技术节能对实现20%节能目标的贡献分析

Achieving the 2010 20-Percent Energy Intensity Target Through Industrial Technology Advancement

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1. “十五”期间技术节能状况

Technical Energy Saving Status in the "10th Five-Year Plan" Period (2000-2005)

“十五”期间，主要高耗能产品的能源单耗均呈下降趋势，技术进步因素促进GDP能源强度下降。

In the "10th Five-Year Plan" period, the unit energy consumption of major high energy-consuming products declined, and technological advancement contributed to GDP energy intensity improvement.

但由于高耗能行业增长速度均高于GDP增长速度，结构变化引起GDP能源强度升高的因素抵消和淹没了技术进步使GDP能源强度降低因素的效果。

However, high energy-consuming industry grew faster than GDP, structural transformation counteracted the reducing effect of technology and caused an overall increase in GDP energy intensity.

主要耗能产品的能源单耗变化

Unit Energy Consumption Changes Major Energy-Intensive Products

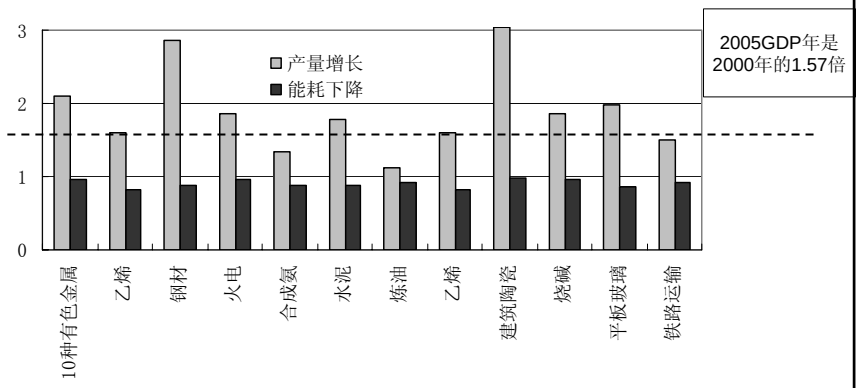
	2000	2005	Reduction Rate （%）2005 to 2000	Annual Output Growth Rate（%）2000-2005
供电煤耗 (kgce/kWh) Coal Consumption for Power Supply	392	376	4.1	12.8
水泥综合能耗 (kgce/t) Overall Energy Consumption of Cement	181	157	13.3	12.3
钢可比能耗 (kgce/t) Comparable Energy Consumption of Steel	784	740	5.6	22.4
电解铝 (kWh/t) Electrolytic Aluminum	15480	15080	2.6	22.7
合成氨综合能耗 (大型，Kgce/t) Overall Energy Consumption of ammonia synthesis	1372	1210	4.2	11.8

2000~2005年，GDP平均增长率为9.48%，表中5种高耗能产品年均增长率为16.1%

From 2000~2005，average GDP growth rate was 9.48%, and the average growth rate of the Five Energy-Intensive Products above was 16.1%.

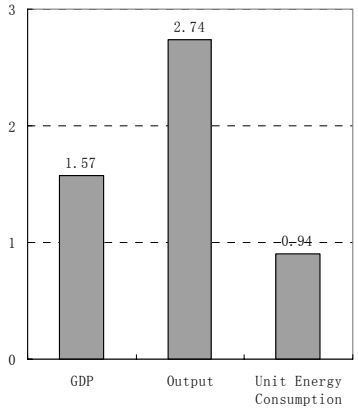
高耗能产业产量增加抵消了技术节能的作用

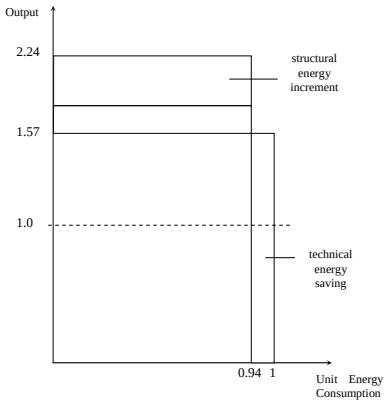
Increased output by energy-intensive sectors offsets the energy-saving effect of technology



“十五”期间钢铁耗能分析

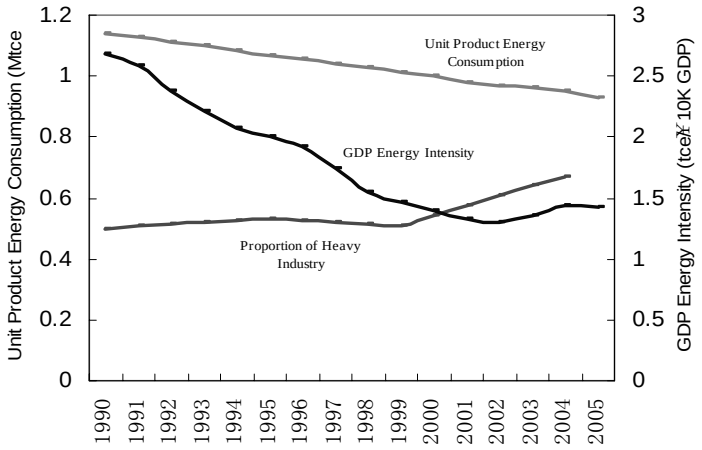
Energy Consumption Analysis of the Steel Industry in the "10th Five-Year Plan" Period





产品能源单耗、重工业在工业中比重以及GDP能源强度变化

Unit Product Energy Consumption, Proportion of Heavy Industry and GDP Energy Intensity Change



十五期间高耗能产业技术进步的节能量

Energy Saving by Technology Advancement in Energy-Intensive Industry in the "10th Five-Year Plan" Period

十五期间高耗能产业技术进步实现的节能总量为1.25亿标煤，占2005年能耗总量的5.62%，其中既有产品节能量为5624.83万吨标煤，新增产品节能量为6894.29万吨标煤

Gross energy savings by technological advancement in energy-intensive industry was 125 mtce for the "10th Five-Year Plan" period, equaling 5.62% of gross energy consumption in 2005. The amount of product energy saving was 56.2483 mtce (68.9429 mtce for new products)

Energy Saving	钢材 Steel	水泥 Cement	玻璃 Glass	建筑陶瓷 Building Ceramic	10 种有色金属 10 Non-ferrous Metal	乙烯 Ethylene	电力 Power	铁路货运 Railway Freight	合成氨 Ammonia Synthesis	烧碱 Caustic soda
存量节能 Stock	1919.32	1552.20	73.41	25.76	111.60	94.13	1632.75	104.66	111.00	33.39
增量节能 Increment	3875.57	1214.20	72.89	52.64	123.38	65.61	1394.25	52.86	42.89	26.07
总节能量 Gross	5794.89	2766.40	146.30	78.40	234.98	159.74	3027.00	157.52	153.90	59.46

“十一五”能源单耗下降目标（国家中长期节能规划）

Unit Energy Consumption Reduction Target in "11th Five-Year Plan" Period (National Mid- and Long-Term Energy Conservation Plan)

	2005	2010	Reduction Rate（%） 2010 to 2005
供电煤耗 (kgce/kWh) Coal Consumption for Power Supply	377	360	4.3
水泥综合能耗 (kgce/t) Overall Energy Consumption of Cement	181	157	13.3
钢综合能耗 (kgce/t) Overall Energy Consumption of Steel	760	730	4.0
合成氨综合能耗 (大型 kgce/t) Overall Energy Consumption of ammonia synthesis	1210	1140	5.8

“十一五”期间，主要耗能产品能源单耗平均下降5%以上

The average reduction of unit energy consumption of main energy-intensive products exceeded 5% in the "11th Five-Year Plan" period

节能潜力的分类
Classification of Energy Saving Potential

- 技术节能潜力：技术上可以实现的节能潜力

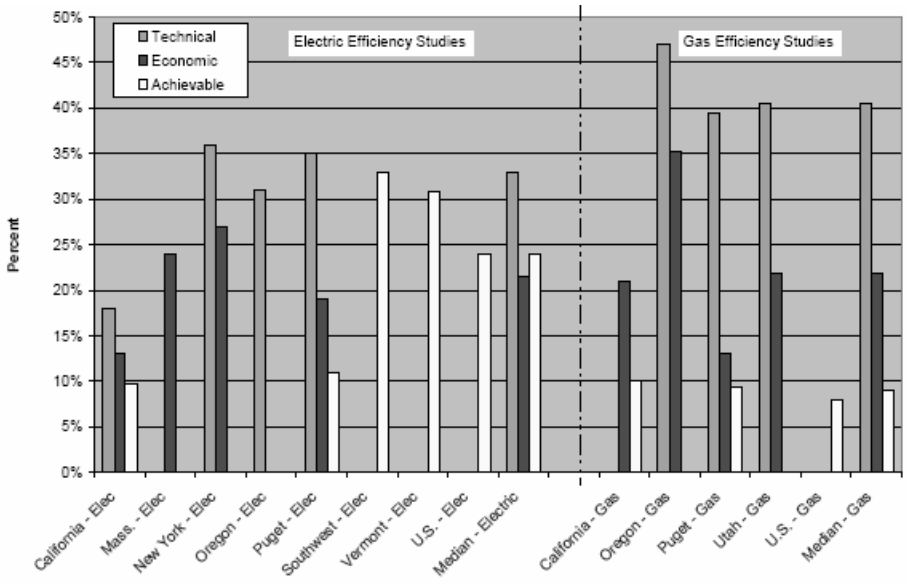
  Technological potential: Technologically achievable energy saving potential
- 经济节能潜力：除技术因素外还考虑经济成本因素的制约

  Economic potential: Includes constraints of economic costs
- 可实现的节能潜力：除考虑上述两个因素外，还要考虑使用者对产品接受程度和是否愿意采用

  Achievable potential: Includes user willingness to accept and adopt products
- 近期（5年内）可实现的节能潜力

  The short- term achievable potential: Achievable in 5 years

美国研究结果分析—能源类型
U.S. Analysis--Energy Types



我国技术节能潜力分析

Analysis of China's Technological Energy Saving Potential

- **八个高耗能行业主要耗能产品的能源单耗比世界先进水平高40%左右，能源系统效率比发达国家低10个百分点左右。**

  China's average unit product energy consumption of 8 major energy-intensive industries exceeds international advanced levels by 40%. Energy system efficiency is 10% lower than in developed countries.

- **技术可行、经济效益明显的技术节能潜力很大，实现技术节能的障碍主要不在于技术本身的可行性。**

  The viability of the technology itself is not the main barrier: there is great savings potential in feasibility and economic efficiency.

- **技术节能可分解为生产容量的存量技术节能和增量节能。生产容量的存量要经过技术改造或技术升级实现节能，要有一个相对缓慢的过程，2010年可投产的新生产容量，基本上是在建或已设计好的项目，其能耗技术指标基本上已经确定。**

  Technical energy saving can be divided into existing stock technological energy saving and increment technological energy saving. Existing stock through technological transformation is relatively slow. The new production capacity for 2010 is either designed or under construction, and its energy consumption indicators have been determined.

"十一五"可实现的技术节能潜力分析

Achievable Technical Energy Saving Potential Analysis in the "11th Five-Year Plan" Period

"十一五"期间，高耗能产品能源单耗下降5~10%，相应能源系统的转换和利用效率提高2.5~3.0个百分点（即提高7~9%），不考虑产业结构和产品结构的变化，技术节能可使GDP能源强度下降6.4~7.8%。

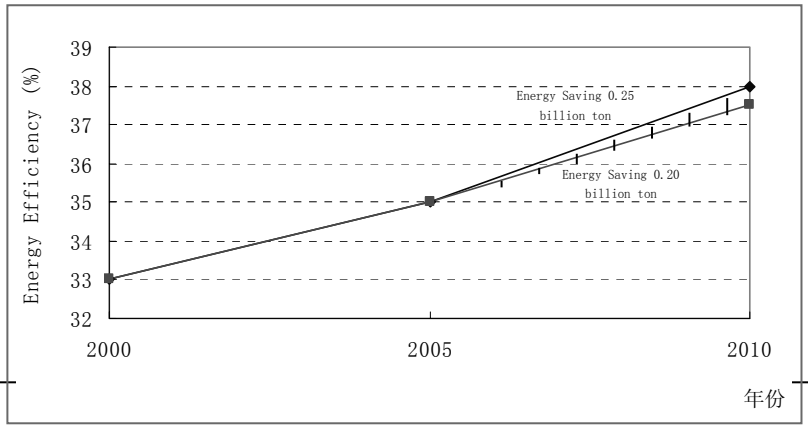
In the "11th Five-Year Plan" period, unit energy consumption of energy-intensive products should decrease 5-10%, and the efficiency of energy conversion and utilization system should increase 2.5-3.0 percentage points. Excluding changes in industrial and product structure, 6.4-7.8% of GDP energy intensity decrease will be attributable to technology.

"十一五"期间，争取实现技术节能2.0~2.5亿吨标准煤左右，对实现GDP能源强度下降20%目标的贡献率可达30~40%。

In the "11th Five-Year Plan" Period, technical energy saving will be 200-250 mtce, contributing 30-40% to the target of 20% reduction in GDP energy intensity.

“十一五”期间，即使加大节能投入力度和强化节能管理措施，可实现的技术节能也远小于技术经济可行的技术节能潜力。

In the "11th Five-Year Plan" period, even if energy saving inputs and energy management measures are intensified, achievable technological energy saving will be far less than the full potential of technologically and economically feasible savings.



(2) 高耗能工业部门节能

Energy Saving in Energy-Intensive Industry Sectors

- 存量节能：技术改造，淘汰老旧设备

  Existing **Stock Energy Savings**: technological renovation, elimination of outdated equipment
- 增量节能：新增生产能力采用先进技术

  Incremental Energy Saving: new energy production capacity using advanced technology
- 推行行业技术标准和行业节能目标

  Implementing the industry technological standards and industry energy-saving targets
- 财政、税收、金融等经济激励政策

  Fiscal, tax and finance policies, and other economic incentives

例1. 钢铁工业主要节能措施

Example 1. Major Energy-Saving Measures in Steel Industry

- **优化工艺结构，用先进的工艺流程取代落后的高耗能工艺流程，淘汰高耗能设备**

  Updating processing structure with advanced high-efficiency processing, eliminating energy-intensive equipment

- **推广精料、高炉富氧、提高炼铁喷煤比、热风烧结等炼铁系统节能技术**

  Promoting high-grade materials and blast furnaces, improving energy-saving technology, (i.e. Blast Furnace coal injection, Hot-air Sintering)

- **推广高效化全连铸、超高功率电炉、废钢预热等炼钢综合节能技术**

  Promoting integrated energy-saving technologies (i.e. efficient continuous casting, ultra-high-power electric furnaces, steel scrap preheating)

- **推广一火成材、热送热装等轧钢节能技术；推广高炉压差发电(TRT)、干熄焦(CDQ)、副产煤气回收利用、热风炉余热回收、烧结余热回收、蓄热式轧钢加热炉等回收余能、余热、余压节能技术**

  Promoting One Heating Processing; Hot Delivery Hot Charging and other steel rolling energy-saving technologies; promoting BF TRT, CDQ, By-Product Gas recycling, waste heat recovery of hot stove, sintering waste heat recovery, regenerative steel rolling heating furnace and other waste energy, heat, pressure recycling technologies

吨钢综合能耗由2005年的760kgce/t下降到2010年的680 kgce/t

Overall energy consumption per ton of steel production decline from 760kgce/t in 2005 to 680 kgce/t in 2010

例2. 建材行业主要节能技术

Example 2. Major Energy-saving Technologies in Building Materials Industry

- **水泥行业 Cement Industry**
  - 采取发展新型干法窑外分解技术，提高新型干法水泥熟料比重 Developing new dry processing pre-calcining kiln system technology
  - 对现有大中型回转窑进行节能改造，淘汰落后的小水泥窑等 Making large and medium-sized kilns more efficient; eliminated small kilns

  水泥综合能耗由2005年的155kgce/t下降到2010年的140kgce/t

  Overall energy consumption decreased from 155kgce/t to 140 kgce/t

  玻璃行业 Glass Industry
  - 发展先进的浮法工艺，淘汰落后的垂直引上和平拉工艺 Developing advanced flotation process, and eliminating vertical drawing and Colburn processes
  - 推广炉窑全保温技术、富氧和全氧燃烧技术 Promoting full insulation furnace technology, oxygen-rich and oxygen combustion technology

    平板玻璃综合能耗由2005年26kgce/重箱下降到2010年的21kgce/重箱

    Overall energy consumption of flat glass decline from 26kgce/container in 2005 to 24kgce/container in 2010/155kgce/t in 2005 to 145kgce/t in 2010

例3. 化学工业主要节能技术

Example 3. Major Energy-saving Technologies in the Chemical Industry

- **合成氨 Ammonia Synthesis**
  - 大型合成氨推广一段炉烟气余热回收，采用新型催化剂，改造蒸汽系统
    Promoting large-scale ammonia synthesis in furnace gas waste heat recovery, using new catalysts to transform the steam system.
  - 推广中小型合成氨节能技术改造，降低吨氨能耗。
    Promoting small and medium ammonia synthesis energy-saving technology, reducing energy consumption per ton of ammonia production.

  综合能耗由2005年的1339kgce/t下降到2010年的1313 kgce/t。

  Overall energy consumption decline from 1339kgce/t in 2005 to 1313 kgce/t in 2010

- **烧碱 Caustic Soda**
  - 生产逐步淘汰石墨阳极隔膜法烧碱，增加先进的离子膜法烧碱的产量。 Phasing eliminate graphite anode diaphragm caustic soda anode and diaphragm caustic soda production, and increasing advanced ion exchange membrane caustic soda production

  综合能耗由2005年的1500kgce/t下降到2010年的1400 kgce/t。

  Overall energy consumption decline from 1503kgce/t in 2005 to 1400 kgce/t in 2010.

例4. 电力工业主要节能措施

Example 4. Major Energy-saving Measures in the Power Industry

- **开发60万kw及以上超临界、超超临界机组、大型联合循环机组技术**

  Develop ≥600 MW supercritical and ultra-supercritical units, and large-scale combined cycle power plant technology.

- **重点发展高效率的清洁燃烧技术；实施“以大代小”提高单机容量**

  Focus on the development of high efficiency clean combustion technology; improve unit capacity by "Large-Scale Substitutes”.

- **2010年后，新技术如超超临界机组的应用将得到普及**

  Universally apply new technologies (e.g. ultra-supercritical units) by 2010.

到2010年，火电机组年供电标准煤耗达到360g/kWh

By 2010, energy consumption of the power supply will reach 360g/kWh.

(3) 建筑节能
Buildings Energy Saving

- 新建建筑严格执行节能**50%**的设计标准（每年新建建筑为**20**亿平方米，节能潜力大）

  The strict implementation of 50% energy savings in new building design standards (huge savings potential with 2000 million m^2 per year of new construction)
- 既有建筑节能改造，大中城市改造**15~25%**

  15-25% energy saving renovation of existing buildings, transforming large and medium-sized cities
- 改革供热体制

  Heating system reform
- 大型公用建筑系统节能（每平方米耗能为民用建筑**10**倍）

  Energy savings for large public buildings (energy consumption per m^2 is 10 times greater than for residential buildings)
- 加强监督和处罚力度

  Intensifying supervision and punishments

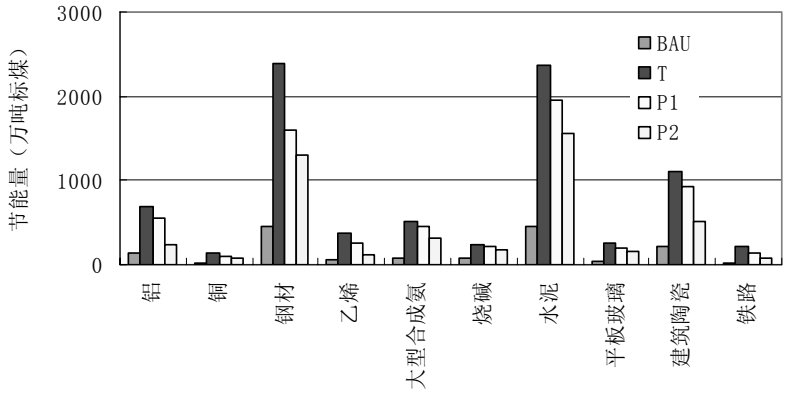
(4) 通用设备及终端电器节能
General equipment and electrical appliances energy saving

- 电机推行新节能标准，风机、水泵效率（设计）从**75~80%**提高到**85%**左右。**2010**年节能**200**亿**kWh**

  Implement the new energy saving standards for motors, fans, and pump efficiency (design), which have been increased from 75-80% to 85%; this achieves energy savings of 20 billion kWh by 2010
- 家用电器推行新节能标准和能效标识，**2010**年节能折算一次能源**3900**万**tce**

  Implement new energy saving standards and energy efficiency labels for household appliances and products; energy saving will be 39 mtce by 2010 (converted into primary energy)

各部门节能潜力比较
Comparison of Energy Savings among Sectors



“十一五”技术节能效果分析
Energy Saving Effect of Energy Technology Innovation during the "11th Five-Year Plan" Period

	Energy Saving 200Mtce	Energy Saving 250Mtce
Annual GDP Growth Rate (%）	7.5	7.5
Energy Saving required to achieve the target of energy intensity reduction of 20% (Mtce)	639	639
Technical Energy Saving Contribution Rate	31.2	39.1
Energy intensity reduction from technological innovation in energy (%)	6.2	7.8

(5) 当前推进技术节能的主要障碍不是技术本身，也不是项目的经济性问题。影响节能技术推广的因素错综复杂，既有地方和部门利益，又有投融资体制，还有政策和监管等方面的问题。

Currently, the main barriers to promoting technological energy saving are not the technology itself, nor economic issues. Complicated factors include local and departmental interests, the investment and financing system, policies and regulatory issues.

节能技术推广不能仅依靠市场行为，要有各级政府的有效推动。

Promotion of technological innovation cannot only rely on the market; governments at all levels must be involved.

4. 几点看法

Concluding Remarks

(1) 我国“十一五”实现GDP能源强度下降20%左右的目标，在加强推进技术节能的同时，必须调整产业结构，控制高耗能产业增长的速度。否则技术节能对GDP能源强度下降的效果会被高耗能产品比重增长对GDP能源强度增加的因素所抵消。

According to China's "11th Five-Year Plan" , to achieve the goal of 20% reduction in GDP energy intensity, it is necessary to strengthen and push forward technical energy saving, adjust the industrial structure, and control the growth rate of high energy-consuming industries. Otherwise, high energy-consuming industry growth increased the GDP energy intensity, and counteracted the reduction effect by technical energy saving.

如果“十一五”期间继续维持“十五”末的产业结构和产品结构不变，“十一五”期间可实现的技术节能潜力使GDP能源强度下降不会超过10%。

If in the "11th Five-Year Plan" period maintain the industrial structure and product mix as the end of "10th Five-Year Plan" period, achievable technical energy saving Potential to reduce GDP energy intensity will not exceed 10%.

(2) GDP能源强度下降目标是一个动态的相对性指标，实现相同GDP能源强度下降率，GDP增长率越大，则相应能源消费弹性也越大，期末能源总消费量则增长越快。如果"十一五"GDP年增长率平均从7.5%上升到10%，同时实现GDP能源强度下降20%的目标，2010年能源总消费量亦由2556.4Mtce上升到2865.8Mtce，增加309.4Mtce。

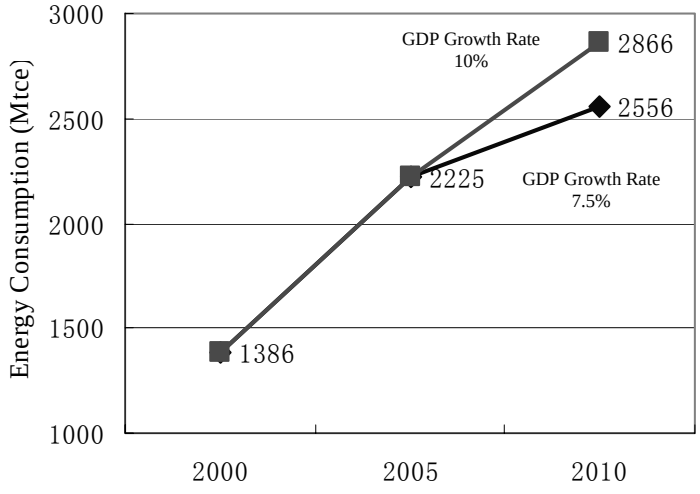
The GDP energy intensity target is dynamic and relative. Greater GDP growth means greater elastic energy consumption and the faster growth of terminal gross energy consumption. If the average annual GDP growth rate increases from 7.5% to 10% in the 11th Five-Year period, and the goal of reducing energy intensity by 20% is reached, gross energy consumption will increase from 2556.4 Mtce to 2865.8 Mtce (added 309.4 Mtce.)

当前能源供应规划和建设计划都以2010年25.5亿tce为依据，如果GDP过快增长，"十一五"期间仍会出现能源供应紧缺局面。而能源总消费量的快速增长也是我国难以承受的。因此在注重GDP能源强度下降20%目标的同时，要控制GDP增长速度，切实转变发展模式，从而控制能源需求量的增长。

The current energy supply and construction plans follow the baseline of 2550 mtce in 2010. Excessive growth of GDP will bring energy shortages. So while working to meet the target of 20% reduction in GDP energy intensity, we must control GDP growth rate and change the development mode in order to control the growth of energy demand.

在实现20%目标下，不同GDP增长率的能源消费量变化

Achieving the target of 20% reduction: energy consumption changes with varying GDP growth



实现GDP能源强度下降20%情况下，不同GDP增长速度的能源消费比较

Achieving The Target of 20% Reduction:
Comparing Energy Consumption with Varying GDP Growth Rates

	2005	2010	
		GDP annual growth rate 7.5%	GDP annual growth rate 10%
GDP 能源强度（tce/￥10K） GDP Energy Intensity	1.22	0.976	0.976
能源消费弹性 Elasticity of Energy Consumption		0.375	0.520
能源总消费量（Mtce） Gross Energy Consumption	2224.68	2556.4	2865.8
实现的节能量（Mtce） Gross Energy Saving		638.7	716.5

(3) 节能技术的推广一定要因地制宜，讲求实效。不能盲目引进国外先进技术和能耗标准，也不要片面扩大技术节能的潜力和效果，要认真进行论证和示范，节能潜力和措施要全面评价。

Implementation of energy-saving technologies should fit local conditions, with emphasis on practicality. We cannot blindly import foreign technology and standards, nor engage in one-sided expansion of energy-saving technological potential and effects. We should carefully process feasibility studies and demonstrations to assess energy saving measures and potential.

例如集中供冷和热电冷三联产并不一定节能，片面的能源技术效率提高，可能带来终端需求加大，其结果并不一定能实现节能效果。我国建筑保温水平比发达国家低1-2倍，但采暖能耗处于同一水平。

For example, central cooling and tri-generation energy combined cooling, heating and power are not effective for energy savings, one-sided efficiency-improving technologies may increase terminal potential demand without necessarily saving energy. China's building heat preservation levels are 1-2 times lower than in developed countries, while heating energy consumption is the same.

Thank you
for your attention!