

The background of the slide features a grayscale image of several wind turbines against a light gray sky. A large, solid red horizontal band spans the middle of the image, containing the main title in white text. To the right of this band, there is a graphic of orange dots connected by thin lines, resembling a network or data flow. The bottom of the slide is white, containing the date, copyright information, and the CGI logo with its tagline.

# IT solutions for improved wind energy integration

17<sup>th</sup> October 2013

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**CGI**

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**CGI**



# CGI is a global end-to-end IT and business process services leader

High-end business  
and IT consulting

69,000 professionals,  
85% shareholders\*

10,000 clients across  
the globe

System integration, IT  
and business process  
outsourcing

400 offices,  
40 countries around  
the world

Client satisfaction:  
9.1/10

100+ mission-critical  
IP-based solutions

\$10B annualized  
revenue

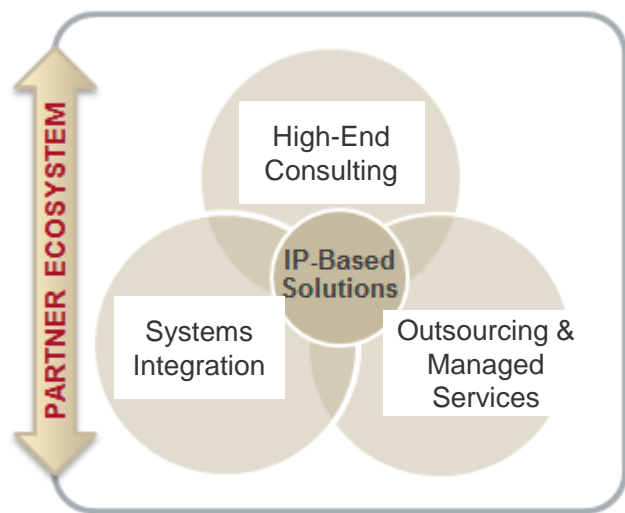
World's 5<sup>th</sup> largest independent IT and BPS firm



\* Before Logica

**CGI**

# We are a global leader in business and technology services for the Utilities sector



	Electricity	Water and Waste	Gas
Production			Upstream gas is part of CGI's Oil and Gas sector
Transmission			
Distribution			
Supply			

- **6,000+** Utilities professionals working with clients across 5 continents
- More than **25 years experience** in the sector: serving more than 200 clients, including **8 of the current top 10** utilities in North America and in Europe
- Designed, built, delivered and have operated **10 out of 16** of the world's central energy market systems
- Award-winning **Smart Data Services** for smart metering deployed by the majority of electricity suppliers in the UK
- Innovator in areas such as **renewable generation management** and **electric vehicle charging** infrastructures
- **20+** IP-based solutions
- Over **60 of the top 100 utilities** in North America utilize CGI IP-based solutions in the areas of outage management, work and asset management, mobile workforce management and analytics.

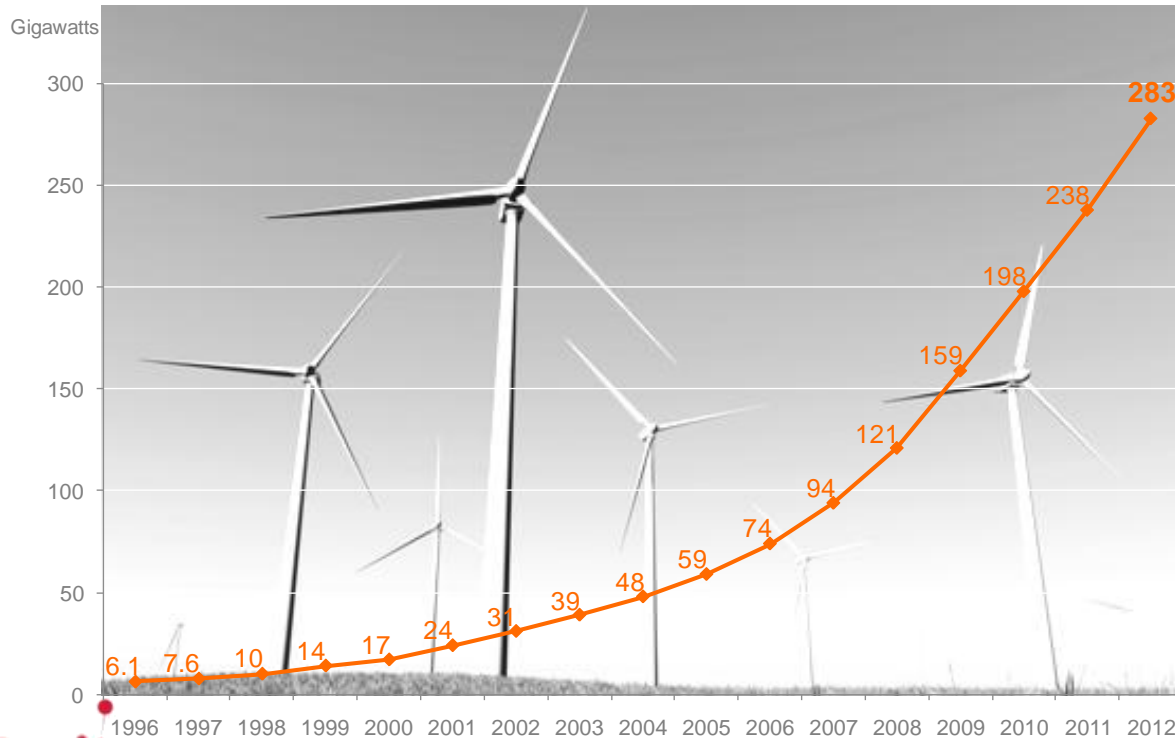


# Renewables opportunities and challenges

## Renewable sources are the call of the future

Energy paradigm is shifting. Climate change, along with increasing consumption and dwindling sources of fossil fuels are driving the development of clean energy.

### Growing Wind Power Global Capacity



### The challenges



Operation of diverse and disperse renewable assets

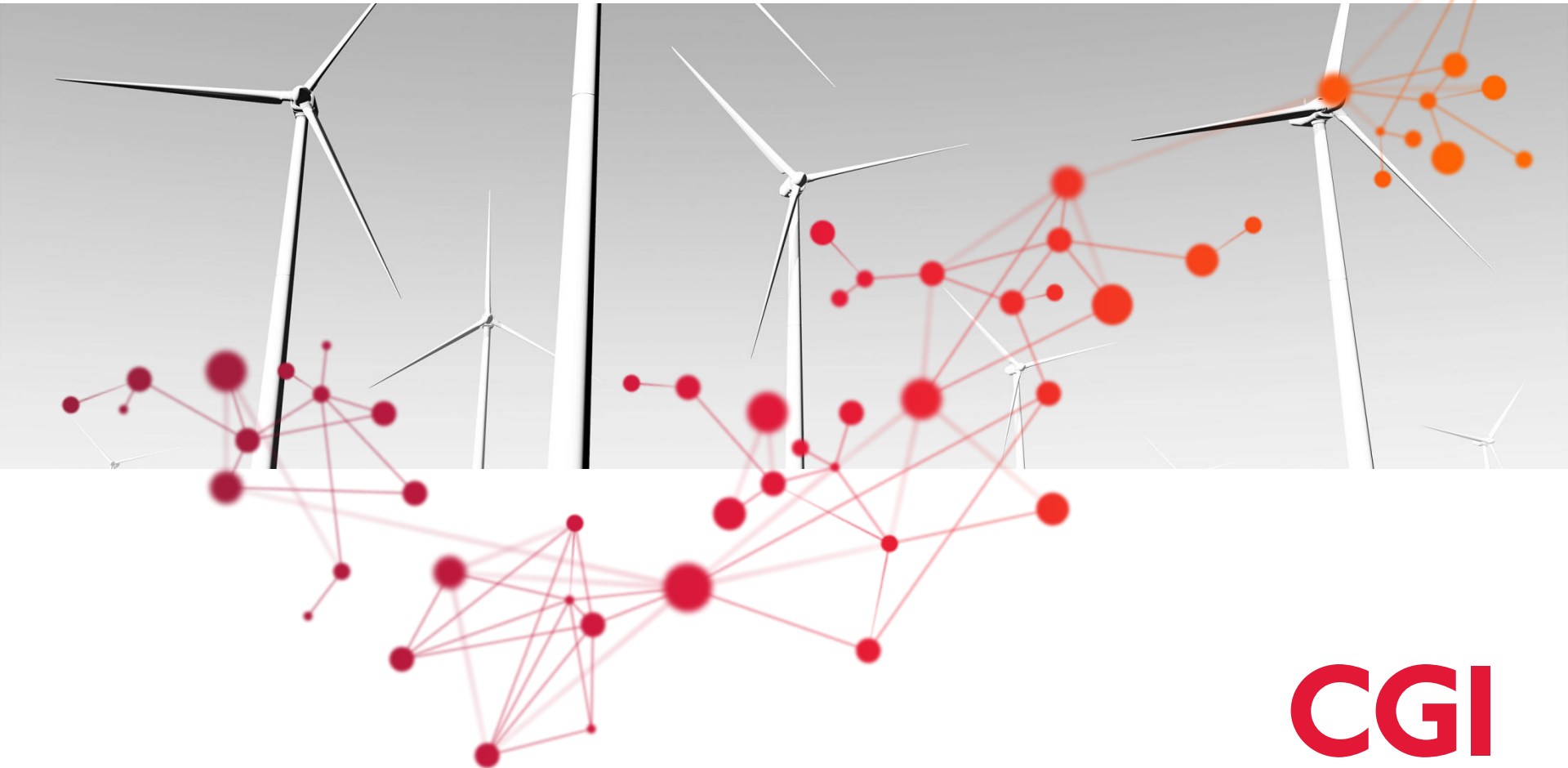


Integration of renewable energy sources in the grid safely and reliably



Maximization of assets performance

# An Integrated Approach for Renewables management



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# Diverse and disperse renewables portfolio

## Multi manufacturer, vendor and protocol

Renewables' producers or operators usually have a pool of diverse production assets geographically disperse

### WIND TURBINES



### SUBSTATION



### PROTOCOLS



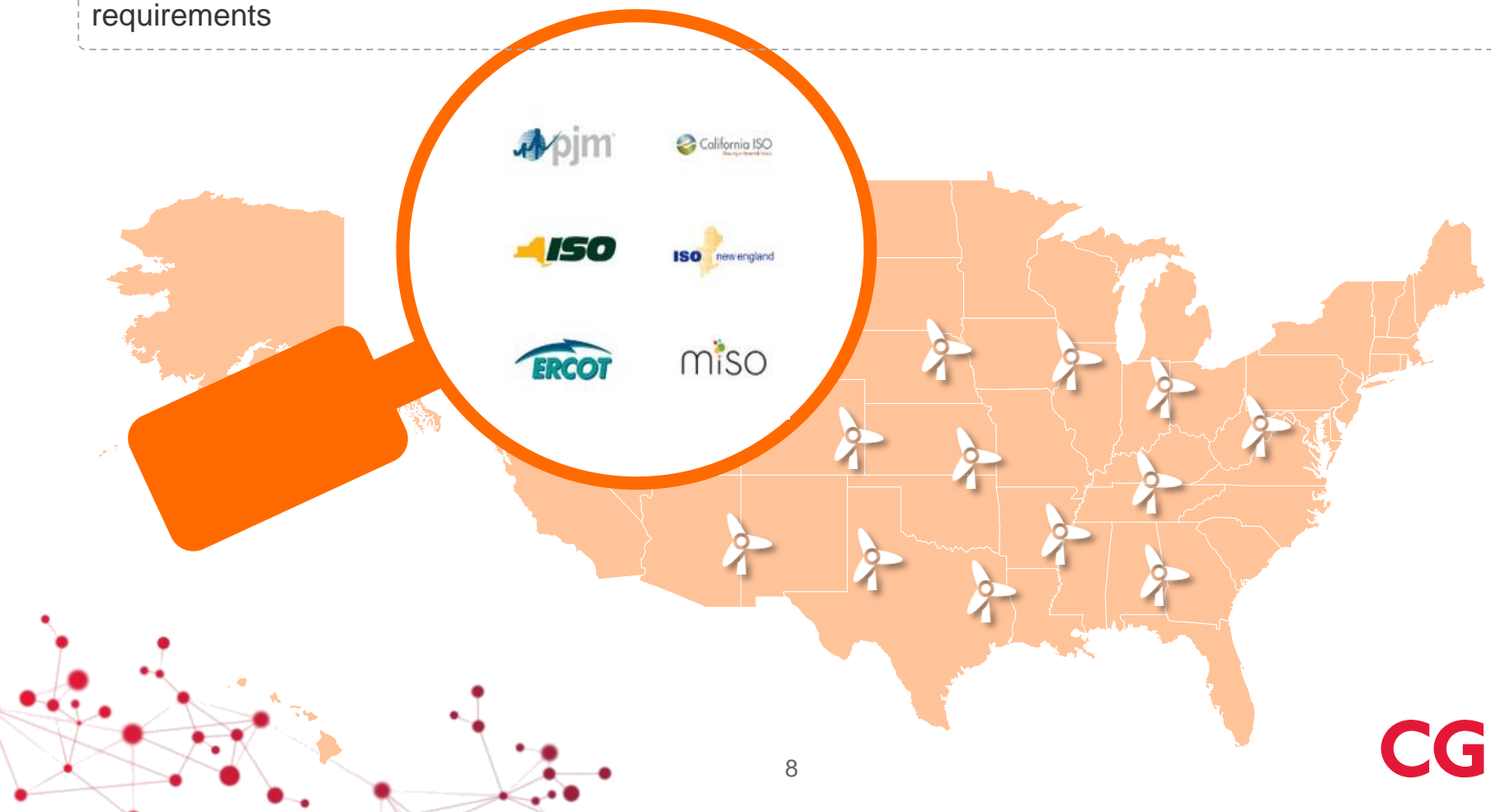
- OPC DA
- OPC XML
- Modbus TCP/IP
- IEC101
- IEC 104
- DNP
- ICCP
- and more ...



# Operating in several geographies

## Complying with specific regulatory codes

Renewables energy is delivered in the grid fulfilling applicable regulations as well as market requirements





# Technical integration approach

## Data Normalization Engine

Data model and SW developed by CGI to unify all different WTG models and manufacturers, enabling comparison of operational performance on a common baseline

## Renewables Application

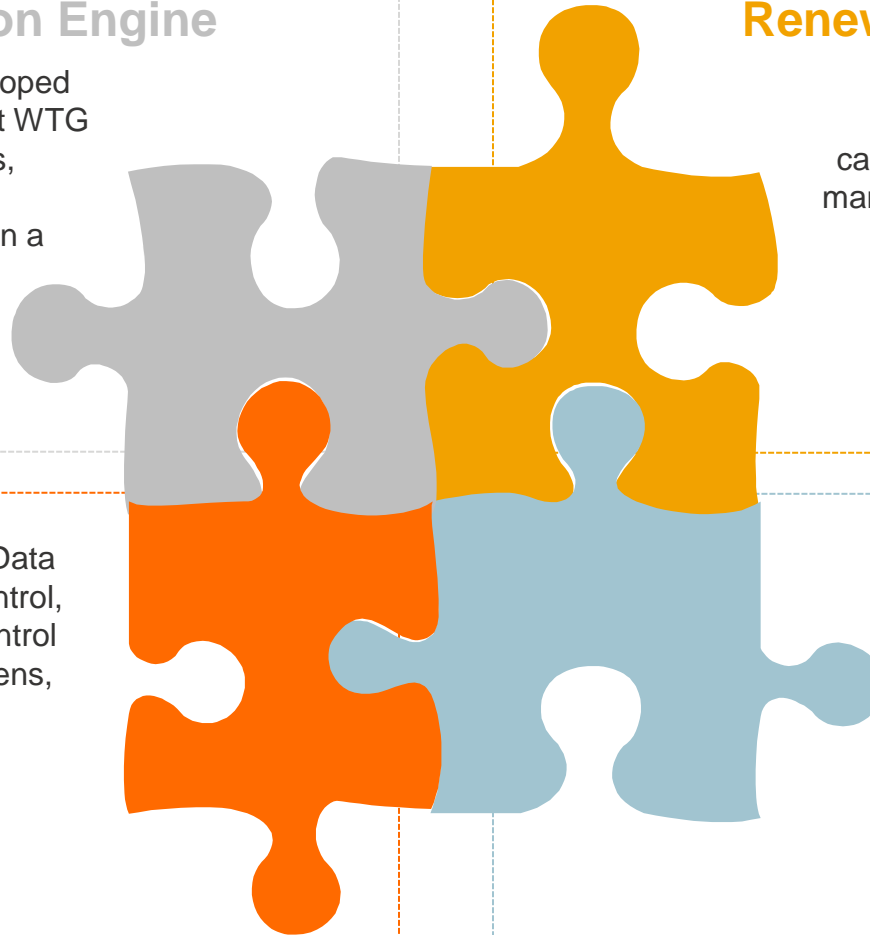
Allows for advanced and optimized monitoring capabilities, control and alarm management, as well as report viewing and configuration

Supervisory, Control and Data Acquisition for process control, enabling operation and control in real time (Alstom, Siemens, ABB, GE, Emerson, ...)

**SCADA**

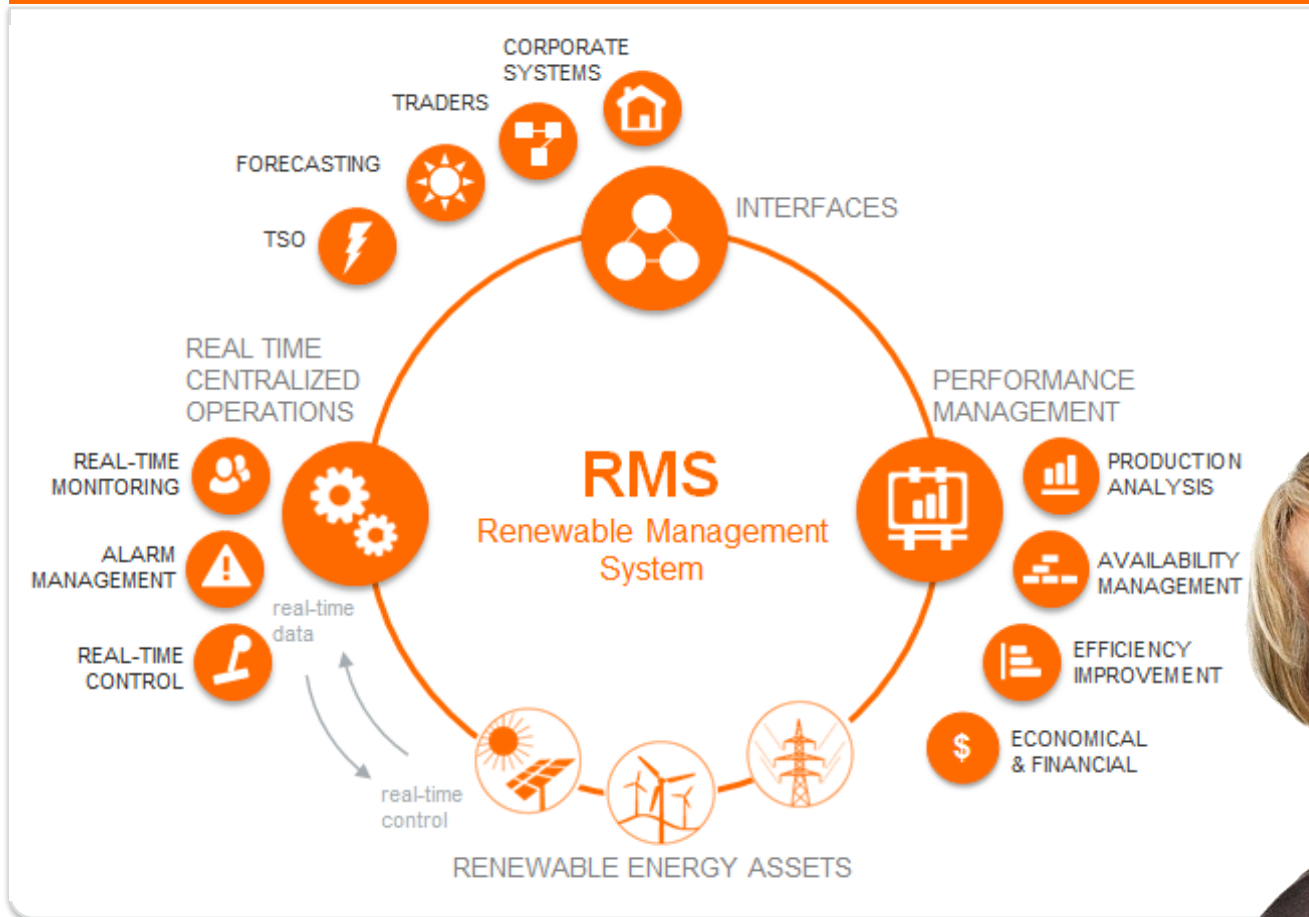
Stores data retrieved from the SCADA (relational DB: SQL, ORACLE or Historian: OSI PI, GE, ...) to store master data & configuration (relational DB: SQL, ORACLE )

**Historical DB and Master Data DB**



# CGI Renewables Management System

RMS is an IT platform for real time control of your renewables portfolio that enables improved operational performance.



# What we do ?

## REAL TIME CENTRALIZED OPERATION

### MULTI MANUFACTURER VENDOR AND PROTOCOL

Real-time interface with more than 30 different wind turbine models/manufactures, 8 different substation vendors and more than 10 real-time protocols ›

### REAL-TIME DISPATCH CENTERS

Centralized and real-time monitoring, control and alarm management of all the mixed renewable portfolio from a single platform ›

### CONNECTION TO TSO AND ISO

Immediate connection to the grid ensuring grid safety and compliance with regulation codes in various geographies ›

### IMPROVE ASSETS AVAILABILITY

Immediate fault detection and alarm management allows faster response and decreases downtime as well as maintenance costs ›

## PERFORMANCE MANAGEMENT

### SPREAD OPERATION DATA THROUGH THE COMPANY

Normalized and consolidated operational data provided throughout a intuitive web based application ›

### OEM WARRANTY MANAGEMENT

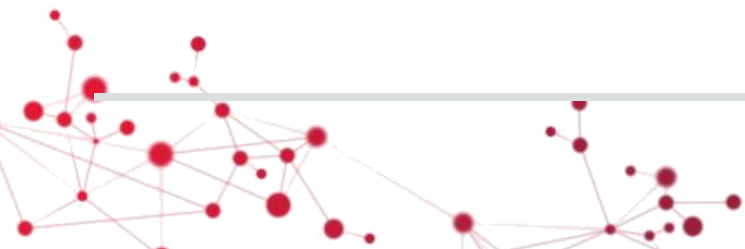
Customizable commercial availability, downtime responsibility attributed intelligently based on fault events ›

### PROACTIVE MAINTENANCE

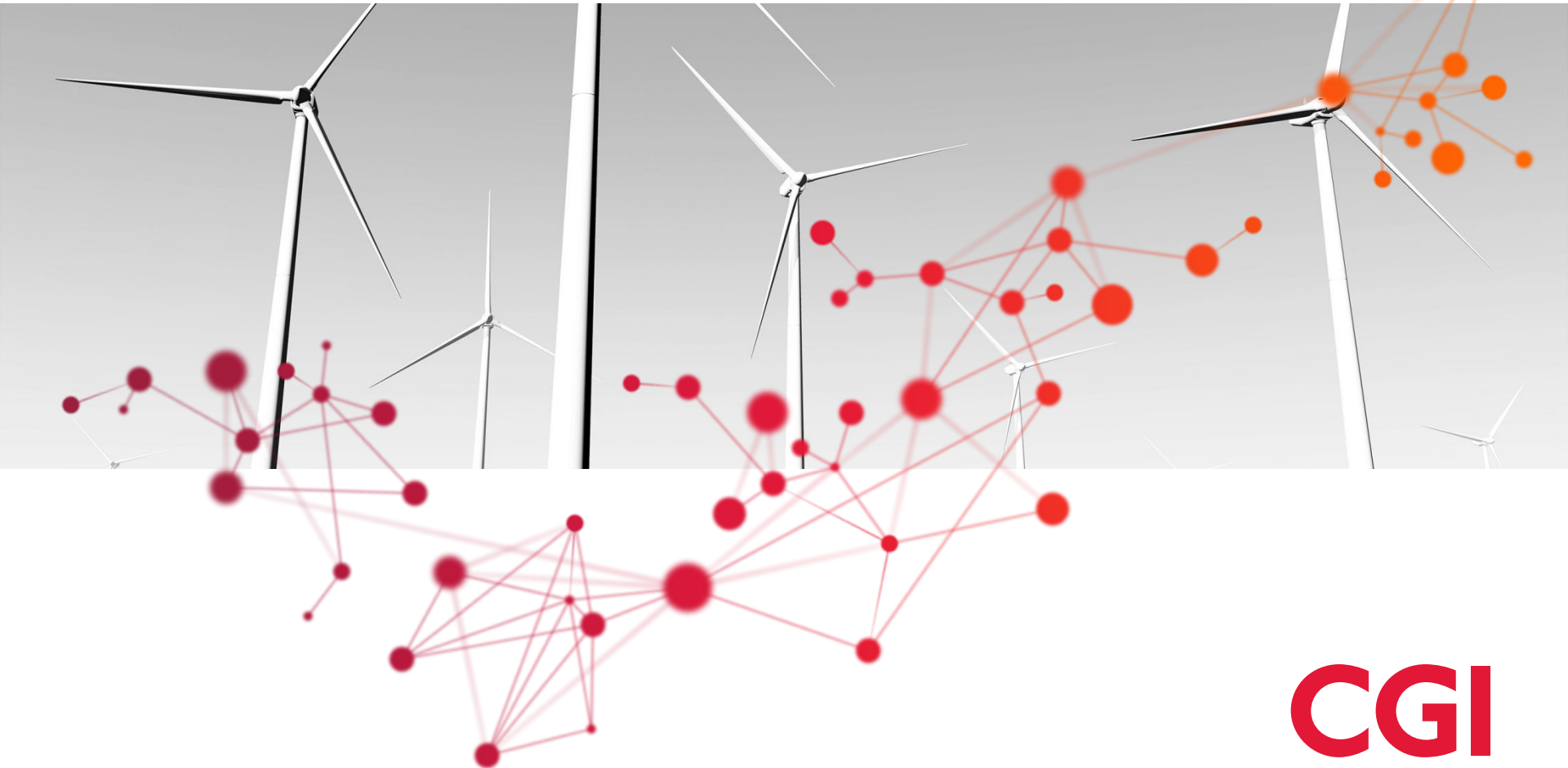
Through condition-based monitoring, downtime, order time for parts among others ›

### IMPROVE OPERATION EFFICIENCY

Optimizes O&M resources and efficiency through management of data by exception. Allows the establishment of goals and KPIs ›



# A dream come true



# CGI

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# Success Story

## What were the client challenges ?

- How to retrieve real time data and control wind turbines from more than 12 separate manufacturers
- How to make historical data available for analysis and reporting purposes supporting Operational Excellence
- How to maintain the stability and security of the electrical grid by preventing overload situations

## How did we address the client challenges ?

- Provided a state-of-the-art renewables management system for hundreds of wind farms across Portugal, Spain, France, Belgium, Poland, Romania & USA
- Set up real-time control centers in Porto, Oviedo and Houston for 2,000 wind generators
- Implement and manage a Performance Management system with 20 standard reports and 7 analysis tools

## What were the benefits to the client ?

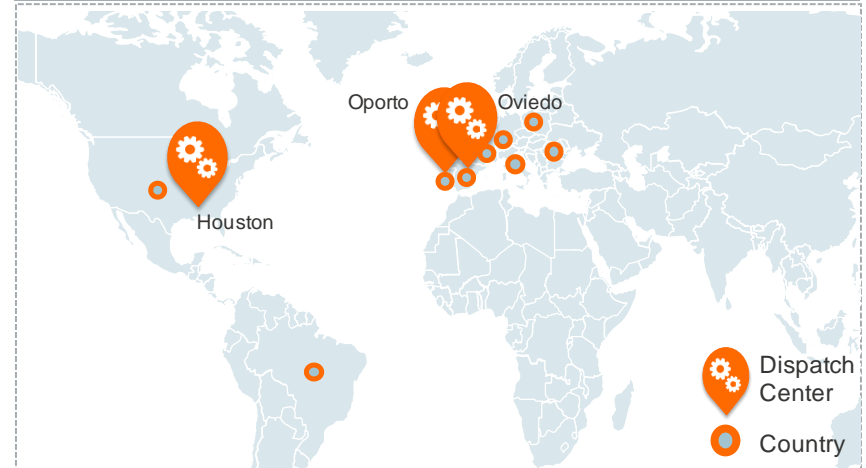
- Improved predictability of wind farms portfolio performance and better asset management
- Use of turbines from different manufacturers
- Efficient handling of high data volumes
- Integration with other tools like weather forecasting

## Why the client choose us ?

EDP Renewables is a world leader in the renewable energy sector that designs, develops, constructs and operates renewable generation facilities. EDP is the world's third largest wind energy company and needed a wind farm control and management system.

We have partnered with EDP in mission-critical and complex projects that need both innovative solutions and experience.

## Project Landscape



3

Dispatch Centres

6000

WTGs

9

GW

2.000.000

Data Points

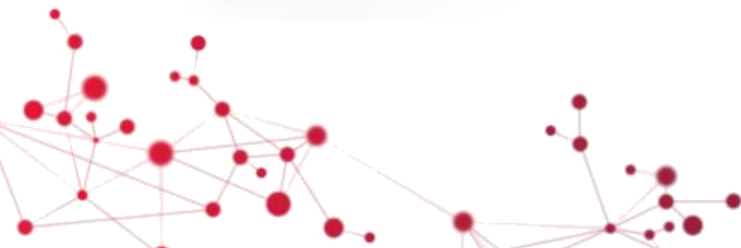
# Challenges and achievements

## CHALLENGES

- Diversity of assets
- Quantity of assets
- Communications
- Different geographies

## ACHIEVEMENTS

- Uniform management of assets
- Real time control of wind assets
- Performance Management tool
- Uniform Operations model



# Challenge: diversity and quantity of assets

## WIND TURBINES



- AW 70
- AW 77
- AW 82
- AW 82 1.5 MW



- ECO 74
- ECO 80
- ECO 100



- E 40
- E 66
- E 70
- E 82



- AE 61
- G 47
- G 52
- G 58
- G 80
- G 83
- G 87
- G 90
- G 42 – G47
- G 47
- V 42



- GE 1.5s
- GE 1.5sle
- GE 1.5xle
- GE 2.5xl



- A 300



- MD 77



- S 88



- N 90



- IB 1.3.B62



- NM 48
- NM52
- NM 72
- NM 82



- V 42
- V 66
- V 80
- V 82
- V 90

## SUBSTATIONS



## PROTOCOLS



- OPC DA
- OPC XML
- Modbus TCP/IP
- IEC 101
- IEC 104
- ICCP (TASE.2)

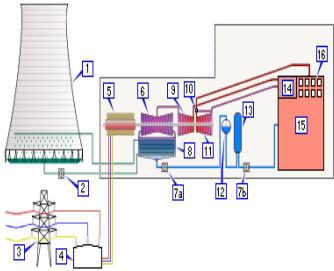


# Challenge: quantity of assets

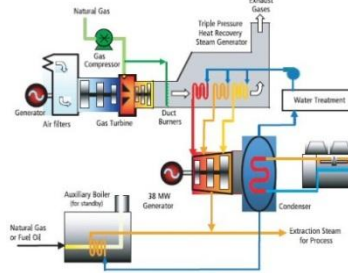
Managing wind farms is more challenging than other types of power generation

The number of tags/MW of generation power for wind energy is much higher than for other sources

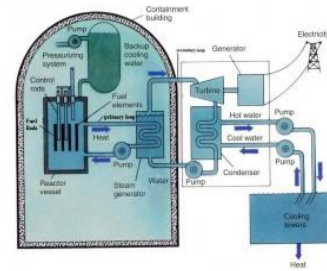
## THERMAL POWER PLANT



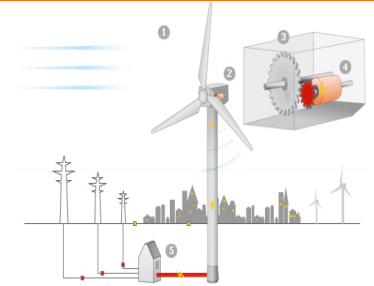
## COGEN POWER PLANT



## NUCLEAR POWER PLANT



## WIND POWER PLANT



Installed cap. 40 MW

Nr. Tags ~ 2000 tags

Tags/MW ~ 50 tags/MW

Installed cap. 50 MW

Nr. Tags ~ 5000 tags

Tags/MW ~ 100 tags/MW

Installed cap. 800 MW

Nr. Tags ~ 20000 tags

Tags/MW ~ 25 tags/MW

Installed cap. 20 MW

Nr. Tags ~ 3000 tags

Tags/MW ~ 150 tags/MW

~ 2.000.000 data points  
for 10 GW of wind power

A specific communications infrastructure was utilized to support a variety of different communication infrastructures

- VSAT
- SDH
- Optical Fibre
- ISDN
- GPR

## CGI

# Challenge: different geographies

USA



Portugal



Spain



Poland



Romania



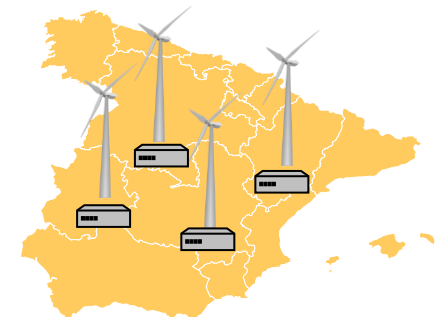
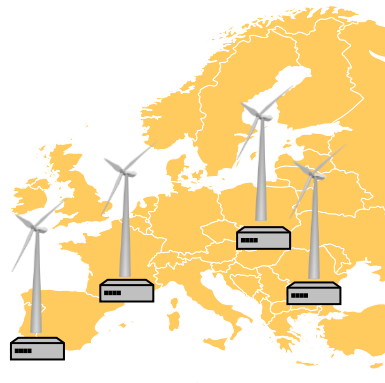
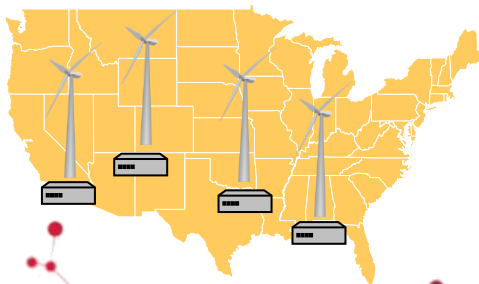
Operations

Houston

Porto

Oviedo

Wind Power Plants



CGI

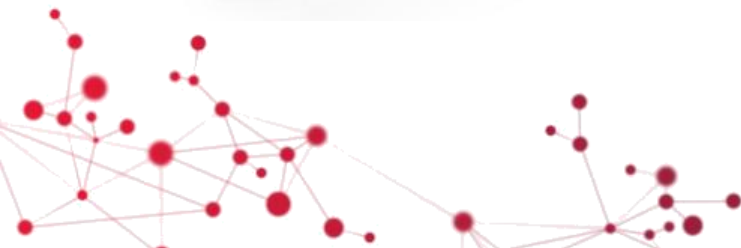
# Challenges and achievements

## CHALLENGES

- Diversity of assets
- Quantity of assets
- Communications
- Different geographies

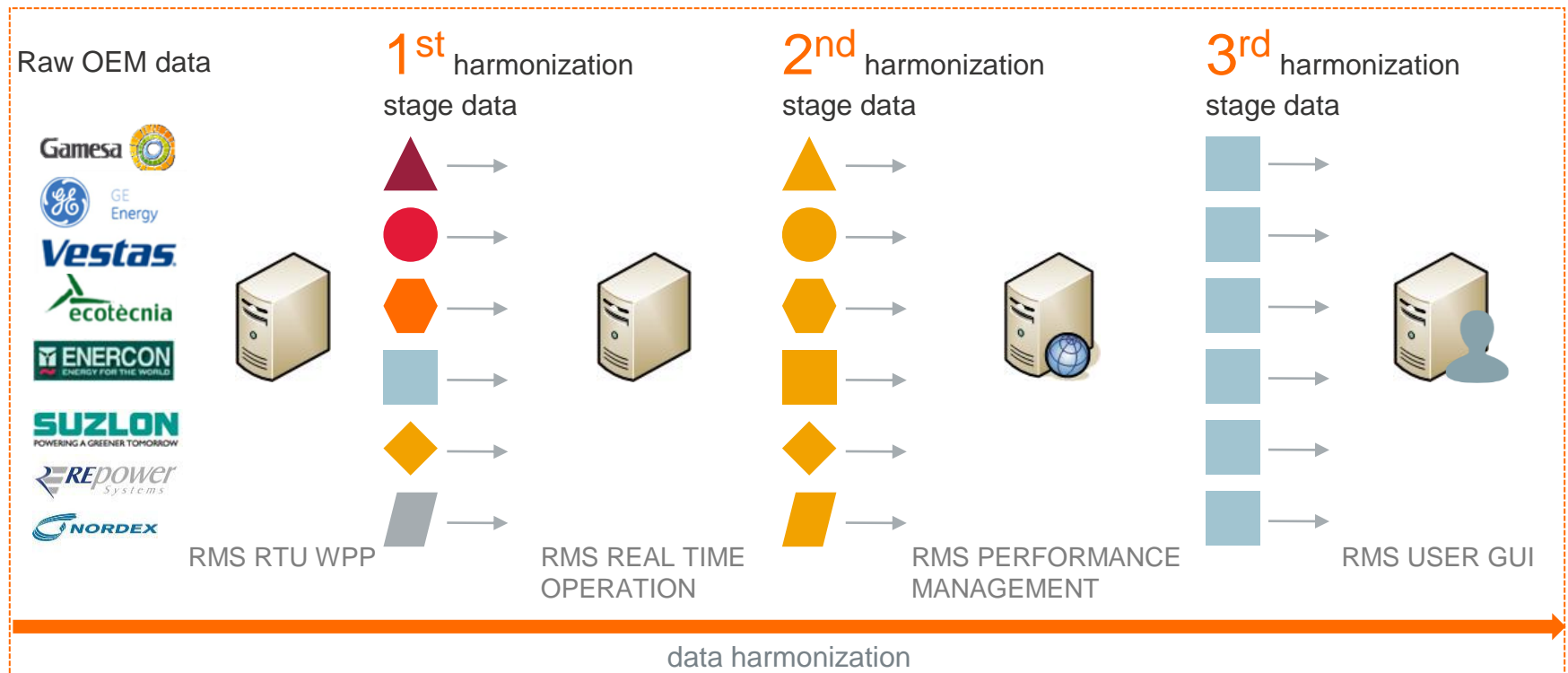
## ACHIEVEMENTS

- Uniform management of assets
- Real time control of wind assets
- Performance Management tool
- Uniform Operations model



# Achievement: uniform management of assets

**CGI** worked with EDP Renewables to harmonize data from the field. An end-to-end normalization of data was achieved for different assets regardless of OEM resulting in uniform management of the complete portfolio.



WEMS uses the IEC 61400-25 naming convention for the object model and signals

# Achievement: real time control of wind assets

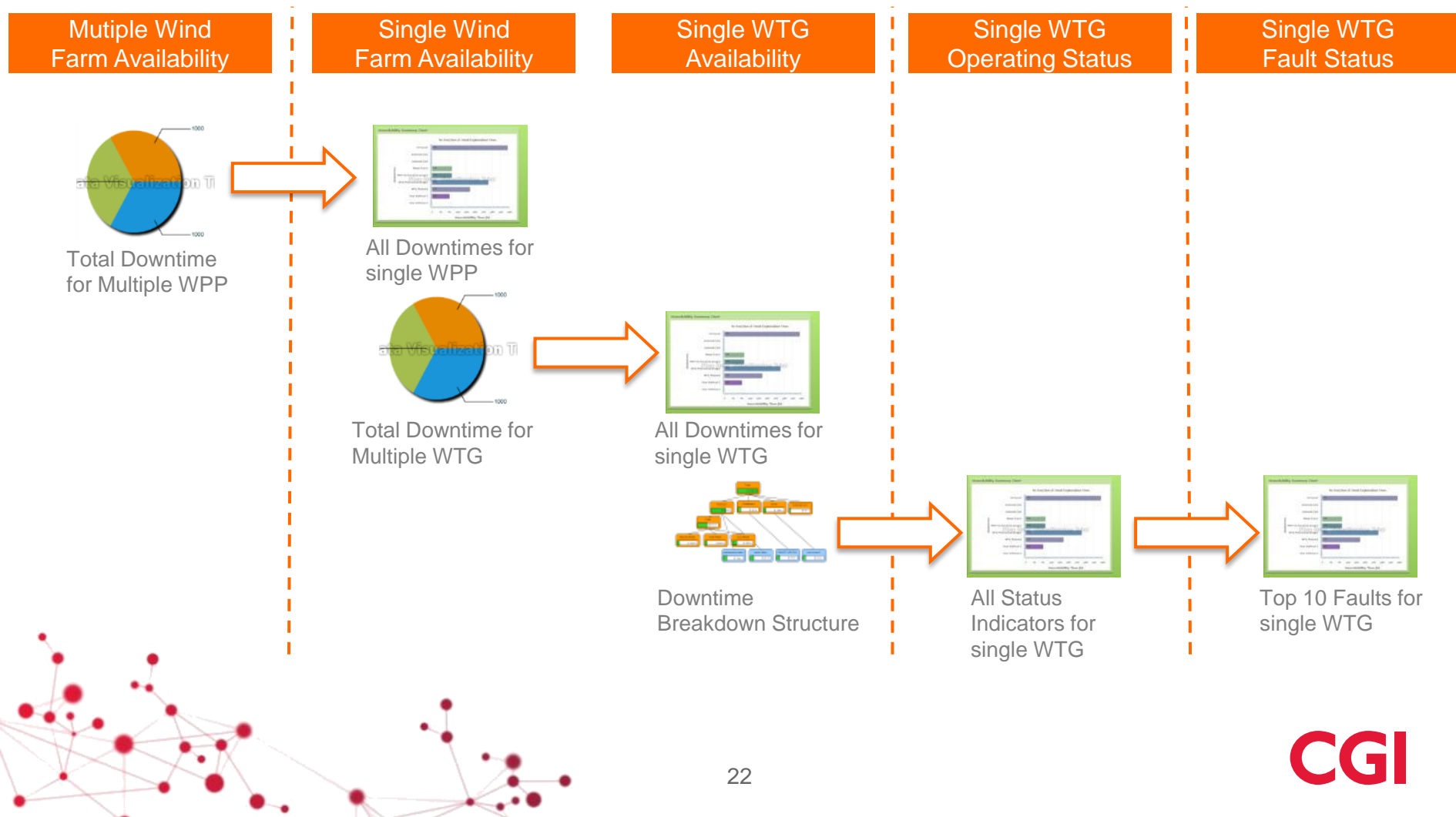
The WEMS SCADA is designed to give the user a quick and complete overview of the status of operations. The look and feel is logical and easy to understand

Increasing level of detail



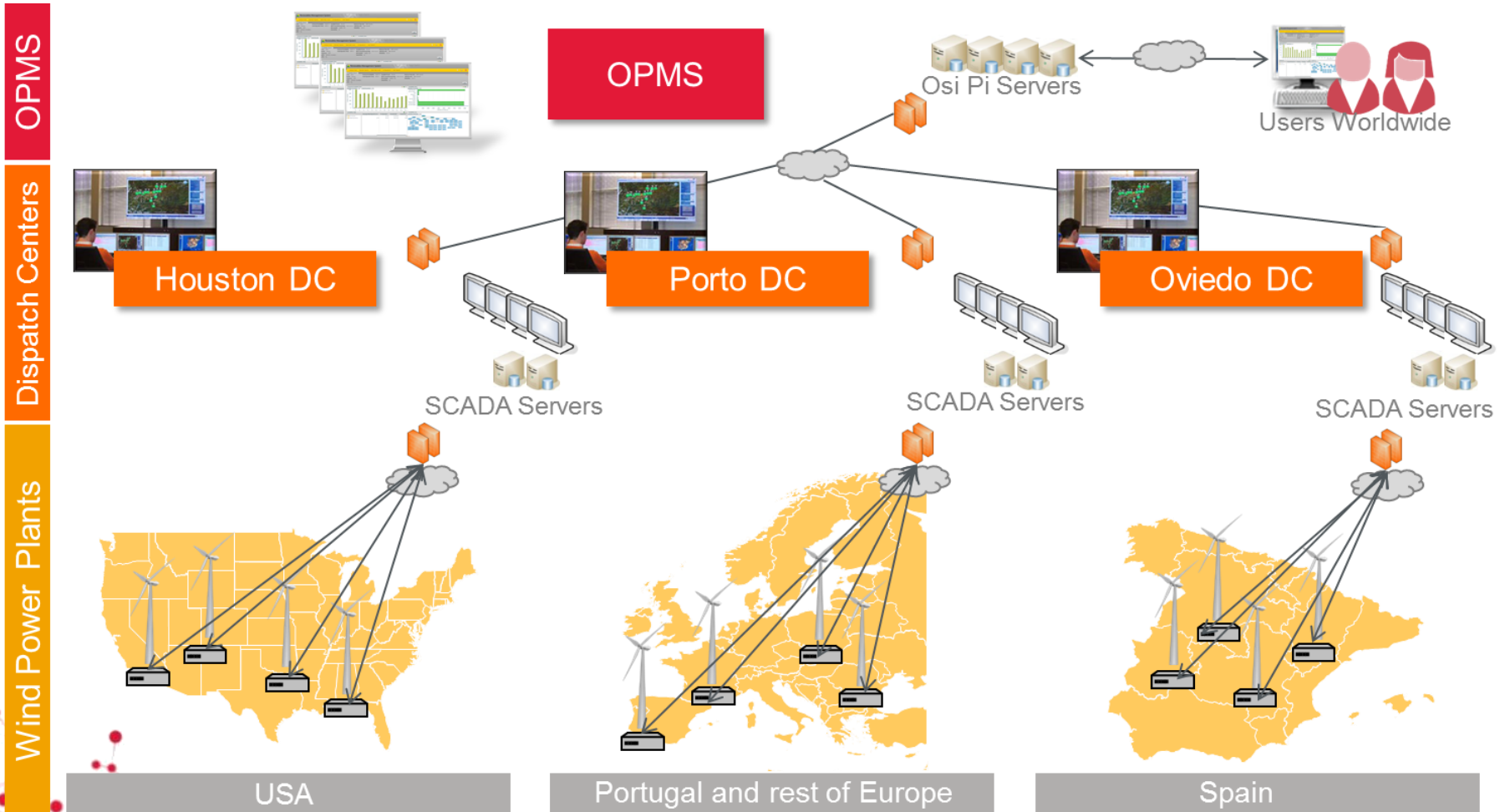
# Achievement: performance management tool

The Operational Performance Management System supports detailed analysis. For example, the “availability reports” allow drill-down on availability indicators, from the overall cause of downtime on a set of wind farms, to the most significant fault on a wind turbine.

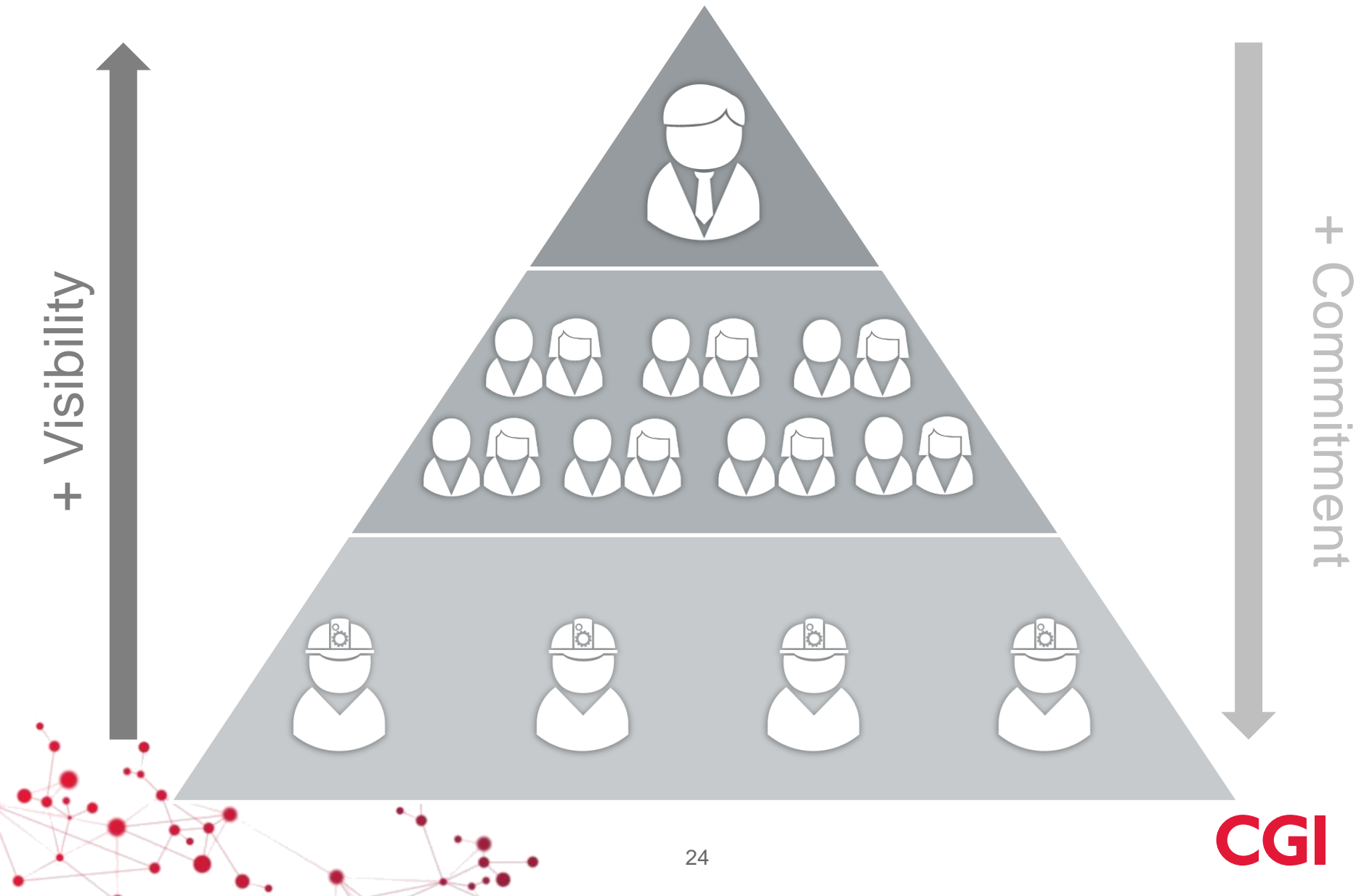




# Achievement: uniform operational model



Ultimately: improved visibility and stronger commitment



# Recent award and recognition

DID YOU KNOW?

???

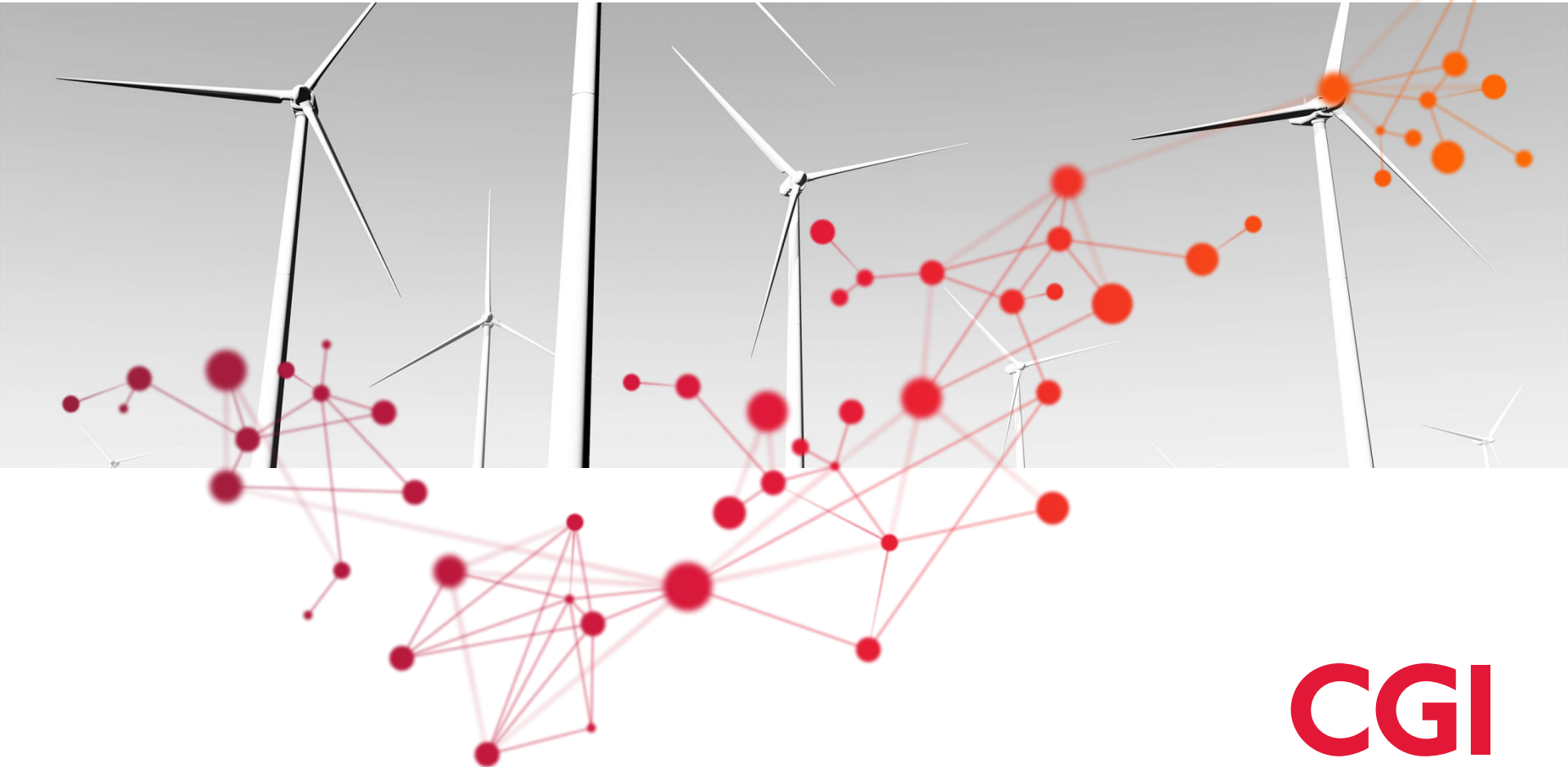
IN 2011 CGI WAS AWARDED THE “**EXCELLENCE IN RENEWABLE ENERGY AWARD FOR INNOVATION IN TECHNOLOGY**” BY THE RENEWABLE ENERGY WORLD CONFERENCE.

CGI was chosen because of its unique contribution to the production of safer and more reliable renewable energy, facilitating smart integration in the grid.

The RMS system supports the real-time management platforms of Horizon wind farms in the United States of America. It controls 25 wind farms with more than 800 wind turbines and an installed capacity exceeding 3.500MW, equivalent to the average annual consumption of 2 million homes.



# Renewables as a sustainable answer for energy demand



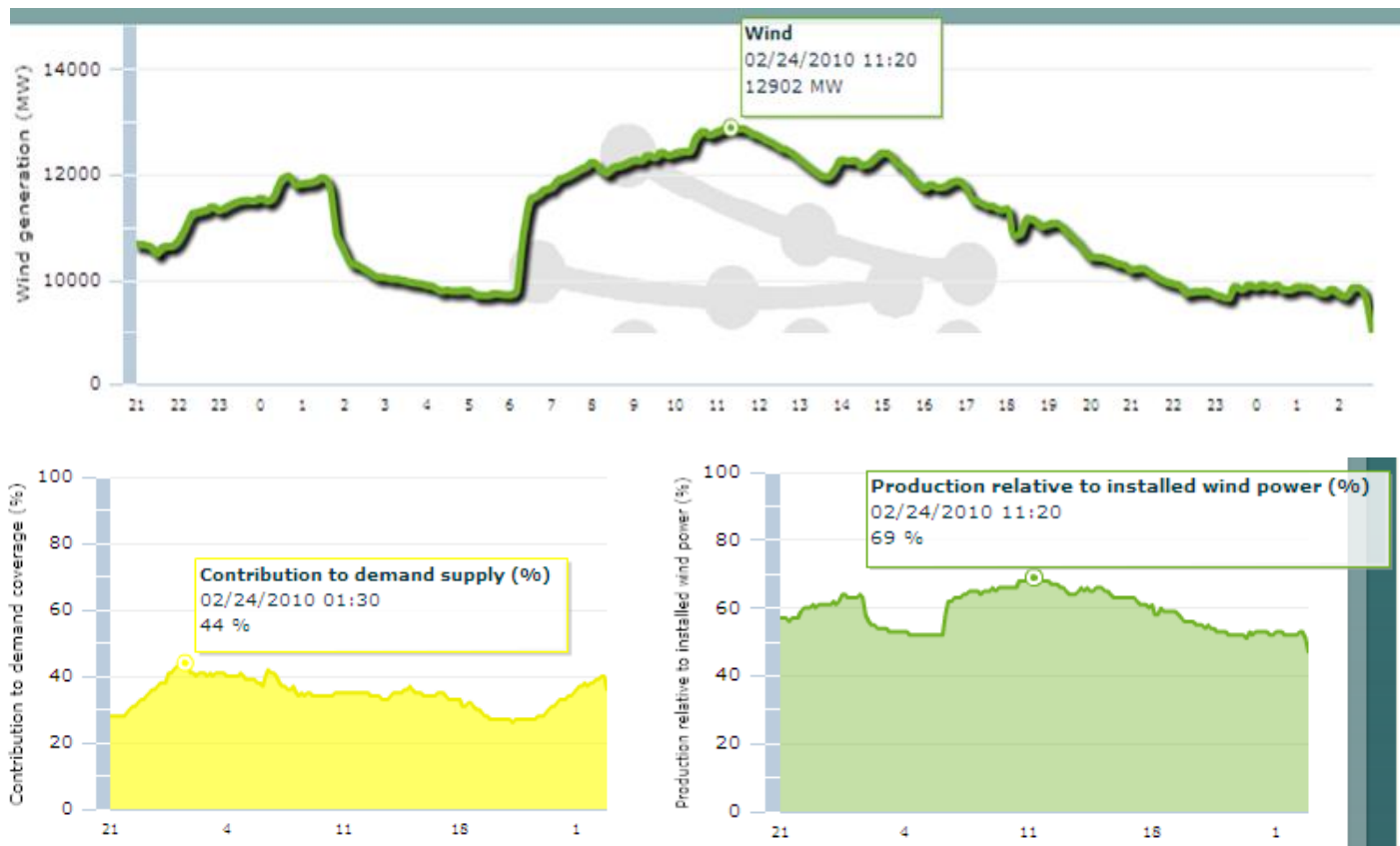
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# A higher integration of wind energy on the grid

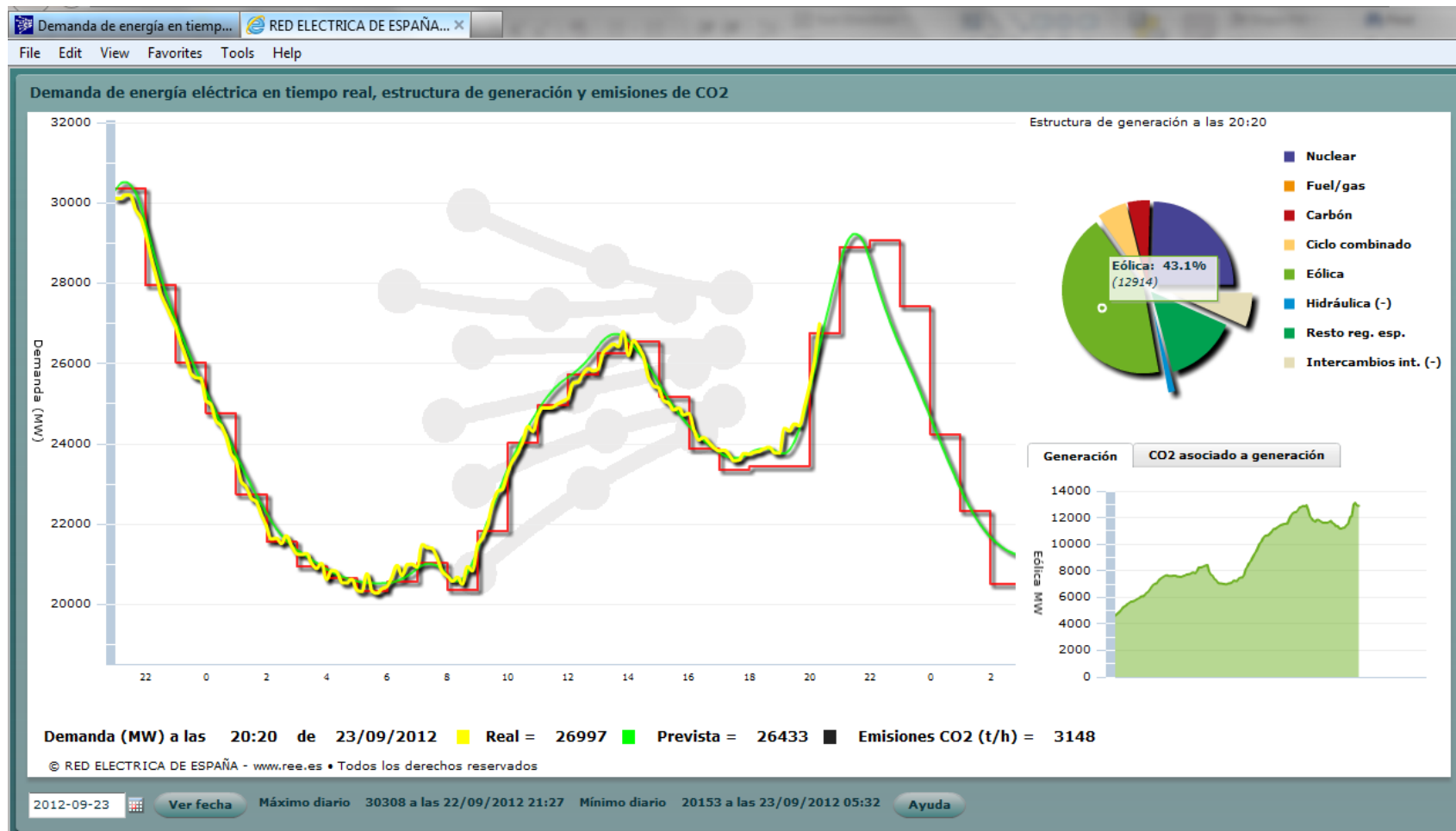
On 24 February 2010, at 11:20am, the Transmission System Operator in Spain (REE) registered a new record Wind Energy production of 12.9 GW. This corresponds to a contribution to Demand Supply of 44 %.

During 2010 more than 50% of Demand Supply in Portugal was based on renewable energy (hydro + wind).



# ...over the years...

On 23<sup>rd</sup> September in Spain at 8:20pm, REE registered 43,1% Wind penetration (12,941MW).



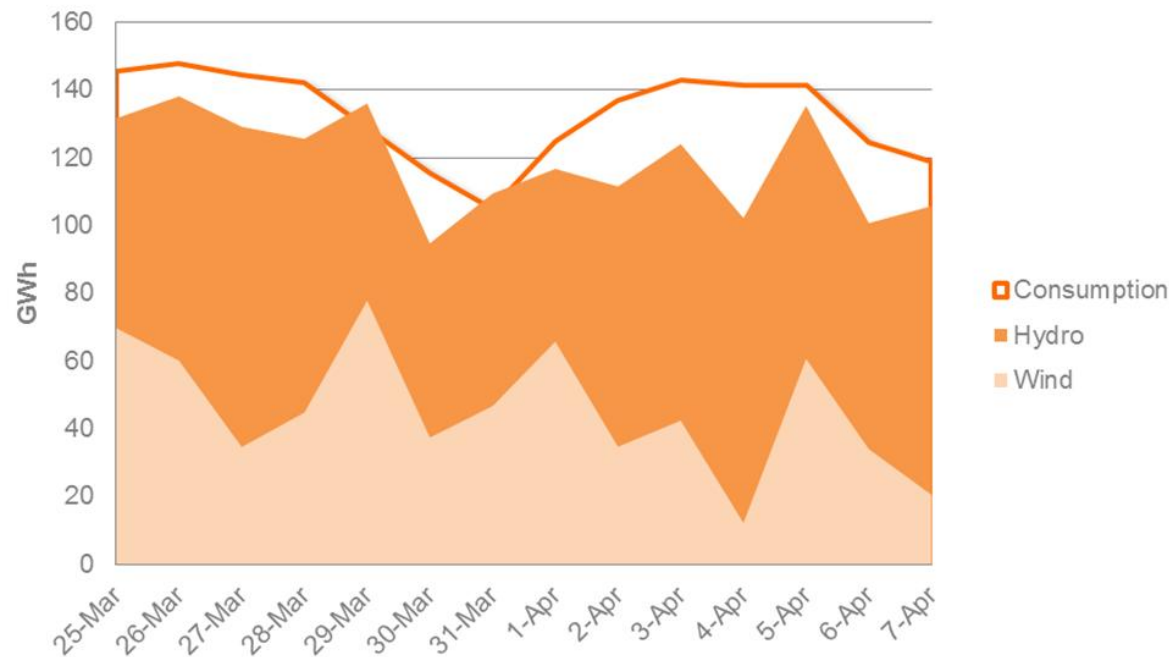
# Renewables as a sustainable answer to energy demand

## Complying with specific regulation codes

In April 2013 for a period of almost one week all demand was met by Renewables (Hydro and Wind).

In January REN registered 55% of consumption being supplied by Wind.

**Wind Energy Production in Portugal**  
from 25th March to 7th April 2013





## Our commitment to you

We approach every engagement with one objective in mind: to help clients succeed



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