Hawaii
Modern Grid Technology & Leading Practices Workshop

Operational Communications Panel

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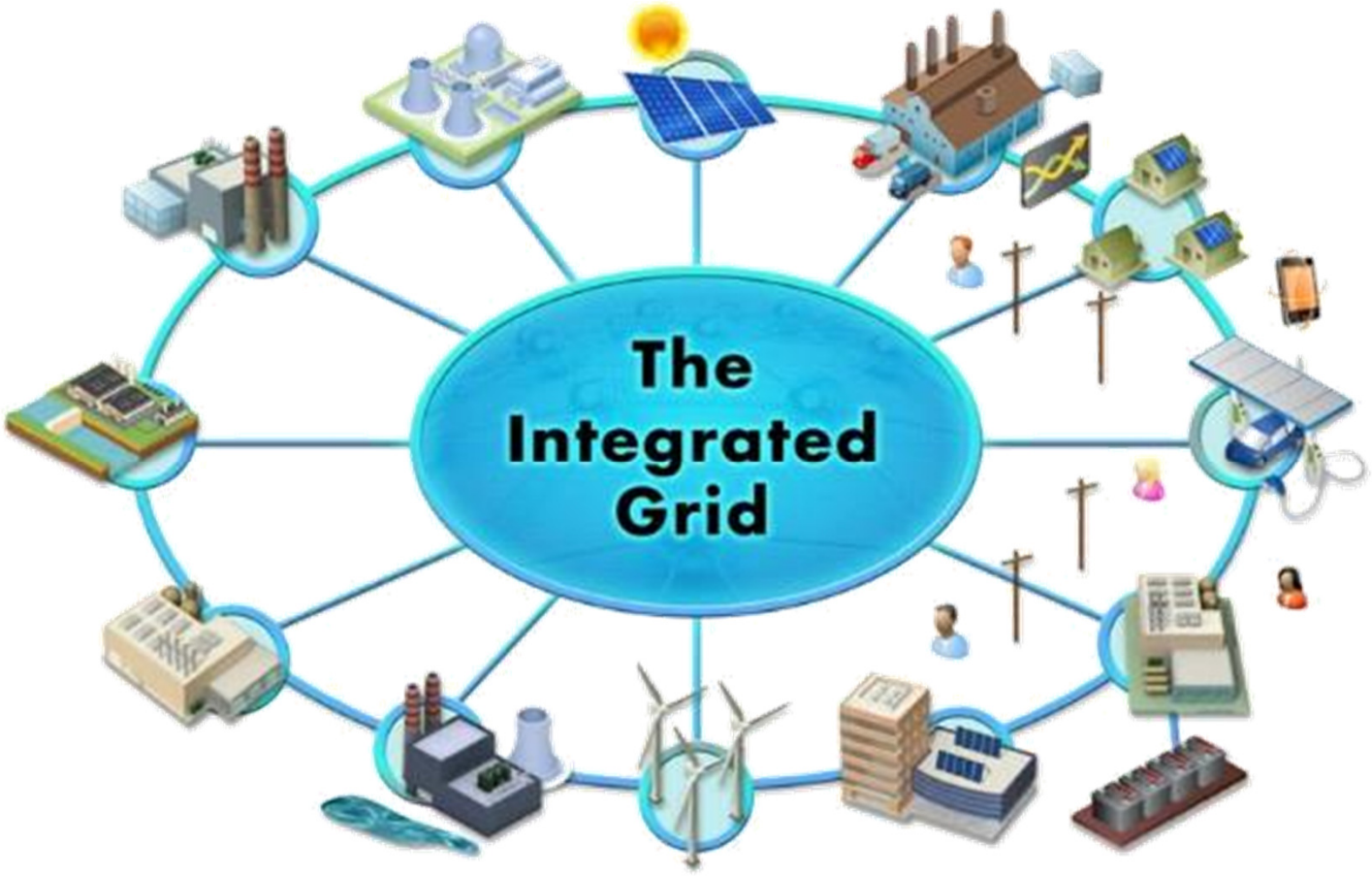
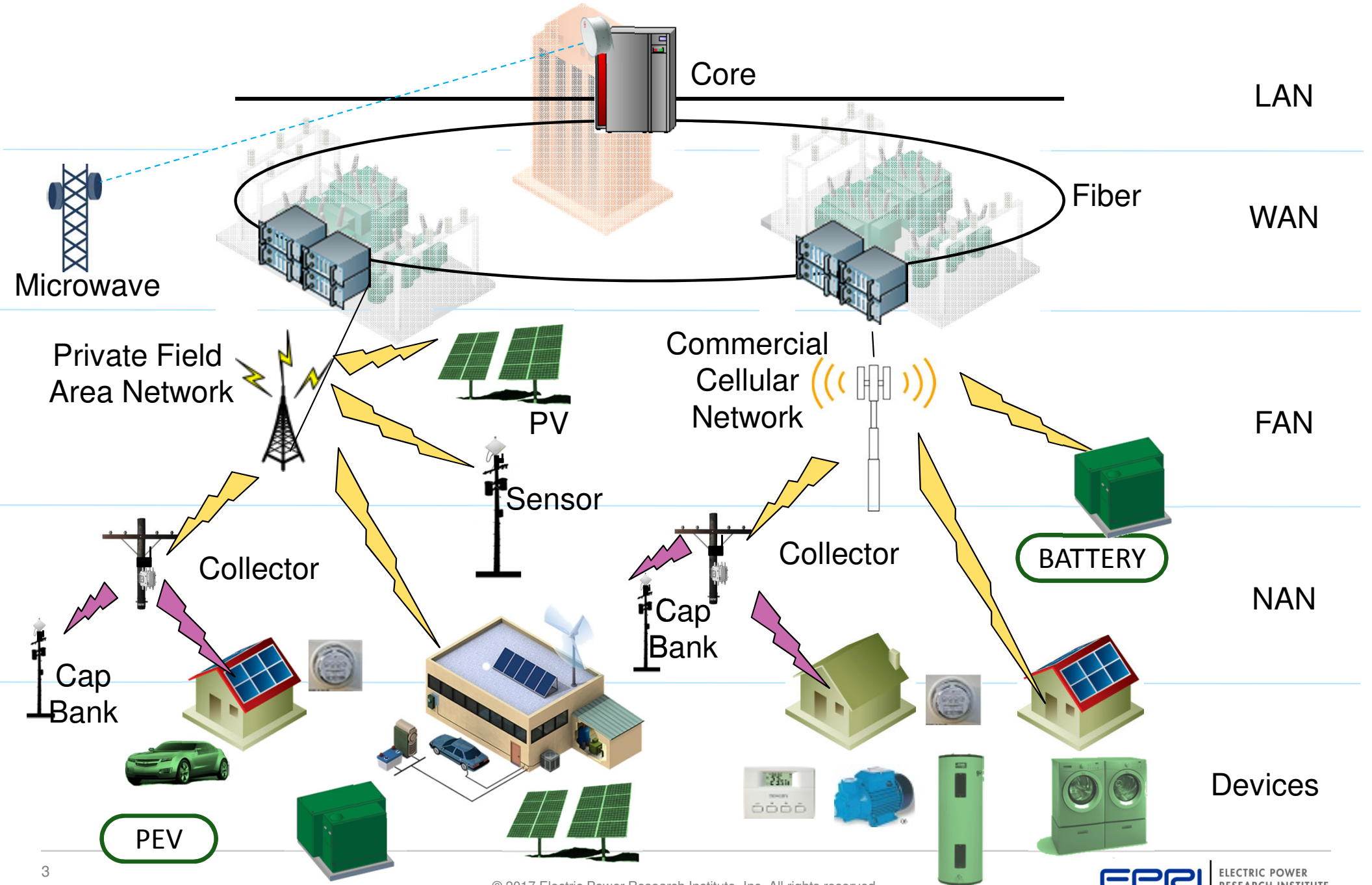
Telecommunications Enables:

- Distribution management systems, advanced meters, traditional grid infrastructure, and other smart grid platforms.
- Demand Response Management System (DRMS)



Utility Private Network Tiered Architecture



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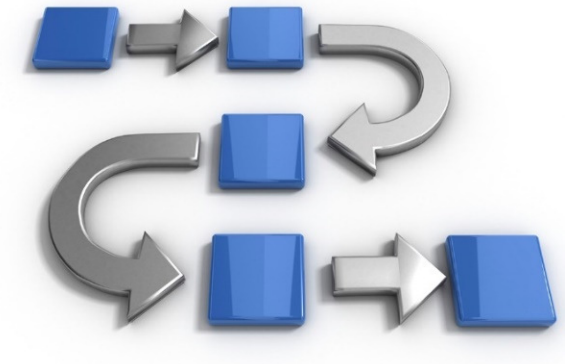
Mapping Use Cases to Network Tiers

- Advanced DMS and Smart Grid platforms > FAN
  - 100s-1,000s of endpoints
  - Medium to low latency *
  - Low, medium, high data rates *
  - High reliability and resiliency
- DRMS end points (DSM and DG) > NAN
  - 10,000s - 100,000s of endpoints
  - High to medium latency *
  - Low, medium data rates *
  - Reliability and resiliency TBD

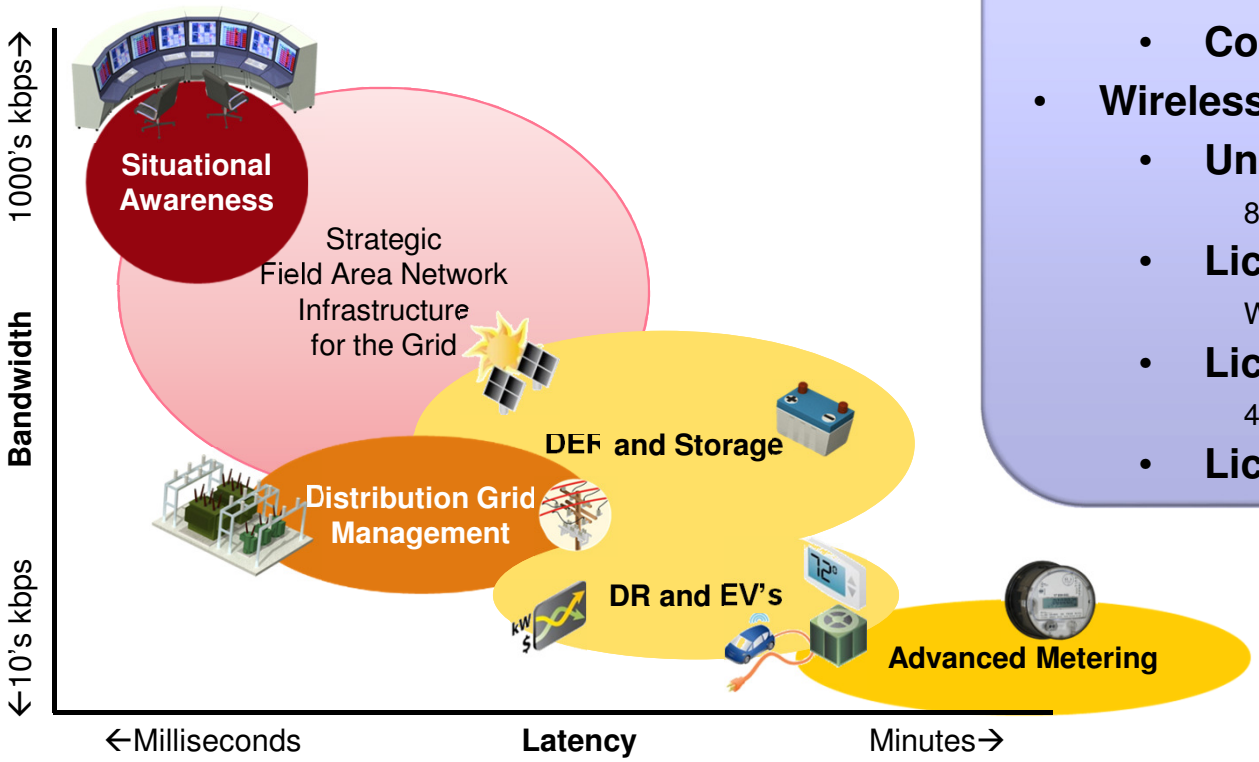


* varies by device type and use case

Solutions Analysis

- Taxonomy of options, but root choice is private infrastructure or commercial service provider
- Important criteria is ability to deploy in a phased and modular fashion in strategic locations initially
  - WAN
    - Fiber and/or broadband PTP microwave radio
  - FAN
    - Fiber and/or broadband PTMP radio (sub 2 GHz spectrum)
  - NAN / Devices
    - PTMP private radio, commercial cellular, customer broadband

Communication Requirements & Options



Options:

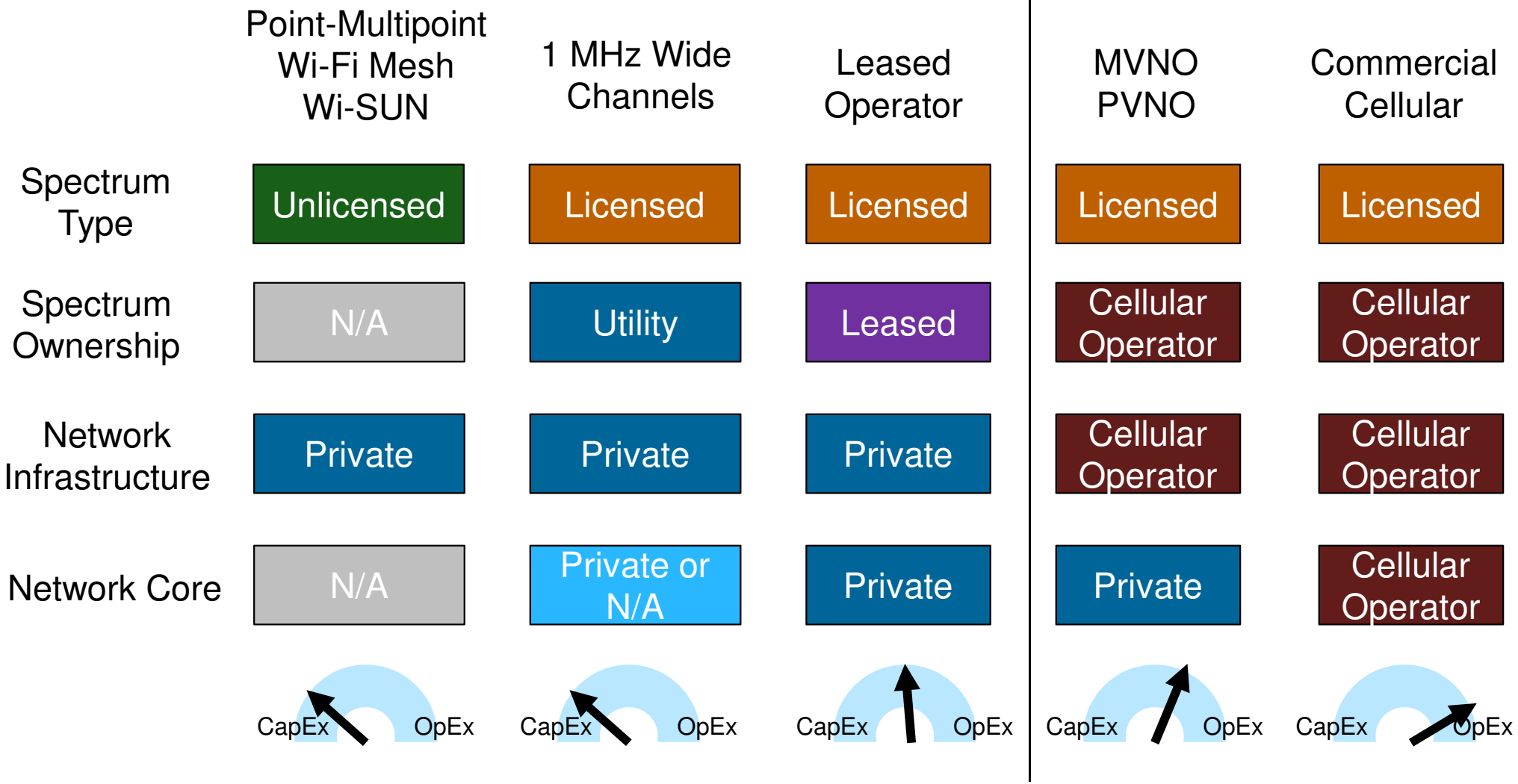
- **Wired:**
  - **Copper, Fiber**
- **Wireless:**
  - **Unlicensed Private**
    802.11 (2.4GHZ, 5GHz), 802.15.4g (915 MHz)
  - **Licensed Private**
    WiMAX, LTE
  - **Licensed Public**
    4G, LTE
  - **Licensed Public Safety Sharing**

←High **Reliability/Security** Low→
Requirements

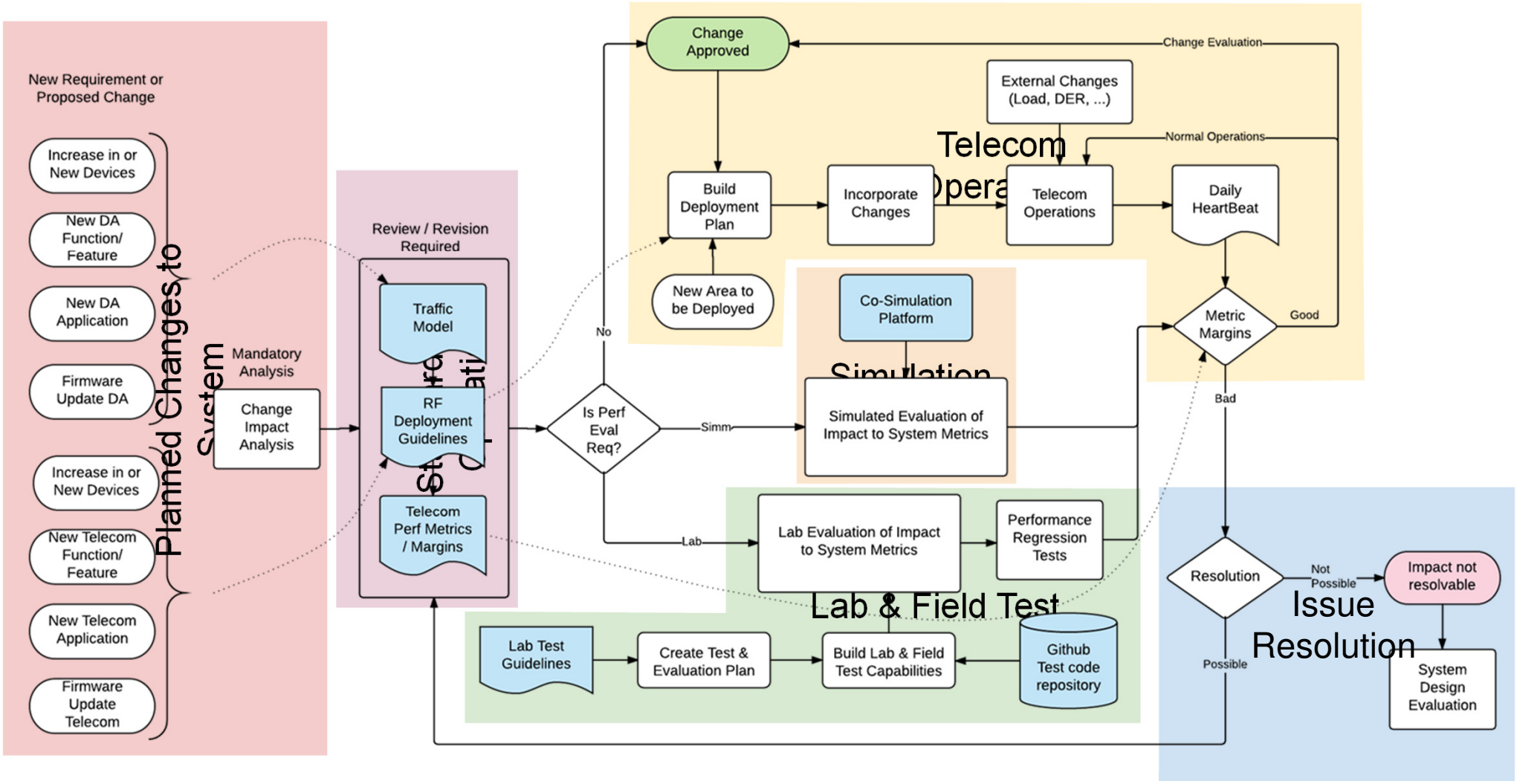
Communication Requirements:

- **Available**
- **Affordable**
- **Reliable**
- **Resilient**

Wireless Solution Space



Telecom Planning Process Areas



Summary/Conclusion

- One size does not fit all
  - Despite the preference for a single homogenous solution, different use cases and geographic territories drive the optimal solution towards a set of technologies (e.g. fiber and wireless)
- Benchmarks/best practices exist, but Hawaii really is a "postcard from the future"
  - Implement best practices first, e.g. communications to all substations
  - Recommend tight integration of telecom planning with T&D planning

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