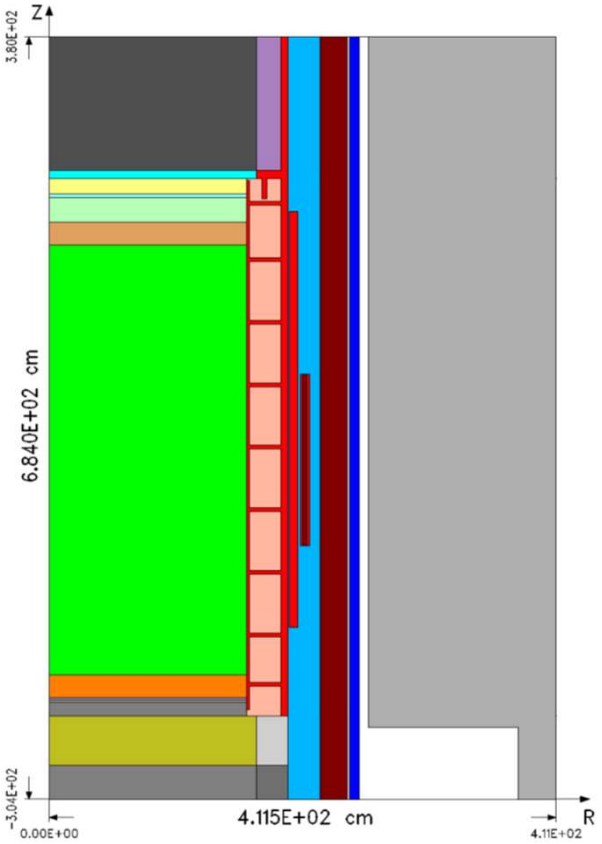
Sección R-θ

Fluencias en 3D sinteticas a partir de fluencias en 2D mediante metodología aprobada por la NRC.

1.WCAP-14040-A, Revision 4

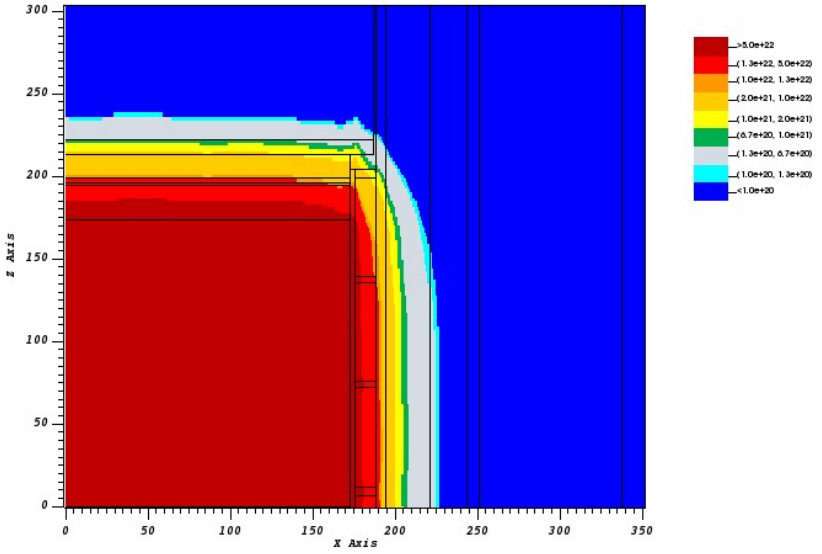
2.WCAP-16083-NP-A, Revision 0

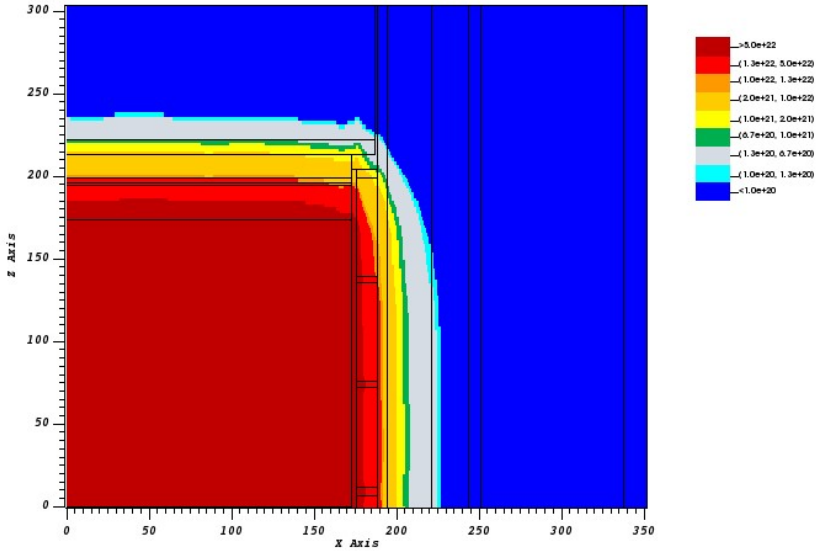
Últimos ejemplos: Salem Unit 1, Catawba Unit 1 y 2, **Asco Unit 1 y 2**, H.B. Robinson Unit 2, **Almaraz (1 y 2)**



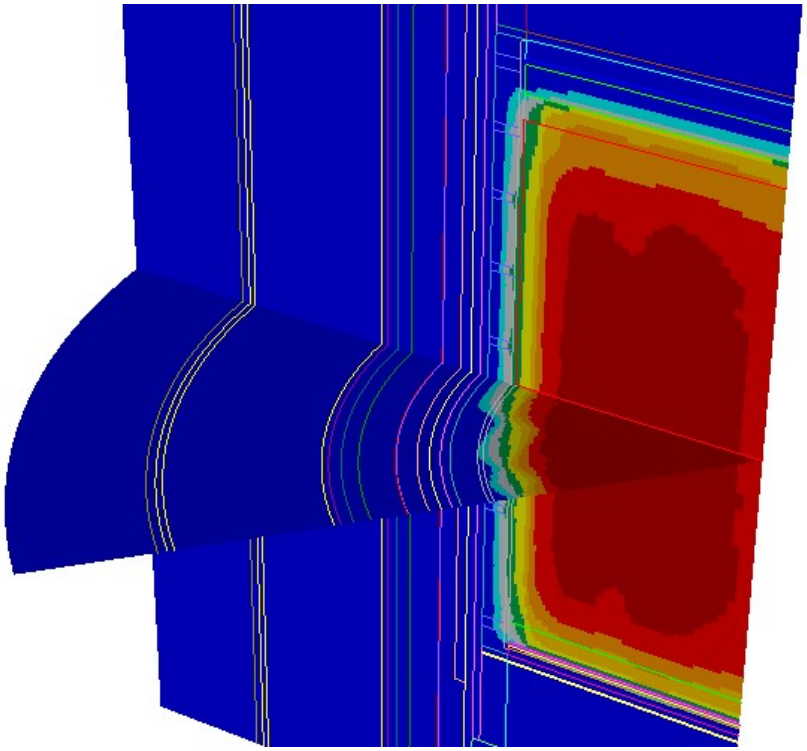
Sección R-Z

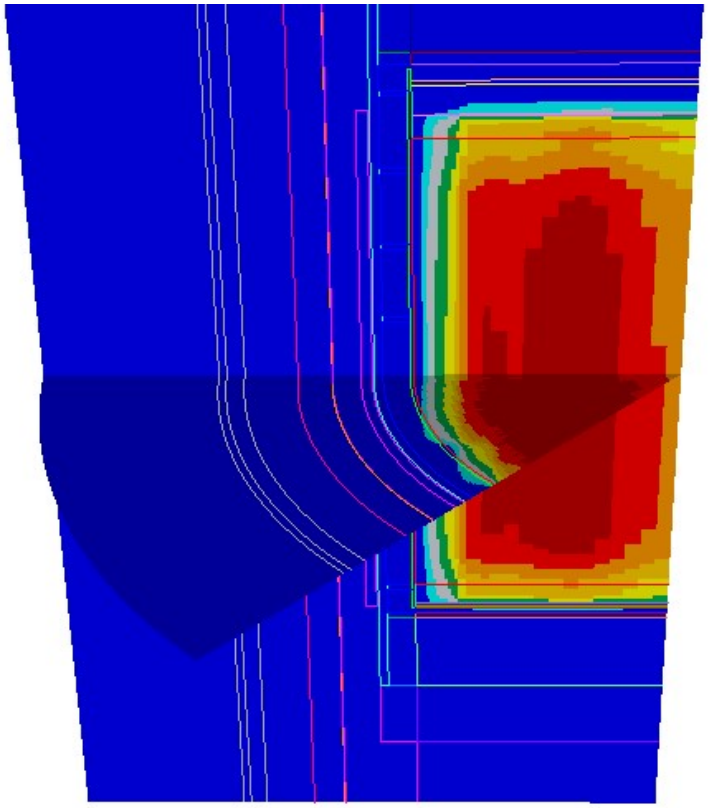
Ejemplos de aplicaciones. Fluencia en vasija. 2D.





Ejemplos de aplicaciones. Fluencia en vasija. 3D.





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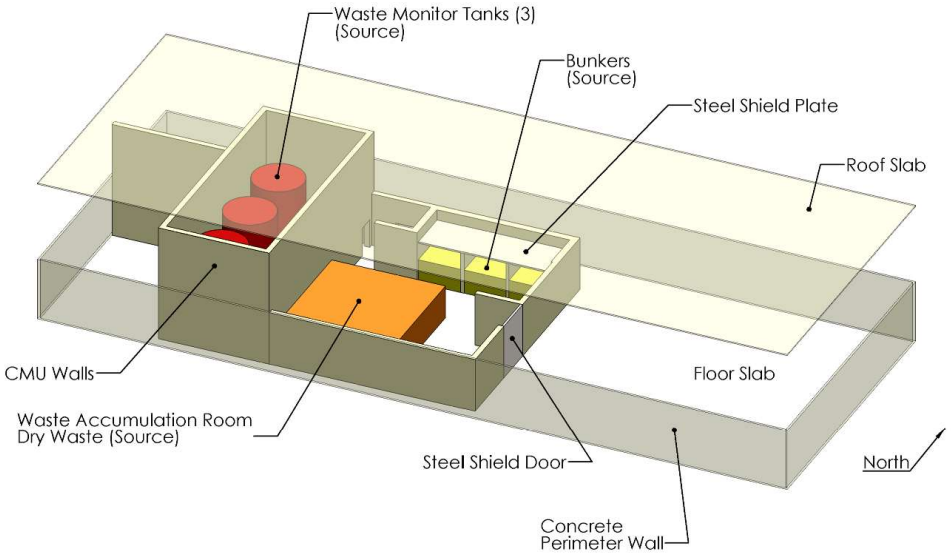
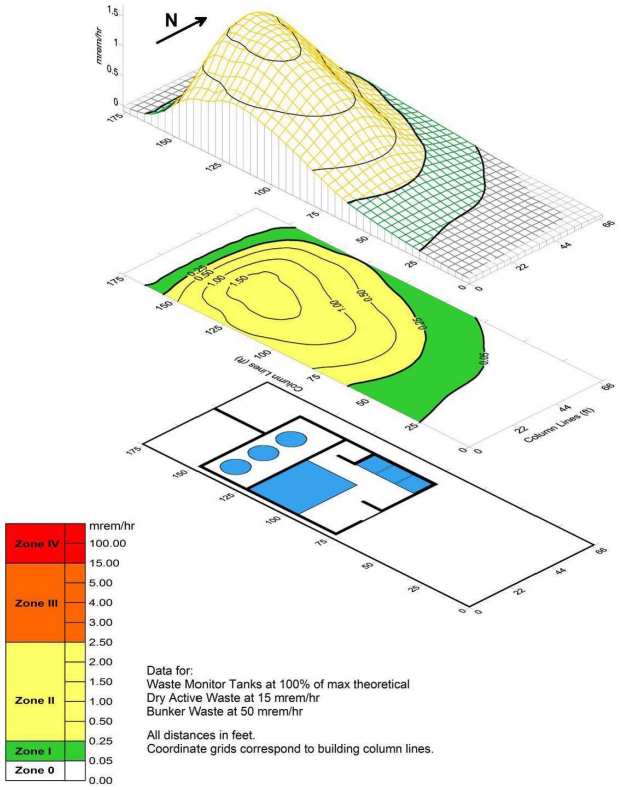
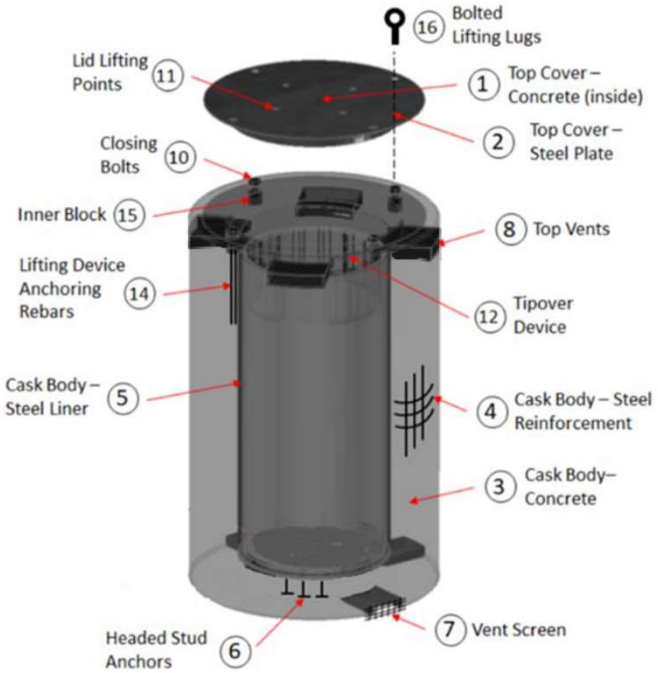
Ejemplos de aplicaciones. Edificio de tratamiento de residuos **AP1000® Plant.**



Código
MCNP®



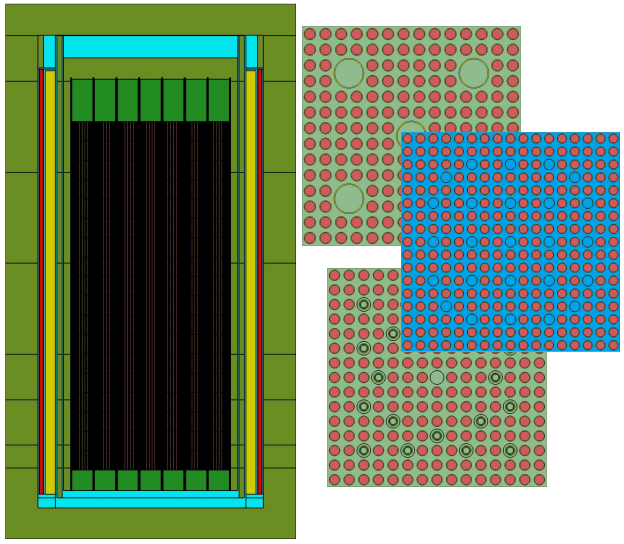
Ejemplos de aplicaciones. **SENTRY™ Cask**.

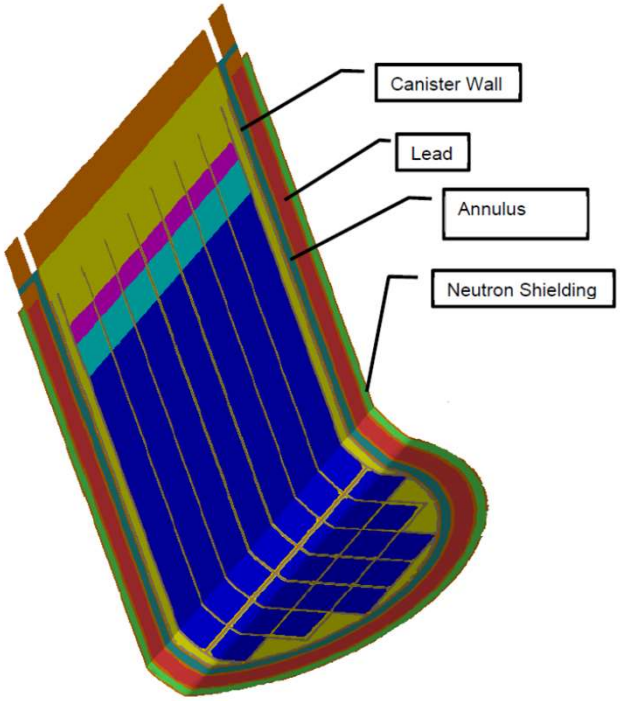


Contenedor de almacenamiento

Blindajes con **MCNP®**, criticidad con SCALE

www.westinghousenuclear.com-SENTRY





Contenedor de transferencia

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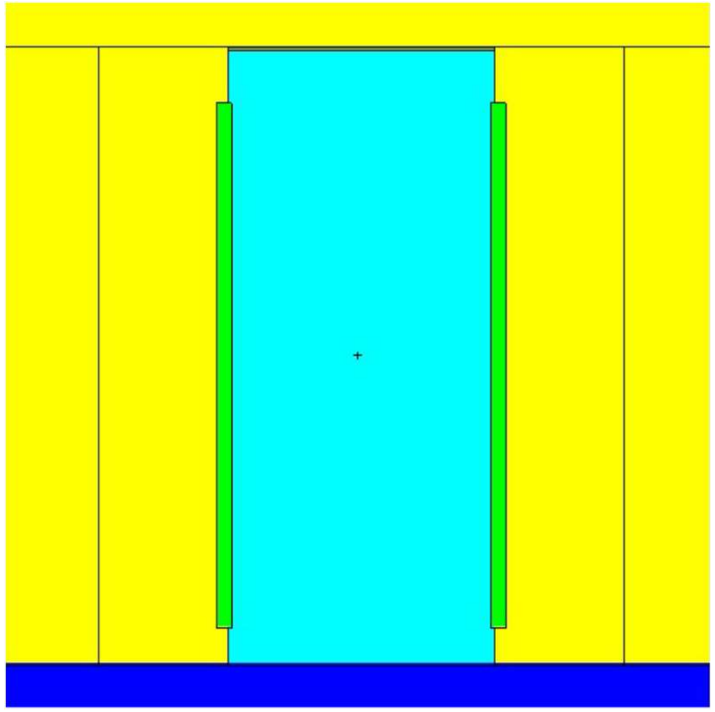
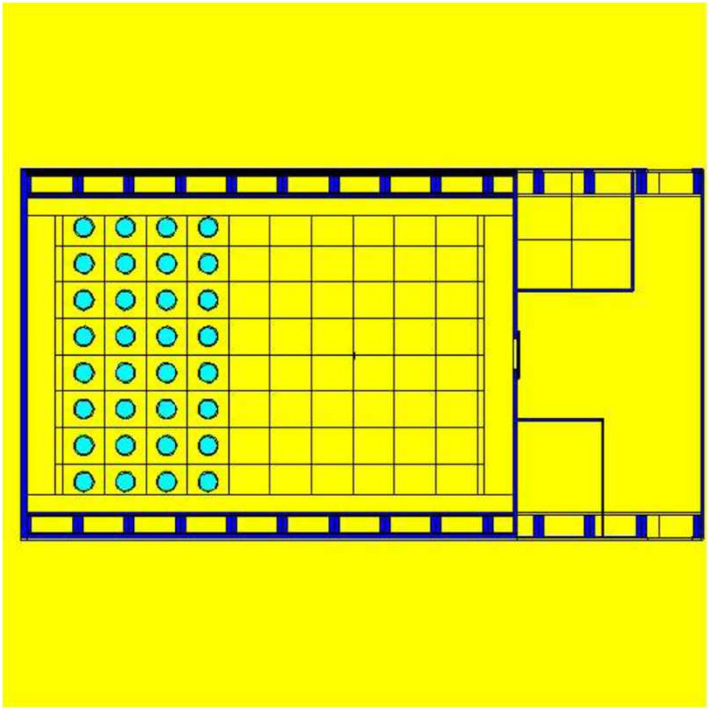
Ejemplos de aplicaciones. ATI TRILLO, contenedor ENSA-DPT.



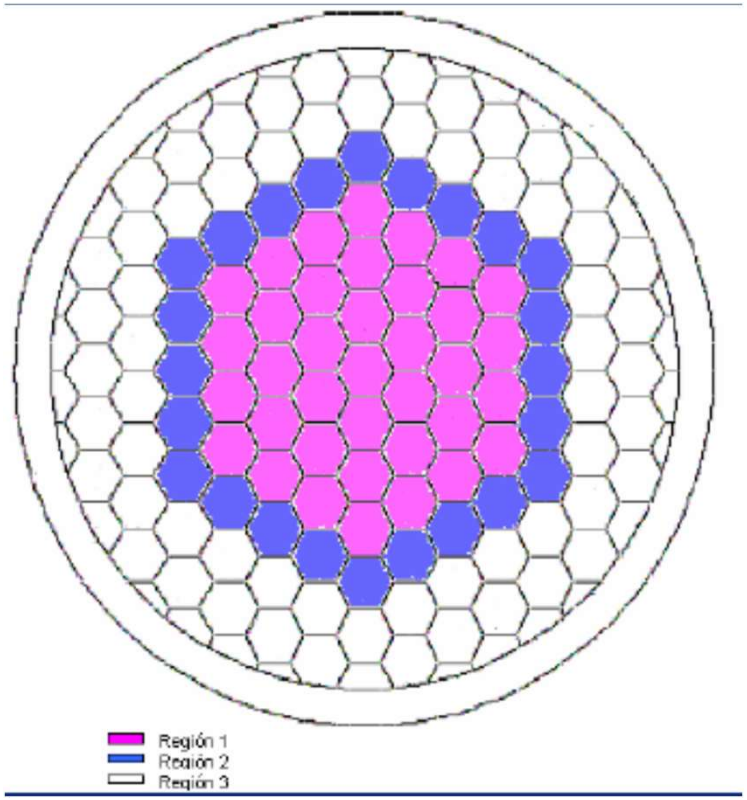
Modelado con **MCNP®**

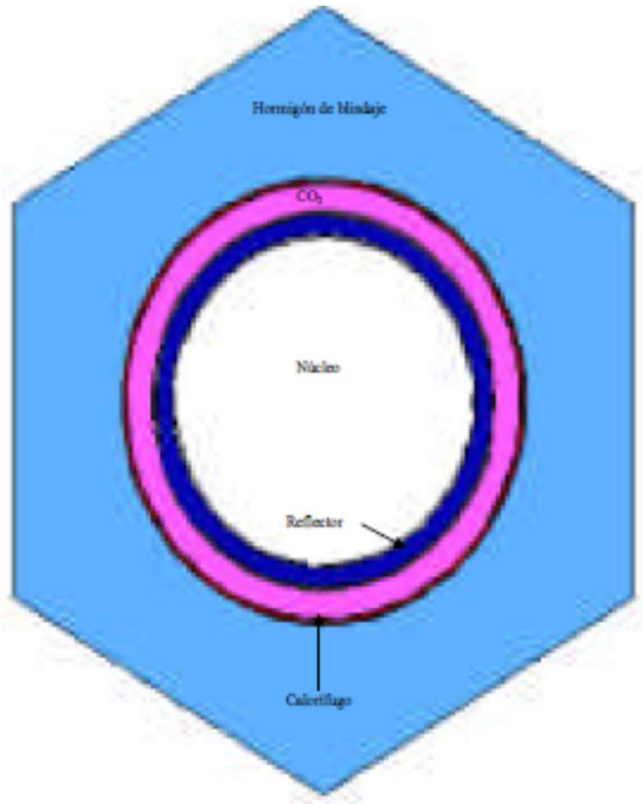


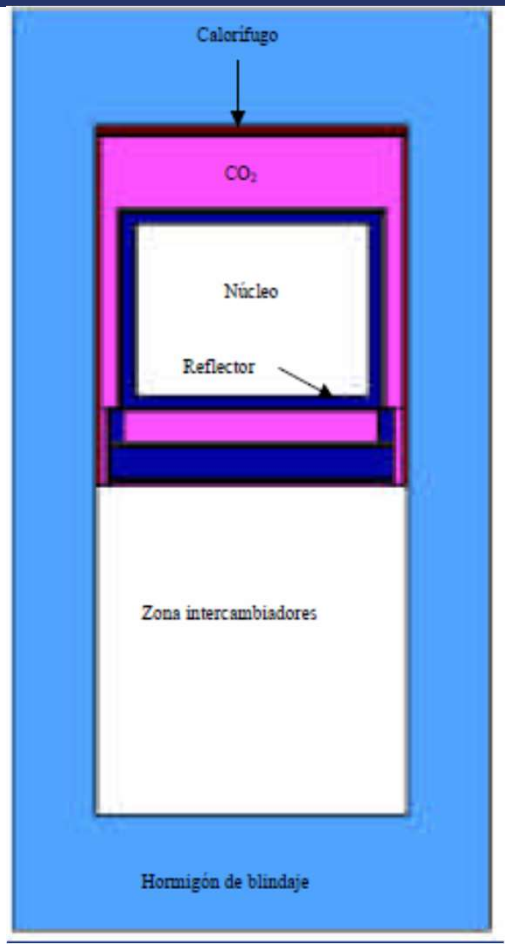
Modelo simplificado del contenedor ENSA-DPT

Vista en planta

Ejemplos de aplicaciones. Activación Vandellòs I.







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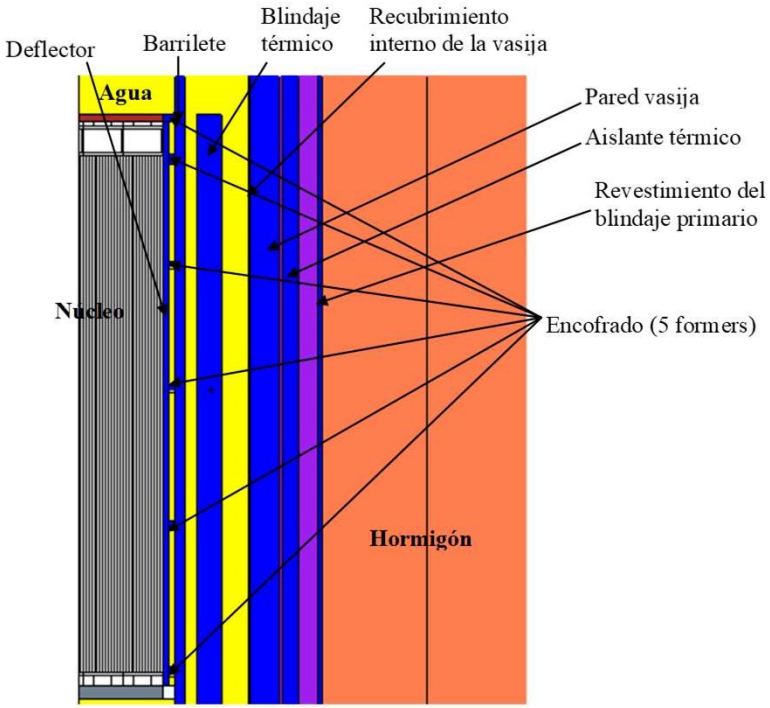
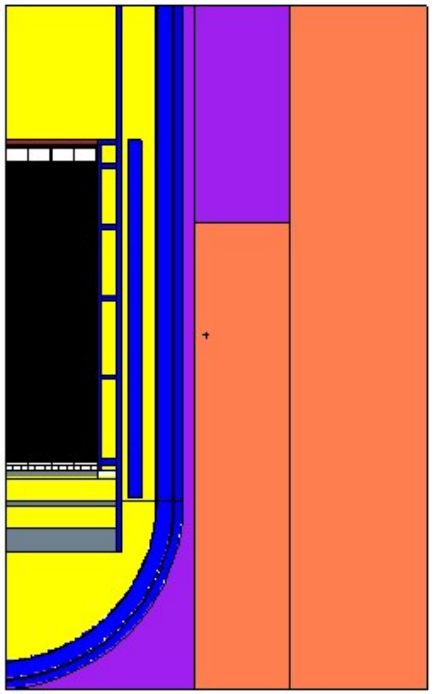
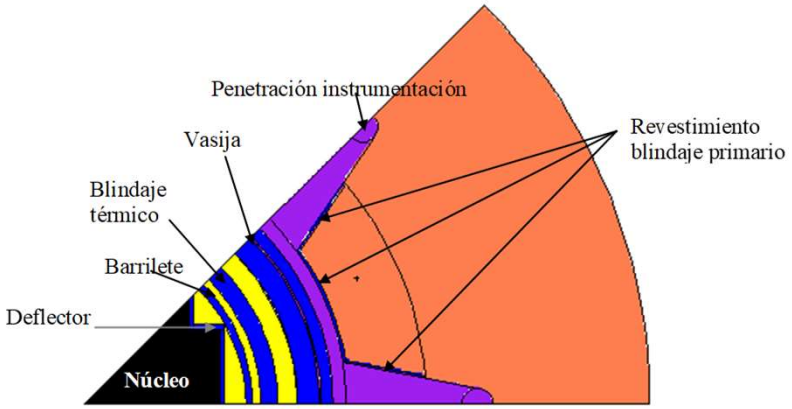
Ejemplos de aplicaciones. Activación vasija Zorita.







Ejemplos de aplicaciones. LFR y **eVinci™**.

- Reactor LFR
  - Quemados y flujos neutrónicos calculados con SERPENT
  - Flujos neutrónicos acoplados a ORIGEN-S mediante COUPLE para cálculo de término fuente, calor residual de decaimiento…
  - https://www.westinghousenuclear.com/new-plants/lead-cooled-fast-reactor
- **eVinci™** micro-reactor
  - Flujos neutrónicos calculados con SERPENT
  - Producción del Ar-41 en el intercambiador de calor con **MCNP®**
  - https://www.westinghousenuclear.com/new-plants/evinci-micro-reactor

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Preguntas?