



Powering Innovation:

**Impacts of Nanotechnology
on Energy & Energy
Technology**

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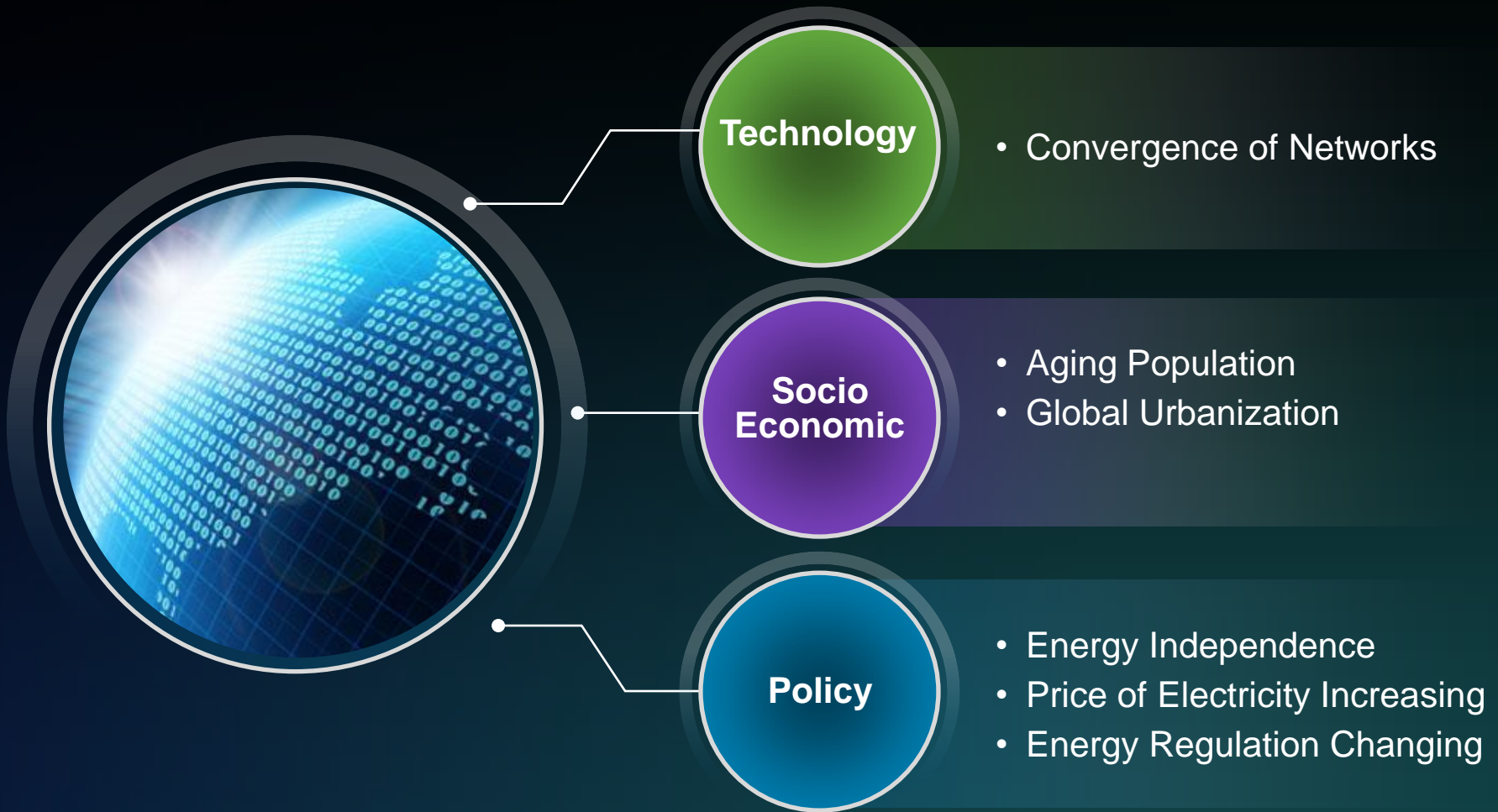


Ken Russell is a Director and Enterprise Strategist with Cisco's Advisory Group. Based out of Charlotte, Ken collaborates with Cisco's internal Smart Grid Business Unit, provides guiding experience to Cisco's largest customers and is a trusted advisor for senior executives and their staffs. He previously served as CIO for the David Murdock Research Institute as well as spent several years in the Office of the CIO as Director of IT Strategies & Consulting with Duke Energy.



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Global Megatrends Changing Energy



Internet of Things

Everything Becomes Connected

2015

There Will Be

25 BILLION

Devices Connected to the Network,

up from 12 BILLION in 2010



*Numbers are estimates based on current, known technology.
Source: Cisco IBSG*

“Transform energy production, distribution and consumption using an end-to-end Internet Protocol (IP) platform to meet the world’s future energy needs”



Cisco Connected Grid Vision

Power of Internet Protocol (IP)

- Today's grid has multiple siloed subsystems.
- Information flow will evolve from one way to "N-way"
- Observability will be vital to smart grid
- IP delivers multi-service capabilities & scalability
- IP-based communications are crucial for complex networks



Energy Technology Megatrends

Limited Sensing

TO

Deep Situational Awareness

Batch Processing

TO

Real Time Processing

Centralized

TO

Distributed

Limited Security

TO

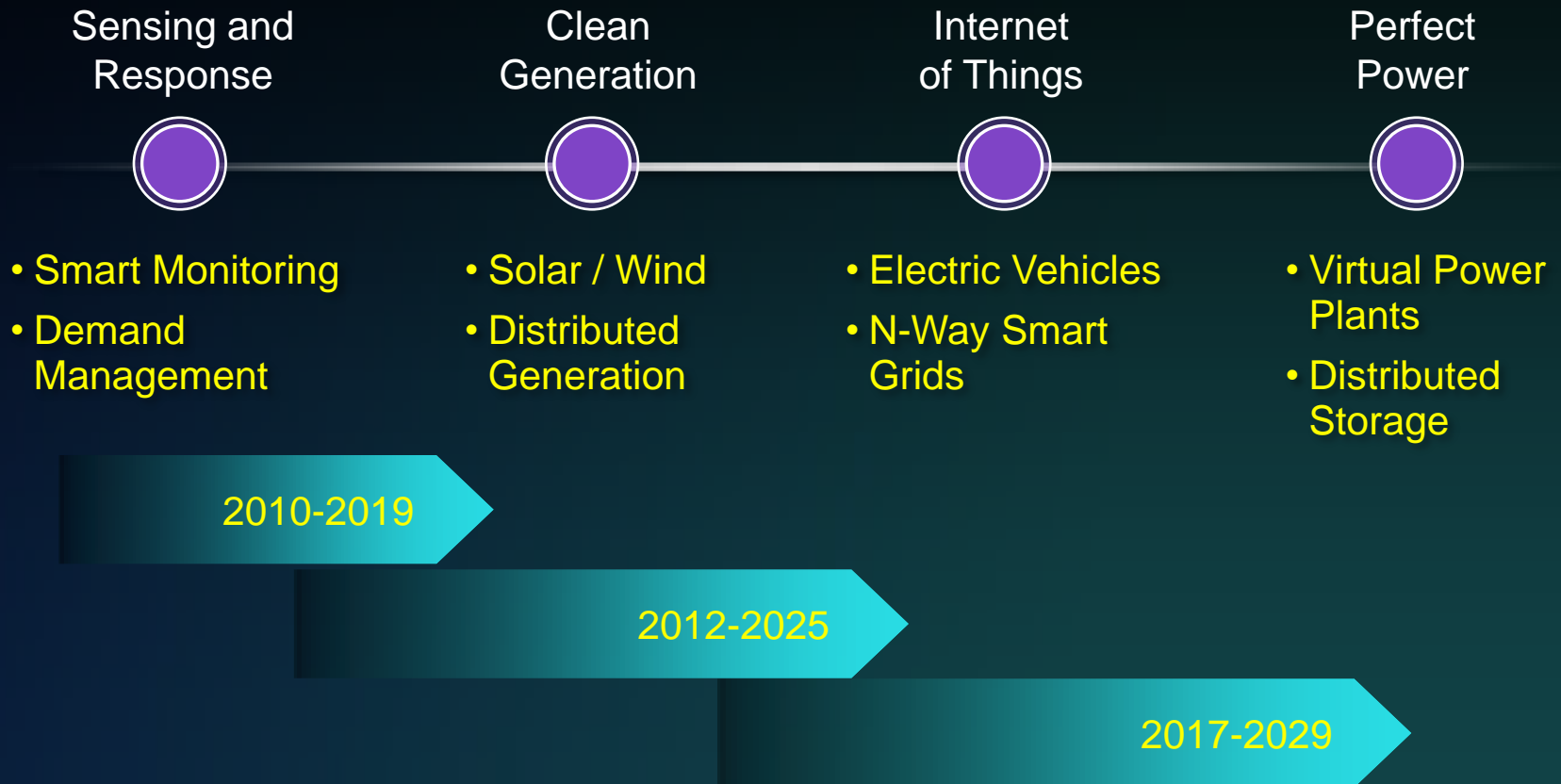
Pervasive Security

Proprietary

TO

Open Standards

A “Future History” of the Grid



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- Today's energy grid has multiple "siloes" subsystems:

How might we leverage emerging technologies to make the transition to a "smarter" grid easier and more reliable?

- University research will have a major impact on the future of electrical energy systems:

What are some of the key enablers for implementation of a truly sustainable and "smart" electricity grid and what are some examples of university research directed towards meeting this challenging goal?

- Nanotechnology is poised to help with the efficiency and costs of energy production, not just in this country but worldwide:

What are some of the "quick wins" (and possible paths to market) for increasing efficiency, decreasing consumption, and driving development in emerging areas?



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- Policy makers are tapping the potential for onsite generation for commercial and residential customers :

What are some of the opportunities (or threats) of greater independence from an increasingly diverse energy grid (including new and different types of generation, distribution and sensor technologies)?





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