

The role of the market and traditional regulation in decarbonizing China's energy supply

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Outline

- **Theoretical framework:** Traditional regulation and markets for environmental protection and energy security
- **Low-carbon investments in China:** centrally planned or market-driven?
- **Electricity pricing:** internalising the carbon cost through regulated or free market prices?

Theoretical framework

- **Traditional regulation and markets in the environmental law literature:**
 - technology based regulation
 - e.g., performance standards or forced closure
 - effective, but cost-efficient?
 - taxes and ETS
 - cost-efficient, but can carbon prices drive decarbonization?
 - In the EU, ETS reform and use of “companion policies”

» See Fisher et al; Faure & Skogh; Driesen; Matthes.

- **Traditional regulation and markets in the energy policy literature**
 - Energy monopoly:
 - Energy security through price and investment regulation
 - Simplicity, but cost-efficient?
 - Liberalization
 - Efficiency through market, but energy security concerns
 - In the EU, market reform (e.g., capacity payment, tenders)
 - » Joskow; Newberry; Neuhoff & De Vries; Roques.

• Environment–energy interaction:

– Traditional regulation: energy price increases to recover the cost of cleaner equipment incentivize use of cleaner equipment

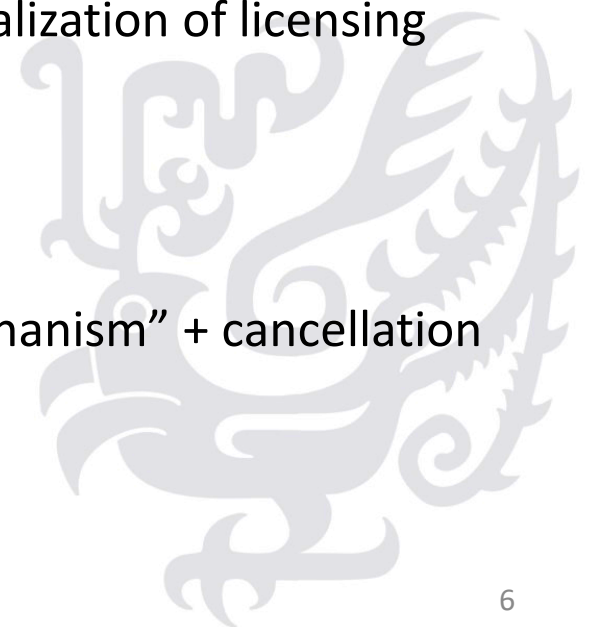
– Emissions Trading:

- Right of energy companies to make investments
- “Waterbed” effect: adapt cap to GHG reductions from “companion” energy policies
- “Pass through”: energy prices must reflect carbon cost
- “Merit order” effect: spot energy trading to drive inefficient plants out of the market
- “Windfall profits”: energy price deregulation + free allocation

» Coggins & Smith; Bohi & Burtraw; Fowlie; Mitchell & Woodman; Ellerman, de Perthuis & Convery.

Low-carbon investments in China: centrally planned or market-driven?

- Initiative with energy companies:
 - I.e., the carbon cost can be integrated into companies investment proposals
- State approval of investments
 - The role of provincial authorities, with decentralization of licensing power
- Controlling overcapacity
 - Central control through “capacity warning mechanism” + cancellation of licenses



- Planning: targets, performance standards and forced decommissioning
 - Targets

Target	By 2020	Bound entities	Enforcing agencies	Implications of non-compliance
Energy intensity	15% /GDP	Provincial govern's and SOEs	NDRC and provincial govern's	Performance assessment of officials, financial support, restrictions on investment approval
Carbon intensity	18% / GDP	Provincial govern's and SOEs	NDRC and provincial govern's	Performance assessment of officials, financial support
Non-fossil fuel sources	15%	Provincial govern's, and SOEs	NDRC, NEA and provincial govern's	Revoking the business licence of power generators

– Performance standards

Target	By 2020	Bound entities	Enforcing agencies	Implications of non-compliance
Efficiency of existing coal power plants	310 g standard coal-eq and below per kwh (reduced from 318 g in 2015)	Coal-fired power plants	NDRC and NEA	Restrictions to access to resources (<i>i.e.</i> , water) and facing elimination
Efficiency of new coal power plants	300 g standard coal-eq and below per kwh	Coal-fired power plants	NDRC and NEA	Disapproval for construction
Pollutants discharged by coal power plants	Less than 35 mg SO ₂ , 50 mg NO _x and 10 mg ashes	Coal-fired power plants	NDRC and MEP	Restrictions to access to resources (<i>i.e.</i> , water) and facing elimination

– Forced decommissioning

Period	Planned closure (GW)	Actual closure (GW)
11 th FYP	50	72.1
12 th FYP	20	28
13 th FYP	20	70 (estimated in total, and 4.918 in 2016)

– Assessment

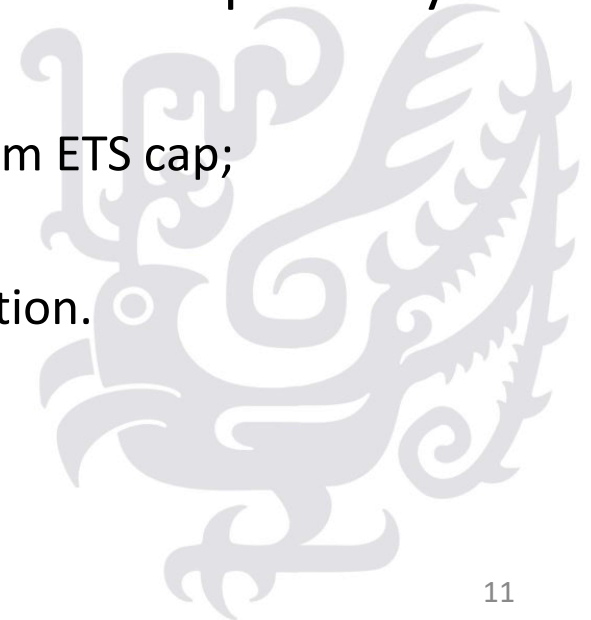
- Closure of small-scale thermal installations
- Resulted in improved efficiency of production
 - average efficiency of coal-fired power plants increased to 315 g/kWh in 2015, compared to 355 g/kWh in 2011

Capacity (10,000 kW)	Total installed capacity (10,000 kW)	Average energy efficiency (g/kWh)	% of total capacity surveyed
0.6 and above	97,033	315	100.00
60 and above	41,638	287* 309	42.91
Between 30 and 60	34,600	305	35.66
Between 20 and 30	5,488	324	5.66
Between 10 and 20	6,403	327	6.60
Less than 10	8,904	355	9.18

– * above 1000MW

– Assessment (continued)

- Use of most severe form of regulatory interference
 - forced closure of plant, termination of license
- Not necessarily incompatible with Emissions Trading Scheme, provided “waterbed” effect is anticipated by:
 - Reducing expected GHG reductions from ETS cap;
 - Cancelling allowances, or
 - using output-based approach to allocation.



Electricity pricing: internalising the carbon cost through regulated or free market prices?

- Deregulation of electricity prices in China
 - From project-to-project “cost plus” on-grid tariffs to benchmarking
 - 2015 deregulation reform
 - Gradual introduction of freely negotiated prices
 - Creation of spot exchange by 2020
 - Exceptions



- Environmental pricing incentives before the deregulation reform (“carrot”)
 - Increase on-grid tariff for installations with desulphurisation, denitrification, and ash reduction equipment.
 - Lower overall benchmark to keep system in balance.



- Environmental costs after price deregulation: tax and ETS (“stick”)
 - 2016 Environmental Protection Tax Law:
 - SO₂, Nox, ashes
 - Not carbon
 - Most severe impact on small coal power plants
 - Large plants are more efficient, with partial desulphurisation, denitrification and removal of ashes

– The Emissions Trading Scheme:

- Parallel reform of electricity pricing and ETS
- “Pass through”: price deregulation will facilitate integration of carbon cost in electricity prices
- “Merit order”: spot market will facilitate efforts to push inefficient plants out of the market
- “Windfall profits”: address impact of price deregulation + free allocation
- BUT political acceptability?
 - With overcapacity, deregulation results in price decreases
 - With scarcity of production + ETS, prices will increase

Conclusion

- Effectiveness of traditional regulation
 - Maintains central control, with decentralized approval
 - Phasing out of inefficient plants, modernization of large plants
- Parallel energy reform + ETS: internalize carbon cost
- Need for “companion policies”
 - Limits to market (ETS + liberalization)
 - No incompatibility, provided adjustments are made
- Role of the market:
 - Facilitate the realization of central investment objectives
 - BUT will price increases be tolerated?

Binding Targets related to China's Coal Power Generation in the 13th Five-year Plan (2016-2020)

General targets	Details of targets by 2020	Policy documents containing the targets	Bound entities	Enforcing agencies	Implications of non-compliance
Energy intensity Target	15% reduction per unit GDP	Notice of the State Council on Issuing the Integrated Workplan for Energy Conservation and Emissions Reduction during the 13 th FYP, State Council Order No. (2016) 74, 20 Dec 2016	Provincial governments and central SOEs	NDRC and provincial governments	Affecting overall performance assessment of officials, reducing relevant financial support, facing higher end-use tariff, and restrictions on new investment approval for energy intensive projects
Carbon emissions intensity target	18% reduction per unit GDP	Notice of the State Council on Issuing the Workplan to Control Greenhouse Gas Emissions during the 13 th FYP, State Council Order No. (2016) 61, 27 Oct 2016	Provincial governments and central SOEs	NDRC and provincial governments	Affecting overall performance assessment of officials and reducing relevant financial support
Electricity consumption from non-fossil fuel sources	Renewable energy generation (non-hydro) by power generation companies increasing to 9% Increasing to 15% and above in the total electricity consumption (12% in 2015)	Guiding Opinions of the NEA on Establishing a Guiding System for Renewable Energy Development and Utilization Targets, NEA Order No. (2016) 54, 29 Feb 2016 Notice of the State Council on Issuing the 13 th FYP for Energy Development, State Council Order No. (2016) 74, 20 Dec 2016	Provincial governments, and central SOEs	NDRC, NEA and provincial governments	Revoking the business license of power generators for electricity generation

Binding Targets continued...

General targets	Details of targets by 2020	Policy documents containing the targets	Bound entities	Enforcing agencies	Implications of non-compliance
Coal consumption by existing coal thermal power plant	310 g standard coal-eq and below per kwh electricity generated (reduced from 318 g in 2015)	The 13 th FYP for Electricity Development (2016-2020), NDRC and NEA, 7 Nov 2016 Notice of the State Council on Issuing the 13 th FYP for Energy Development, State Council Order No. (2016) 74, 20 Dec 2016	Coal-fired power plants	NDRC and NEA	Restrictions to access to resources (i.e. water) and facing elimination
Coal consumption by existing coal thermal power plant	300 g standard coal-eq and below per kwh electricity generated	The 13 th FYP for Electricity Development (2016-2020), NDRC and NEA, 7 Nov 2016 Notice of the State Council on Issuing the 13 th FYP for Energy Development, State Council Order No. (2016) 74, 20 Dec 2016	Coal-fired power plants	NDRC and NEA	Disapproval for construction
Pollutants discharged by coal power generation	Less than 35 mg SO ₂ , 50 mg NO _x and 10 mg smoke and dust per every cubic meter of emissions discharged	Notice of the State Council on Issuing the 13 th FYP for Energy Development, State Council Order No. (2016) 74, 20 Dec 2016	Coal-fired power plants	NDRC and MEP	Restrictions to access to resources (i.e. water) and facing elimination



Non-binding Targets related to China's Coal Power Generation in the 13th Five-year Plan (2016-2020)

General targets	Details of targets by 2020	Policy documents containing the targets	Bound entities	Enforcing agencies
Total energy consumption	5 billion tons of standard coal-eq	<p>Notice of the State Council on Issuing the Workplan to Control Greenhouse Gas Emissions during the 13th FYP, State Council Order No. (2016) 61, 27 Oct 2016</p> <p>Notice of the State Council on Issuing the Integrated Workplan for Energy Conservation and Emissions Reduction during the 13th FYP, State Council Order No. (2016) 74, 20 Dec 2016</p>	Provincial governments and central SOEs	National Development and Reform Commission (NDRC), Ministry of Industry and Information Technology (MIIT), Ministry of Environmental Protection (MEP), and National Energy Administration (NEA)
Total capacity of coal power generation nationwide	1100 gigawatts and below	<p>The 13th FYP for Electricity Development (2016-2020), NDRC and NEA, 7 Nov 2016</p> <p>Notice of the State Council on Issuing the 13th Five-year Plan for Energy Development, State Council Order No. (2016) 74, 20 Dec 2016</p>	Provincial governments	NDRC, NEA and provincial governments as the approving authority for new coal thermal power generation
Total capacity of newly built coal power generation	200 gigawatts and below	Notice of the State Council on Issuing the 13 th FYP for Energy Development, State Council Order No. (2016) 74, 20 Dec 2016	Coal-fired plants investors	NDRC, NEA and provincial governments as the approving authority to disapprove and suspend approving new investments, and suspend and halt construction of some approved projects
Elimination of inefficient coal power generation	20 gigawatts	<p>Notice of the NDRC and the NEA on Promoting the Proper Development of China's Coal Power Generation, NDRC and NEA Order No. (2016) 565, 17 Mar 2016</p> <p>Notice of the State Council on Issuing the 13th FYP for Energy Development, State Council Order No. (2016) 74, 20 Dec 2016</p>	Efficient installations (incl. straight condensing turbine units in operation for 20 years and condensing steam turbine units in use for 25 years) less than 300 megawatts that fail to meet the environmental or energy efficiency standards and refuse to retrofit	MEP, NEA, and provincial, municipal and county level governments

Non-binding targets continued...

General targets	Details of targets by 2020	Policy documents containing the targets	Bound entities	Enforcing agencies
Carbon emissions by large power generation corporations	550 g carbon emissions per kwh and below	Notice of the State Council on Issuing the Workplan to Control Greenhouse Gas Emissions during the 13 th FYP, State Council Order No. (2016) 61, 27 Oct 2016	Large power generation corporations	NDRC and NEA
Coal consumption by coal thermal power generation	Increasing to 55% and above in the total coal consumption (49% in 2015)	Notice of the State Council on Issuing the 13 th FYP for Energy Development, State Council Order No. (2016) 74, 20 Dec 2016	Coal-fired power plants	NDRC and NEA
Carbon emissions by coal-fired plants	Reducing to around 865 g per kwh	The 13 th FYP for Electricity Development (2016-2020), NDRC and NEA, 7 Nov 2016	Coal-fired power plants	NDRC and NEA

