Golden Concord Holdings Limited
協鑫(集團)控股有限公司

协鑫集团低碳领导力分享

Low Carbon Leadership

2011年12月 Dec 2011

Peter Xie

Bringing Green Power to Life

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协鑫新能源愿景、使命和目标
GCL New Energy's Vision, Mission and Objectives

成为全球最受尊重的新能源产品和解决方案供应商
To become the most respected provider of new energy products and solutions

把绿色能源带进生活
Bringing Green Power to Life

通过科技创新和资源整合，提供最有竞争力的新能源产品和解决方案，改善人类生存环境

To improve human living environment by providing the most competitive new energy products and solutions through technology innovation and integration

协鑫历史 History of GCL-Poly

Nov 2007

GCL-Poly, a subsidiary of Golden Concord Group (3800.HK)was listed on Hong Kong Stock Exchange

Dec 2009

GCL-Poly was selected as a constituent of Hang Seng Composite Index

Feb 2010

GCL-Poly was selected as a constituent of Hang Seng Mainland 100 Index

Jul 2010

GCL-Poly issued 3.1 billion new shares to China Investment Corporation

Aug 2010

GCL-Poly was elected as one of the most innovative Chinese companies in 2010 by Fortune Magazine

Dec 2010

GCL-Poly ramped up to 3.5GW of wafer capacity

July 2011

GCL-Poly ramped up to 6.5GW of wafer capacity

Major Businesses of GCL-Poly

GCL-Poly Energy Holdings Limited
保利協鑫能源控股有限公司

Solar Business

Polysilicon & Wafer Business



Solar Farm & System Integration Business



Power Business



保利协鑫简介： 光伏业务概述
GCL-Poly: PV Business Intro

保利协鑫光伏业务涉足产业链的多晶硅、铸锭/硅棒、硅片、系统集成，以及光伏电站等环节：
GCL-Poly is engaged in businesses along the value chain, including polysilicon, ingot/silicon rods, wafer, system integration and solar farms:

- **多晶硅，铸锭/硅棒及硅片： polysilicon, ingot/silicon rods, wafer:**

-多晶硅：2010年产能达21,000吨，位列全国第一，全球第三

- **Polysilicon:** 21,000MT in 2010, No. 1 in China and No.3 in the world

-2011年预计产能达65,000吨，有望成为全球第一

- Expand to 65,000MT in 2011, expect to be world No.1

-硅片：2010年产能达3.5GW，位列全球第一

- **Wafer:** 3.5GW in 2010, World No. 1

-2011年预计产能达6.5GW，将继续巩固全球领先地位

- Expect to reach 6.5GW in 2011, will consolidate the leading position worldwide

-2010年所占全球的市场份额约为40%

- 40% of global market share in 2010

- **系统集成：System Integration**

- 与全球范围内的项目开发商，总包商，集成商，安装商，分销商，金融投资商，电力生产商和电力公司等展开了广泛的光伏项目战略合作

- Work as an integrator of resources along the solar industry value chain by forming strategic alliances with top global manufacturers, developers, EPCs, financial institutions and investors

- 旗下中环光伏系统有限公司是国内光伏系统集成领域国家标准的主要参与制定单位

- The subsidiary company of Zhong Huan Solar System Integration is the main domestic participant in making national standards of PV system integration

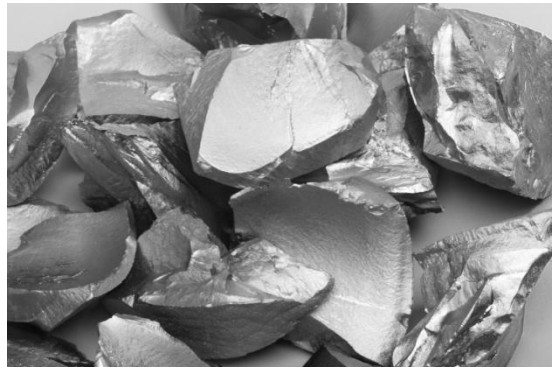
- **光伏电站：Solar Famrs**

-拥有亚州最大光伏运营电站（20MW）

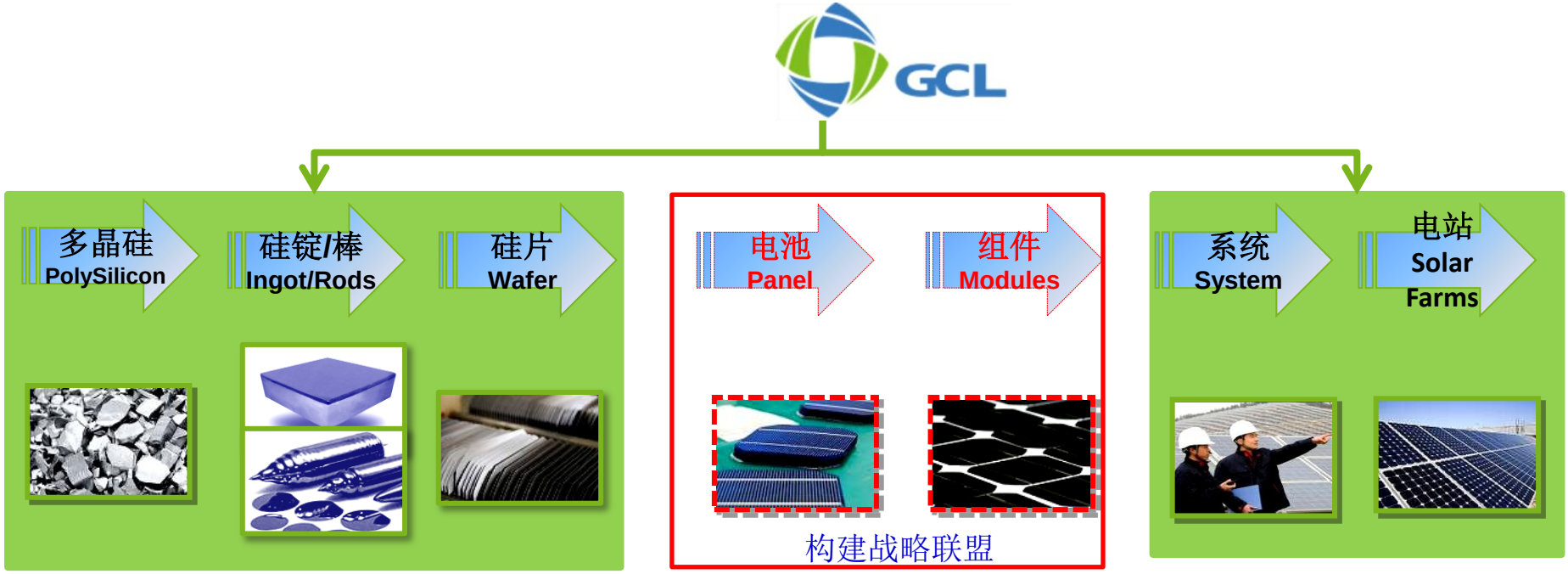
- Owns the biggest operating solar farm in Asia (20MW)

-海外光伏电站总装机容量及开工量》200MW

- Total capacity and start-ins of oversea solar farms > 200MW



保利协鑫简介：GCL光伏发展战略
GCL-Poly: GCL PV Development Strategy



GCL核心业务领域，截至2011年度末，多晶硅产能已达65000吨，硅片产能已达6.5吉瓦

GCL不直接进入，与合作伙伴构建战略联盟

GCL协助合作伙伴推广组件产品应用于系统及电站建设

Core business fields of GCL, total capacity of Polysilicon and wafer has reached to 65000MT and 6.5GW respectively by the end of 2011

GCL does not get involved directly, forming strategic alliances with partners

GCL assists partners in promoting module products applied in system and solar farms construction

保利协鑫简介： GCL海外光伏电站概述
GCL-Poly: GCL Oversea Solar Farms Intro

主要优势 Main Advantages

>15年的电厂设计与总承包(EPC) 的丰富经验
> 15 years of rich experiences in design power plants and EPC
拥有出色的运营和维护(O&M) 能力
Outstanding capabilities of O&M
全球唯一垂直产业链从硅材料到电力运营
The only global company with vertical integration from PV silicon technology to IPP.

主要业务 Main Businesses

开发项目、合作开发 **Project development (In co-operation)**
电站项目设计和建设 **Design and construction in power plant**
电站运营和管理 **power plant O&M**

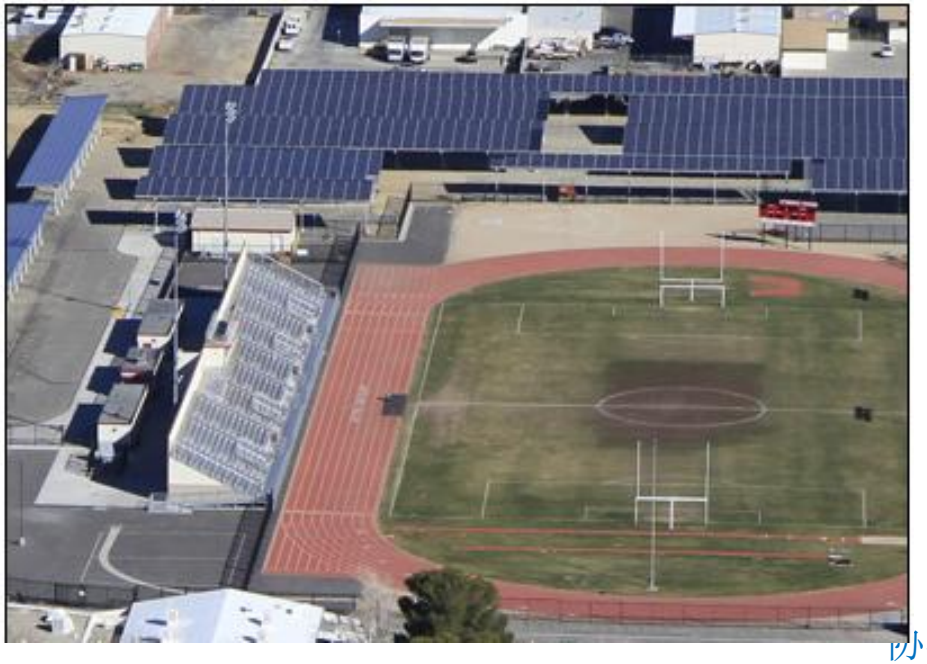
主要策略 Main Strategies

侧重与合资企业合伙方联合开发
Prefer to develop with JV partners
与在当地有成熟开发经验，具备优质项目的开发商合作
Work with local developers with experiences and high-quality projects
凭借协鑫成熟的设计机构和现有的EPC和O&M能力进行运作
Using the design institution and current EPC and O&M capabilities of GCL for operation
有效和具有竞争力的融资结构
Effective and competitive financing structure




GCL Solar Energy Ltd

- The largest 20MW Operating Solar Power Plant in China
- The power plant's development, design, construction, operation, maintenance and management are all carried out by GCL
- Connected to the grid and started operation on 30th Dec 2009



Other Completed Projects in U.S. (1H11)
• Little Rock High School
• Knight High School
• Desert Wind High School
• Palmdale High School
• Antelope Valley High School
Global Pipeline
3.0 GW

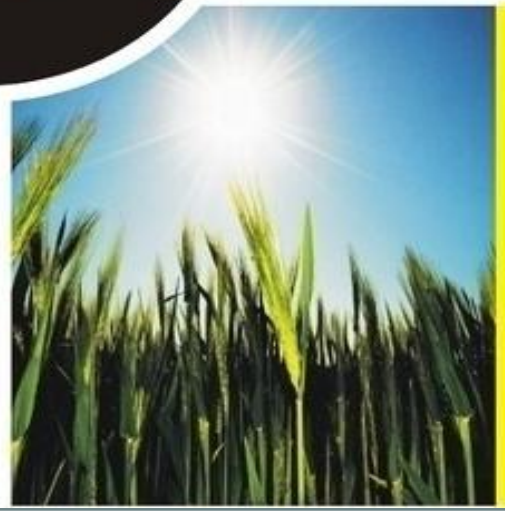
地球能源危机

使用太阳能能源，人类共同的责任
Solar Energy Application，Global Responsibility

太阳能能源的利用，将成为人类未来发展的必由之路，太阳能能源为人类解决环境污染、能源缺失问题，以拯救我们赖以生存的地球和环境，据计算使用一台容量为120升的太阳能热水器一年，等于少砍伐8棵大树，节约214公斤标准煤节约163立方米天然气，节约1748度电产生的热量、减少678公斤二氧化碳的排放……

中国高建筑能耗
Chinese High Energy-Consumption construction

我国每年新增建筑约20亿平方米，但是接近99%为高能耗建筑，单位建筑能耗为发达国家的三倍以上。到2020年，我国建筑能耗将达到10.89tec（亿吨标准煤），用电高峰期将相当于10个三峡电站满负荷输出。



太阳能新能源
New Energy, Solar Energy

太阳能是大自然馈赠给人类的礼物，据计算，整个太阳燃烧1秒相当于1.28亿亿吨标准煤所释放出的能量，辐射到地球上的能量只有它的22亿分之一，每秒钟照射到地球上的能量就相当于500万吨煤，如果照射40分钟，便足以满足全人类一年的能量需求。

应对气候变化与温室气体减排压力
Climate Change and Drive to low emission

现在

- 目前，中国的温室气体排放大约有80多亿吨，占全球温室气体排放的23%
- China CO2 emission >8 billion tons, 23% of global emission

未来

- 按照我国的发展目标，到2020年GDP翻两番，能源消耗翻一番，15%非化石能源比例
- At the current development speed, China GDP doubles in 2020, energy consumption also doubles, renewables~15%

后果

- 温室气体的排放至少增长60-70%，达到130-150亿吨，占世界温室气体排放的40%左右
- CO2 emission increases by 60-70% to 13-15 billion tons, 40% global emission

措施

- 面对减排的国际压力，中国必须严格控制二氧化碳排放，大力发展可再生能源,低碳能源。
- China has to control CO2 emission to help global climate. Renewable is the only way.

中国太阳能的资源远大于其它可再生能源
Solar in China, the Only Abundant Renewable

种类 Type		我国每年可再生能源资源可开发量 Available Renewable per year	折合标准煤（亿吨） Equivalent of Coal （ 100 mill T）
太阳能 **Solar**		100,000 GW	16 0
风能 **Wind**		1,000 GW	2.46
水能 **Hydro**		经济可开发 Economic Viable 400 GW 技术可开发 Technical Viable540 GW	4.8～6.4
生物质能 **Bio**	生物质发电 Biomass	3亿吨秸秆 + 3亿吨林业废弃物 300 mill T straw+ 300 mill T waste	1.5 + 2.0 = 3.5
	液体燃料 **Liquid**	5000万吨 50 million T	0.5
	沼气 **BioGas**	800亿m^3 80 billion m^3	0.6
	总计 **Sum**		4.6
地热能 terrestrial Thermal		3.3 billion T	33（但适于发电的少）Not viable for electricity generation

协鑫新能源战略 GCL's New Energy Strategy

☐ 全球能源危机扩大，中国的能源危机尤其突出。
Energy crisis is a big global problem, especially for China
☐ 新能源是危机的解决方案。 **New energy is the solution**
☐ 行业定位：绿能、节能、储能
Industrial Positioning: Green Energy, Energy Saving, Energy Storage

开源 New Energy Source

- 太阳能 Solar Power
- 风能 Wind Power
- 生物质能 Biomass Energy
- 核能 Nuclear Power

节流 Energy Saving

- LED
- 储能 Energy Storage
- 电动车 Electric Vehicle
- 再回收 Recycling

GCL创新技术举措（1/6）：多晶硅

项目project	举措methods	效果results
氢冷却装置 Hydrogen cooling	•自主设计单体10万吨，目前世界上最大、最先进的冷氢化装置 Self-designed monomer of 100,000 tons cold hydrogenation unit, the world's largest and most advanced  	•实现完全闭路循环、零排放、环保理念至上 • complete closed loop, zero-emission, environment friendly •产品品质、电耗、综合能耗、运营成本、投资成本世界领先 •World leading in Product quality, power consumption, overall energy consumption, operating costs, investment costs
还原炉 Reduction furnace	•自主设计高效还原炉 Self-designed High efficient reduction furnace	•还原电耗低于40度/公斤 •Less than 40kilowatt hour/kilo electricity is used for reduction •产品品质、还原电耗、产率、转化率位居世界最先进行列 •World leading in product quality, reduction energy consuming amount, Production rate, conversion rate
能源优化技术 Energy optimization techniques	•蒸汽透平技术 Steam turbine technology •凝水回收能源综合利用技术 Condensate Recycling and energy utilization technology •多品位能源综合利用技术 Multi-grade energy utilization technology •废水综合回收利用技术 wastewater recycling and using technology •高效还原炉节电技术及冷却水能量回收技术等 Highly efficient electricity reduction furnace and cooling water energy recycling technology	•增大能源利用效率，减少多晶硅单位生产能耗 •Increasing energy efficiency, and reducing unit energy consumption of polysilicon production

GCL创新技术举措（2/6）：多晶硅（续）

项目	举措	效果
优化物料循环及技术 Optimize material Circulation and Technology	•单套十万吨/年四氯化硅处理技术及粗分技术，并配套碴浆回收处理技术 Single set of one hundred thousand tons / year of silicon tetrachloride and coarse sub-processing technology, and slurry recycling technology •运用高效精馏工艺技术的应用 Application of highly efficient distillation technology •全新GCL理念研发的还原尾气回收处理系统 Reducing exhaust recycling and disposing system invented by GCL •全新理念的多晶硅收获整理技术 New Polysilicon harvesting and trimming technology	•使冷氢化物料处理流程进一步完善，充分回收物料并利用 Further improved cold hydrogenated material disposing process ,and fully recycle materials to use •实现了国内最大的单套三氯氢硅精馏提纯 Achieved the largest single set of trichlorosilane distilling purification in China •采用自主技术实现还原尾气处理 Self-designed exhaust gas reduction technology •首次在多晶硅行业引入自动化生产线理念，既减少用工，也对多晶硅产品后续处理带来极大便利，最大限度地保证多晶硅品质 For the first time in the polysilicon industry, introduction of the concept of automated production lines, reduces employment, and brings great convenience in follow-up disposing of polysilicon products
设计与施工优化 Design and Construction Optimization	•优秀的总图布置技术 Excellent general layout techniques •在施工图设计中使用三维技术 3-D construction plan	•减少物料输送中的能量及质量损失 Reduction of material transportation loss in energy and quality •设计效果更加直观，避免设计错误，减少对施工的影响 More intuitive design, avoiding design errors and reducing its impact of construction • 缩短产品品质达标时间 Shorten the time needed to achieving quality standard
新技术、新路线、新设备研发 New technologies, new routes, new equipment R & D	• 开发新型多晶硅技术路线 R&D in new type policilicon technologies • 48对棒及48对以上还原炉型的设计开发 R&D IN 48 pairs rods and above reduction furnace • 引进洁净施工理念，引进洁净监理，强化施工过程中洁净管理 Ideas and implementations of Clean construction •反应耦合的化学气相沉积全功能模拟技术开发 Develop in reaction coupled of chemical vapor deposition technique full-featured simulation	•优化关键技术 Optimize key technology •新建装置工艺更加合理 More appropriate methods of installation of devices •能耗、流程、结构及布局更加优化 Optimized energy consuming, processes, structure and layout.

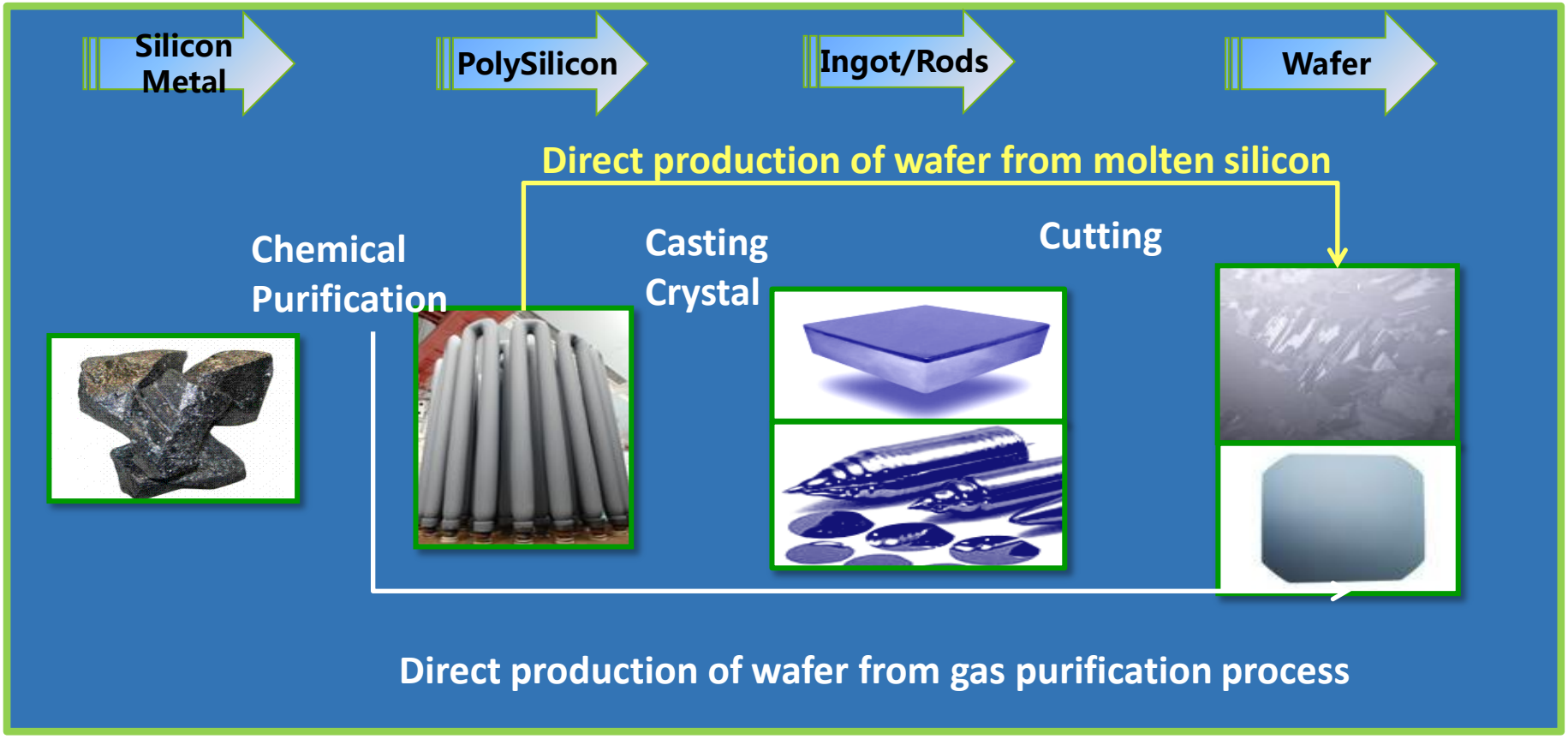
GCL创新技术举措（3/6）：铸锭/拉晶
ingot/Crystalization

项目	举措measures	效果results
铸锭炉热场 Ingot furnace thermal	**•DSS450铸锭炉大投量650KG铸锭工艺的开发** Develop the method of 650KG input ingot using DSS450 ingot furnace **•DSS450铸锭炉大投量800KG铸锭工艺的开发** Develop the method of 800KG input ingot using DSS450 ingot furnace	**•在现有设备的基础上产能提升约20%-30%，成品率提高约1%-2%，每千克硅锭能耗降低22%-24%** 20-30% capacity has been improved on current equipments, yield rate improved 1%-2%, energy consumption of rots has been decreased 22%-24%/Kg
铸锭单晶 Single crystal ingot	**•DSS450铸锭炉G5铸造单晶开发** Develop G5 single crystal ingot by DSS450 ingot furnace **•DSS450铸锭炉大投量800KG铸锭工艺的开发** Develop the method of 800KG input ingot using DSS450 ingot furnace	**•转化效率比普通多晶高0.3%-0.5%** Conversion efficiency is 0.3% -0.5%higher than ordinary polycrystalline **•项目取得最高17.72%的光电转换效率** Achieved the highest photoelectric conversion efficiency of 17.72% **•光衰与普通多晶类似，远低于直拉单晶** Lumen is similar to ordinary polycrystalline, much below the Czochralski crystal **•相比直拉单晶片，具有更大光吸收面积** Compared to Czochralski crystal piece, we have larger area to absorb light
大型铸锭炉 Huge ingot furnace	**•自主研发800KG大容量铸锭炉** Self R&D 800KG large capacity ingot furnace	**•大容量，产率、良率提升，能耗降低** Large capacity, enhancement in rate of production and qualification, less energy consumption

GCL创新技术举措（4/6）：切片/辅料 Slicing/supporting material

项目 Project	举措 Measures	效果 Results
线、砂、液的技术优化 Optimization of the line, sand, liquid technology	•MB、NTC切片机的双向切割改造 two-way cutting transformation of the MB, NTC slicer •回收砂、不同型号的砂的工艺试用 Recycling sand, trial process of different types sand •各种掺比的回收液的工艺试用 the trial process of mixed-ratio recycling fluids	•有效降低成本 •Significant cost reduction •优化生产工艺 •Optimization production technology
切片流程优化 Optimization of slicing process	•切片工艺优化：导轮、线径、机台参数等的调整和配合 Optimization of slicing: adjusting and matching Guide pulley, wire, parameters of machine •清洗工艺优化 Optimization of purging	•有效降低成本 •Significant cost reduction •提高产品质量 •Improvement on quality •优化生产工艺 •Optimization production technology
辅料技术提升 Improvement on supporting material technology	•废坩埚回收工艺 Crucible waste recycling process •合成炉尾气回收系统 exhaust gas compositing furnace recycle system •精馏脱硼装置 Boron removal by distillation •单面吸浆坩锅 Single midge crucible	•有效降低成本 •Significant cost reduction •提高产品质量 •Optimization production technology

GCL创新技术举措（5/6）：全力研发新型晶硅光伏技术
Creative technology initiatives by GCL: New type of Silicon PV Technology



TCS气相沉积硅片，直接硅片技术，液态金属衬底硅片；LASS技术；改进型RGS技术等等 TCS vapor deposition of silicon, Direct wafer technology, Liquid metal substrate wafer; LASS Technology, Improved RGS Technology, etc.

- 有全新概念，也有对老技术的全面提升 Brand new concept, with overall improvement in old technology
- 技术原型已近做出，成熟期应在未来3~5年 Technology protocol has been made, expected to be matured in 3-5 yrs.
- 颠覆现有技术路线，减少工序，极大程度节约硅料，并提升品质 Less processes, saved more materials and improved quality
- 这些新兴技术目标直指光伏组件成本50美分/瓦 Targeting at USD 0.5/W of PV modules costs

GCL创新技术举措（6/6）：长期持续的科研投入
Creative technology initiatives by GCL: long-term R&D Investment continuously

科技研发机构

R&D Institutions

- 建设美国华盛顿州里奇兰（Richland）的美国研发中心，汇集中、美最优秀科研专家 US R&D center is set up in Richland, Washington, where excellent experts are gathered there
- 成立苏州中科协鑫工业研究院 GCL Industrial Research Center in Suzhou
- 成立苏州协鑫工业应用研究院 GCL Industrial Application Research Center in Suzhou
- 设立江苏光伏发电系统集成工程技术研究中心 GCL Industrial Application Research Center in Suzhou
- 成立南大 – 协鑫研究院 Nanjing University – GCL Research Institution
- 成立中环工程研究院 Nanjing University – GCL Research Institution
- 建立博士后科研工作站，先后成立了2个技术研究所 Postdoctoral Research station was set up, as well as 2 technology research institution
- 3个省级技术研究中心、1个博士后、1个院士工作站 3 provincial technology research center, 1 postdoctoral and 1 academician work station

自主知识产权技术创新

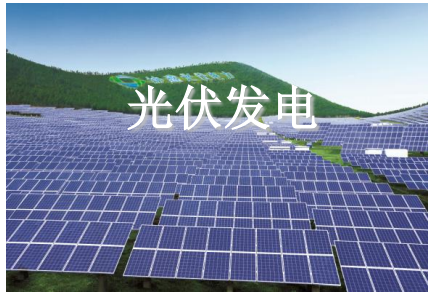
IPs and Innovative Technologies

- 荣获2006年度国家科技进步二等奖
- Won Second price of 2006 National Scientific Advancement Reward
- 荣获国家环境保护技术一等奖
- Won First price of National Environmental Protection Technology Reward
- 拥有30多项专利技术和GCL自主创新的科技品牌
- GCL owns over 30 IPs and innovative technology brands

GCL节能减排举措：我们为社会创造价值的每一天
Energy Saving Initiatives: creating values for society every day

- 已投建并运营中国最大产能规模的多晶硅生产基地
- Biggest polysilicon production base in China
- 日产多晶硅约100吨
- 100MT of output per day
- 每天创造产值约3,400万元
- Output value of 34m RMB per day
- 提供逾3,500个就业岗位
- 3,500 jobs were provided

- 已投建并运营全球最大产能规模的硅片生产基地
- Biggest wafer production base in China
- 日产硅片约700万片
- 7m wafers of output per day
- 每天创造产值约9,000万元
- Output value of 90m RMB per day
- 提供逾25,000个就业岗位
- 25,000 jobs were provided



- 已投建并运营亚洲最大的光伏电站（20MW）
- Biggest operating PV power plant in Asia (20MW)
- 已投建海外电站逾10MW
- Invested to build oversea solar farms over 10MW
- 每天发电逾12万度
- 120,000 kmh of electricity are generated per day
- 约满足2.4万户家庭每日生活用电需要*
- Daily needs for electricity of 24,000 households are satisfied

每天减排二氧化碳约3.04万吨，相当于：

- **411万人口每天二氧化碳排放量***
- **每天为全球种植了约3.04万颗树**

Reduction of 30,400MT in CO_2 emission every day, equivalent to:

- **CO_2 emission of 4.11m population every day***
- **30,400 trees are planted in the world every day**

*注：按每户家庭月均使用150度电计算
按人均二氧化碳排放量为2.7吨/年计算
上述统计数据均为截止至2011年底数字

* Note: Calculated as every household uses 150kwh per month
CO_2 emission of 2.7MT/year per capita
The above statistics figures are by the end of 2011

协鑫创造的社会价值
Social Value created by GCL

PV

五年内硅片总销售量107GW，相当于节约标准煤4333万吨(折合27台1百万千瓦机组)，和减排二氧化碳1.6亿吨（中国一年2%碳排放量) The accumulative wafer sales volume in the next five years will be 107GW, and this will help to reduce totally 43.33 million tons of standard coal consumption (equivalent to 27 units of 1 million KWh power generation plants) and 0.16 billion tons of CO2 emission (2% of total China annual CO2 emission).

减少1.6亿吨二氧化碳排放
Reduction of 0.16 billion tons of CO2 emission
=654万亩森林
6.54 million acres of forest

LED

- 五年内芯片总销量1628亿片，如果全部转为7瓦LED灯 (4颗芯片/只），相当于407亿只LED灯，其一年节约的电量为6.3万亿度. The expected total sales volume of LED chips in the next five years will be 162.8 billion units, and if all of them are used for LED bulb (7W, each will use 4 units of chips), this will be amounted to 40.7 billion units of LED bulb, and the accumulative saved electricity will be 6.30 trillion KWh (as compared with normal 60W bulb).

6.3万亿度电
6.3 Trillion KWh =
63个三峡
63 Three Gorges Projects