China Air Quality Planning Workshop

Ministry of Environmental Protection
Beijing, PRC
2013 June 4

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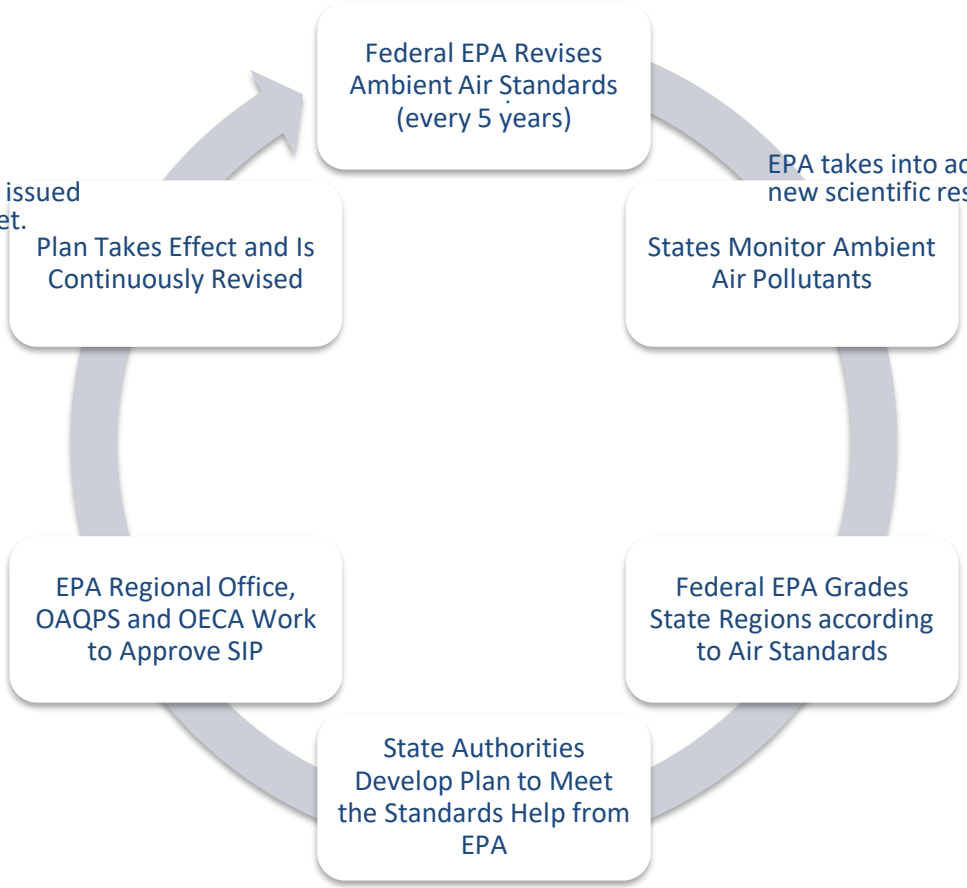
Presentation Overview

- Core air quality program steps
- Multi-pollutant or co-control planning: Introduce concept of IMPEAQ
- Benefits of co-control
- Co-control model process
- China examples of co-control

Air Planning- USA Process



New regulations and requirements may be issued until standards are met.

EPA takes into account new scientific research.

Air quality is continuously monitored. If levels do not decrease, then data is reevaluated and the planning process resumes.

EPA approves all monitoring stations and regulates quality assurance.

Regional EPA serves as liaisons between state authorities and other EPA offices.

Air Quality Management Areas are classified attainment or non-attainment.

Local authorities convene stakeholder process.

Authorities analyze data, assess sources, determine technologies and policies that will reduce pollution to the level of the standards.

Air Quality Planning Steps

- Assess pollutant concentrations through air monitoring network
- Conduct air quality modeling to estimate change in pollutants needed to reach public health and environmental endpoints (i.e, Grade II standards) and timing to achieve this level
- Determine number of tons of pollution that must be reduced to reach the desired endpoints
- Assess control measures capable of achieving required level of reductions

Air Quality Planning Steps (2)

- Select control measures based on reduction potential and cost-effectiveness
- Implement and enforce control measures
- Confirm efficacy of control measures through air quality monitoring, audit/inspection
- Repeat until required level of pollution reductions are achieved

Why Multi-Pollutant or Co-Control?

- Human lungs encounter whatever combination of pollutants exist in that parcel and experience the health effects of those pollutants. Likewise, animals, plants and the built environment are affected by the combination of all pollutants
- Evaluate tradeoffs between control measures
  - Some measures may result in increases in other pollutants (e.g., biomass energy decreases GHG but can increase PM and NO_X), or result in increased energy consumption (e.g., end of pipe emission controls can increase consumption 1-3%)

Several Process Models for Co-Control

- Advocated by USA National Academy of Sciences and EPA Clean Air Science Advisory Committee
- GAINS modeling for EU and China reflects environmental and economic benefits of co-control
- Concept integrates air quality and energy planning

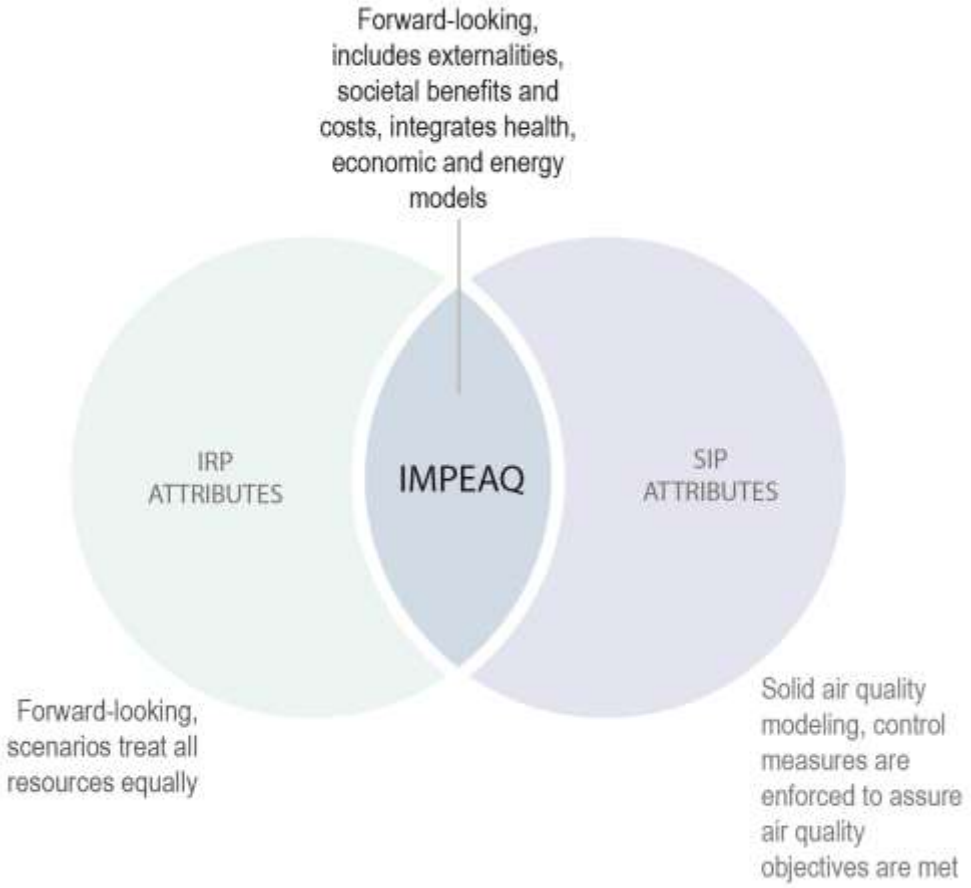
Integrated Multi-pollutant Planning for Energy and Air Quality (IMPEAQ)

- Captures fundamental steps from air quality and energy planning
- Relates public health and environmental goals to pollutant reductions, i.e.,
  - What measures can reduce public health impacts 50% by 2030?
  - What role can energy efficiency and renewable energy play to meet air quality standards?

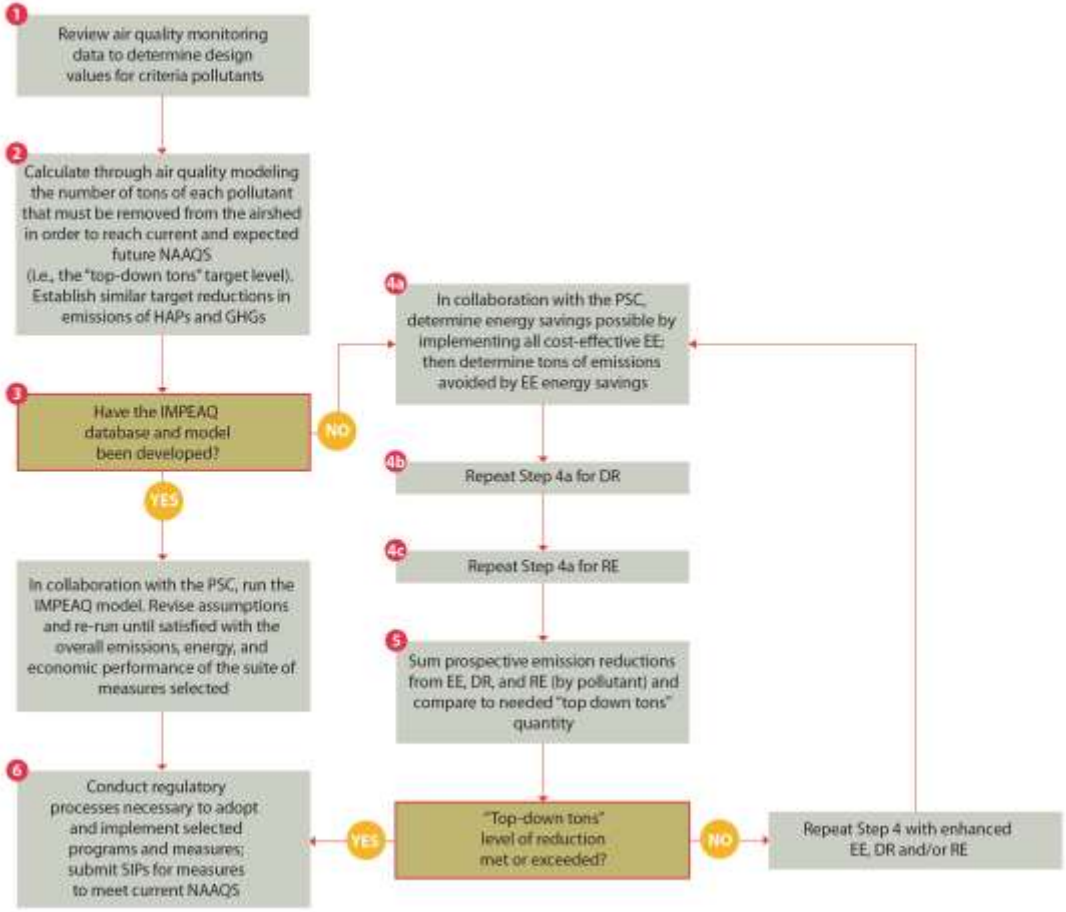
IMPEAQ Can Address These Questions

- How clean does the province or city want its air to be and by when?
- How can it regulate air quality the way that humans, animals and plants experience the effects of air pollution, i.e., from a multi-pollutant perspective?
- How can a province or city meet legal requirements and maintain flexibility in the choices for control measures?
- How can costs be optimized while complying with environmental and energy system reliability requirements?

Relationship of IMPEAQ to Energy Planning ("IRP") and and Air Planning ("SIP") Attributes



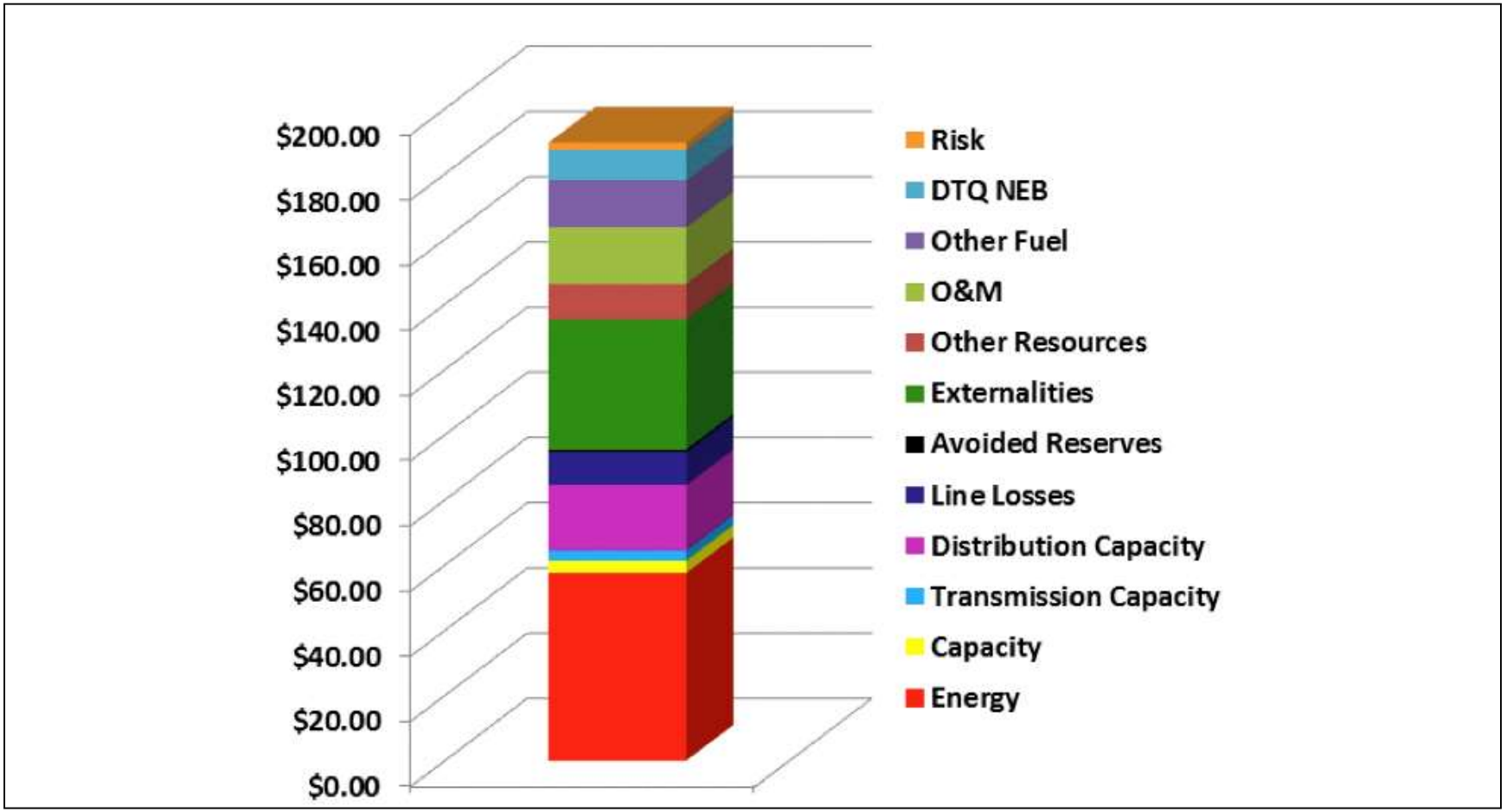
IMPEAQ Model Process



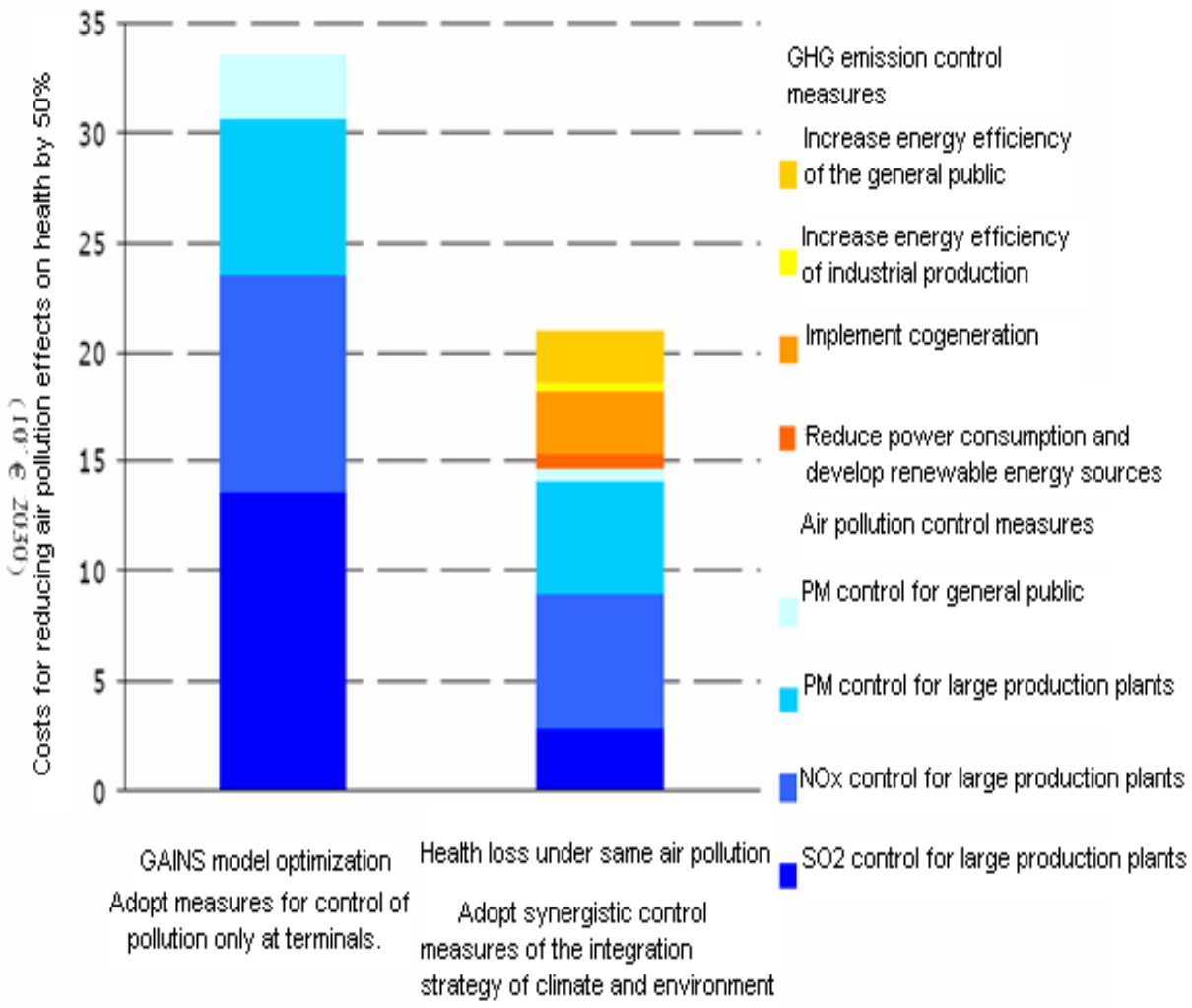
Illustrative Co-Control Measures Database for IMPEAQ

ID #	Description	Sources	Cost	Units	SO2 Impact	NOx Impact	CO2 Impact	HAPs Impact	Penetration Limit	Interactions with Other Measures	Feasibility (1-10)	Etc ...
1	RPS	EGUs	$50	MWh	Y	Y	Y	Y	x	#2, #3	9	x
2	SCR	EGUs	$5000	Ton	N	Y	Y(-)	N	x	n/a	9	x
3	EE	EGUs	-$5	MWh	Y	Y	Y	Y	x	#1, #2	8	x
4	I/M	Cars	$30	Ton	N	Y	Y	Y	x	n/a	2	x

Control Measures such as Energy Efficiency Have Multiple Benefits



Synergistic Effects of Multi-pollutant Planning Have Economic Benefits



China Examples of Co-Control

Key Regions Described in State Council's Regional Air Quality Guidance

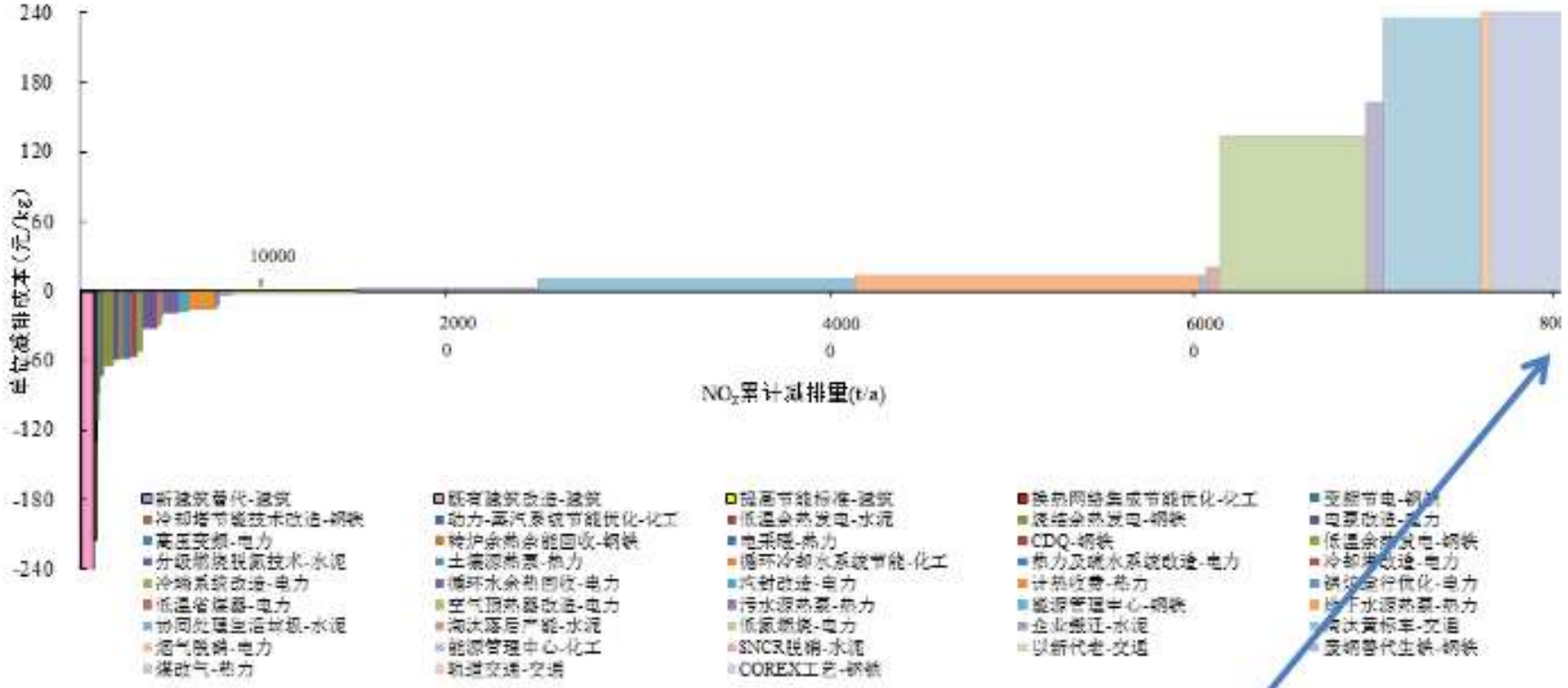
1. Central Liaoning [Province] (Shenyang etc.)
2. Shandong Peninsula (Qingdao etc.)
3. Greater Wuhan
4. Changsha, Zhuzhou and Xiangtan region
5. Chengdu and Chongqing region
6. Areas around Taiwan Strait (Xiamen etc.)

7. Shanxi [Province] (Taiyuan etc.)
8. Shaanxi [Province] (Xi'an etc.)
9. Xinjiang [Province] (Ürümqi etc.)
10. Gansu [Province] (Lanzhou)

= Economic Zones

= City Clusters

乌鲁木齐市将实施节能减排措施的NO_x单位(边际)减排成本曲线（“十二五”）



“十二五”乌鲁木齐市将实施节能减排措施的累计NO_x减排效果为 **81,933t/a**

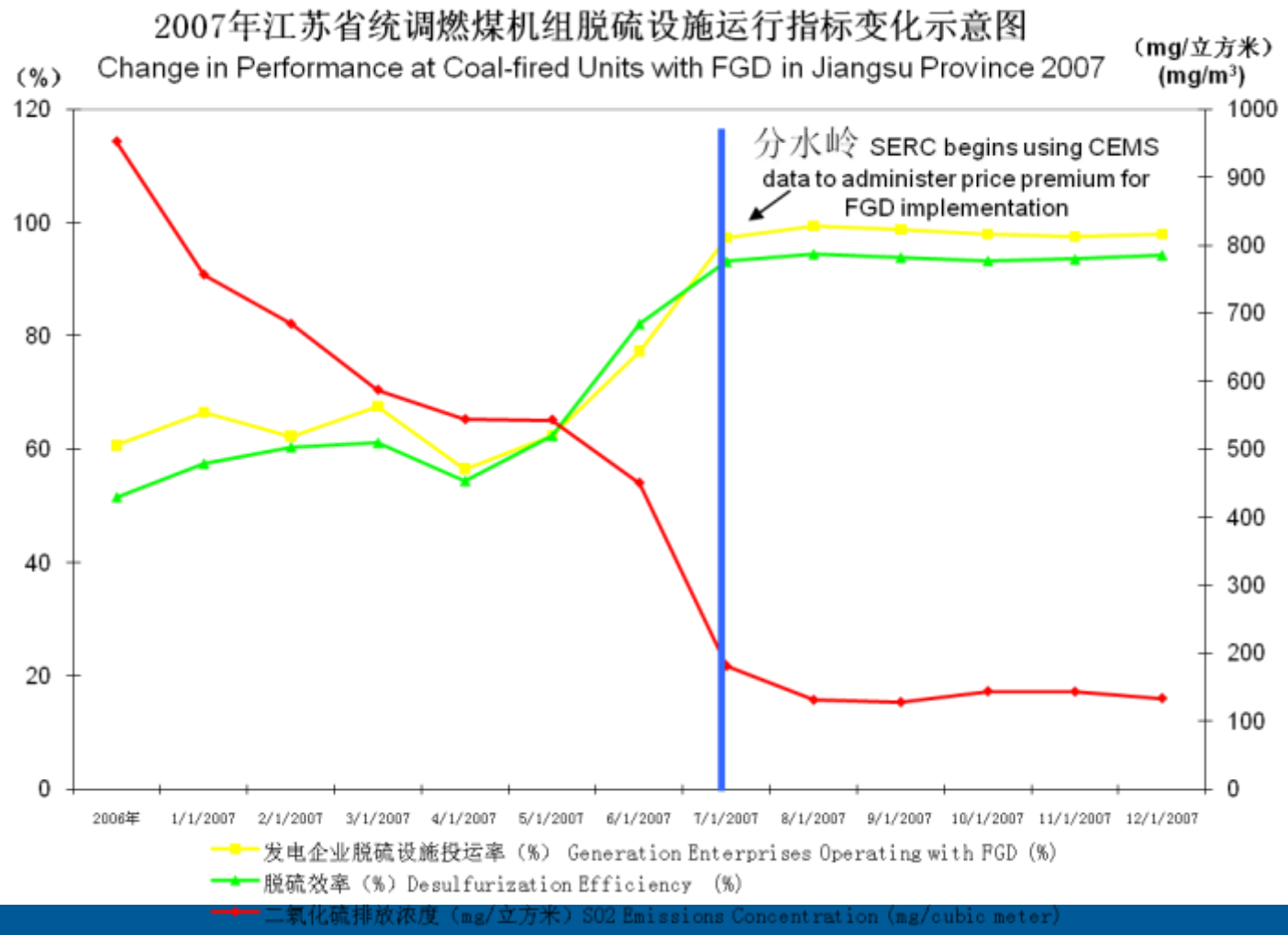
Conclusions

- Co-control air quality planning is flexible, can be tailored to meet specific needs of province or city
- Accommodates future changes to air quality standards through long-term view
- Comprehensive approach vs. piece meal; provides certainty to affected sources, addresses public interest in the enterprise as a whole
- Transparent process considers tradeoffs between pollutants, impacts and benefits to the energy sector

Innovative Policies

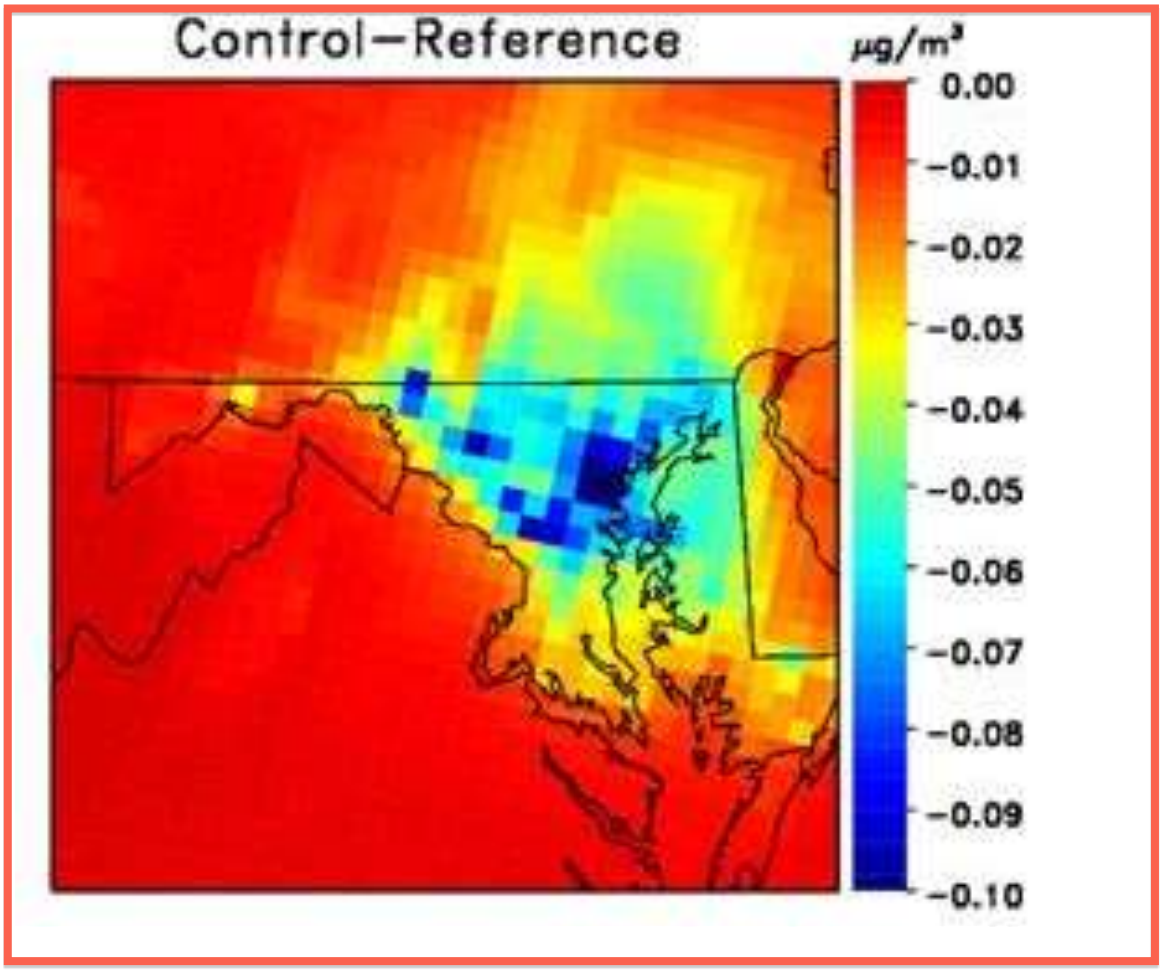
- Use of CEMS data to dispatch power plants
- Modeling the air quality benefits of energy efficiency and renewable energy
- Allowing only the cleanest power plants to run during periods of unhealthy air quality

Use of Emissions Data to Administer SO_2 Pricing



Modeled Fine Particulate Benefits

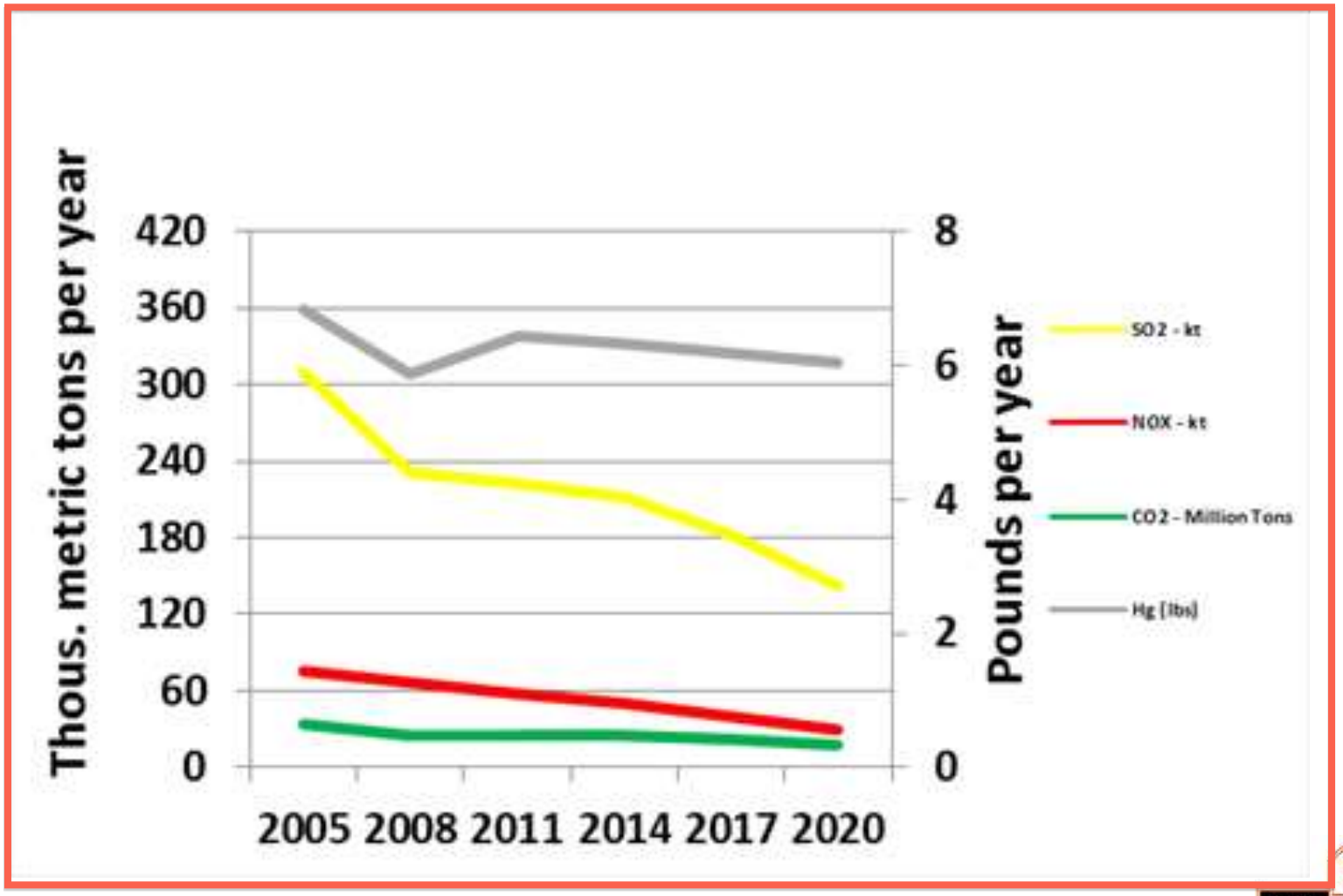
… from EE/RE Efforts



Very Preliminary Results – For Demonstration and Discussion Purposes Only

Power Sector Emission Reductions

… from EE/RE Efforts



Very Preliminary Results – For Demonstration and Discussion Purposes Only

Incentive for the Cleanest Plants During Periods of Unhealthy Air Quality

- When the AQI reaches 300, permit only those power plants with the “best controls” for NOx and SO2 to operate.
- Data are currently transmitted to grid operators
- Is simple to put into effect and to enforce

About RAP

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power and natural gas sectors. RAP has deep expertise in regulatory and market policies that:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at www.raponline.org

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