4th U.S.-China Energy Efficiency Forum
September 25, 2013

Compiled Presentations from Track 2,
Breakout Session 2/Afternoon

Energy Management in Energy-Intensive Facilities
The Green Grid: Accelerating the Resource Efficient Digital Economy

John Tuccillo
The Green Grid President and Chairman of The Board
Schneider Electric, Senior Vice President, Industry and Government
The global authority on resource efficient information technology and data centers.
Over 200 Members Worldwide

More than 4,000 active participants

Connected Global Interest Groups

• Data Center Maturity Model 2.0 Harqs Singh of Thomson Reuters
• Data Center and ICT Utilization: Mark Aggar of Microsoft
• Software Efficiencies: Kim Shearer of Microsoft
• Water: Winnie Lam of Google
• TGG Data Center Logo Program: Jack Pouchet of Emerson
• Government Engagements: Rona Newmark of EMC
• Cloud Efficiencies: Winston Saunders of Intel
• Data Center Life Cycle: Christophe Garnier of Schneider Electric
More than 400 Deliverables
Hundreds of Thousands of Downloads

White Papers

Webcasts

Detailed Reports

Case Studies

On-line Tools
New Tools

Data Center Maturity Model Assessment Tool

Over 400 active assessments!

• Outlines current best practices and a 5 year industry roadmap

• Purpose:
  ▪ Evaluate your data center and IT portfolio
  ▪ Access your personal DCMM equalizer
  ▪ Obtain benchmarking results

Updated Air-Side Free Cooling Maps

• ASHRAE Class A2 and A3 Maps for:
  ▪ EMEA
  ▪ Japan
  ▪ North America
## The Green Grid China Forum 2013 Agenda

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<td>09:00-09:10</td>
<td>Opening Speech</td>
<td>David Wang, Ph.D.</td>
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<td>09:10-09:15</td>
<td>Government Official Speech</td>
<td>1. Yuqi Xie, Department of Industry and information technology policy Commissioner for Standards, Communication Development Division, MITT</td>
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<td>09:15-09:45</td>
<td>TGG management Speech</td>
<td>2. Roger Tipley Vice President, The Green Grid</td>
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<td>10:25-10:40</td>
<td>Tea Break</td>
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<td>10:40-11:20</td>
<td>GGA—Data Center Green Grade Assessment</td>
<td>5. Baohong He, Ph.D. China Council Chair, The Green Grid Director of Internet Center of CATR</td>
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<td>11:20-12:00</td>
<td>DCMM—The Green Grid's Data Center Maturity Model</td>
<td>6. Chang Tsann China Liaison WG Vice Chair, The Green Grid Practice Director, APJ I&amp;CC Data Center Transformation, Dell</td>
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<td>12:00-12:30</td>
<td>The Green Grid-Driving IT Efficiency Through Collaboration</td>
<td>7. Jian Wu China Marketing WG Vice Chair, The Green Grid</td>
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<td>12:30-13:30</td>
<td>Lunch</td>
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<td>13:30-14:10</td>
<td>PUE—PUE Consolidation</td>
<td>Roger Tipley</td>
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<td>14:10-14:50</td>
<td>LCA—Data Center Life Cycle Analysis</td>
<td>8. Xiongwei Lian China Technical WG Vice Chair, The Green Grid Assistant President, Centrin Data Systems Ltd.</td>
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<td>14:50-15:05</td>
<td>Tea Break</td>
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<td>15:05-15:45</td>
<td>Panel discussion on DCIM</td>
<td>9. Xiongwei Lian/Hongyu Shou/Keith Gislason</td>
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<td>15:45-16:25</td>
<td>Panel discussion on Data Center Overall Health Management</td>
<td>10. David Wang, Ph.D./Lu Cao/Baohua Lei/Jianbing Zhang</td>
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<td>16:25-16:30</td>
<td>Wrap up</td>
<td>David Wang, Ph.D.</td>
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Joining the Conversation
www.thegreengrid.org

Thank you!

Questions or Comment?
John.Tuccillo@Schneider-Electric.com

Ms. Graziella Siciliano, Office of International Affairs
U.S. Department of Energy

4th U.S.-China Energy Efficiency Forum
September 25, 2013
Sheraton Pentagon City Hotel
Ministers and other high-level representatives convened for the Clean Energy Ministerial in Washington in July 2010, Abu Dhabi in April 2011, London in April 2012, and will meet in New Delhi in April 2013 and Seoul in 2014 to collaborate on policies and programs that accelerate the global transition to clean energy technologies.
GSEP is one of 13 ongoing Clean Energy Ministerial (CEM) initiatives.

GSEP objectives are to significantly cut global energy use by:

- Encouraging industrial facilities and commercial buildings to pursue continuous improvements in energy efficiency
- Promoting public-private partnerships for cooperation on specific technologies or in individual energy-intensive sectors

Within GSEP there are six working groups
The GSEP EMWG works to *accelerate the adoption and use of energy management systems (EnMS) in industry and in commercial buildings worldwide.*

The GSEP EMWG leverages the extensive experience of its member countries who employ a range of approaches to promote EnMS on the national level including:

- Mandatory programs with specified targets or improvements
- Mandatory programs for requiring improved understanding of energy use and saving opportunities
- Information dissemination or energy rating programs
- Voluntary agreements and programs
Time and again, industrial energy efficiency has been demonstrated to be *cost-effective* while having a positive effect on productivity.

Despite this, energy efficiency improvements with very favorable payback periods often *do not get implemented*.

Even projects that *are* implemented may *not be sustained* due to lack of supportive operational and maintenance practices.

**Problem:** Energy efficiency is not integrated into daily management practices.

**Solution:** Staff at all levels within an organization need to be engaged in the management of energy on an ongoing basis.

*Energy management requires an organization to shift from a project-by-project approach to one of continual improvement in energy performance.*
What is an Energy Management System (EnMS)?

Energy management systems (EnMS) help an organization institutionalize the policies, procedures, and tools to systematically track, analyze, and improve energy efficiency—leading to continual improvements in energy performance.

*Industries that adopt EnMS may save up to 10-30% of their total energy use!*
The GSEP EMWG’s collaborative approach facilitates active peer sharing on a broad range of relevant activities led by its member countries.

Together, GSEP EMWG members:

• Advocate for energy management
• Provide assistance on policies and programs
• Develop tools and resources
Advocating for Energy Management

The GSEP EMWG is building the business case for energy management to effectively communicate its diverse benefits for the industrial and commercial sectors.

**Key 2013-2014 Activities:**

**Case Studies:** Members are producing a suite of case studies to *showcase early adopters* and help to *develop a compelling business case* based on real-world data and experiences.

**Energy Performance Database (EPD):** Members are leading an effort to collect and organize energy performance data submitted by member countries into a secure database. Analyses of the collected data will establish specific impacts, paybacks, and other findings to *demonstrate the value* of energy management and *identify effective strategies* for implementation.
Providing Assistance on Policies and Programs

The GSEP EMWG offers stakeholders (governments, NGOs, etc.) technical support for their efforts to design, implement, and evaluate energy management policies and programs.

Key 2013-2014 Activities:

Peer sharing webinars and workshops: Discussion of a range of topics including policy and program developments, new resources and tools, and barriers/enables to industry uptake.

- Next webinar is October 2, 2013

Pilot Projects: Members share information and technical expertise to support pilot projects.

- **3M Canada**: Using ISO 50001, a 3M facility improved its energy performance by 15.2% during a two-year pilot project.
- **Multiple U.S. pilots**: 13 facilities have improved their performance by 5.6-25.8% over a 2-3 year period.
- **Multiple Korean pilots**: 16 facilities participated in a pilot project.
The GSEP EMWG develops and disseminates practical tools and resources (enablers) to support government and industry implementation efforts.

Key 2013-2014 Activities

**Workforce Development:** Members have shared information on their workforce training and credentialing programs, including qualification criteria, training requirements, and training materials.

- Next report to be published October 2013
Key 2013-2014 Activities (continued)

**EnMS Practitioner’s Toolbox:** Document between 10 to 20 key processes, practices and supporting tools that could make an immediate, cost effective and substantive EnMS benefits within corporations.

- Solidifying partnership with the Institute for Industrial Productivity (IIP) to help execute this activity
- GSEP is very pleased to welcome China’s support and engagement on the practitioner’s toolkit
For more information visit:  
www.cleanenergyministerial.org/energymanagement

Or Contact:  
Graziella Siciliano,  graziella.siciliano@hq.doe.gov
Energy Management System in China
Contents

- Background of EnMS
- Key Elements of EnMS
- Pilot and Certification of EnMS
- Best Practice of EnMS
History of EnMS Standards

2000
EU (CEN/CENELEC) : EN16001
US, Denmark, Sweden, Ireland, UK, Korea, Germany released EnMS standards and implement domestically

2008
China : develop GB/T23331

2011
ISO50001 launched, ISO/TC242 set up, develop implementation guidelines

2012
China: GB/T23332 : ISO50001 equivalent adoption
Roadmap of EnMS Series of Standards in China

1. The 1st stage (2005)
   - Develop GB/T23331 Requirement of EnMS

2. The 2nd stage (2009)
   - ISO50001 adoption; General guidance and implementation guideline in iron and steel, cement industry

3. The 3rd stage (2012)
   - Implementation guideline and performance evaluation standards in 10 industrial sectors

Source: LI Aixian, CNIS, 2012
PDCA - the Core of EnMS

Plan

Energy review, energy baseline, energy performance indicators, energy objectives, energy targets, energy management action plan

Check

Corrective action, continual improvement

Do

Monitoring, measurement, analysis, evaluation of compliance, internal audit

Action

Implementation and operation
Top-10,000 Enterprises EE Program

- 250 Mtce energy saving by Top-10,000, accounting for 38% of overall goal
- National Guideline in Promoting EnMS issued in 2012

<table>
<thead>
<tr>
<th>Program</th>
<th>Energy Savings (Mtce)</th>
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<td>Top-1,000 Program Achievement</td>
<td>156</td>
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<tr>
<td>Top-10,000 Program Target</td>
<td>250</td>
</tr>
<tr>
<td>12th FYP Target (2011-2015)</td>
<td>670</td>
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Procedure of Certification on EnMS

- Preparation and preliminary review
- Information dissemination and skills training
- Plan and adoption of technical retrofitting
- EnMS planning, documentation and implementation
- Evaluation on operation of EnMS
- Training on internal auditor
- Continual improvement
- Certification
EnMS Pilots and Certification Globally

Entities on ISO 50001 certification by Sep 2012

468 entities on ISO50001 certification
2000 enterprises being certified

Source: Julia Reinaud, IIP, 2012
Best Practice of EnMS - Shandong Province

- ‘To promote EnMS establishment’, ‘To pilot EnMS in key energy intensive enterprises’ is required in government document
- In 2008-2009, EnMS piloting in 8 enterprises representing 6 industrial sectors
- In 2010, EnMS scaling up in 44 enterprises in Shandong
- In 2011, demonstration zone of EnMS in Dezhou city
- In 2012, world’s largest EnMS Promotion Program initiated in Shandong engaging 1188 enterprises
Actively collect and enforce energy conservation regulations and policies.

Set up control /management on overall process; Manage energy in real-time and systematically.

Upgrading energy efficiency technology on a regular basis

Foster a culture of energy conservation, continual improvement on energy conservation rules and regulations, awareness and practice.
Key Elements of a Successful EnMS

- EnMS serves as important acting points to establish long-term mechanism of energy conservation;
- It’s a combination of government leading, enterprise self-driving and experts’ guidance;
- EnMS establishment integrated with equipment installation and staff capacity building;
- Attach importance to energy performance evaluation, when implement EnMS;
- The success of EnMS relies on:
  - Attention and emphasis from top managers;
  - Compatible with existing management systems;
  - A channel for information exchange;
  - Adhere to PDCA cycle, keep continual self-improvement.
The Constructing of Energy Management and Control Center of Enterprises in Industry

China Center of Information Industry Development

WANG Xu

2013.9.25  WASHINGTON D.C.
1 The connotation and building content of Energy Management and Control Center of Enterprises

2 The constructing of Energy Management and Control Center of Enterprises in China

3 The Example of Energy Management and Control Center of Enterprises
The Connotation and Building Content of Energy Management and Control Center of Enterprises
The connotation of Energy Management and Control Center of Enterprises

The meaning of the energy management and control center of enterprises is in the process of production, to monitor and manage the supply, transmission and usage of energy, so as to realise the integrity of management and control, update and optimize energy balance, attain energy conservation and consumption reduction systematically. It is a comprehensive application of modern information technology in energy management of enterprises.
The connotation of Energy Management and Control Center of Enterprises

- Energy supply
- Energy adjustment
- Energy Saving
- Energy Production
- Energy equipment control
- Environment protection
- Energy management center
The main use of energy management and control center of enterprises:

◆ Effective monitoring and improving the security and stable operation.
◆ Systematic optimization and reducing energy cost.
◆ Improving energy management and labor productivity.
The building content of Energy Management and Control Center of Enterprises

1 The building of the operation support system of the energy management and control center

(1) The use of the energy management center in the energy production and management activities should be clear.

(2) Establishing the operation of production and business processes compatible with the energy management center mode.

(3) The establishment of the various management system, operating procedures supporting the production patterns in the energy management center.
The building content of Energy Management and Control Center of Enterprises

2 The improvement and optimization of the Primary energy process and equipment

Energy process and equipment directly lead to the actual function of the effect of the energy center. So synchronized revamping or necessary optimize should be made in the energy management center.
3 Constructing featured EMS system

EMS is the core items in the energy center, complete EMS projects should be achieved:

(1) From a system perspective, energy center should be centralized, online, real-time monitoring and adjustment.

(2) Controling effectively energy information, energy equipment status of energy generating unit.

(3) EMS is helpful to the production on the basis of the objective data.
The Constructing of Energy Management and Control Center of Enterprises in China
Construction:

In 2009, Ministry of Industry and Information Technology and Ministry of Finance began to support the energy management center demonstration projects in the industrial areas. The government allocated funds to the qualified enterprises.

The energy management and control center was built first in the iron and steel industry which has some experience and...
Construction:

276 projects have been supported in the recent five years. The demonstration projects extended from steel industry to the petrochemical, chemical, nonferrous metals and so on. The scope covered 30 provinces.

The energy management and control center plays an important role in promoting the depth of integration of...
Policy:
Supporting the information technology transformation in the key energy companies. Monitoring dynamically and managing the enterprise energy production, distribution and consumption to improve and optimize the energy balance.

Goal:
The medium-sized enterprises' energy management close to the world advanced level in 2015 in...
The Constructing of Energy Management and Control Center of Enterprises in China

**Measures:**

- Promoting the implementation of Energy Management and Control Center in nonferrous metals, chemicals, building materials and so on based on the experience of iron and steel enterprise.

- Supporting a number of medium-sized enterprises to build enterprise energy management center during "Twelve Five" period.

- Supervise the construction of the energy management and control center with greater efforts.
The Example of Energy Management and Control Center of Enterprises - Baosteel
The Construction of Baosteel Energy Management and Control Center

◆ In the 1980s early, the focused energy management ideas, large-scale application of computer control and the most economical allocation run has been used in the construction of Baosteel energy management and control center.

◆ The energy management and control center has been developed in the projects during the second, the third and fifteen, eleven-five plan.

◆ Currently the relatively complete idea has been formed which focused on energy
Promoting the construction of enterprise energy management center comprehensively

- Stainless steel Energy Management System - produced in 2004
- Ning steel Energy Management System - produced in 2007
- Luo Jing relocation project Energy Management System - produced in 2007
- Special Steel Energy Management System -
Thanks for listening!

www.ccidthinktank.com
Building a Sustainable Future
US-China Energy Efficiency Coordination

US-China Energy Efficiency Forum

September 25, 2013

RJ Meyers
Data Center Product Manager
US Environmental Protection Agency, ENERGY STAR Program

• Accelerate development and adoption of energy efficiency solutions in U.S. and China
• 8 areas of cooperation, including consumer product testing and labeling

Computers and Servers:
• Harmonize test procedures
• Collaborate on product verification systems
• Exchange best practices in labeling
Key Activities

• July 2010 computer standards meeting in Beijing
• August 2010 discussion at US conference
• January 2011 conference call
• April 2012 conference call

• Future Plans:
  – Participate in periodic webinars and conference calls
  – Joint review of new test procedures
ENERGY STAR Servers
Testing
The Server Efficiency Rating Tool (SERT)

- Tool to measure idle and active server energy efficiency
  - Simulates typical workloads
  - Enables full comparison of server energy efficiency
  - [http://www.spec.org/sert/](http://www.spec.org/sert/)

- Developed by the Standard Performance Evaluation Corporation (SPEC).
  - Currently in Version 1.0.2.
  - Covers most server products on the market.
  - Small license fee.
Benefits of SERT

• First total server energy efficiency tool.
• Standardized test procedure
  – Standard format, easy to transport and analyze.
• Other governments are adopting it
  – EU, Canada.
  – Interest from Japan, South Korea, and others.
The Future of SERT

- EPA is using SERT in ENERGY STAR Servers Version 2.0.
- Data generated by SERT will be used to set active mode server efficiency requirements in Servers Version 3.0.

- EPA:
  - Discuss the use of SERT with the appropriate contacts in the Chinese government.

- SPEC:
  - Discuss SERT.
  - Provide SERT training to interested organizations.
  - Open to expansions to SERT.
Thank you!

Robert Meyers
Data Center Product Manager, ENERGY STAR
202-343-9923
Meyers.Robert@epa.gov
Energy Efficiency Improvement Program for Data Centers (EEIP4DC)

Chinese Institute of Electronics (CIE)

ZONG Fang

2013/09/25
Outline

1. Introduction to CIE
2. Energy Efficiency Improvement Program for Data Center (EEIP4DC)
3. CIE’s Plan on EEIP4DC
Introduction to CIE

Chinese Institute of Electronics (CIE), established in 1962, is a voluntary, legally registered academic, non-profit, and non-governmental organization formed by scientists, institutions and enterprises of electronic information field.

- **10,000 members**
- **8 technical councils**
- **44 societies**
  - Semiconduct or
  - Computer
  - Telecomm etc.
- **More than 100 academic conferences per year**
Introduction to CIE

◆ CIE’s offerings and services

- International Academic and Technology Exchanges
- Research and Recommendation on Electronic Technology
- Promotion of Electronic Information Technology
- Technology Consultation and S&T Evaluation
- Professional Training and Certification
- Government Program
- Media and Publications

◆ CIE has a long history in international cooperation.
  - Member of IFIP, URSI, ICCCS, IMIA, and APNNA
  - Working relationship with IEEE, IET, ISAP, and KITE
Introduction to CIE

In the last 5 years, CIE is focusing on hotspot in the ICT field, such as cloud computing, internet of things, and energy saving & emission reduction.
Introduction to CIE

In 2007, CIE established China Electronics Energy Saving Council (CEESC) cooperated with Intel (China), Lenovo, and other companies and institutes.

GbI
Use ICT to provide an opportunity for traditional industry to save energy.

Green by IT

Energy Saving & Emission Reduction

Green of IT

GtI
Optimize the manufacturing technology, process, and equipment of electronic and information industry.

GoI
Make sure the design process and use of products of electronic and information industry are energy saving.
Introduction to CIE

◆ CEESC’s main works on energy saving and emission reduction

**Government Program**
- Recommended Catalog of Applied Electronic Information Technologies on Energy Conservation
- Screening and Assessments of Advanced Energy Conservation Technologies of Electronic Information Industry (A National Science and Technology Support Program funded by Ministry of Science and Technology)

**Conference**
- 1st Summit on Low-Carbon Economic Development Promotion of Information and Communication Industry in China
- Summit on China ICT Industry Promoting Low-Carbon Economy Development (2013)

**International Exchanges**
- Environment and Safety Performance Improvement of Small and Medium Electrical and Electronic Enterprises in China (Cooperated with EU)
- ICT Industry and Low Carbon Economic Development in China (Phase 1 in 2010 and Phase 2 in 2012)

**Technology Promotion**
- Energy Saving Solution for IDC, Digital Prototyping, and Product Lifecycle Management (PLM)
Outline

1. Introduction to CIE
2. Energy Efficiency Improvement Program for Data Center (EEIP4DC)
3. CIE’s Plan on EEIP4DC
Energy Efficiency Improvement Program for Data Center (EEIP4DC)

- In the last 2 years, the huge energy consumption of data centers draws more and more attention in China.

**Government Policy**
- In Y2011, 430,000 DCs consume 1.5% of total electricity consumption.
- MIIT
- NDRC
- Y2013, 4 standards.
- Y2013, 2 directly related policies.

**Market**
- Y2005-Y2012, the DC market size raised 6 times.
- In the incoming 5 years, the computing requirement to DC will raise 7-10 times.

**Energy Consumption**
- Typical PUE value of most DCs in China is 2.2~3.0.
Energy Efficiency Improvement Program for Data Center (EEIP4DC)

- EEIP4DC is a half-government-backed program helping data centers in China protect the environment through superior energy efficiency.

Diagram:
- Energy Efficiency Improvement Services
- Energy Saving Technology Recommendation
- Green Data Center Best Practices Implementation and Recommendation
- Government Program
- Standardization
- Monitoring
- Professional Certification

www.cie-info.org.cn
Energy Efficiency Improvement Program for Data Center (EEIP4DC)

- China-U.S. cooperation is one of the most important parts of EEIP4DC.

- CIE
  - Energy Saving Technology Recommendation
  - Green Data Center Best Practices
  - Energy Efficiency Improvement Services
  - Professional Certification
  - Government Program

- CESI
  - Standardization
  - Monitoring
  - Professional Certification
  - Government Program

- LBNL
  - Green Data Center Best Practices
  - Professional Training
  - Energy Efficiency Improvement Services
Outline

1. Introduction to CIE

2. Energy Efficiency Improvement Program for Data Center (EEIP4DC)

3. CIE’s Plan on EEIP4DC
In CIE, Green Data Center Working Group (GDCWG) is responsible for implementing EEIP4DC.

- **Energy Saving Tech**
  - Seminars
  - Technology Collection
  Scope: DC Owner and Equipment Provider

- **Best Practices**
  - Implementation
  - Recommendation
  - Implementation Guide
  Scope: Telecoms, Internet, Banking, Insurance, Petroleum, etc.

- **Energy Efficiency Improvement Services**
  - Improvement Method Study
  - Improvement Method Training
  - Service Platform

- **Professional Certification**
  - Training Experts Team
  - Professional Certification
  - Certification Body of Knowledge Framework
  Scope: DC Engineer
CIE’s Plan on EEIP4DC

◆ What we have done

- 3 teams: policy, market planning, and technology
  - 100 experts

- Initially planned the green data center best practices
  - Cooperated with LBNL

- Solicited 50 energy saving technology solutions for data center
CIE’s Plan on EEIP4DC

◆ CIE’s plan of cooperation

- Cooperation with ECP (US-China Energy Cooperation Program) and Lawrence Berkeley National Lab in the following fields:

- Y2013, 2 seminars
- Y2014, 2 seminars
- Y2015, TBD

- Energy Saving Technology Recommendation

- Green Data Center Best Practices
  - Y2013, 3 projects
  - Y2014-Y2017, 5 projects per year

- Energy Efficiency Improvement Services
  - Y2014-Y2017, services for 10 data centers

- Professional Certification
  - Y2014, 5 training courses
  - Y2015-, TBD
If you have any questions, pls feel free to contact us at zongfang@cie-info.org.cn

Thank you for your attention!