APEC LCMNT Project Feasibility Study Phase 1
Tianjin YUJIAPU Low-Carbon CBD

Submitted by: Japan
APEC LCMT Project
Feasibility Study Phase 1
Tianjin YUJIAPU Low-Carbon CBD

FS Report (Final Draft)
18, Oct, 2011

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3. Outline of Yujiapu Financial District
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5. Summary of menu of measures for achievement of targets
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10. Renewable Energy Use Planning
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Outline of Yujiapu financial district

- The financial district occupies approximately 4km² with a total construction area of 9,500,000m².
- Total planned daytime population is 500,000 and nighttime population is 50,000.
- Construction is ongoing in some part of precedent development area.
- Most of architectural planes within this district are selected by international competition.

Framework of LCMT FS in Yujiapu

Prepare a Low-Carbon Strategy for Yujiapu CBD based on “LCMT Concept”

(0) Investigate the detailed information about Yujiapu necessary for FS

(1) Develop a comprehensive concept for low carbon town development

(2) Define the CO2 reduction targets and other concerning indexes for evaluating the progress of low carbon

(3) Prepare the categories to make low carbon challenge in urban development

(4) Select and develop CO2 reduction measures in each planning category

Analyze CO2 reductions and cost increase of measures in each category

Report Preparation
(1) Main target < CO2 reduction target >

[ Aiming at real reduction of approximately 50% ]

In 2020 (mid-term) real reduction of approximately 30% (which is over 50% CO2/GDP)
In 2030 (long-term) real reduction of approximately 50%

1) Standard type buildings without low carbonized
2) GDP growth in 2011 and 2012 in China are predicted 9.6% and 9.5% by IMF analysis. In this CO2 target study, the GDP growth by 2020 is set as 5% that is around ½ of the actual growth with consideration of uncertainty of prediction.
3) Mitigation effects by area energy, renewal energy and untapped energy have been counted into the result of CO2 reduction in Buildings

BAU (Business as Usual) 1)
(Transportation)

30% reduction

50% reduction

Hierarchy Approach for developing Integrated Low carbon processes

It is necessary to configure Breakdown targets of CO2 mitigation on each measure in each Category to achieve the total Low carbon Target.
5. Summary of menu of measures for achievement of targets

The Optimum target categories for studying CO2 Reduction Measures in CBD

Setting the Target of Low-carbon Town

- Low carbon Urban Structure Planning
- Transportation Planning
- Environmental Planning
- Low-carbon Building Design
- Area Energy Planning
- AEMS (Area Energy Management System)
- Untapped Energy Use Planning
- Renewable Energy Use Planning

7. Design Methodology of Low carbon Architecture

(1) Energy consumption and Low-Carbon measures

Design Low-Carbon building along the following steps:

**Load Reduction**
- Sun shading blind, louver
- High performance Facade system
- Greenery Roof

**Natural Energy Use**
- Day lighting
- Natural ventilation, Underground heat
- Solar panel on buildings

**High Efficiency Equipments & System**
- Top runner Chiller, Heat Recovery system
- Inverter Fan&Pump
- HF lamp
- LED lamp
- Building Management System (BMS)
(4) Prediction of CO\textsubscript{2} Reduction effects (Office)

CO\textsubscript{2} emission has been assumed and achieved 40% reduction from BAU with combinations of low carbon measures. 40% of reduction in commercial buildings and 30% for the residential and hotels.

$$\text{CO}_2 \text{ reduction effects of Low carbon measures in Model Office Building}$$
Urban climate planning for Heat island mitigation

Simulation Result
Distribution of air temperature (GL+1.5m), 13:00, August

Air temperature differences (Case2 - Case1): Lower area than Case1

Approximately 2.0 degree lower than Case1 (BAU)

Comprehensive analysis of Low-Carbon measures

(1) Simulation results of CO2 in Buildings and area energy, Untapped energy, Renewable energy

- The CO2 emission from BAU buildings is approximately 1.37 million t-CO2/year.
- The CO2 reduction rate may be approximately 30% by measures of Low energy Buildings, DHC, Untapped Energy, and Renewal Energy.

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<thead>
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<th>Phase</th>
<th>CO2 Emission (t-CO2/year)</th>
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<tbody>
<tr>
<td>PHASE-1</td>
<td>Low energy Buildings</td>
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<tr>
<td>PHASE-1</td>
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<tr>
<td>PHASE-1</td>
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30.8% reduction

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<th>Phase</th>
<th>CO2 Emission (t-CO2/year)</th>
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<tr>
<td>PHASE-2</td>
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<tr>
<td>PHASE-2</td>
<td>800,000</td>
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30.8% reduction
(2) Calculation results in Transportation sector

(Biusiness as usual)

+ Change in land use
+ BRT
+ Loop Bus
+ Encouraging the Usage of Bicycles
+ Road Pricing
+ Electric cars

Approximately 30% Reduction

(3) Estimate of cost for CO2 emission reduction (RMB/t-CO2)

The comprehensive measures are necessary in order to achieve Low-carbon target.