Coldry Technology
Coldry 褐煤干燥技术




Presentation: 6th China Advanced Coal Chemical Summit 2010
第六届中国新型煤化工国际峰会

Kos Galtos, CEO

AGENDA提纲

The Chinese Coal Market/中国煤炭市场

The Opportunity/市场机会

Coldry Technology/Coldry褐煤干燥技术

Coldry Process/Coldry工艺流程

Coldry Benefits/Coldry的优势

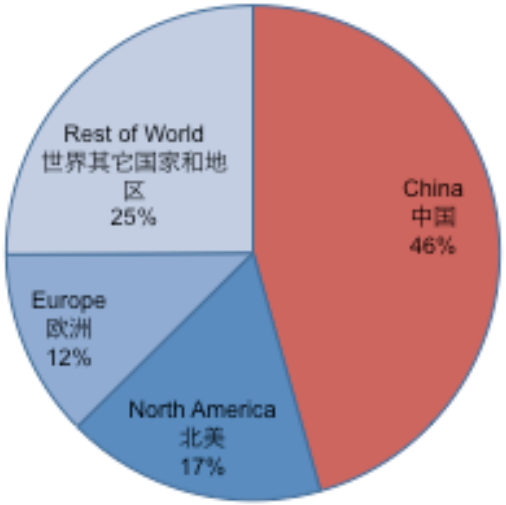
Path Forward/业务拓展

Coal in China中国煤炭市场

- In 2009, China accounted for:
  - 46% of the global production
  - 47% of the global consumption
- 2009年的中国:
  - 占据世界煤炭产量的46%
  - 占据世界煤炭消费量47%

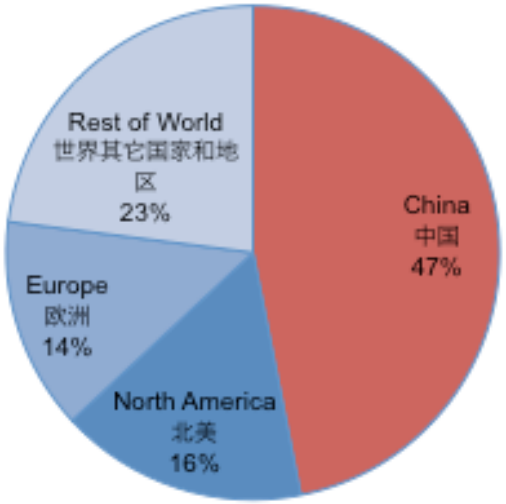
Percentage of world coal production

世界煤炭产量分布



Percentage of world coal consumption

世界煤炭消费量分布



Projected Demand for Coal 煤炭需求预测

The IEA estimate that in 2020 coal demand in China will be:

- 3.17 billion tons
- 2.1 billion tons in the power sector
- 13% increase, or 400 million tons, compared with 2010.

国际能源署预测，到2020年，中国标准煤需求将达到:

- 31.7亿吨
- 21亿吨用于发电
- 与2010年相比，增长4亿吨，增长率为13%

Projected Coal Demand up to 2020 (MT)
2020年中国标准煤需求预测 （百万吨）

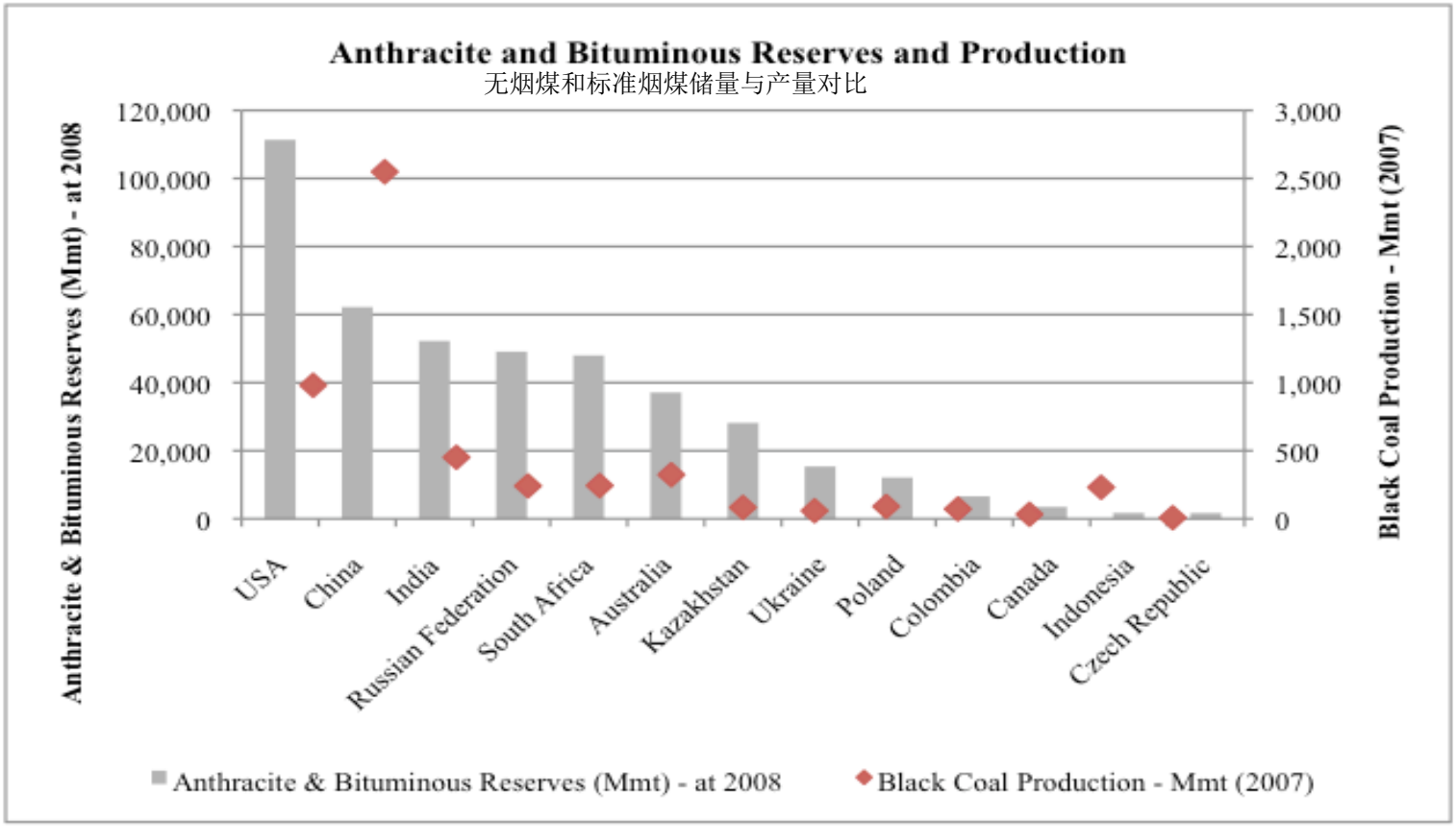
Sector行业	2005	2010	2020
Power电力	1110	1700	2100
Steel钢铁	255	350	320
Construction Materials建筑	285	340	300
Chemicals化工	96	180	250
Residential and Others居民及其它	332	230	200
Total总计	**2078**	**2800**	**3170**

Sources: *IEA Cleaner Coal in China 2009 （国际能源署）*

Chinese Coal Consumption中国煤炭消费量

Consumption levels of black coal in China exceed the current production capabilities, with resources expected to be extinguished in the medium term future – around 20 years

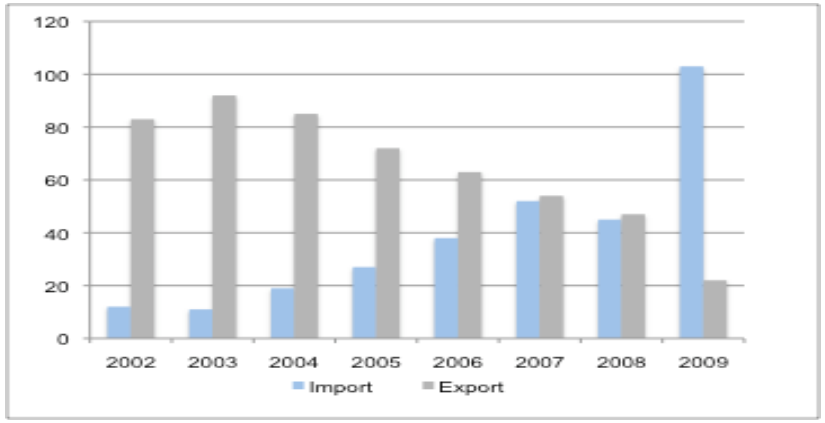
如果中国保持目前的煤炭产量，按2008年探明的标准煤储量（无烟煤和标准烟煤）测算，只能维持20年左右。



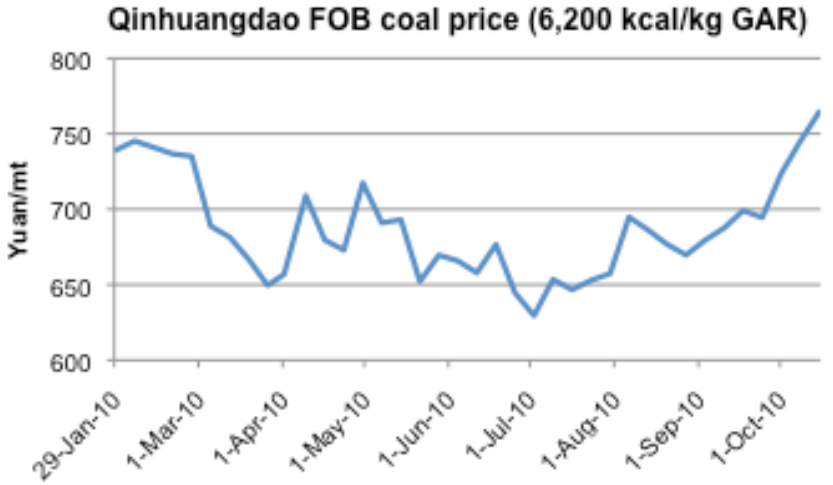
无烟煤和标准烟煤（百万吨）：2008年　　标准烟煤产量（百万吨）：2007年

Coal Imports and International Pricing 煤炭进口及国际煤炭价格

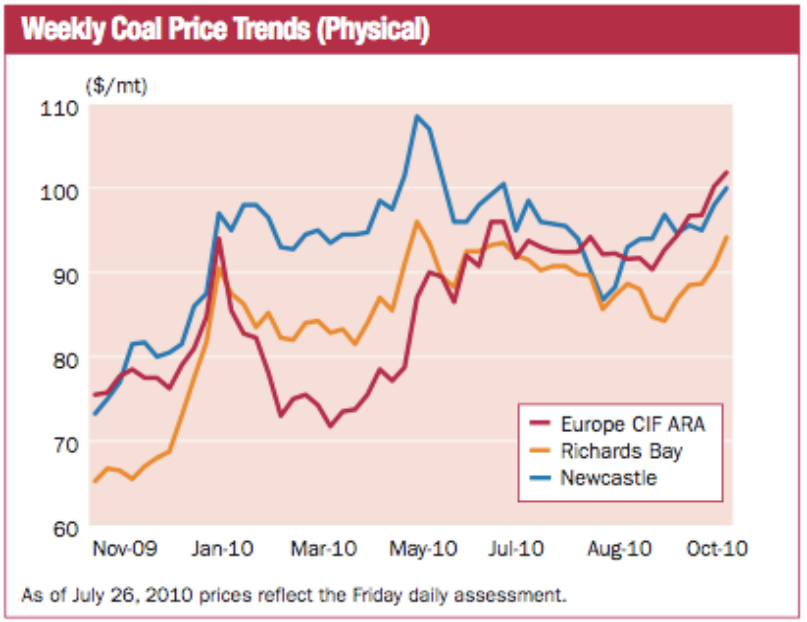
Coal Imports and Exports
煤炭进出口



Unit: Mmt 单位：百万吨



- In 2009, China became a net importer of coal
  2009年中国成为煤炭净进口国。
- China's exports and imports are exposed to the international coal price
  中国煤炭进出口受制于国际国内煤炭价格变化
- Based on average import price of USD80/mt, in 2009 net outflow for coal purchases were above USD 8 billion.
  按80美元/吨进口煤平均价格折算，2009年中国用于购买国外煤炭的总支出将超过80亿美金。



Sources: *Coal Information 2009, Shenhua (中国神华), Platts International, Environmental Clean Technologies Limited analysis.*

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Lignite in the Present褐煤开发利用现状

- China's demand for energy continues to rise
  - Coal chief amongst the available sources
- Supply of hard coals limited, and cost of exploitation increasing
- Lignite & Sub-Bituminous usage rate low, and largely confined to mine-mouth power generation applications
- Finance to exploit Lignite & Sub-Bituminous reserves difficult to obtain
- Growing global CO_2 emissions pressure on existing Lignite utilisation
- Opportunity exists to develop internal reserves for use in power generation and other higher value applications

- 中国对能源的需求与日俱增
  - 煤炭仍旧占据绝对主导地位
- 优质烟煤供应紧缺，开发费用上涨
- 褐煤和次烟煤开发利用相对仍然不足，而且很大程度上用于坑口发电
- 开发褐煤和次烟煤投资回报率比较低
- 全球二氧化碳排放量的增加给现有的褐煤利用造成了很大的压力
- 因此，提质褐煤用于内部发电或生产高发热量的干燥产品具有很好的市场机会

The Opportunity市场机会

Efficiently and effectively removing water from Lignite and Sub-Bituminous coals using Coldry technology to create a Black Coal Equivalent will:

- Enable Lignite & Sub-Bituminous coal as a primary energy supply that:
  - Facilitates energy security
  - Stimulates regional economic growth
  - Further enhance China's balance of trade
- Reduce uncertainty associated with project financing
- Mitigate CO_2 emissions generated versus current technologies
- Create a viable gateway to gasification and CTX technologies using the chemically most suitable coals

利用Coldry干燥技术使褐煤高效脱水，并生产与优质硬煤质量相当的产品可以：

- 使褐煤和次烟煤成为主要的能源供应
  - 确保能源安全
  - 刺激区域经济增长
  - 减少煤炭进口
- 减低项目开发的不确定性
- 减低二氧化碳排放量
- 使褐煤气化和相关煤基化工成为现实

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Coldry is a unique coal drying and water recovery technology which creates a Black Coal Equivalent (BCE)
Coldry是独特的干燥褐煤并回收水的技术，可以生产与优质硬煤品质相当的产品

Coldry is an energy rich fuel from lignite or sub-bituminous coals
Coldry通过高效脱水，使褐煤和次烟煤的价值提升

Coldry is stable and transportable
Coldry产品质量稳定，可供异地销售

Coldry – What does it do?
Coldry褐煤干燥技术可以做什么？

- Coldry Technology cost effectively removes water from Lignite and Sub-Bituminous coals
- Creates a high energy Black Coal Equivalent (BCE) pellet
- Overcomes the source coal tendency for spontaneous combustion
- Eliminates the re-absorption of atmospheric water
- Retains high value volatile characteristics beneficial for gasification and chemical processes
- Provides opportunity for recovery of water expelled from the coal as a pure near-potable distilled water stream

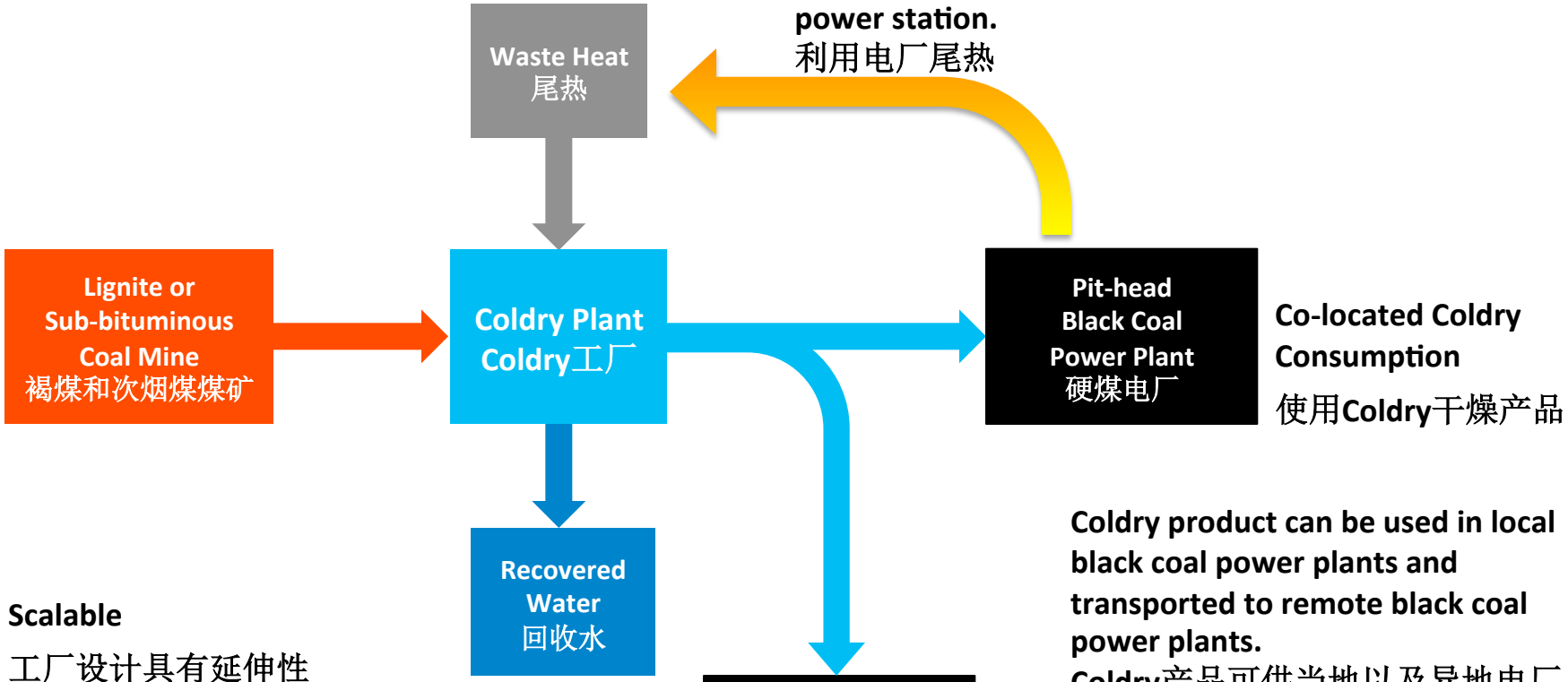
- Coldry褐煤干燥技术可以以低成本干燥褐煤和次烟煤
- 生产与优质硬煤品质相当的干燥产品
- 克服了煤炭自燃的风险
- 干燥产品不回水
- 干燥产品保持高挥发份，适用于煤气化和其它煤化工
- 干燥过程回收水，品质与蒸馏水相当

Coldry – How does it do it?
Coldry褐煤干燥技术如何实现脱水目标？

- Process stimulates natural chemical reaction within coal
- Reaction polymerises active sites in the coal compounds, expelling chemically bound water
- Polymerisation collapses coal pore structure, expelling physically trapped water
- Ejected water migrates to the surface of coal pellets
- Through utilisation of waste heat, from an adjacent power station, the surface water is evaporated

- 此技术使煤炭内部发生化学反应
- 煤炭内部发生化学反应，分解内水
- 聚合作用破坏煤炭气孔结构，脱去外水
- 稀出的水分到达产品的表面
- 通过利用电厂尾热，产品的表层水蒸发

Coldry Process Overview
Coldry技术运用示意



Scalable

工厂设计具有延伸性

Immediately Deployable

可立即投入运行

Cost-effective

运行成本低

Coldry product can be used in local black coal power plants and transported to remote black coal power plants.
Coldry产品可供当地以及异地电厂使用。

100% Coldry possible in significantly upgraded Lignite plants.
褐煤锅炉经过改装，可100%使用Coldry干燥产品。

Benefits of Coldry
Coldry的优点

- Significant CO_2 reduction
- Extends life of Lignite reserves through greater efficiencies in use
- Allows efficient and safe transportation of otherwise stranded resources to export market
- Improves energy security for a rapidly growing economy

- 大幅降低二氧化碳排放量
- 高效开发利用褐煤资源
- 使褐煤提质，扩展销路
- 提升能源安全

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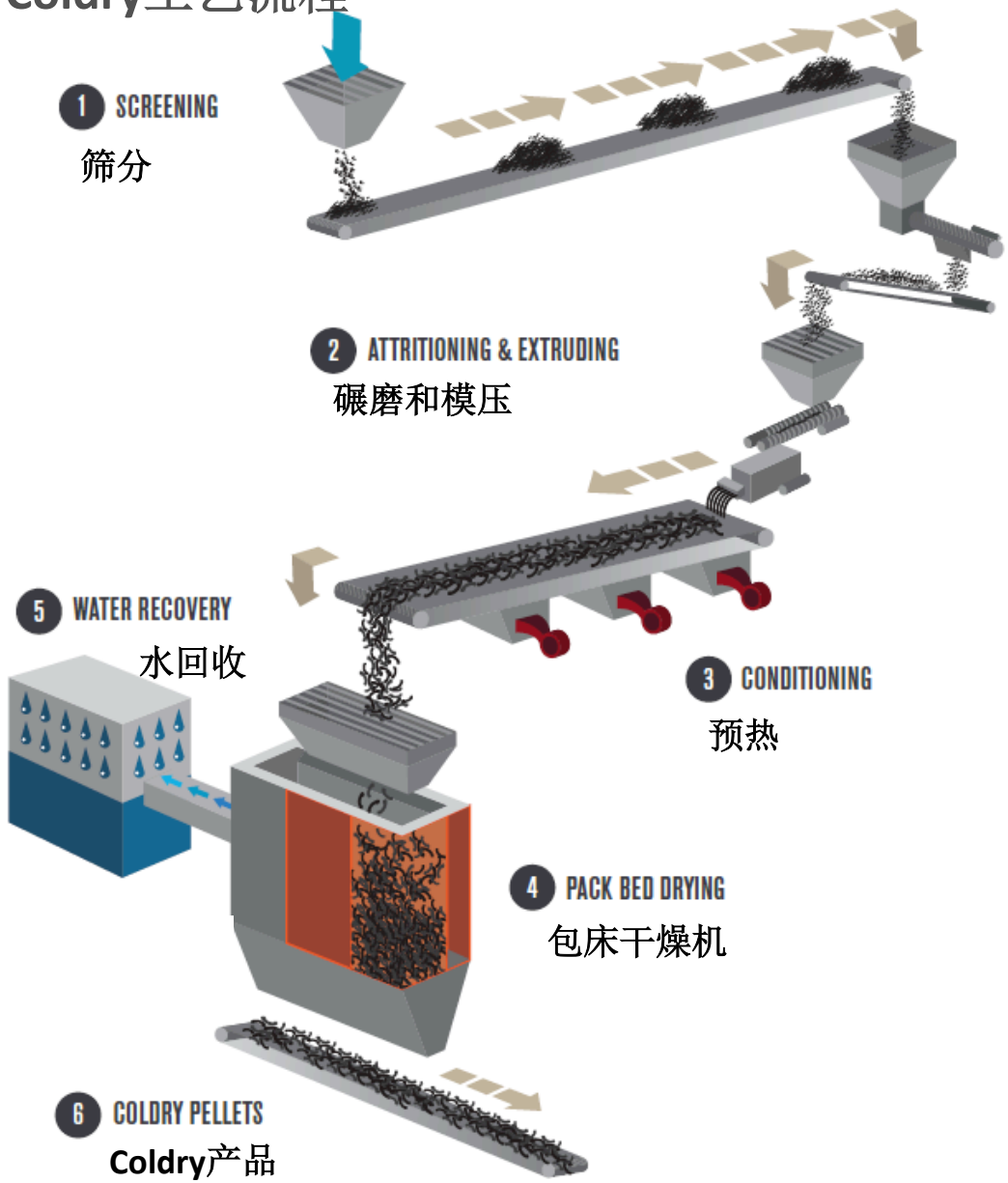
Coldry Process
Coldry工艺流程



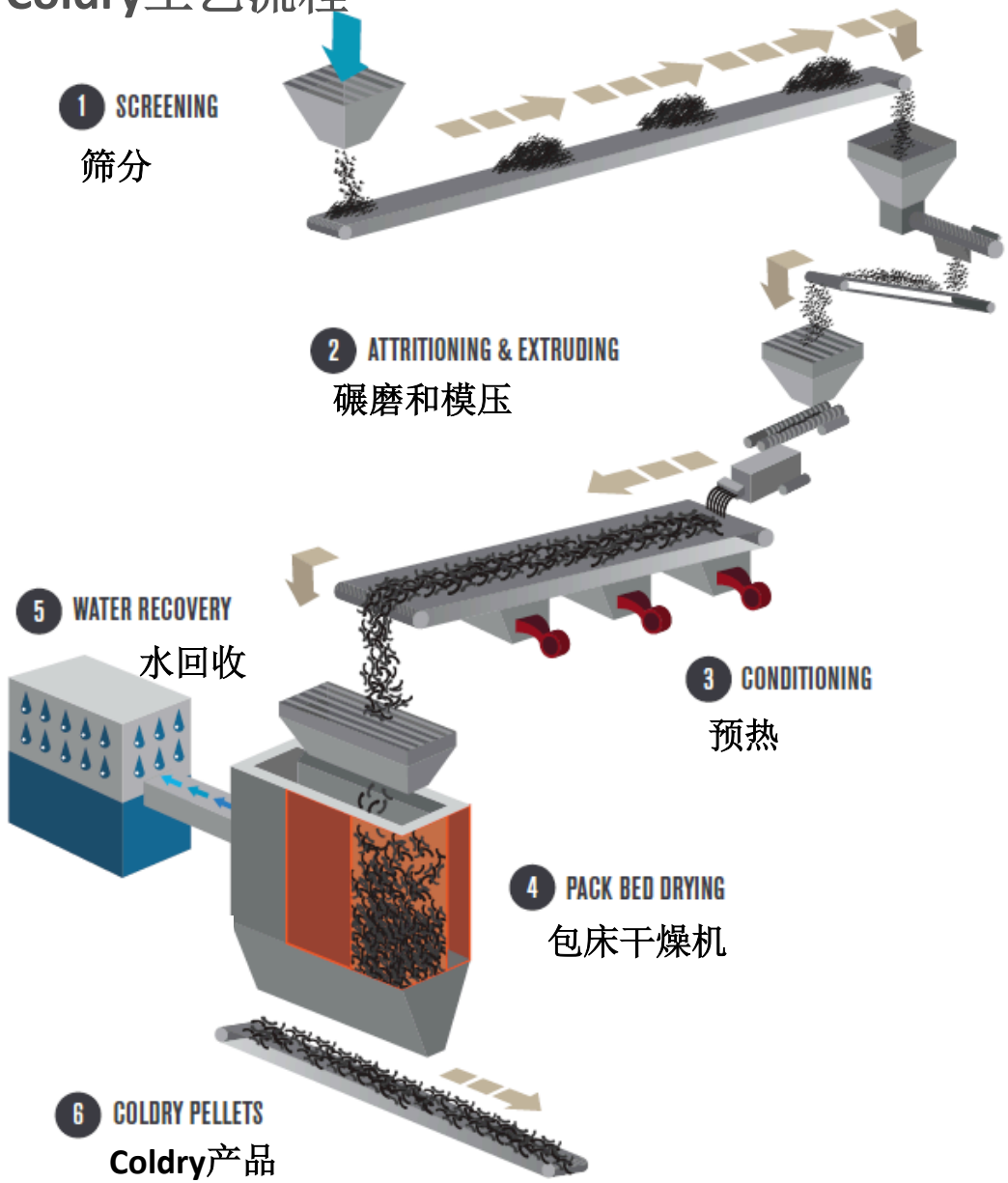
Coldry is a simple, mechanical process which generates a Black Coal Equivalent energy pellet.

1. Screening and adding a small quantity of water to the raw coal
2. Initiating an exothermic chemical reaction to expel water through attritioning and extrusion of a plasticized mixture

Coldry是一项工艺简单的机械式褐煤脱水技术，用于生产与硬煤质量相当的干燥产品。

1. 筛分并为原煤加入一小部分水
2. 通过碾磨和挤压，激发放热反应，使煤炭脱水

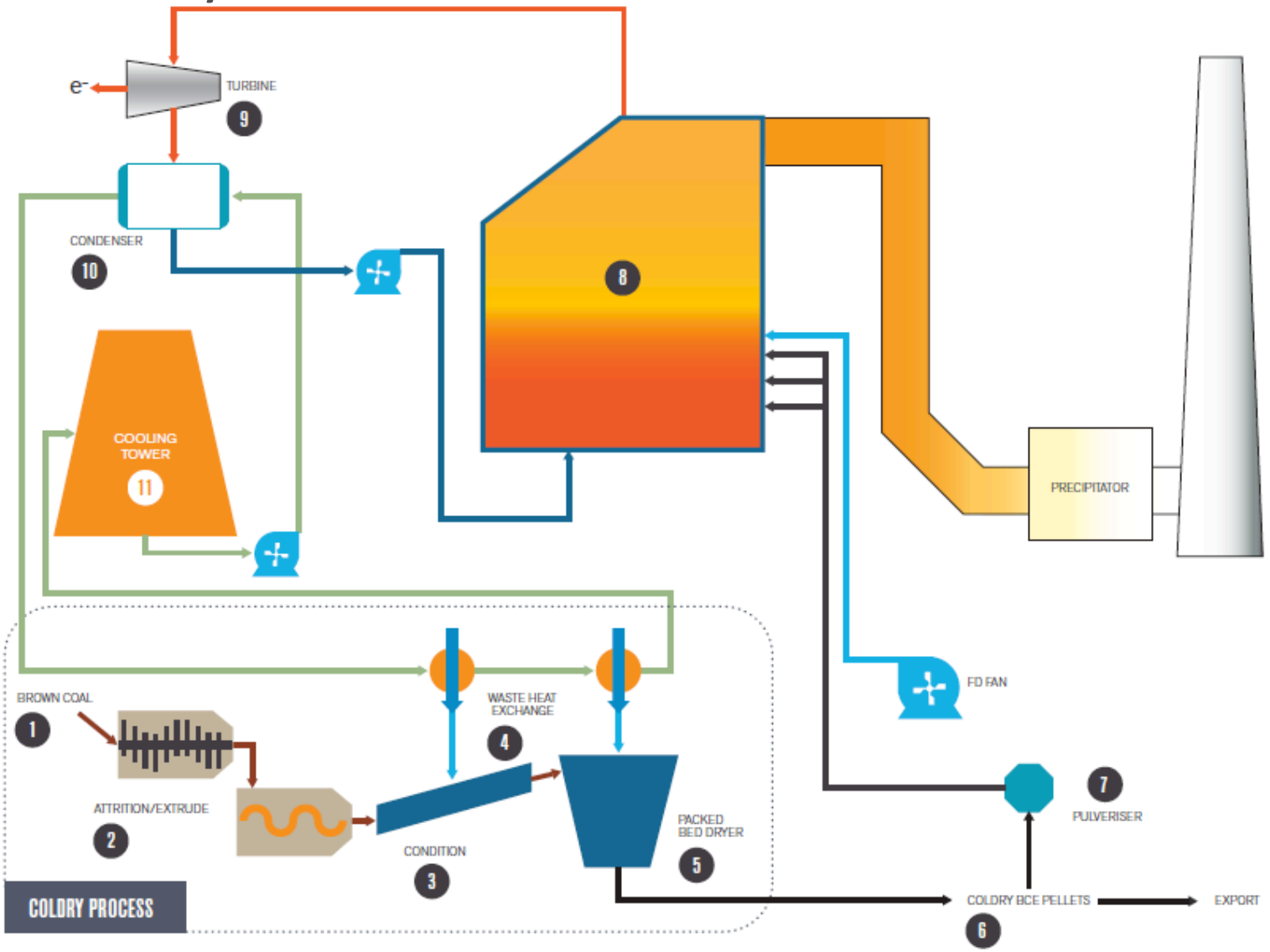
Coldry Process
Coldry工艺流程



3. Warm air toughening of extruded mixture on a conditioning conveyer prior to pack bed dryer delivery
4. Removal of moisture in a pack bed dryer
5. Recovery of water released in the drying process
6. Stockpiling of high energy Coldry pellets ready for use or transport

3 在进入干燥机之前，用热气预热
4 在干燥机内完成脱水
5 干燥的同时回收水
6 Coldry产品下线

Coldry Integrated Power Plant
一体式Coldry电厂设计示意



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Coldry Performance Characteristics
产品规格

Chinese Sub-bitumionous **中国次烟煤**	As-mined **原煤**	Coldry **产品**	% **变化率**
Moisture **水分** (%)	34.8	15.0	-57%
Ash Yield **灰份** (%db)	18.4	17.5	-5%
Gross Wet Calorific Value **高位湿基**发热**量**	14.5 GJ/mt 3,900 kcal/kg	19.1 GJ/mt 5,140 kcal/kg	31%
Net Wet Calorific Value **低位湿基**发热**量**	13.3 GJ/mt 3,580 kcal/kg	18.2 GJ/mt 4,900 kcal/kg	37%

Coldry drives value creation

- Significant increases in net energy content
- Retention of the valuable volatile fractions, ideal feed for gasification processes
- Low ash levels derived from the raw coal (similarly with Sulphur)
- Transportation effectiveness – Non-pyrophoric, Low moisture

Coldry创造价值

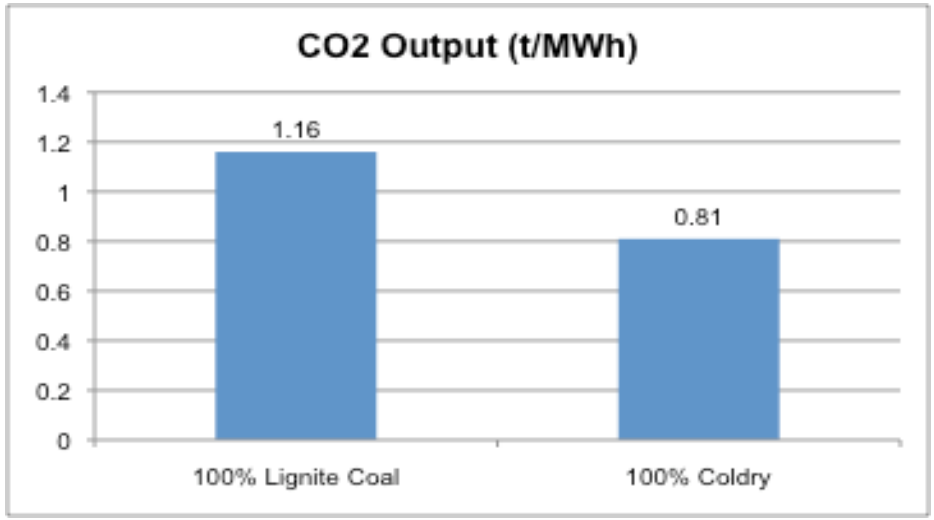
- 提升发热量
- 保留挥发份，用于煤气化
- 保留褐煤低灰份、低硫份的优点
- 运输的经济性——无自燃的风险、低水

Source: ECT database of Coldry testing results

CO_2 mitigation opportunities
实现二氧化碳减排

Utilisation of 100% Coldry mix in a modified boiler can reduce CO_2 emissions by up to 30%.
如果锅炉经过修改，100%使用Coldry产品，那么可以减少二氧化碳排放量达30%。

Fuel Specifications **燃料规格**	**Lignite** **褐煤**	**Coldry** **产品**
Energy (net as received) 接收基发热量	3,580 kcal/kg	4,895 kcal/kg
Carbon (% as received) 接收基固定碳	37.4%	49.0%

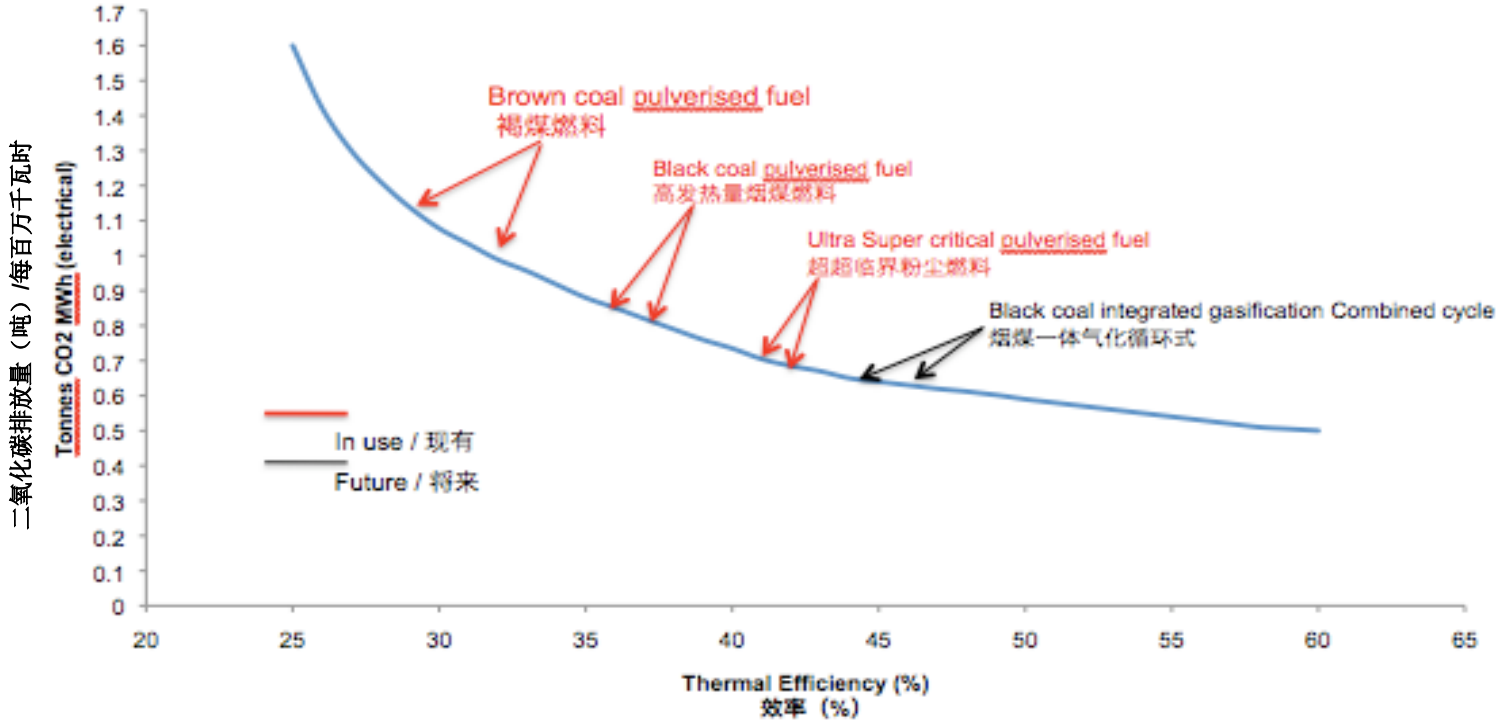


二氧化碳排放量 （吨/百万千瓦时）

Coldry: Benefits for China
Coldry在中国的应用前景

Cleaner Coal: Reduced Emissions & Enhanced Efficiency 洁净煤：减排 & 增效

- Reduced emissions in comparison to brown coal powered stations, from use of a low moisture, high efficiency, black coal equivalent 与传统褐煤电厂相比，通过使用低水、高发热量的干燥产品可以达到减排目标
- Efficiency enhancement through cooling improvements / reduced evaporative loss 电厂冷却废热的有效利用
- Integrating Coldry with a black coal power station is a compelling alternative to lignite based power generation options currently available与传统褐煤电厂相比，一体化Coldry电厂可以实现经济性
    - Enables deployment of more efficient proven technologies利用已经成熟的高效技术



Coldry Plant Economics
Coldry工厂经济测算

Based on utilisation of Western resources for purchase, installation and operation of equipment, and generates investment worthy economic returns.
根据西欧国家的工业数据测算，Coldry项目经济效益良好。

Raw Coal Moisture Content/ 原料水分	40%	45%	50%	55%
Annual Output at ultimate moisture level per module 按产品最终水分测算的年产量	556,510t	421,306t	324,193t	249,997t
Processing Cost Breakdown /加工成本分解*				
Maintenance /维护	$1.75	$2.20	$2.74	$3.42
Labour 人工	$0.43	$0.57	$0.73	$0.95
Electricity 电力	$4.53	$5.31	$6.26	$7.43
Processing Costs* 加工成本	$6.71	$8.08	$9.73	$11.81
Feedstock Cost Breakdown 原料成本分解				
Feedstock Required* /所需原料	1.42t	1.55t	1.70t	1.89t
Feedstock Mining Cost (/tonne) 原料开采成本（/吨）	$10.00	$9.50	$9.00	$8.50
Feedstock Cost*（原料成本）	$14.17	$14.68	$15.30	$16.06
Coldry BCE Production Cost* Coldry产品成本	$20.88	$22.76	$25.03	$27.86
Coldry Plant Capital Costs USD (/tonne) Coldry工厂固定资本支出百万美元 (/吨)	**$87.7**	**$109.9**	**$137.0**	**$171.2**
Coldry Plant Simple ROI - No Depreciation (%) /简单投资回报率-无折旧（%）	56.3%	43.2%	33.0%	24.8%
Coldry Plant Simple Payback - No Depreciation (years) 简单投资回收期-无折旧（年限）	1.8	2.3	3.0	4.0

* per finished product tonne plus agreed royalty 以最终产品一吨为基准

Assumptions
1.Maintenance: 2% of CAPEX
2.Electricity cost: USD 0.09 per KWh
3.Coldry sale price of $70/t for payback period and ROI
4. No depreciation

基本假设
1.维修: 固定资本支出的2%
2.电费: USD 0.09 per KWh
3.Coldry干燥产品价格：70美元/吨
4.不含折旧

Coldry Plant Economics
Coldry工厂经济测算

Based on utilisation of Chinese resources for purchase, installation and operation of equipment – 30% cheaper purchase / installation costs and 40% cheaper operational expenditure, and generates substantially more attractive investment returns.

在中国，设备等支出要低30%，运营成本低40%，测算的经济效益更为可观。

Raw Coal Moisture Content/ 原料水分	40%	45%	50%	55%
Annual Output at ultimate moisture level per module 按产品最终水分测算的年产量	556,509t	421,306t	324,192t	249,997t
Processing Cost Breakdown /加工成本分解*				
Maintenance /维护	$1.15	$1.44	$1.79	$2.24
Labour 人工	$0.26	$0.34	$0.44	$0.57
Electricity 电力	$4.53	$5.31	$6.26	$7.43
Processing Costs* 加工成本	$5.94	$7.09	$8.49	$10.24
Feedstock Cost Breakdown 原料成本分解				
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Feedstock Cost*（原料成本）	$14.17	$14.68	$15.30	$16.06
Coldry BCE Production Cost* Coldry产品成本	$20.11	$21.77	$23.79	$26.30
Coldry Plant Capital Costs USD (/tonne) Coldry工厂固定资本支出百万美元 (/吨)	**$57.4**	**$71.9**	**$89.6**	**$112.0**
Coldry Plant Simple ROI - No Depreciation (%) /简单投资回报率-无折旧（%）	87.4%	67.3%	51.8%	39.3%
Coldry Plant Simple Payback - No Depreciation (years) 简单投资回收期-无折旧（年限）	1.1	1.5	1.9	2.5

* per finished product tonne plus agreed royalty 以最终产品一吨为基准

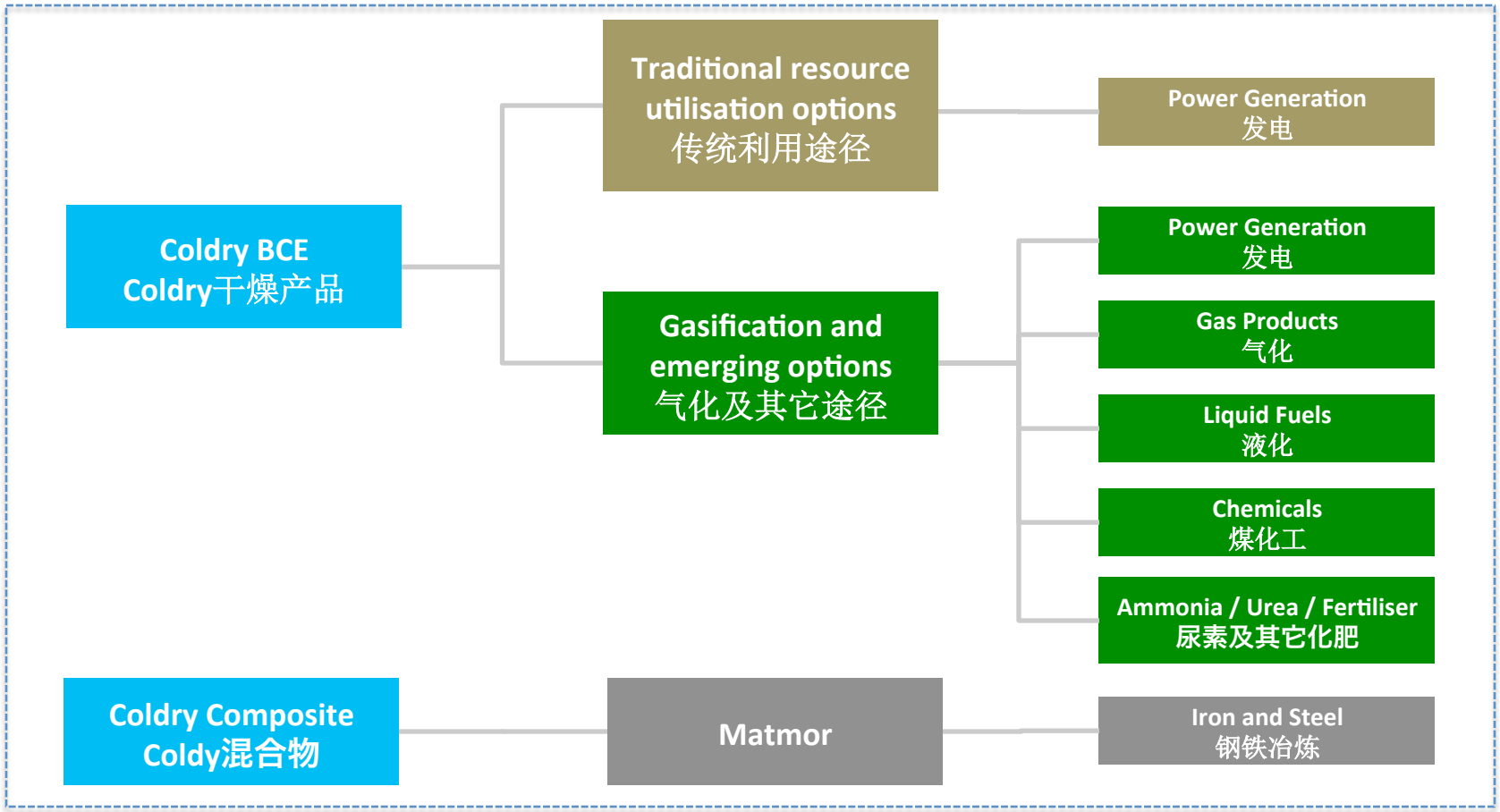
Assumptions
1.30% capital cost reduction from Australian estimate
2.40% labour cost reduction from Australian estimate
3.Maintenance: 2% of CAPEX
4.Electricity cost: USD 0.09 per KWh
5.Coldry sale price of $70/t for payback period and ROI
6. No depreciation

基本假设
1.在中国，固定资本支出比澳大利亚低30%
2.在中国，人力成本比澳大利亚低40%
3.维修: 固定成本的2%
4.电费: USD 0.09 per KWh
5.Coldry干燥产品价格：70美元/吨
6.不含折旧

Downstream Coal Industries
下游煤炭产业

Once de-watered, Lignite has a wide range of high value applications beyond the traditional use in thermal power stations.

经过脱水后的褐煤可以广泛应用于除发电以外的其它领域。



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ECT Globally
ECT在全球

- ECT have formed a strategic relationship with a private enterprise in Vietnam for the delivery of Coldry using Australian Lignite resources in the La Trobe Valley
  - Phase 1: 2M mtpa growing to 20M mtpa
- Discussions are also underway with:
  - Poland: Collaborative work with PGE, the worlds largest CO_2 emitter
  - Indonesia: JV established to develop 10 million tonne / year project for drying of sub-bituminous coal
  - India & Greece: Discussions underway with various parties to develop Coldry for local production needs
  - Other countries: Interest globally for ECT's Coldry technology

- ECT已经与越南某私人公司签订了战略合作协议开发维多利亚州拉筹伯山谷的褐煤资源
  - 一期每年2百万吨，增至每年2000万吨
- 其它进展还包括:
  - 波兰：与世界上最大的二氧化碳排放企业PGE开展战略合作
  - 印尼：年产1000万吨次烟煤干燥项目
  - 印度和希腊：项目谈判在进行当中
  - 其它国家：已经表示出浓厚兴趣

ECT Path forward in China
ECT在中国

- Environmental Clean Technologies understands China's energy needs, and can help enhance China's Lignite & Sub-Bituminous utilisation
- We do this by forming partnerships with domestic Chinese companies for the development of Coldry technology in China
- We seek companies who are:
  - Lignite & Sub-Bituminous coal asset owners
  - Experienced in Lignite power generation
  - Financially able to co-develop Coldry in China

- ECT深刻了解中国的能源需求，愿帮助中国提升褐煤与次烟煤利用的能力
- 我们希望与中国相关企业建立合作机制，共同在中国发展Coldry褐煤干燥技术
- 我们希望与这些企业建立合作机制:
  - 褐煤与次烟煤煤矿
  - 褐煤发电企业
  - 财务状况良好，有能力发展Coldry

Thank You! 谢谢！

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