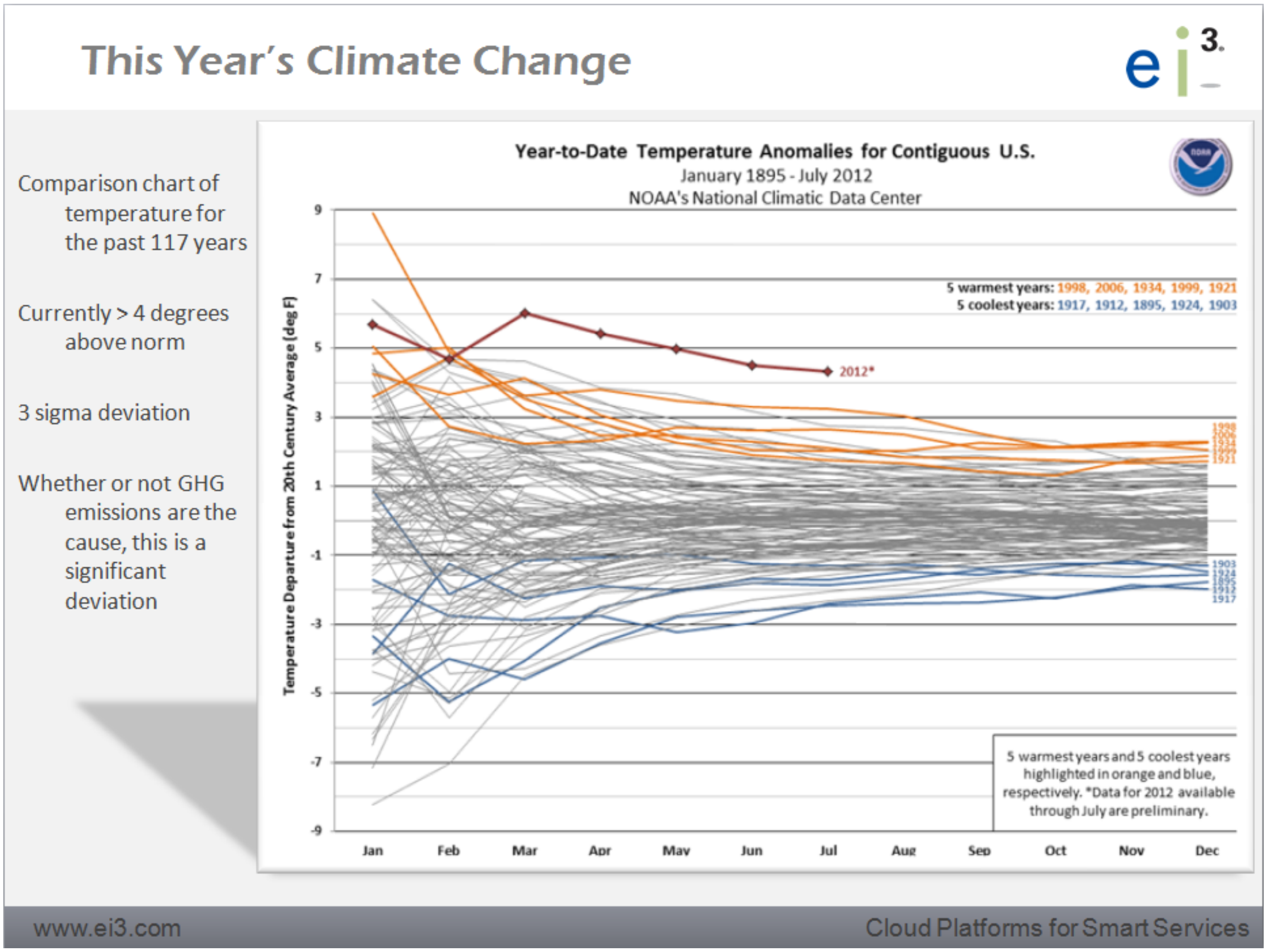
ei3 corporation
presentation

Scope 3 Emissions Measurement of Packaging by using Remote Monitoring

September 2012

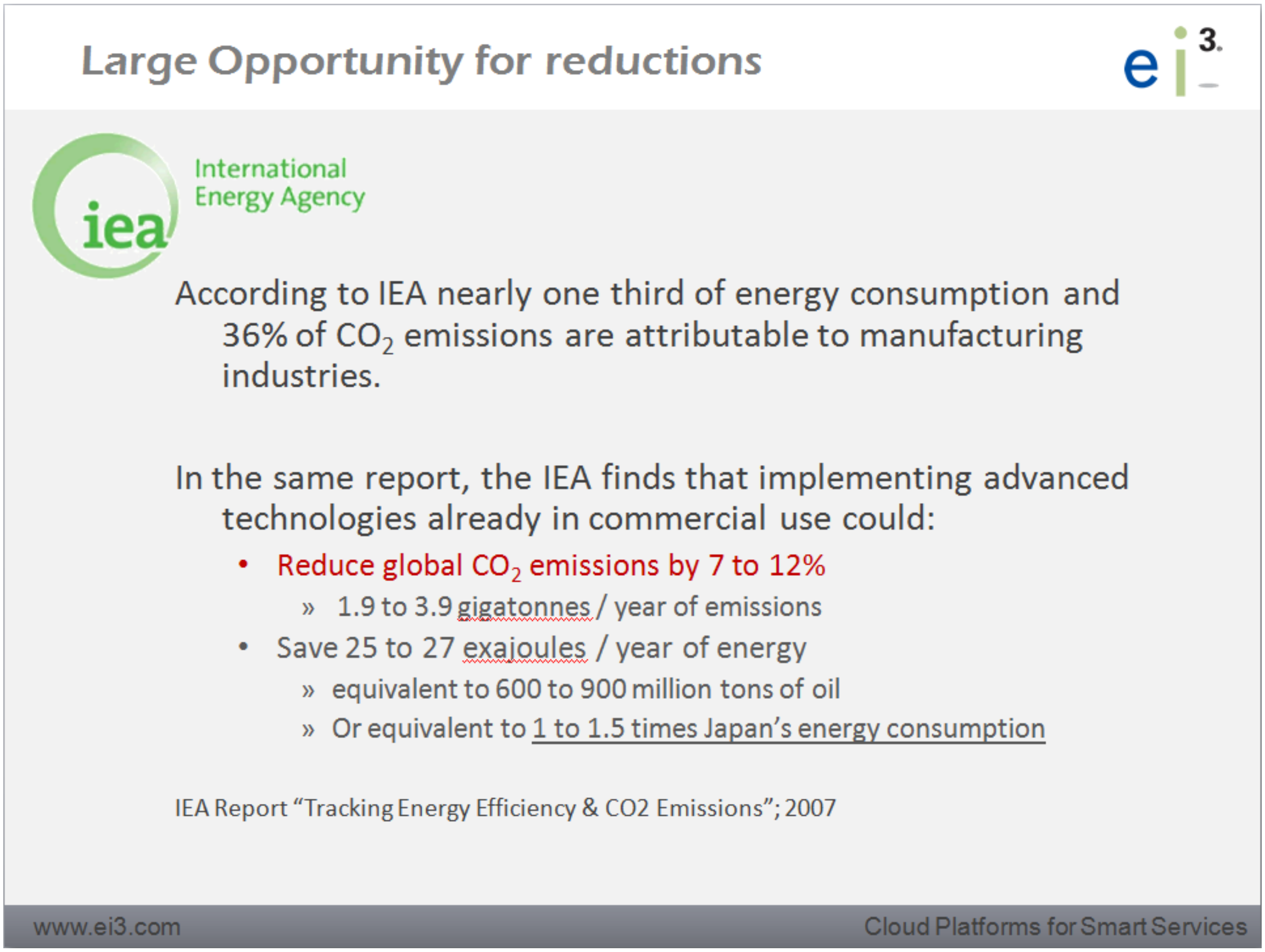


This Year's Climate Change

Before we get started on my topic I want to share this chart, it is graphic prepared by NOAA that shows the year-to-date temperature anomalies for the contiguous United States. In the center of this chart on the y axis, at a value of zero indicates the mean temperature for the year to date, so a data point running on the zero axis indicates the temperature is average as compared to the past 117 years.

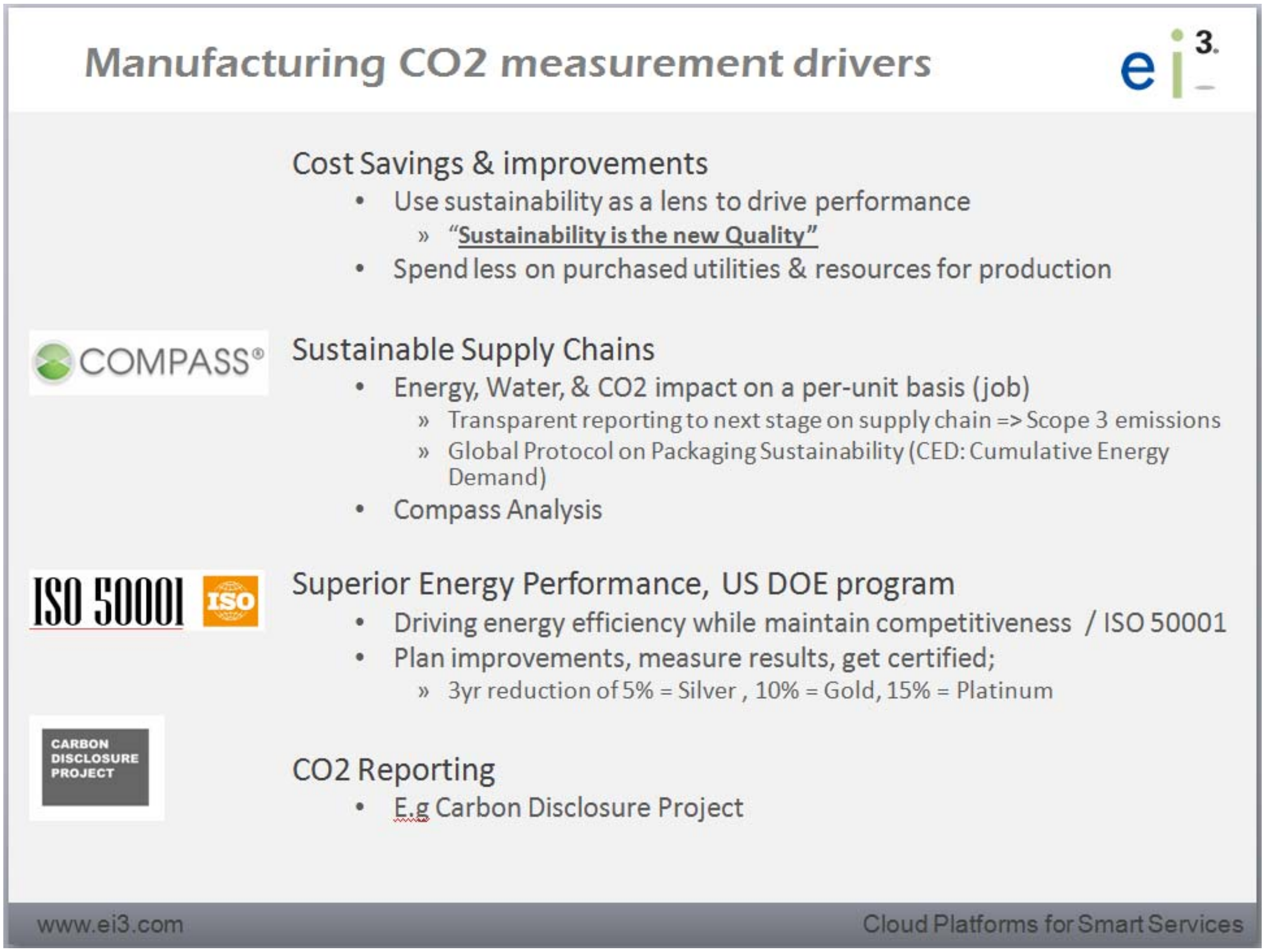
Since most of you are professionals working in the business of Sustainability, I think this is a good chart to reflect upon. The debate about CO_2 emissions causing climate change continues to rage but seeing that 2012 is running at more than 4 degrees above the hundred-year norm makes me think that something big is going on. And even if there is a small chance that carbon dioxide emissions are the behind this change, even if only in part, that we all need to work hard to reduce our emissions.

I am a great believer in the saying, ***"you can't manage what you can't measure."*** So in the realm of the Sustainable Packaging Coalition, by measuring the Carbon emissions of package production, we are creating a lens through which we can begin to reduce these green house gas emissions and at the same time increasing our business competitiveness. Scope 3 emissions measurement is my topic and today I aim to share with you my company's successes in creating measurement systems. When implemented correctly they can have profoundly positive impact to the package manufacturer.



Large Opportunity for Reductions

In a report made back in 2007, the IEA attributed 33% of energy use and 36% of CO2 emissions to manufacturing industries. So working on reductions in the manufacturing process holds the promise of helping us reduce our emissions. In fact, this same IEA report claims that implementing commercially available advanced technologies we could reduce global CO2 emissions by 7 to 12% and reduce energy use by the equivalent of the entire energy use of Japan.



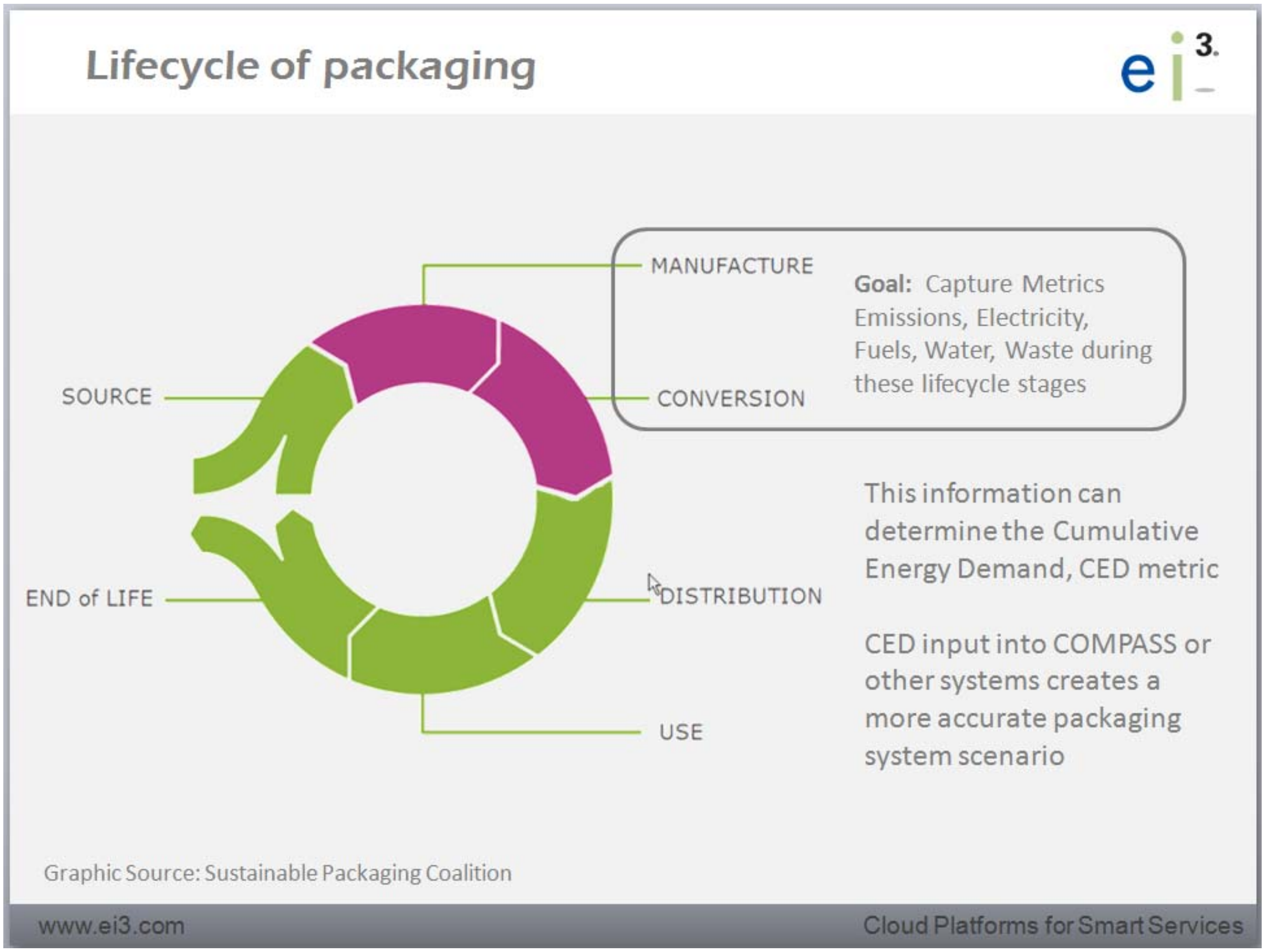
Manufacturing CO2 Measurement Drivers

From our perspective; we see organizations driven to measure by a number of factors including;

1) Use Sustainability as a Lens to drive performance, for example finding ways to reduce Energy Consumption while maintaining output helps identify and drive cost savings.
2) We see bellweather companies are seeking to understand the Sustainability footprint and have begun requesting details about the carbon footprint of items they purchase such as food and soft goods. And are exploring with Minal about how to provide Compass with quantitative data that could enhance its accuracy while increasing its responsiveness to new technologies.
3) Superior Energy Performance is a new program just being launched by the US Department of Energy. This program is calling on manufactures to find ways to reduce their energy use while

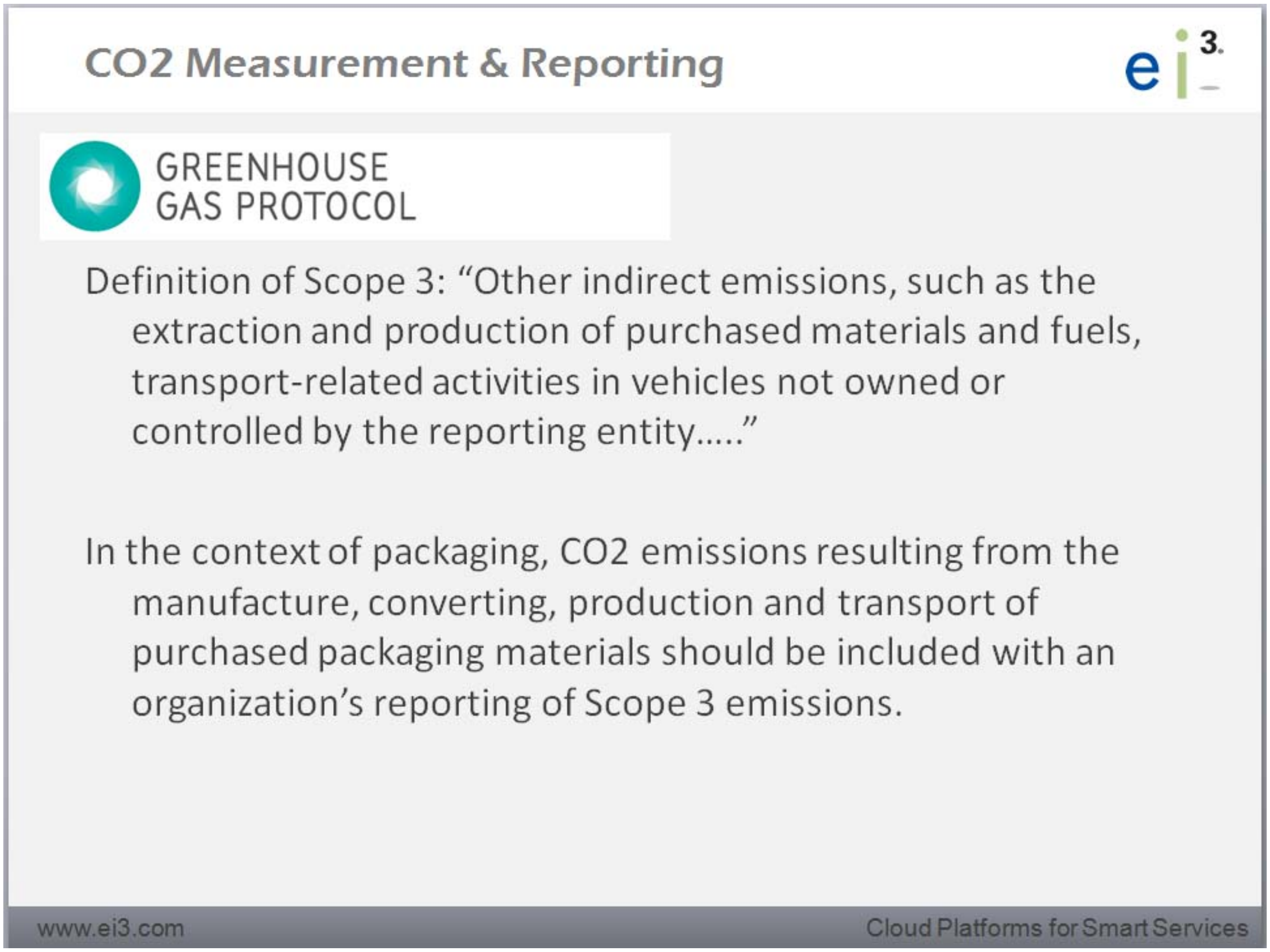
maintaining competitiveness. Certification levels are established and a protocol is published that is based on detailed measurement, base lining and normalization. SEP is based upon ISO 50000 a newly published standard which relies upon normalized measurement to validate savings.

4) Organizations that report struggle to understand their emissions so having a measurement based technique reduces the effort for reporting. Our work is concentrated on the manufacturing and converting part of the packaging lifecycle.



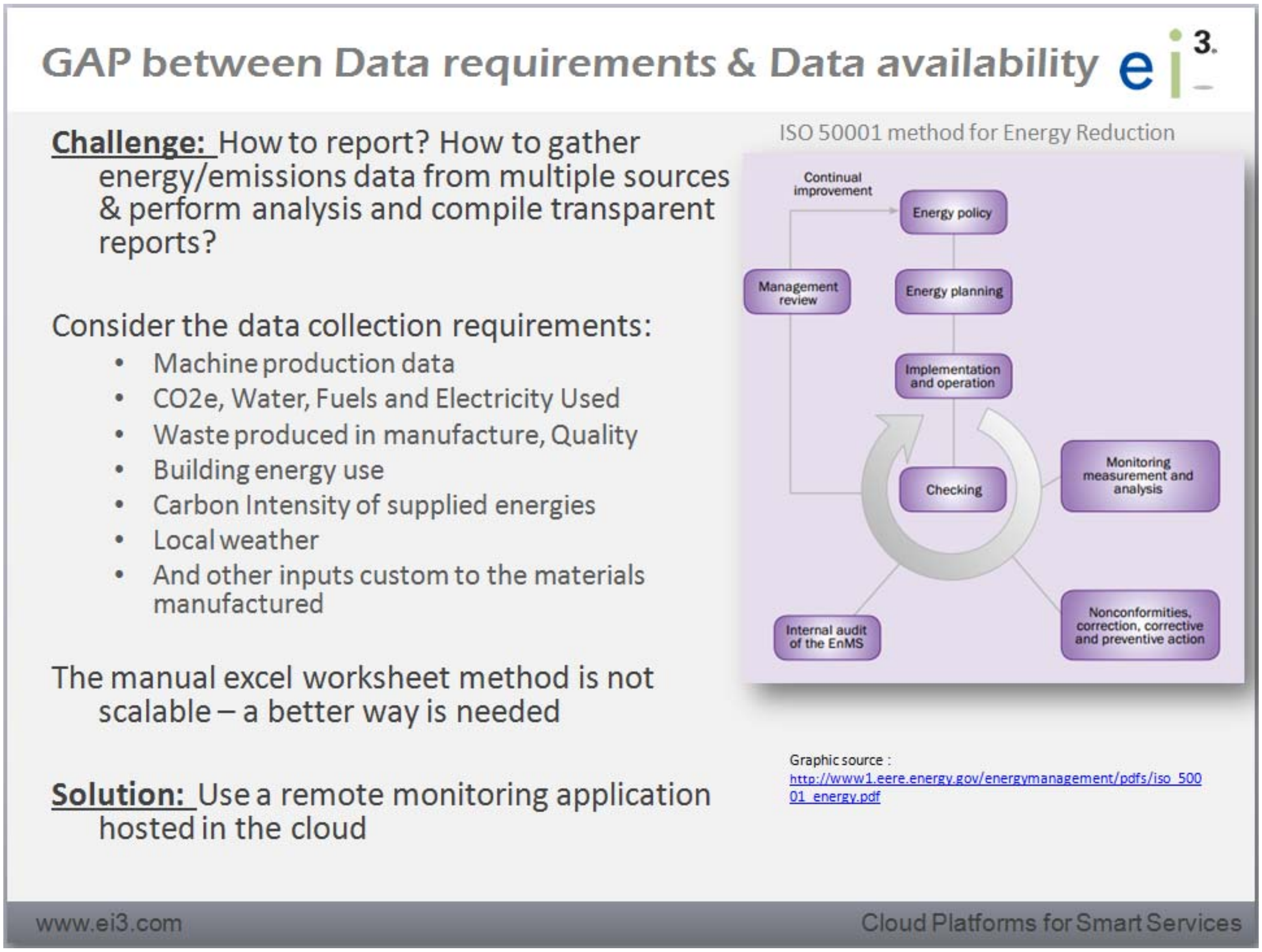
Lifecycle of Packaging

So to bring measurement of the manufacturing stage into the framework of the SPC, we will be examining the measurement of energy consumption is described as Cumulative Energy Demand, or CED in the Global Protocol on Packaging Sustainability v2. More specifically we are concentrating on these two areas, manufacture and conversion.



CO2 Measurement & Reporting

Further, in the context of packaging, from the perspective of further up the supply chain, we are measuring “the production of purchased materials”, those packages, are scope 3. Of course from the point of view of the converting factory, these emissions can also be reported as scope 2; even scope 1 in certain cases.



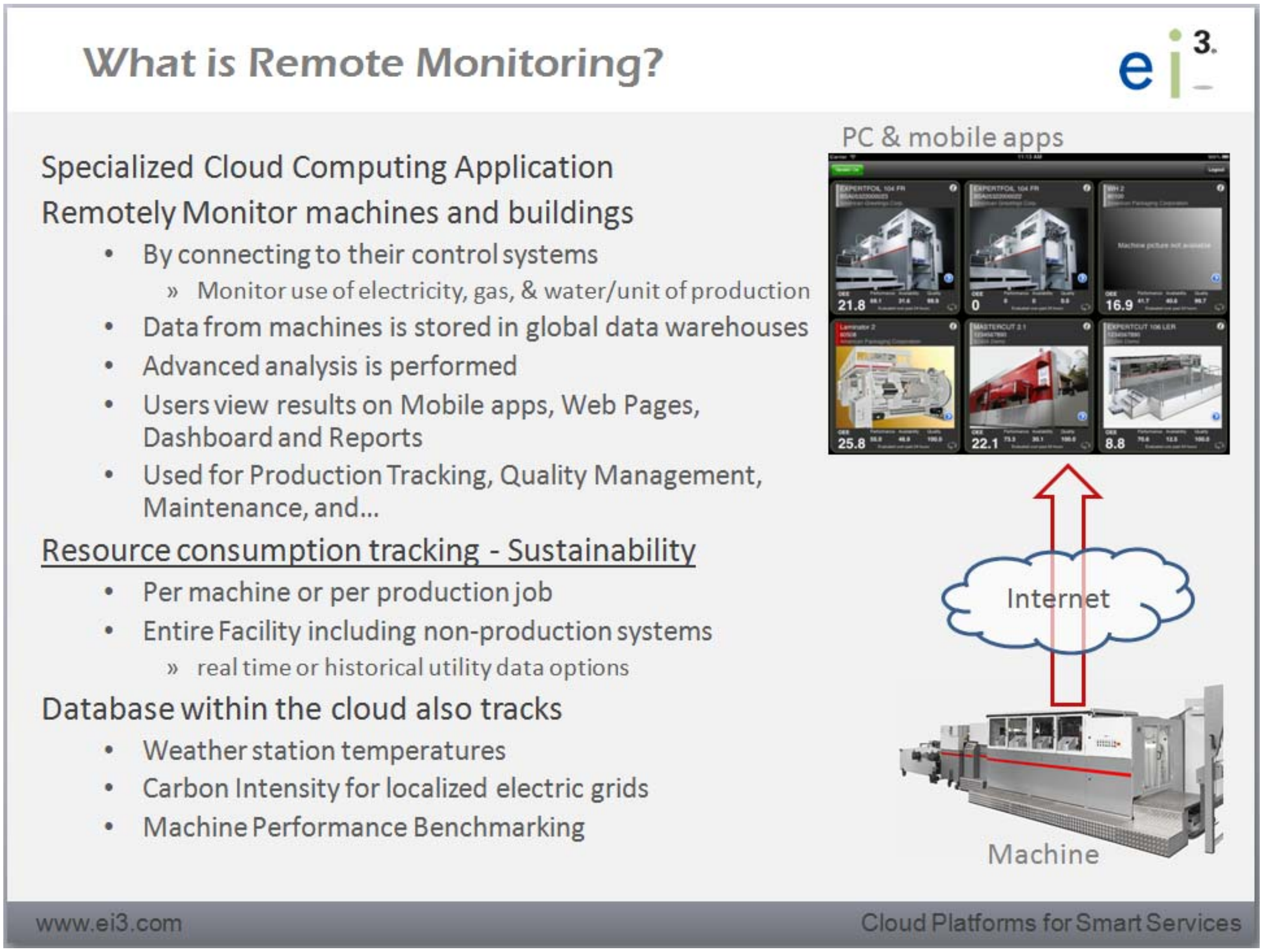
Gap between Data requirements and Data availability

So the big question, the challenge presented here is "How to Report?",. "How to gather energy and emissions data from multiple sources and perform analysis to compile the transparent reports called out in multiple protocols?"

Consider the many items required to be logged; machine production, Water, Fuels, and electricity used, waste produced, building energy use, carbon intensity of local energy supplies, local weather and other inputs. The amount of information to be compiled for analysis is substantial.

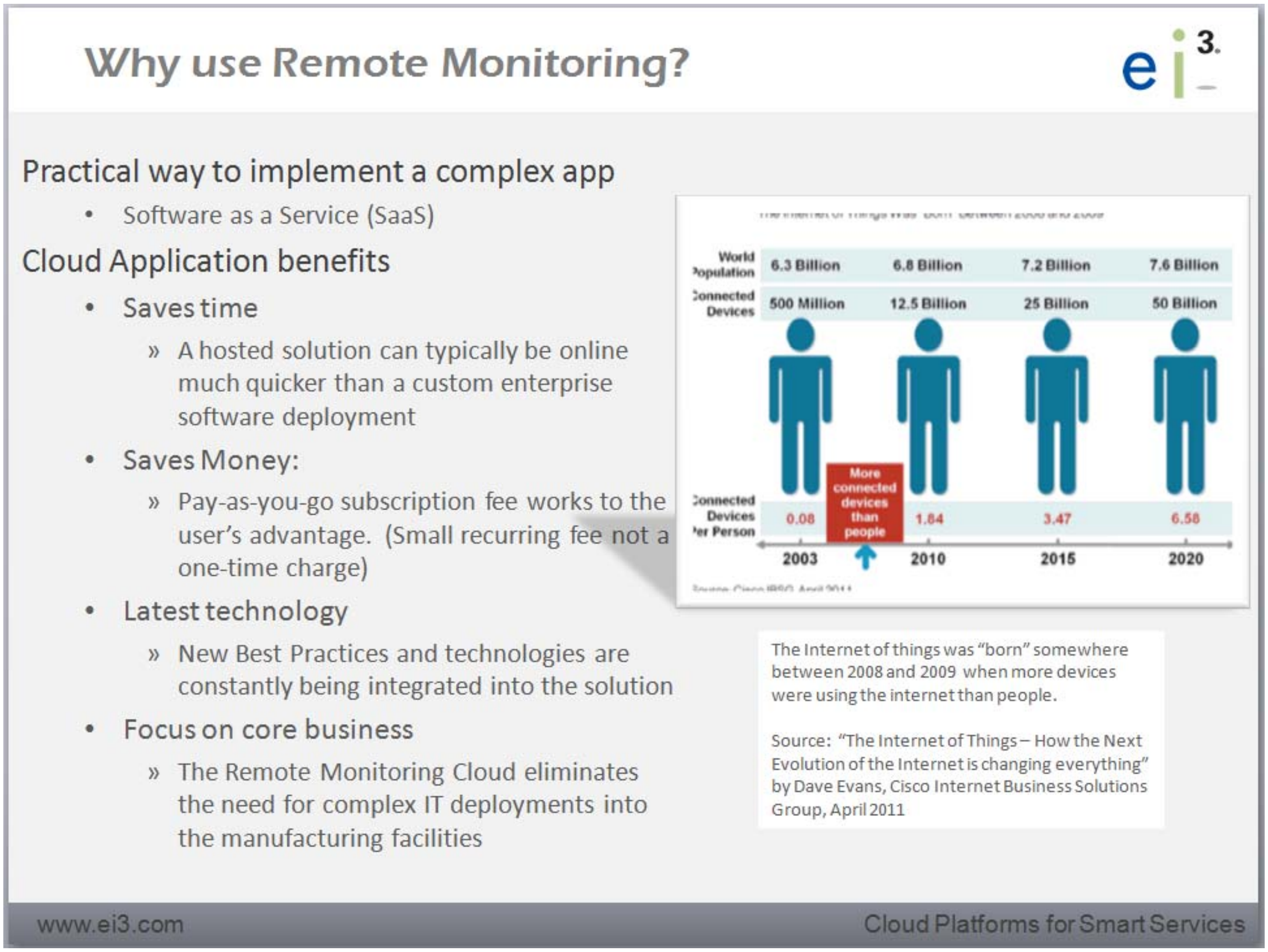
Clearly the manual excel worksheet method is not scalable.

The solution to this challenge we see emerging is to use a remote monitoring cloud application to measure, compile and report on energy and CO_2 emissions.



What is Remote Monitoring

What is Remote Monitoring?, we define this as a specialized cloud computer application, we also call it a "Smart Service" In sum, we connect to the control systems of machines, gather data about production, energy use and store it in a network of global data warehouses. Dedicated high performance computers analyze this data to show key performance indicators for production, quality management and now resource consumption to report on sustainability. It can be tracked by machine, by in-house job, in real time or historically. Using a central data warehouse enables tracking of other key variables outside of the plant including weather, and local grid carbon intensity. Also, a cloud application also enables benchmarking comparisons to be made, in a confidential manner.



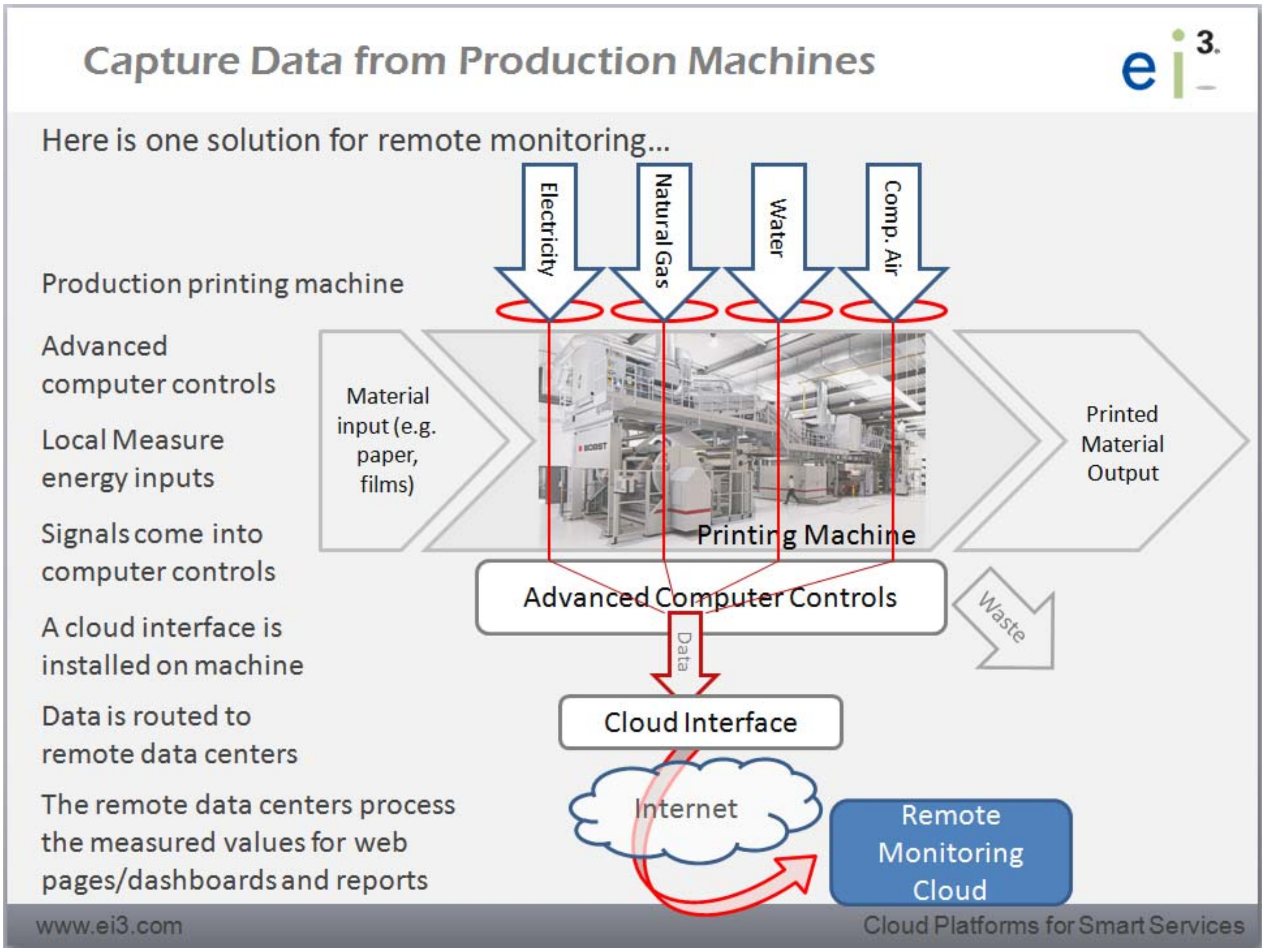
Why use Remote Monitoring?

Just a quick touch on this topic, Software-as-a-Service is growing in popularity, it enables an organization to save time, save money, get access to the latest technology and focus on their core business. It is highly secure. In fact today, there are more machines and devices connected to the internet than people, and the number is growing rapidly.

Real world Converting Machine Example

To help make this make more sense, I will provide you with an actual machine example. One of our business partners, and a company that many of you might be familiar with, is Bobst. For those who don't know Bobst, they the world's leading supplier of equipment and services to packaging manufacturers in the folding carton, corrugated board, and flexible materials industries. Founded in 1890 in Lausanne, Switzerland, Bobst has a presence in more than 50 countries, runs 11 production facilities in 8 countries and employes over 5,000 people around the world.

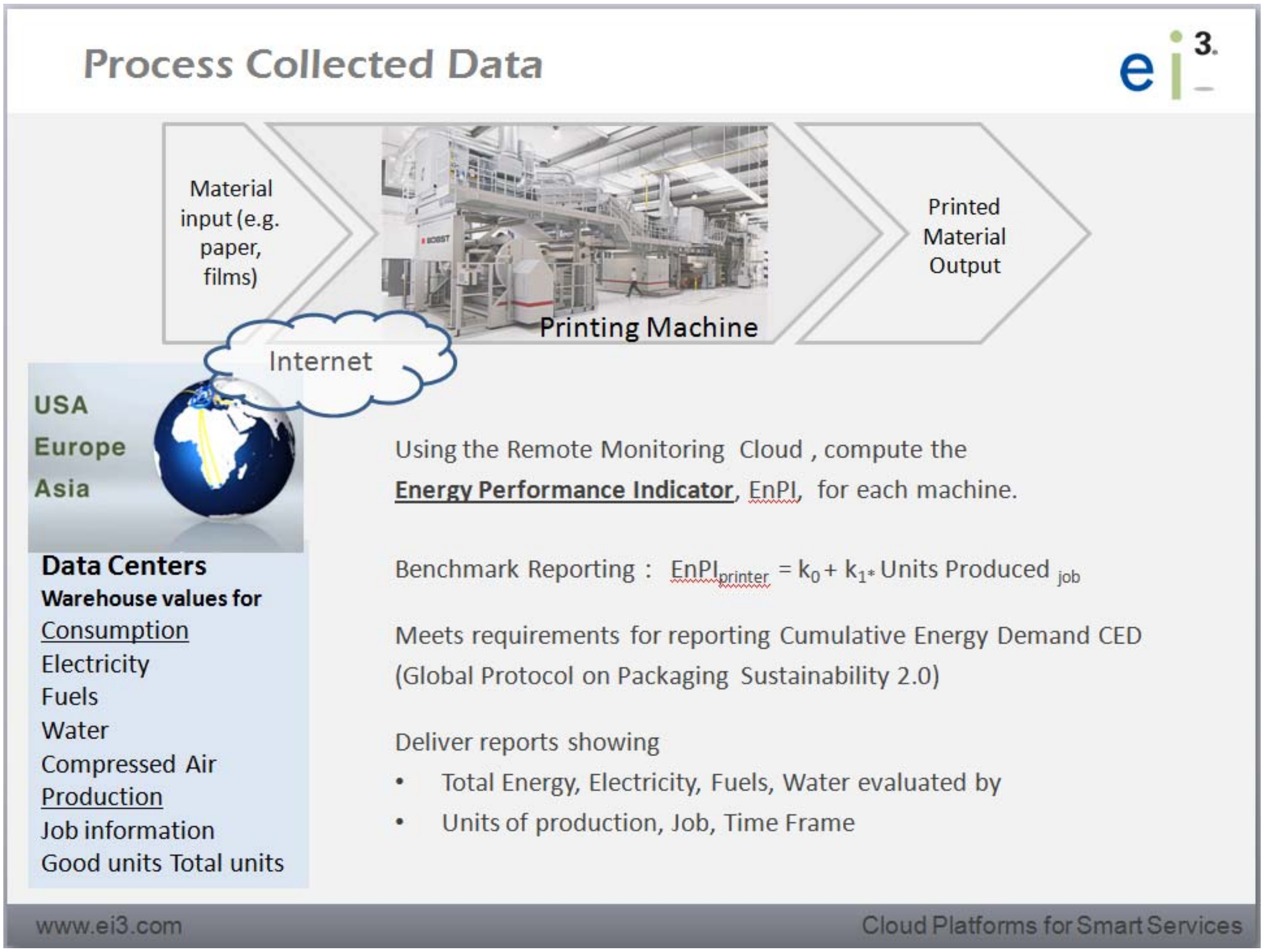
This Bobst printing machine is a Flexographic web-fed printing press. It can print on various substrates to produce cartons, bags, boxes and labels. This machine runs up to 2000 Feet per minute, that's about 22 Miles per hour. It can processes a web of 110 inches wide or almost 10 feet. Fischer & Kreke, the Bobst division has a technology for starting up printing jobs with zero product waste. This machine is shipped with a remote monitoring capability as a standard feature.



Capturing Data from Production machines

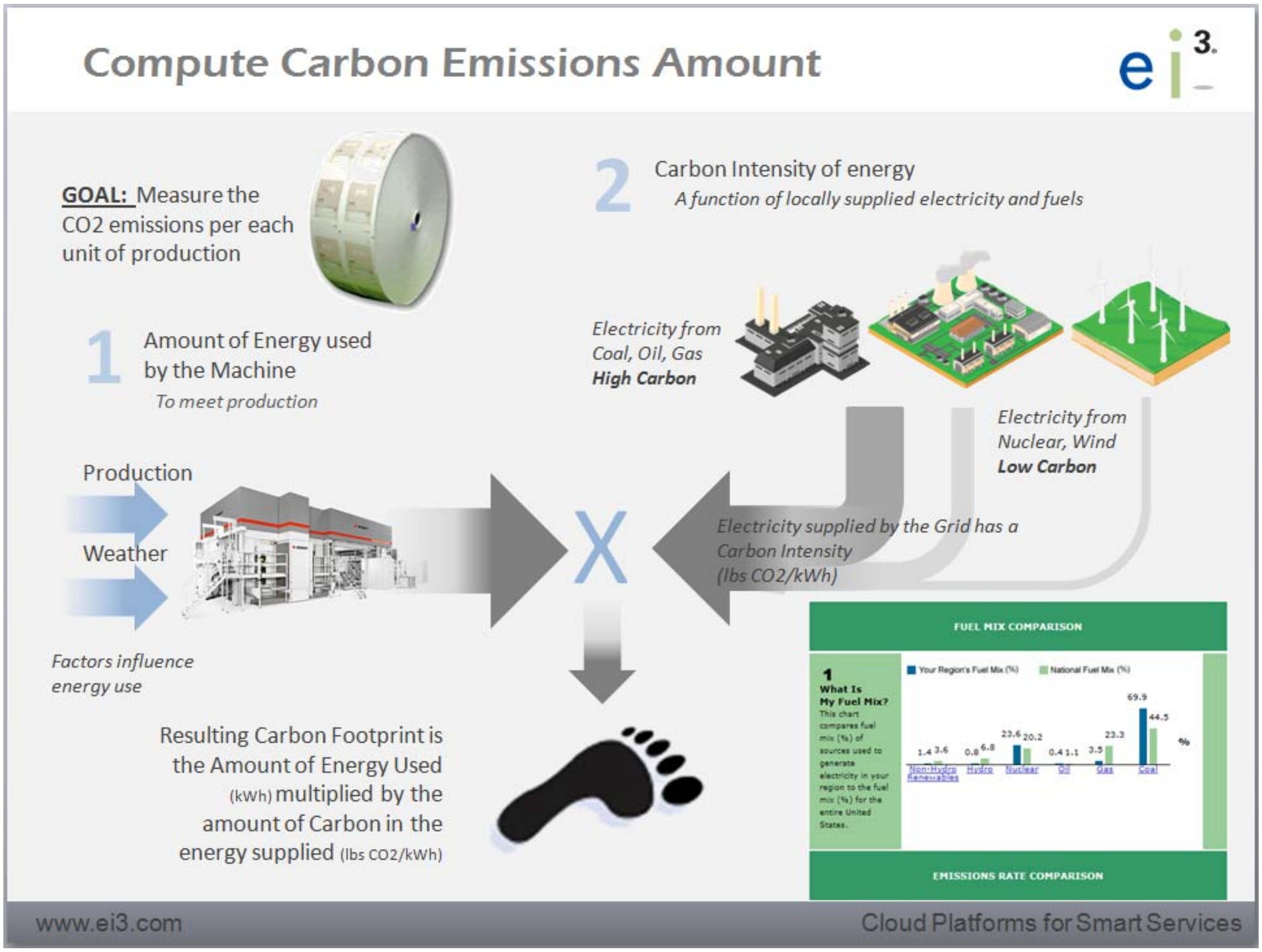
Here is how remote monitoring works, first we capture data from the machine. This machine has an advanced system of computer controls. The machine also has sensors to measure the electricity for operation, gas for its dryers, water for its cooling rolls, and compressed air to make things move. Each of these sensors are tied into the machine's computer controls. A remote monitoring interface is provided to connect the machine into the cloud, and this interface allows data to flow securely from the machine's computer to the data warehouse.

At the data warehouse, powerful internet servers work to create web pages dashboards and reports for users. Also this same method can work with existing – older machines. Depending on the machine, new sensors need to be added, and in some cases a new controller might be installed if the existing machine does not have a compatible computer.



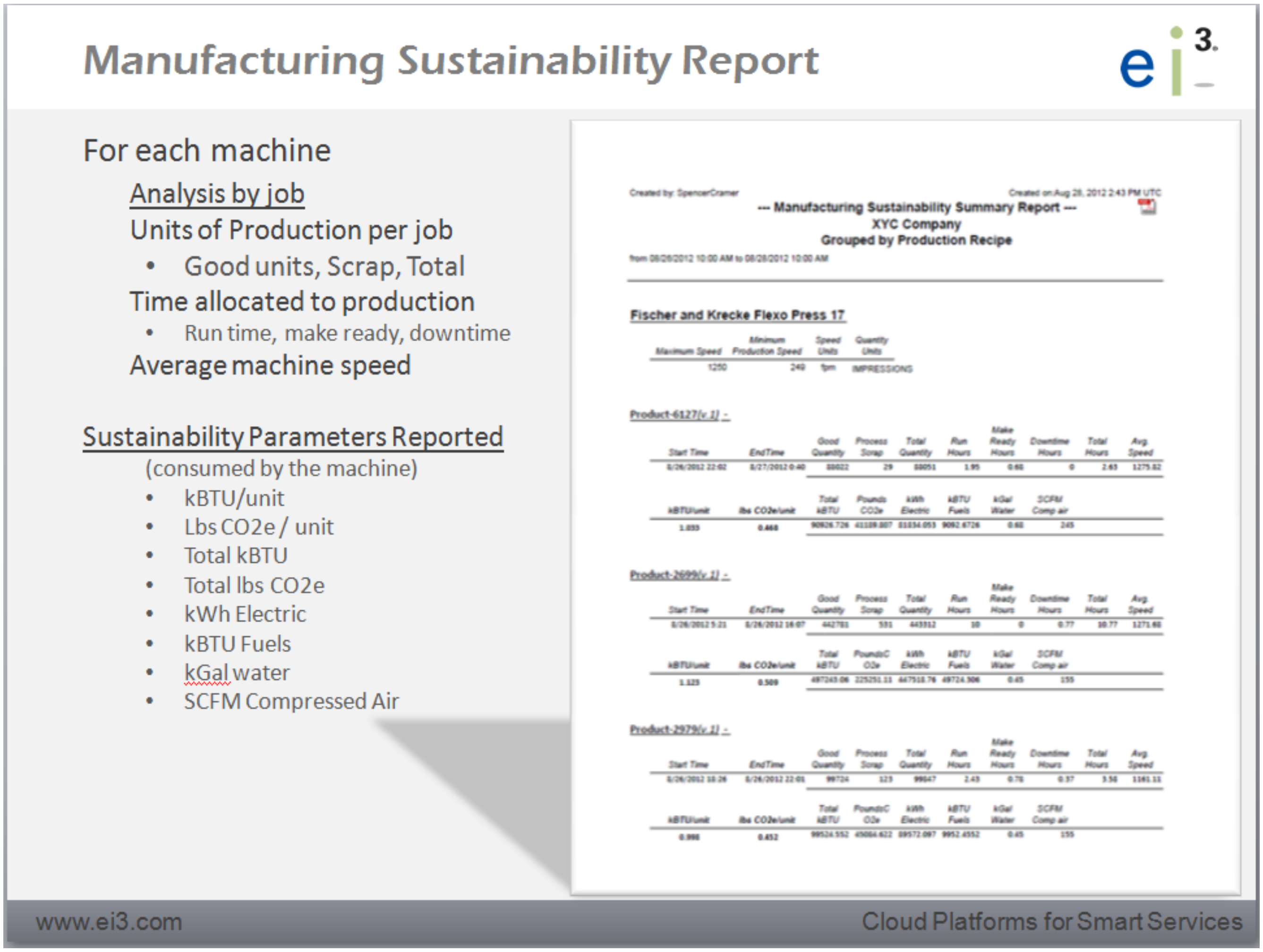
Process Collected Data

Once the data reaches the data warehouse, values are in place for Consumption of Electricity, fuels, water, air, and production, including job information and units produced. At the data center the machines' consumption is modeled for benchmarking purposes. A characteristic equation for the energy performance per unit of production is computed. This becomes the core data for the CED.



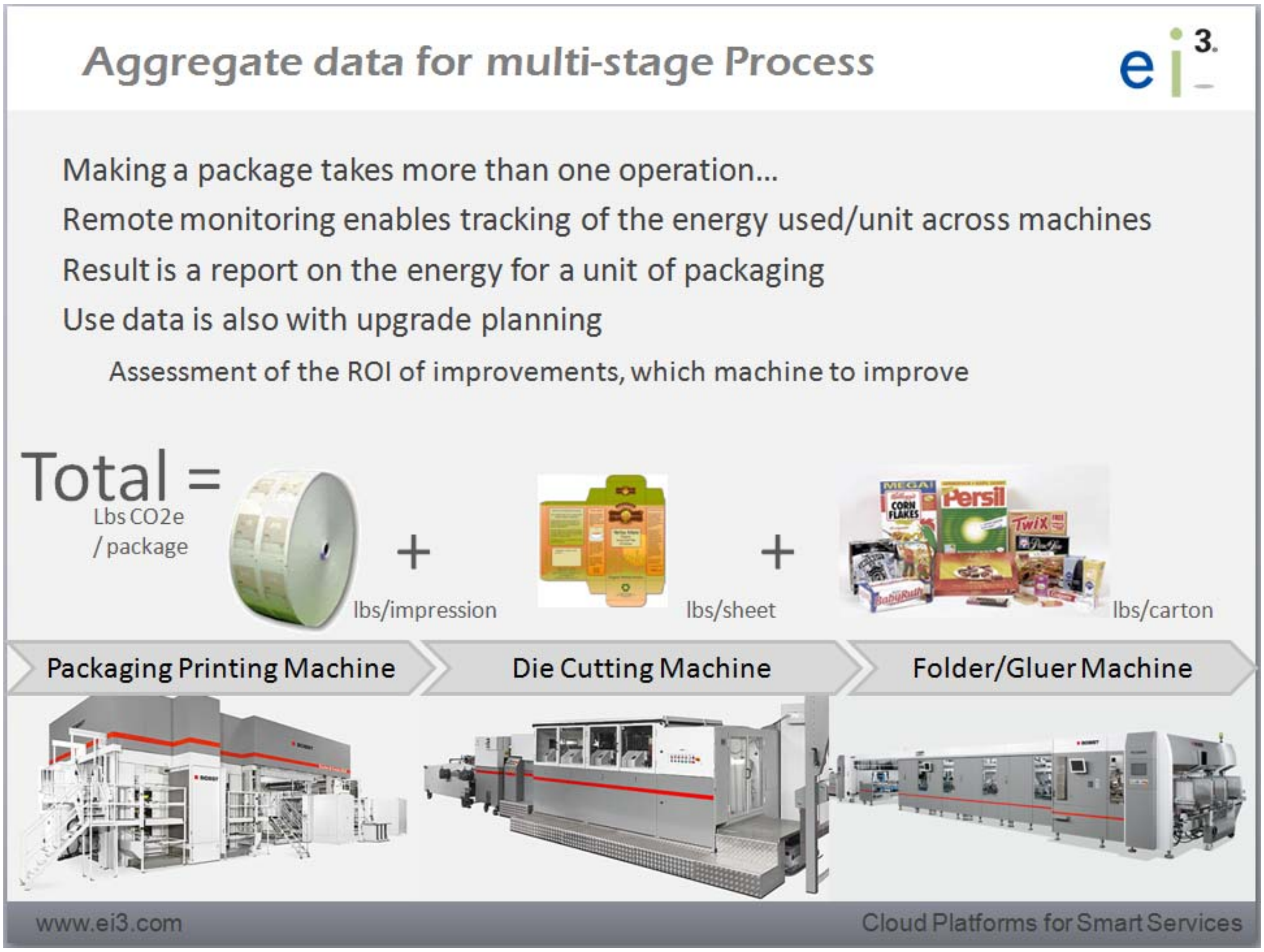
Compute Carbon emissions amount

Wit h the energy data known we are one step away from goal – This is to know the carbon footprint of the unit of production. But we need to merge in data about the local carbon intensity. With a database of local carbon intensity values, it is possible to integrate these intensities with the energy of production, and from there we have the CO2 emissions per unit of production. This is the number that can be provided to supply chain partners for their reports.



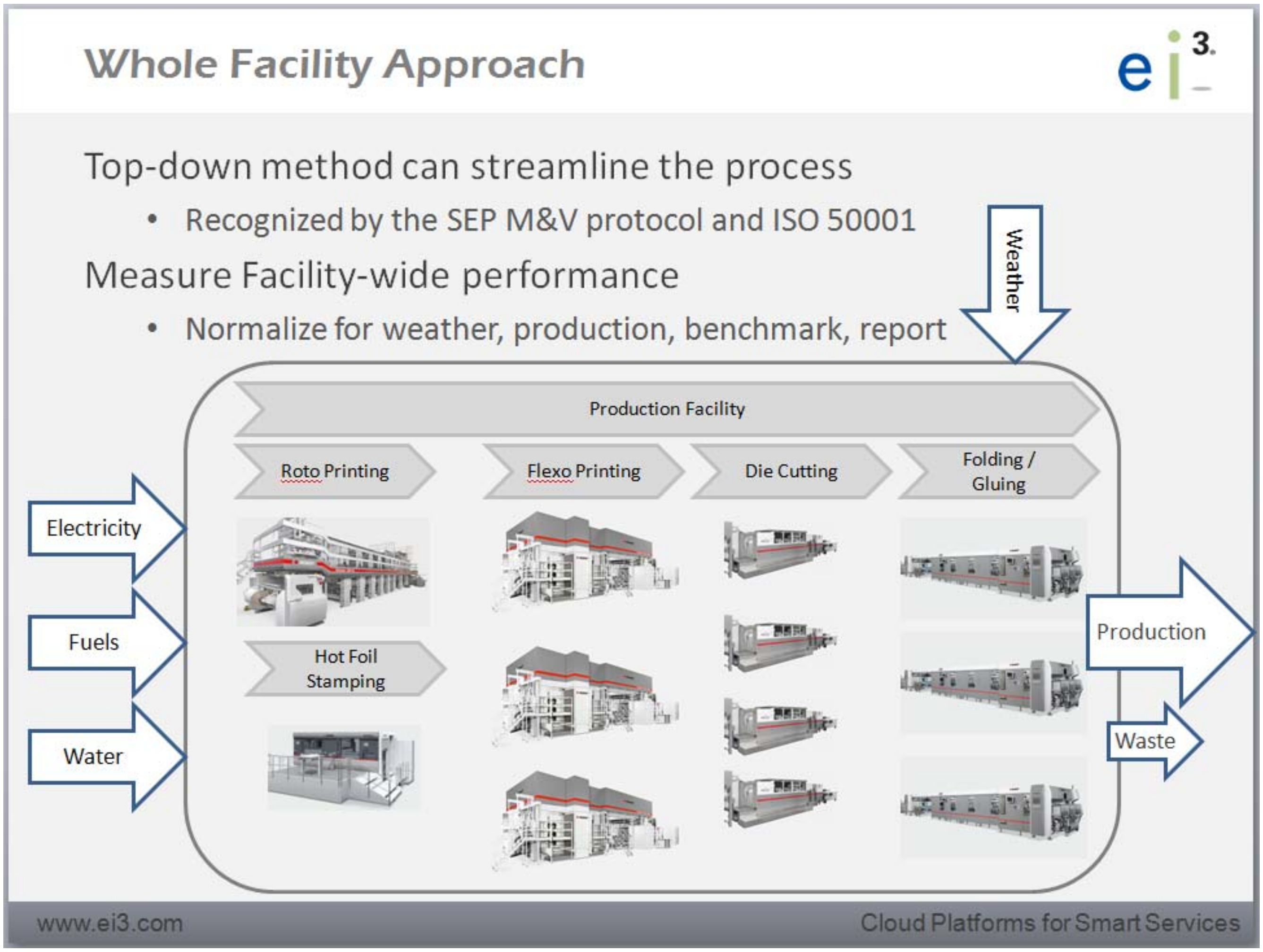
Manufacturing Sustainability Report

A manufacturing sustainability report can be provided directly from the cloud server, this report can be customized for different organizations. In its most basic form, as this summary report shows, the key metrics of energy consumption and CO_2 emissions are provided on a job by job basis. Here you can see the values of units produced analyzed by job, and in the table below, the Energy and CO_2 metrics are provided.



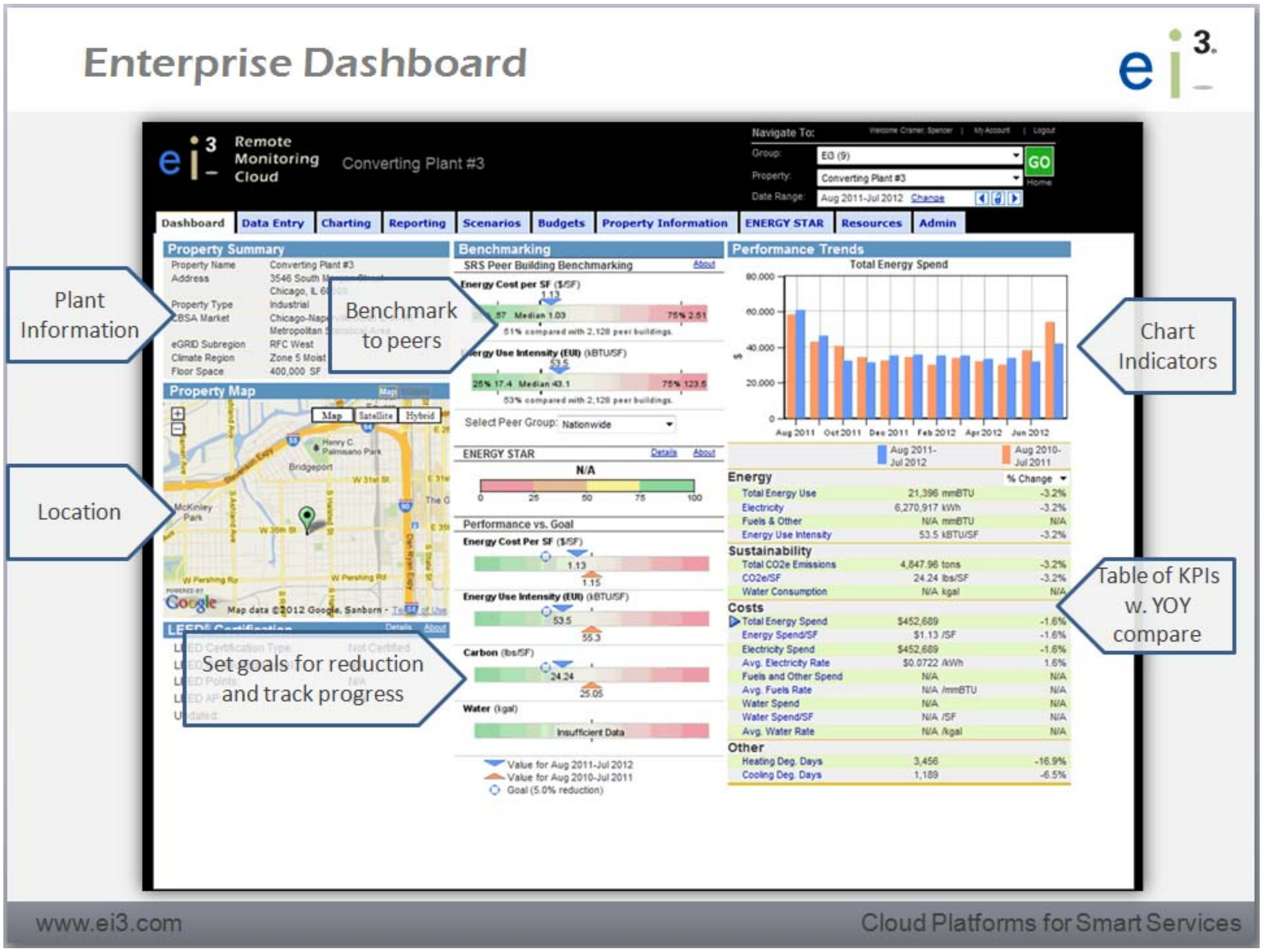
Aggregate Data for a multi-stage process

Most products require operation on more than one machine. By have each machine connected to a remote monitoring interface, the Energy values are measured and carbon emissions calculated. This aggregation method provides a report of the total impact of the converting stage of the package. Having the energy use data makes helps with planning machine upgrades and even production scheduling.



Whole Facility Approach

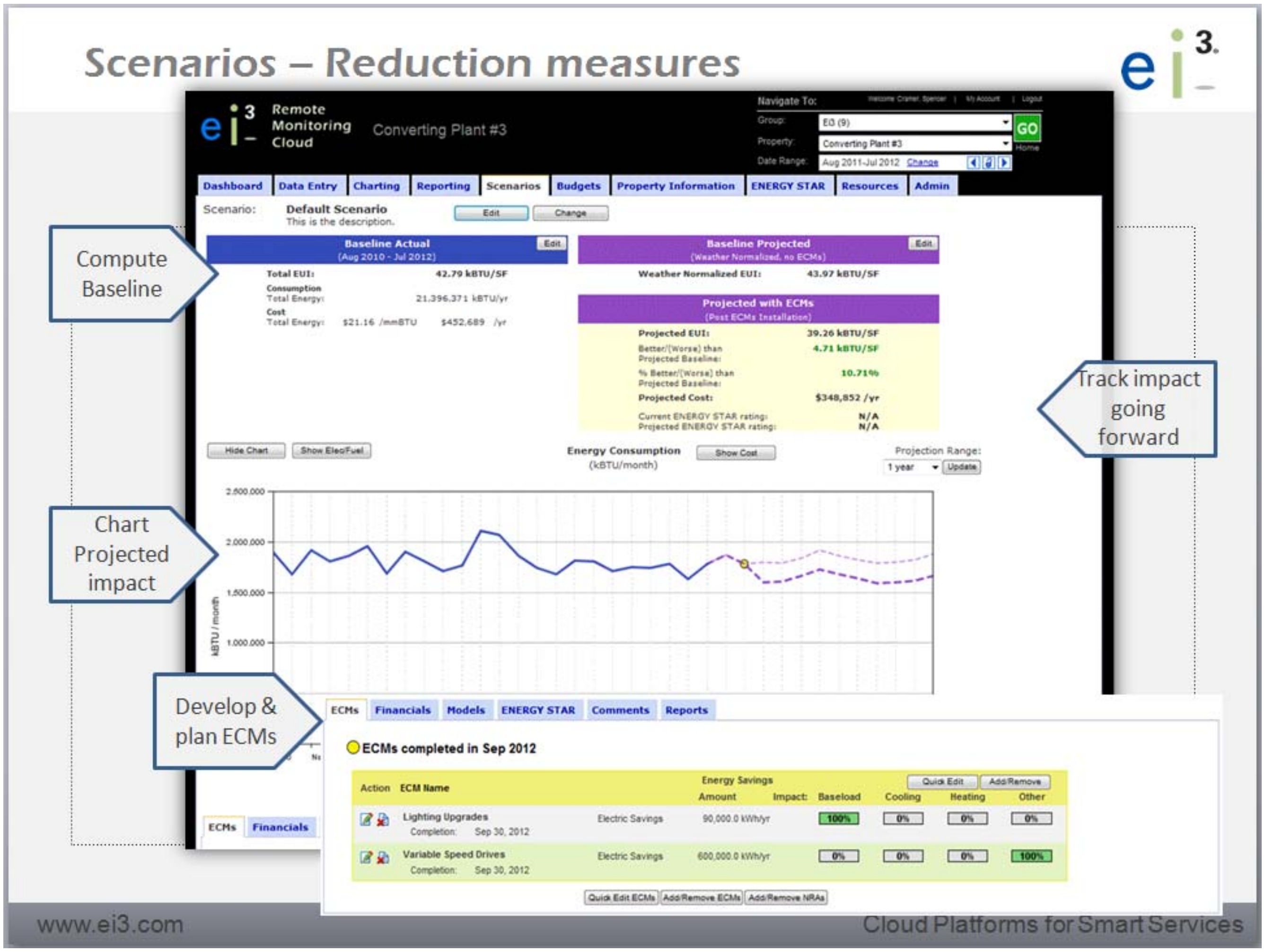
In many cases the whole facility approach works well for defining an energy consumption baseline. This baseline is used to project savings and measure and verify that the projected savings actually materialized. A whole facility approach looks at the building as a single unit and normalizes energy use for the weather, the amount of production made, and other significant factors. This analysis can be done either through remote monitoring of the main energy meters at the building or by inputting historical utility bills.



Enterprise Dashboard

Once the energy consumption data is in the system, it can be tracked in a number of ways. The remote monitoring cloud application has the ability to display dashboards of energy use, as this sample shows.

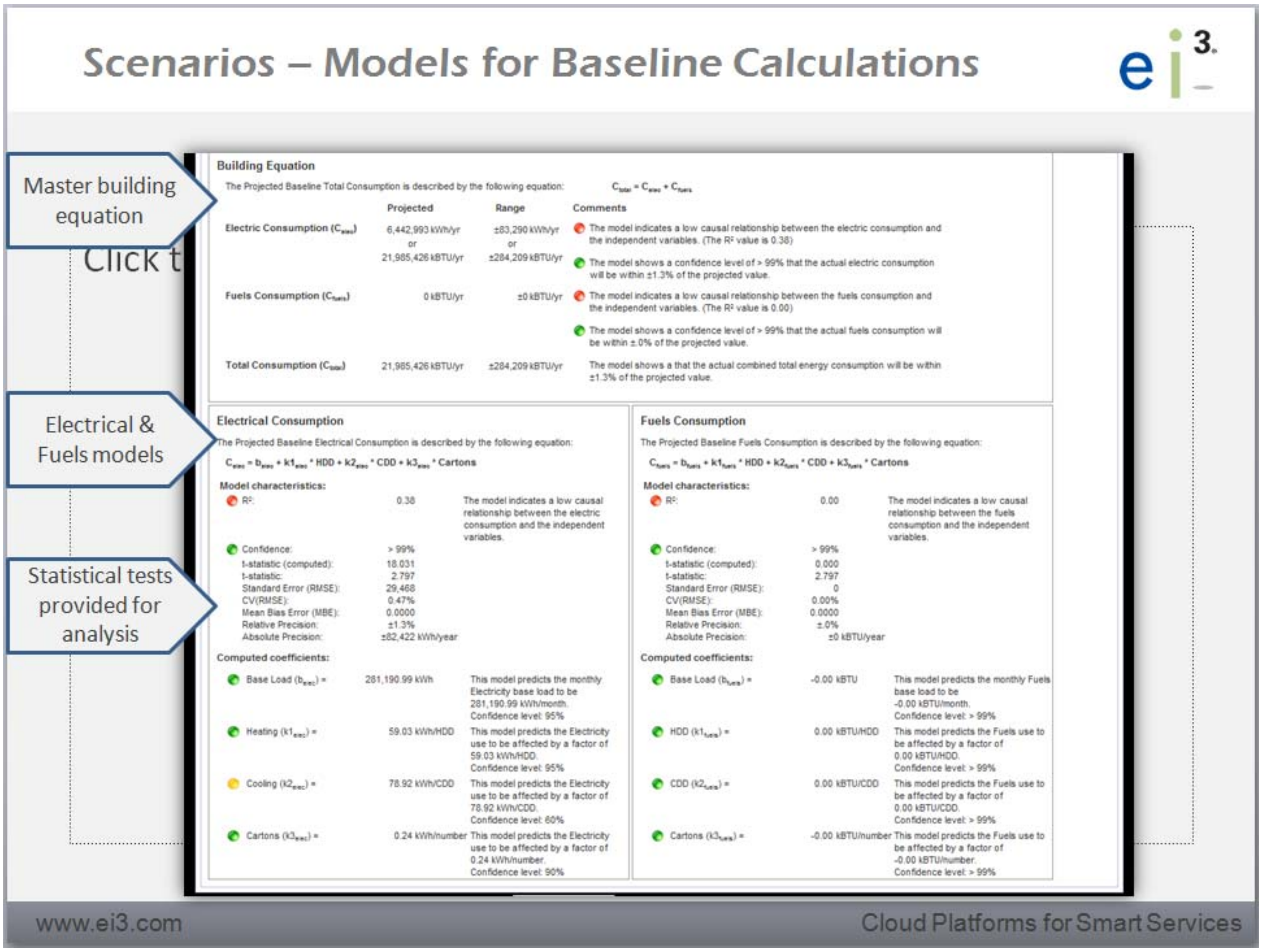
On the right hand side are key performance metrics showing the whole building's energy use in a number of ways. Totals for energy, electricity and fuels and a per-square-foot number showing the energy intensity of the building. These numbers are for the past twelve months and are compared to the prior year to show progress. The Carbon emissions numbers are also shown along with the water used at the facility. Costs are displayed with a number of comparison metrics as well to drive cost savings. On the left side there are some features on this dashboard are useful to organizations trying to reduce theuir carbon footprint. One is this benchmarking to peers; each object in the system contributes to the database in a blind manner, that means that it becomes available for comparison. Right now you can see that this manufacturing site in the Chicago area is being compared to 2129 building around the country. Also there are goals features that can be used to drive savings programs across the company.



Scenarios – Reduction Measures

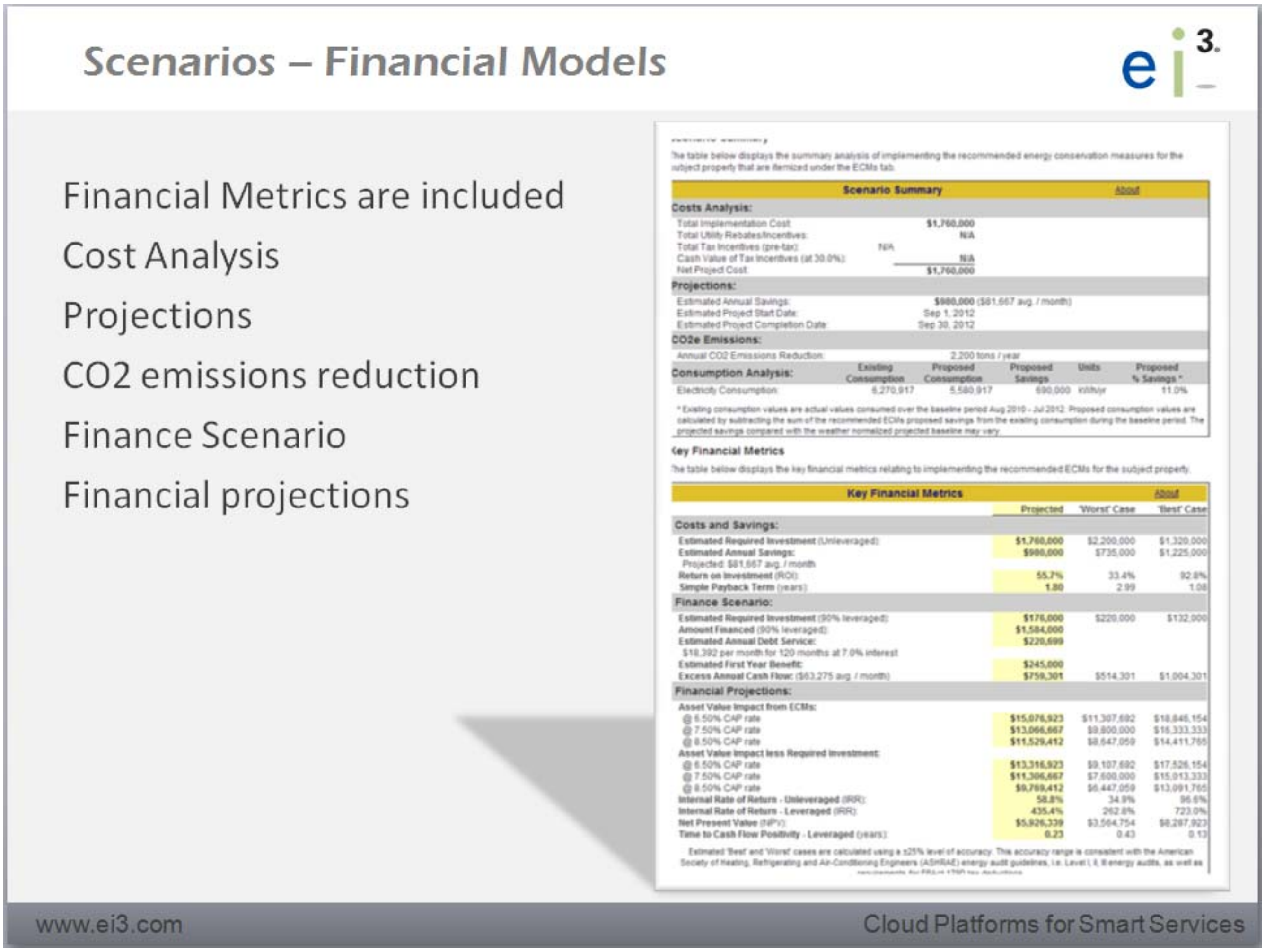
In the scenarios section a tool is provided to show the potential impact of energy conservation measures – or ECMs. The first step is to develop a baseline model of the facility that normalizes its energy use for weather and for production. This baseline method ensures that the projected savings of a ECM is measured fairly.

Each ECM that is contemplated is defined to have a potential impact along with a cost. For example, a lighting upgrade might reduce the base load of a building by a certain percentage. This reduction would be independent of the weather since the building's lights are always on. In contrast a Variable speed drive upgrade to certain equipment might have an impact related to production, again independent of the weather. Once these ECMs are defined, the scenario tool shows the projected energy use going forward and if implemented becomes the basis of a measurement & verification program.



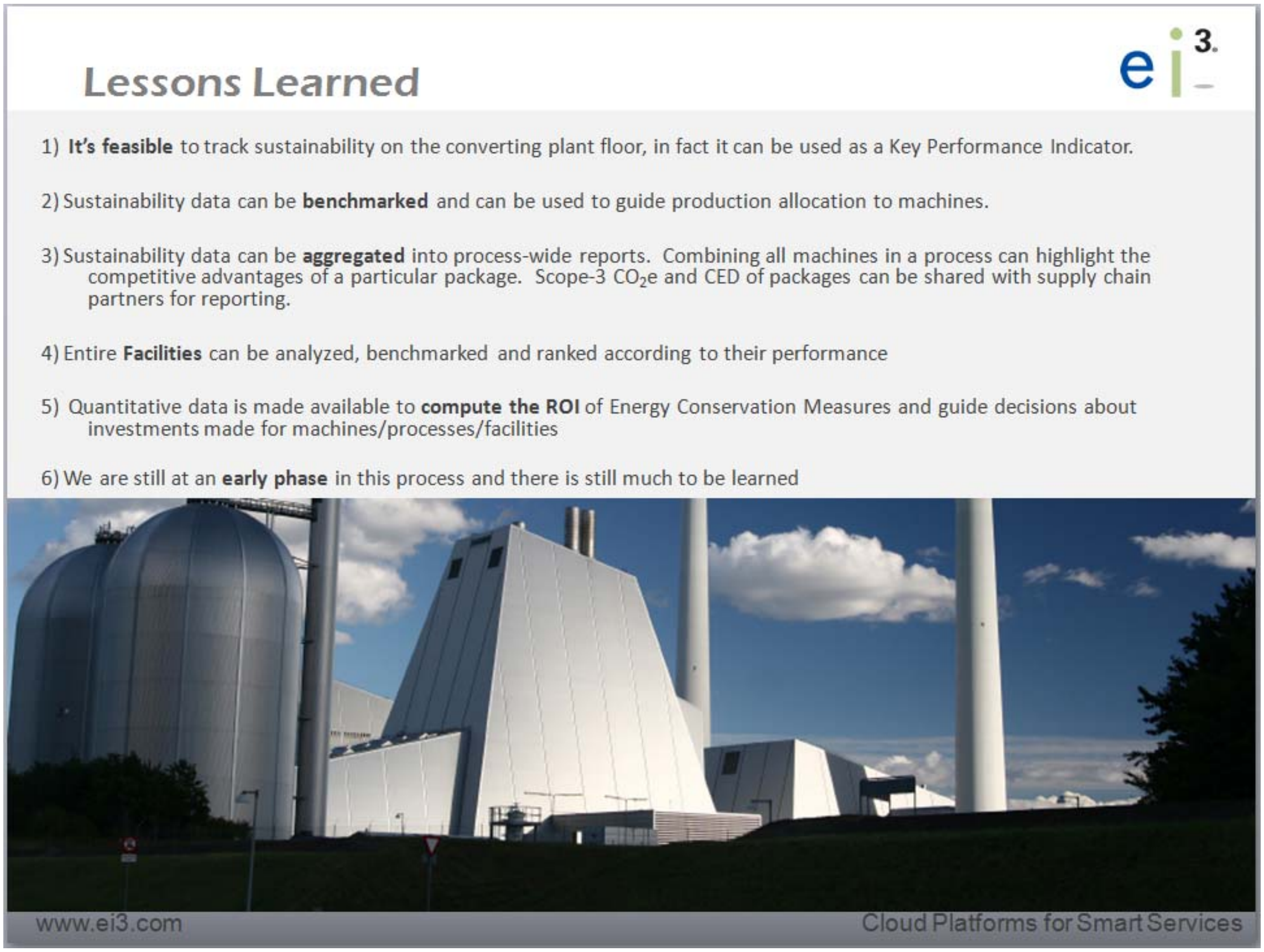
Scenarios – Models for Baseline Calculations

Whether it is a machine to an entire facility, the system bases its scenario calculations on stastical models that rely upon comparing the consumption of energy to the units of production and the weather. The models generated are provided with statistical tests to show the user how accurate and precise the models are. With this information, it becomes easier to identify ECMs that hold the promise of saving energy – and money.



Scenarios – Financial Models

Every scenario is comprised of a group of ECMs. So it is possible to model the financial impact of implementing the improvements. This is based on the projected – normalized energy savings and some key assumptions about costs for energy, escalation, tax incentives, utility rebates and other facts. With this information it becomes easier to analyze and approve moving forward on reduction projects.



Lessons Learned

So in this brief presentation, we went through a lot of technologies to remotely monitor, calculate and analyze sustainability data. From my experience working in this field for a number of years, here are the highlights that I can share.

1) It is feasible to track sustainability on the converting plant floor. And with this data it can be used as a KPI number similar to production and quality.
2) Sustainability data can be bench marked and can help the production manager better understand how to allocate production to machines.
3) Data can be aggregated to create a complete CO2/unit number. This forms the basis of a transparent standards based reporting methodology.
4) Entire facilities can be analyzed benchmarked and ranked.
5) Quantitative data is made available to **compute the ROI** of Energy Conservation Measures and guide

decisions about investments made for machines/processes/facilities

6) This is still an **early phase** in this process and there is still much to be learned

Thank-you

I have tried to briefly share my perspective on remote monitoring 's role in measuring CO23 emissions. As I am sure you can image there is a lot more that could be said. And if you are interested in learning more, please feel invited to contact me either during this meeting or after wards.

About Ei3 Corporation

Since 2000 Ei3 Corporation has been delivering Cloud Platforms for Smart Services to leading global organizations in a wide range of industries including manufacturing, converting, printing, and information technology. These Software-as-a-Service solutions enable better understanding of performance and life cycle of manufacturing equipment, buildings and other assets. Ei3's platforms analyze remotely monitored data to deliver actionable Business Intelligence as web pages, dashboard and reports onto the desktops and mobile devices of corporate clients as well as third party software systems.

About the Author

Spencer Cramer founded Ei3 to pursue his vision of creating a Software-as-a-Service business that connects machines & devices to people & systems. By steadfastly following a strategy of delivering cloud computing platforms to global enterprises, Mr. Cramer has built Ei3 into an award-winning leader within the field of Machine-to-Machine (M2M) communications, the nascent market that is also known as Smart Services. As Chief Executive Officer Spencer provides vision and contributes towards Ei3′s mission by setting strategy and managing day-to-day operations. With 25 years of experience leading technology companies, his track record of business success comes from his ability to innovate, license technology, create enterprise sales, provide administration, and motivate teams.

scramer@ei3.com