

Welcome!

- Thank you for joining today's webinar:
Latest Developments and Market Projections on Automated Demand Response
- If you have a question please use the question box located on the right side of your screen.
- Questions for our speaker will be addressed at the end of the presentation.
- This webinar will be recorded for future playback.

Today's Speaker



- Brett Feldman senior research analyst, Navigant Research, contributing to the Utility Transformations



AUTOMATED DEMAND RESPONSE

GLOBAL MARKET ANALYSIS AND FORECASTS

JANUARY 20, 2015

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MARKET INTELLIGENCE • ANALYSIS • BENCHMARKING

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Introduction



NAVIGANT RESEARCH PROVIDES IN-DEPTH ANALYSIS OF GLOBAL CLEAN TECHNOLOGY MARKETS.

The team's research methodology combines supply-side industry analysis, end-user primary research and demand assessment, and deep examination of technology trends to provide a comprehensive view of the Energy Ecosystem.

RESEARCH PROGRAMS:

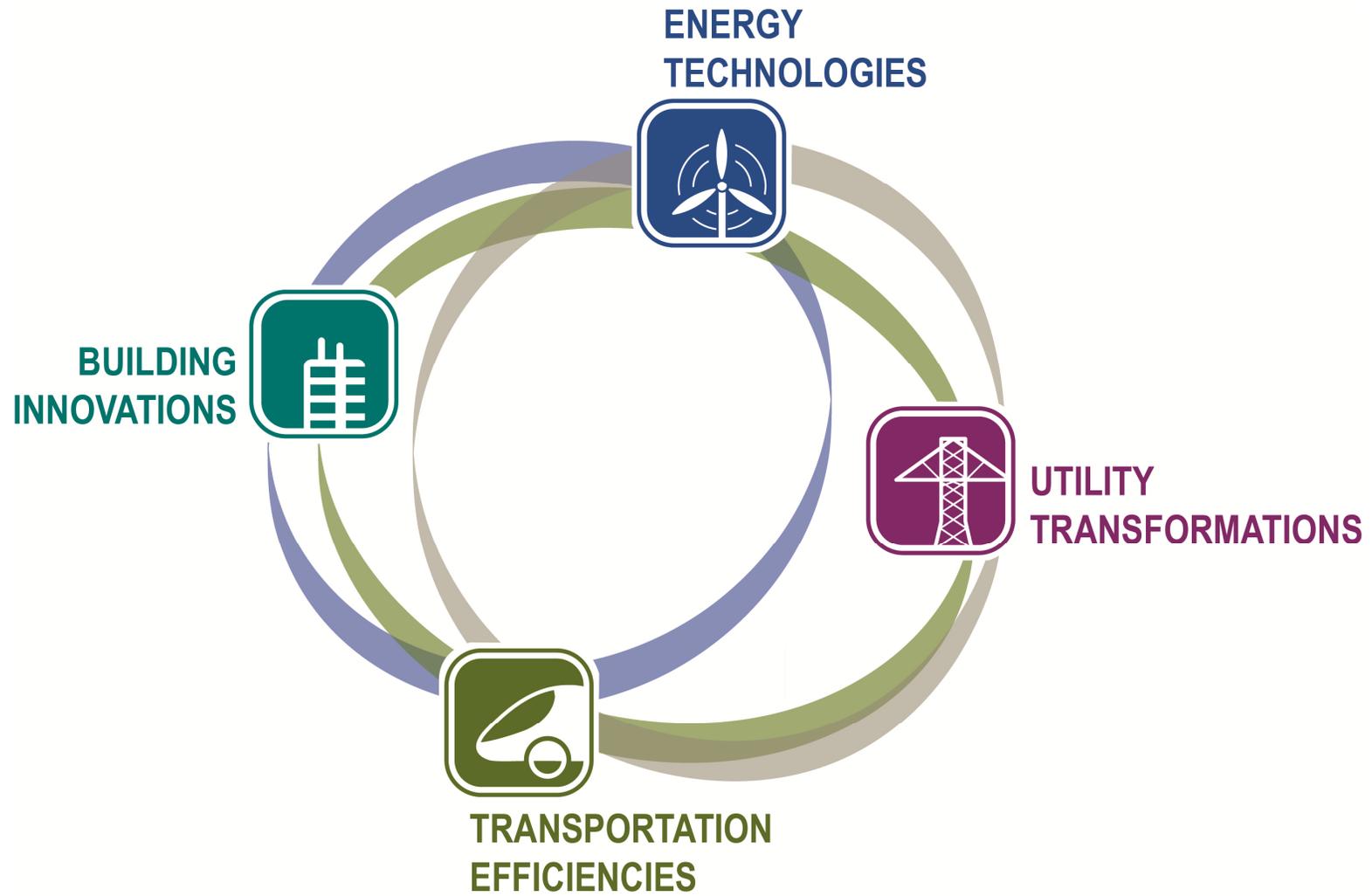
Energy Technologies
Utility Transformations
Transportation Efficiencies
Building Innovations

RESEARCH OFFERINGS:

Research Reports
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- Custom Market Analysis
- Market Sizing and Forecasting
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- Go-to-Market Services
- Strategic Advisory Sessions
- Commercial Due Diligence
- Technology Evaluation

Energy Ecosystem



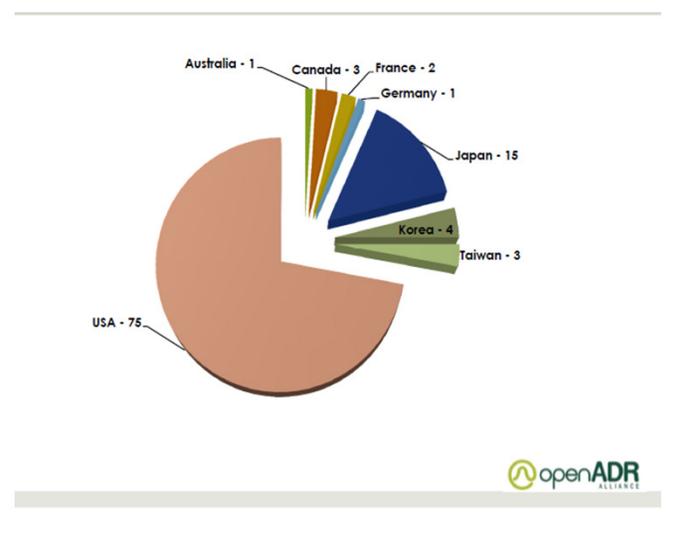
MARKET DRIVERS AND BARRIERS

Automated DR Drivers

» Standards

- › OpenADR
- › Leadership in Energy and Environmental Design (LEED)
- › California Title 24

OpenADR Members by Country



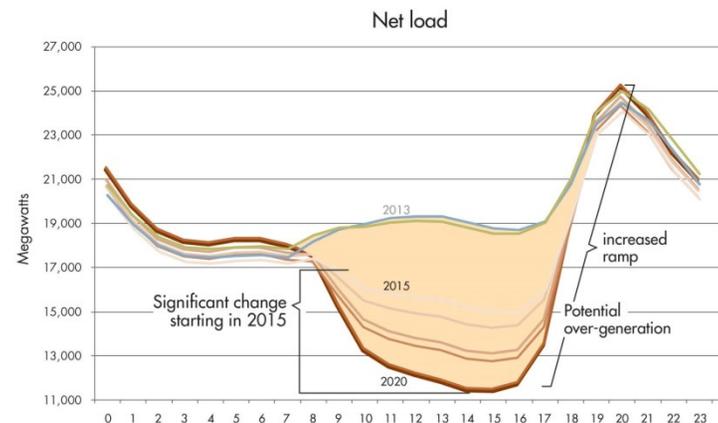
(Source: OpenADR Alliance)

Automated DR Drivers

- » Ancillary services markets
- » Renewable integration
 - › California
 - › Hawaiian Electric Company
 - › Europe

CAISO's Duck Graph

Growing need for flexibility starting 2015



California ISO
Ready to meet your needs

3

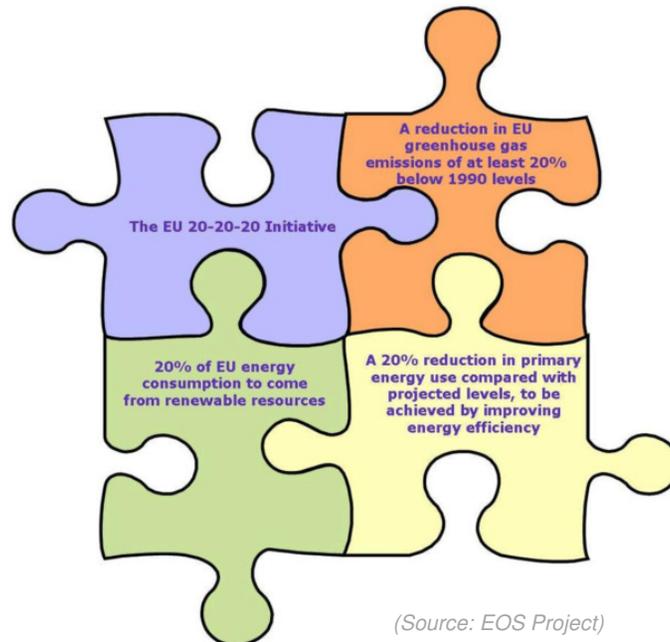
(Source: California Independent System Operator)

Automated DR Drivers

» International growth

- › Europe
- › Asia

20-20-20 Provisions



Fukushima Nuclear Station



(Source: World Nuclear Association)

Tianjin Economic-Technological Development Area



(Source: United States Trade and Development Agency)

Automated DR Barriers

- » Customer control concerns
- » Lack of building automation systems (BAS)
- » Cost
- » Federal Energy Regulatory Commission (FERC) Order 745 court case

TECHNOLOGY TRENDS

Two-Way Communication

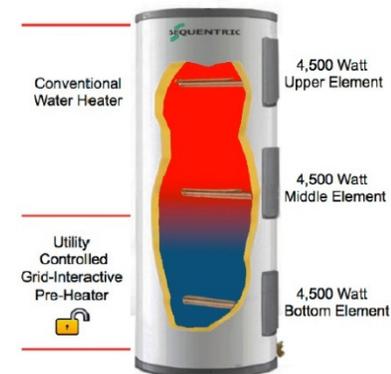
- » Programmable thermostats
 - › Bring your own thermostat/device
- » Grid interactive water heating
 - › Large storage capacity
 - › Fast response capability

Smart Thermostat



(Source: Nest)

Connected Pre-Heater



(Source: Prometheus Institute)

DR Communication Options

Network Functionality Comparisons

| Function | AMI | Wi-Fi | Smart Grid |
|----------------------|-----------------|--------------------|------------|
| Speed | Low | High | High |
| Network Availability | Always on | Customer-dependent | Always on |
| Load Control | Scheduled | Immediate | Immediate |
| Acknowledgement | Next meter read | Immediate | Immediate |
| Customer Engagement | No | Yes | Yes |

(Sources: Navigant Research, Comverge, Silver Spring Networks)

SAMPLE PROJECTS

Bonneville Power Administration

- » Bonneville Power Administration (BPA) developed an ADR platform to implement DR pilots targeted for commercial and industrial customers:
 - › Pilot 1: Integration of DR and renewable energy in cold storage warehouses across four utility territories
 - Compressor and evaporator loads were controlled up and down using ADR signals
 - 51 load control events across the five participating refrigerated warehouses
 - Average of 976 kW of load decrease and 462 kW of load increase
 - › Pilot 2: Integration of DR and renewable energy for a paper mill site in the city of Port Angeles:
 - ADR control strategies included turning on and off mechanical pulping motors
 - 11 load control events for the paper mill
 - Average 21.5 MW of load decrease and 17.6 MW of load increase

Purpose of Fast DR:

“Quick-start bridge resource”
to manage the intermittency of renewable energy generation

- **Pilot overview**
 - ❑ Commercial sector, ~20 customers, each ~100 kW load drop
 - ❑ Automated response to HECO signal
 - ❑ Akuacom DRAS/Honeywell implementation
- **Customer incentives**
 - ❑ Up to \$10/kW-month
 - ❑ 50 cents/kWh during events
 - ❑ Enablement reimbursement (~\$300/kW)
- **Schedule**
 - ❑ 2012: customer enrollment and technical audits
 - ❑ Winter/spring 2013: enablement
 - ❑ 2013-14: Fast DR event execution
 - ❑ 2014: Full year operation; possible filing for full-scale implementation



(Source: Navigant Consulting)

United Kingdom

- » Honeywell working with two partners on ADR projects
 - › Scottish and Southern Energy (SSE)
 - Allows the utility to alert customers when energy use is expected to peak and create grid congestion
 - Controller communicates with building management system (BMS), which makes short-term changes based on parameters set in advance
 - › Stor Generation
 - Automatically adjusts energy use in buildings to help stabilize the electrical grid in National Grid's Short Term Operating Reserve (STOR)
 - Combines and feeds power from onsite generators into the grid as well

Japan

- » Ministry of Economy, Trade and Industry (METI) directing various efforts to bring more DR deployment
 - › Emphasis to have a well-established OpenADR standard
 - › OpenADR task force includes Japan Smart Community Alliance (JSCA), major electric utilities, and Japanese equipment manufacturers (Toshiba, Hitachi, Mitsubishi, Fujitsu, etc.)
 - › Testing of reference OpenADR systems with factories and commercial buildings took place in late 2013/early 2014
 - › Kyocera is partnering with IBM and Tokyu to demo an ADR network consisting of 25 demo sites

China

- » Challenge: Grid reliability
 - › Managing rapid increase in demand and influx of renewables
- » Conducted ADR pilot in the Tianjin Economic-Technological Development Area
- » Peak load reduction system pilot and feasibility study involved standards-based ADR based on OpenADR
- » Two commercial buildings and one industrial facility participated as demonstration sites
- » China wants to prepare for a nationwide deployment starting in 2016, with a goal of 150 MW to 200 MW within smart cities dedicated to ADR

INDUSTRY NEWS

Press Releases: AutoGrid

- » \$12.75 million round of funding from E.ON
 - › Develop new applications for Energy Data Platform software
- » Selected by BPA to implement and manage advanced DR demonstrations

AutoGrid's DROMS



(Source: AutoGrid)

Press Releases: Comverge

- » Released a new suite of IntelliSOURCE advanced applications for demand management optimization
 - › Machine-learning system that utilizes Big Data analytics and two-way device telemetry to improve forecasting capabilities
 - › Can determine the most cost-effective assets for a utility to deploy, taking customer and environmental factors into account

Comverge's IntelliSOURCE

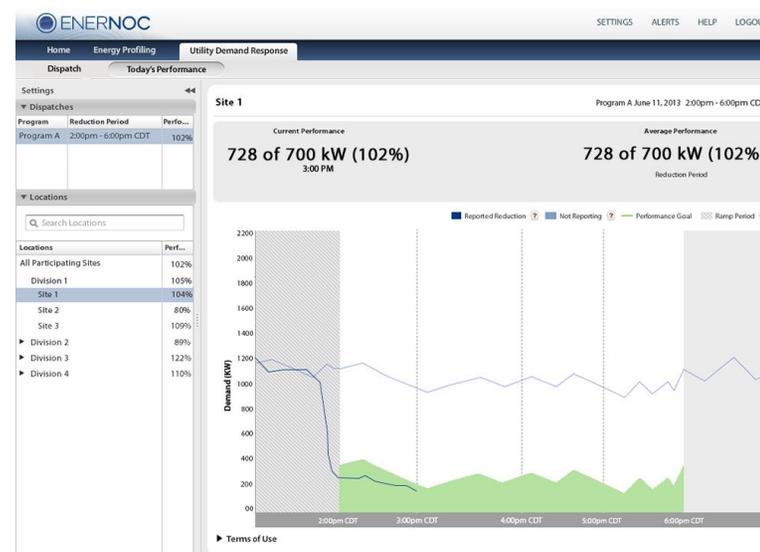


(Source: Comverge)

Press Releases: EnerNOC

- » Introduced a new utility DR product called Demand Manager
 - › Software as a service (SaaS) platform that provides utilities and retail electric providers with the tools to manage DR programs
 - › Includes a data integration application programming interface (API) that allows EnerNOC's software to integrate with utility interval meters, thereby leveraging smart meter investments

EnerNOC's Demand Manager

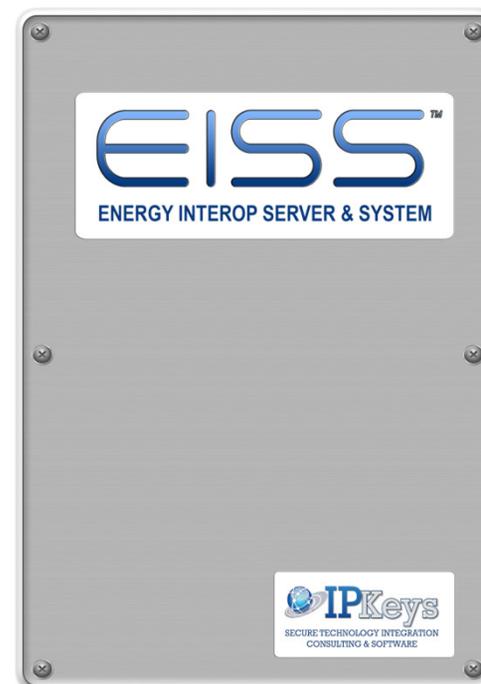


(Source: EnerNOC)

Press Releases: IPKeys

- » Conducted pilot at PJM for DR in ancillary services
 - › Included Walmart, the Lawrence Berkley National Laboratory, and Schneider Electric
 - › Sent signals to Walmart's BMS for synchronous reserve and Schneider's variable frequency drive (VFD) lab for frequency regulation
- » Bought North America Power Partners (NAPP) to add aggregation functions

IPKey's EISS



(Source: IPKeys)

Press Releases: Landis+Gyr

- » Working with Consolidated Edison to manage energy use at electric vehicle charging stations
 - › Load control switches at 50 homes
 - › Study how customers respond to DR requests at different times of day
- » Released updated version of Power Center, an operating software for DR applications
 - › Links Landis+Gyr load control switches to the advanced metering infrastructure (AMI) network

Landis+Gyr Load Control Switch



(Source: Landis+Gyr)

Press Releases: Powerit

- » Published Electrical Demand Automation Software specification
- » Offering Spara load control hardware and software on a white-label basis to OEMs and service providers that want to build advanced demand management into their branded products
- » Releasing Spara software onto third-party hardware for companies such as Mitsubishi and Siemens

Powerit's SparaHub

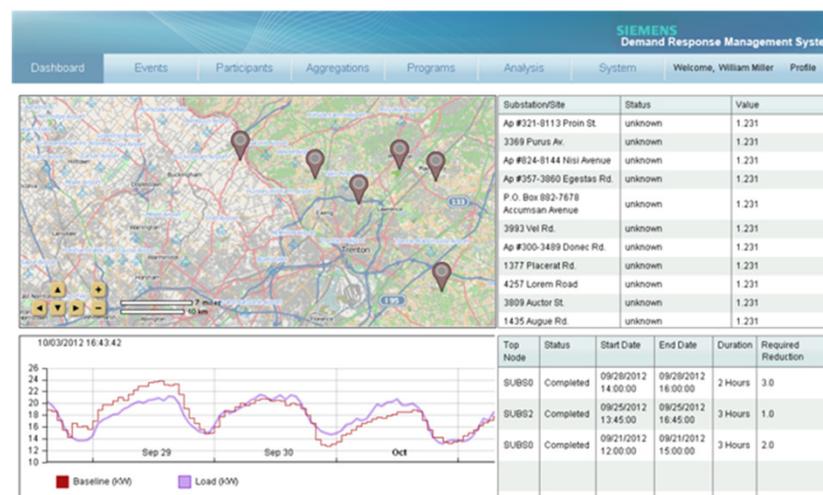


(Source: Powerit)

Press Releases: Siemens

- » Signed deal with Direct Energy to provide DR management system (DRMS)
 - › Largest DRMS deal for a non-utility retail energy supplier
 - › Integrates with multiple independent system operators (ISOs) and DR programs
 - › Supports consumer-bidding DR programs

Siemens' DRMS



(Source: Siemens)

Press Releases: Silver Spring Networks

- » Introduced CustomerIQ Thermostat App
 - › Mobile energy management and DR event control without reliance on residential broadband or Wi-Fi
 - › Can work with any ZigBee Smart Energy protocol device
 - › Available as iOS and Android apps and a web version

CustomerIQ Thermostat App



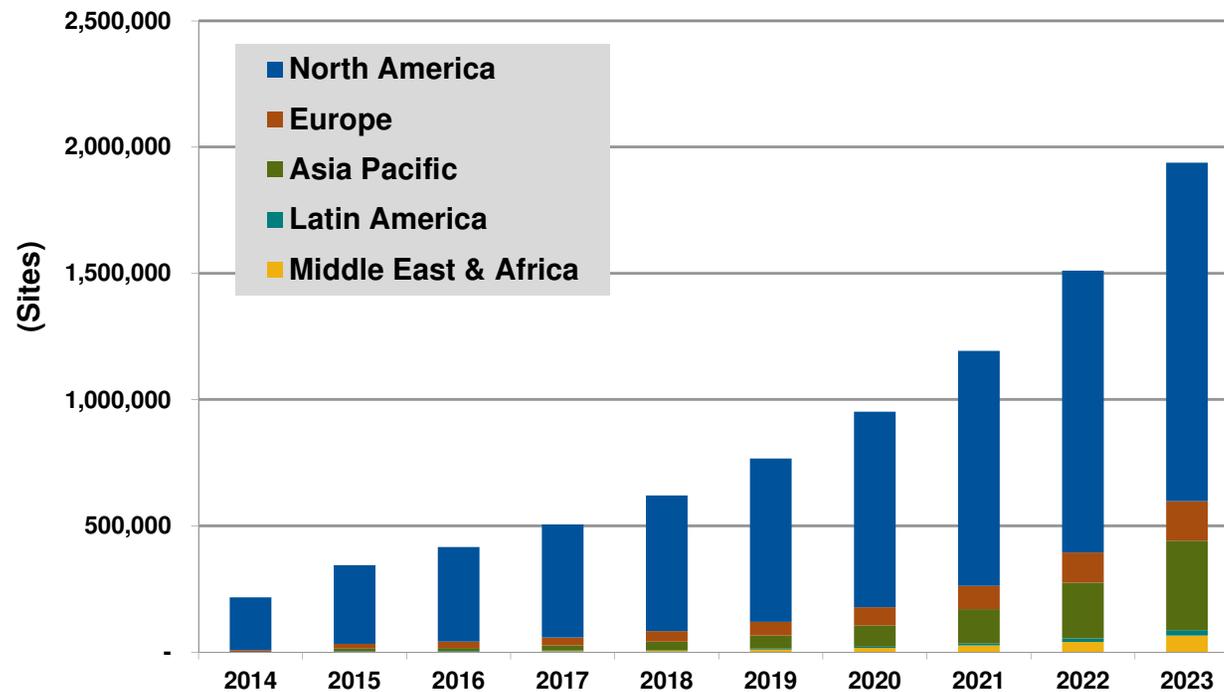
(Source: Silver Spring Networks)

MARKET FORECASTS

Market Forecasts

» Number of ADR sites expected to grow to almost 2 million by 2023

ADR Sites by Region, World Markets: 2014-2023

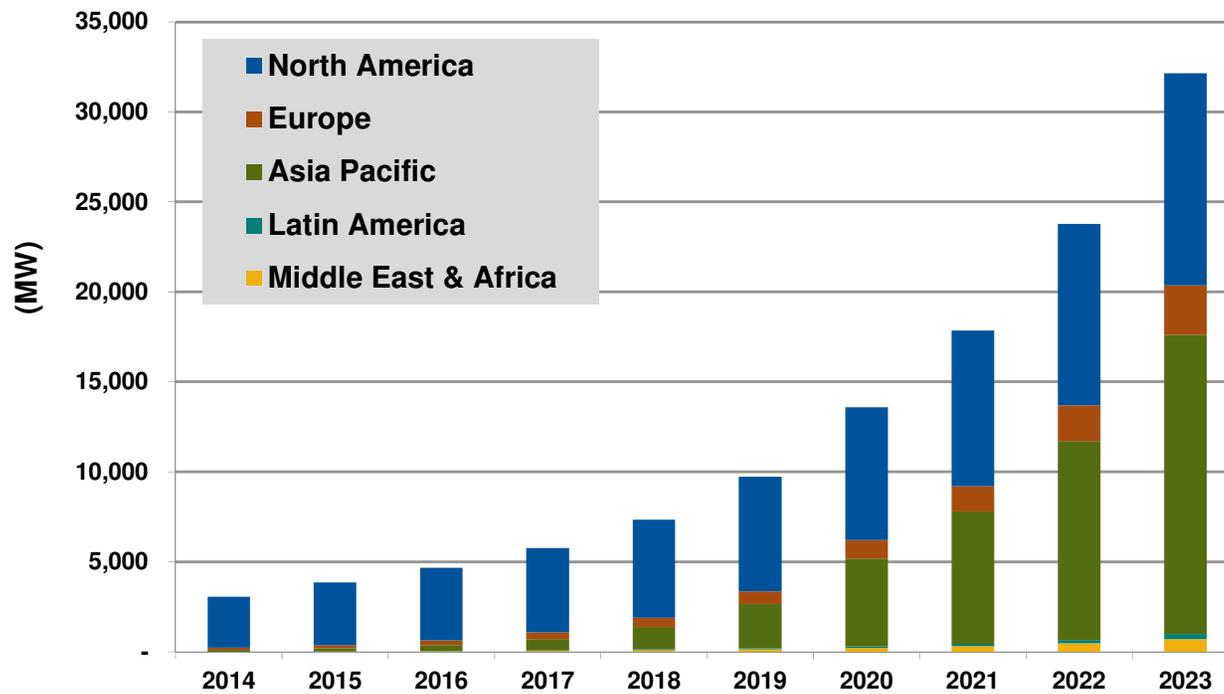


(Source: Navigant Research)

Market Forecasts

» ADR Capacity expected to grow to over 30 GW by 2023

ADR Capacity by Region, World Markets: 2014-2023

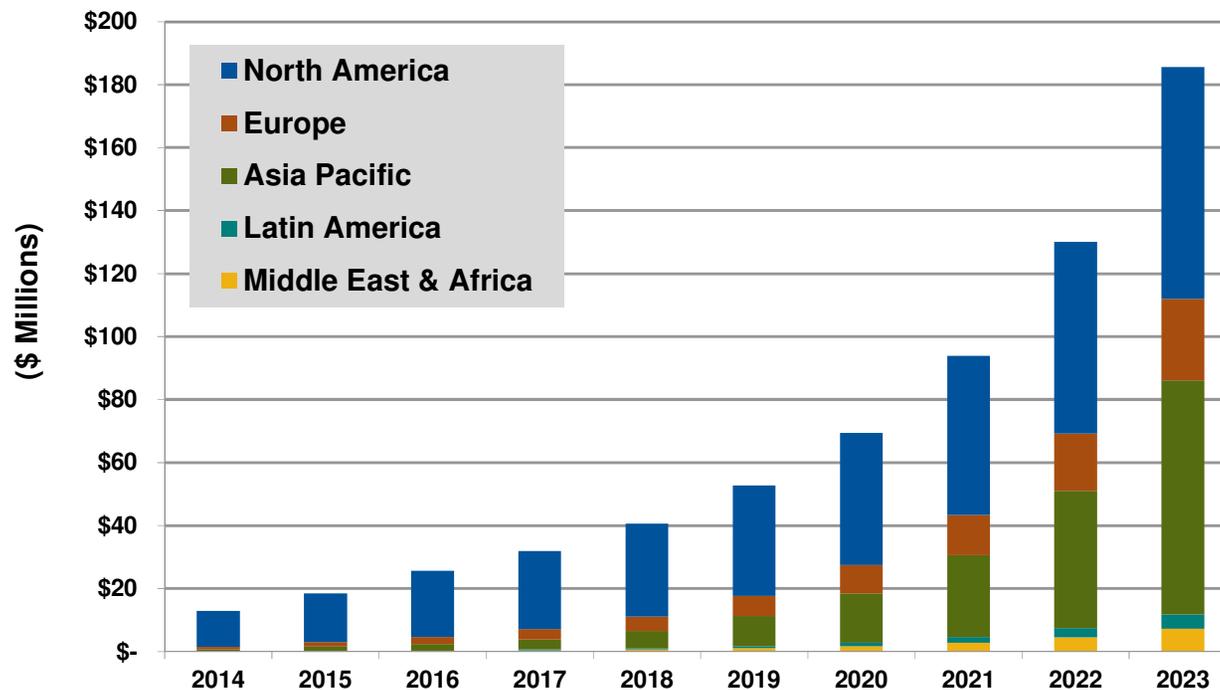


(Source: Navigant Research)

Market Forecasts

» ADR Spending expected to grow to over \$180 million by 2023

ADR Spending by Region, World Markets: 2014-2023



(Source: Navigant Research)

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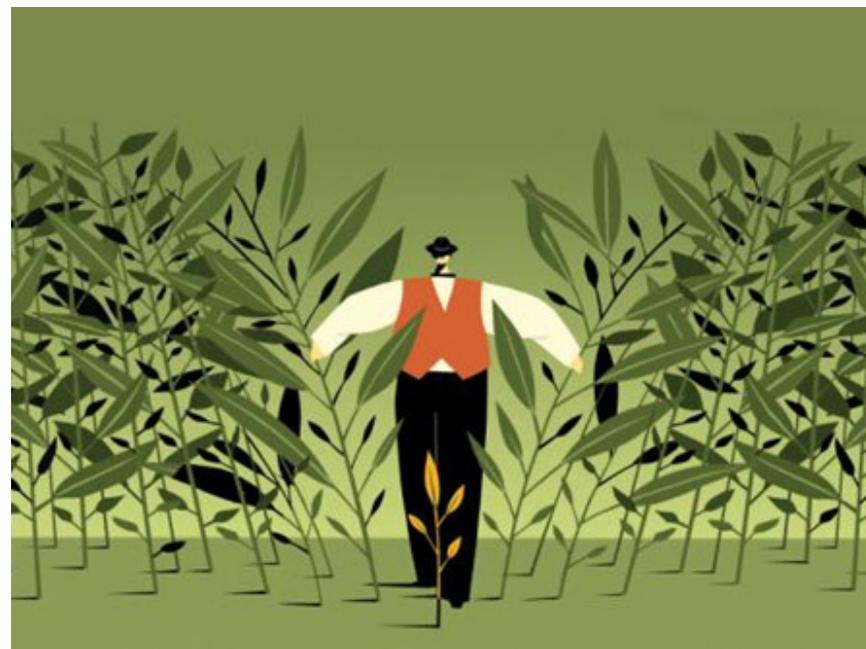
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Q&A

- Recording and slides from this presentation will be available at www.openadr.org.
- The OpenADR Webinar Series will continue throughout 2015. More information on future topics and registration details coming soon.

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Thank You!

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