Nuclear Power Development of China
Outline

PART I: General Introduction of NESs Development

PART II: Advanced NESs Related Sustainability
1 General Introduction of NES Development
According to IAEA, until 2014, there are 388 NPPs in 31 countries, generating 333 GWe, which is 10% of the total energy output of the world.
Until 2014, there are 22 NPP units in mainland of China, 20290MW\textsubscript{e} totally, which is only 1.5\% of total energy generation units and 2.4\% of the total electricity generation.
IN 2015, THE NES INSTALLED CAPACITY WILL REACH 40000 MWe, 18000 MWe UNDER CONSTRUCTION.

THE NES INSTALLED CAPACITY WILL REACH 58000 MWe, 30000 MWe UNDER CONSTRUCTION UNTIL 2020. IN 2015, 27 UNITS ARE IN OPERATION AND 28 UNITS ARE UNDER CONSTRUCTION.

150000 MWe IN 2050.
HIGH UTILIZATION OF LIMITED URANIUM RESOURCES, MAKE SURE OF THE SUSTAINABILITY, "THREE STEPS OF THE NES DEVELOPMENT", COMBINE THE CLOSED FUEL CYCLE.

THERMAL REACTORS

FAST REACTORS

FUSION REACTORS
CLOSED FUEL CYCLE PATH

THERMAL CLOSED CYCLE
THERMAL RECTOR
FUEL FAB.
MINING ENRICHMENT
U RECYCLING
U UTILIZATION RATIO
30% UP

HRW REDUCES TO LESS THAN 25%

Pu RECYCLING
Pu REPROSSESE
FUEL FAB.

FAST CLOSED CYCLE
FAST REACTOR
FUEL FAB.

U UTILIZATION RATIO
60 TIMES UP

MAXIMIZE THE UTILIZATION OF RESOURCES AND ENERGY OUTPUT, MINIMIZE THE RW.
RESOURCES UTILIZATION AND FUEL CYCLES

CURRENT

U MINE → ENRICHMENT → PWR FUEL FAB. → PWR → STORE

MID-LONG TERM (2030~)

Pu RECYCLE : 55,000 kWh/kgNU, 30% UP

NEAR-TERM (~2020)

Pu RECYCLE : 47,000 kWh/kgNU, 12% UP
RESOURCES UTILIZATION AND FUEL CYCLES

- DEPLETED U
  - FR FUEL FAB.
  - REPROCESSE UNIT
  - WASTE

- CURRENT
- NEAR TERM (~2020)
- MID-LONG TERM (~2030)

- FINAL TARGET OF U-Pu FUEL CYCLE
  - FR AND REPROCESSING TEC.
  - 60 TIMES UP OF U UTILIZATION RATIO
Advanced NESs Related Sustainability
CONVERSION RATIO IS HIGHER THAN LWR 0.8 VS. 0.5

U235 RATIO IN SPENT FUEL IS 0.2 wt%, HIGH U UTILIZATION RATIO

UTILIZE NATRUAL U, SAVE SEPARATE WORK
65 MWth, 20MWe;
UO2 FUEL UTILIZED;
REACHED CRITICAL OPERATION IN 2010;
COMMERCIAL CFR1000 IS UNDER DESIGN
LEAD ALLOY COOLED FR

300MWth, 100MWe; ADVANCED Uzr FUEL; DEMONSTRATION NPP WILL BE ESTABLISHED IN 2025.
MSR

10MWth, 4MWe;

- TRISO U FUEL, UO2 PARTICLES;
- EXPERIMENTAL SYSTEM WILL BE ESTABLISHED SINCE 2017;
- Th-U CYCLE WILL BE ADOPTED IN THE TMSR-LIQUID FUEL REACTOR.
- Started in late of 1980s;
- MID-term demonstration unit has finished hot commission in 2010;
- 200tU/a and 800tU/a units will be established in sequence.
THANKS EVERYONE!