

Nuclear Technology in China for the New Century

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People to People Ambassador Programs

- Purpose
 - foster peace through understanding
 - provide forum for exchange of technical and cultural information
- Delegation Leaders
 - Alan E. Waltar, Ph.D.
 - Margaret S. Chu, Ph.D.
- Delegation represented many facets of nuclear industry



People to People Ambassador Programs

SPECIFIC DELEGATION GOALS

- Obtain better understanding of China's nuclear power industry
- Construction of Generation III reactors
- R&D of advanced reactors (HTGR and CEFBR)
- Plans for other aspects of fuel cycle
- Safety culture in China and gov't organization



Professional Delegation & Guests



Delegation from Oak Ridge



People to People Ambassador Programs

BEIJING TECHNICAL PROGRAM INCLUDED VISITS TO:

- Energy Foundation, Dr. Fuqiang Yang
- Chinese Nuclear Society, Mr. Fu Manchang
- Institute of Nuclear and new Energy Technology
- China Institute of Atomic Energy
- China Nuclear Data Center



China's Goals for Nuclear Power

- Nuclear capacity will reach 40 GWe by 2020
 - 4% of total installed capacity
- Self-reliance in technology with international coop.
- Demonstration of large-scale PWR and HTGR
- Improve operational capability of current reactors
- Adopting Gen-III technology with international coop.
- Setup experimental fast reactor



Institute of Nuclear and new Energy Technology

- Research Institute of Tsinghua University
- Three Test Reactors
 - 1964 Swimming Pool Reactor
 - 1989 5 MW Test Heating Reactor
 - 2000 10 MW HTGR, HTR-10
- HTR-PM (Pebble Bed Module) Demonstration
 - 2007: Preliminary Design; Submit PSAR
 - 2009: Pour 1st concrete; Approval from NNSA
 - 2013: Finish Project



China Institute of Atomic Energy



President Zhao Zhixiang



Advanced Reactors

CHINA EXPERIMENTAL FAST REACTOR (CEFR)

- Sponsored by China Institute of Atomic Energy
 - main research organization of China National Nuclear Corporation
- Goal: Fast Breeder Reactor commercialization by 2030
- CEFR Operating Parameters: 65 MWt; 20 MWe

Advanced Reactors

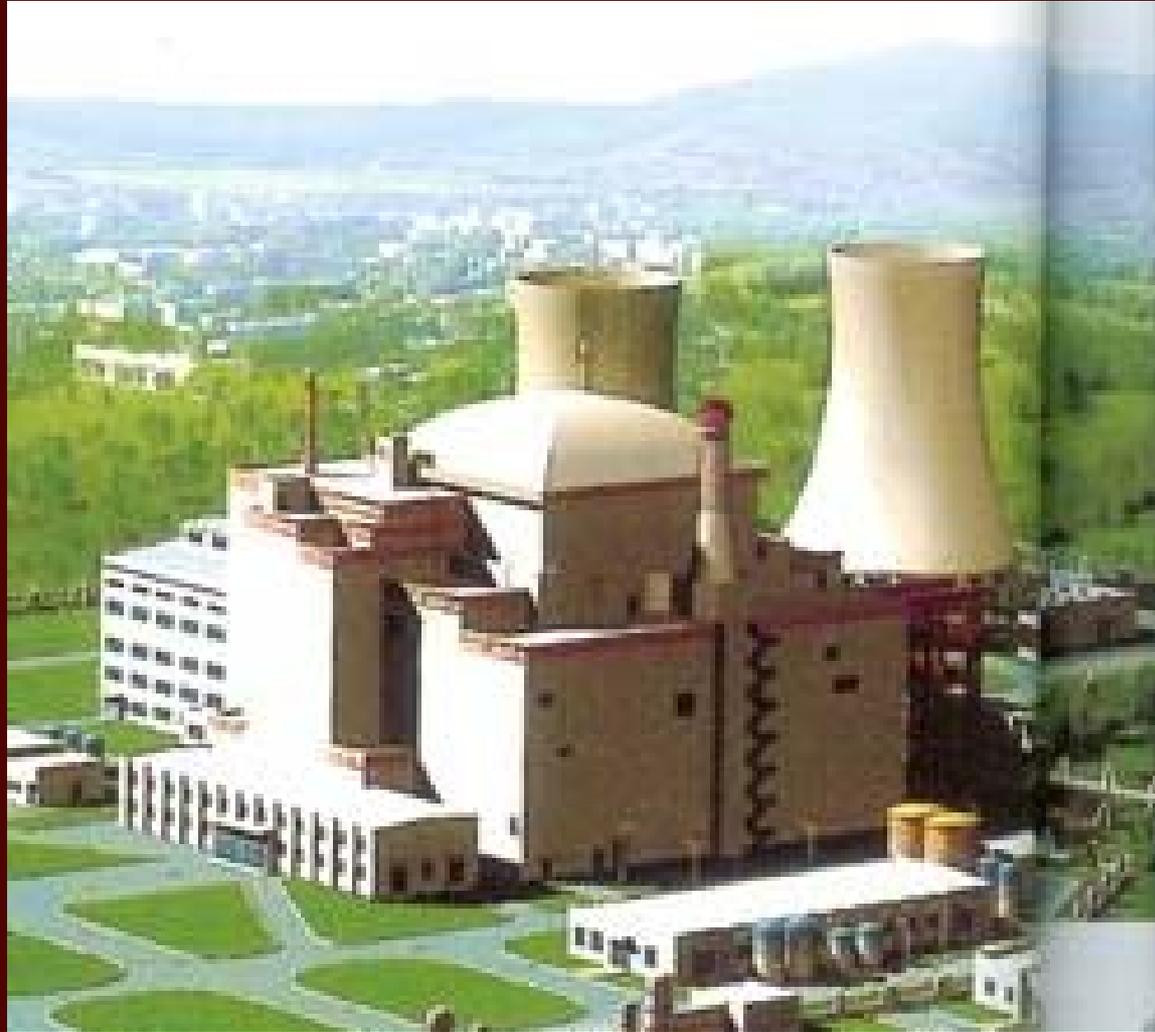
CHINA EXPERIMENTAL FAST REACTOR (CEFR)

- Schedule
 - 1995: Project identified
 - 1997: Preliminary design approved
 - 2004: Detailed design finished
 - 6/2009: 1st Loading
 - 9/2009: 1st Criticality
 - 6/2010: Connect to Grid

CEFR (under construction)



CEFR (artist rendering)



People to People Ambassador Programs

SHANGHAI TECHNICAL PROGRAM INCLUDED VISITS TO:

- Shanghai Nuclear Society
- Shanghai Nuclear Engineering Research & Design Institute
- Qinshan Nuclear Power Station
- China Nuclear Power Design Co.

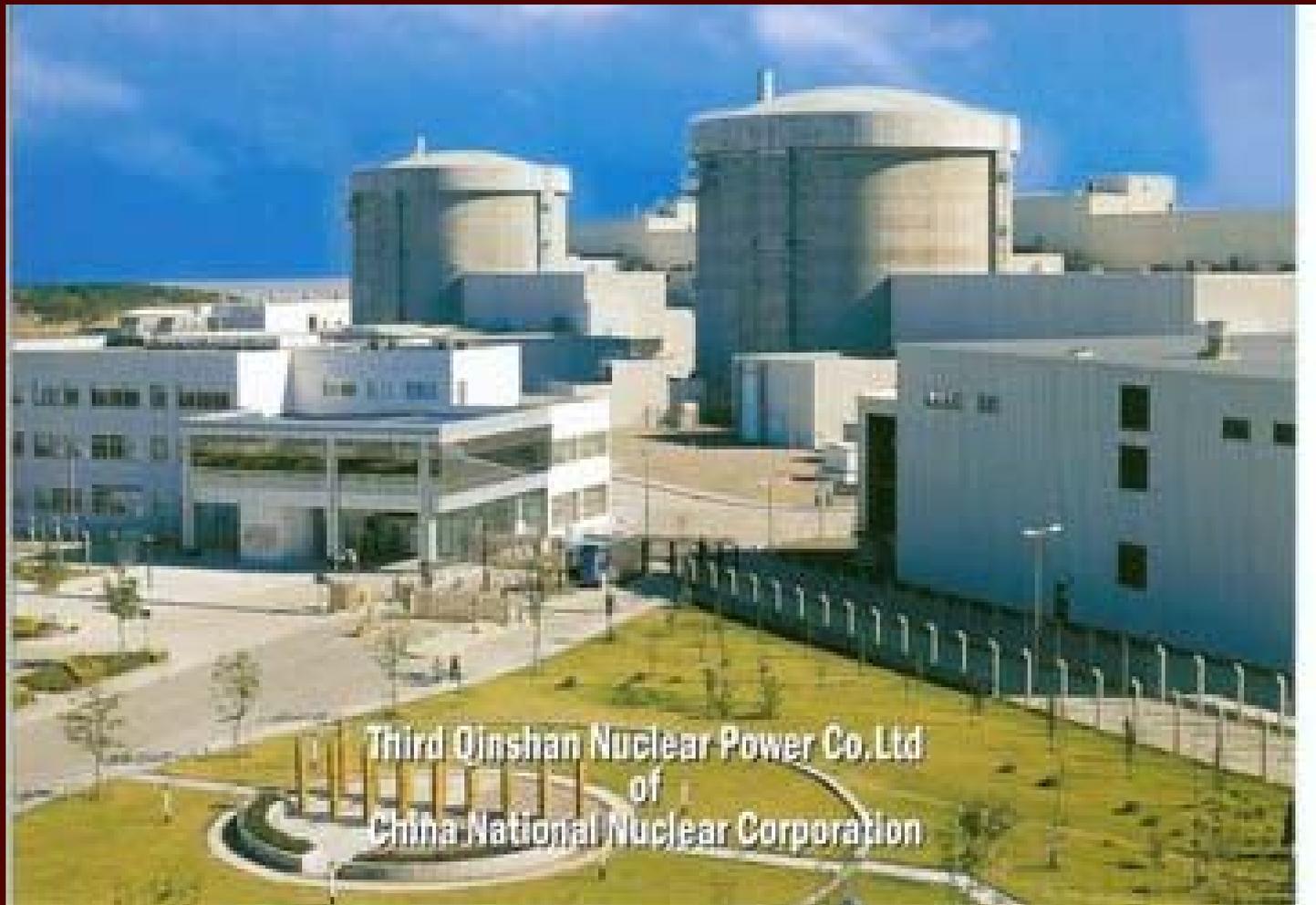


Plants in Operation

- QINSHAN Nuclear Power Plant
 - Phase I: 300 MWe PWR (1994)
 - Phase II: 2 x 650 MWe PWR, CNP-600 (2002, 2004)
 - Phase III: 2 x 700 MWe PHWR, CANDU6 (2002, 2003)
- GUANGDONG DAYAWAN Nuclear Power Plant
 - 2 x 950 MWe PWR, Framatome (1994)
- LING'AO Nuclear Power Plant
 - 2 x 950 MWe PWR, CPR-1000 (2002, 2003)
- TIANWAN Nuclear Power Plant
 - 2 x 1000 MWe PWR, VVER (2007)



Qinshan CANDU NP Site



Qinshan Nuclear Power Plant



Qinshan Nuclear Power Plant



Delegation at Qinshan Phase III



Qinshan Control Room



China Nuclear Power Design Co.

深圳中广核工程设计有限公司 CHINA NUCLEAR POWER DESIGN CO.,LTD (SHENZHEN)

Overview

- ◆ China Nuclear Power Design Co., LTD (CNPDC) was founded on 18th May 2005.
- ◆ Registered capital: ¥20 million RMB (12 million by CNPEC & 8 million by GEDI).

Background

- ◆ To promote nuclear power development in compliance with the national energy development plan
- ◆ To achieve the strategic development of CGNPC.

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graph TD; CGNPC[CGNPC] -- 100% --> CNPEC[CNPEC]; CNPEC -- 60% --> CNPDC[CNPDC]; GEDI[GEDI] -- 40% --> CNPDC;
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10/19/2005

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Plants Under Construction



Plants under Construction

- GUANGDONG YANGJIANG Nuclear Power Plant
 - Largest nuclear power project in China (\$8 billion)
 - 2 x 1650 MWe EPR, Areva (2006)
 - Plans for 4 additional 1000 MWe-level units
- QINSHAN Nuclear Power Plant
 - Phase I Extension: 2 x 1000 MWe indigenous units
 - Phase II Extension: 2 x 650 MWe PWR, CNP-650 (2006)
- ZHEJIANG SANMEN Nuclear Power Plant
 - 2 x 1100 MWe PWR, AP1000 (2004)
 - Plans for 4 additional 1000 MWe-level units

Plants under Construction

- LIAONING HONGYANHE Nuclear Power Plant
 - 2 x 1080 MWe PWR, CPR-1000 (2007)
 - Plans for 4 additional 1000 MWe-level units
- SHANDONG HAIYANG Nuclear Power Plant
 - 2 x 1100 MWe PWR, AP1000 (2009)
 - Plans for 4 additional 1000 MWe-level units
- WEIHAI, SHANDONG Province
 - Plans to establish 200 MWe HTGR-PM NPP
 - First pebble-bed reactor in commercial use in world
 - China Huaneng Group will lead construction

Plants under Construction

- JIANGXI PROVINCE

- NPP planned in Pengze County (2008)
- \$5.33 billion investment, 4000 MWe capacity

- CHONGQING

- China Power Investment Corp. planning NPP (2013)
- \$2.67 billion investment, 1800 MWe capacity

- HUNAN PROVINCE

- NPP in planning stages
- 6000 MWe total capacity (2000 MWe capacity in 1st stage)
- Feasibility study to be completed in 2008



China Nuclear Power Design Co.



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China Nuclear Power Design Co.



Additional Notes

- Plans for Fuel Reprocessing
- Future Supply of Uranium
- Concerns about Workforce for Future NPP's
- Observed Differences
 - No anti-nuclear movement in China
 - Chinese gov't positively promotes nuclear power
 - Financial considerations for new NPP's
 - Pathway to construction on new NPP and R&D reactors

Tian'anmen Square



Tian'anmen Square



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Tian'anmen Square



Tian'anmen Square



Tian'anmen Square



Tian'anmen Square



Tian'anmen Square



Olympic Stadium – Bird's Nest



Peking Duck Dinner



Peking Duck Dinner



Forbidden City



Forbidden City



Forbidden City



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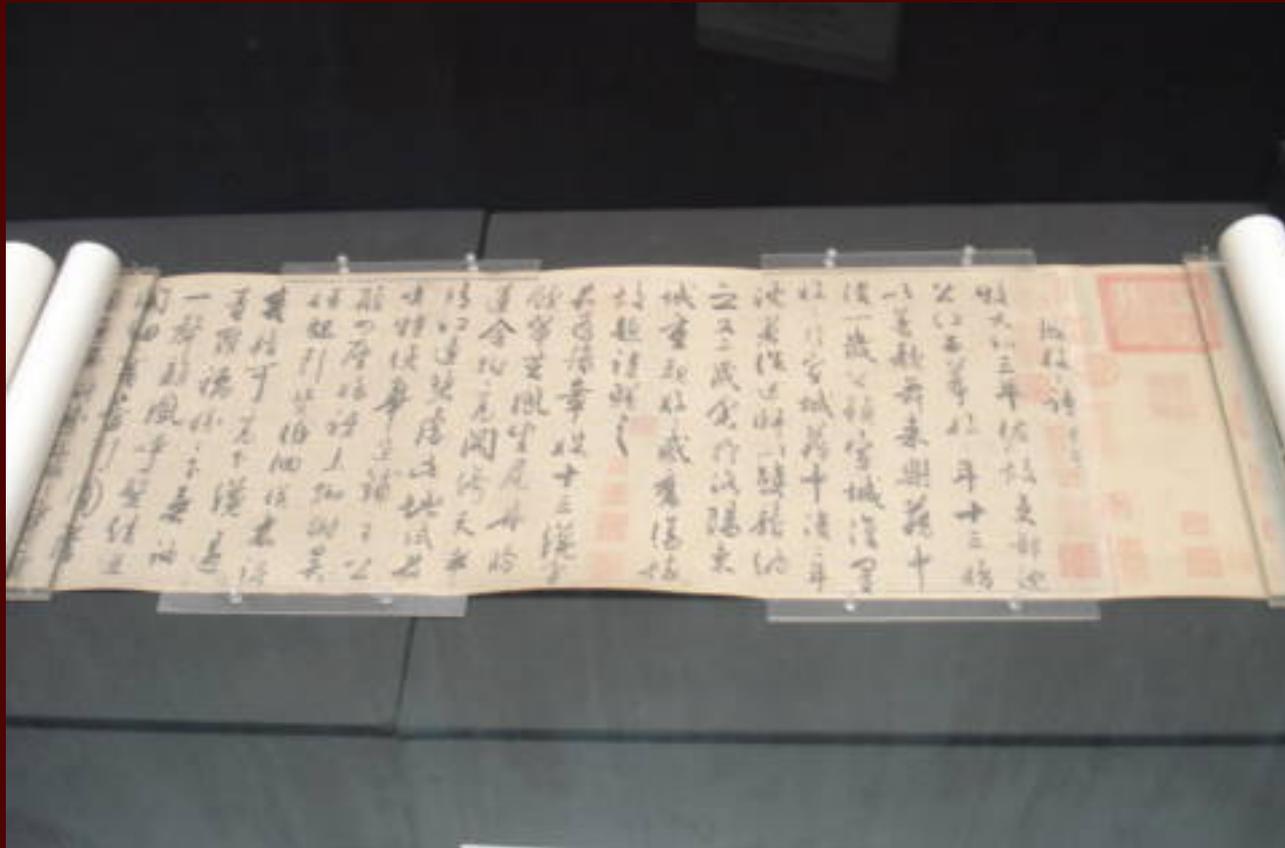
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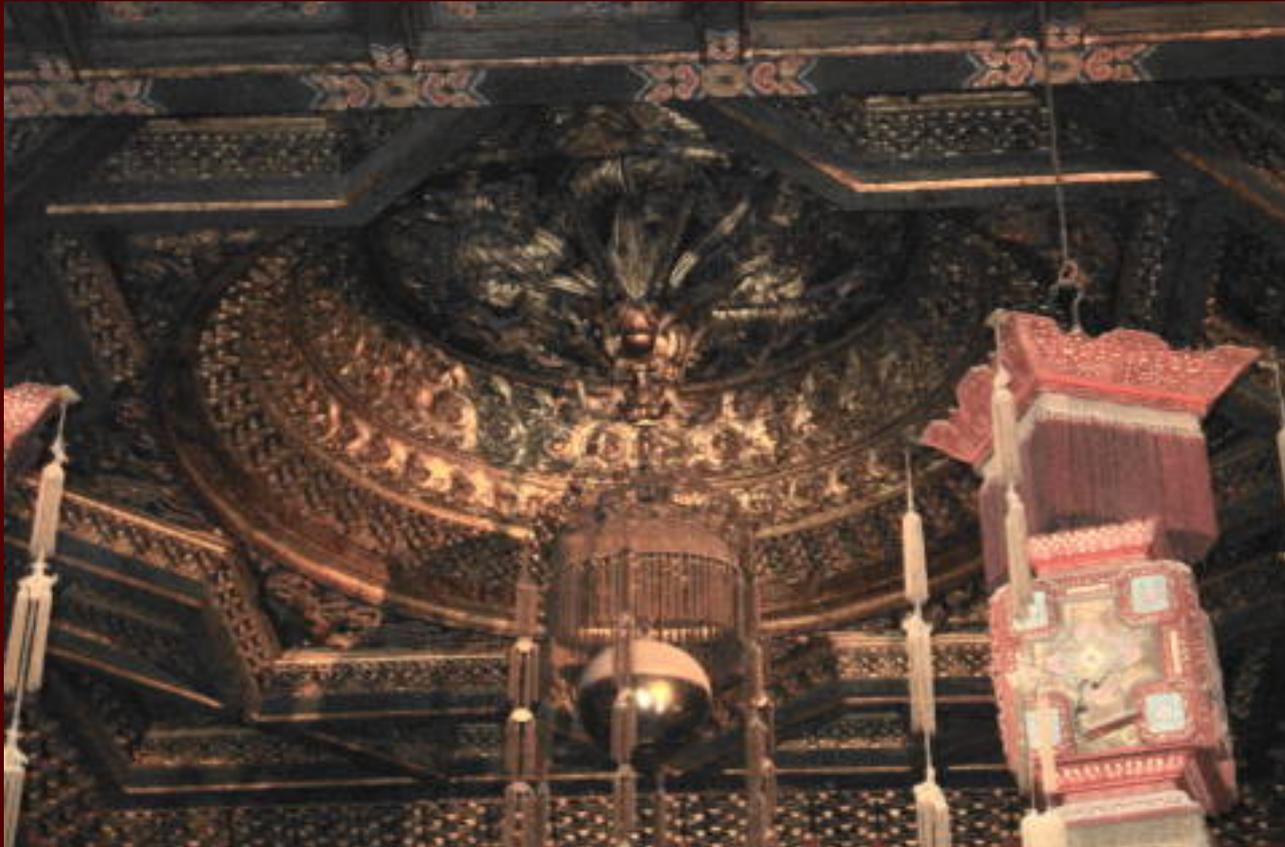
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Great Wall of China



Great Wall of China



Great Wall of China



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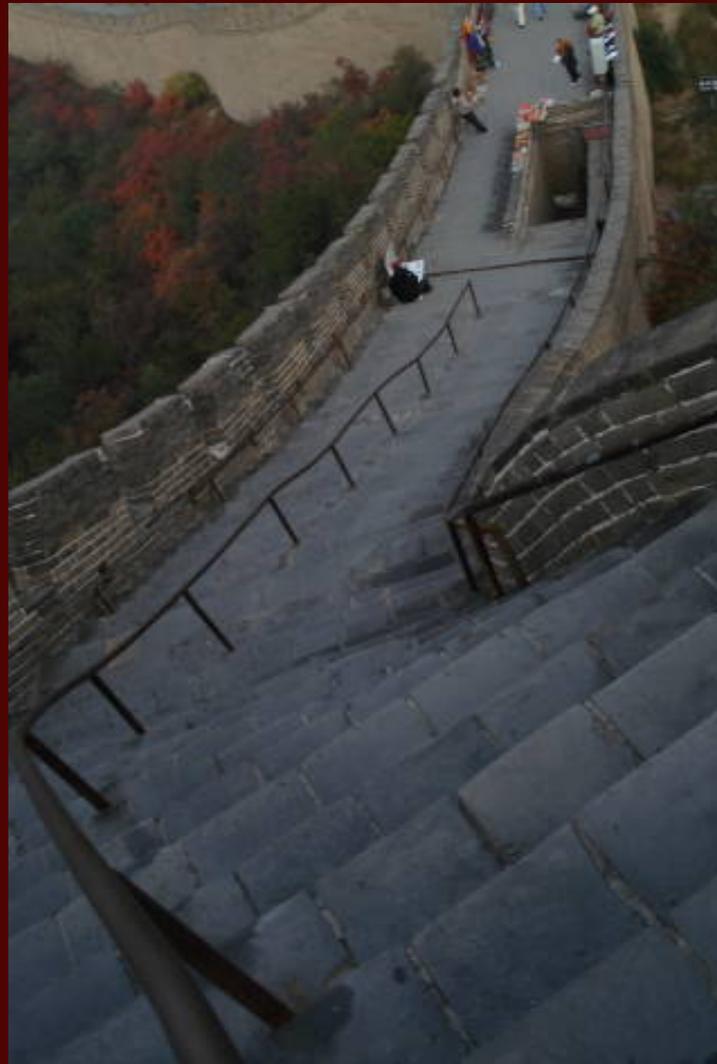
Great Wall of China



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Shanghai Skyline



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Shanghai Skyline



Shanghai Skyline



Shanghai Skyline



Shanghai Skyline



Shanghai Skyline



Shanghai Skyline



Shanghai Skyline



Acrobat Show



Acrobat Show



Acrobat Show



Yu Garden



Yu Garden



Yu Garden



Yu Garden



Yu Garden



Yu Garden



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Yu Garden



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Yu Garden



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