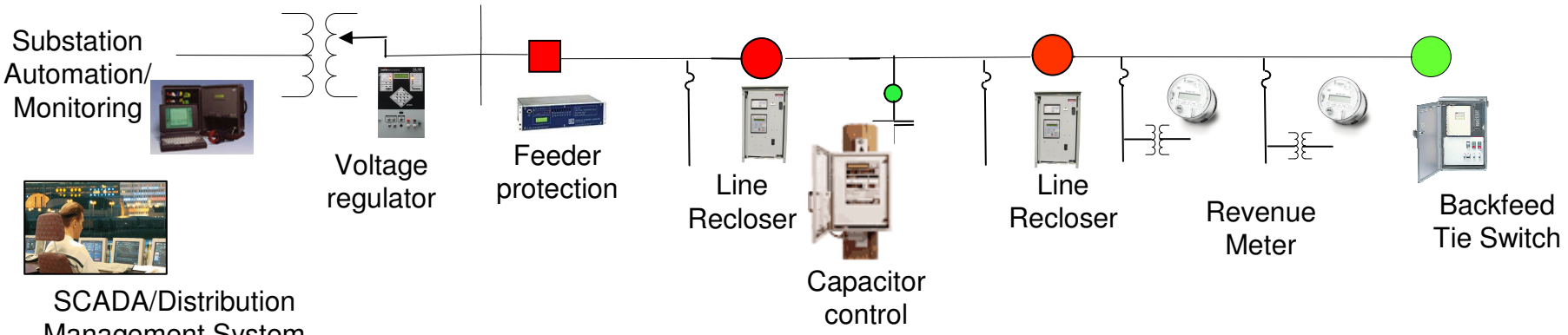
David Lubkeman

EPRI Advanced Distribution Workshop – Vendor Perspective

Current Situation for Distribution Automation

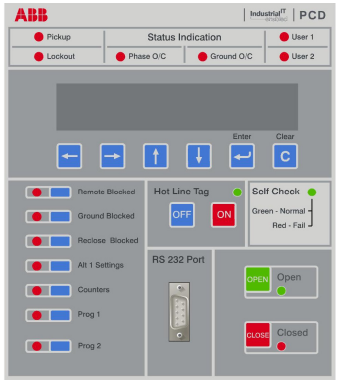
- Automation at feeder level often based on localized protection/control applications running on the device without need for communications to other devices.
- Communications often limited to SCADA interface only (trip status, basic measurements, switch commands, control set-points).
- Centralized switch control normally manually supervised, not automated.
- Operation of circuit often not optimal with respect to losses and voltage control.
- Often difficult to make business case.



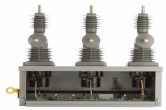
Intelligent Electronic Device (IED)

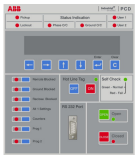
SCADA Interface → Alarms, Measurements

SCADA Interface → Control, Settings

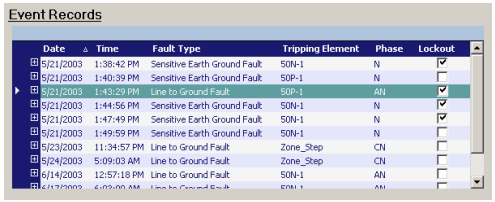


Device Logic
Input/Output

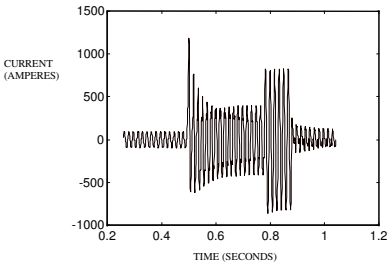




Event Records



Waveform Capture

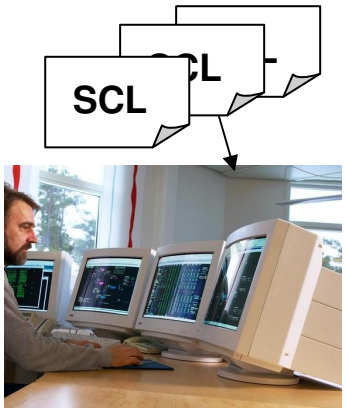


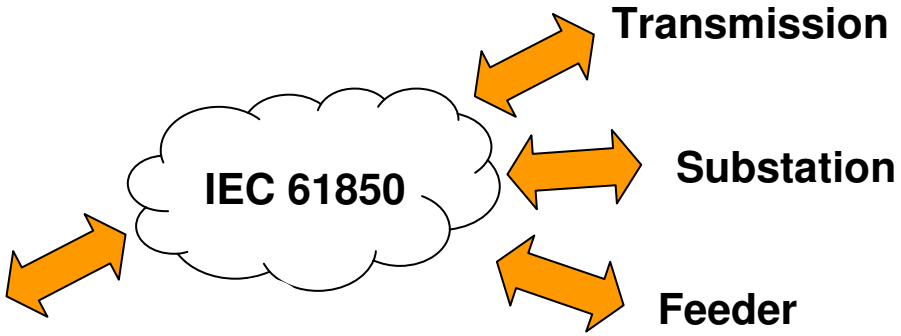
IED Characteristics:

- Contains one or more microprocessors
- Has at least one communications port, usually 2 or 3
- Has a defined data structure
- Transmits requested data in response to a query
- Accepts and executes commands
- May have a user interface (display and selection keys)

IEC 61850 – Not just for Substation Automation

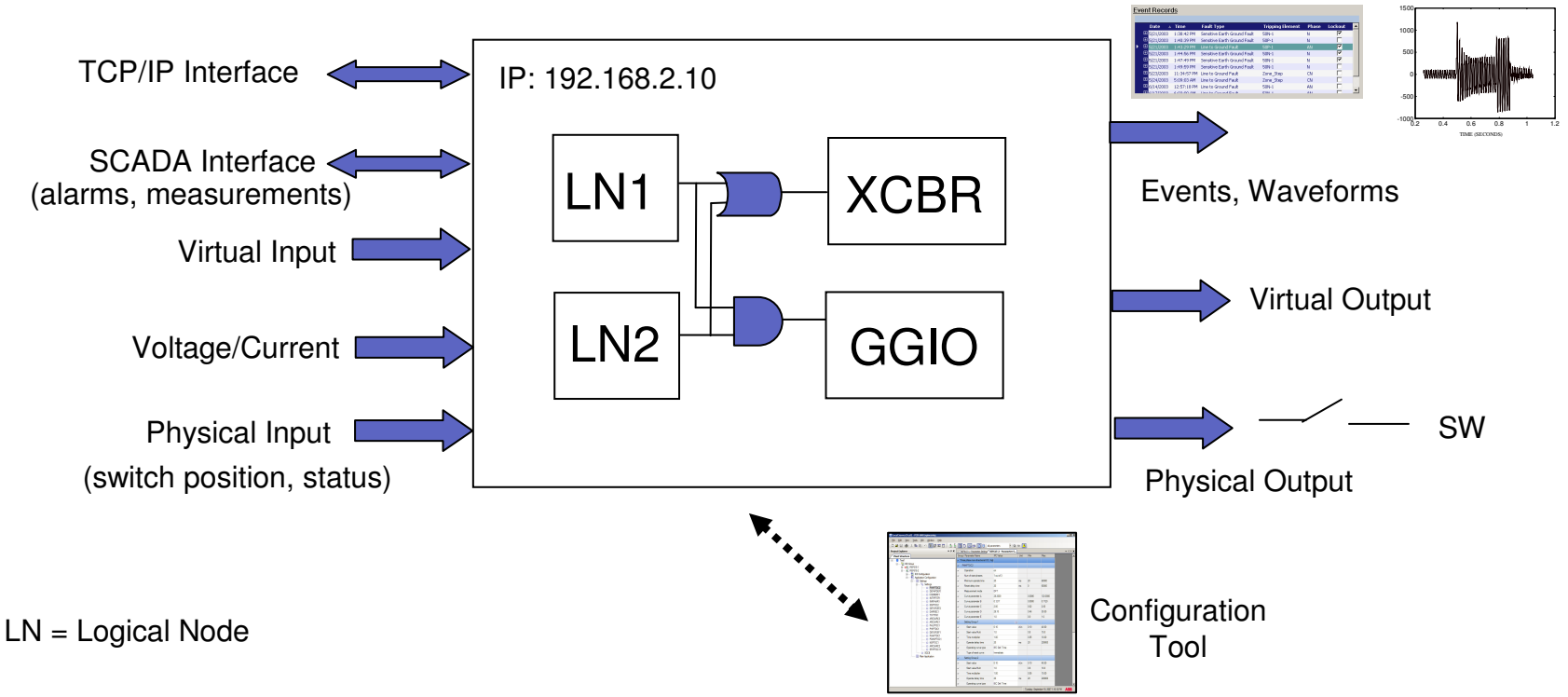
- IEC 61850 is a protocol designed for the electric utility industry… optimizes Ethernet connectivity:
  - Utilizes TCP/IP
  - Plug and play functionality.
  - OPEN Protocol Format - Coopers' "Reclose Block" status point will be the SAME point as ABB's, SEL's, GE's etc. with IEC61850
  - Utilizes Goose Technology (Generic Object Oriented Substation Event)





61850-Based IEDs

IED becomes an network (and enterprise)-addressable device



Substation Configuration Language (SCL)

To be able to exchange the device descriptions and system parameters between tools of different manufacturers in a compatible way, IEC 61850-6 defines a substation configuration language (SCL)

- .ICD file - IED Capability Description
- .SSD file - System Specification Description
- .SCD file - Substation Configuration Description
- .CID file - Configured IED Description

DA Open-Architecture Solutions

- **Future Solutions offerings based on Open Standards**

  Nonproprietary solutions for DA using open standards, such as IEC 61850.
  Utilize protocol conversion technology for converting between various legacy standards and IEC 61850.

- **Support for present/future communications options**

  WiMax (802.16), Broadband over Power Lines, digital cellular, etc.

- **IEDs, Gateways include basic logic for supporting distribution automation applications**

  IEC 61850-based logic using peer-to-peer for basic automation functionality such as loop control, fault location, volt/var control, etc.

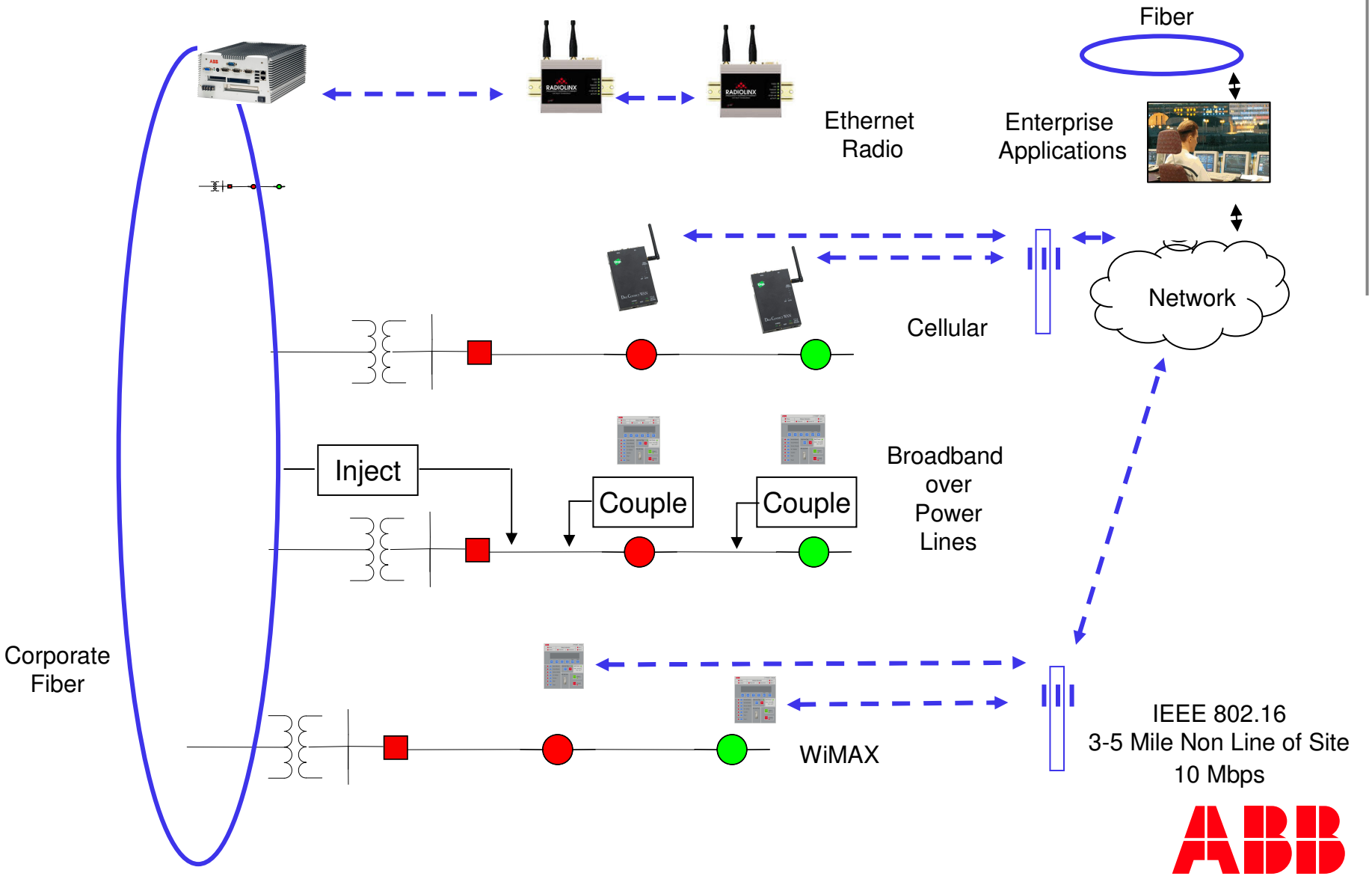
- **Scalable solution functionality**

  Can offer basic solutions for just a few feeders, or more complex solutions involving interaction with distribution management system.

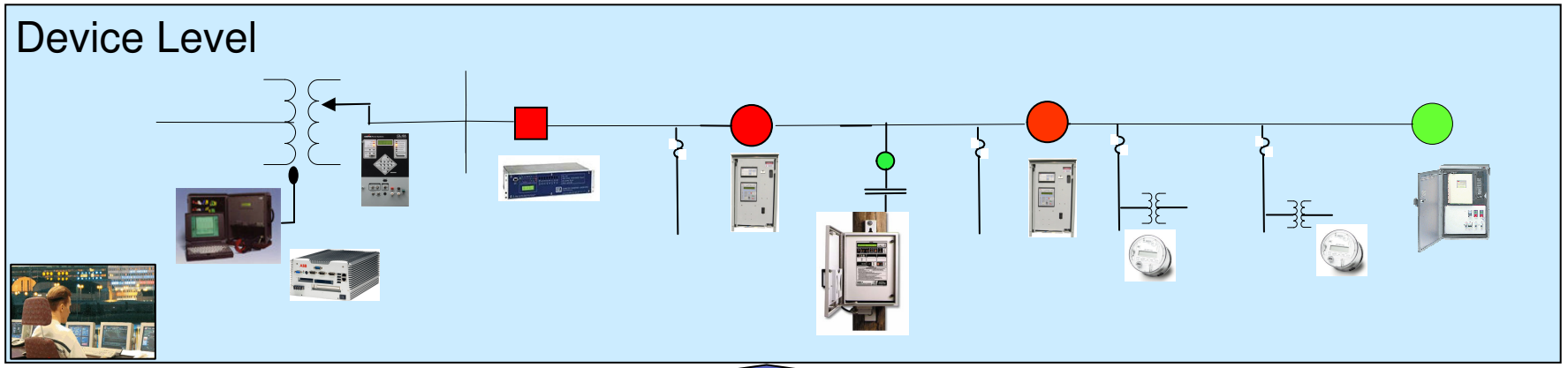
- **Configuration tools**

  Tools made available for automating IED and solution configuration.

Future Communications Connectivity



Automation Justification



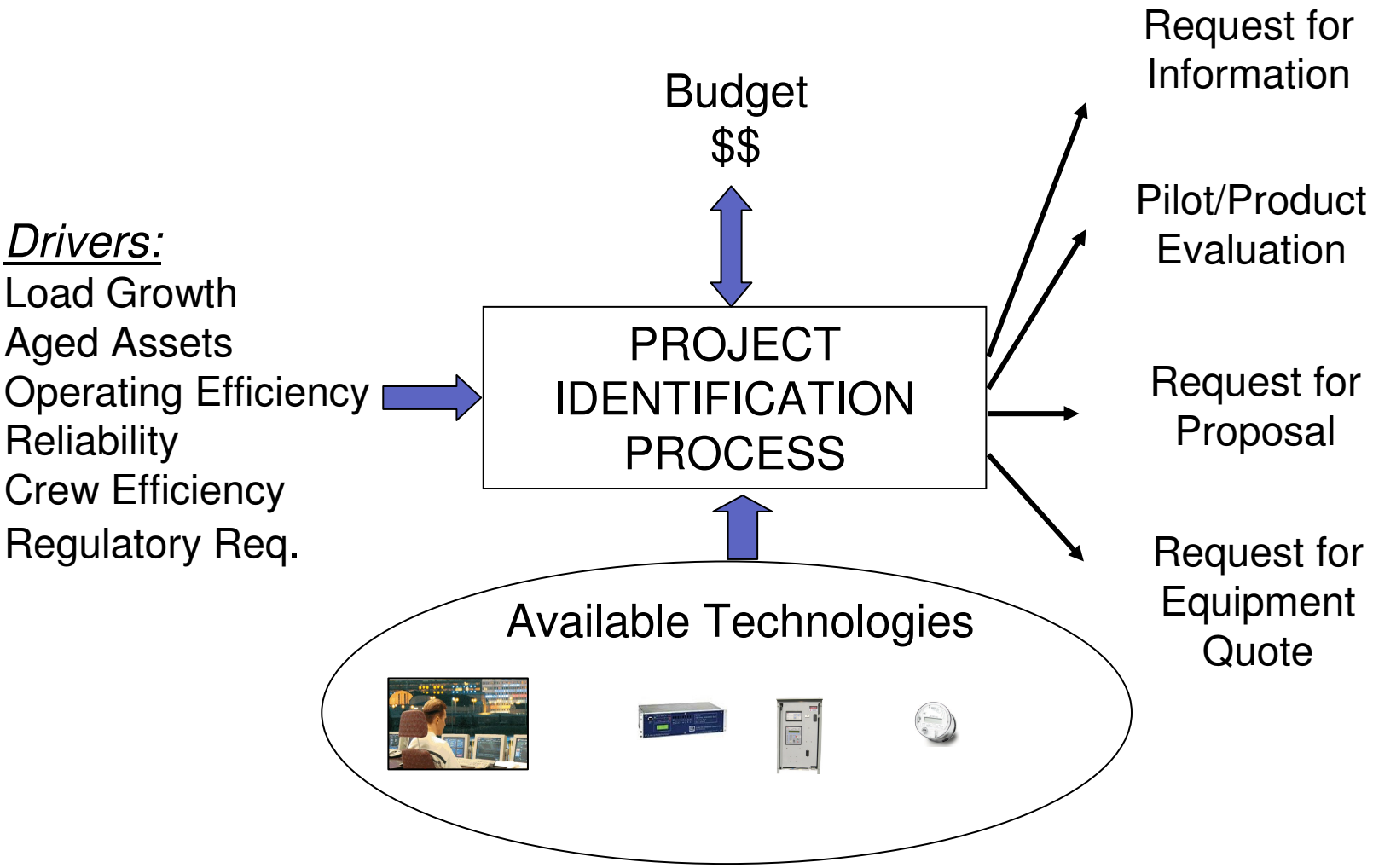
Applications

- Predictive Maintenance
- Volt/Var Control
- Fault Location
- Auto-Restoration
- Power Quality Mon.
- Peak Demand Reduction

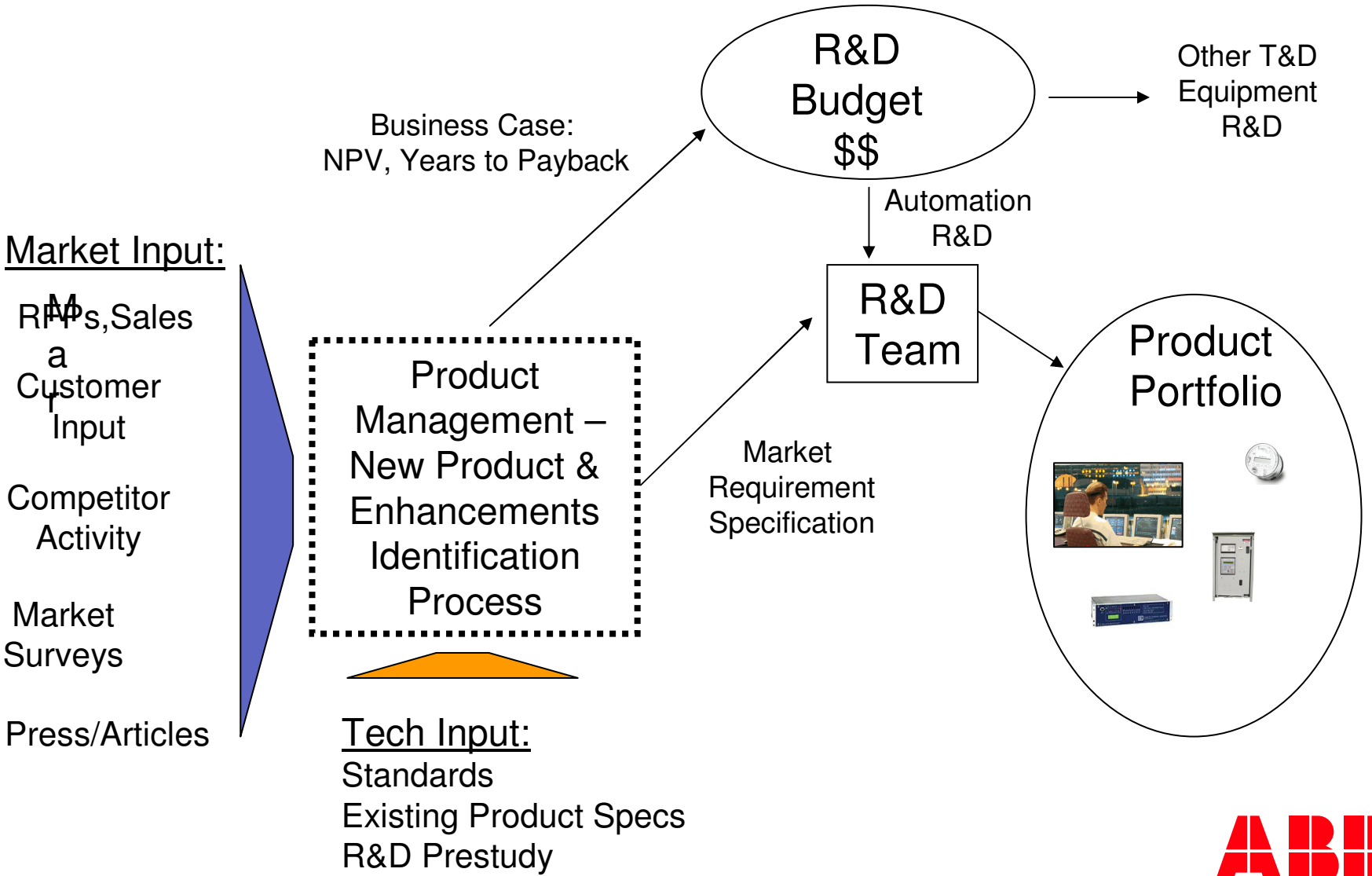
Business Payback

- $ per avoided maint.
- $ per avoided equip. failure
- $ per Reduced SAIDI minutes
- $ per crew dispatch hours
- $ per kWh loss reduction
- $ per kVA peak reduction
- $ penalized for poor power quality

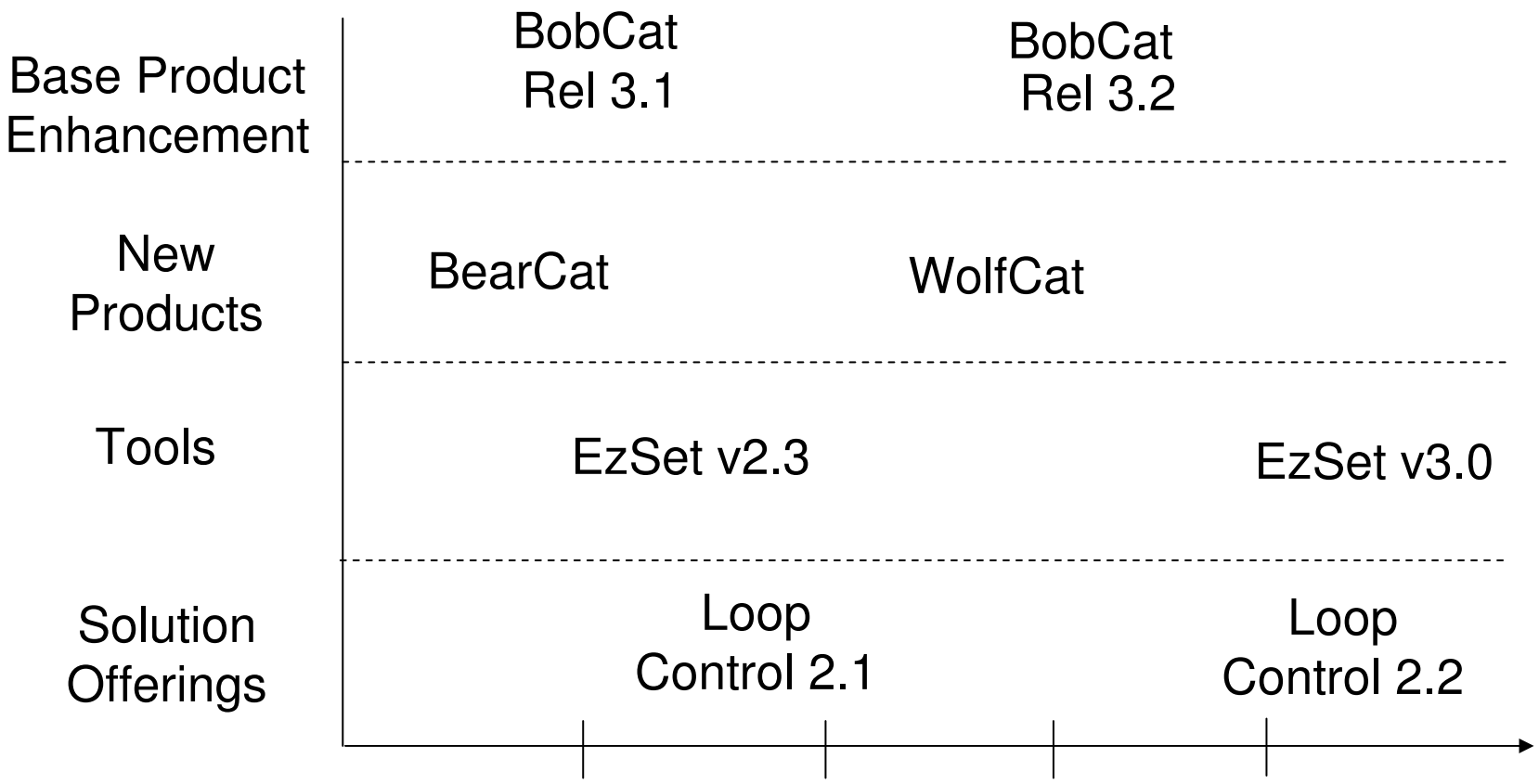
Utility-Side DA Investment Process



Vendor-Side DA Investment Process



Product Roadmap Example



Market Requirement Specification

Requirements for a new device or new functionality

- Role of Device in Product Portfolio
- Cost Target
- Use Cases
- Protection, Control, Monitoring Functions
- HMI
- Communications
- I/O
- Power
- Compliance Standards
- Configuration Tool
- etc.

Gaps

- Short-term roadmap input for automation-related product offerings.
- Accuracy of business case associated with new automation offerings/functionality (what are customer really going to spend money on).
- How to package cost-effective distribution automation functionality into standardized product offerings.
- Making automation solutions less complex, easier to market and sell.
- Underutilization of pilot activity for proving out concepts.
- More tangible success stories (for management).
- No DA interoperability testbed.

Importance of Pilot Activities

- Demonstrate potential of technology.
- Valuable feedback to host utility and vendors regarding application requirements, product design and functionality.
- Helps build organizational support for future deployment.
- Demonstration of technology before full deployment.
- Quantification of financial benefits possible with new technology.

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