Smart Grid City

Boulder Colorado

Contributing to ensuring energy security in a carbon constrained world.

Xcel Energy®

Energy Customers of the Future

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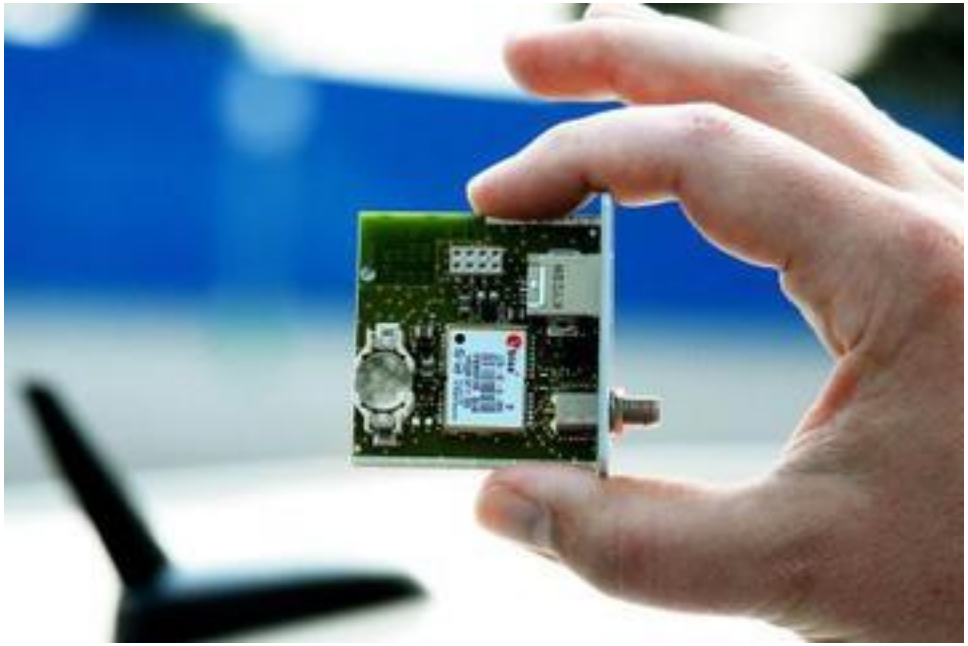
The Technology Today and Tomorrow



“He’s been dead for more than 75 years, but Thomas Edison—hailed as the father of the light bulb—probably could run the nation’s modern-day electric grid. It just hasn’t changed that much.”

Denver Business Journal
March 30, 2007

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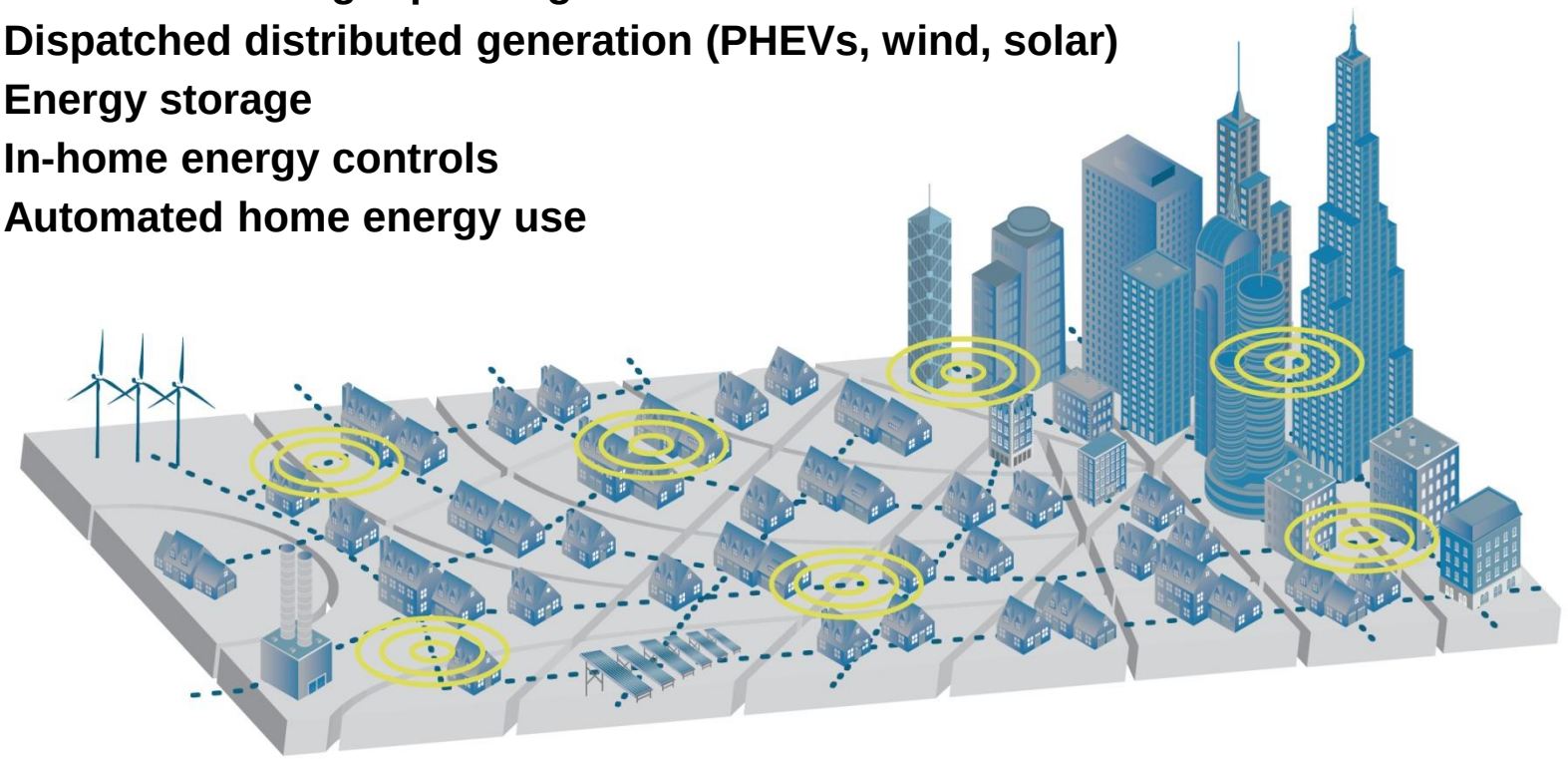
Smart Grid City

- Involves the entire energy pathway from the power source to the home and all points in between
- Rich in IT
- High-speed, real-time, two-way communications
- Sensors enabling rapid diagnosis and corrections
- Dispatched distributed generation (PHEVs, wind, solar)
- Energy storage
- In-home energy controls
- Automated home energy use



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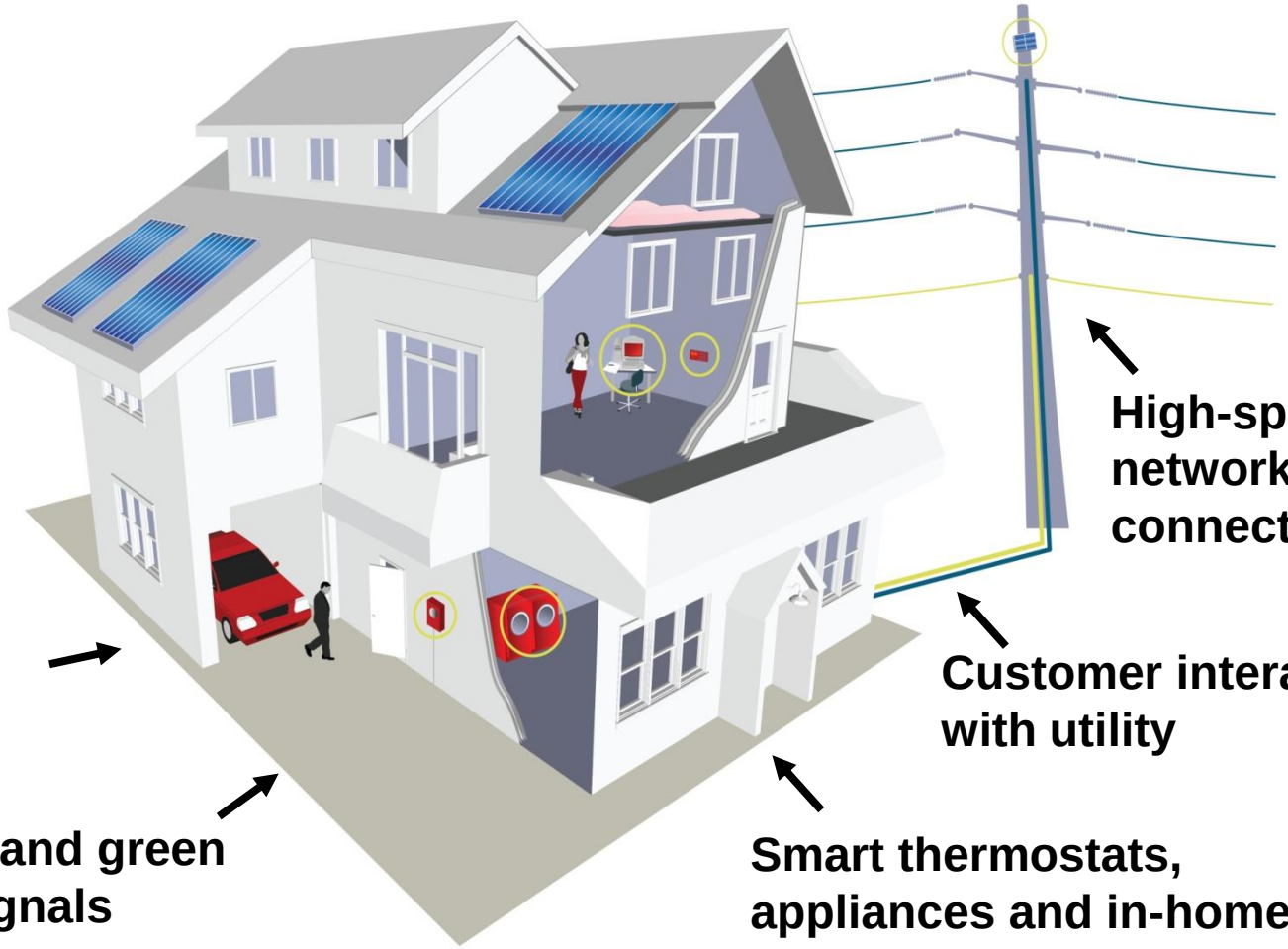

Smart House

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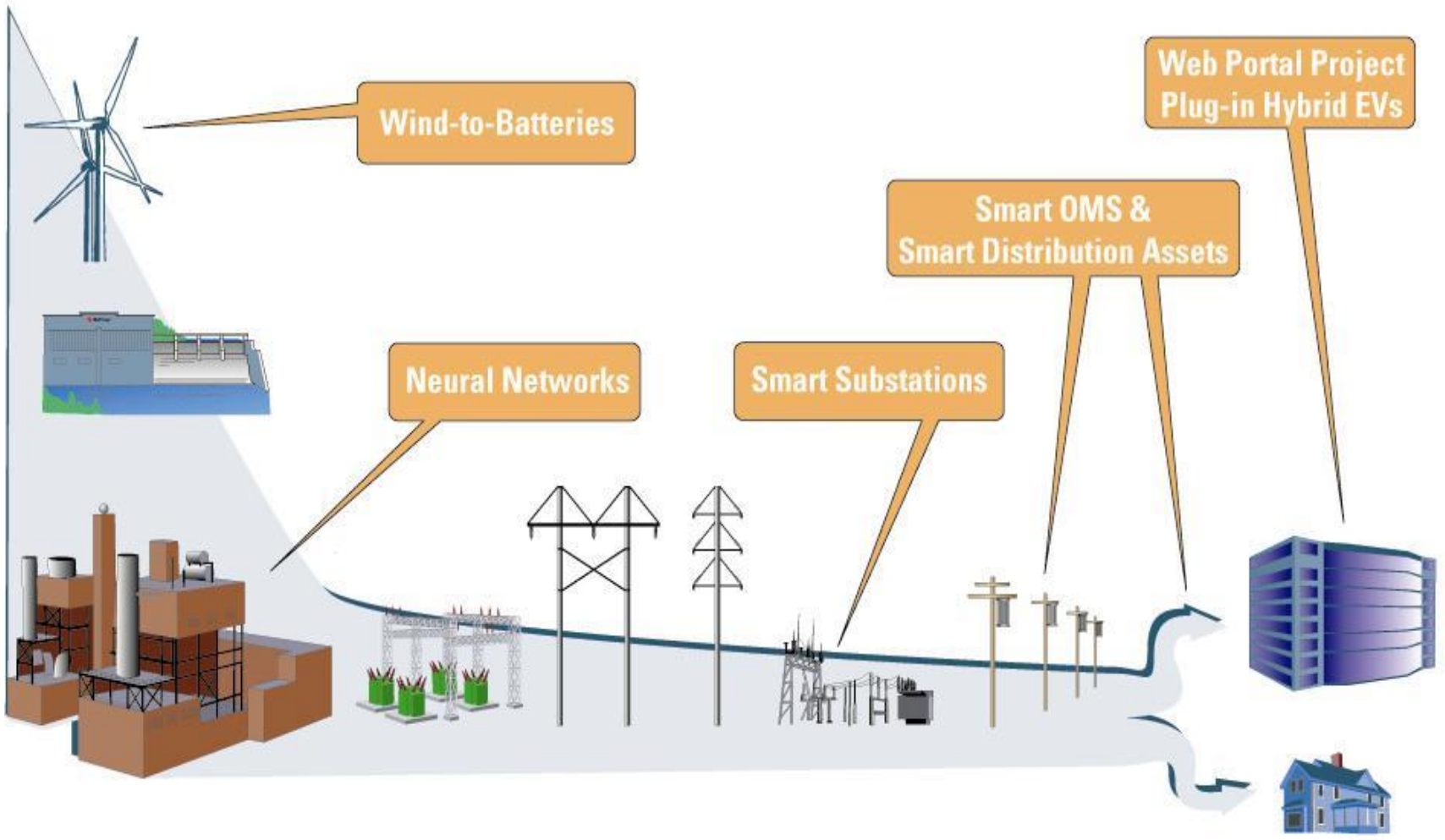
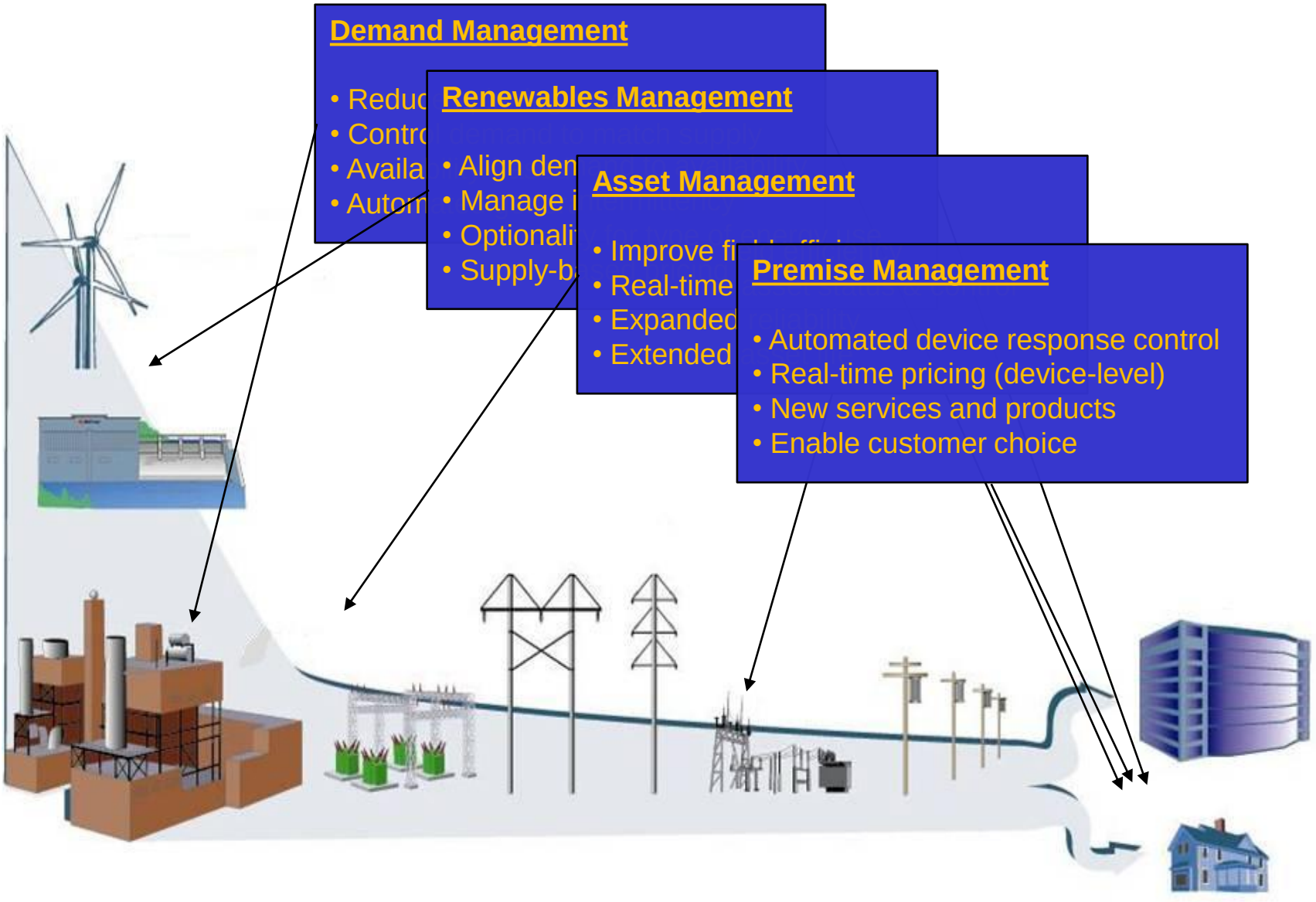
SmartGridCity™ – Key Concepts



SmartGridCity™ – Key Values



Transforming an Industry

- **Reverse the model by matching demand to available supply**
- **Utilize real-time information and connectivity rather than long-term models and averages to manage the grid**
- **Maximize renewable and distributed generation with automated dispatch control**
- **Create capability to *know* where our power is and where it's needed**

Change will be Difficult

- Operating paradigm and approach
- Employee skills and methods
- Customer interaction
- Regulation, pricing and incentives

Observations

- **The business model is changing: throughput versus a service**
- **The regulatory paradigm will need to change**
- **Carbon regulation creates opportunity and danger**
- **Environmental pressures will increase and energy prices will rise**

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