



# China 12<sup>th</sup> FYP Update – The Work Plan. Focus on Energy Conservation and Emission Reduction

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## EXECUTIVE SUMMARY

This note elaborates on our April 2011 report on China's 12th Five Year Plan ("12th FYP") wherein we noted the many major policy guidance targets issued by the central government as part of the country's continued leadership towards a low-carbon economy. In our April report we noted that various ministries would issue more detailed work plans in the coming months and that those work plans would provide additional information on how the objectives ratified by the National People's Congress would be undertaken.

On 7 September the State Council issued the "12th Five Year Comprehensive Work Plan for Energy Conservation and Emission Reduction" (the "Work Plan") which sets forth implementation guidelines for energy conservation and emissions reductions. While not yet a finely detailed set of administrative orders, guidelines and legislation, this Work Plan is the first-to-be released since the 12<sup>th</sup> Five year plan was ratified in March and provides insight into the key targets and strategies to achieve a greener society. In particular, the energy conservation and emissions reduction Work Plan not only affirms the major targets for energy intensity and carbon intensity improvements addressed in the 12th FYP, it includes slightly more stringent standards for NO<sub>x</sub>, SO<sub>x</sub>, Ammoniac Nitrogen emissions and water quality for the 2012-2015 period compared to the 2011 period. Table 1, below, offers a summary of expectations from our April report and sets forth the incremental detail provided by the energy conservation and emissions reductions work plan.

From an investment perspective, we believe the affirmed policy directions visible in the Work Plan suggest considerable infrastructure-related investment opportunities ranging from equipment and component manufacturers, services vendors and certainly project financings in the next 3-5 years. Much of the opportunity will lie in the areas of energy efficiency improving building retrofits across 500 million square meters of building space and in the waste processing and treatment areas as China's level of urbanization rises from 46% in 2010 to an estimated 64% by 2025. Areas for examination for investment potential include window treatments, insulation, thermostats, lighting systems, HVAC monitoring and control (eg "Smart building systems"), among others. Within public infrastructure, waste treatment systems (solid waste, sewage and biogas) and water purification systems are likely areas for major construction services, equipment sales and project financing opportunities. Building retrofits alone could generate USD\$193 billion in business activity and waste water programs another USD\$45 billion.

**Table 1: Energy Conservation and Emissions Reductions Work Plan Comparison to 12<sup>th</sup> FYP Expectations**

Items in March 12 <sup>th</sup> Five Year Plan Announcements	September Updates
<ul style="list-style-type: none"> <li>Energy Intensity<sup>(1)</sup>: ~4% reduction in 2011; a cumulative economy-wide 16% reduction, by 2015; and an 18% cumulative reduction for industrial output energy intensity by 2015</li> </ul>	<ul style="list-style-type: none"> <li>Confirmed with a energy intensity reduction of 16% cumulative reduction by 2015 compared to 2010 level</li> </ul>
<ul style="list-style-type: none"> <li>Target 'new energy' (non-fossil fuel) generation as a proportion of total generation at 11.4% in 2015, rising to 15% by 2020</li> </ul>	<ul style="list-style-type: none"> <li>Confirmed</li> </ul>
<ul style="list-style-type: none"> <li>NOx reduction of 1.5% YoY in 2011</li> </ul>	<ul style="list-style-type: none"> <li>NOx cumulative reduction of 10% by 2015 with average 2.1% YoY reduction</li> </ul>
<ul style="list-style-type: none"> <li>SOx reduction of 1.5% YoY in 2011</li> </ul>	<ul style="list-style-type: none"> <li>SOx cumulative reduction of 8% by 2015 with average 1.7% YoY reduction</li> </ul>
<ul style="list-style-type: none"> <li>Aquatic O2 demand reduction of 1.5% YoY in 2011</li> </ul>	<ul style="list-style-type: none"> <li>Aquatic O2 demand cumulative reduction of 8% by 2015 with average 1.7% YoY reduction</li> </ul>
<ul style="list-style-type: none"> <li>Ammoniac Nitrogen reduction of 1.5% YoY in 2011; and cumulative 10% reduction by 2015</li> </ul>	<ul style="list-style-type: none"> <li>Ammoniac Nitrogen cumulative reduction of 10% by 2015 with average 2.1% YoY reduction</li> </ul>
<ul style="list-style-type: none"> <li>Industrial water consumption intensity reduction of 7% YoY in 2011; and cumulative 30% cumulative reduction by 2015</li> </ul>	<ul style="list-style-type: none"> <li>Confirmed</li> </ul>
<ul style="list-style-type: none"> <li>Plans for resource consumption fees and environmental taxes</li> </ul>	<ul style="list-style-type: none"> <li>Confirmed</li> </ul>
<ul style="list-style-type: none"> <li>Plans for market-centric power pricing mechanisms, including demand-side management and carbon and emissions/pollutant trading mechanisms</li> </ul>	<ul style="list-style-type: none"> <li>Confirmed</li> </ul>
<ul style="list-style-type: none"> <li>Establish and deploy a public system for GHG statistics and accounting</li> </ul>	<ul style="list-style-type: none"> <li>Confirmed</li> </ul>
<ul style="list-style-type: none"> <li>Improve business conditions for energy efficiency services sector (e.g. comparable terms for financing energy, gas, and water that industrial players enjoy) and support for energy performance contracting</li> </ul>	<ul style="list-style-type: none"> <li>Confirmed</li> </ul>
<ul style="list-style-type: none"> <li>Inclusion of compliance measures in provincial and local cadre performance criteria for energy and environmental objectives</li> </ul>	<ul style="list-style-type: none"> <li>Confirmed</li> </ul>

Source: National Development and Reform Commission 12<sup>th</sup> Five Year Plan, State Council Work Report for Energy Conservation and Emissions Reductions, 7 September 2011, DBCCA analyses, 2011.

Note (1): On 28 March 2011 China's Ministry of Industry and Information Technology announced a more aggressive 18% improvement target for energy intensity and carbon emissions per unit of industrial output compared to the 16% and 17% energy and carbon intensity improvement targets per unit of GDP. These targets are not inconsistent and merely reflect a more narrow focus on industrial output in the case of the 18% improvement target while the 16% and 17% targets focus on the entire economy. Industrial Output accounted for 46% of national GDP in 2009.

Comparing objectives and policy actions set forth in the 12th FYP (March 2011) to the new energy conservation and emissions reductions Work Plan of 7 September 2011, we note a consistent focus on improving energy efficiency, fostering development of renewable energy, establishing market mechanisms for emission and carbon trading platforms and developing more reliable and comprehensive energy and emission data systems, among others. In addition to affirming these policy targets, the Work Plan expands the focus of the 12<sup>th</sup> FYP, offering details on several

new targets for green buildings, transportation, heavy industries targeted for energy savings, recycling principles for cities, industrial parks and rural agriculture zones.

**Energy Intensity: On Track for 2020 Goals of 40%-45% Reductions from 2005 Levels**

Given the scope and depth of the objectives in the 12th FYP to decarbonize China's energy infrastructure and improve the country's natural environment, there will be many additional Work Plans addressing other mission objectives. This Work Plan, focusing on energy efficiency and emissions reductions, is an important one in that it affirms the improvement trajectories for Energy Intensity and offers some incremental data on the topic.

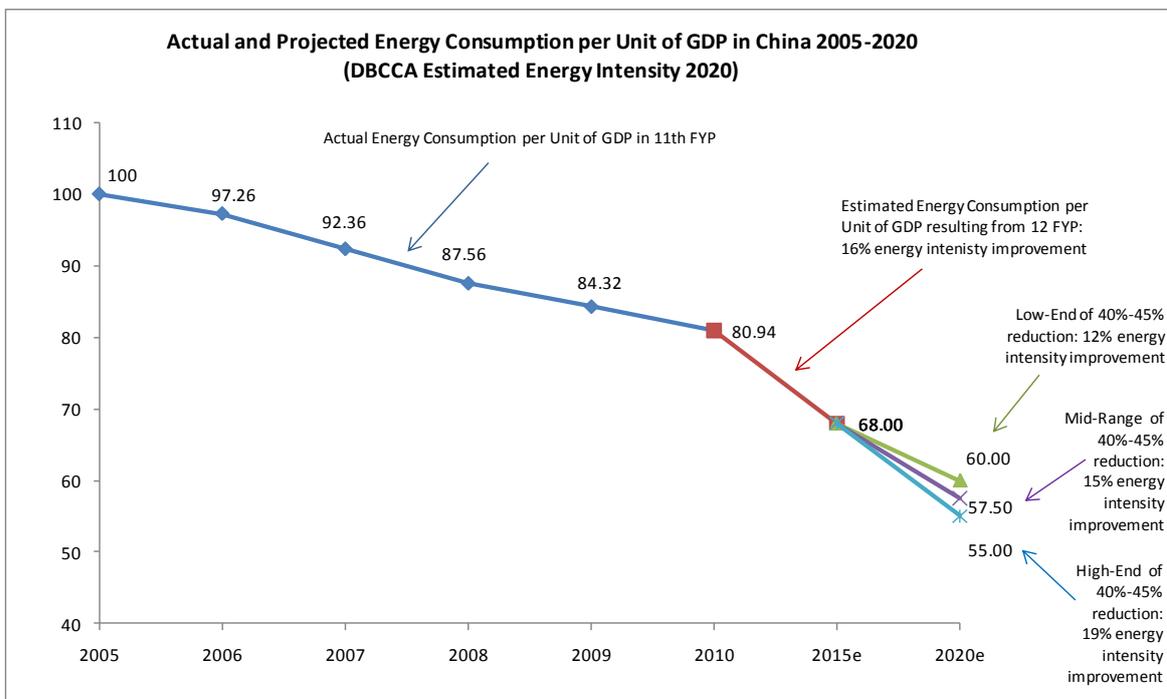
**Table 2: Energy Intensity Data and Improvement Trends**

Year	Energy Intensity (Tons SCE/RMB10,000 GDP)	5 Year Period Cumulative Improvement	Cumulative Improvement from 2005
2005	1.276	NM	NM
2010	1.034	19%	19%
2015	0.869	16%	32%

Source: 12th Five Year Comprehensive Work Plan for Energy Conservation and Emission Reduction, DBCCA analyses 2011  
 "SCE" = Standard Coal Equivalent; an unit used to measure energy content

For example, these new energy intensity details are consistent and track as expected with earlier data set forth in the 12th FYP. Figure 1 provides a graphic depiction using this new data (as compared to the indexed version presented in our earlier report).

**Figure 1: Actual and Projected Energy Intensity Improvement Trends, 2005a-2020e**



Source: National Development and Reform Commission 12<sup>th</sup> Five Year Plan, State Council Work Report for Energy Conservation and Emissions Reductions, 7 September 2011, DBCCA analyses, 2011.

## Energy Generation and Industrial Structure Shifts Greenward

In the Work Plan the Chinese government has reinforced the goal of increasing non fossil fuel contribution to 11.4% of primary energy consumption compared to 8.3% in 2010, representing a 6.6% annual average increase in non-fossil fuel contributions. Although the tragedy at Japan's Fukushima Daiichi nuclear power again brought the issue of nuclear safety squarely into the spotlight, the Chinese government does not appear to be veering away from the increasing the nuclear component of electricity generation. We continue to expect China to have approximately 50 GW of nuclear installed generation capacity in place by 2015 and we estimate 70-75GW in place by 2020. The Work Plan states clearly that China will keep developing nuclear power as plant safety can be addressed through engineering and operational control measures. Concerning hydropower development, the Work Plan continues to emphasize that an additional 120 GW of capacity be installed, with increased attention to ecological protection and fair resettlements of displaced residents.

The 12th FYP identified seven strategic emerging industrials ("SEI's") (Table 3) that are expected to be key drivers of economic growth, emerging technologies and innovation. Government policy actions will be formulated with the intention of fostering these areas. In the new Work Plan the SEI's are now expected to account for 8% of 2015 GDP, up from 4% in 2010 as reported by the NDRC. Looking farther ahead to 2020, Vice-President Zhang Xiaoqiang of the NDRC notes the SEI's will comprise approximately 15% of GDP by 2020. We expect incremental details on industrial planning to unfold later this year and in 2012.

**Table 3: The Super Seven Through 2015**

12 <sup>th</sup> Five Year Plan – Strategic Emerging Industries
<ul style="list-style-type: none"><li>• Biotechnology</li><li>• Clean Energy Vehicles</li><li>• Energy Conservation and Environmental Protection</li><li>• High-End Manufacturing Equipment</li><li>• New Energy</li><li>• New Materials</li><li>• Next-Generation Information Technology</li></ul>

Source: National Development and Reform Commission 12th Five Year Plan, DBCCA analyses, 2011.

The Work Plan continues to focus on restricting high energy-consuming and high emission industries by controlling the new project approval process through governmental oversight of several key developmental processes. These include the land permitting and environmental study approval processes, as well as more attentive control over access to debt financing.

For existing projects, the Chinese government will continue replacing the old low efficiency industrial or manufacturing capacity by assigning capacity reduction quotas across different regions. Earlier this year, the NDRC issued an updated 2011 version of the "Guidance Catalog for Adjustment of Industrial Structure Guide." This document serves as the principal guideline for project evaluation and review in an enhanced effort to make the economy greener. We expected that the rules and details contained therein will be used to either encourage desired investment or restrict prohibited or unwanted development. Proposed new projects that could be categorized as restricted or prohibited will face considerable difficulties in obtaining project approval and financing. Existing projects that have undesirable characteristics will be required to make technology upgrades or face potential mandated closure. Sectors where closures of inefficient facilities could occur may include steel making, aluminum smelting, chemical processing and salt, cement and brick manufacture, among others.

### ***Heavy Industrials and Major Energy Consuming Businesses Can Deliver the Largest Energy and Emissions Gains***

The Work Plan identifies the power, coal, steel, metal processing, petrochemical and chemical, construction, textile, paper sectors, among others, as those to face stricter energy and emissions reduction requirements. The Work Plan calls for operational efficiency of industrial boilers and furnaces to improve by 5% and 2%, respectively, through 2015 and for power generation system efficiency to improve 2-3%. China now plans to install 20 GW of new residual-heat/residual-pressure power generation capacity to improve energy utilization and carbon intensity.

The Work Plan also seeks broad improvements in energy management, particularly for companies which consume more than 10,000 ton of standard coal equivalent (“SCE”) fuel annually. China is aiming to achieve 250 million ton of SCE collective reduction in energy consumption from those heavy users. The Work Plan emphasizes requirements for more regular energy audits of the high energy consuming businesses to be conducted by various government agencies (local, provincial and national) who will then make the audit results available as a matter of accountable public record.

### ***Air and Water Emissions Targets Become Increasingly Strict in 2012-2015 Period***

The Work Plan set forth emissions reductions goals that become increasingly stricter for the 2012-2015 period compared to the 2011 period.

- ***SOx Annual Reduction Rates Increase 23 bp in 2012-2015 Period***  
SOx emissions are now targeted for an average annual 1.7% improvement for the 2011-2015 period, better than the 1.5% for the 2011 period, alone, discussed in the 12th FYP. By 2015, the Work Plan aims for an 8% cumulative reduction in SOx emissions in the five year period. This average rate of improvement implies that SOx emissions in the 2012-2015 period will have to improve at an average annual rate of 1.73%, 23 basis points better than in 2011.
- ***NOx Annual Reduction Rates Increase 79 bp in 2012-2015 Period***  
NOx emissions are now targeted for an average annual 2.1% improvement for the 2011-2015 period, better than the 1.5% for the 2011 period, alone, discussed in the 12th FYP. By 2015, the Work Plan aims for a 10% cumulative reduction in NOx emissions in the five year period. This average rate of improvement implies that NOx emissions in the 2012-2015 period will have to improve at an average annual rate of 2.29%, 79 basis points better than in 2011.
- ***Aquatic O<sub>2</sub> Demand Annual Reduction Rates Increase 23 bp in 2012-2015 Period***  
Aquatic O<sub>2</sub> Demand, a measure of water pollution, is now targeted for an average annual 1.7% improvement for the 2011-2015 period, better than the 1.5% for the 2011 period, alone, discussed in the 12th FYP. By 2015, the Work Plan aims for a 8% cumulative reduction in NOx emissions in the five year period. This average rate of improvement implies that Aquatic O<sub>2</sub> emissions in the 2012-2015 period will have to improve at an average annual rate of 1.73%, 23 basis points better than in 2011.
- ***Ammoniac Nitrogen Annual Reduction Rates Increase 79 bp in 2012-2015 Period***  
Ammoniac Nitrogen emissions are now targeted for an average annual 2.1% improvement for the 2011-2015 period, better than the 1.5% for the 2011 period, alone, discussed in the 12th FYP. By 2015, the Work Plan aims for a 10% cumulative reduction in Ammoniac Nitrogen emissions in the five year period. This average rate of improvement implies that Ammoniac Nitrogen emissions in the 2012-2015 period will have to improve at an average annual rate of 2.29%, 79 basis points better than in 2011.

### ***Greener Buildings and Infrastructure***

In major city areas, especially in northern China, building heating is supplied by fossil-fueled district heating plants. The energy associated with building heating is one of the largest aspects of building energy demand during the winter and as such, the Work Plan is promoting new industrial standards, policies and regulations for better green building development and to replace old heating networks with more efficient ones. To improve the energy efficiency in northern China the Work Plan sets out as a 2015 goal the energy saving retrofitting of 400 million square meters of residential building space. In the non-district heating areas that still experience hot summers and cold winters, the Work Plan aims for 50 million square meters of residential building energy saving retrofits by 2015. Additionally, the Work Plan targets 60 million square meters of public building energy efficiency improvement.

The Chinese government estimates the collective result of the above energy efficiency retrofits could be reduced energy demand comparable to approximately 300 million tons SCE of fuel. The Work Plan also suggests implementation of market-based policies including heating charges in proportion to actual heating services consumption, thus providing a financial incentive to avoid wasting energy. Such actions will require the deployment of both metering and thermostat systems into apartments, homes and offices in order to measure use of heating resources. Looking through to 2020, the Ministry of Construction has estimated the costs of introducing energy savings technologies and measures into the existing building inventory of “large public buildings” could approximate US\$193 billion.

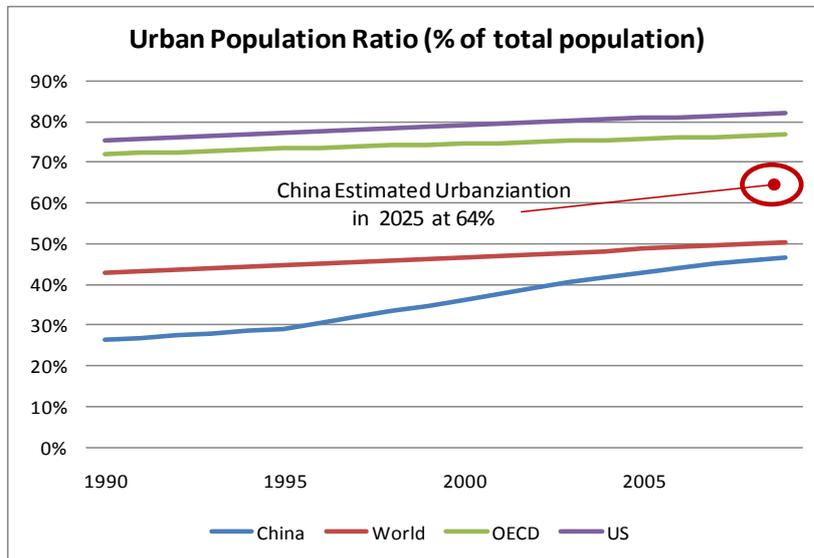
### ***Greener Transportation***

In the area of transportation, the Work Plan will continue to develop green public transportation system and move to decommission “yellow label” high polluting cars registered before 2005 by 2015. Based on national car fleet data, provided in the “**China Vehicle Emission Control Annual Report**” issued by China’s Ministry of Environmental Protection, we estimate there are approximately 10 million “yellow label” vehicles countrywide, representing 17% of China’s auto fleet.

### ***Waste – An Inevitable Consequence of Consumption***

As China’s economy grows and transforms, economic opportunity draws people together into ever larger cities. The trend toward urbanization is well underway in China and in some cases – Chongqing for example – urbanization (e.g. city-bound migration of formerly rural folk) is being actively encouraged for economic growth and more efficient provisioning of resources to the citizenry. Figure 2, below, depicts the China’s trend toward a greater level of urbanization in comparison to other developed regions. By 2025 China’s urbanization level is estimated by **McKinsey & Company** in their report entitled “**Preparing for China’s Urban Billion,**” to rise to 64%, a level approaching that of developed western countries.

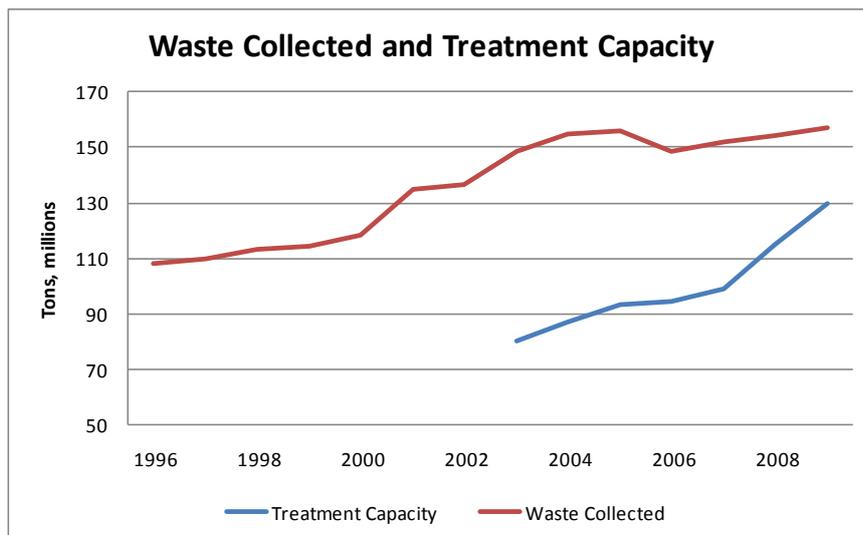
**Figure 2: China's Long March to Urbanization**



Source: CEIC, McKinsey & Company, DBCCA analysis, 2011

Such continued urbanization means the waste and recycling infrastructure in China will have to expand, not only to meet the incremental waste treatment and processing needs of new city dwellers, but also to “catch up” and address the current 17% processing capacity shortfalls in major urban regions as shown by the waste treatment processing deficit in Figure 3. Of particular interest in the Work Plan is the clear understanding that for these waste treatment systems to be developed, resource feedstocks must be assured. To make sure those entrepreneurs developing waste treatment facilities have adequate waste streams for business success, the Work Plan discusses granting exclusive concession operating rights in certain areas including industrial parks, municipalities, or districts.

**Figure 3: Expanding Consumption, Expanding Waste Streams**



Source: CEIC, DBCCA analysis 2011

Note: Treatment Capacity data for periods earlier than 2003 is not available.

To address the likely increased demand arising from urbanization trends, the Work Plan aims to expand by 42 million tons/day the water treatment capacity in the cities and to install 160,000 kilometers of wastewater piping. Despite this investment, the firm **Research in China** estimates that in 2010 only 75% of China's 62 billion tons of waste water was

treated resulting in the remaining 25% of untreated effluent flowing into the country's inland and coastal waters. Already, residential expansion of waste water generation is occurring at more than 4 times that of industrial liquid waste growth. While not cited specifically in the energy conservation and emissions Work Plan, China aims to increase the treatment level to 85% over the next several years.

Industrial waste is identified in the Work Plan as an area for further investment. In 2009 China reutilized approximately 68% of industrial solid waste and the Work Plan sets a 75% reutilization goal for 2015. Industrial scale agricultural and animal waste streams are also addressed qualitatively in the Work Plan, with language intended to create the necessary administrative policies to foster centralization of major livestock operations so waste streams can feed larger scale biogas systems.

### ***Investment Implications***

The energy conservation and emissions reduction Work Plan provides moderate-level detail on where future economic activity is likely to unfold as China "greens" its economy. Clearly, opportunity exists for a range of services, businesses and component vendors to participate in the energy retrofit efforts across almost one-half billion square meters of real estate during the next 3+ years. Window treatments, insulation, thermostats, lighting systems, HVAC monitoring and control (e.g. "Smart building systems"), among others, are likely beneficiaries of this trend. Waste treatment systems – solid waste, sewage and biogas – are likely areas for major construction services, equipment sales and project financing opportunities. Mr. Zhang Yue, the deputy director of the Urban Construction Department of China's Ministry of Construction, estimates spending on wastewater treatment and piping projects are likely to exceed RMB 300 billion (USD\$45 billion).



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