

Solutions for the Crossroads:

“Energy Optimization
from Plant to Plug...”

Aaron Davis, Chief Marketing Officer
Philippe Delorme, EVP Strategy & Innovation



Solutions of the past are simply not sufficient for the future



The world's energy system is at a crossroads. Current global trends in energy supply and consumption are **patently unsustainable** – environmentally, socially, economically. But that can – and must – be altered; there's still time to change the road we're on. It is not an exaggeration to claim that the **future of human prosperity** depends on how successfully we tackle the two central energy challenges facing us today: securing the supply of reliable and affordable energy; and effecting a rapid transformation to a low –carbon, efficient and environmentally benign system of energy supply.

What is needed is nothing short of an **energy revolution.** 

Source: World Energy Outlook

Pervasive changes

from population, standard of living, and technology

- Humans created 161 Exabyte of data in 2006, approximately **three million times** the information in all the books ever written. Projected to be **988** in 2010.
- In 2005, the average IT network user consumed 3Mb bandwidth per month. In 2008, this became **3Mb per day**
- Microsoft and Google announce new datacenter plans based on location of **cheapest** electricity
- \$12 trillion will be spent for energy in the next 20 years, equaling the spending of the **past 100 years**
- Between 2002 & 2007 the cost of electricity was **multiplied by 3**
- « Last year human beings produced **more transistors than rice** grains...and at lower cost... » - IBM

* source: IDC, EMC

Avatars consume as much electricity as Brazilians

DECEMBER 05, 2006

Tony Walsh has, as others do, some doubts about whether Second Life is sustainable as a business. But he also [poses](#) another question that I hadn't come across before: "Is Second Life sustainable ecologically?"

He quotes Philip Rosedale, the head of Linden Lab, the company behind the virtual world: "We're running at full power all the time, so we consume an enormous amount of electrical power in co-location facilities [where they house their [4,000](#) server computers] ... We're running out of power for the square feet of rack space that we've got machines in. We can't for example use [blade] servers right now because they would simply require more electricity than you could get for the floor space they occupy."

Physical sales of virtual goods topped more than \$300M in 2007

20 milligrams CO₂ per second

Greening the Internet: How much CO₂ does this article produce?

updated 12:13 am EDT, Mon July 13, 2009

STORY HIGHLIGHTS

- Every second spent web-browsing generates 20 milligrams of CO₂
- Estimates that the Internet will produce 20 percent of the world's GHGs in 10 years
- Data centers often labeled worst offenders, many taking steps to reduce emissions
- 'Ultimately IT is an efficiency tool, better to move electrons than atoms,' say Google

[Next Article in Technology >](#)

READ

VIDEO

By Lara Falar, Fox-CHN

(CNN) — Twenty milligrams; that's the average amount of carbon emissions generated from the time it took you to read the first two words of this article.



How green is your website? Calculating all the factors involved in a website can be tricky.

Now, depending on how quickly you read, around 80, perhaps even 100 milligrams of CO₂ have been released. And in the several minutes it will take you to get to the end of this story, the number of milligrams of greenhouse gas emitted could be several thousand, if not more.

This may not seem like a lot. "But in aggregate, if you consider all the people visiting a web site and then all the seconds that each of them spends on it, it turns out to be a large number," says Dr. Alexander Wissner-Gross, an Environmental Fellow at Harvard University who studies the environmental impact of computing.

Wissner-Gross estimates every second someone spends browsing a simple web site generates roughly 20 milligrams of CO₂. Whether

downloading a song, sending an email or streaming a video, almost every single activity that takes place in the virtual environment has an impact on the real one.

The Internet will produce 20% of the world's GHG in 10 years...

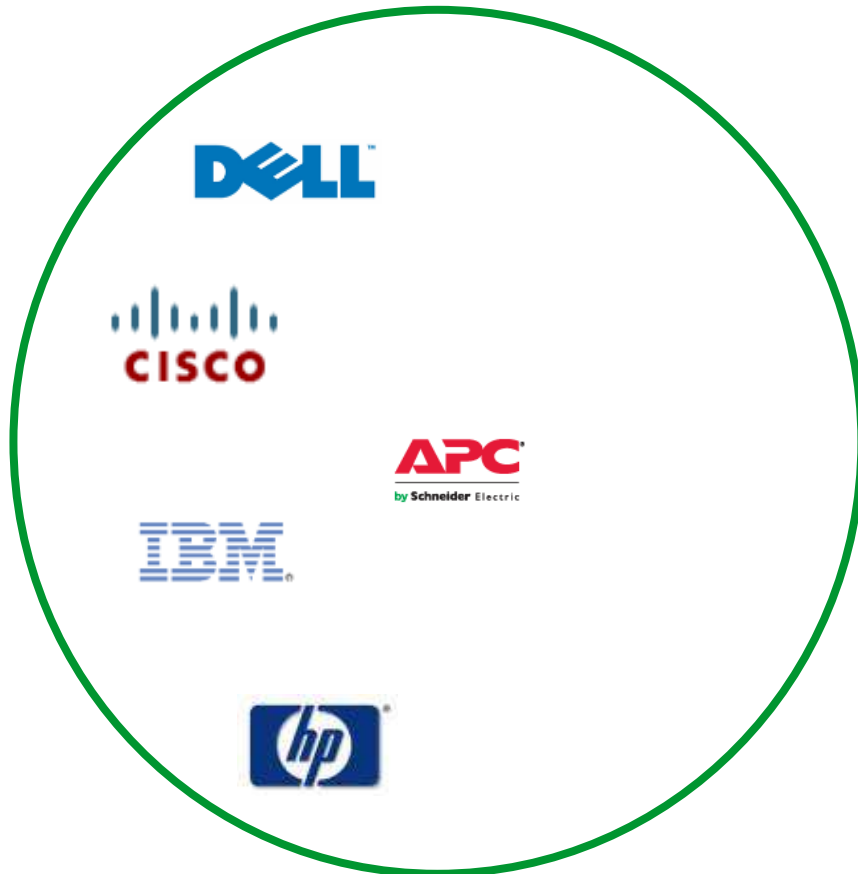
Welcome to the “inelastic” Digital World creating the requirement for an energy revolution...

- Impacting the way we use all types of **power**
- Impacting the way we design and interact with our **buildings and homes**
- Impacting the way we design and use our **production and manufacturing** centers, which in turn drives massive demographic changes
- Impacting our **datacenters** and **personal technology** habits
and the Machine to Machine Internet has barely begun!

Rates of change are ***exponential*** on the problem side... while solutions to date have been ***component and linear***...

The future demands new solutions and the largest companies must lead

Information
Technology

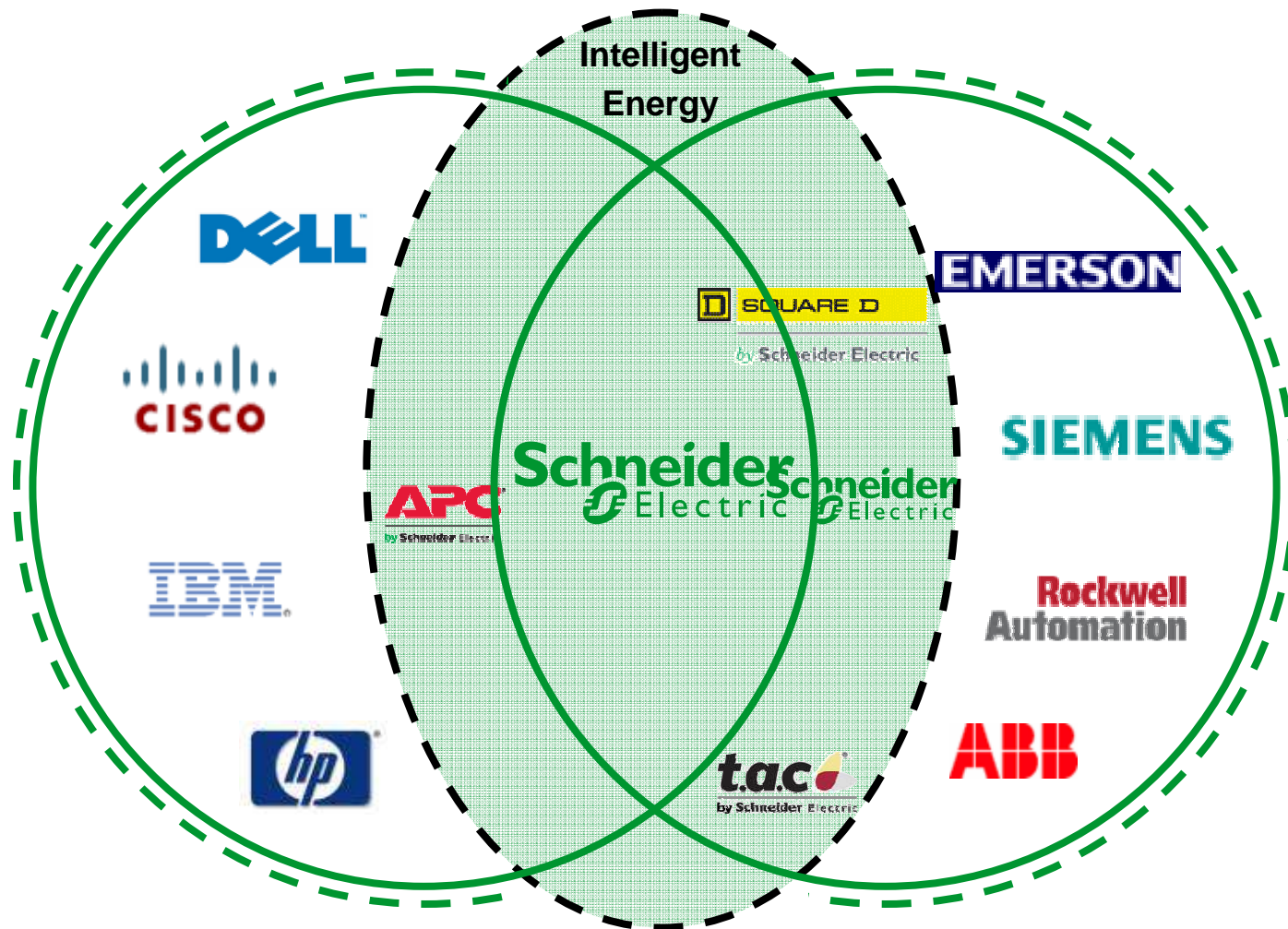


Traditional
Energy & Automation



Solutions must take the best of both worlds....
The “I” and the “E”

And we must own this new market space
whilst maintaining strength in traditional businesses



Winning companies will be focused on **Intelligent Energy**...

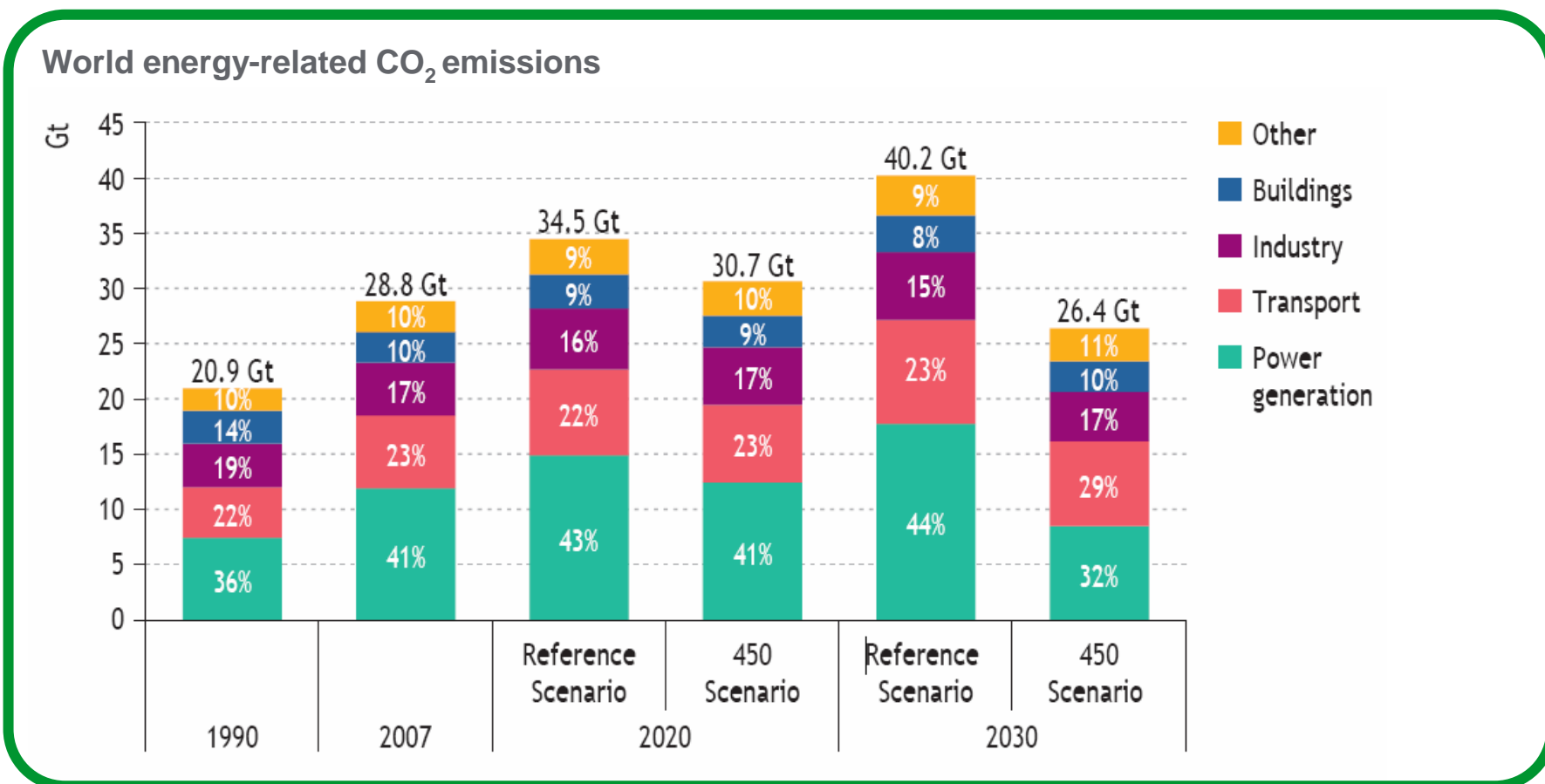
Intelligent Energy:

Enabling the architectural integration of data, power, security, cooling and automation in the Digital World

Generation supply matters

but demand behavior matters most, first!

- Over 67% of CO₂ emissions reduction will come from power generation



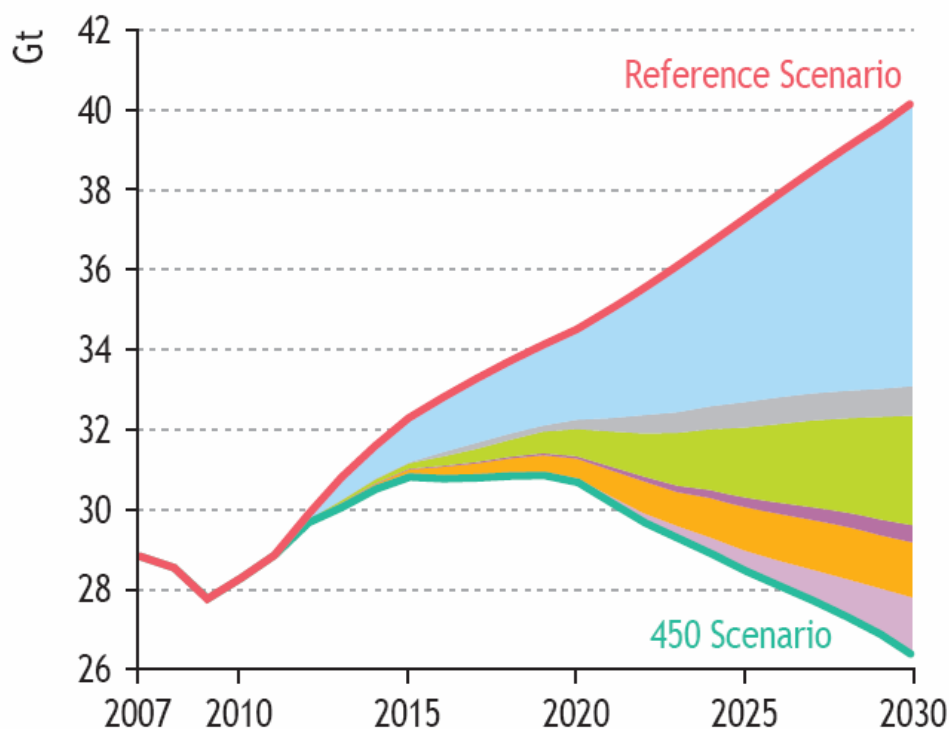
Source: World Energy Outlook 2009, OECD / IEA₉

Generation supply matters

but demand behavior matters most, first!

- Over 50% of CO₂ reduction will come from energy efficiency

World energy-related CO₂ emissions abatement



	Abatement (Mt CO ₂)		Investment (\$2008 billion)	
	2020	2030	2010- 2020	2021- 2030
Efficiency	2 517	7 880	1 999	5 586
End-use	2 284	7 145	1 933	5 551
Power plants	233	735	66	35
Renewables	680	2 741	527	2 260
Biofuels	57	429	27	378
Nuclear	493	1 380	125	491
CCS	102	1 410	56	646

Source: World Energy Outlook 2009, OECD / IEA₁₀

We have 10 years... to fix 4 critical problems

The quickest wins: 50% of CO₂ cut
must come from behaviour

Generation:
> 10 years to fix

Transmission:
> 10 years to fix

Buildings and Process:
1- 5 years to fix

Point of Use:
1-5 years to fix



Problems:

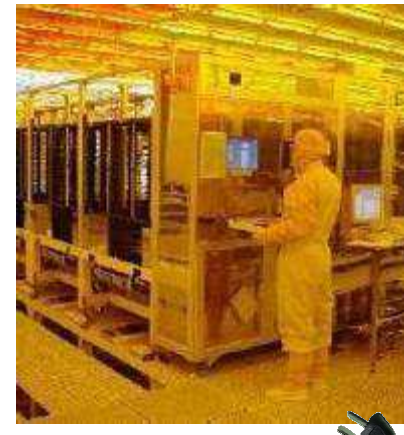
CO2 Emissions
Transmission Efficiency
Capacity Constraints



Stranded Capacity
Capacity Constraints



Stranded Capacity
Service Entrance Capacity



Efficiency
and Integration



Focusing on **point of use architecture** provides **fastest impact** and frees
upstream capacity through Power Plant to Plug Optimization

Behaviour and good system architecture

...can they really make a difference?

17,096 TWh*

Total annual electric power use on earth

41%

approximately goes to industrial & commercial buildings or about 6,960 TWh

20%**

estimation of the % of the 41% wasted due to inefficiency of the traditional building infrastructure, (compared to what is possible for the same cost.)

1,392 TWh

Potential savings now!



France electricity consumption
(536 TWh)

*CIA World Factbook 2008

**ACEEE Study, 2005

Unintegrated Components





Yes, a very big difference!

26 TWh *

The world's current Photo Voltaic power generation capacity continuous equivalent output

Efficient building design are therefore **53+ times greater**
(purely a behaviour and education issue)

Efficient data center design, the savings available in are
7 times greater... over 60x!

*World PV Industry Report Summary March 16, 2009

The energy equation: a system under tension and conflict

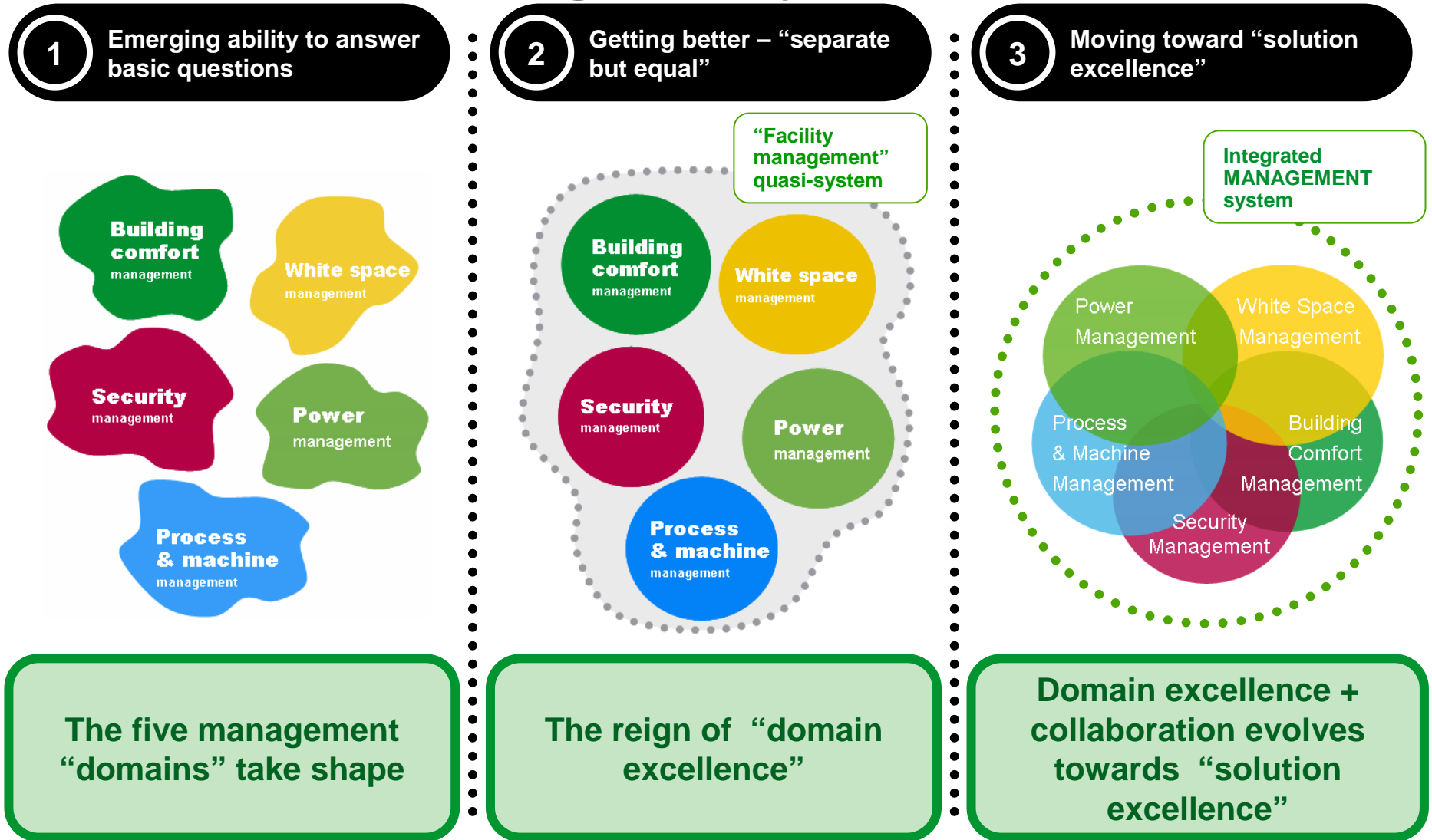
a drive to make energy



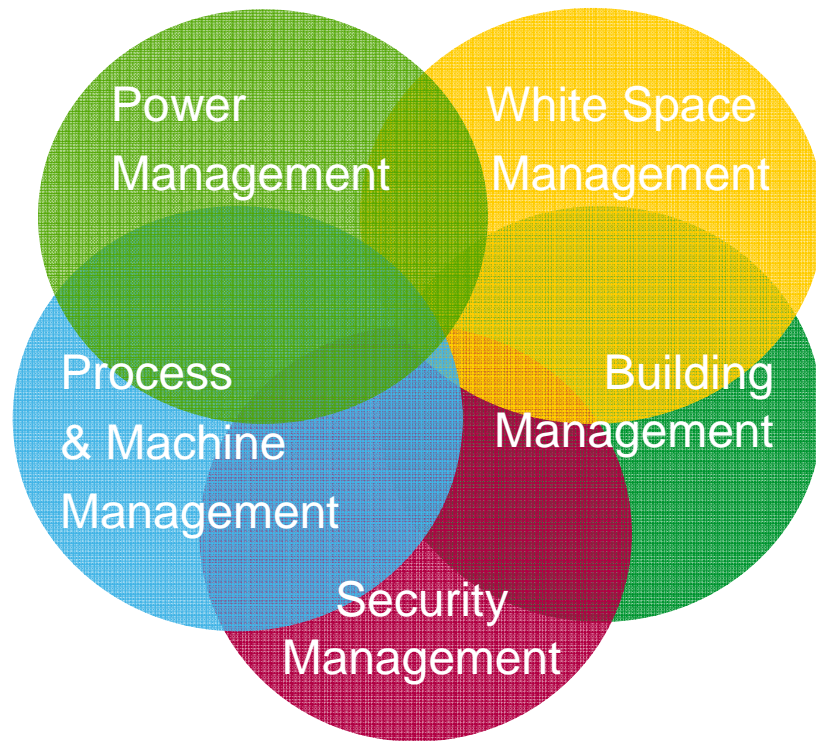
- > Environmental impact
> People safety
> Asset integrity
- > Energy availability
> Energy quality
> Offer quality
- > Energy efficiency
> Reduced Opex
> Reduced Capex
- > Deployment speed
> Ability to integrate
> Ability to scale
- > Carbon free
> Easy installation
> Easy connection

From primordial ooze to the modern age

The evolution of management systems for facilities



EcoStruxure[™].the right ecosystem to support the convergence of 5 key domains

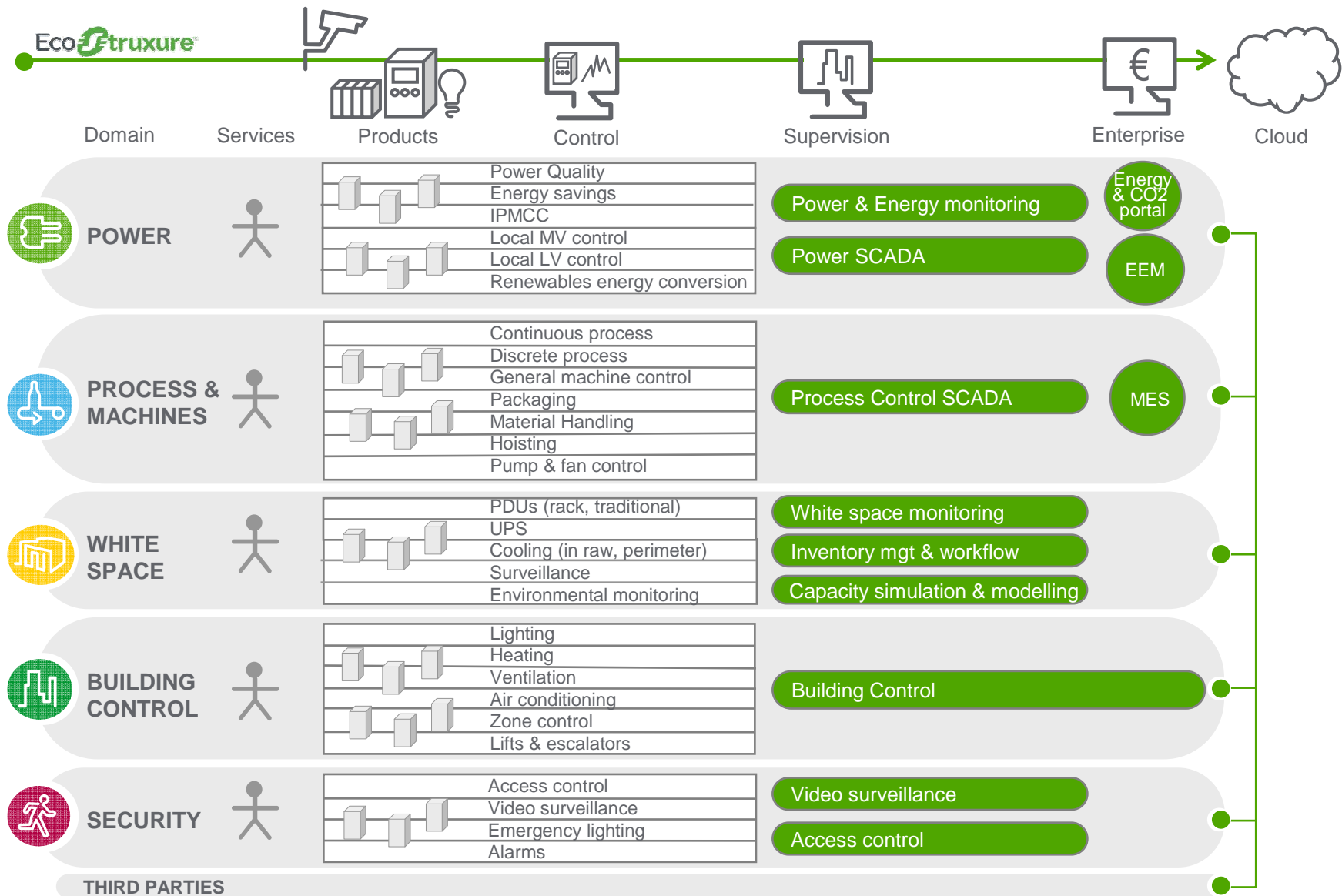


EcoStruxure[™] promise :

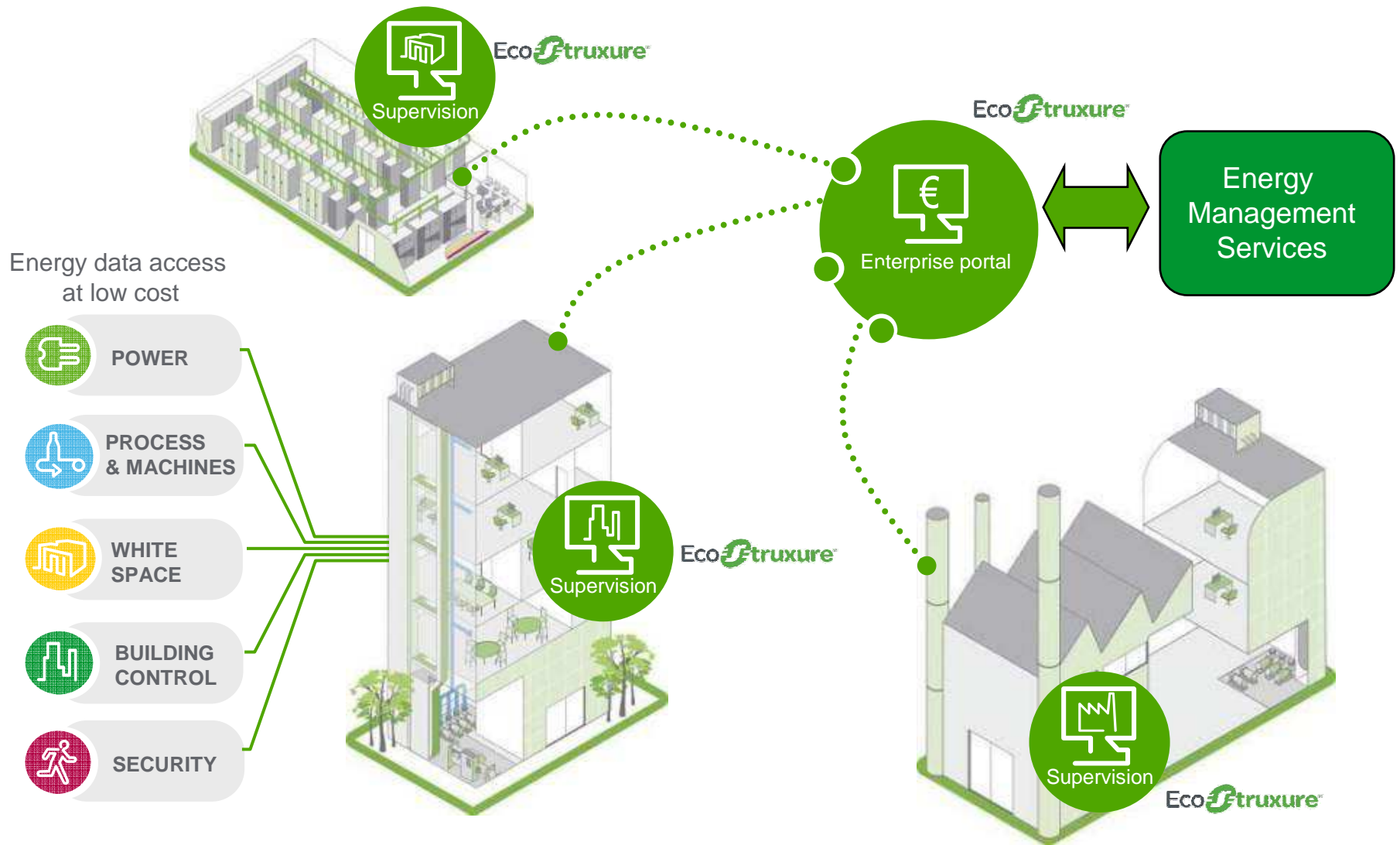
- Guaranteed compatibility / synergy / capability between the 5 domains of expertise
- Energy monitoring everywhere, with up to 30% EE
- Enabled by the right connecting technologies :
 - IP as a common highway
 - Web services as a common language (SOA architectures)

Making energy Safe, reliable, efficient, productive and green

A complete system approach



Solution offer overview



EcoStruxure™ What we plan to bring to the market



Generic Buildings
Hospitals



Data-centers

Seamless **inter-connection and integration** of Power, Build Control, Security & White space **mgt Systems**



Universal Energy monitoring **Module**

One Schneider-Electric **Customer portal**



MMM WWW O&G

Easy **integration of Security** (access/video) in **Process management**

Simple **integration** between **Power & Process**

Enhance **Non-Permanent Monitoring & Control Capabilities**

So let's take a look...

Water Treatment & Distribution





Active energy management architectures ...from Power Plant to Plug

	Possible Savings	Electricity Saved
Industry & Infrastructure	15%	678 TWh
Data Center & Network	30%	410 TWh
Building	20%	1,392 TWh
Residential	15%	552 TWh
		3,033 TWh <u>annually</u>

Source: US DOE-EIA (Energy Outlook 2007), Green Grid for Data Centers, CIA Worldbook
Industry Buildings are included in building and not in industry. SE estimations of possible savings based upon₂₃
best practice design and behaviour changes

Make the most of
your energy™

