



2008

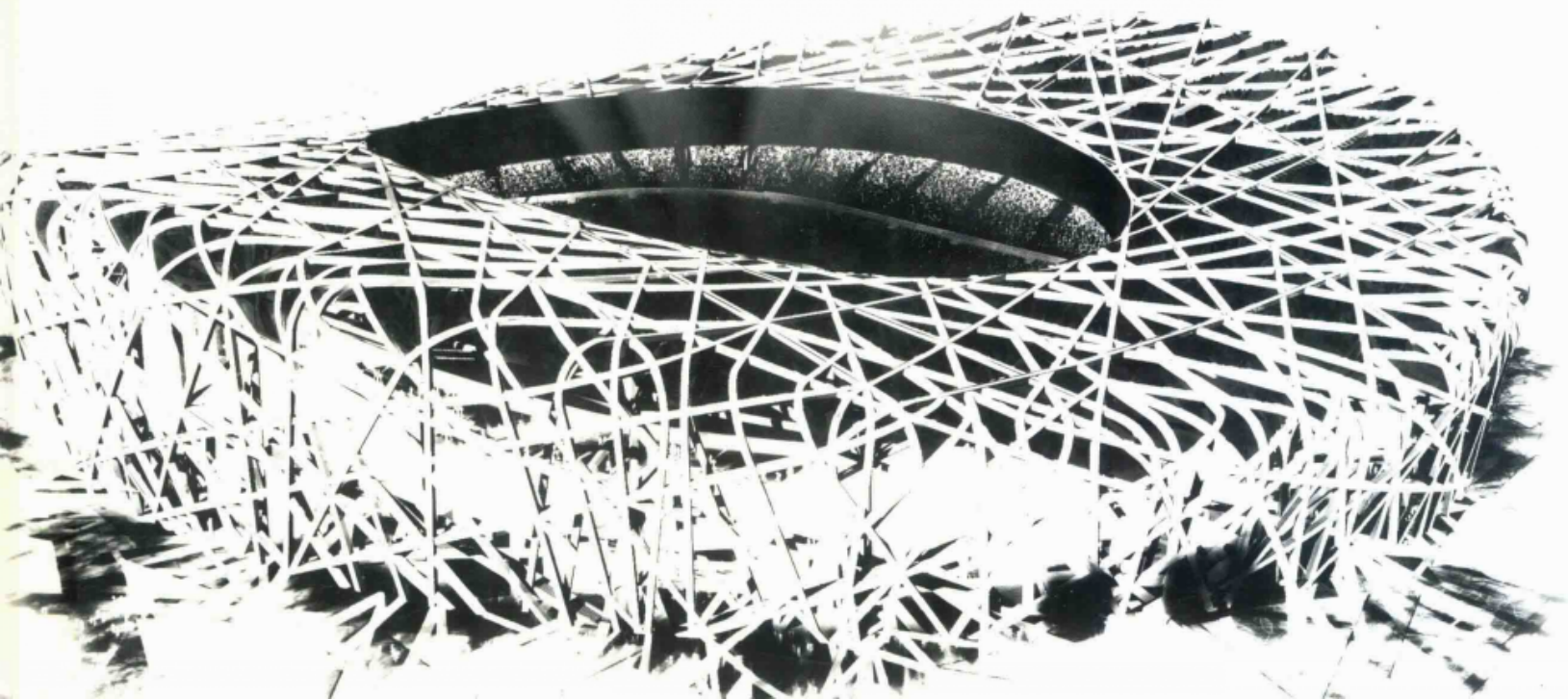
The Hi-Tech Olympics

A Greenhouse of Innovative Projects

科技奥运精品项目集锦

“奥运科技(2008)行动计划”领导小组

The Leading Group for the “Hi-Tech Olympic Games (2008) Action Plan”



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工业和信息化部	Ministry of Industry and Informational Resources of China
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国家体育总局	General Administration of Sports
国家国防科技工业局	Administration of Science, Technology, and Industry for National Defense
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中国工程院	Chinese Academy of Engineering
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目录

总体篇：实践理念 支撑奥运	001
科技奥运的理念	002
科技奥运总体目标	002
科技奥运工作目标	003
科技奥运总体部署	007
科技奥运总体成效	009
开(闭)幕式、大型活动：吹响奥运盛典的前奏	011
支撑篇：节能减排 绿色奥运	016
新能源汽车：绿色车队，崇尚环保	017
绿色能源供应：21世纪的能源	019
高效节能技术：节能减排的有效途径	025
环境保护与资源综合利用：打造生态北京城	031
工程篇：科技支撑 精品工程	044
场馆建筑设计创新：艺术创造精品	045
建筑施工新技术与新材料：让艺术变成现实	051
服务篇：信息服务 以人为本	061
奥运会赛事信息技术服务与通讯保障：信息服务赛事，奥运沟通无限	062
奥运会媒体信息服务：方便记者，快捷新闻	069
公众信息服务：无处不在的奥运资讯	074
保障篇：科技保障 奥运之城	087
奥运交通服务保障：奥运交通，一路畅通	088
奥运气象保障：气象科技保驾护航	100
奥运安全保障：平安北京	103
奥运食品安全保障：安享奥运中华美食	111
合作篇：精诚合作 共铸辉煌	115

Contents

Part I Practice the Concepts and Support the Olympics	001
Concept of a High-tech Olympics	002
The Overall Goal of the High-tech Olympics	002
Indicative Goals of the High-tech Olympics	003
General Deployment for the High-tech Olympics	007
Overall Effects of the High-tech Olympics	009
Opening (Closing) Ceremony and Large-scale Events: The Prelude of the Spectacular Olympic Pageant	011
Part II Save Energy and Reduce Emission, a "Green Olympics"	016
New Energy Vehicles: Green Vehicles, Environmental Chic	017
Green Energy Supply: Energies of 21 st Century	019
High-efficiency Energy-saving Technologies: an Effective Way to Save Energy and Reduce Emission	025
Environmental Protection and Comprehensive Utilization of Resources: Building an Ecological Beijing City	031
Part III Science and Technology Guarantee Outstanding Projects	044
Design Innovation: Artistic Skill Produces High-Class Design	045
New Technologies and Materials in Architectural Construction: Turning Art into Reality	051
Part IV People-oriented Information Services	061
The Olympic Information Technology Services and Communications Guarantee: Information Serves the Games, Olympics Connects the World	062
Olympic Media Information Services: Convenience for Journalists, Promptness of News	069
Public Information Services: Unlimited Olympic Information	074
Part V Science and Technology Secure the Olympic City	087
The Guarantee of Olympic Traffic: Clear Routes all the Way	088
Olympic Meteorological Support: Weather Science Aids the Olympic Games.	100
Olympic Safety and Security: Peaceful Beijing	103
Security Assurance for Olympic Foods: Enjoy Your Meal	111
Part VI Building Achievements through Cooperation	115



现代奥林匹克运动从诞生到蓬勃发展的百年历程，正是人类历史上科学技术爆炸式发展的阶段。科技与奥运的结合日益紧密，日新月异的科学技术铸就了一幕幕奥运经典，一届届奥运盛会也成为展示科技魅力的最佳舞台！

2001年7月13日，百年奥运情定北京。“科技奥运”成为我们对世界的庄严承诺。从那一天起，2008成为无数人心中跃动的期盼。七年的时间转瞬即逝，奥运的脚步越来越近，北京准备好了吗？

是的，北京准备好了！

“鸟巢”、“水立方”……一座座奥运场馆拔地而起，它们代表着世界最先进的设计理念、最高超的建筑技术和最先进的建

The one hundred-year development of the modern Olympic Games, from its birth to its present-day success, has also seen unprecedented growth in the area of science and technology. Increasingly, the links between the Olympics and science and technology have grown closer. Rapid changes in science and technology have been behind many of the more classic moments in previous Olympic Games. It has become one of the best opportunities to showcase science and technology on the world stage.

On July 13, 2001, with 100 years of history behind it, the Olympic Games finally chose Beijing as its host city. At that time, Beijing made a solemn commitment to the world to put on a “hi-tech Olympics”. Since then, the year 2008 has made the hearts of countless people beat with anticipation. Seven years have passed in the twinkling of an eye, and now the Olympics are approaching.

Is Beijing ready? Yes, Beijing is ready!

Buildings like the “Bird’s Nest” and the “Water Cube” have sprung up. These buildings with their advanced design concepts make use of sophisticated architectural technologies and the most advanced modern materials. They will definitely be considered as classics in architectural history. The green, energy-saving technologies prepared for Olympics, including “new energy

materials”, “solar-generated electricity” and so on, perfectly demonstrate the support role of science and technology in the “Green Olympics”. They also highlight China’s powerful science and technology prowess and are evidence of China’s determination to save energy, reduce emissions, and protect the environment. TD-SCDMA mobile communications, high-definition television, laser displays...faced with the wave of information technologies sweeping the world, Beijing shines through. Players and tourists from all over the world will experience unparalleled speed and clearness when accessing information and communication systems.

美好北京，精彩奥运，科技与梦想同行。奥运盛会即将来临，我们迎接的不仅是一场世界瞩目的体育盛会，也将是一次弘扬科学精神、展示高新科技成果的盛会，让我们拭目以待。

Beautiful Beijing, a brilliant Olympic Games – science and technology will go hand in hand with this dream. The 2008 Olympics are coming and we will welcome not only a world-renowned sporting event, but also a pageant to promote our scientific spirit and to display our hi-tech achievements. Let’s wait and see.

(一) 总体篇:实践理念 支撑奥运

Part I Practice the Concepts and Support the Olympics



Concept of the Hi-tech Olympics

The concept of the “hi-tech Olympics” was first proposed in Beijing’s application for hosting the 2008 Games. The goal was to apply scientific applications to the Olympics, to support the Games with advanced technologies, and to benefit the whole society with achievements made in the hi-tech Olympic construction.

The Overall Goal of the Hi-tech Olympics

All science and technology sources will be integrated effectively to meet the requirements of Olympic construction, providing advanced, reliable, and applicable technology support and guarantees. With the combination of science and technology and the Olympic spirit, the Olympics should also be a platform to popularize scientific knowledge; to improve citizen’s scientific know-how, to promote the progress of science and technology, to benefit society, and to achieve the goal of “science and technology supporting the Olympics, the Olympics promoting science and technology”.

一、科技奥运的理念

北京在申奥中第一次提出了“科技奥运”理念，就是要以科学精神组织奥运，以先进技术支撑奥运，以科技奥运成果惠及社会。

二、科技奥运总体目标

有效集成满足奥运建设需求的科技资源，为成功举办北京奥运会提供先进、可靠、适用的技术支持和技术保障；通过科学技术与奥林匹克精神的融合，使奥运会成为传播科学知识、提高公众科学素质、促进科技进步并惠及社会的平台，达到“科技助奥运、奥运促科技”的目的。

三、科技奥运工作目标

目标一：采用先进、环保的清洁汽车技术，实现奥林匹克公园中心区域交通“零排放”，中心区域周边地区及奥林匹克交通优先路线交通“低排放”。

目标二：采用太阳能、风能和地热等绿色能源技术，使奥运场馆绿色能源供应比例达到26%以上。

目标三：采用雨洪利用、中水回用、污水处理及再生利用等技术，使奥运场馆（区）多年平均雨水综合利用率超过80%，奥运场馆中水回用、污水处理再生利用率达到100%。

目标四：在奥运主要场馆及设施大面积使用半导体照明和地（水）源热泵等高效能源利用技术，实现节能60—70%。

目标五：市区道路路网群体交通诱导覆盖率达80%以上，奥林匹克交通优先路线平均时速不低于60公里，以及对5000辆奥运车辆的监控服务。

目标六：基本实现4个“ANY”的奥运信息服务目标，满足奥运会期间各方面的个性化信息服务需求。



目标一：[注释]

奥林匹克公园中心区域：主要指奥林匹克公园中心区、奥林匹克公园南区（奥体中心），是北京奥运会和残奥会的主要比赛区域，面积3.15平方公里，主要包括各奥运场馆、奥运村、媒体村、技术营运中心等奥运会主要基础设施区域。

整个奥林匹克区域称为奥林匹克公园，位于城市中轴线的北端，面积约1215公顷，自北向南分为奥林匹克公园北区（森林公园）、奥林匹克公园中心区、奥林匹克公园南区（奥体中心）三部分。

奥林匹克公园中心区周边地区及奥林匹克交通优先路线：是指选择部分奥运交通规划确定奥林匹克交通优先路线，包括连接中心区、场馆和其他奥运设施等之间的若干条专用交通路线。

目标二：[注释]

绿色能源主要供应奥运会场馆冬季采暖和夏季制冷的用能需要；

按照在奥运工程总建筑面积约199万平方米，其中51万多平方米建筑使用绿色能源计算，比例为26.9%；

奥运会能源使用主要分为奥运场馆冬季采暖和制冷、照明、生活厨房用能（天然气）、生活热水供应用能（太阳能热水供应占60-70%）等四部分。

目标三：[注释]

多年平均雨水综合利用率超过80%，可回收利用雨洪水105万吨/年；

所有场馆采用中水回用系统，如奥林匹克公园和国家游泳中心利用中水共计479万吨/年；

奥运场馆采用集中与分散相结合的污水处理方式，污水处理再生利用率达到100%。

目标四：[注释]

国家游泳中心、奥林匹克多功能演播塔等采用半导体照明（LED），节约夜间景观照明能源70%；

奥运村采用再生水源热泵系统提供冬季供暖和夏季制冷，节约相当于标煤约3600吨/年。

目标五：[注释]

群体交通诱导率：是相对个性化交通诱导而言，指通过大屏幕、广播等形式发布交通信息，对北京市区交通主干道进行车辆出行交通诱导的覆盖比例。

目标六：[注释]

4个“ANY”：北京申奥提出的“任何人，在任何时间、任何奥运相关场所，使用任何终端设备都能够安全、快捷地获取可支付得起的、无语言障碍的、个性化的信息服务”承诺。



Indicative Goals of the Hi-tech Olympics

1. Advanced environmentally friendly vehicle technology will be widely adopted to achieve the goal of “zero emissions” from traffic in the central area of the Olympic Park, as well as the goal of “low emissions” in surrounding areas and on priority Olympic transport routes.

2. Green technologies like solar energy, wind energy, geothermal energy and so on will be adopted, and the green energy supply will account for more than 26% of the overall supply in Olympic venues.

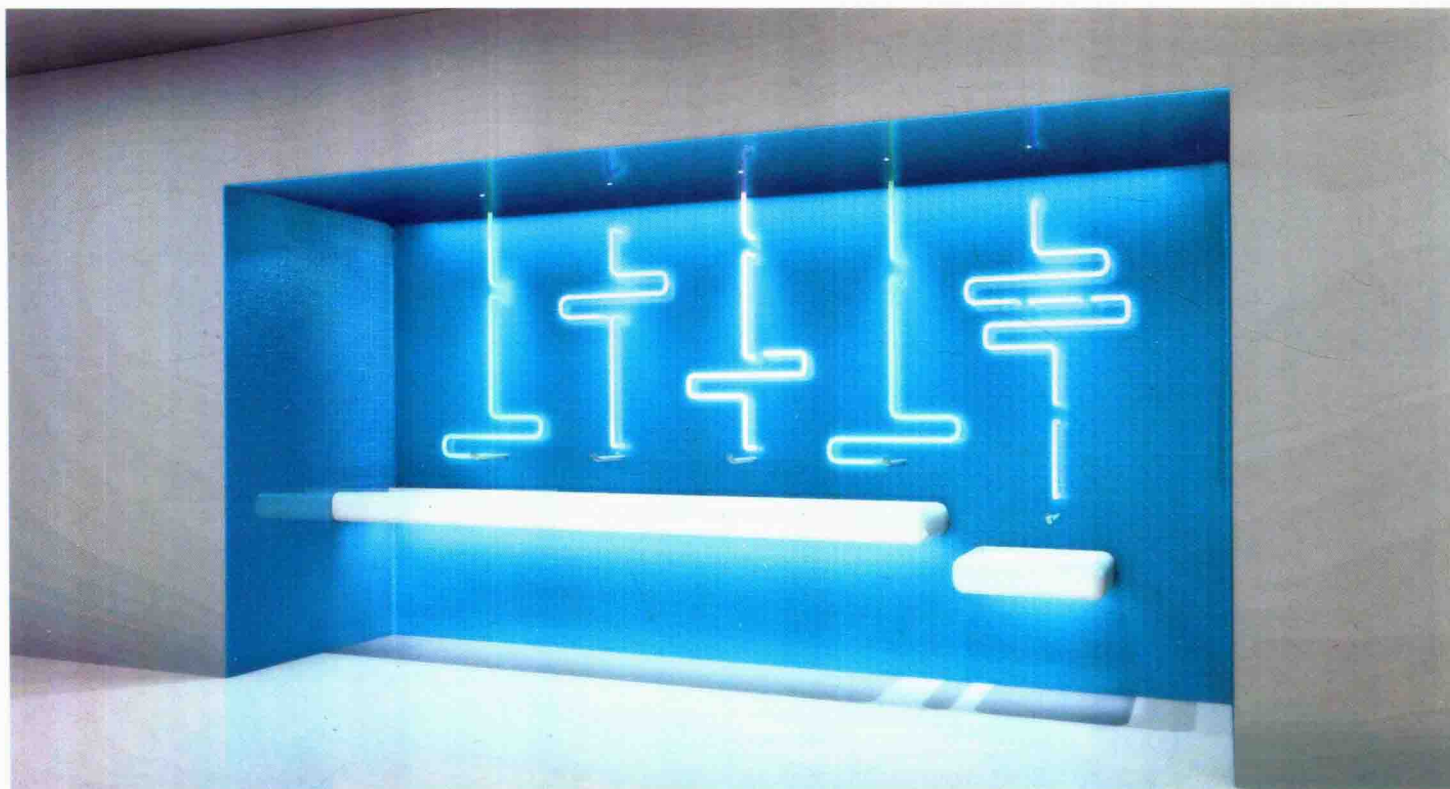
3. Through storm-water run-off systems, gray water use, and through the recycling and treatment of wastewater, the average comprehensive utilization rate of rain for years in the Olympic venues (area) will surpass 80%, and gray water utilization and wastewater

treatment and recycling rate will be 100%.

4. Energy efficient technologies, like semiconductor illumination and geothermal (water) heating pumps, will be widely applied in the main Olympic venues and facilities, reducing energy consumption by 60-70%.

5. The general traffic guidance coverage of city road network is above 80%, with the speed at the priority Olympic transport routes is no slower than 60 kilometers per hour and the monitoring service to the 5,000 Olympic vehicles.

6. The goal of the four “ANYs” in the Olympic information service is basically to meet the demand of individual information services in all areas during the Beijing 2008 Olympics.



1. [Notes]

- The central area of the Olympic Park: this mainly includes the central and southern sections of the Olympic Park. As the major venue for the Beijing 2008 Olympics and the Paralympic Games, it covers 3.15 square kilometers and consists of major infrastructure facilities like the Olympic venues, the Olympic village, the media village, the technology operation center etc.
- The whole Olympic area is called the Olympic Park, and covers 1215 hectares. Located at the northern end of the city's middle axis, it consists of three parts from north to south: the northern section of the Olympic Park (Forest Park), the central section of the Olympic Park, and the southern section of the Olympic Park (the Sports Center Gymnasium)
- The areas surrounding the central part of the Olympic Park and the priority Olympic transport routes: in line with the Olympic transportation planning, priority Olympic transport routes consist of several special transport routes linking the central area, venues and other Olympic facilities.

2. [Notes]

- Green energy is mainly applied to meet the energy demands of winter heating and summer cooling,
- Out of a total of 1.99 million square meters, a total of 510,000 square meters of the Olympic site will use green energy, amounting to 26.9% of the total.
- The energy demands of the Games can be broken into four parts: energy for winter heating and summer cooling, lighting, kitchen (gas), and hot water supply (this supply requires solar energy amounting to 60-70% of the total).

3. [Notes]

- The comprehensive utilization rate of rain for years will surpass 80%, and the amount of recycled storm water will be 1.05 million tons per year;

- All venues will adopt a gray water system. The total amount of gray water utilized in the Olympic Park and the National Aquatics Center will be up to 4.79 million tons per year;

- The Olympic venues adopt the integration of centralized and separated wastewater treatment facilities, and the wastewater treatment and recycling rate is 100%.

4. [Notes]

- Light Emitting Diode (LED) will be used in the National Aquatics Center and the Olympic multi-functional studio tower. This can reduce energy for night lighting in these areas by 70%;

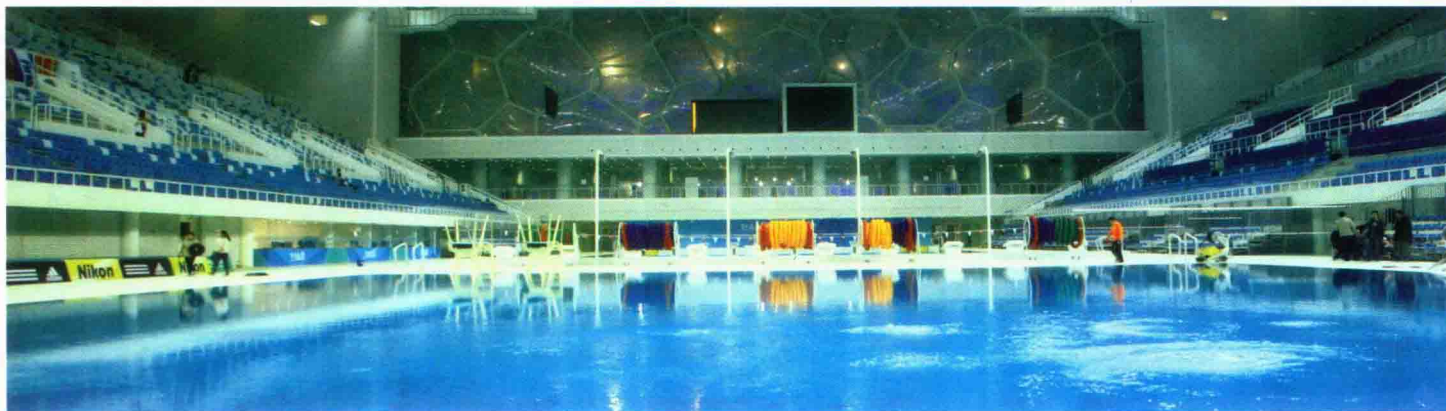
The geothermal heat pump system has been adopted in the Olympic village for the supply of energy for winter heating and summer cooling. The system can save the consumption of standard coal by 3600 tons per year.

5. [Notes]

- The general traffic guidance coverage: compared with the individual traffic guidance coverage, it means the traffic guidance coverage of the vehicles in the city's trunk roads, by distributing the traffic information in large screens, broadcast and so on.

6. [Notes]

- The four "ANYs": The commitment Beijing expressed in its application for hosting the 2008 Olympics to enable "any person in any Olympic-relevant area, at any time, to safely use any necessary equipment to rapidly and affordably access individual information services with no language barriers".affordably access individual information services with no language barriers".





四、科技奥运总体部署

第一，实施了科技奥运重大项目。在“十五”国家重大科技专项和“十一五”国家科技计划中，根据科技奥运的技术需求，组织实施了“北京智能交通（ITS）规划及实施研究”，“电动汽车运行示范、研究开发及产业化项目”等10个重大项目，涉及建筑、交通、生态环保、安全、信息及体育科技等多个领域。

第二，启动了“科技奥运专项”。结合2008北京奥运的实际科技需求，重点在奥运赛事和大型活动技术保障与服务、奥运工程建设、“夺金”体育科技、奥运城市建设等五大方面。

第三，开展了“支撑绿色奥运科技专项行动”。围绕实现奥林匹克公园中心区域“零排放”等六大目标，重点在新能源汽车、绿色能源、节能技术与产品、奥运信息服务、奥运交通服务等六大方面，安排了面向节能减排、环境保护各类技术集成应用的重点项目。

第四，集成全国科技资源，为奥运建设提供技术支持与服务。科技部以863、科技攻关（支撑）等国家科技计划为主体，联合北京市等成员单位共同实施了一大批科技奥运项目，集成了全国科技力量，全面投入科技奥运建设。截至目前，项目（课题）国内外专利申请数量已超过320项，经授权专利已逾180项。

第五，积极利用国际资源，开展科技奥运国际合作。与欧盟、美国、澳大利亚和国际奥委会等国家和组织建立了科技奥运合作关系，建立了“中—欧数字奥运工作组”等协调机制，共同确立了有关合作框架和近100个重点合作项目；与美国能源部围绕天然气利用、分布式电源发展、绿色奥运资源规划等能源议题方面开展了合作；与澳大利亚开展了食品安全、医疗保障和气象科研等12个领域的项目合作等。

General Planning for the Hi-tech Olympics

Firstly, key projects that form the basis of the hi-tech Olympics have been implemented. In the key sci-tech special projects during the 10th Five-Year Plan(2001-2005) and the State Sci-Tech Plan during the 11th Five-Year Plan(2006-2010), there are ten key projects which have been organized and are currently underway in accordance with the technology requirements of the Olympics. These involve the fields of architecture, transport, environmental protection, security, information, physical science and technology etc. Examples include the “Research, Planning and Implementation of the Beijing Intelligent Transportation System (ITS)”, and the “Demonstration, Research and Industrialization of Electronic Vehicles Operation”.

Secondly, “Specific Projects for the Hi-tech Olympics” have been started. In line with the practical requirements of the Beijing 2008 Olympics, five aspects have been emphasized. These include technology guarantees and services for Olympic competitions and large-scale events, Olympic project construction, science and technology employed to help China's athletes win gold at the Olympics, and the Olympic urban construction.

Thirdly, “Green Olympics Action Initiatives” have been implemented. In order to achieve the six indicative goals such as “zero emissions” from traffic in the central area of the Olympic Park, six aspects will be stressed. These include new energy vehicles, green energy, energy-saving technologies and products, Olympic information services, and Olympic transport services. Key projects, involving the integrated application of various technologies in the fields of energy saving, emission reduction and environmental protection, have been arranged.

Fourthly, nationwide technology sources have been integrated to provide technology support and services for Olympic construction. The Ministry of Science and Technology, alongside relevant bodies in Beijing, has integrated nationwide technology sources which have been devoted entirely to the Olympic construction. It has also implemented a large number of Olympic science and technology projects based on national science and technology programs, such as the “863” Hi-tech Research and Development Program, and the National Key Technology R&D Program. At this stage, more than 320 patents have been applied in China and abroad, and more than 180 of these have been approved.

Fifthly, international sources have been positively used to support international cooperation during the hi-tech Olympics. The cooperation relationships with countries and organizations like the EU, the United States, Australia, and the IOC have been established. For example, coordination systems such as the “China-EU digital Olympic working team” have set up related cooperative frameworks and secured deals on about 100 key projects. Cooperation with the U.S. Department of Energy has been channeled into energy projects like natural gas utilization, the development of a distributive power supply, resource planning for a “Green Olympics” and so on. Cooperation with Australia has been over 12 fields including food safety, health care, and meteorological research.



五、科技奥运总体成效

北京奥组委在2006年6月第67次执委会评价,“在科技部和北京市政府的共同牵头组织下,科技奥运形成了有效的工作机制,成功地组织了全国的科技资源,以满足奥运科技需求为导向,为奥运建设提供了全方位的支持和服务”。

(一) 以高科技打造北京奥运,全方位落实“科技奥运”理念

- 1.突破了奥运会开闭幕式、火炬传递等大型活动中的关键技术,为打造高科技与中国文化完美结合的开闭幕式和火炬传递仪式提供了科技保障。
- 2.集中攻克了与奥运赛事组织、媒体服务相关的信息、通信、声像等核心技术,为奥运会赛事的顺利组织和高效运行提供了技术服务。
- 3.大量采用了先进的奥运场馆设计与施工新技术、新工艺和新产品,为实现奥运工程独特的设计和安全施工提供了重要技术支持。
- 4.着力加强体育科技攻关,为中国体育健儿在北京奥运会上再获佳绩,再创辉煌提供了科技支持。

(二) 以先进、适用的清洁技术实现节能减排目标,全面落实“绿色奥运”理念

- 1.全面采用先进环保的清洁汽车技术,促进奥林匹克公园中心区域交通“零排放”,中心区域周边地区及奥林匹克交通优先路线交通“低排放”目标实现。
- 2.广泛应用新能源及高效节能技术,推进奥运工程节能减排。
- 3.集成应用经济适用节水技术,提高奥运场馆(区)水资源综合利用效率。
- 4.推广应用生态改善与环境综合治理技术,加快资源节约、空气清新、水质洁净、环境优美的北京生态型城市建设步伐。

(三) 科技保障“以人为本”的奥运城市服务与安全,进一步丰富“人文奥运”内涵

- 1.着力打造“数字奥运”的公众信息服务,为城市信息化服务提供了

科技保障。

- 2.积极采用了智能交通技术,为城市交通建设和奥运交通疏导提供了科技保障。
- 3.有效提高气象探测水平,采用精细化预报技术,为城市气象服务提供了科技支撑。
- 4.重点突破了奥运场馆安保、食品安全等关键技术,为确保北京奥运安全、顺利举行提供了科技保证。

(四) 以北京奥运建设为契机,增强我国自主创新能力建设,推进科技成果产业化进程

- 1.突破多项关键技术,为进一步推进产业发展奠定坚实的技术基础。“科技奥运”建设有效地促进了奥运场馆建设、信息通信等重点领域一批关键技术的解决,取得了多项世界第一的科技成果,并为相关产业的进一步发展奠定了很好的技术基础。
- 2.以奥运需求为动力,促进建筑、信息、环保和新能源等产业的整体提升,有效推动一批新兴行业的快速发展。通过满足各领域奥运科技需求,扩大了产品市场规模,加快了新能源汽车、3G技术等一批先进、成熟技术成果的产业化,形成了一批新的行业增长点,促进了产业链的完善,实现了新能源汽车、通信等行业的整体突破,推动了下一代互联网、太阳能光伏发电等一批新兴行业的快速发展。
- 3.为企业参与奥运建设搭建了平台,推动一批民族品牌走向世界。“科技奥运”建设为我国民族企业参与奥运建设、通过奥运平台走向世界创造了难得的历史机遇。在“科技奥运”建设中,一批民族企业脱颖而出,凭借先进的科学技术、优质的产品与服务,向世界展示了民族企业的技术经济实力;同时,借助奥运营销迅速提升了企业品牌价值,使一批民族企业逐步向国际化迈进,打造世界品牌。



Overall Effects of the Hi-tech Olympics

“Organized and led by the Ministry of Science and Technology and the Beijing Municipality, an efficient working system has been formed for the hi-tech Olympics. They have successfully integrated national science and technology resources and managed to provide comprehensive support and services for Olympic construction, in order to meet the requirements of the hi-tech Olympics,” announced the BOCOG at the 67th committee meeting in June 2006.

Hi-tech Plays a Key Role in the Beijing 2008 Olympics and the Concept of the “Hi-tech Olympics” Has been Fully Implemented

1. Breakthroughs in key technologies used in large-scale events, including those used in the opening and closing ceremonies and torch relay, have been made, providing a technology guarantee for these events that perfectly combines superior technology with Chinese culture.
2. Breakthroughs in the core technologies used in the Olympic competitions and some media services, including information, communications, sound and image services, have been made. These provide technology services for the smooth organization and efficient operation of Olympic matches.
3. Many advanced design and construction technologies, techniques and products have been adopted in Olympic venues to achieve the unique design of the Olympic projects, and to provide important technology support for construction safety.
4. Physical science and technology projects have been emphasized to provide technology support for the success of Chinese athletes in the Beijing 2008 Olympics.

The Goal of Energy Saving and Emission Reduction Will be Achieved through the Application of Advanced and Applicable Clean Technologies to Fully Implement the Concept of the “Green Olympics”

1. Advanced environmental protection and green vehicle technology will be widely applied to achieve the goal of “zero emissions” from traffic in the central area of the Olympic Park, and the goal of “low emissions” in the areas surrounding the center of the park and on the priority Olympics transport routes.
2. New energy efficient and energy saving technologies will be applied to promote energy saving and emission reduction in Olympic projects.
3. Economically sound water saving technologies will be integrated and adopted to improve the comprehensive water utilization rate in the Olympic venues (area).
4. Technologies for environmental improvement and comprehensive management will be extensively applied to speed up the pace of constructing an “Eco-Beijing”. The characteristics of this “Eco-Beijing” include resource conservation, air purification, water cleaning and general environmental beautification.

Science and Technology can Guarantee “People-oriented” Urban Services and Security, and further Enrich the Connotation of the “People’s Olympics”

1. Public information services of the “Digital Olympics” will be enhanced to provide technology guarantees for urban information services.
2. Intelligent traffic control will be applied to provide technological guarantees for the improvement of traffic services.
3. Meteorological observation and precise forecasting will be applied to provide technological support for the improvement of meteorological services.
4. Breakthroughs in key technologies for the security of the Olympic venues and food safety have been made to guarantee the security and smooth running of the Beijing 2008 Olympics.

The 2008 Olympics will be a Chance for Beijing to Improve its Independent Innovation Ability and to Promote its Technological Industrialization Processes.

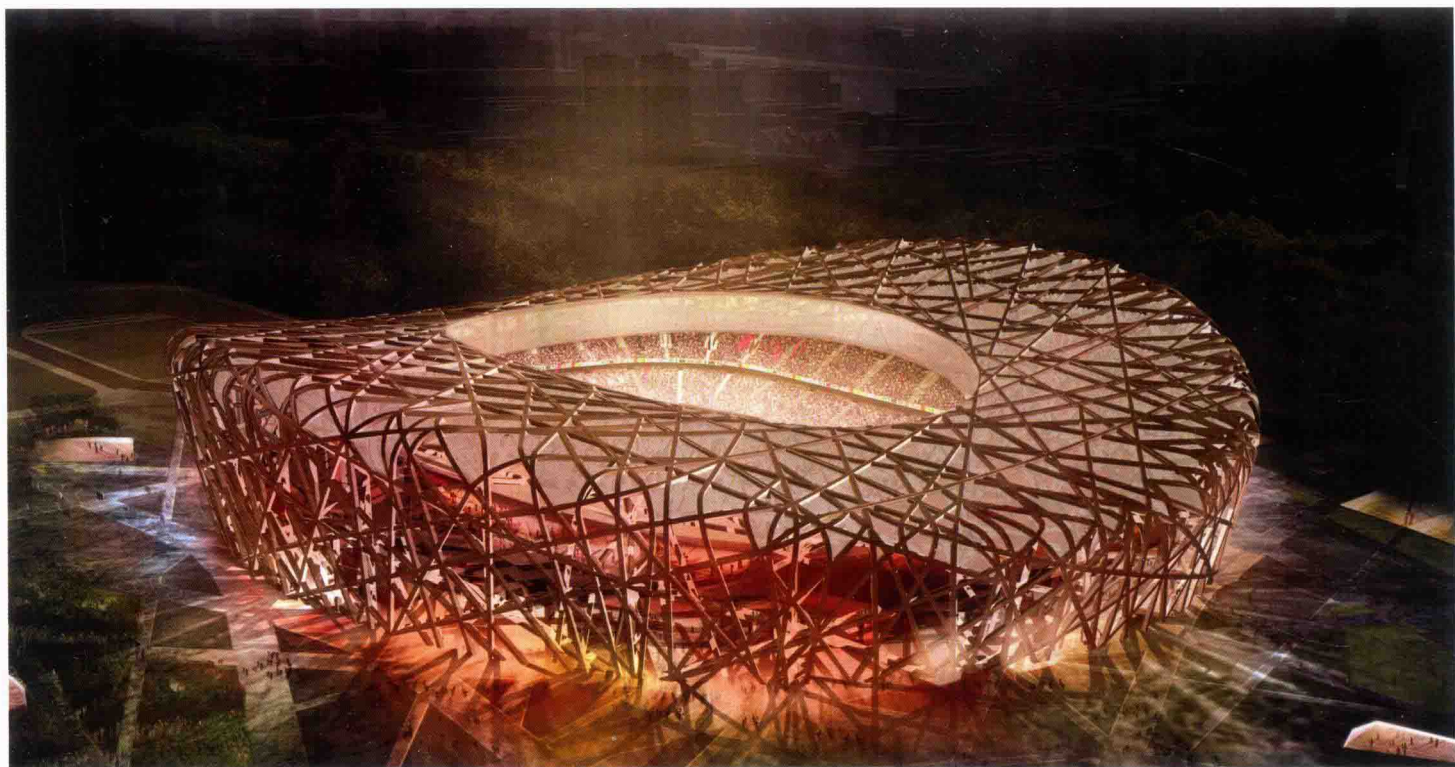
1. New and crucial technological advancements will be made in order to better promote industrial development and secure a solid future for technology. The creation of a “Hi-Tech Olympics” has effectively deciphered key technical issues involving Olympic venue construction and information communication, made many significantly global achievements in science, and laid unyielding groundwork for the expansion of relative industries.
2. Driven by the requirements of the Olympics, an overall improvement in architectural construction and design, information technology, environmental protection and new energy industries has been completed in attempt to successfully promote the development of new industries. Since the Olympics generates a large demand for science and technology, it enlarges the market share of products and accelerates the industrialization of technically-advanced items, such as new energy vehicles and 3G technology. As a result, emerging industries are gaining momentum, filling in the gaps between the industrial chains. The industries of new energy vehicles and communication have had many breakthroughs, improving growth of the next generation of Internet and solar photovoltaic technology.
3. Platforms allowing enterprises to take part in the Olympics have been established to help certain national brands achieve global recognition. The formation of a “Hi-tech Olympics” has brought unprecedented opportunity for our domestic businesses to participate in its construction as well as gain entry into international markets. During this time, a collection of domestic enterprises prevailed over their competitors via advanced science and technology, and high-quality products and services, exposing their technical and economic power on a global scale. Aided by Olympic marketing policies, these outstanding domestic ventures have also tapped into international markets building their brands around the world.

六、开(闭)幕式、大型活动：吹响奥运盛典的前奏

Opening (Closing) Ceremony and Large-scale Events: The Prelude of the Spectacular Olympic Pageant

奥运会开闭幕式：世界瞩目的焦点

The Opening and Closing Ceremonies: The Focus of the World



开闭幕式是奥运会最为精彩和引人注目的重大活动，也是一项复杂的系统工程。科技在开闭幕式中不仅发挥支撑作用，而且通过对艺术创意的技术实现和技术与文化的完美结合，产生独特的艺术效果。

2008年北京奥运会开闭幕式演出和仪式表演中，将充分应用最新科技成果和技术，采用机械、电子、自动控制、声、光、电、影像、多媒体、三维动态仿真等技术，创造出美轮美奂的艺术效果，向全世界展示中国文化的独特魅力。

The Opening and Closing Ceremonies of the Olympic Games are its most spectacular events—and a complicated engineering challenge as well. Science and technology won't just play a supporting role: they will integrate smoothly to produce unique creative effects, bringing innovative artistic ideas to life.

The Opening and Closing Ceremonies will make full use of cutting-edge technology in mechanics, electronics, remote control, sound, light, electricity, video, and 3D dynamic simulation, producing fantastic special effects while showing the whole world the unique charm of Chinese culture.

奥运会开(闭)幕式新型环保焰火及其发射装置：无烟焰火更绚烂

New Environmentally Friendly Fireworks and Launching Devices for the Olympic Opening and Closing Ceremonies: Beautiful Smokeless Fireworks

新型环保焰火发射装置使用压缩空气代替火药，通过电磁阀控制压缩空气释放焰火弹。通过采用无烟/微烟技术、延时增效技术以及减少燃放垃圾技术，焰火药剂的发烟量是原来普通焰火药的1/3-1/5，杜绝目前大型活动焰火表演带来的大量烟雾污染问题。

该系统将在北京奥运会开闭幕式上使用。不产生浓烟和刺激性气味，使奥运会开闭幕式焰火燃放有很清晰的画面，具有安全、可靠、环保以及可精确控制造型图案等特点，同时也避免了使用火药的弹射装置进入奥运会主体育场操作而带来的安全隐患。

Gun powder has been replaced by compressed air in the new environmentally friendly firework launching devices. The compressed air is controlled and released by magnetic valves. Due to technologies, such as smoke elimination or reduction, time expansion and effect enhancement, and waste reduction, the total amount of smoke emitted for these kinds of fireworks is one third to one fifth less than for the traditional kind. These technologies can be used to solve the problems of smokiness and smoke-based pollution in large-scale events.

This system will be used formally in the opening and closing ceremonies of the Beijing 2008 Olympics. Without heavy and pungent smoke, the firework performances in the opening and closing ceremonies will be able to be photographed and filmed clearly. Other effects include improved safety, reliability, environmental protection and more precision in the control of patterns and shapes. At the same time, it will also avoid the safety problems of using gunpowder-based devices in major Olympic venues.

