Perspective from China on Accelerating Fusion Development

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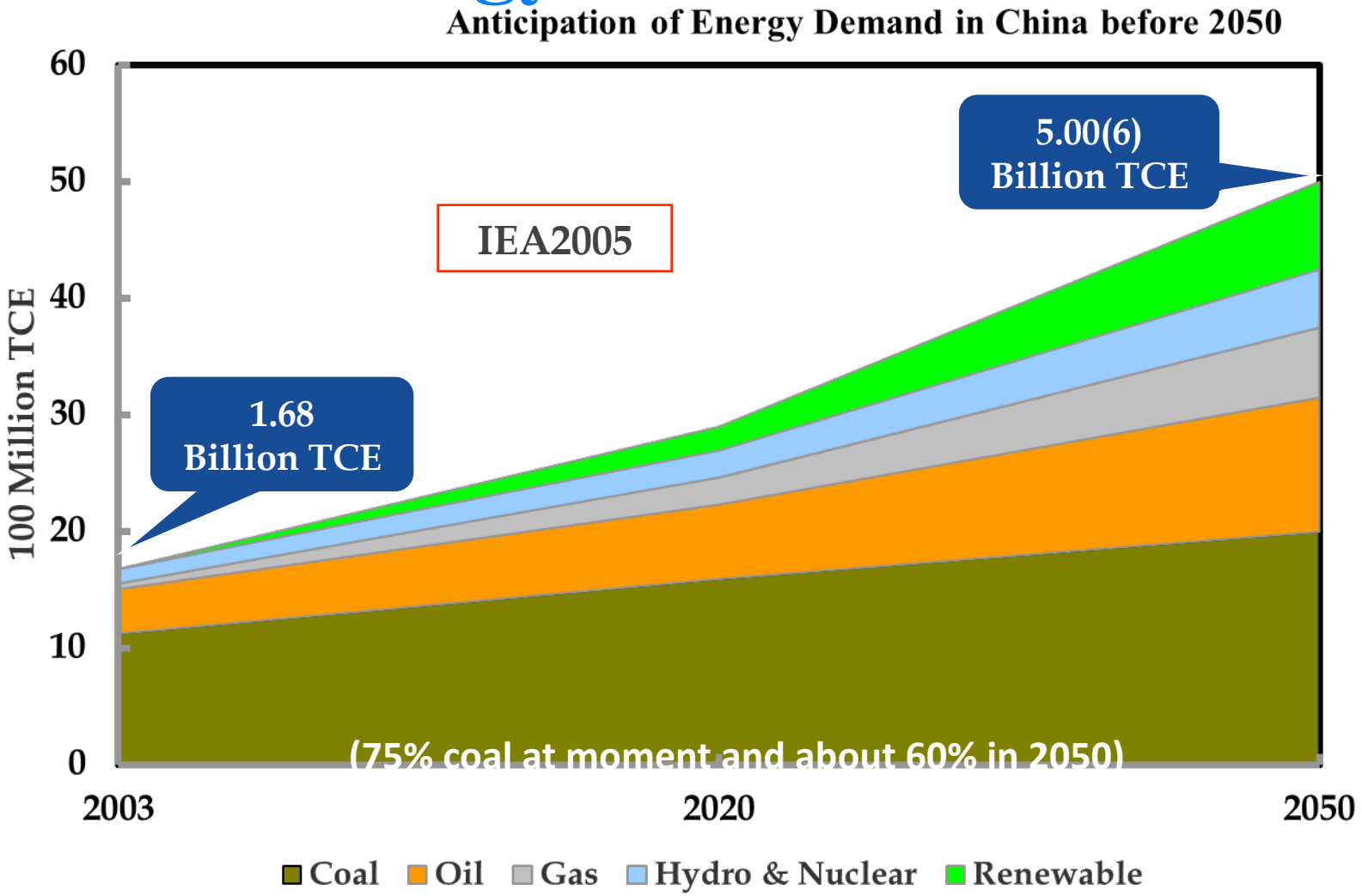
Energy Needs in China

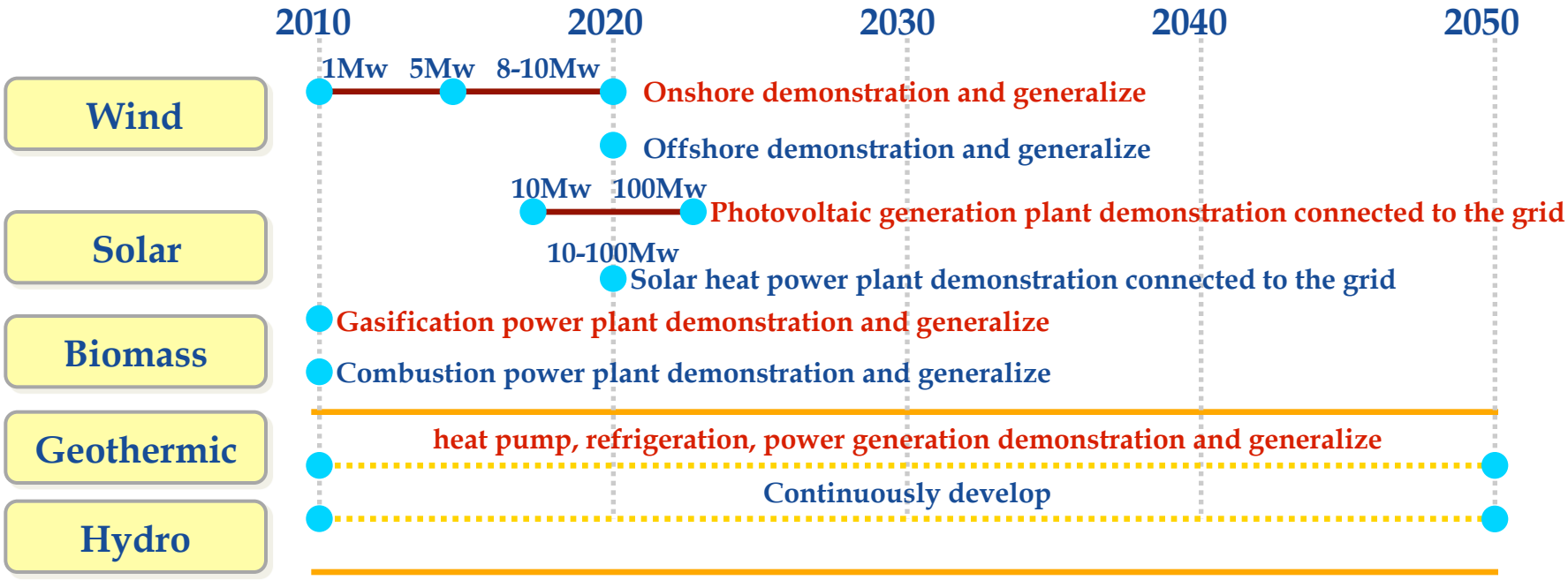


Average Energy consuming in China is still nearly 1/10 of US

CO_2 production is almost No.1

Efforts Made in China

Roadmap for Renewable Energy Power Technology-20% in 2050



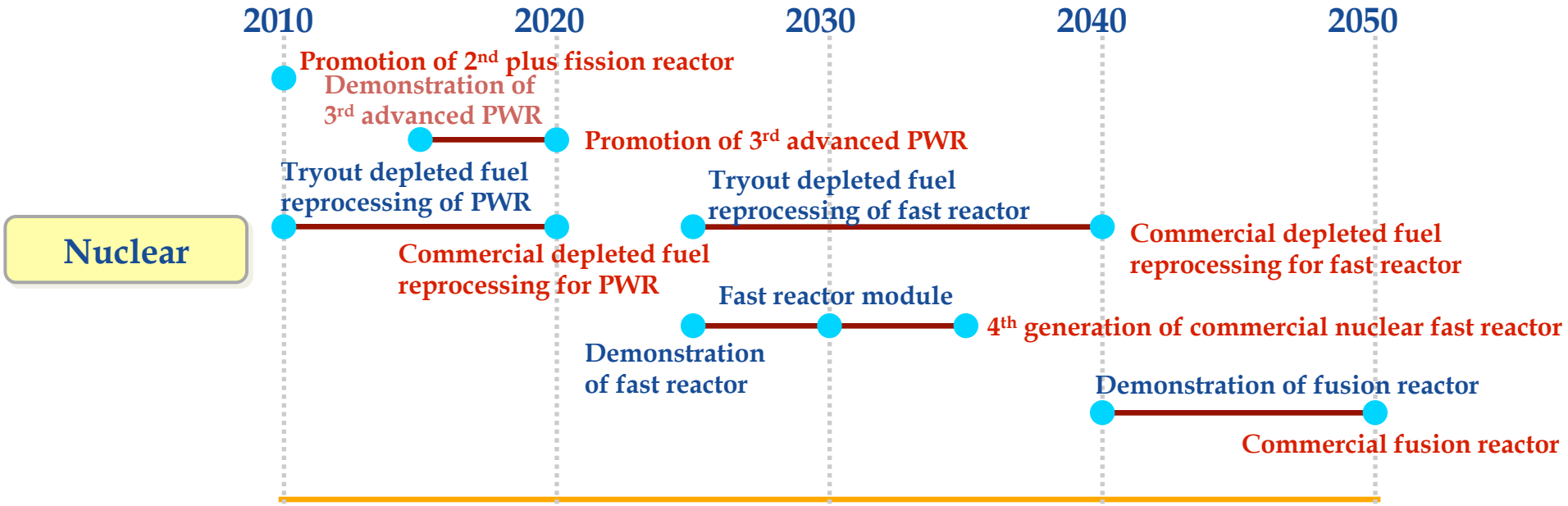
2020 Large-scale development for wind power, steady development for biomass power

2030 Breakthrough for solar power, form an integrate renewable industry chain

2050 Renewable energy play a leading role

Efforts Made in China

Roadmap for Advanced Nuclear Power Technology-15% in 2050, 500 Power Plants

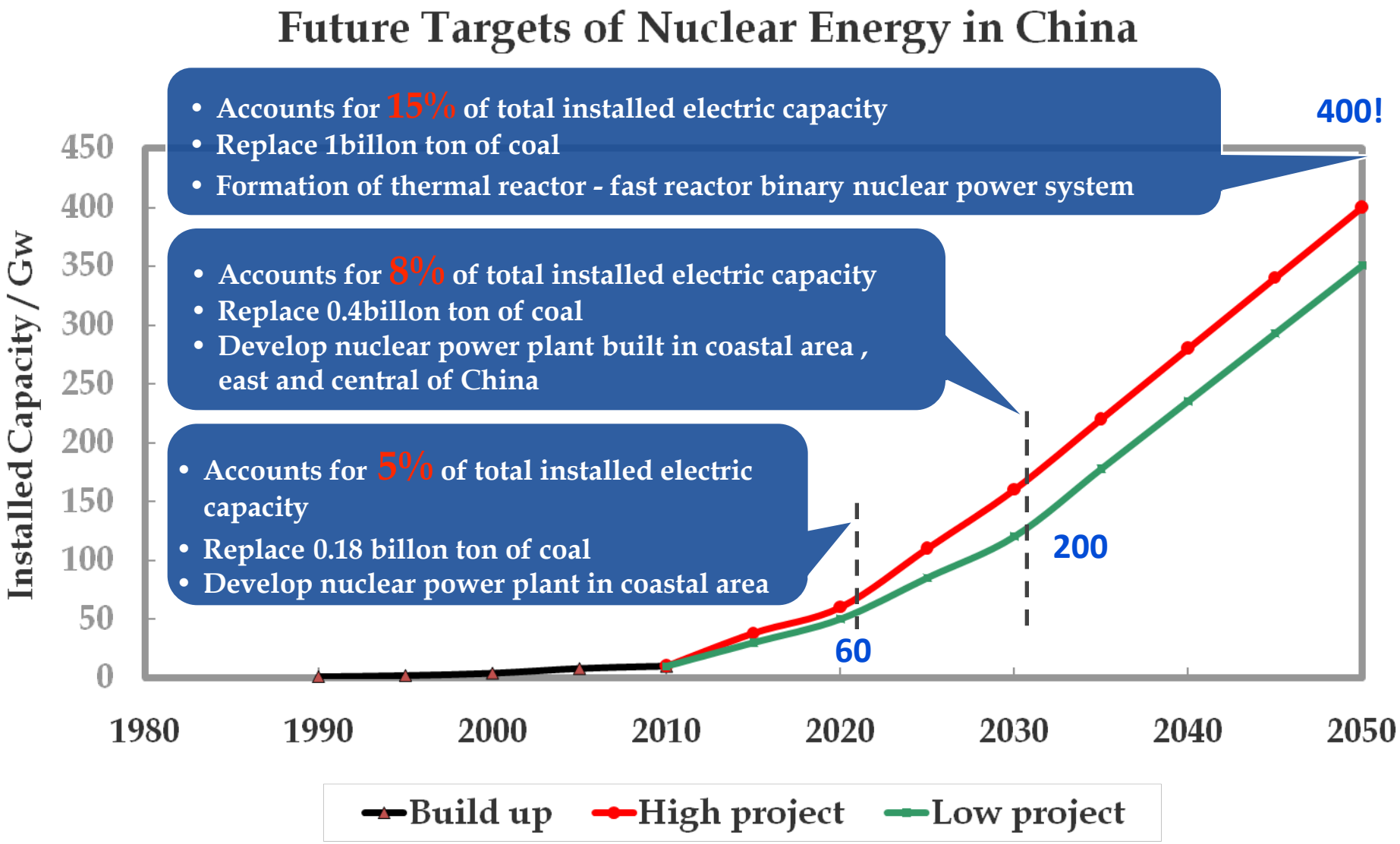


2020 Commercialization of 3rd generation nuclear power

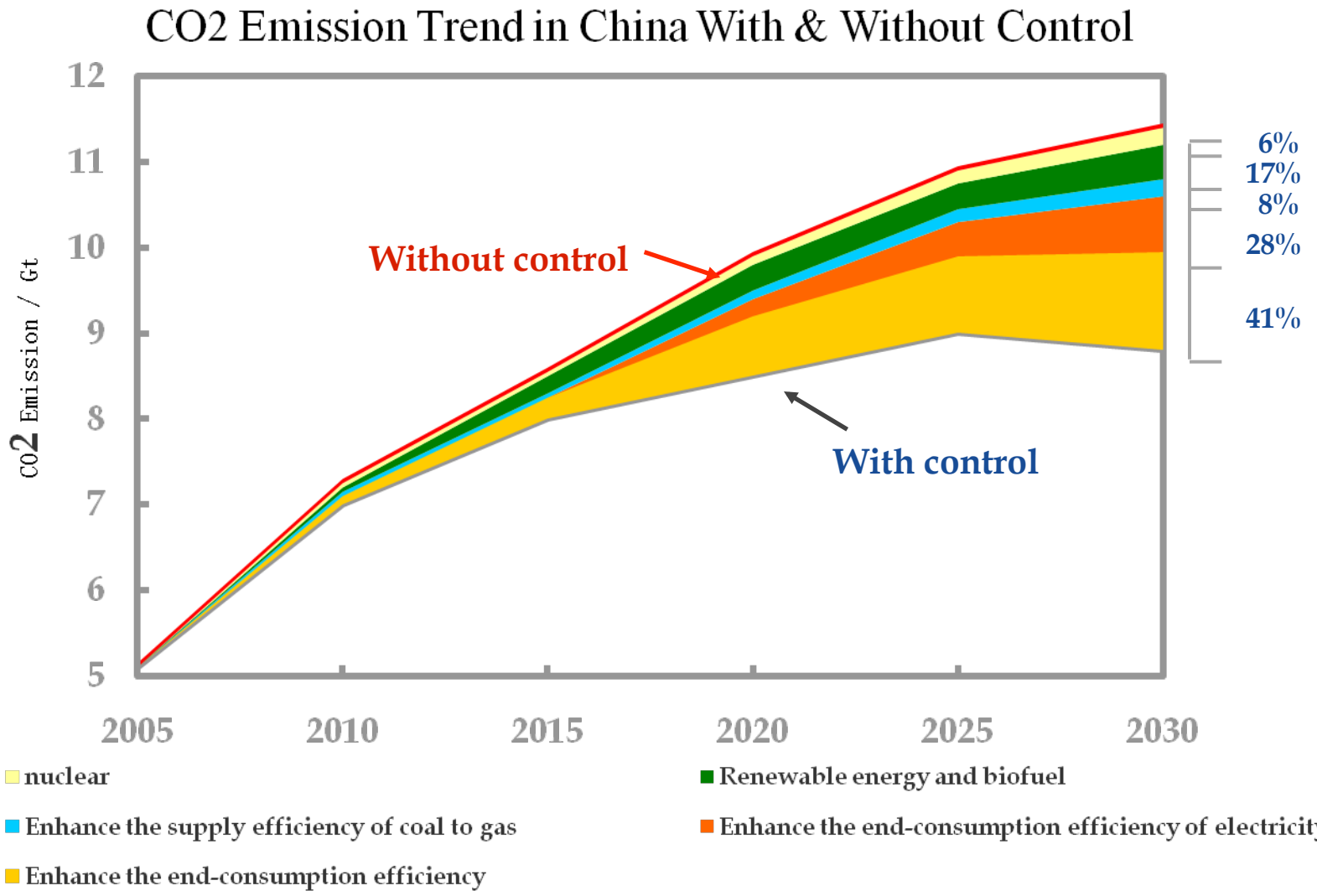
2030 3rd generation nuclear power bulk-built & fast reactor module established

2050 Fast reactor Steady developed & fusion energy breakthroughs made

Efforts Made in China



Efforts Made in China



Nuclear and renewable energy will play a key role in next 20-40 years

Efforts Made in China

G-IV Reactor:

Fast Breeder

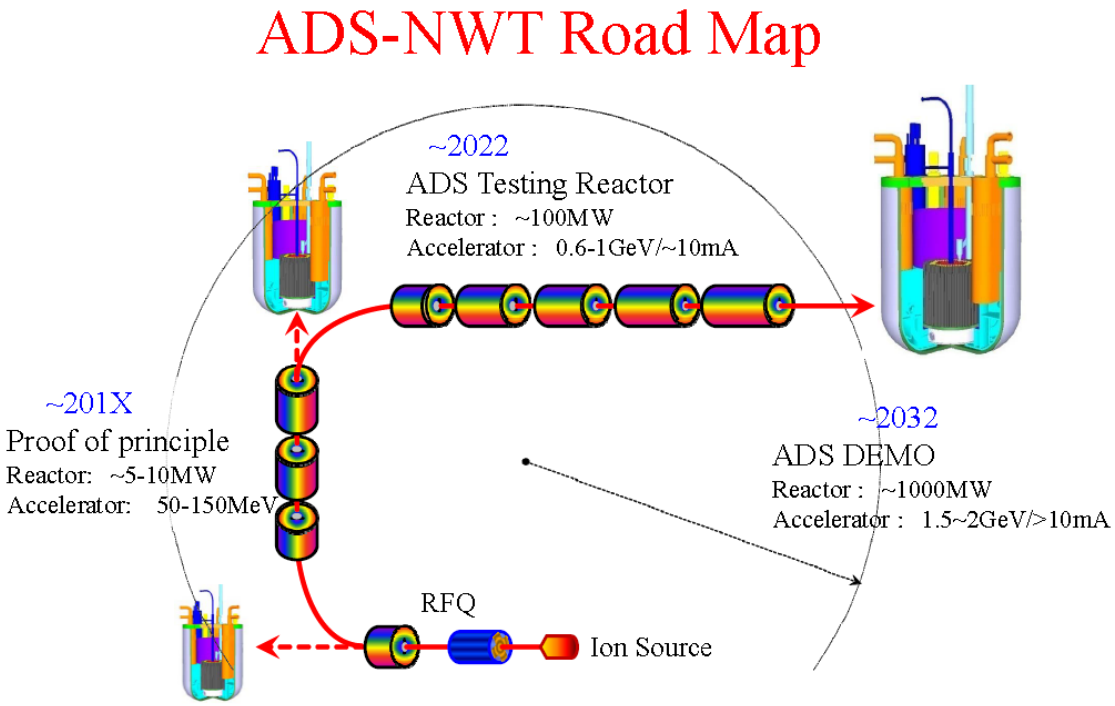
65MW (now)

→800MW(2015)

HTGR

10MW (now)

→ 200MW (2015)



ADS starts for NWT

Z-pinch and Laser hybrid reactor configurations also proposed

CN-MCF Near Term Plan (2020)

ITER construction

- ASIPP: Feeders (100%), Correction Coils (100%), TF Conductors (7%) , PF Conductors (69%), Transfer Cask System(50%), HV Substation Materials (100%), AC-DC Converter (62%)
- SWIP: Blanket FW (10%) &Shield (40%), Gas Injection Valve Boxes+ GDC Conditioning System (88%), Magnetic Supports (100%),
- Diagnostics (3.3%)

Enhance Domestic MCF

Upgrade EAST, HL-2M

ITER technology

TBM

University program

DEMO design (Wan)

DEMO Material

Education program(2000)

Can start construct CN pilot power plant around 2020

Road map

- US: ITER—IFMIF+CTF(FNF)---DEMO-Power Plant
- EU: ITER—IFMIF--- DEMO-Power Plan
- KO: ITER— DEMO---Power Plan

CN:

Risks are always there. Nothing is perfect.

Learning by Doing.

Make Next Step forward is most important

One party dominate cooperation mechanism

EDEMO /Pilot plant (20 years)
Electricity generation with reduced mission

Electricity generation

No need real steady state

Burning plasma control

Sufficient T Breeding

As a CTF

H_2 production

Testing tokamak system availability (reliability, buildability, operability and maintainability)

P_{fusion}~200MW, t = a few hours to weeks

Based on existing technologies:

Option 1: Pure Fusion

A FDF-class with SC coils

A ST-type compact device

Option 2: Fusion –Fission hybrid

Fusion: Q=1-3, Pth=50-100MW

Fission: M= 20-30, Pt = 0.3-1.5GW

Or:

ITER-type machine with different blanket: Pt =5GW, Pe=1.5GW

Summary

- China needs fusion energy more urgent than any other countries.
- To get Fusion energy work is the wish from top leader and public.
- To demonstrate fusion can work in long pulse (SSO) is most important.
- A pilot or EDMOE device may provide a better choice for China.