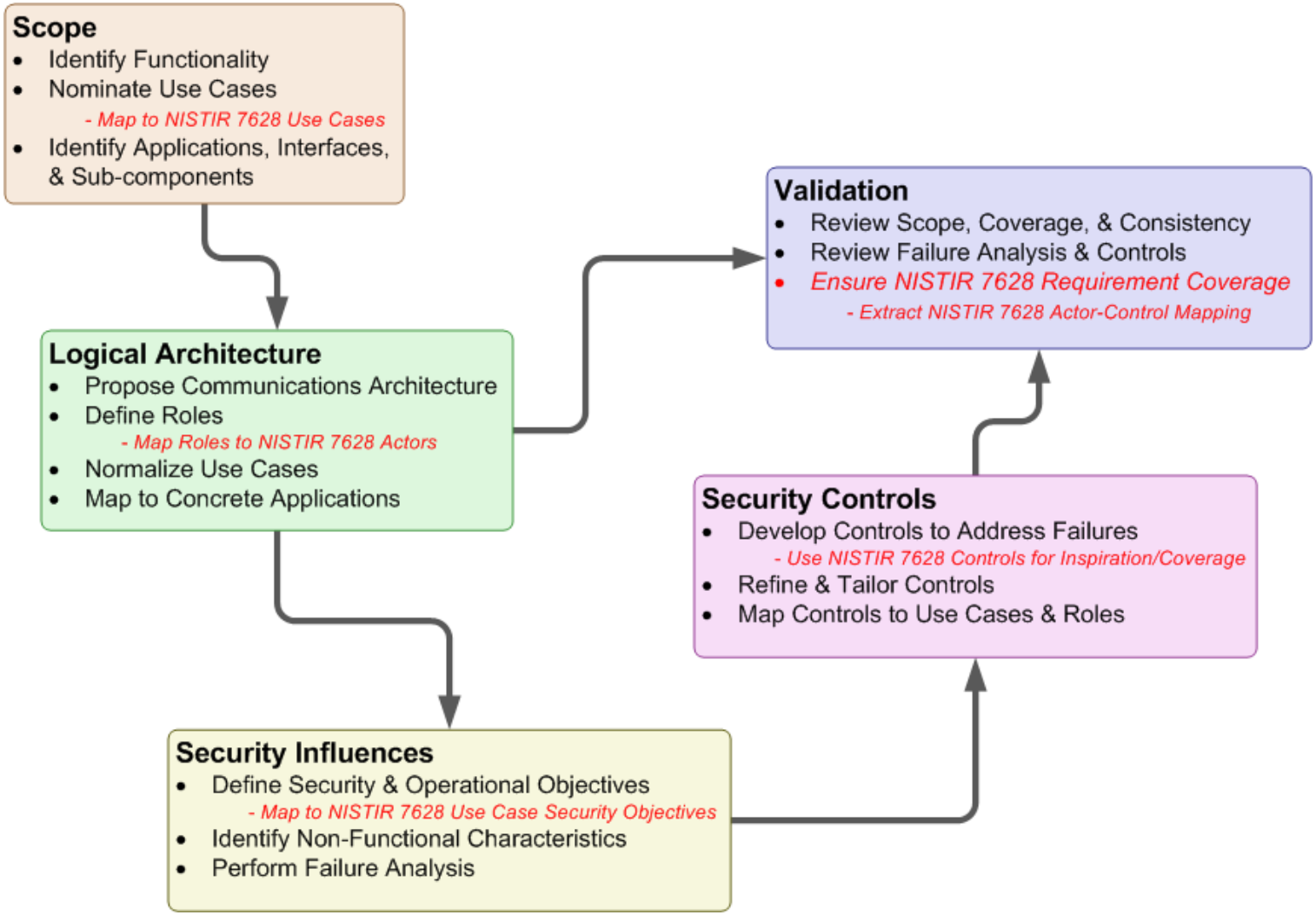
Use Case to Control Process



Basic Steps

1. Scope
   a) Nominate functionality (i.e., use case titles)
   b) Delineate real-world application/component coverage

Black Box

2. Logical Architecture
   a) Nominate logical architecture
   b) Define roles by functionality
   c) Refine use cases & logical architecture

White Box

3. Security Constraints
   a) Define security & operational objectives
   b) Perform failure analysis

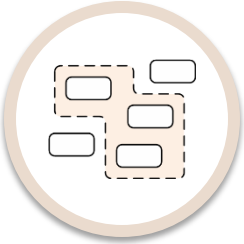
Justification

4. Security Controls
   a) Define controls (including recommended network segmentation)
   b) Map and tailor controls to roles
5. Validation

Reqmts

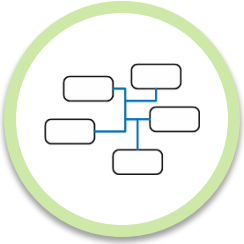
Process Notes: Scope

- Why is this important?
  - First point of entry for new audiences
  - Will likely dictate whether the document gets broad review and engagement
- What does it do?
  - End users must be able to figure out if this document applies to them or not
  - Need an easy and clear “yes” or “no” answer
  - Should not have to understand the rest of the document
- What is the approach?
  - Define functionality covered in real-world terms
  - Provide examples using real-world terminology



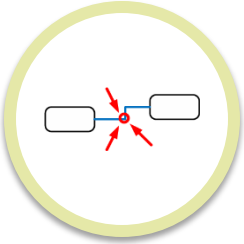
Process Notes: Logical Architecture

- Why is this important?
  - Lack of coverage for functionality is the root of security vulnerabilities
  - Lack of coverage is rarely intentional
    - Ambiguity in terminology
    - Changes in functionality over time
- What does it do?
  - Provides abstract (vendor-neutral) representation of the system to bind controls
  - Removes ambiguity about functionality covered
- What is the approach?
  - Define roles in terms of functionality
  - Describe relationships between the roles
  - Define the functionality in terms of use cases
    - Use a normalized format that facilitates verification of coverage

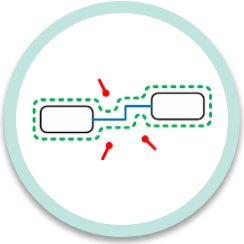


Process Notes: Security Constraints

- Why is this important?
  - Security ultimately has a cost
  - How do we know we are investing in the right place?
- What does it do?
  - Provides justification for selection of controls
  - Provides traceability for ***when*** (not if) system functionality changes
  - Provides a means to quantifiably claim coverage
- What is the approach?
  - Define objectives for system operation
    - What the system should do
    - What the system should **NOT** do
  - Define failures the system should prevent
    - Bind to functionality (avoidance is one means of mitigating risk)
    - Look at both common and functionality-specific failures

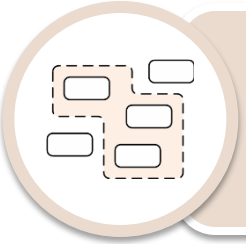


Process Notes: Security Controls



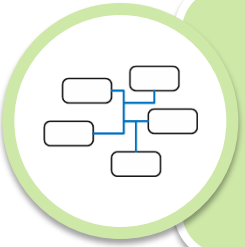
- Why is this important?
  - Actions and requirements must be precisely defined
- What does it do?
  - Provides actionable guidance for the end user
  - Establishes a context to link high-level objectives to low-level security mechanisms
- What is the approach?
  - Generate controls
    - Brainstorm controls from failures
    - Normalize controls into approachable and useful organization for the end user
  - Map to logical architecture
    - System (i.e., network segmentation)
    - Roles
  - Adapt controls to specific context for each role
    - (e.g., consider resource constraints, access requirements, maintenance…)

Document Essentials



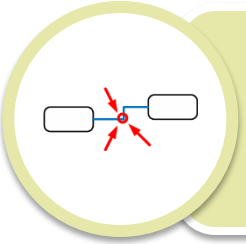
Scope

- Functionality Covered
- Applications, Interfaces, & Sub-Components
- Explicit Examples



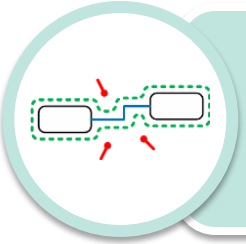
Logical Architecture

- Communications Architecture
- Roles
- Use Cases
- Mapping to Concrete Applications



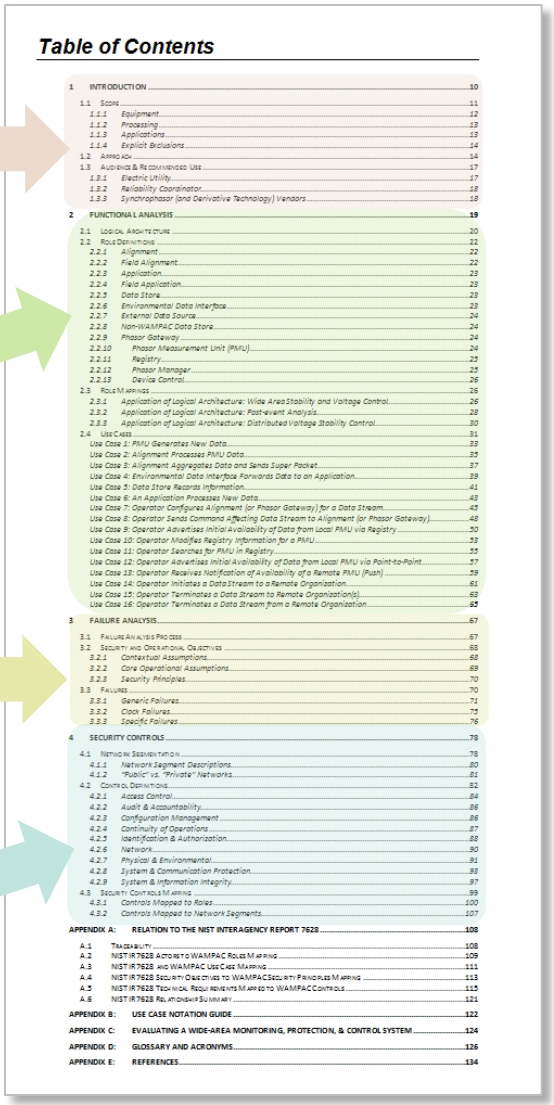
Security Considerations

- Contextual & Operational Assumptions
- Security Principles
- Failure Analysis



Security Controls

- Network Segmentation
- Control Definitions
- Mapping of Controls to Roles & Segments



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For Each Use Case You Need To Think About

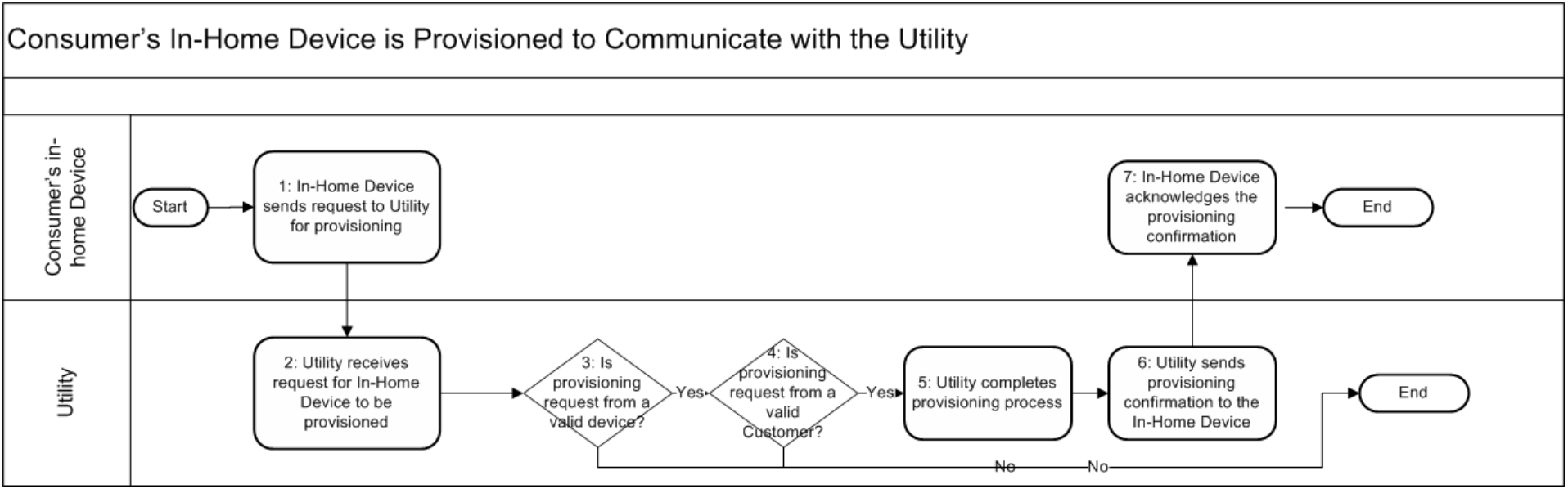
- Preconditions
- Minimal Guarantees
- Success Guarantees
- Trigger

Use case 1 - Customer’s In Home Device is Provisioned to Communicate With the Utility

Use case 1 - Summary

- Scenario: Customer’s In Home Device is Provisioned to Communicate With the Utility
- Description: This scenario describes the process to configure a customer’s device to receive and send data to utility systems. The device could be an information display, communicating thermostat, load control device, or smart appliance.

Use case 1 – Business Flow



Use Case 1 – SG Characteristics

- Characteristics
  - Enables active participation by consumers
  - Accommodates all generation and storage options
  - Enables new products, services and markets
- Potential Stakeholder issues
  - Customer device standards
  - Customer data privacy and security

Use Case 1 – SG CyberSecurity Objectives

- To protect passwords
- To protect key material
- To authenticate with other devices on the AMI system

Use case 1 – Potential Transactions

- Registration of the customer device
- Authentication of the customer device
- Receiving information from the utility
- Sending information to the utility
- Receiving a command from the utility
- Recording information on the device

Use case 1 – Potential Information

- Customer ID
- Customer authentication
- Device location information
- Device ID
- Device type
- Device configuration
- Device authentication information
- Logging information
- Time of day

Use case 1 – Potential Failures With (1)

- Send Data
  - Sends to wrong place
  - Sends wrong data
  - Sends corrupted data
  - Spurious send
  - Not authorized to send
  - Sends data late (not timely)
- Receive data
  - Not from authorized sender/from wrong sender
  - Receives wrong data
  - Receives corrupted data
  - Spurious receive
  - Does not receive timely data
  - Data is inappropriately rejected

Use case 1 – Potential Failures With (2)

- Store data
  - Allows unauthorized access and manipulation
  - Storage corrupted
  - Storage exhaustion
- Process data
  - Does not execute in a timely fashion (resource starvation)
  - Mis-configured
  - Subverted to execute wrong code

Use case 1 – Potential Failures With (3)

- Potential specific failures
  - Communication interruption – verbal, email and other non-energy use information
  - Does not act on a authenticated command
  - Acts on a authenticated command against local policy
  - Stolen credentials used to authorize command
  - Processes unrecognized command
  - Processes unauthenticated command
  - Fails to execute action based on changes to its operational parameters, its data, or its internal state
  - Processes an incorrectly formatted message
  - Does not respond to a message in a timely fashion
  - Fails to execute action in a timely fashion after receiving a legitimate message

Use case 1 – Potential Failures With (4)

- Potential specific failures
  - Need to have graceful failure (fail safely)
  - Default failure configuration (e.g. DR)
  - Fails to protect information or resources against authorized access
  - Fails to accept authorized and valid message
  - Fails to execute action based on changes to its operational parameters, its data, or its internal state
  - Executes wrong action based on changes to its operational parameters, its data, or its internal state
  - Accepts corrupted configuration file
  - Hardware, facilities or both fail and prevent proper operation
  - Failure to provide adequate protection against reasonable expectations for harm due to natural phenomenon, such as earthquakes, hurricanes, tornadoes, and electromagnetic interference
  - Failure to provide recovery mechanisms essential for the restoration of a failed or compromised system

Use case 1 – Potential Controls for Each Failure

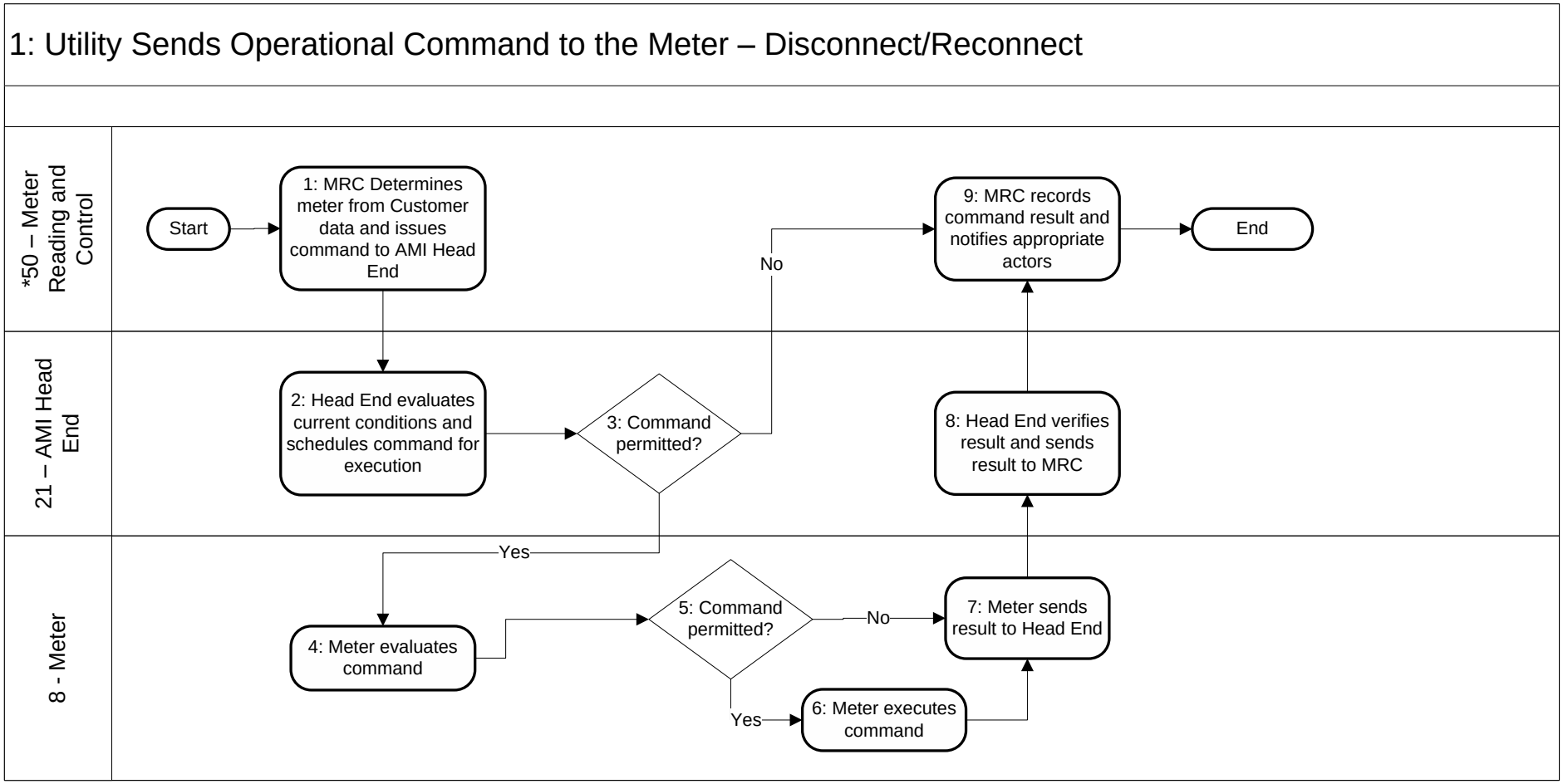
- Define at least one control for each failure
- Create a mapping back and forth to ensure every failure has a control and for every control we can indentify at least one failure

Use case 2 - Remote Connect/Disconnect of Meter

Use case 2 - Summary

- Scenario: Remote Connect/Disconnect of Meter
- Description: Traditionally, utilities send a metering service person to connect or disconnect the meter. With an AMI system, the connect/disconnect can be performed remotely by switching the remote connect/disconnect (RCD) switch for the following reasons:
  - Remote Connect for Move-In
  - Remote Connect for Reinstatement on Payment
  - Remote Disconnect for Move-Out
  - Remote Disconnect for Nonpayment
  - Remote Disconnect for Emergency Load Control
  - Unsolicited Connect / Disconnect Event

Use case 2 – Business Flow



Use Case 2 – SG Characteristics

- Characteristics
  - Optimizes asset utilization and operate efficiently
  - Operates resiliently against attack and natural disasters
- Potential Stakeholder issues
  - Customer data privacy and security
  - Retail Electric Supplier access
  - Customer data access
  - Customer Safety

Use Case 2 – SG CyberSecurity Objectives

- Integrity of control commands to the RCD switch is critical to avoid unwarranted disconnections or dangerous/unsafe connections. The impact of invalid switching could be very large if many meters are involved
- Availability to turn meter back on when needed is important
- Confidentiality requirements of the RCD command is generally not very important, except related to non-payment

Use case 2 – Potential Transactions

- Valid registration of device/meter
- Authentication of the device/meter
- Receiving information from the utility
- Sending information/confirmation to the utility
- Receiving a command from the utility
- Recording information on the device

Use case 2 – Potential Information

- Customer ID
- Customer authentication
- Device location information
- Device/Meter ID
- Device/Meter type
- Device/Meter configuration
- Device/Meter authentication information
- Logging information
- Time of day
- Command information from device/meter and utility
- Response to the command from device/meter and utility

Use case 2 – Potential Failures With

- Sending information
  - Authorization
  - Authentication
  - Disclosure
  - Availability
  - Logging / Auditing
  - Communication links – down, delay, etc
- Receiving information
- Information storage
- Communication method
- The information itself

Use case 2 – Potential Controls for Each Failure

- Define at least one control for each failure
- Create a mapping back and forth to ensure every failure has a control and for every control we can indentify at least one failure