



Lessons Learned from Developing Smart Grid Roadmaps

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Smart Grid Roadmap Projects

- Tennessee Valley Authority
 - Transmission
 - Distribution
- Southern Company
- First Energy
- Long Island Power Authority
- California Independent System Operator
- Duke Energy
- Salt River Project
- American Electric Power



- California – in partnership with PG&E, SCE and SDG&E

Developing a Roadmap is Always a Bigger Effort Than You Think it Will Be

- Consultants are costly...
- ...but nowhere near as costly as the internal resources needed
- Key internal people from across the organization must be involved in developing the roadmap



There is as Much Value From the “Journey” as in the End Product

- Tremendous value from the shared experience of defining the future vision and developing use cases
- Participants have a hand in developing the roadmap



A Successful Roadmap Must be Driven From the Top

- Need a senior executive sponsor
 - To make resources available
 - To provide credibility to the activity
- Roadmap is both top-down and bottoms-up

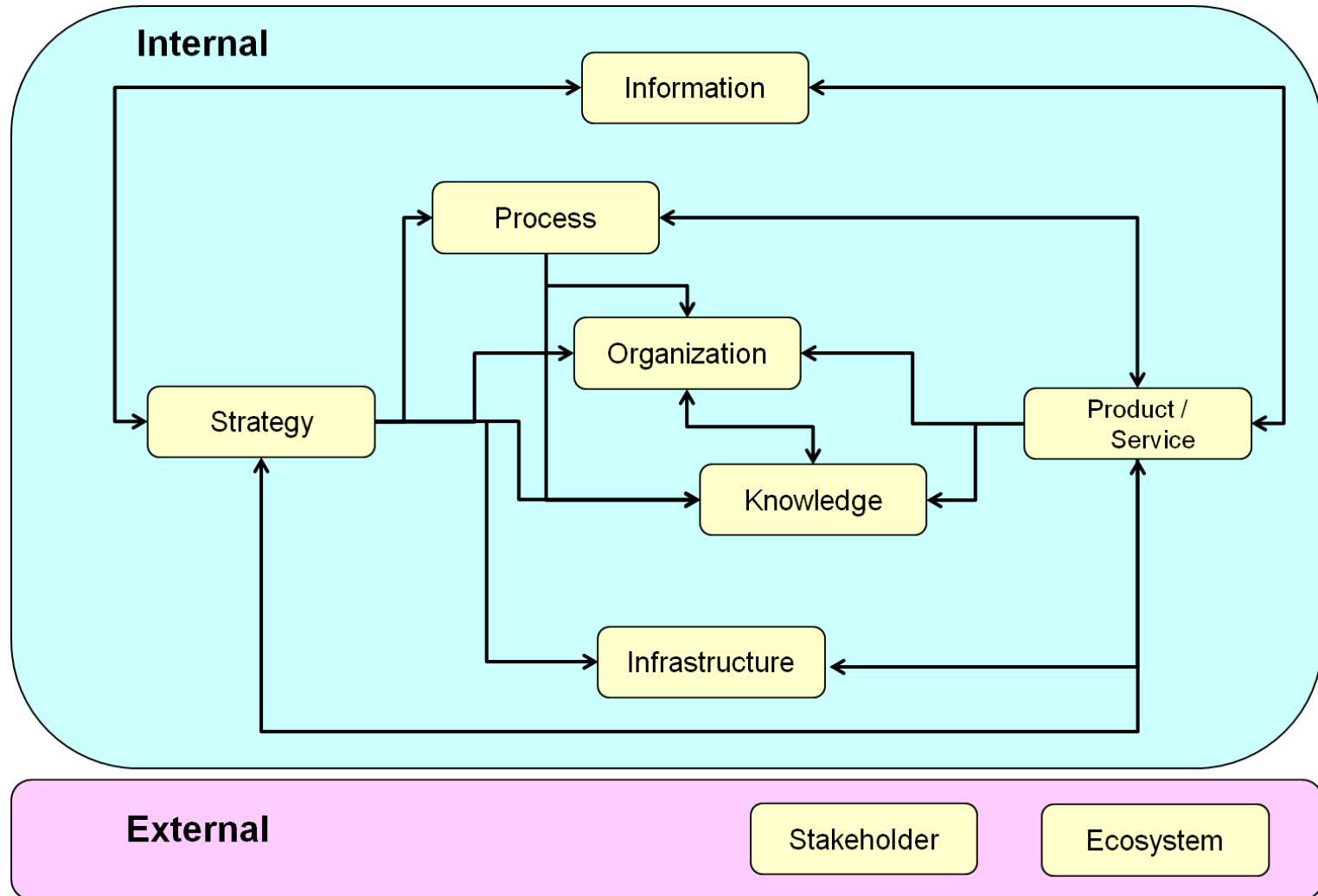


A Successful Roadmap Must Take a Holistic View

- Need to look across the entire enterprise
- Need to understand how a change in one part of the organization can impact another part of the organization
- Need to understand activities underway in different parts of the organization
- Need to break out of “silo” thinking



Enterprise Architecture “View” Elements



A Successful Roadmap Put the Stakeholders at the Center

- Need to identify who are the stakeholders – both within the company and outside of the company
- Need to define what the stakeholders value



Need a Future State Vision That Stakeholders Can Understand and Embrace

- Smart Grid means different things to different people
- Keep it simple
- Graphics are tremendously helpful



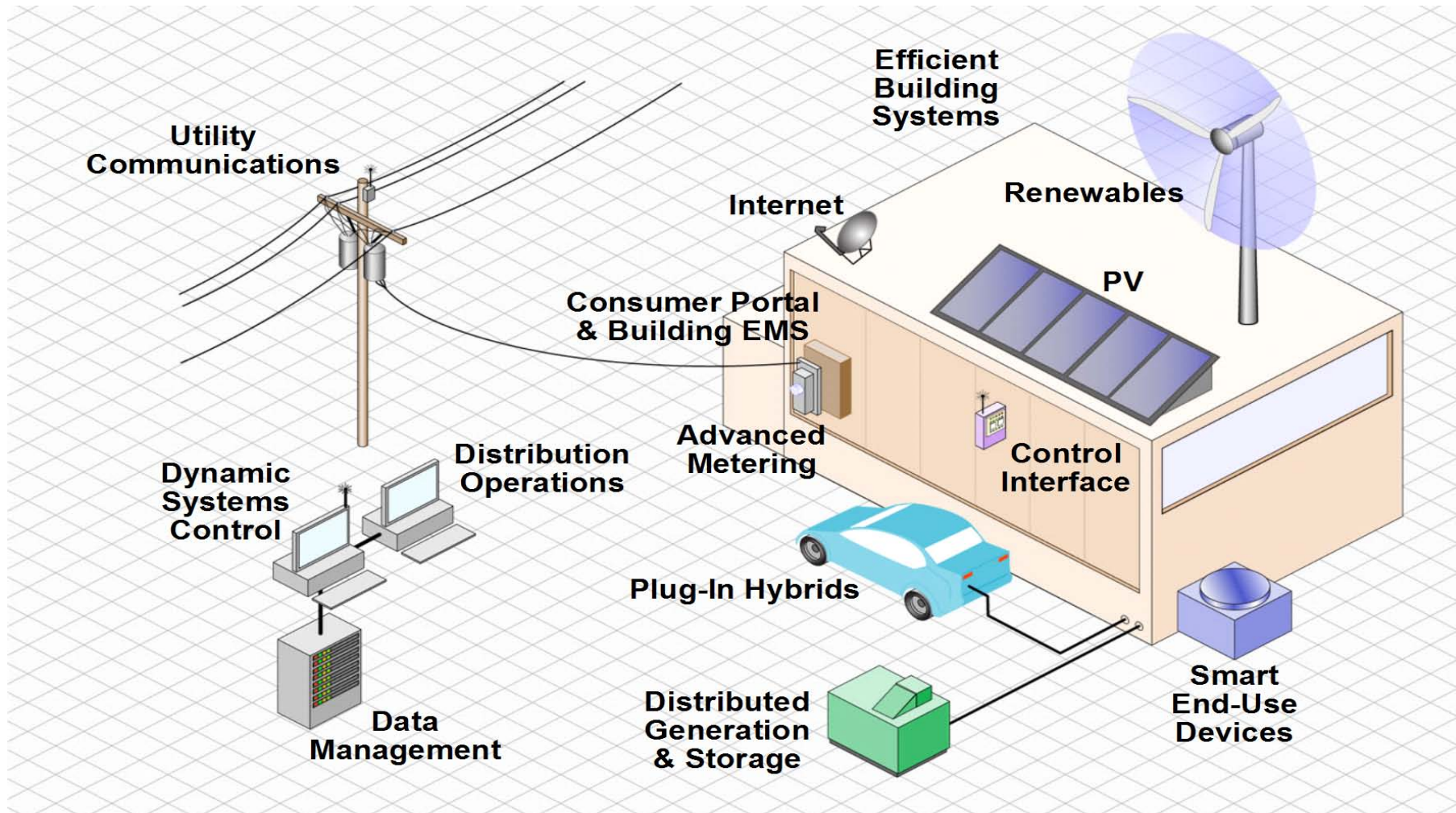
California 2020 Vision Summary

“The smart grid will link electricity with communications and computer control to create a highly automated, responsive, and resilient power delivery system that will both optimize service and empower customers to make informed energy decisions.”

The smart grid will:

- Empower consumers and open markets
- Facilitate the wide-spread presence of intermittent renewable generation
- Optimize grid reliability, resilience, security and efficiency in the face of increasing complexity to mitigate issues such as plug-in electric vehicles, intermittent renewable generation, and human caused and natural disasters

Future Smart Grid Vision



Always Be Thinking About the Value Proposition

- At every level of Roadmap development



Cal ISO Roadmap

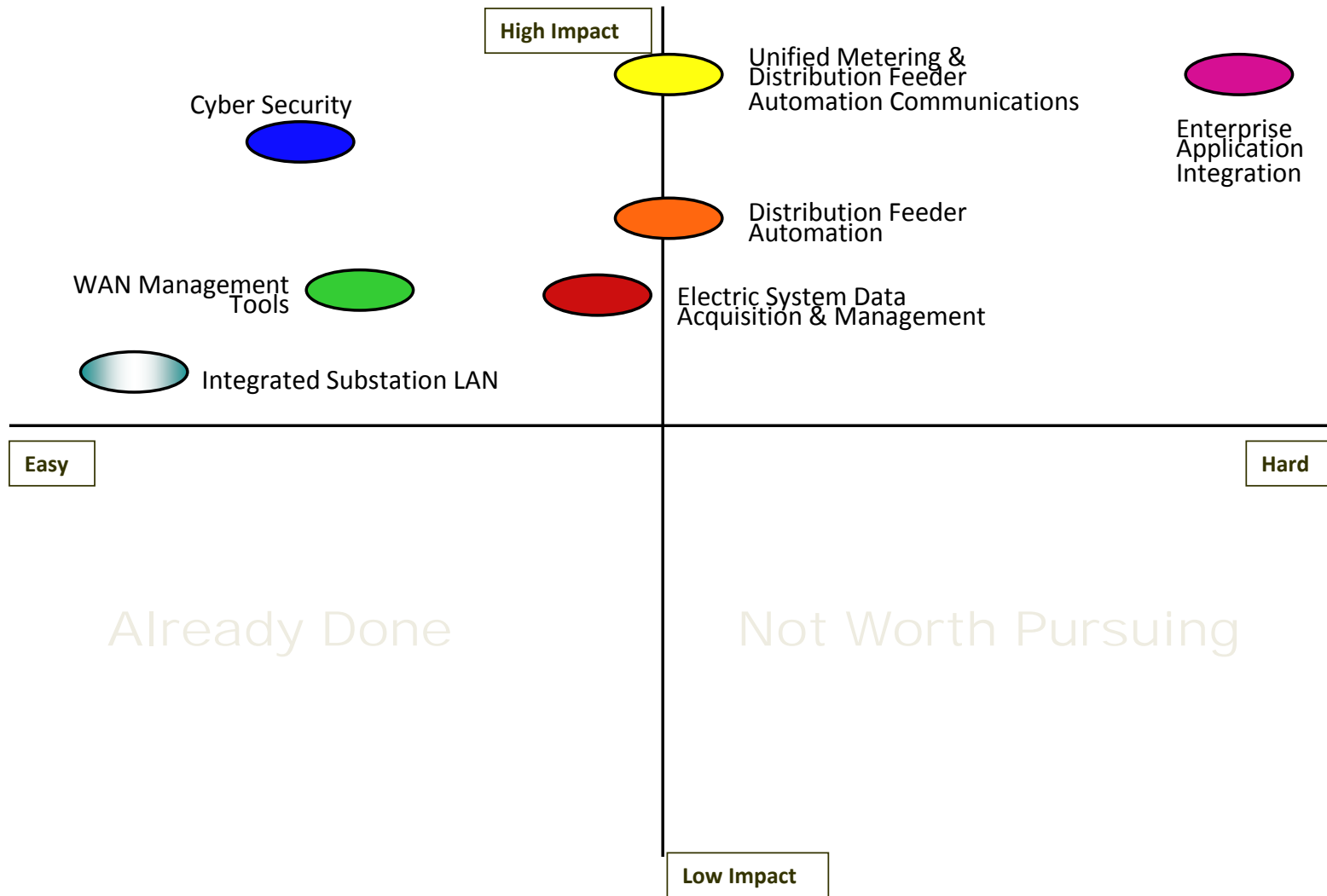
The ISO will research, pilot, implement smart grid technologies that:

- Increase grid visibility, efficiency, and reliability
- Enable diverse generation including utility-scale renewable resources, demand response, storage and smaller-scale solar PV technologies to fully participate in the wholesale market
- Provide enhanced physical and cyber security.

The expected benefits from smart grid technology deployments include:

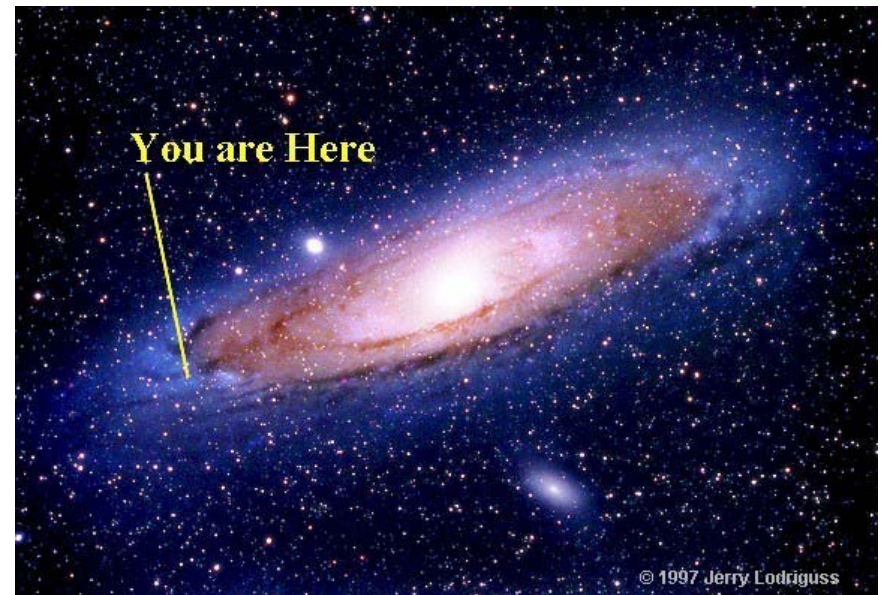
- Ability to recognize grid problems sooner and resolve them
- Efficiently use the transmission system to defer or displace costly transmission investments
- Enable consumers to react to grid conditions making them active participants in their energy use
- Leverage conventional generation and emerging technologies when possible including distributed energy resources, demand response and energy storage, to address the challenges introduced by variable renewable resources.

Value Proposition - Analysis



Tremendous Important to Define the Current State

- Much more difficult to develop than most people think
- Need to have key technical people engaged
- As you think about the future state, you will constantly be referring back to the current state



Don't Get Lost in Technology

- Easy to do
- There is a tremendous amount of technology involved in the Smart Grid
- Sometimes you need to pry the smart meters out of people's hands
- "Trust me. We'll get to technology."



Don't Get Lost in Systems Integration

- System Integration is a HUGE part of implementation
- A Smart Grid is a highly integrated “system of systems”
- Common trap is to get caught up in SI issues
- “Trust me. We’ll get to systems integration.”



Importance of Enterprise Policies

- Organization-wide security policy
- Organization-wide privacy policy
- Organization-wide integration policy
- Establishing these policies is typically the first items on the roadmap



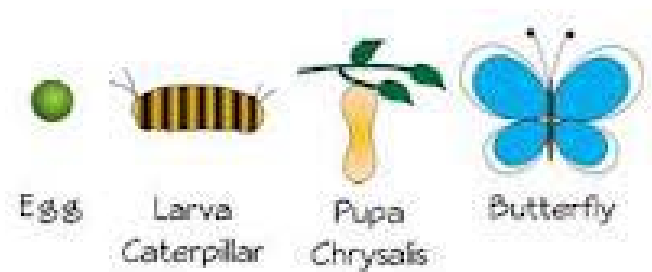
Communications Technology is a BIG Part of the Smart Grid

- Typically an early item on the roadmap
- Need to develop requirements
- Need to evaluate current and emerging technologies



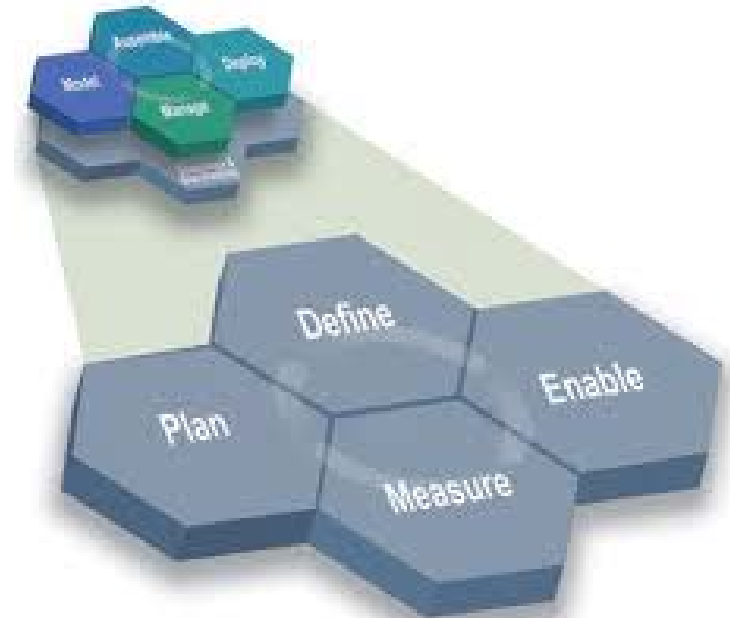
Don't Just Add – Think Replacement and Transition

- Easy to focus on the new IT systems, communications systems, IEDs, etc.
- Large existing infrastructure in place
- Need to develop transitioning and management strategies



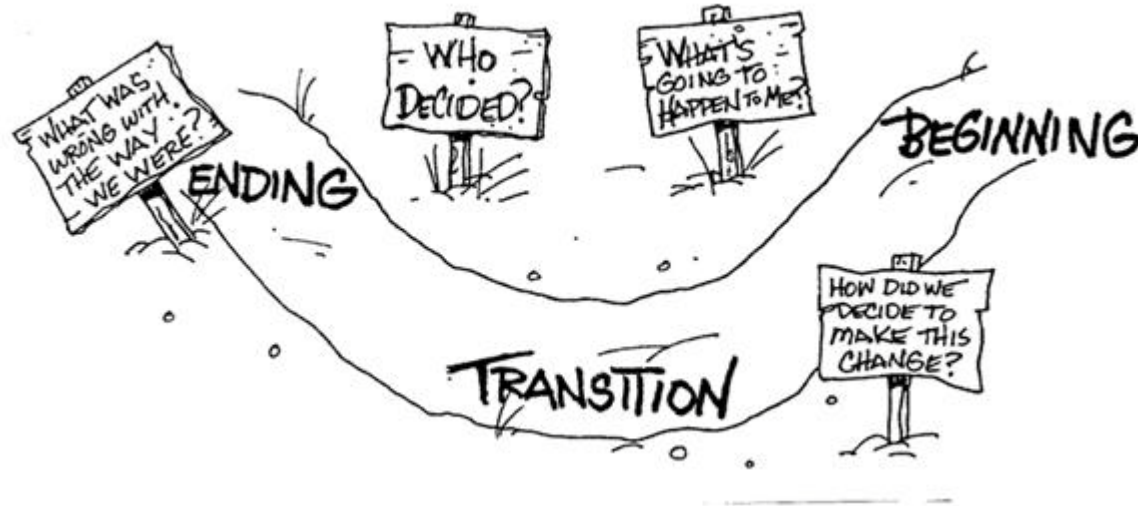
A Successful Roadmap Has a Strong, Well-Defined Governance Structure

- Cross-departmental executive steering committee
- Cross-departmental implementation teams
- Well-defined roles and responsibilities
- Metrics to define success
- Process for updating the roadmap



Training and Change Management are Important

- It will be the people that will make or break the success of the roadmap and its implementation



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3. A Successful Roadmap Must be Driven From the Top
4. A Successful Roadmap Must Take a Holistic View
5. A Successful Roadmap Put the Stakeholders at the Center
6. Need a Future State Vision That Stakeholders Can Understand and Embrace
7. Always Be Thinking About the Value Proposition
8. Tremendous Important to Define the Current State
9. Don't Get Lost in Technology
10. Don't Get Lost in Systems Integration
11. Importance of Enterprise Policies
12. Communications Technology is a BIG Part of the Smart Grid
13. Don't Just Add – Think Replacement and Transition
14. A Successful Roadmap Has a Strong, Well-Defined Governance Structure
15. Training and Change Management are Important