

IAITAM ACE
 May 7-9, 2024 The M Resort Las Vegas, NV

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 Nlyte Software
 Accelerating sustainability through integrated data center management (IDCM)

Finding your IAITAM Oasis

1

Agenda

1. Conversation baselines
2. Sustainability rules, standards
3. Initial action plans
4. Bringing it all together

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2

What is the purpose of a data center?

Directions to the airport?

Let's play a game of video poker!

What is the exchange rate from Dollars to Euros?

Amazon, show me the best deal on men's winter coats!

To answer questions and process requests

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3

1

Data centers are everywhere

There is some form of Data Center in every vertical – they're called different things

IDF closet
Edge computing
Data Center in a rack

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4

Data centers use a lot of resources and regulators have taken notice

- An average data center consumes over 100x the power of a large commercial office building. ¹
A large data center uses the electricity equivalent of a small U.S. town. ¹
- Data centers are estimated to be responsible for up to 3% of global electricity consumption ² and are projected to touch 4% by 2030. The average hyperscale facility consumes 20-50MW annually – enough electricity to power up to 37,000 homes.
- One Google search is equal to turning on a 60W light bulb for 17 seconds, or about 0.0003 kWh of energy, or roughly 0.2g of carbon dioxide. ³
- The typical data center uses about 3-5 million gallons of water per day – the same amount of water as a city of 30,000-50,000 people. ⁴
- “2023 is shaping up to be a year of increased sustainability regulations for the data center industry – both in the U.S. and globally.” ⁵

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1 US DOE - www.energy.gov/news/buildingdata-centers-and-servers
 2 DataCenter Magazine - <https://datacentermagazine.com/articles/efficiency-to-loom-large-for-data-center-industry-in-2023>
 3 TIME MAGAZINE - <https://techland.time.com/2011/09/09/5-things-you-d-never-guess-about-googles-energy-use/>
 4 Venkatesh Uddameri, professor and director of the Water Resources Center at Texas Tech University, via NBC News - <https://www.nbcnews.com/tech/internet/what-are-data-centers-pump-back-against-data-center-n1721344>
 5 “Tougher Reporting Mandates Ahead for Data Centers” - datacenterknowledge.com

5

Conversation baselines

Sustainability compliance reporting legislation is on the rise

Market	Legislation	Key Points
EU	EU Energy Efficiency Directive (EED)	Compliance failure can result in fines and other penalties. The revised directive was published in the EU Official Journal and entered into force on 10 October 2023 . The EU Energy Efficiency Directive (EED) is a European Union directive which mandates energy efficiency improvements within the European Union. The EU Energy Efficiency Directive (EED) is a European Union directive which mandates energy efficiency improvements within the European Union.
USA / Global	SEC Climate Risk Disclosures	United States SEC's Enhancement and Standardization of Climate-Related Disclosures On March 6, 2024 , the SEC adopted final rules to enhance the transparency and standardization of climate-related disclosures required from registrants in their registration statements and annual reports. This move, initially proposed on March 21, 2022, marks a pivotal shift towards integrating climate considerations into corporate reporting, reflecting the growing investor demand for reliable and consistent climate-related information.
USA / California	Senate Bill 253 Senate Bill 261	California's Climate Corporate Data Accountability and Financial Risk Acts In October 2023 , California made a significant leap forward in climate legislation by enacting two groundbreaking bills: Senate Bill 253, the Climate Corporate Data Accountability Act, and Senate Bill 261, the Climate-Related Financial Risk Act. These bills, passed with robust support in both legislative branches, mark a historic shift in corporate responsibility towards climate change.

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“Most operators expect carbon emissions reporting requirements soon — yet many are unprepared.”
 Source: Uptime Institute in their Global Survey of IT and Data Center Managers 2022

6

Conversation baselines

ASHRAE Standard 90.4: Energy Standard For Data Centers - February 2023¹

ASHRAE JOURNAL Newsletter

February 14, 2023

From February 2023 ASHRAE Journal

Standard 90.4: Energy Standard For Data Centers

By Terry Rodgers, Member ASHRAE; Robert E. MacFarlane, Member ASHRAE; and Joseph F. Prisco

ASHRAE SSFC 90.4 will publish an updated version of Standard 90.4, Energy Standard for Data Centers, this year as ANSI/ASHRAE Standard 90.4-2022, which will be incorporated into Standard 90.1 as an Alternate Compliance Path. This article gives an overview of the purposes of Standard 90.4, its history and how it can be effectively used when designing and building data centers. [Read more](#)

1. ASHRAE Standard 90.4: Energy Standard For Data Centers
https://images.magnetmail.net/images/clients/ASHRAE/attach/44-52_00.pdf

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7

Conversation baselines

The purpose and opportunity cost of data centers

Questions → **Purpose** → **Answers**

Power → **Cost** → **Heat**

Clean Water → **Cost** → **Dirty Water**

Legislation

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8

Data center sustainability rules and standards

Measures, calculations, and rules vary by region, are complex...

European Commission
Energy, Climate change, Environment

US SEC Enhancement and Standardization of Climate-Related Disclosures

CALIFORNIA ENERGY COMMISSION
Computer Rooms & Data Centers

Source: Uptime Institute

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9

Data center sustainability rules and standards ...and are moving targets

Upcoming SEC climate disclosure rules bring urgency to ESG data strategy planning



Power Usage Effectiveness (PUE) Metric

"To address the growing concerns about a transition to a 100% green data center footprint, the U.S. Green Building Council (USGBC) has introduced a new metric, PUE, to measure the energy efficiency of data centers." - Reuters, May 2023

European Energy Efficiency Directive published, with mandatory data center reporting

Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2018/843 (recast)

Update – Germany tightens energy efficiency requirements: New challenges for companies and data centers

On 21 September 2023, the German Parliament passed the Energy Efficiency (Energy Saving) Ordinance (EnEV) which sets significantly tighter energy efficiency requirements for companies and data centers to monitor.

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10

Initial action plans Improve sustainability and prepare for stricter reporting mandates

1 STRATEGY
Create a strategy to execute sustainable practices and comply with information reporting requirements.

2 PROCESS
Enact processes to ensure projects increase the work delivered per megawatt-hour of energy consumed across data center operations.

3 METRICS
Establish data collection, management, dashboarding, and reporting processes for the needed information.


4 REPORTING
Enable a reporting framework that supports real-time information and annualized sustainability compliance reporting.

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11

Initial action plans

STRATEGY → Determine requirements by location



CONCENTRIC ACTION ENERGY EFFICIENCY DIRECTIVE

- 1. Framework
- 2. Good practices/Best practices

Document	Author	Organization	Type	Date
Reflections on Scotland's Approach - UK	Yvette Sheppard	Scottish Government	Report	Jan 20
Community Energy in Scotland - UK	Chris Garner	Scottish Government	Report	Jan 20
Minimum Standards in the Private Rental Sector - United Kingdom	James Kerry	Department for Business, Energy and Industrial Strategy	Report	Mar 19
Energy poverty in England - United Kingdom	James Kerry	Department for Business, Energy and Industrial Strategy	Report	Mar 19
Assessment and reporting evaluation - United Kingdom	Gary Stratton	BEIS	Report	Oct 18
Good practice benchmarks: Tailoring advice based on customer advice - UK	Caitlin Berr	Energy Saving Trust	Report	Oct 17
Article 4 Building Renovation Strategy: Overview of national building stock - UK			Report	Aug 16


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12

4


Initial action plans

STRATEGY → Align cooling with workload demand



- Increase efficiency by matching workloads to available free cooling and renewable energy sources at optimal times
- Utilize autonomous and remote management, particularly in edge locations
- Leverage energy-efficient cooling options in high-density environments
- Ensure Building Automation Systems and Data Center Infrastructure Management solutions are integrated so that infrastructure appropriately serves the workloads being run

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13


Initial action plans

STRATEGY → Target carbon-intensive infrastructure


Microsoft Plans to Stop Using Diesel Generators by 2030



- Identify infrastructure with heaviest carbon footprint
- For new builds, design in alternative energy sources
 - Solar PV arrays
 - Hydrogen fuel cells



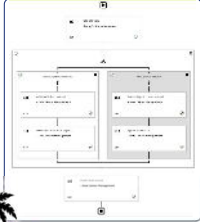
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14

Initial action plans


PROCESS → Implement workflow management



- Develop organizational processes for sustainability certifications / compliance / reporting
- Establish procurement guidelines to ensure purchase of efficient equipment
- Identify points in equipment deployment processes for inserting or tweaking efficiency gains
- Define processes for optimizing metrics

Task	Owner/Project	Start	End	Status
200	Greenfield Action - Energy Efficiency	08/01/2022	09/01/2022	Completed
201	Greenfield Action - Energy Efficiency	08/01/2022	09/01/2022	Completed
202	Greenfield Action - Energy Efficiency	08/01/2022	09/01/2022	Completed
203	Greenfield Action - Energy Efficiency	08/01/2022	09/01/2022	Completed
204	Greenfield Action - Energy Efficiency	08/01/2022	09/01/2022	Completed
205	Greenfield Action - Energy Efficiency	08/01/2022	09/01/2022	Completed
206	Greenfield Action - Energy Efficiency	08/01/2022	09/01/2022	Completed
207	Greenfield Action - Energy Efficiency	08/01/2022	09/01/2022	Completed
208	Greenfield Action - Energy Efficiency	08/01/2022	09/01/2022	Completed
209	Greenfield Action - Energy Efficiency	08/01/2022	09/01/2022	Completed

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15

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METRICS → Start with the basic metrics for your region

- Power Usage Effectiveness (PUE)** – The total facility power divided by the IT equipment power consumption.
- Carbon Usage Effectiveness (CUE)** – The ratio of Total CO2 emissions (kg) divided by Total IT Energy (kWh).
- Water Usage Effectiveness (WUE)** – The ratio of the annual site water usage in liters to the IT equipment energy usage in kilowatt-hours (kWh) during the same period.
- Total CO₂** - An estimate of the total greenhouse gas emissions produced by a data center. It's usually measured in metric tons of carbon dioxide equivalent (CO₂e).



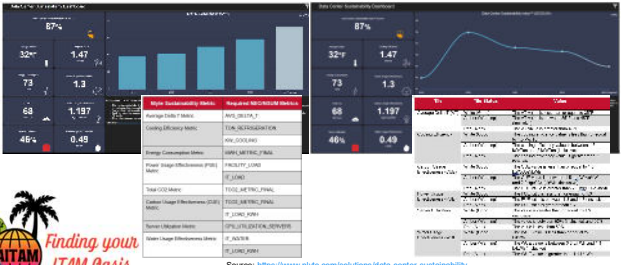

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16

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REPORTING → Real-Time Dashboarding → Thresholds, Alarming, and Visual Indicators

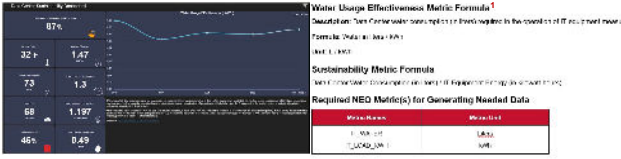
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17

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REPORTING → Real-Time Dashboarding → Example Detail: Water Usage Effectiveness(WUE)




Water Usage Effectiveness Metric Formula¹
 Definition: "The ratio of water usage, typically measured in gallons, to the amount of IT equipment power used." Formula: $WUE = \frac{W}{E}$
 Unit: L/kWh

Sustainability Metric Formula
 Note: The same formula can be used to compare the water usage of different data centers.

Required NEO Metric(s) for Generating Needed Data

Metric	Required
IT Equipment Power	Yes
Water Usage	Yes

"While data center water consumption may not be a core focus for operators, it is non-trivial, with U.S. data centers estimated to consume over 400 million gallons per day (Nature, 2018). It is estimated that less than a third of data center owners and operators in the U.S. measure and track water consumption. Metrics such as water usage effectiveness, or WUE, have emerged to enable assessment of water efficiency performance relative to other data centers."²



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1 Source: <https://www.nyta.com/solutions/data-center-sustainability>
 2 Source: <https://datacenters.lbl.gov/water-efficiency>

18

Initial action plans

REPORTING → Annualized Compliance Reporting

ENERGY EFFICIENCY DIRECTIVE REPORT
Site Code: MIA-00000000000000000000

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19

Bringing it all together

Integrated Data Center Management (IDCM) enables sustainable data centers and reporting

Building Automation System (BAS) Thermal + Energy Management

- Thermal Delivery:**
 - Creation and delivery of thermal change to one or more zones
 - Context: zones and schedules
- Thermal Management:**
 - Orchestration of thermal management, facility system visualization, monitoring and reporting
 - Context: entire building / campus, schedules, sophisticated capabilities, flexible, programmable

Data Center Management System (DCIM) Asset and Energy Management

- Asset Management:**
 - Monitor, manage, report on IT / computing assets
 - Context: data center, data center equipment, workloads
- Energy Management:**
 - Monitor, manage and report on energy
 - Context: data center, data center equipment

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20

Bringing it all together

Integrated Data Center Management (IDCM) enables sustainable data centers and reporting

Building Automation System (BAS) Thermal + Energy Management

- Thermal Delivery:**
 - Reduce costs (efficiency)
 - Improve uptime (servers and HVAC mechanical)
 - Provide operational insight (multi-sourced metrics)

Data Center Management System (DCIM) Asset and Energy Management

All of which can be used to drive sustainable operation and deliver required reporting

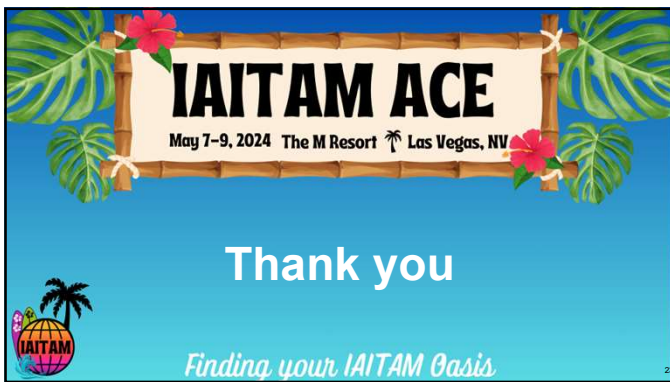
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21

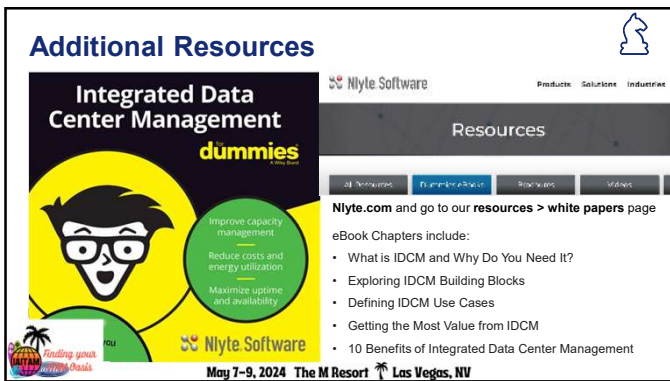
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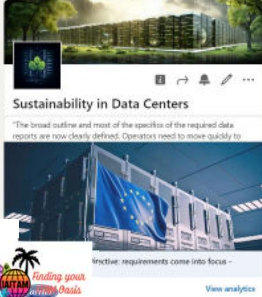


23



24

Additional Resources 



Sustainability in Data Centers

"The broad outline and most of the specifics of the required data reports are now clearly defined. Operators need to move quickly to

instruct requirements come into focus -



[View analytics](#)

LinkedIn Group


Sustainability in Data Centers

This public group explores energy efficiency, carbon footprint reduction, waste management, water conservation, green infrastructure, sustainable innovation, legislation, standards, policies, and case studies.

On LinkedIn, Search "Sustainability in Data Centers."

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25
