

Shanghai
2013-09-25

BBS Workshop

Dr. Michael Voigt

EcoCommercial Building program

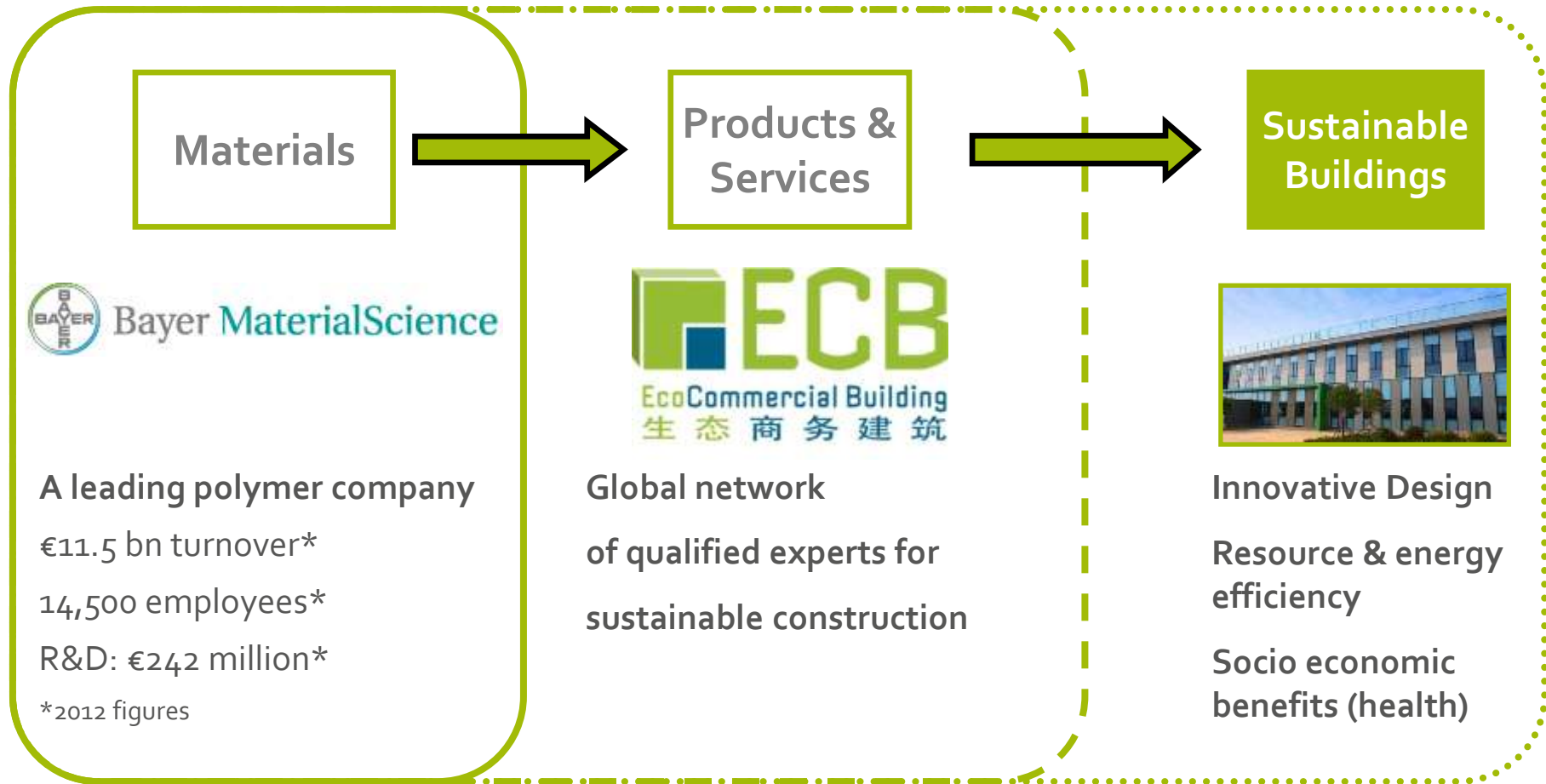
Experiences and Measurements of Low Carbon Buildings in China



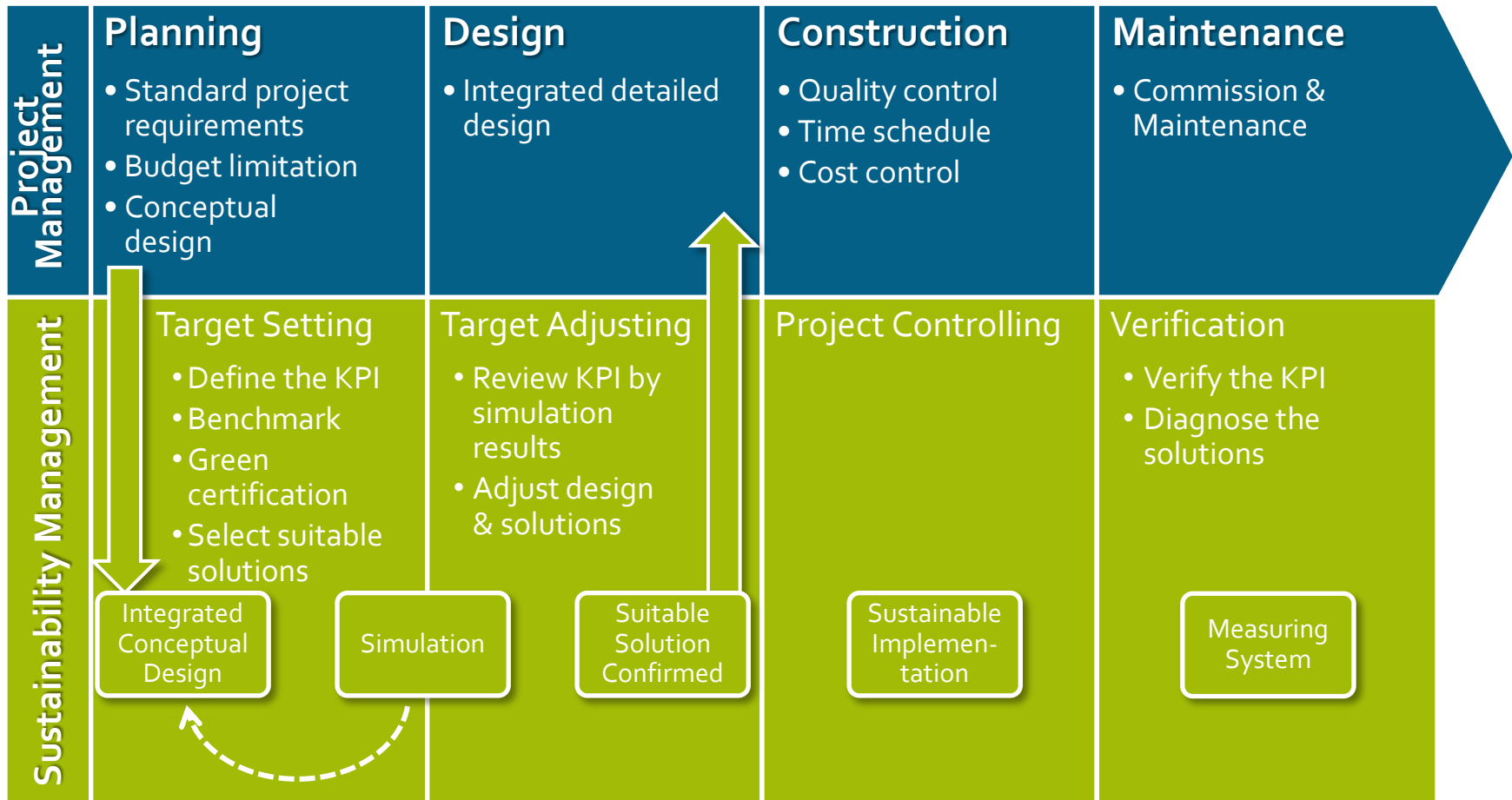
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Sustainable Buildings are the Smallest Building Blocks of a Green City



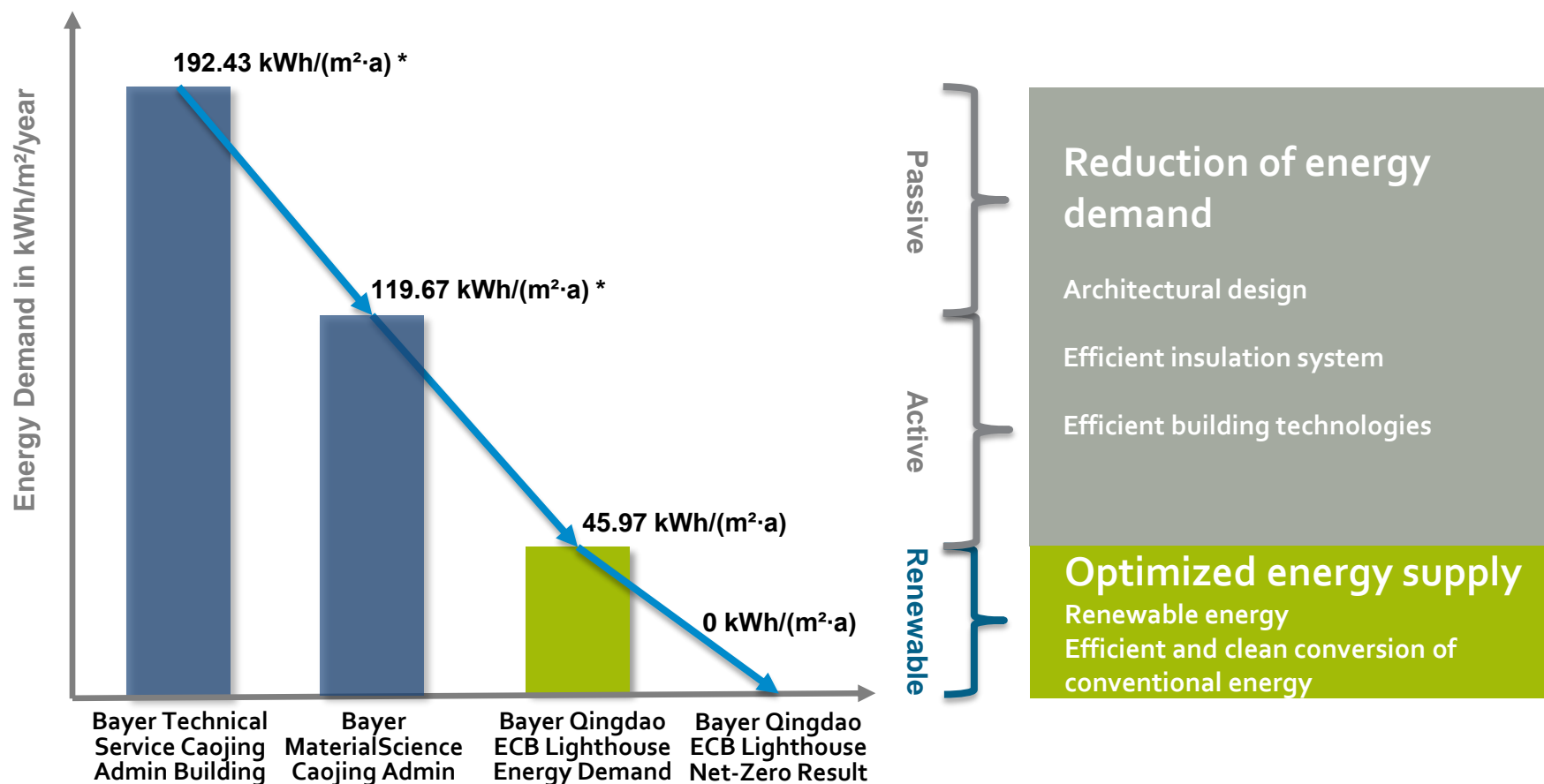
Deliberate Iteration of the Design Results in an Energetic and Economic Optimum



Learning to Save Energy

Comparable Functions: Industrial Office

Route to Zero-Emission



* actual figures of 2009 / all figures denote final energy (electricity)

The Office Power Center

Building data

- Type: Office and meeting center
- Construction type: Concrete structure
- Floor space 1,163 m² / 60 work spaces

Climate data

- Continental climate with hot summer
- Mean temperature Sum / Win 25 °C / 9 °C

Energy and environment data

- Primary energy demand 73.68 kWh/(m² a) (simulation, monitoring ongoing since Sep 2012)

Financials

- Total building cost 13.3 mio CNY
- Engineering effort 4.2 mio CNY

Certificates and awards

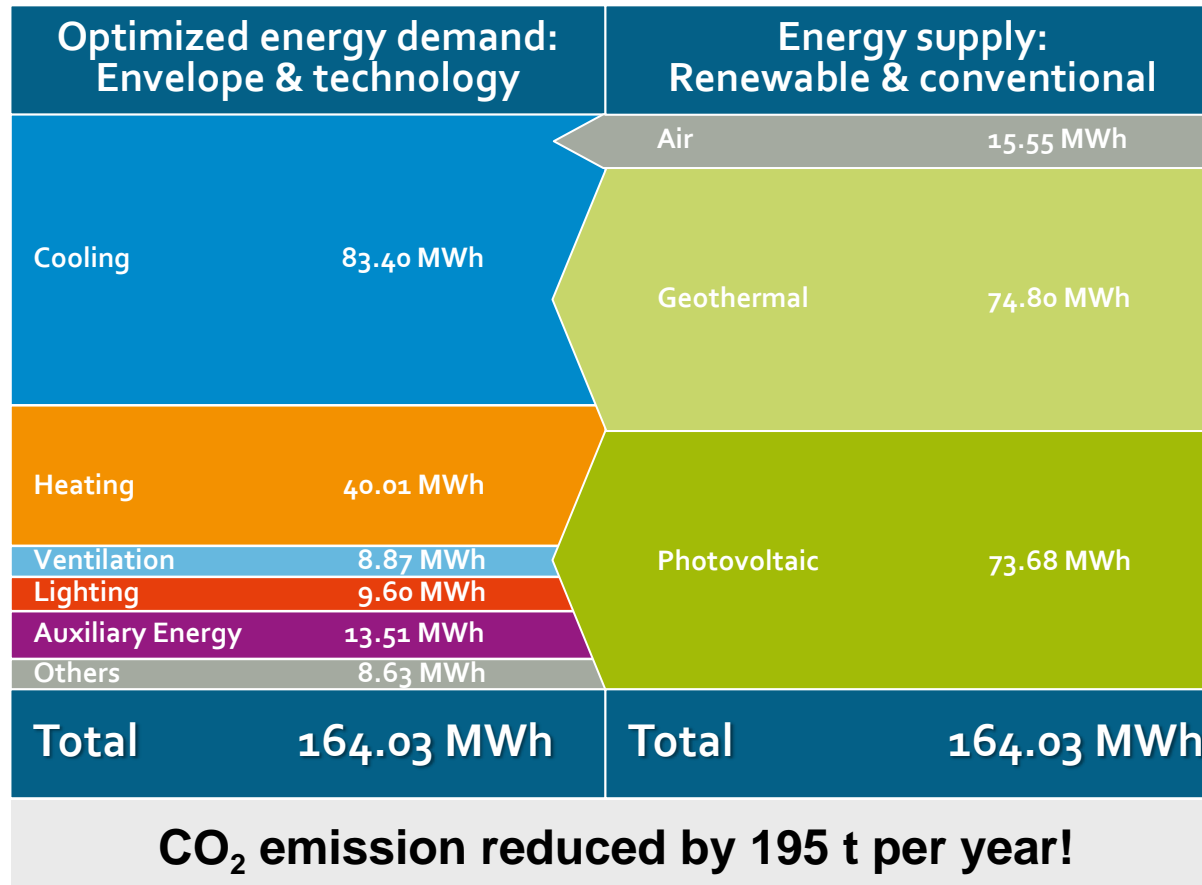
- LEED Gold certified
- Best Practice of Global Green Building from GFHS

Architect, Engineering & Project Management: Bayer Technology and Engineering (Shanghai) Co., Ltd.



The Energy Balance Diagram from Simulation is the Benchmark for Verification in Reality

■ Example: BMS (Qingdao), site administration building



* All data are the simulation result calculated in TRNSYS software by Bayer Technology Services

Energy Measuring System

ECB Qingdao Lighthouse Project



Annual energy balance:

+4.92 kWh/(m²·a)

Sample: **365** days **Annual**

⚡ Annual energy consumption (KPI)

59.14 kWh/(m²·a)

☀ Annual renewable energy generation

64.06 kWh/(m²·a)

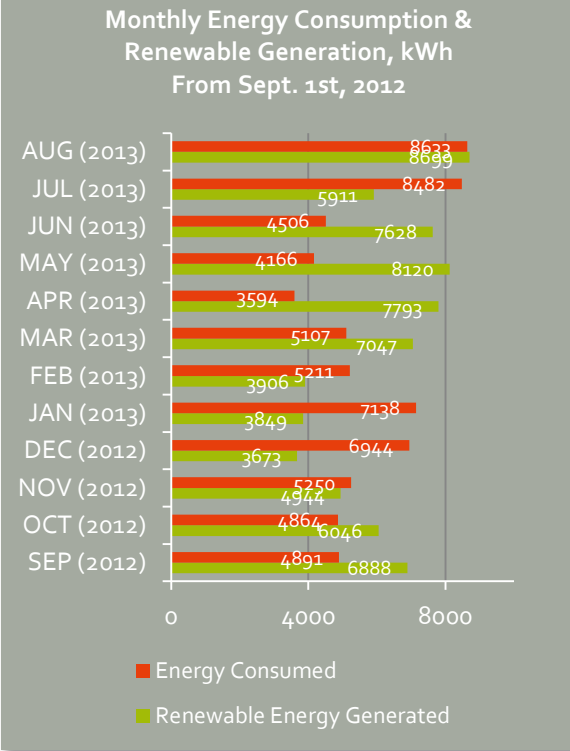
Current date: **2013/8/31** **Total**

Starting date: 2012/9/01

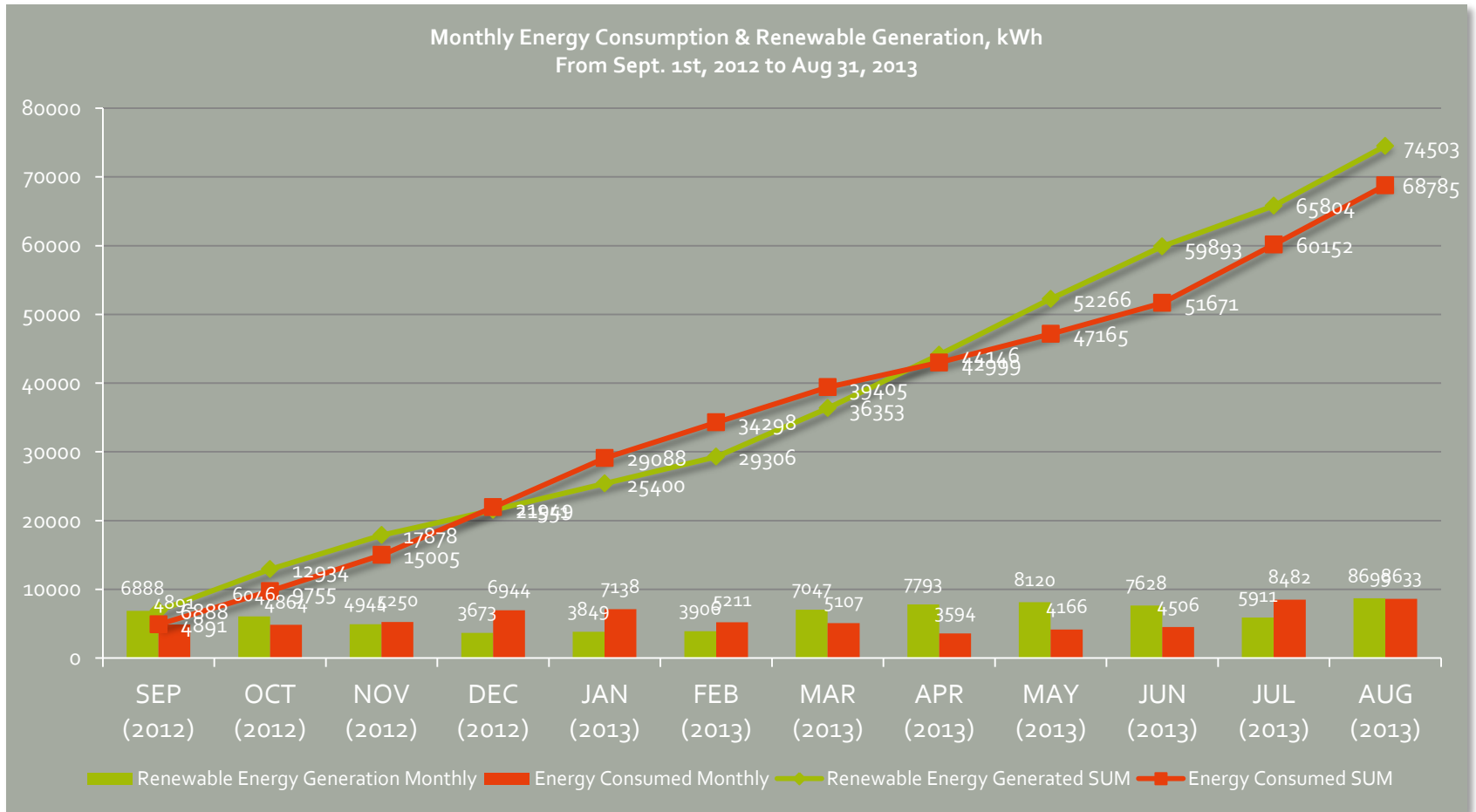
G.F.A: 1,163 m²

⚡ Sum of Energy Consumed : **68,785** kWh

☀ Sum of Renewable Energy : **74,503** kWh



Monthly Summary of the Energy Consumption Balance



ECB青岛示范项目的关键指标

Key Message of ECB Qingdao Lighthouse

可持续指标 Sustainability Features

Energy Saving

- 相比国标节能80%以上
80% Energy saving according to GB Code



Renewable Energy

- 百分百由可再生能源供应零能耗概念
100% renewable energy supply for net-zero emission



Comfort

- 舒适的室内气候
Comfortable indoor climate

Quality

- 拜耳的高质量材料
High Quality Material from Bayer and its ECB Members

Health

- 高质量的室内空气
High air quality for office user



Sustainability Driver

此建筑中的生态商务建筑解决方案

ECB solutions in this building



聚氨酯屋面保温系统

PUR Roof and Floor Insulation



建筑外围护 Building Envelop

聚氨酯屋面
保温系统
PUR Roof
Insulation

100mm rigid PUR insulation panel.
100 毫米聚氨酯硬泡屋面保温板

楼板聚氨酯
保温系统
PUR Floor
Insulation

50mm rigid PUR insulation system on the floor
slab.
50毫米聚氨酯硬泡保温板把空调区域分为两层

地坪保温
PUR Ground
Insulation

100mm rigid PUR insulation underneath the
ground slab
100毫米聚氨酯硬泡保温板安装在地坪下

Energy Saving

Quality



拜铁膜®屋面防水

Baytec® (SPR) Spray Roofing System



拜耳材料科技的建筑应用

BMS Material Application

拜铁膜®屋面防水 BayTec® (SPR) Spray Roofing System

喷涂聚氨酯屋面防水系统，由于喷涂施工的特性，和不规则的屋面具有良好的贴合度，防水防腐

BayTec SPR roofing system, the spray PU system has good compatible performance with irregular surface, anti-corrosion and water proofed



高品质窗系统

High Performance Window System

建筑外围护

Building Envelope

高性能窗系统	Thermal block Aluminum window profile with double low-E glass, $K(U) \leq 1.8 \text{ W/m}^2/\text{K}$
High Performance Window System	热断桥铝合金窗系统，双层low-e玻璃，整体K值仅1.8

Energy Saving



结构蓄热供冷系统

Thermally-Active Building System



建筑技术-暖通

Building Technologies - HVAC

<p>结构蓄热供冷系统 TABS System</p>	<p>结构制冷系统, 预制水管埋入混凝土板的中间, 对混凝土蓄冷蓄热, 减少了空调的能耗 Thermally-active building system, prefabricated piping embedded into center of the concrete slabs, reduce the energy of AC by treating on the structure</p>
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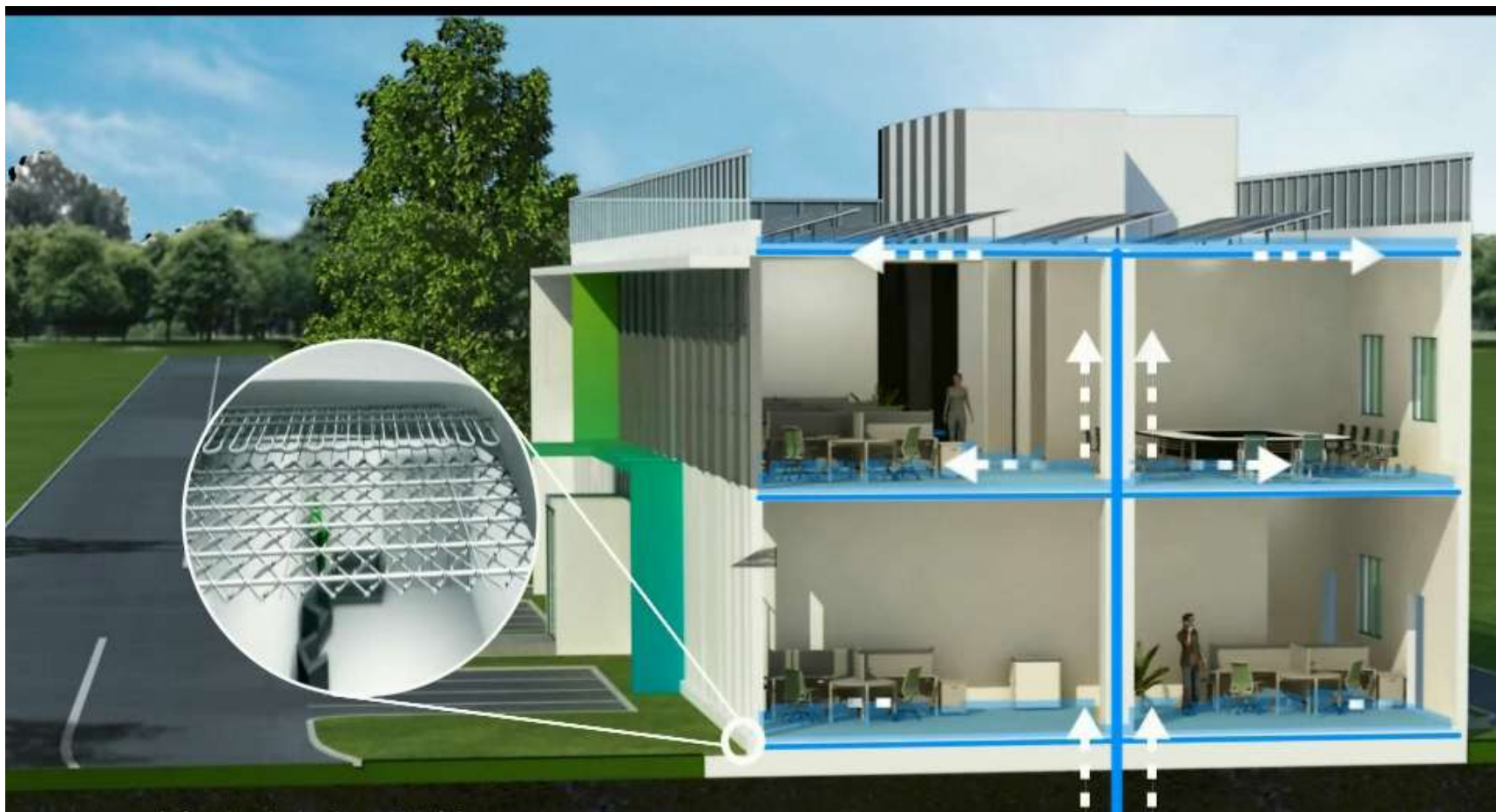
C comfort

E energy Saving



结构蓄热供冷系统

Thermally-Active Building System



辐射增强吊顶系统

Quick Element Ceiling



建筑技术-暖通

Building Technologies - HVAC

辐射吊顶增强	辐射吊顶局部增强了部分区域的制冷和制热
Quick Elements Ceiling	Quick elements enhance the cooling & heating capacity through an increase of the surface area

C comfort

E energy Saving



热回收转轮系统

Heat Recovery System

建筑技术-暖通

Building Technologies - HVAC

<p>热回收系统 Heat Recovery Wheel</p>	<p>在空气处理机组中增加轮式热回收模块，利用废弃和新风进行非接触的热交换，减少空气处理机组的能耗</p> <p>Wheel type heat recovery section in AHU, exchanges the heat from waste air to the fresh air to reduce the energy consumption of air process section</p>
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Energy Saving



地源热泵系统

Ground Source Heat Pump System

建筑技术-暖通

Building Technologies - HVAC

地源热泵系
统
GSHP
System

地源热泵系统，12个直径150mm的孔钻入地表100米以下，两套水冷热泵，整体制冷量达110kW，制热量达50kW
GSHP system, 12 holes with depth ca. 100 m and $\phi = 150$ mm, 2 sets of water cooled heat pump units with a total cooling capacity of 110 kW and of 50 kW for heating

Energy Saving



LED 照明系统

LED Lighting



建筑技术-电气

Building Technologies - Electrical

LED 照明系统	LED照明系统，寿命更长，能耗更低。
LED Lighting System	LED lighting systems consume less energy and have a long lifetime



Energy Saving

光伏发电系统

Photovoltaic System



可持续能源

Renewable Energy

光伏太阳能
系统

Photovoltaic
System

太阳能光伏并网发电系统，通过逆变器
传入并网，装机容量66kW

PV system, the surplus electricity will be
transferred to the service building and the
production plant, the power of the system
is 66kW



Renewable Energy

聚氨酯地坪 PUR Flooring



室内空气质量 Indoor Air Quality

<p>聚氨酯地坪 PUR Flooring System</p>	<p>水性聚氨酯原料，含低挥发性有机物同时提供良好的弹性脚感，易清洁，防开裂</p> <p>Waterborne polyurethane material, provides elastic & comfortable foot feeling with low TVOC emission, easy to clean, prevention of crack</p>
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Comfort

Quality

Health



聚氨酯墙面涂料

PUR Wall Coating



室内空气质量

Indoor Air Quality

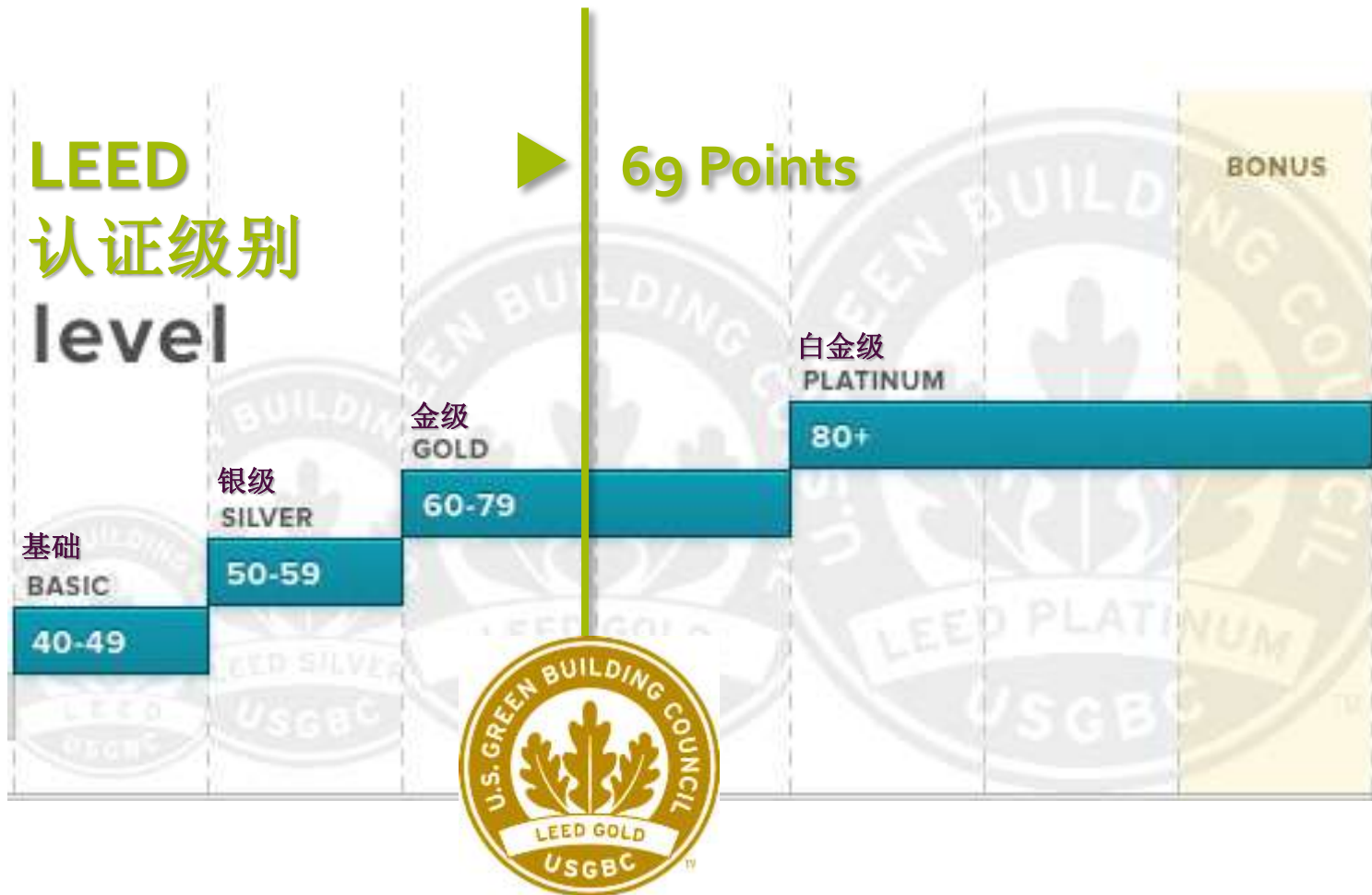
<p>聚氨酯墙面 涂料</p> <p>PUR Wall Coating</p>	<p>水性聚氨酯原料，低挥发性有机物</p> <p>Waterborne Polyurethane Material, low VOC emission, easy stain removal, high weatherability and durability</p>
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Quality

Health

认证 Certification



ECB Competence Network in China



Thank you for your attention

