Master Universitario de Ingenieria Nuclear

UPC-ENDESA

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Universidad Politecnica de Catalunya

- Since 1954 ETSEIB-UPC has an education program on Nuclear Engineering.
- From 1964 to 1977 the experimental education program was developed using an experimental nuclear reactor called Argos (Argonaut type reactor).
- UPC is providing every year about 130 ECTS on purely Nuclear Engineering oriented courses, with a PhD program on Nuclear Engineering.

Nuclear Education with the new model

- Bologna academic model
  - Degree → 240 ECTS, 4 years
  - Master → 60 to 120 ECTS
    - Master of Nuclear Engineering. 90 ECTS, 1.5 years
  - Ph.D. → Ph.D. program + Ph.D. thesis
    - Nuclear Engineering Ph.D. Program

- The experimental nuclear engineering education activities are developed with:
  - Nuclear Power Plant Conceptual Simulator SIREP-1300
  - With the education experimental laboratories:
    - nuclear physics
    - modern physics
    - radiation protection
    - ionization technology
  - With some research laboratories.
    - Institut de Tecniques Energetiques.
    - Departament de Fisica I Enginyeria Nuclear

Education Experimental Laboratory:

Education Experimental Laboratory:

Education Experimental Laboratory:

Nuclear Physics Education Experimental Laboratory:

UPC students doing practices with Full scope Nuclear Power plant Simulator of Tecnatom, 100 km from Barcelona .

Students Technical visits to Nuclear Fuel usine ENUSA (Salamanca, Spain)

Students Technical visits to Asco Nuclear Power Plant (Tarragona, Spain).

Students Technical visits in Nuclear Engineering Area.

15-5-2006, Visit a Tore Supra + ITER site, ETSEIB-UPC

UPC Ph. D. Progam in Nuclear Engineering

- The UPC Ph. D. Program in Nuclear Engineering is a quality Ph. D program for the Spanish ministry.
  - Departament de Fisica i Enginyeria Nuclear
  - Institut de Tecniques Energetiques.
- Total number of professor or lectures in the program: 14
- Number of Ph. D. Theses presented in the program (from 1995 to 2010): 31

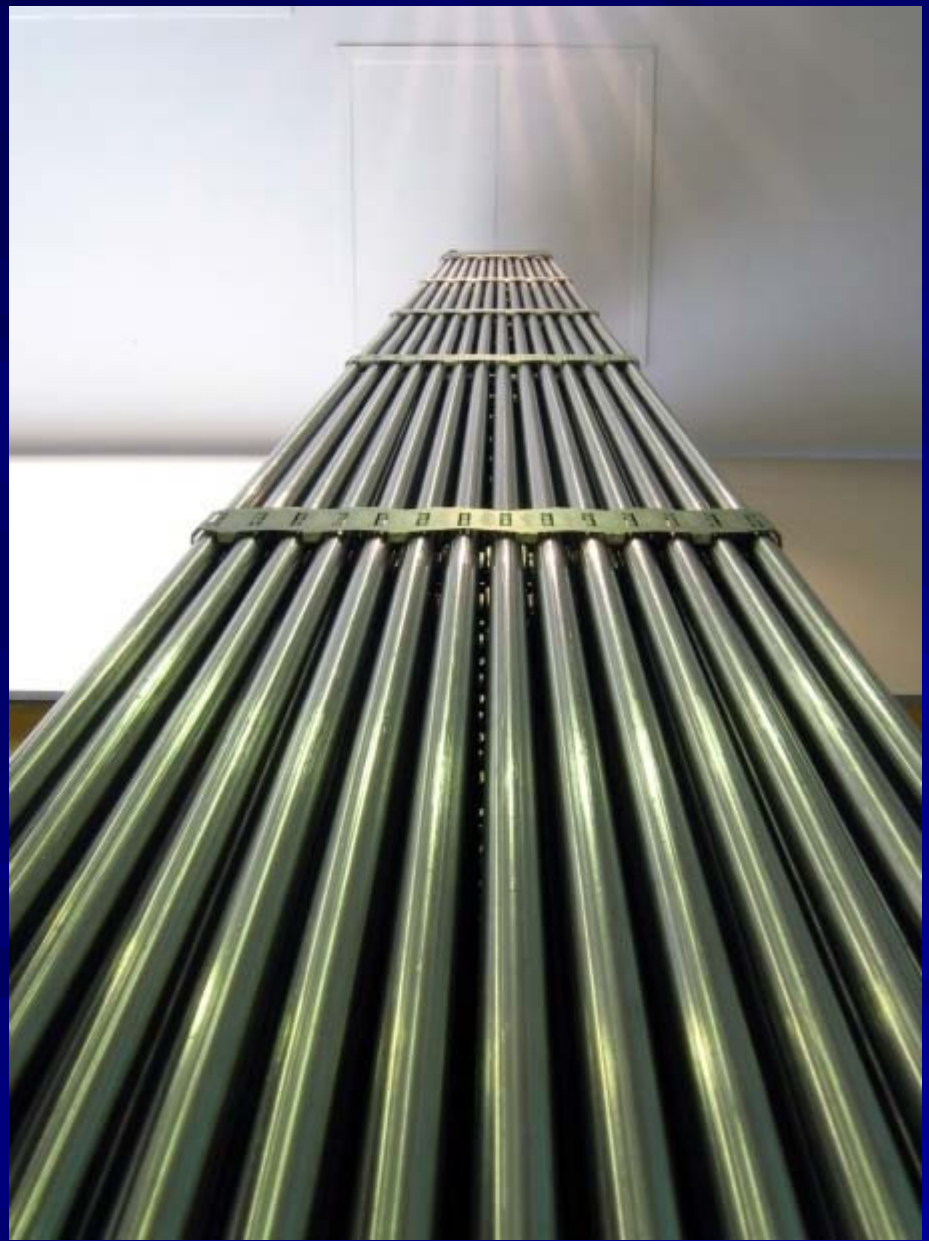
Campus Virtual for 28.000 students

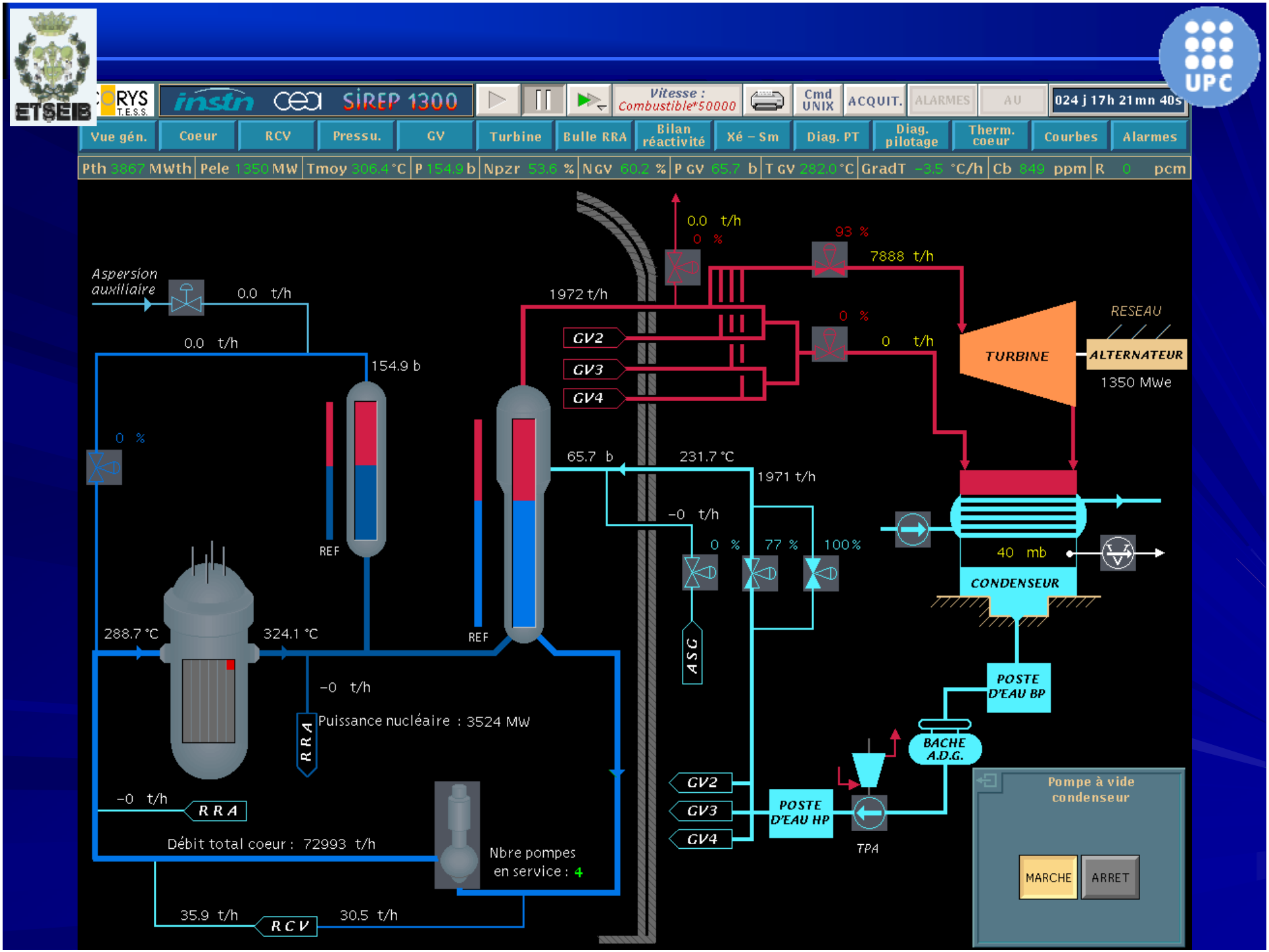
Nuclear Power Plant Conceptual Simulator

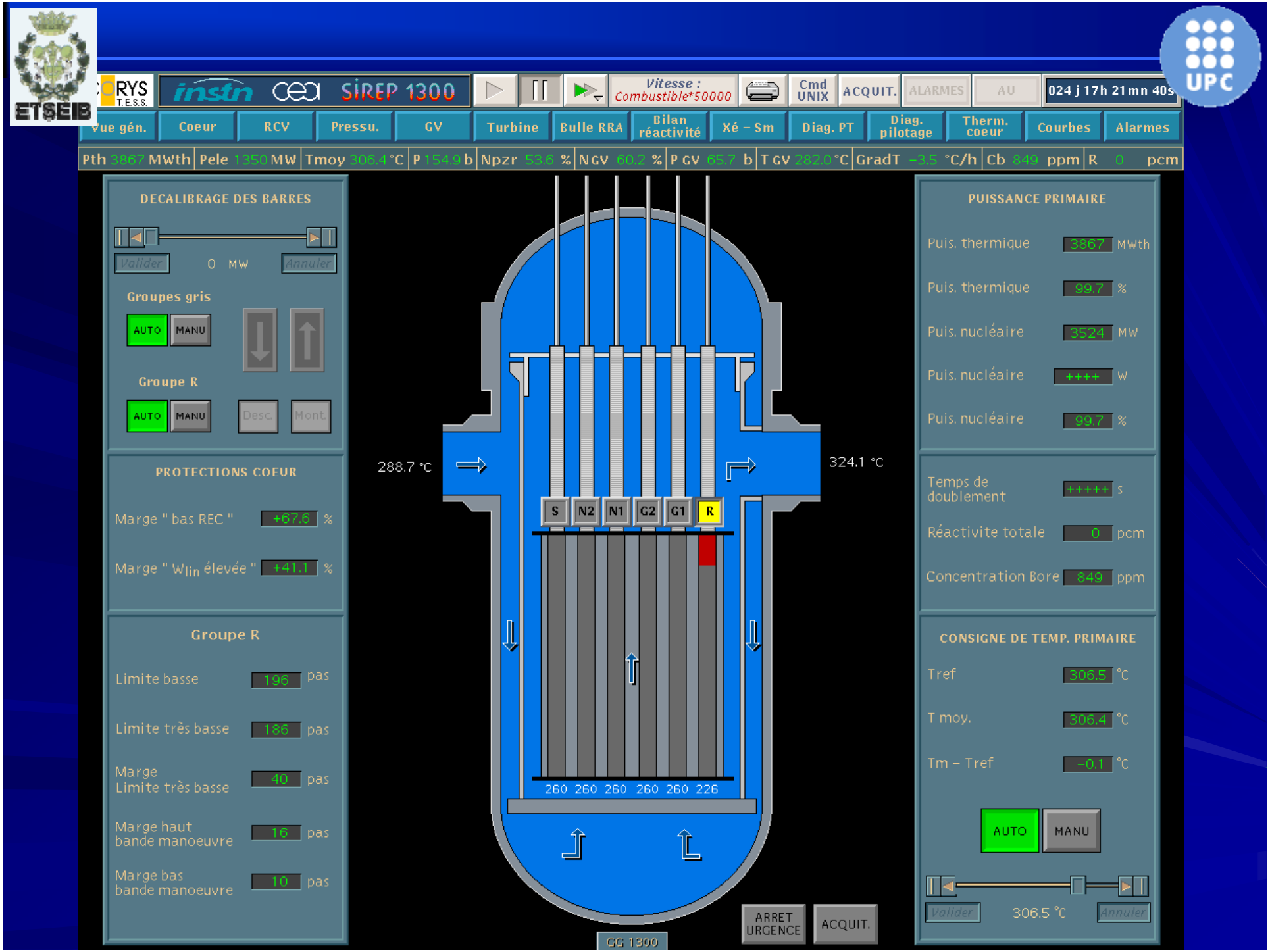
- The Nuclear Power Plant Conceptual Simulator SIREP-1300 reproduces a 1350 MWe PWR with 4 loops.
- In the course of Nuclear Reactor Physics (5 ECTS), the students perform 5 experiences with this simulator
- In the course of Nuclear Power Plants (5 ECTS), they also accomplish 5 experiences, each one taking two hours.

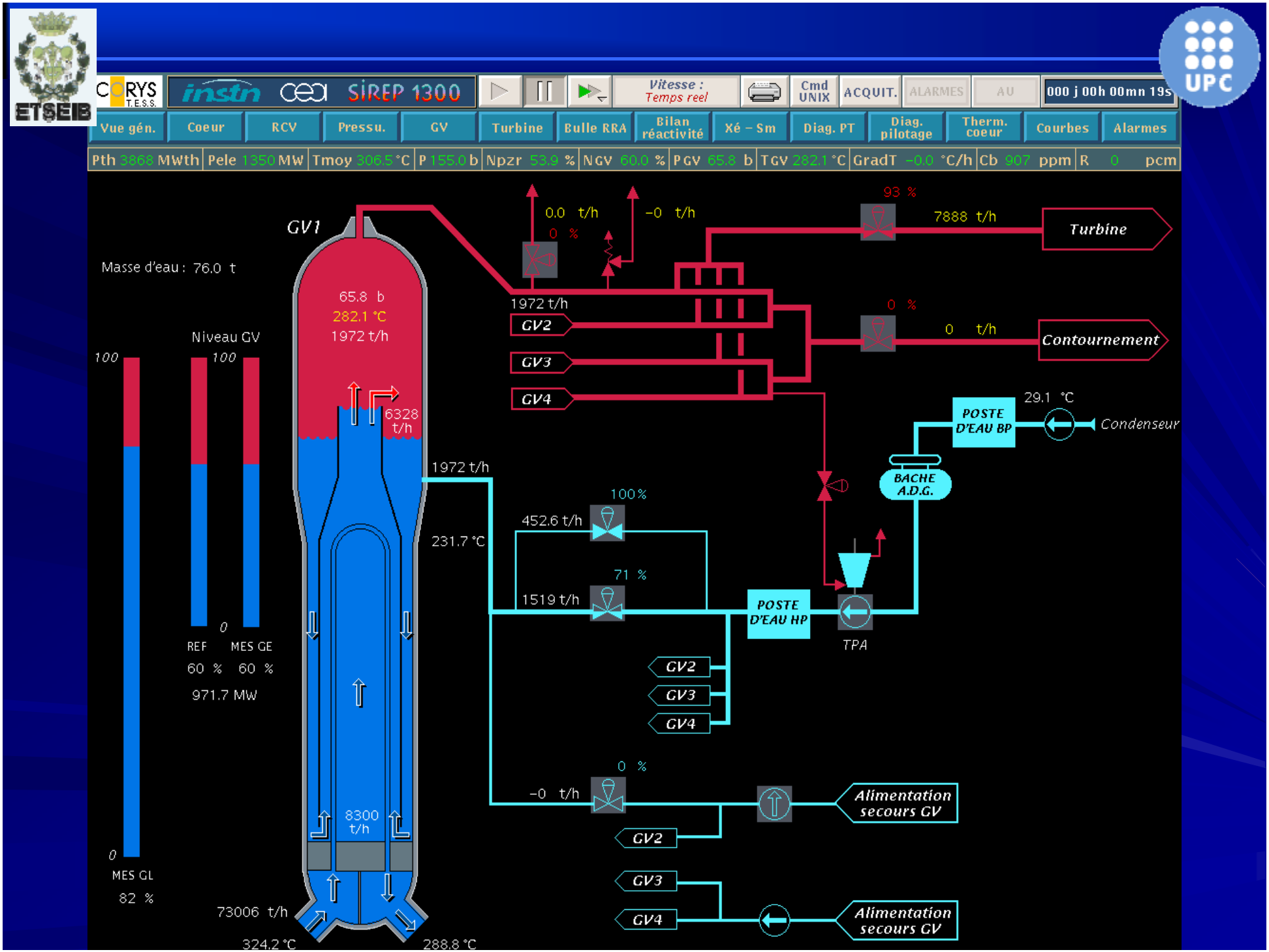

Simulador Conceptual de Central Nuclear
Secció d'Enginyeria Nuclear - DFEN
CSN

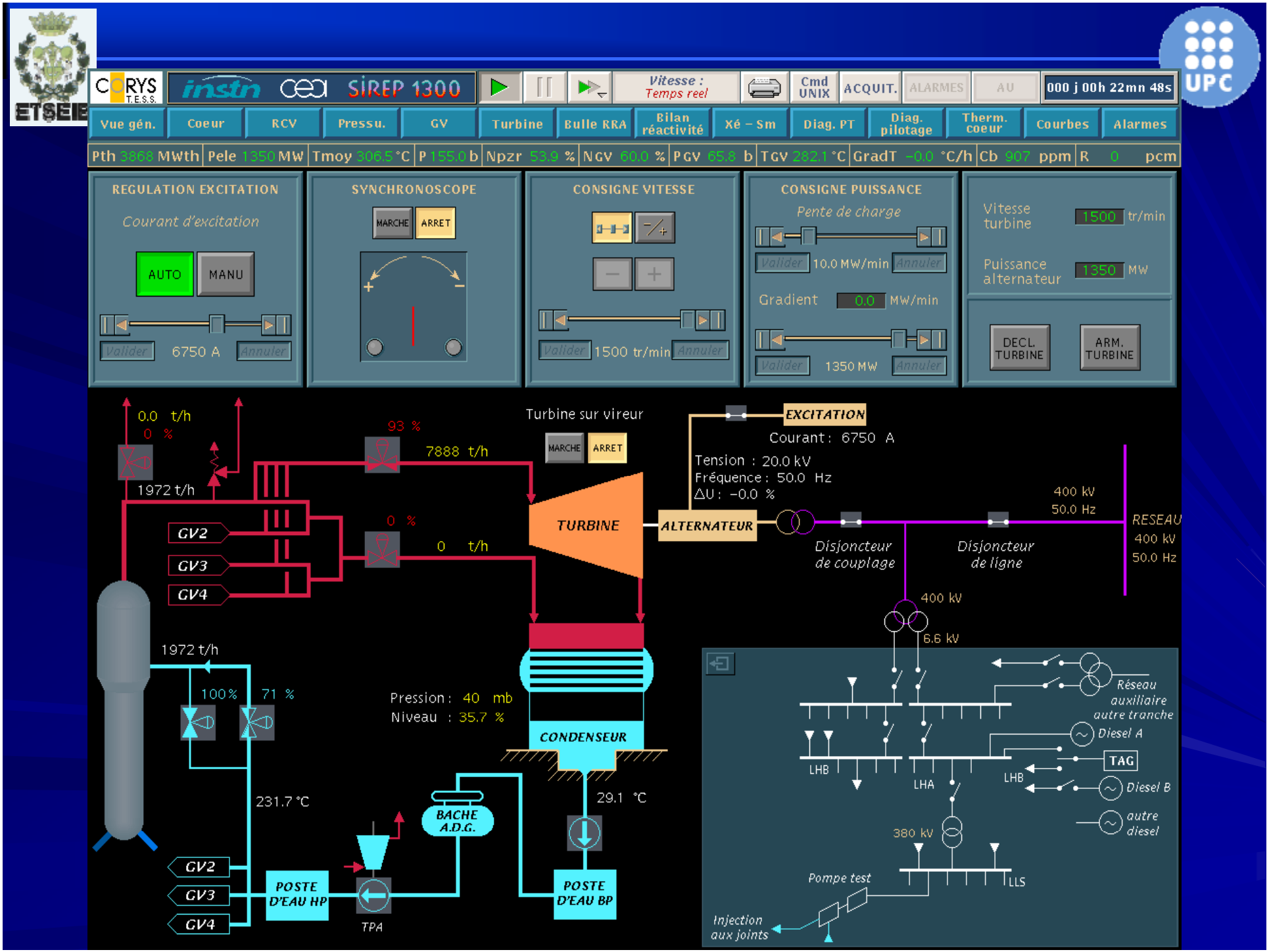

SAMSUNG
SAMSUNG
SAMSUNG
Sun

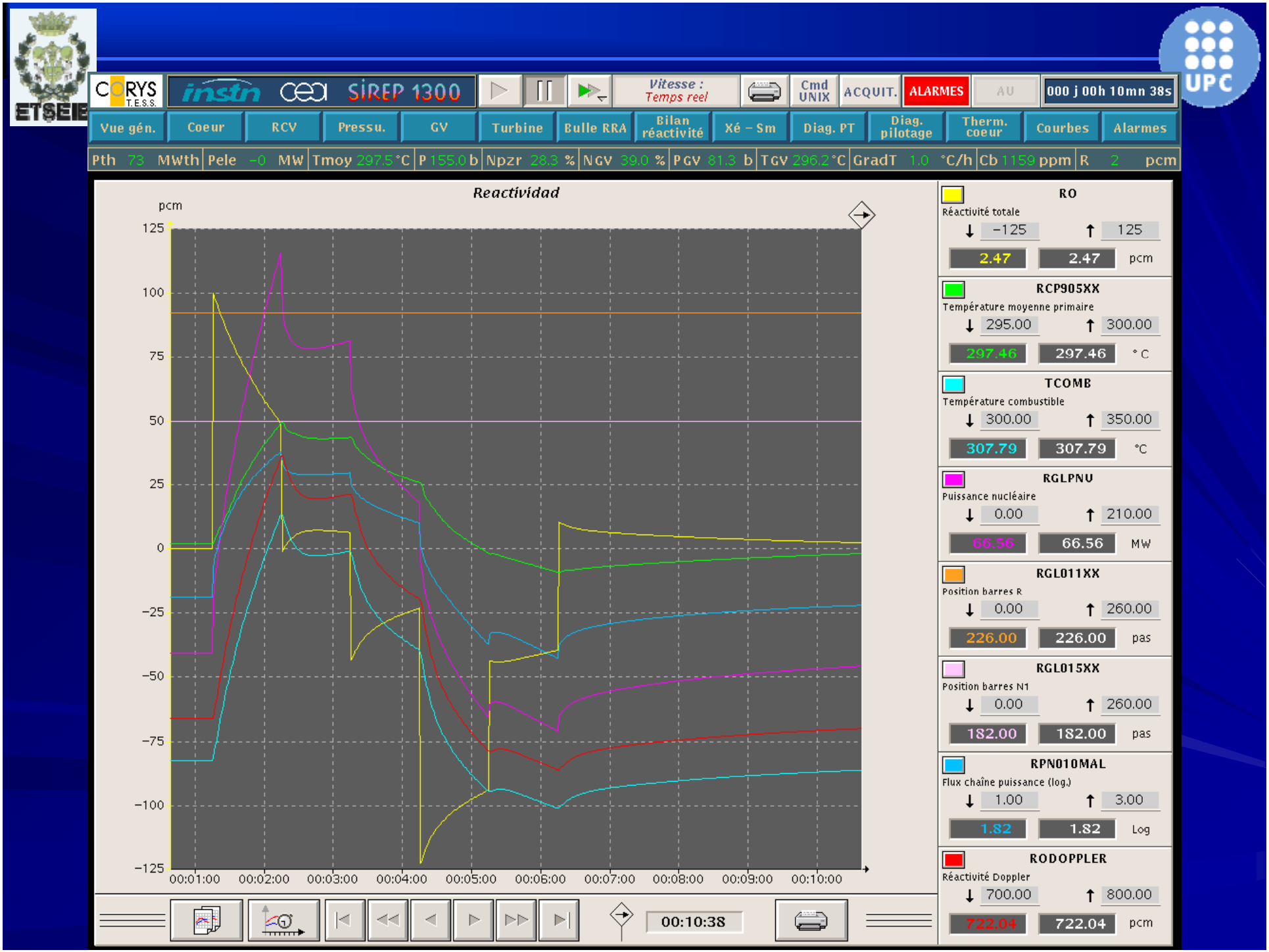


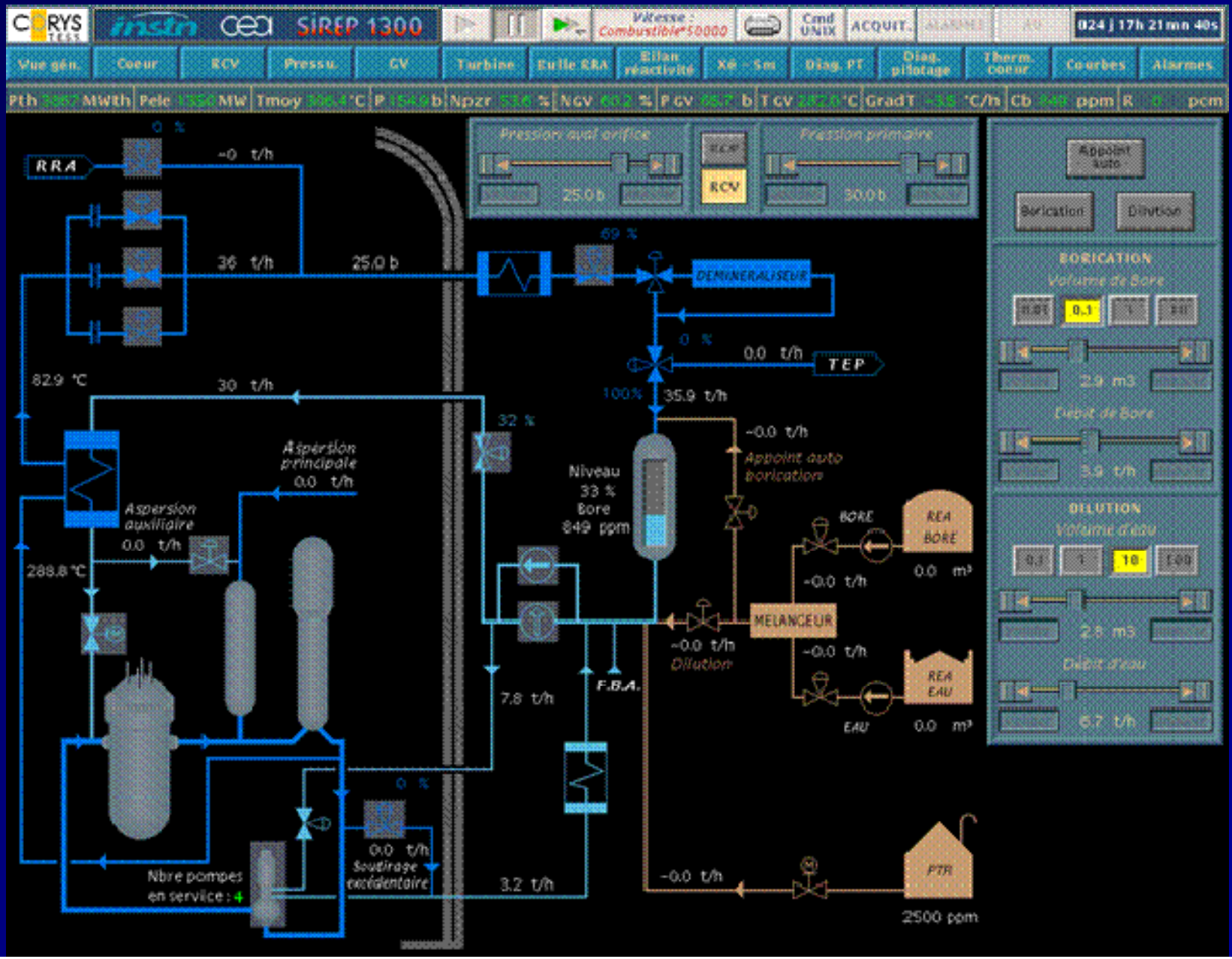

ETSEIB
UPC
ORYS T.E.S.S.
instn
ceai
SIREP 1300
Vitesse : Combustible*50000
Cmd UNIX
ACQUIT.
ALARMES
AU
024 j 17h 21mn 40s
Vue gén.
Coeur
RCV
Pressu.
GV
Turbine
Bulle RRA
Bilan réactivité
Xé – Sm
Diag. PT
Diag. pilotage
Therm. coeur
Courbes
Alarmes
Pth 3867 MWth
Pele 1350 MW
Tmoy 306.4 °C
P 154.9 b
Npzr 53.6 %
NGV 60.2 %
P GV 65.7 b
T GV 282.0 °C
GradT -3.5 °C/h
Cb 849 ppm
R 0 pcm
0.0 t/h
0 %
93 %
7888 t/h
1972 t/h
Aspersion auxiliaire
0.0 t/h
0.0 t/h
154.9 b
GV2
GV3
GV4
0 %
0 t/h
TURBINE
RESEAU
ALTERNATEUR
1350 MWe
0 %
65.7 b
231.7 °C
1971 t/h
-0 t/h
0 %
77 %
100 %
40 mb
CONDENSEUR
REF
REF
288.7 °C
324.1 °C
ASG
-0 t/h
Puissance nucléaire : 3524 MW
RRA
POSTE D'EAU BP
BACHE A.D.G.
-0 t/h
RRA
GV2
GV3
GV4
POSTE D'EAU HP
TPA
Débit total coeur : 72993 t/h
Nbre pompes en service : 4
Pompe à vide condenseur
MARCHE
ARRET
35.9 t/h
RCV
30.5 t/h


SIREP 1300
Vitesse : Combustible*50000
Cmd UNIX
ACQUIT.
ALARMES
AU
024 j 17h 21mn 40s
Vue gén.
Coeur
RCV
Pressu.
GV
Turbine
Bulle RRA
Bilan réactivité
Xé – Sm
Diag. PT
Diag. pilotage
Therm. coeur
Courbes
Alarmes
Pth 3867 MWth
Pele 1350 MW
Tmoy 306.4 °C
P 154.9 b
Npzr 53.6 %
NGV 60.2 %
P GV 65.7 b
T GV 282.0 °C
GradT -3.5 °C/h
Cb 849 ppm
R 0 pcm
DECALIBRAGE DES BARRES
Valider
0 MW
Annuler
Groupes gris
AUTO
MANU
Groupe R
AUTO
MANU
Desc.
Mont.
PROTECTIONS COEUR
Marge " bas REC " +67.6 %
Marge " Wlin élevée " +41.1 %
Groupe R
Limite basse 196 pas
Limite très basse 186 pas
Marge Limite très basse 40 pas
Marge haut bande manoeuvre 16 pas
Marge bas bande manoeuvre 10 pas
288.7 °C
324.1 °C
S
N2
N1
G2
G1
R
260 260 260 260 260 226
GG 1300
ARRET URGENCE
ACQUIT.
PUISSANCE PRIMAIRE
Puis. thermique 3867 MWth
Puis. thermique 99.7 %
Puis. nucléaire 3524 MW
Puis. nucléaire ++++ W
Puis. nucléaire 99.7 %
Temps de doublement +++++ s
Réactivite totale 0 pcm
Concentration Bore 849 ppm
CONSIGNE DE TEMP. PRIMAIRE
Tref 306.5 °C
T moy. 306.4 °C
Tm – Tref -0.1 °C
AUTO
MANU
Valider
306.5 °C
Annuler


CORYS T.E.S.S.
instn ceai SIREP 1300
Vitesse : Temps reel
Cmd UNIX
ACQUIT.
ALARMES
AU
000 j 00h 00mn 19s
Vue gén.
Coeur
RCV
Pressu.
GV
Turbine
Bulle RRA
Bilan réactivité
Xé – Sm
Diag. PT
Diag. pilotage
Therm. coeur
Courbes
Alarmes
Pth 3868 MWth
Pele 1350 MW
Tmoy 306.5 °C
P 155.0 b
Npzr 53.9 %
NGV 60.0 %
PGV 65.8 b
TGV 282.1 °C
GradT -0.0 °C/h
Cb 907 ppm
R 0 pcm
GV1
Masse d'eau : 76.0 t
65.8 b
282.1 °C
1972 t/h
Niveau GV
100
100
0
REF
MES GE
60 %
60 %
971.7 MW
0
MES GL
82 %
6328 t/h
8300 t/h
73006 t/h
324.2 °C
288.8 °C
0.0 t/h
0 %
-0 t/h
93 %
7888 t/h
Turbine
1972 t/h
GV2
GV3
GV4
0 %
0 t/h
Contournement
29.1 °C
POSTE D'EAU BP
Condenseur
BACHE A.D.G.
1972 t/h
231.7 °C
100 %
452.6 t/h
71 %
1519 t/h
POSTE D'EAU HP
TPA
GV2
GV3
GV4
0 %
-0 t/h
Alimentation secours GV
GV2
GV3
GV4
Alimentation secours GV


CORYS T.E.S.S.
instn
ceai
SIREP 1300
Vitesse : Temps reel
Cmd UNIX
ACQUIT.
ALARMES
AU
000 j 00h 22mn 48s
Vue gén.
Coeur
RCV
Pressu.
GV
Turbine
Bulle RRA
Bilan réactivité
Xé – Sm
Diag. PT
Diag. pilotage
Therm. coeur
Courbes
Alarmes
Pth 3868 MWth
Pele 1350 MW
Tmoy 306.5 °C
P 155.0 b
Npzr 53.9 %
NGV 60.0 %
PGV 65.8 b
TGV 282.1 °C
GradT -0.0 °C/h
Cb 907 ppm
R 0 pcm
REGULATION EXCITATION
Courant d'excitation
AUTO
MANU
Valider
6750 A
Annuler
SYNCHRONOSCOPE
MARCHE
ARRET
CONSIGNE VITESSE
Valider
1500 tr/min
Annuler
CONSIGNE PUISSANCE
Pente de charge
Valider
10.0 MW/min
Annuler
Gradient
0.0
MW/min
Valider
1350 MW
Annuler
Vitesse turbine
1500
tr/min
Puissance alternateur
1350
MW
DECL. TURBINE
ARM. TURBINE
0.0 t/h
0 %
1972 t/h
93 %
7888 t/h
Turbine sur vireur
MARCHE
ARRET
EXCITATION
Courant : 6750 A
Tension : 20.0 kV
Fréquence : 50.0 Hz
ΔU : -0.0 %
0 %
0 t/h
GV2
GV3
GV4
TURBINE
ALTERNATEUR
400 kV
50.0 Hz
RESEAU
400 kV
50.0 Hz
Disjoncteur de couplage
Disjoncteur de ligne
400 kV
6.6 kV
1972 t/h
100 %
71 %
Pression : 40 mb
Niveau : 35.7 %
CONDENSEUR
231.7 °C
29.1 °C
BACHE A.D.G.
GV2
GV3
GV4
POSTE D'EAU HP
TPA
POSTE D'EAU BP
Réseau auxiliaire autre tranche
Diesel A
TAG
Diesel B
autre diesel
LHB
LHA
LHB
380 kV
Pompe test
LLS
Injection aux joints


CORYS T.E.S.S.
instn ceai SIREP 1300
Vitesse : Temps reel
Cmd UNIX
ACQUIT.
ALARMES
AU
000 j 00h 10mn 38s
Vue gén.
Coeur
RCV
Pressu.
GV
Turbine
Bulle RRA
Bilan réactivité
Xé – Sm
Diag. PT
Diag. pilotage
Therm. coeur
Courbes
Alarmes
Pth 73 MWth
Pele -0 MW
Tmoy 297.5 °C
P 155.0 b
Npzr 28.3 %
NGV 39.0 %
PGV 81.3 b
TGV 296.2 °C
GradT 1.0 °C/h
Cb 1159 ppm
R 2 pcm
Reactividad
pcm
125
100
75
50
25
0
-25
-50
-75
-100
-125
00:01:00
00:02:00
00:03:00
00:04:00
00:05:00
00:06:00
00:07:00
00:08:00
00:09:00
00:10:00
00:10:38
RO
Réactivité totale
-125
125
2.47
2.47
pcm
RCP905XX
Température moyenne primaire
295.00
300.00
297.46
297.46
°C
TCOMB
Température combustible
300.00
350.00
307.79
307.79
°C
RGLPNU
Puissance nucléaire
0.00
210.00
66.56
66.56
MW
RGL011XX
Position barres R
0.00
260.00
226.00
226.00
pas
RGL015XX
Position barres N1
0.00
260.00
182.00
182.00
pas
RPN010MAL
Flux chaîne puissance (log.)
1.00
3.00
1.82
1.82
Log
RODOPPLER
Réactivité Doppler
700.00
800.00
722.04
722.04
pcm


SIREP 1300
Vue gén.
Coeur
RCV
Pressu.
GV
Turbine
Bulle RRA
Effet réactivité
Xé - Sm
Diag. PT
Diag. pilotage
Therm. coeur
Courbes
Alarmes
RRA
36 t/h
25.0 b
DEMINERALISEUR
TEP
0.0 t/h
82.9 °C
30 t/h
35.9 t/h
Aspersion principale
0.0 t/h
Aspersion auxiliaire
288.8 °C
Niveau
33 %
Bore
849 ppm
Appoint auto Borication
BORE
REA BORE
0.0 m³
MELANGEUR
Dilution
REA EAU
EAU
F.B.A.
7.8 t/h
3.2 t/h
Soutirage excédentaire
Nbre pompes en service : 4
PTR
2500 ppm
Pression aval orifice
Pression primaire
25.0 b
30.0 b
RCV
Appoint auto
Borication
Dilution
BORICATION
Volume de Bore
Débit de Bore
DILUTION
Volume d'eau
Débit d'eau

Difusión a través de redes internacionales

- European Nuclear Education Network.
- Asian Network for Education in Nuclear Technology.
- Latin America Network for Education in Nuclear Technology.
- African Network for Education in Nuclear Technology.

SALIDAS PROFESIONALES MASTER INGENIERIA NUCLEAR:

- ASOCIACION NUCLEAR ASCO
- TECNATOM (centrales nucleares)
- TECNATOM
- CONSEJO DE SEGURIDAD NUCLEAR
- WESTINGHOUSE
- ENSA, EQUIPOS NUCLEARES S.A.
- ENDESA
- ENEL
- EMPRESARIOS AGRUPADOS.
- INITEC
- SENER
- IDOM
- ENUSA
- IBERDROLA
- ENRESA
- FUSION FOR ENERGY (Barcelona)
- ITER (Cadarache, Francia)
- AREVA
- EDF
- EON
- IAEA, Agencia Internacional de Energia Atómica (Viena)
- CEA, Comisariat Energie Atomique
- Ciemat
- ATOM CAREERS IN EUROPE:

http://www.careersineurope.com/events/live/1001/AtomiCareers-Event

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