



the green grid®  
get connected to efficient IT

# The Green Grid, Metrics and DCMM

Presented by: Jay Taylor

[www.thegreengrid.org](http://www.thegreengrid.org)

# About The Green Grid

- A not-for-profit international consortium committed to advancing resource efficiency in business computing ecosystems and achieving bottom-line results
- Develop meaningful, user-centric standards, metrics and tools to help IT and facilities better achieve efficiency and sustainability across the entire data center ecosystem
  - Improving data center efficiency and sustainability is only effective when it is measurable
- Promotion and training about standards, measurement methods, best practices and technologies
- Collaborating with governments and other standards makers around the world

# Over 170 Members Worldwide



# The energy dilemma is here to stay

The facts

**x 2**

Energy  
demand

By 2050

Electricity by 2030

Source: IEA 2007

The need

**÷ 2**

CO<sub>2</sub> emissions  
to avoid dramatic  
climate changes by  
2050

Source: IPCC 2007, figure (vs. 1990 level)

vs

Frequent  
power outages

Rising  
energy prices

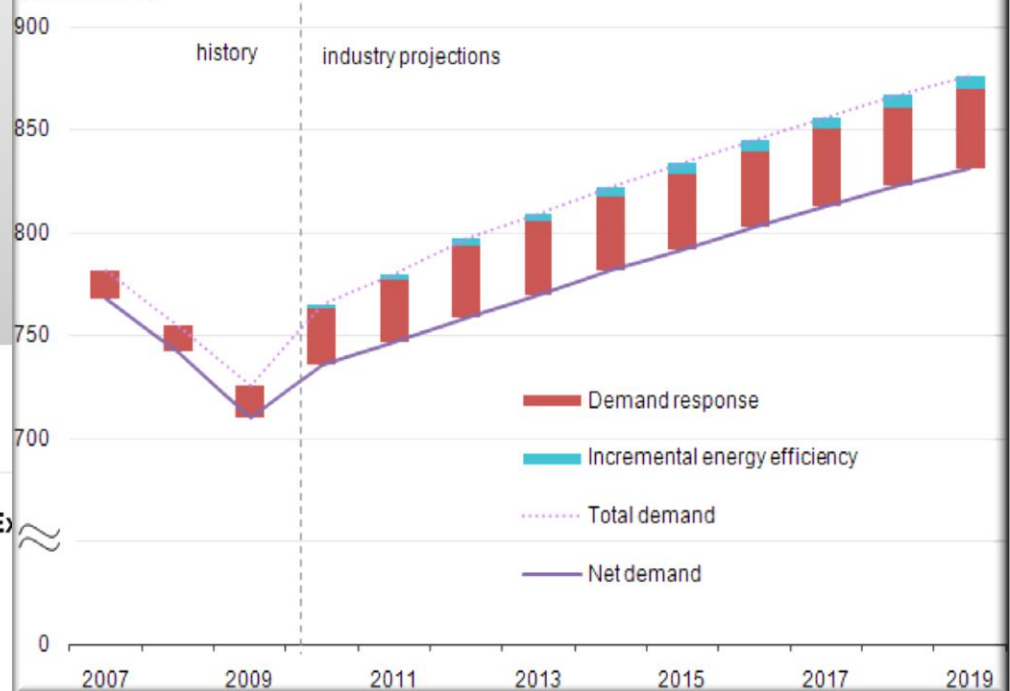
Climate change  
resource access  
& control

# Enough Said?

U.S. Nationwide Gasoline Prices	
Regular	4.54
Plus	4.82
Premium	4.99
Diesel	4.73

## Grid planners report increases in expected peak demand response, energy efficiency

gigawatts (GW)



Bloomberg Businessweek  
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Thursday February 23, 2012

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## Oil Rises to Nine-Month High on Greek Aid Deal, Iran Ex

February 21, 2012, 10:07 PM EST

- Tweet 19
- Share 5
- +1 0
- Business Exchange
- E-mail
- Print

By Morning Zhou and Mark Shenk

Feb. 21 (Bloomberg) -- Oil increased to a nine-month high after Greece won a second bailout and Iran said it stopped selling crude to France and Britain.

Futures rose 2.5 percent after the euro-area ministers approved 130 billion euros (\$173 billion) in aid for Greece by tapping into European Central Bank profits and coaxing investors into providing debt relief, shielding the region from a default. Iran stopped selling oil to the countries yesterday, preempting a European Union ban, an official news website said.

"There's a lot of relief about the Greek situation in the market and Iran is making a lot of noises," said Kyle Cooper, director of research at IAF Advisors, a Houston-based energy consulting company. "The Greek agreement has increased optimism about the economy."

Crude oil for March delivery gained \$2.60 to \$105.84 a barrel on the New York Mercantile Exchange, the highest settlement since May 4. Futures have risen 7.1 percent this year. The March contract expired at the close of floor trading.

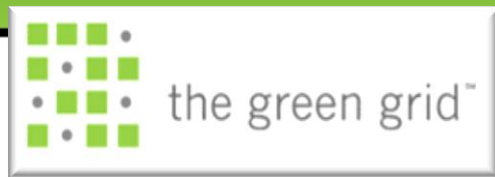
The more active April contract increased \$2.65, or 2.6 percent, to \$106.25 a barrel on the Nymex. Floor trading was closed yesterday because of the U.S. Presidents Day holiday.

Brent oil for April settlement increased \$1.61, or 1.3 percent, to \$121.66 a barrel on the London-based ICE Futures Europe exchange, also a nine-month high.

Green Grid



# But Did You Know....?



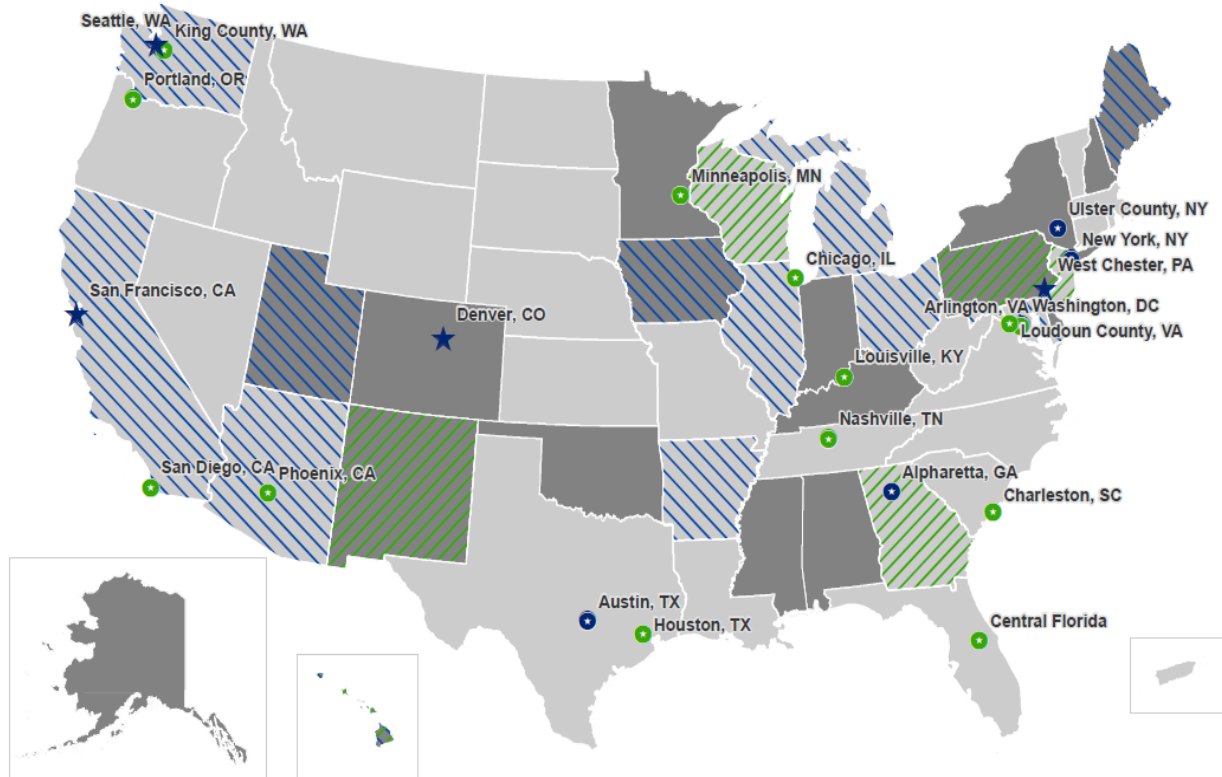
Green Grid  
White Paper  
#44 on  
EMEA Data  
Center  
Energy  
Policy

	Kingdom United	France	Germany	Spain	Nether-lands	Italy	Switzer-land	South Africa	Russia	United Arab Emirates	Saudi Arabia	Qatar
<b>EU and International Policy</b>												
Energy Performance of Buildings Directive	✓	✓	✓	✓	✓	✓						
Revisions to the Energy Performance of Buildings Directive	✓	✓	✓	✓	✓	✓						
Mandatory Energy Labelling (e.g., The Energy Labelling Directive)	✓	✓	✓	✓	✓	✓					✓	
EU Ecolabel / Flower	✓	✓	✓	✓	✓	✓						
The EC Code of Conduct on Data Centre Energy Efficiency	✓	✓	✓	✓	✓	✓						
Expansion of the Eco-Design Directive	✓	✓	✓	✓	✓	✓						
Fluorinated Greenhouse Gases	✓	✓	✓	✓	✓	✓						
EU GHG Emission Trading Scheme	✓	✓	✓	✓	✓	✓						
ETSI / CEN / CENELEC Standards	✓	✓	✓	✓	✓	✓						
ISO 50001 and ISO 14001	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ITU Sustainable ICT Specification	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EU Energy Star	✓	✓	✓	✓	✓	✓						
Energy Star (US)							✓	✓	✓	✓	✓	✓
Monitoring, Measuring and Reporting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>Mandatory Policies (Building Regulations, Planning and Mandatory Performance)</b>												
Building Regulations Driving Energy Performance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Strong Planning Policy Driving Low Carbon Development	✓											
Future Mandatory Energy Performance	✓											

# But Did You Know....?



Used with  
Permission from  
the US EPA



- Local Benchmarking
- Local Voluntary Program
- Local Benchmarking and Voluntary Program
- State Benchmarking
- State Voluntary Program
- State ARRA-funded Program

# So How Do I Start?

## Assess the Energy Efficiency of Your Data Center

- US EPA Energy Star Data Center Rating System
  - Portfolio Manager
- US DOE Data Center Energy Practitioner Program
  - DC Pro
- The Green Grid
  - Data Center Maturity Model
  - PUE Reporting On-line Tool

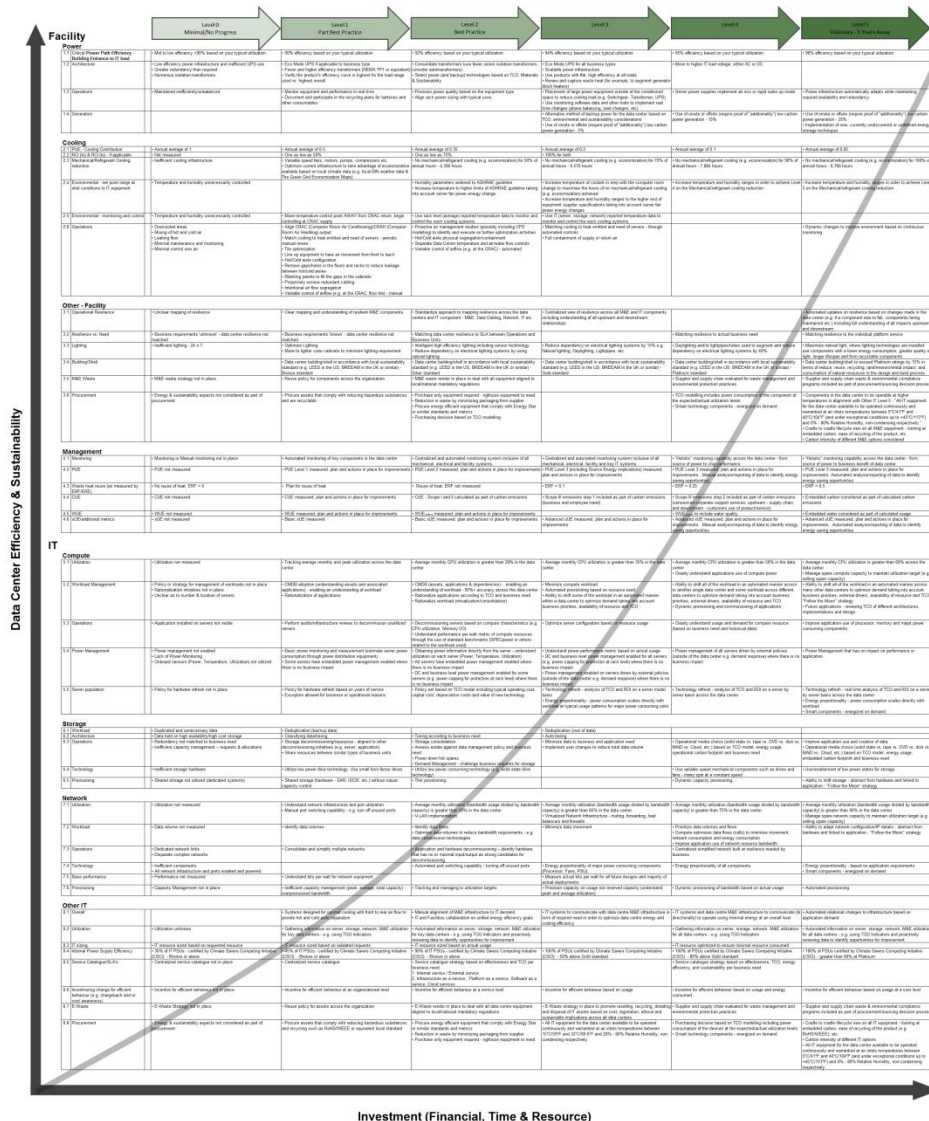
**Establish your baseline with an  
assessment  
and then manage with DCIM**



# Data Center Maturity Model

- DCMM: A roadmap for the industry to significantly improve efficiency and sustainability through benchmarking data center facility efficiency to clearly show where improvements can be made
- Integrates every aspect of the data center including power, cooling, compute, storage and network
- Provides guidelines by data center area such that operators can benchmark their current performance using the Data Center Maturity Model Equalizer, thereby:
  - Understand how far they are from best practice
  - Identify the ongoing steps and innovations required to achieve greater energy efficiency and sustainability improvements, both today and into the future.
  - Use the higher levels of the model to inform data center and IT strategy.

# Data Center Maturity Model



# Structure






- Minimal/No Progress
- Part Best Practice
- Best Practice
- Reasonable Step (between Level 2 and 5)
- Reasonable Step (between Level 2 and 5)
- Visionary – 5 Year View


# Scope Includes


- Energy Efficiency
  - Energy demand
  - Energy supply – low carbon generation
  - Utilization/Effectiveness
- Sustainability
  - Carbon
  - Water
  - Waste heat
  - Materials management
    - E-Waste
    - Cradle to cradle approach – lifecycle
  - Building sustainability
- Monitoring/metrics

# Accessing Online


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## Data Center Maturity Model


The new Data Center Maturity Model (DCMM) outlines capability descriptors by area so users can benchmark their current performance, determine their maturity levels, and identify the ongoing steps and innovations necessary to achieve greater energy efficiency and sustainability.

[Download the DCMM Tool!](#)


CUE™ White Paper | TGG Webcasts | **Data Center Maturity Model** | WUE™ White Paper | Global Metrics


### Latest Content

**Recommendations For Measuring and Reporting Overall Data Center Efficiency Version 2 - Measuring PUE for Data Centers (May 2011)**  
17 May, 2011 | [Comment now](#)


**The Green Grid In Collaboration With Other Data**

### Popular Content


**WP#22-Usage and Public Reporting Guidelines for PUE/DCiE**  
02 October, 2009 | [Comment now](#)

**WP#25-The Green Grid Energy Policy Research for Data Centres: France, Germany, The Netherlands, and The United**


### Member Company Feature

**interxion**

Interxion has participated as a Contributor Member of The Green Grid for two years and served an important role in a number

 Internet

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## General Tools

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### Data Center Maturity Model

Posted In:  
**General**

21 February, 2011



Launch Tool

The Green Grid has developed the [Data Center Maturity Model \(DCMM\)](#) and [supporting white paper](#) to outline capability descriptors by area such that users can benchmark their current performance, determine their levels of maturity, and identify the ongoing steps and innovations necessary to achieve greater energy efficiency and sustainability, both today and into the future. The maturity model touches upon every aspect of the data center including power, cooling, compute, storage and network. The levels of the model outline current best practices and a 5-year roadmap for the industry.

**Download**  
[DCMM - Full Model](#)  
[DCMM - All individual Sections in Zip File](#)  
[DCMM - Compute Section](#)  
[DCMM - Cooling Section](#)  
[DCMM - Management Section](#)  
[DCMM - Network Section](#)  
[DCMM - Other Facility Section](#)  
[DCMM - Other IT Section](#)  
[DCMM - Power Section](#)  
[DCMM - Storage Section](#)

### Comment Policy

The comment option is to provide feedback on this particular deliverable. Any advertisement of products will be removed.

### Related Content



**ASHRAE 2008 Deployment Japan Survey and Japanese Case Studies on Data Center Efficiency (2011 Technical Forum)**

202 Downloads | Comment now



**A Target on Their Backs: ICT and the Economic Imperative of Energy Efficiency (2011 Technical Forum)**

909 Downloads | Comment now

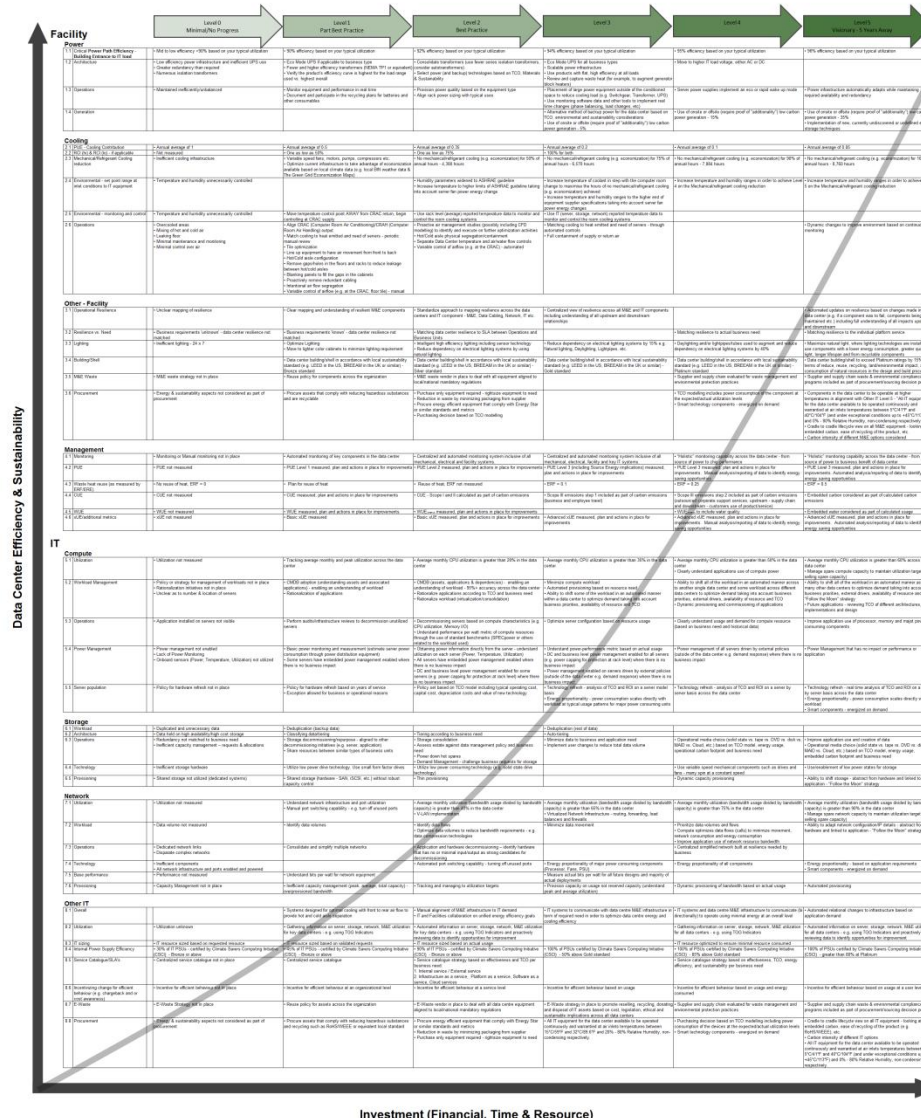


**Plotting a Path to Sustainability with The Green Grid's Data Center Maturity Model (2011 Technical Forum)**

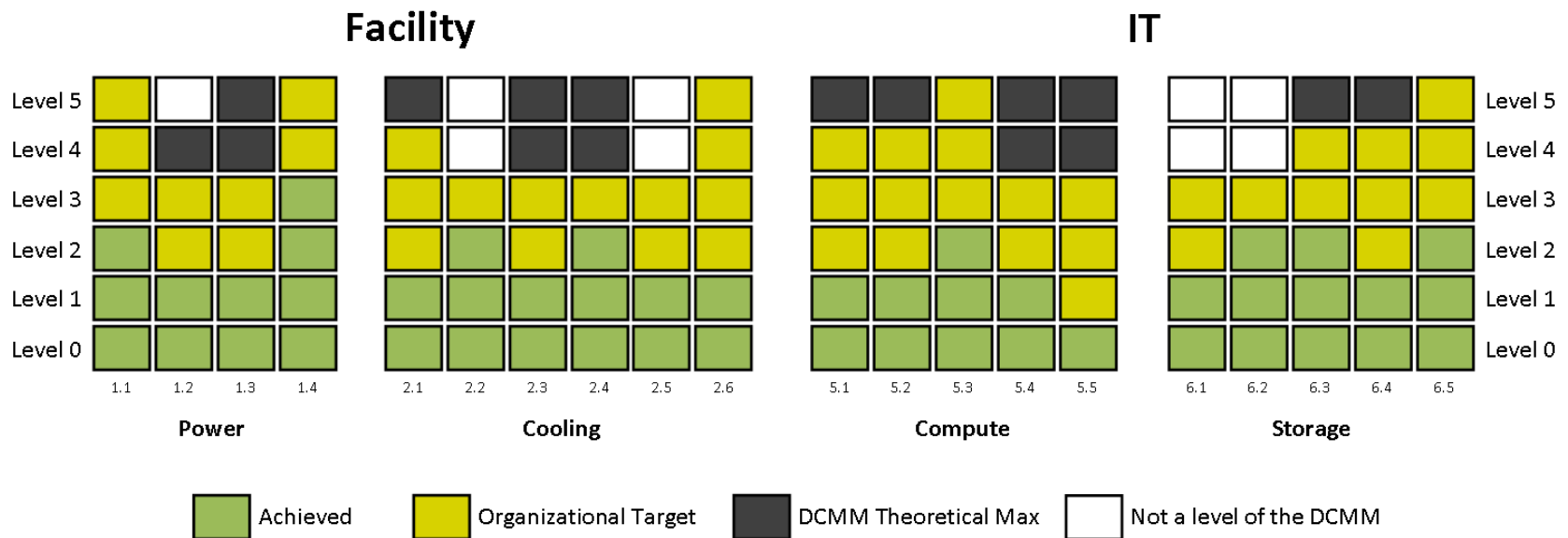
714 Downloads | Comment now



# Data Center Maturity Model



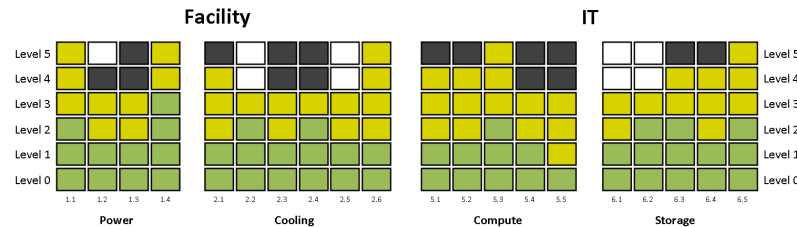
# Data Center Maturity Model Equalizer



# Feedback

## Feedback

- Where do I assess myself?
- How do I get the equaliser for my data center?



## Also

- Track progress over multiple years for data centers
- Enter a template and create copies
- Export assessment and equaliser
- High level and detailed assessments – depends on time and number of data centers
- Built with only user experience in mind and usable from your mobile device

# DCMM Stakeholder Use Cases



# Content

DCMM Integrates every aspect of the data center for a holistic business approach to efficiency

## Maturity Model

*Facility*

IT

Power

Cooling

Management

Other

Computer

Storage

Network

Other

# Facility – Power

- Critical Power Path Efficiency – Building Entrance to IT load
- Architecture
- Operations
- Generation



# Facility – Cooling

- PUE – Cooling Contribution
- RCI (hi) & RCI (lo) – if applicable
- Mechanical/Refrigerant Cooling reduction
- Environmental – set point range at inlet to IT equipment
- Environmental – monitoring and control
- Operations

# Facility – Other

- Operational Resilience
- Resilience vs. Need
- Lighting
- Building/Shell
- M&E Waste
- Procurement

# Facility – Management

- Monitoring
- PUE
- Waste heat reuse (as measured by ERF/ERE)
- CUE
- WUE
- xUE/additional metrics

# IT – Compute

- Utilization
- Workload Management
- Operations
- Power management
- Server populations

# IT – Storage

- Workload
- Architecture
- Operations
- Technology
- Provisioning

# IT – Network

- Utilization
- Workload
- Operations
- Technology
- Base Performance
- Provisioning



# IT – Other

- Utilization
- IT Sizing
- Internal Power Supply
- Service Catalogue/SLA's
- Incentivizing change for efficient behaviour
- E-Waste
- Procurement

# Assessment Tool - Questions

[Return to My Assessments Page](#)

## Data Center Maturity Model - Site Information

### Questions

1	Data Center name :	<input type="text"/>
2	What country is your data center located :	-- Select --
3	Building classification :	-- Select --
4	What type of data center is your site :	-- Select --
5	What vertical sector is your site in :	-- Select --
6	What is the Tier of your data centre (1-4) :	-- Select --
7	What is the age of your data centre (in years) :	-- Select --
8	Size of your data centre (sq ft) :	-- Select --
9	Annual average PUE :	-- Select --
10	Current measured UPS output (IT load only) :	-- Select --
11	Number of Servers :	-- Select --
12	Age of Servers :	-- Select --

# Assessment Tool - Summary or Detailed

Launch Summary

Launch Detailed

✓ Achieved  
○ Target

Level 2  
Best Practice

6.3 Operations



- Storage consolidation
- Assess estate against data management policy and business need
- Power down hot spares
- Demand Management - challenge business requests for storage

✓ Achieved  
○ Target

Level 2  
Best Practice

✓ Achieved    ■ Target    ▨ Partial

6.3 Operations



- Storage consolidation

6.3 Operations



- Assess estate against data management policy and business need

6.3 Operations



- Power down hot spares

6.3 Operations



- Demand Management - challenge business requests for storage



Facility

Power

Cooling

Other-Facility

Management

IT

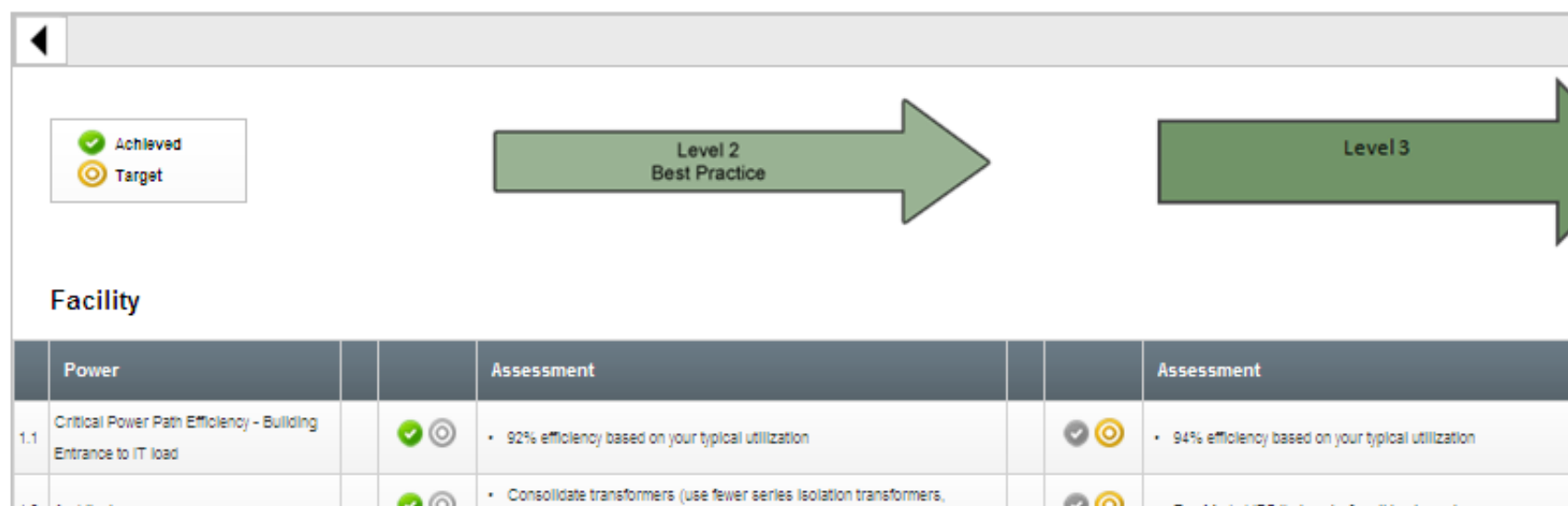
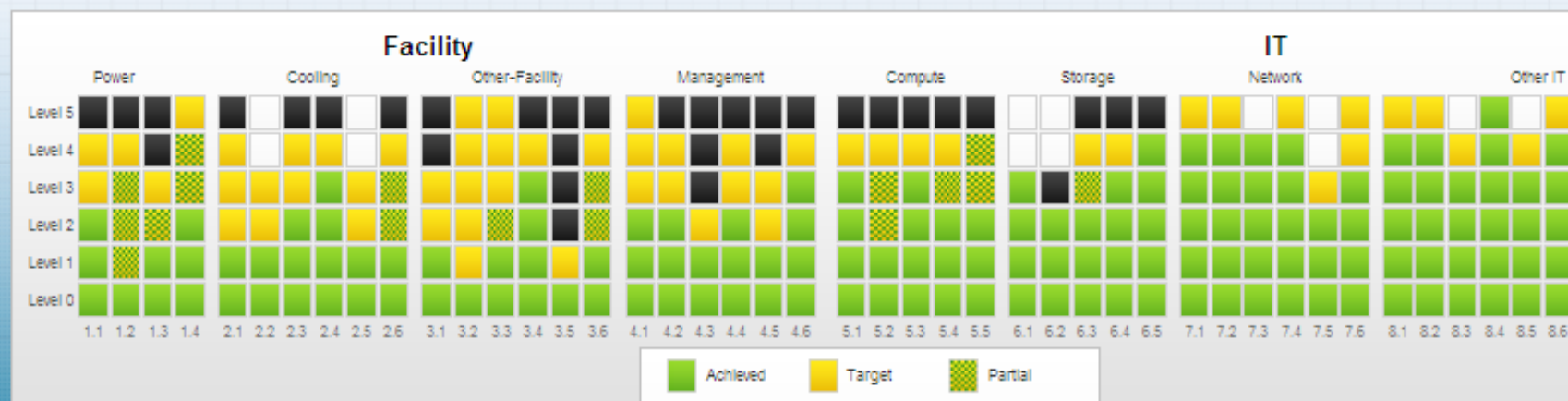
Compute

Storage

Network

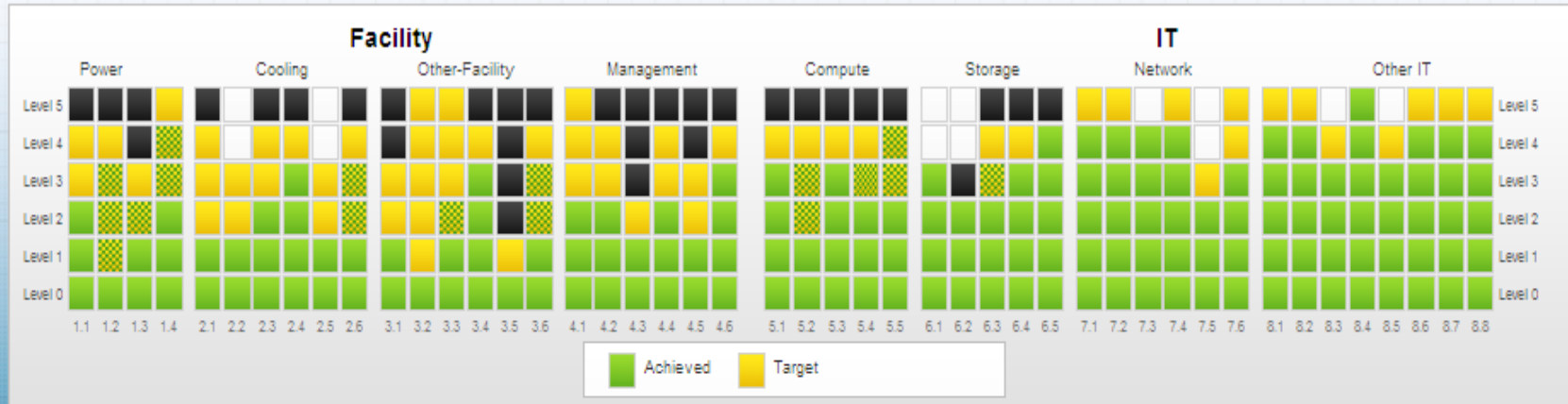
Other IT

## Data Center Maturity Model - Detailed Assessment (Carolina)



# Completed Assessment

## Data Center Maturity Model - Completed Assessment (Carolina)



### Copy Assessment

Please click on the 'Copy Assessment' button to create an updated revision to your assessment. Once selected a copy of your assessment (with a new ID and date) will be created which can be updated. The current

### Export Assessment

View Benchmarks

Export Equalizer to PDF

Export Assessment to Excel

# Benchmark

Facility

Power

Cooling

Other-Facility

Management

IT

Compute

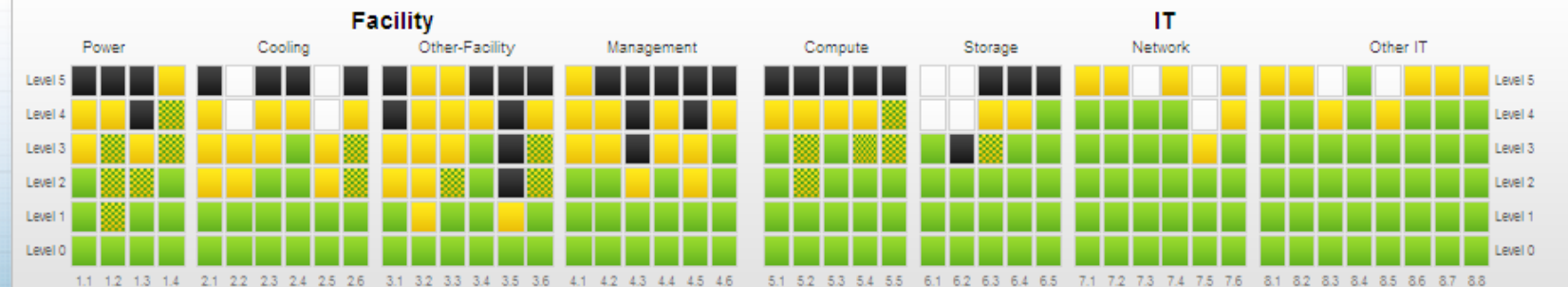
Storage

Network

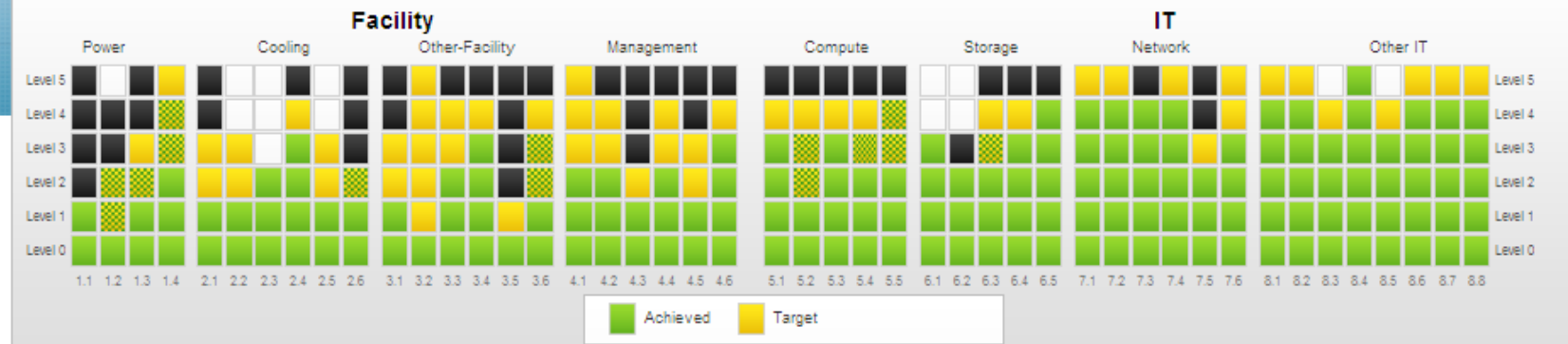
Other IT

## Data Center Maturity Model - Benchmark (Carolina)

### Your Assessment



### Benchmark Data





# Questions – why?

[Return to My Assessments Page](#)

## Data Center Maturity Model - Site Information

### Questions

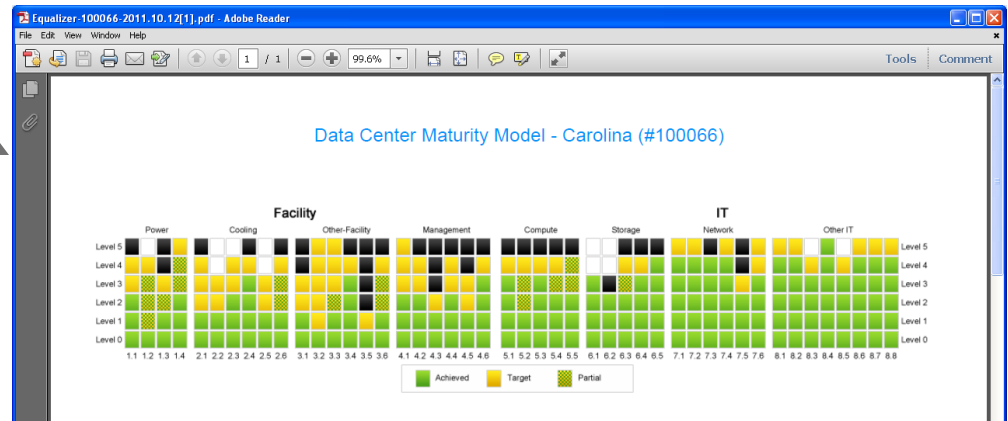
1	Data Center name :	<input type="text"/>
2	What country is your data center located :	-- Select --
3	Building classification :	-- Select --
4	What type of data center is your site :	-- Select --
5	What vertical sector is your site in :	-- Select --
6	What is the Tier of your data centre (1-4) :	-- Select --
7	What is the age of your data centre (in years) :	-- Select --
8	Size of your data centre (sq ft) :	-- Select --
9	Annual average PUE :	-- Select --
10	Current measured UPS output (IT load only) :	-- Select --
11	Number of Servers :	-- Select --
12	Age of Servers :	-- Select --



# Assessment Tool - Export

Export Equalizer to PDF

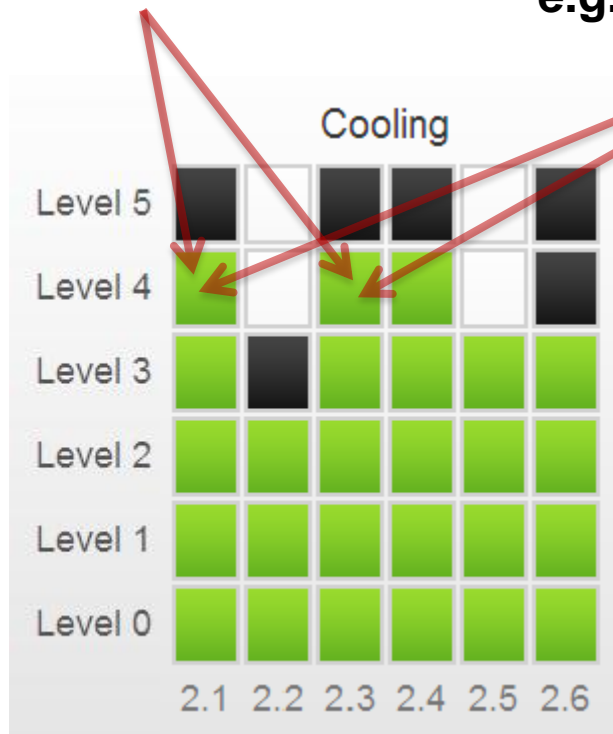
Export Assessment to Excel



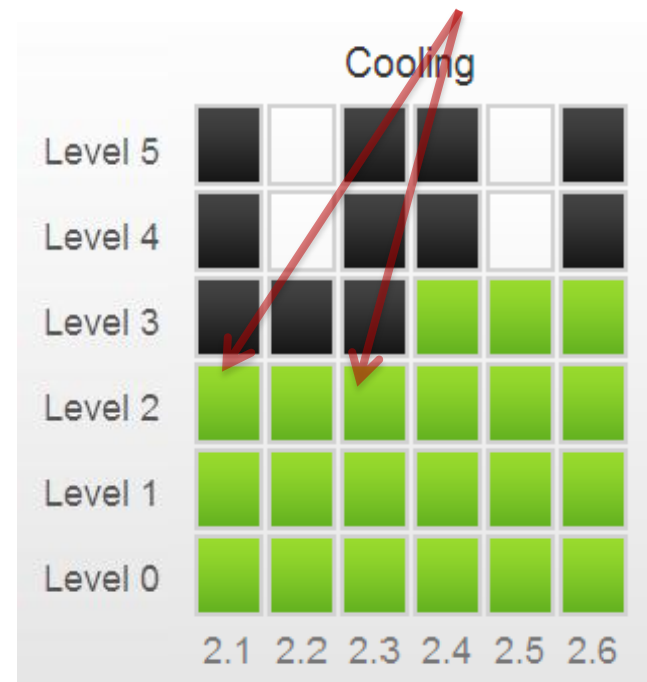
Data Center Maturity Model		LEVEL 0 Minimal/No Progress	LEVEL 1 Part Best Practice	LEVEL 2 Best Practice	LEVEL 3 Best Practice	LEVEL 4 Best Practice	LEVEL 5 Best Practice	
Key		Achieved Target Partial						
Management		1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management
IT		1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management
Compute		1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management	1.0 Build/Build 1.1 Build/Build 1.2 Management 1.3 Management 1.4 Management 1.5 Management 1.6 Management

# Vendor Benefit – product capability

**Product A**  
**Colder climate**  
**e.g. UK, France, Iceland**



**Product C - 2013**  
**Warmer climate**  
**e.g. Singapore, HK**



**Product B**  
**Warmer climate**  
**e.g. Singapore, HK**

# Summary

- Roadmap for the industry to significantly improve efficiency and sustainability
- Benchmark your data center using the Data Center Maturity Model Equalizer, thereby:
  - Seeing how you compare to best practice – Level 2
  - Identifying the ongoing steps and innovations required to achieve greater energy efficiency and sustainability improvements
  - Designing new data centers and IT using the model's higher levels
- Provides your C-level suite with a clear guide for improving the energy efficiency and sustainability of the data center portfolio



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Thank you  
Come join The Green Grid learn from  
industry experts and help guide  
the industry

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