

Ambient Air Quality Standard Development

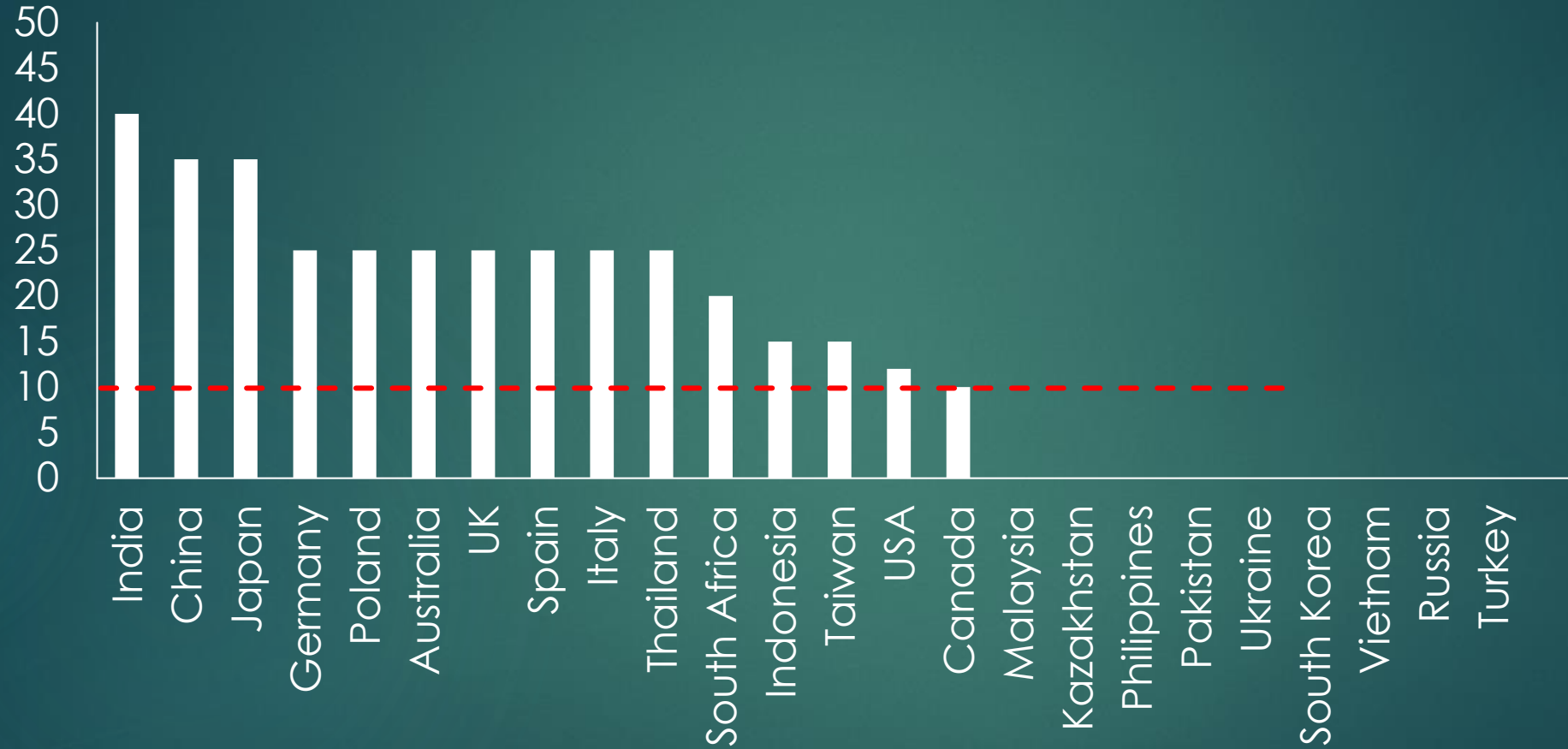
- ▶ Process
- ▶ Standards
- ▶ Implementation
- ▶ Pollutants of Concern
- ▶ Tools

Process

- ▶ Epidemiological Studies
- ▶ Peer Review by Science Advisory Board
- ▶ Recommended Range of “Safe Levels”
- ▶ EPA Administrator Chooses within Range
- ▶ SIP Implementation

Standards

NAAQS Annual PM_{2.5} (mg/m³)



Implementation

- ▶ Federal authorities adopt NAAQS, identify attainment status
- ▶ State/local authorities develop emission inventory
- ▶ Model impacts of alternate options to achieve NAAQS (or reasonable further progress for serious nonattainment areas)
- ▶ Propose SIP – a basket of regulations limiting emissions from different sources
- ▶ EPA review and approve, if EPA disapproves then EPA develops and implements FIP

Pollutants of Concern

- ▶ PM_{2.5} –
 - ▶ PM₁₀, SO₂, NO_x
 - ▶ Power plants, other LCPs, agricultural burning, mobile sources
- ▶ Ozone
 - ▶ NO_x, Volatile Organic Compounds (VOCs)
 - ▶ Mobile Sources, refineries, chemical plants, area sources

Tools – Mobile Sources

- ▶ Low Sulfur Diesel
- ▶ Reformulated Gasoline
- ▶ Periodic Motor Vehicle Inspection
- ▶ Public Transit Improvements
- ▶ Clunker buyback
- ▶ LNG/Propane buses
- ▶ Carpool Incentives
- ▶ LEV Incentives
- ▶ PM Traps/SCR for heavy duty diesels (new & retrofit)
- ▶ Stage 2 nozzles

Tools – Stationary Sources

- ▶ SCR + FGD for power plants & LCPs (cement, refineries, ICI boilers)
- ▶ RTO for wood products
- ▶ Low VOC coatings
- ▶ Leak Detection and Repair (refineries, chemical plants)
- ▶ VOC control for storage tanks
- ▶ PM Control for small & medium factories (area sources)
- ▶ Restricting agricultural & other open burning

Pollutant Control in China's Coal-fired Power Generation Industry

燃煤电厂污染物的控制

电力规划设计总院

Electric Power Planning & Engineering Institute

2015 年 1 月 河北省石家庄市

Jan, 2015

Shijiazhuang, Hebei, China

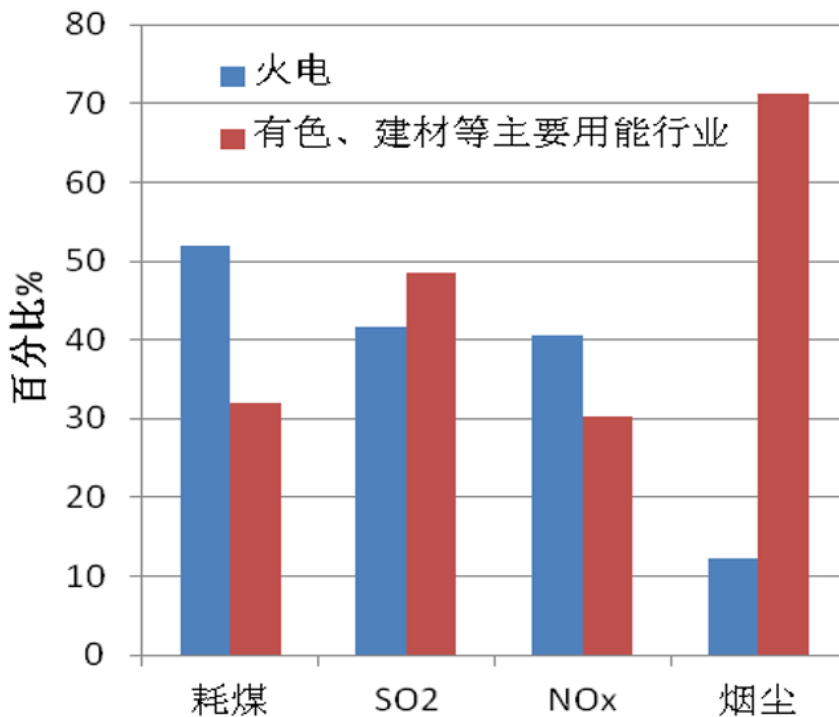
大气灰霾成为重大民生问题 Air pollution becomes a severe problem

- 研究表明，我国大气污染主要为煤烟型污染和机动车尾气污染的大气复合污染，燃煤污染为主；

Research shows that air pollution in China is mainly the combination of coal gas and automobile emission, primarily coal gas.

- 2012年我国火电行业排放二氧化硫883万吨、氮氧化物948万吨、烟尘151万吨，分别占全国总排放量的41.7%、40.6%、12.2%。

In 2012, the total emission from coal-fired industry is SO₂ 883×10⁴t, NO_x 948×10⁴t, dust 151×10⁴t. That is 41.7%, 40.6%, 12.2% of the total pollutant emission, respectively.



2012年火电和其它主要用能行业
耗煤和污染物排放占全国比例
Percentage of emission from coal-fired
industry and other industries, 2012

火电环保标准 Development of "Pollutant emission standard"

- 《火电厂大气污染物排放标准》GB13223-1996，该标准自1997年1月1日起实施。
The "Pollutant emission standard" (GB13223-1996) was executed on Jan 1st, 1997.
- 《火电厂大气污染物排放标准》GB13223-2003，该标准自2004年1月1日起实施，
废止GB13223-1996标准。
The "Pollutant emission standard" (GB13223-2003) was executed on Jan 1st, 2004.
- 《火电厂大气污染物排放标准》GB13223-2011，该标准自2012年1月1日起实施，
废止GB13223-2003标准。
The "Pollutant emission standard" (GB13223-2011) was executed on Jan 1st, 2012.

新建、扩建 燃煤电厂	烟尘 / Dust mg/Nm ³	二氧化硫 / SO ₂ mg/Nm ³	氮氧化物 / NO _x mg/Nm ³
GB13223-1996	200~600	1200~2100	650~1000
GB13223-2003	50~200	400~1200	450~1100
GB13223-2011	20~30	50~200	100~200

火电环保排放标准演变
Development of emission standard in coal-fired industry

火电环保标准比较 Comparison of "Pollutant emission standard"

- 2011年7月29日，中国发布了《火电厂大气污染物排放标准》（GB13223-2011），此标准实施后，燃煤电厂的污染物排放将大幅降低。

On July 29 2011, the "Pollutant emission standard" (GB13223-2011) has been published, and as a result, the pollutant emission decrease tremendously.

国 家 / Country	烟 尘 / Dust mg/Nm ³	二氧化硫 / SO ₂ mg/Nm ³	氮氧化物 / NO _x mg/Nm ³
美 国 / USA	20	184	135
日 本 / Japan	50-100	200	200
欧 盟 / EU	30	200	200
澳大利亚 / Australia	100	200	460
加拿大 / Canada	130	740	460
新西兰 / New Zealand	125	350	410
中 国（非重点地区） China's normal region	30	100-400	100-200
中 国（重点地区） China's crucial region	20	50	100

除尘技术—技术路线选择 Dust removal-technology routine

（低低温）电除尘器（采用提效措施）+吸收塔除尘+湿式除尘器

- 电除尘器配合各类提效措施，如移动电极技术、分室振打技术、高频电源等，使电除尘器出口浓度不大于 20 mg/Nm^3 。考虑吸收塔的整体除尘效果后，再配置70%左右除尘效率的湿式除尘器，烟尘排放可达到 5mg/Nm^3 。如：浙能六横电厂。 ESP combined with moveable electric paddle, separate room vibration, high-frequency electric source, can reduce dust at the exit of ESP to 20mg . Considering the dust removal effect in absorption tower, and with wet ESP at 70% efficiency, the dust emission can be no large than 5mg .

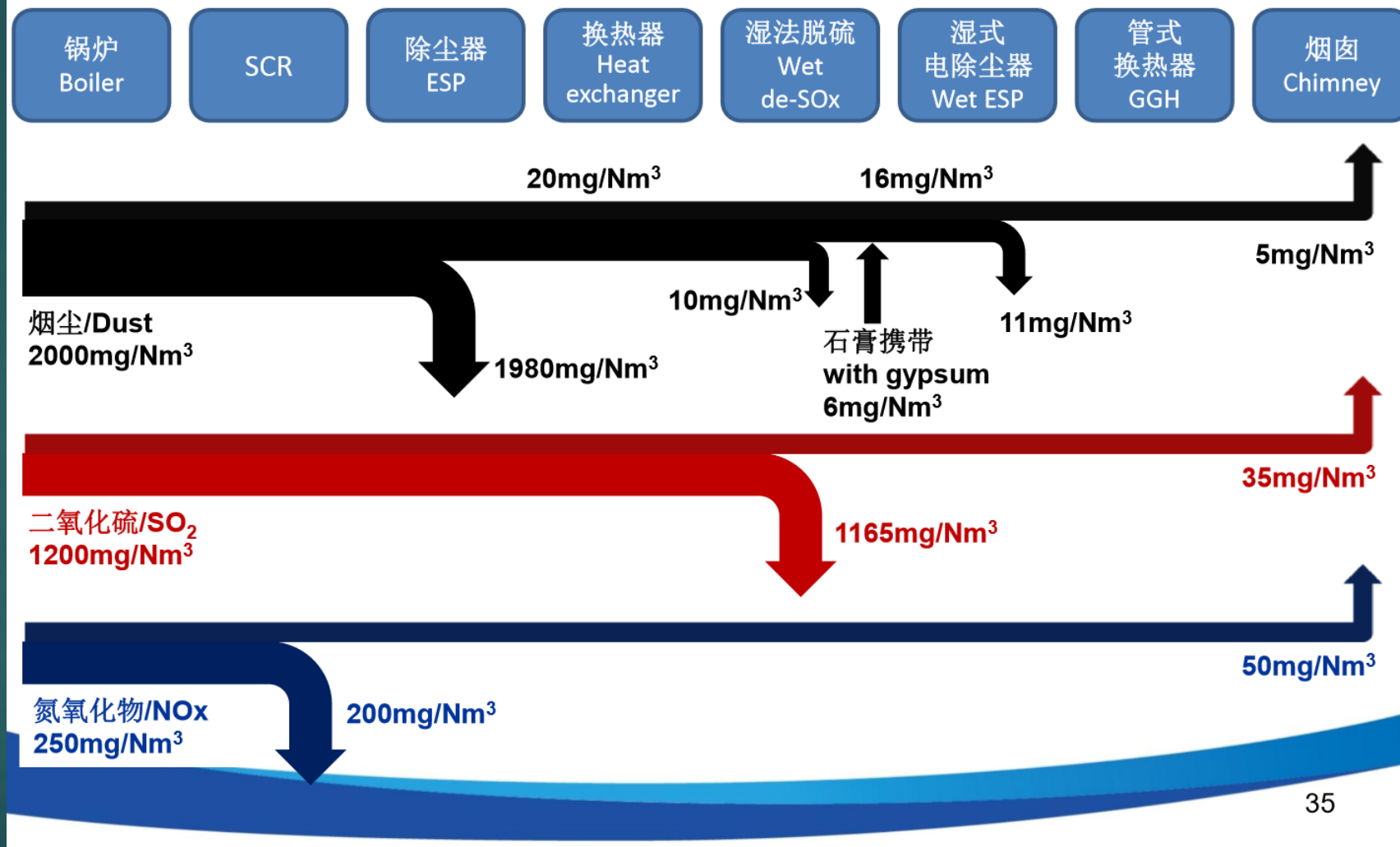
低低温电除尘器+高效除尘吸收塔

- 采用低低温电除尘器，使电除尘器出口浓度不大于 $15\sim 20 \text{ mg/Nm}^3$ ，采用高效除尘吸收塔后，烟尘排放可达到 5mg/Nm^3 。如：华能长兴电厂。 Apply low low temperature ESP to reduce the exit dust to $15\sim 20\text{mg}$, and use high efficiency absorption tower to achieve dust emission at 5mg .

袋式除尘器

超净排放典型工程 Typical super low emission projects

超净排放典型布置 Typical arrangement of super low emission project



Getting to Healthy Air in Indonesia

- ▶ Will require “all of the above” approach
- ▶ Priorities – clean fuels, power plants

Costs

- ▶ Clean Fuels and Power Plant Controls Are the Most Cost Effective Options to Significantly Reduce Pollution Levels in the Near Term
- ▶ Controlling Existing Power Plants Will Cost But a Few Dollars per Person per Year – Less than the Cost of Not Using Them
- ▶ Controlling Existing Power Plants Will Cost Less Than the Cost of Idle Excess Capacity and Far Less Than Planned New Construction

Potential Options for Energy Sector

- ▶ Accept a lower reserve margin;
- ▶ Cancel new coal-fired generation; mothball excess PLN generating capacity
- ▶ Implement EE and DSM programs
- ▶ Review & implement programs to reduce T&D losses
- ▶ Buyout excess under construction capacity PPAs; apply stringent emission limits to under construction units
- ▶ Environmental Dispatch
- ▶ Low sulfur coal, interim NOx controls now
- ▶ Develop and implement phased plan to install full controls