

Smart Grids as a pillar of smart cities - Realistic expectations and synergies

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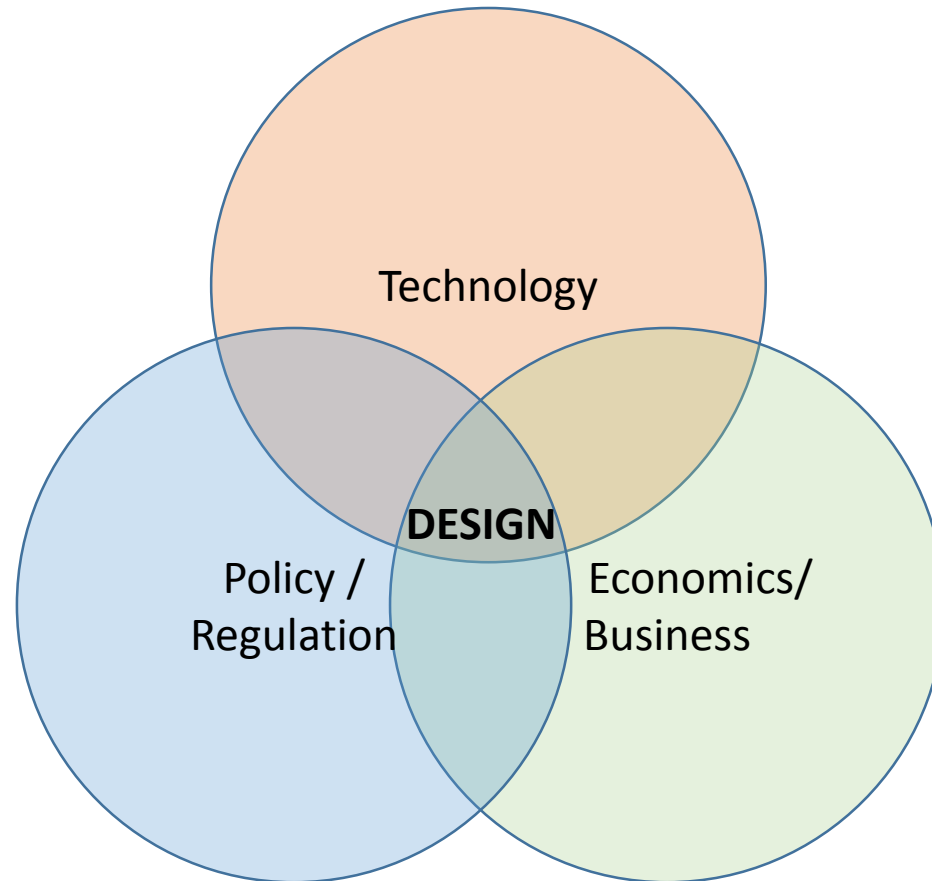
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Are “Clean” and “Smart” just buzzwords?

- The industry joke has been – are you “buzzword-compliant”
 - No one wants to be dumb or dirty
 - But clean and smart are continuums
- Disruption is a good driver – because BAU isn’t working
 - Power sector talks of “transitions” to cleaner solutions (low-carbon)
 - Other disruptions
 - EVs
 - Edge-based (e.g., rooftop solar) – Uberization risk

Design is key – What do want, and WHY, THEN worry about HOW



Good Design (continued)

- Societal Cost-Benefit Analysis is key
 - NOT simple investor-centric RoI
 - BUT there is an interlinkage

COST ↔ FUNCTIONALITY ↔ BENEFITS

- Mostly retrofit for much of India
 - Implications
 - Lots of legacy systems
 - Lots of issues of physical space, access, RoW, etc.

Pillars of a Smart City

- Power
- Transport
- Public Safety
- Utilities (gas, water, etc.)

What does “Smart” Give Us?

- Visibility
 - You can't change what you can't measure
- Granularity
 - Averages are misleading
 - Differentiation is what can lead to greater efficiency
- Dynamics
 - Averages are misleading
 - Need to think of marginal if not (ultimately) transactive energy

Making Smart Work at a Systems Level

- Computer Science: Sense, Think, Act
- Meter and Communications = first step only
- WHERE is your intelligence?
 - Know the chain, e.g., Consumer Meter, Distribution Transformer, Sub-station, and up
 - Is information only edge to the Central Office (or Cloud)?
 - If I'm measuring at all nodes, where do I reconcile?
 - Example of load-curtailment during emergencies...not an easy problem (need more local smarts, else all data goes upstream)
- USE CASES – a key technique – Example: theft reduction
 - Can't do “incomplete” deployments (only some users)

Communications

- Cost isn't the ONLY concern
 - Who owns it?
 - What's its life
 - Backwards Compatibility?
 - Forward Compatibility
 - The delta between ICT cycles timeframes and physical assets...need to split them up as a layered approach
 - Key metrics – derive from Use cases
 - Predictability, latency, bandwidth, error tolerance, etc.
- Canopy approaches – pros and cons
 - City WiFi?
- Transparent communications
 - Downside is you can't know what's inside beyond an error check
 - Can't deploy mid-point intelligence

Clean Power

- Does RE (clean) mean rooftop solar?
 - Does it mean 24x7 or in total only?
 - Some can/should come from outside
- Islandable but integrated microgrids
 - Mumbai can be viewed as a “microgrid” compared to India

Challenges of Syncing Timeframes

- Smart Grids have standards, and experience
 - Do they have to carry along other utilities?
- Water has higher losses in some places
 - Electricity design is different – more ranges of flows

How to make “SMART” solutions work

- AHAM has 3 key insights for Smart Appliances – applies to Smart Cities
 - Simplicity – plug and play
 - Incentives – usually economic, such as time of day
 - User wants control (and choice)
- Complexity is a major challenge of growing data
 - 5 minute electricity readings = 100K readings per year
 - Will any consumer be starting at a portal/app/in-home display to see when we have low electricity prices?
 - Needs a level of automation

Data and Rights

- Lots of data – supposed to be the new oil
 - Who can access it?
 - Who owns it?
- Privacy isn't just an abstract concern
 - Smart meters (or even digital with Time of Day)
 - Can at least tell if you're home or not
 - Can even tell how many people are showering

Business models

- It's not expensive done right – on a life cycle basis
 - BUT up-front costs are high
 - Who bears risks vs. returns
- Learning curve and its costs
 - How do we cross the chasm?
- If we expect solutions to be a commodity, why will industry participate?
 - Volume
 - Value-add
 - Think WiFi – security, enterprise grade, management, etc.

How do we get there?

- Pilots
 - Learning vs. deployment
 - Challenge of minimum scale
 - Electricity: Feeder at a technical level, but sub-division at an operational level
 - LESSON – keep the logical and physical in sync
- Coordination via open standards
- Power will always come early, esp. compared to other utilities

Smart Cities, like Smart Grids are an Ecosystem

- There cannot be a single solution or answer or standard
- Let's also not get fixated on standards (which will be a portfolio) or even CMM/ISO/etc....



Thank you...