# Storage Business Model White Paper

Summary June 11 2013

# Storage Business Model White Paper - Purpose

- Identify existing business models for investors/operators, utilities, end users
- Discuss alignment of storage “value proposition” with existing market designs and regulatory paradigms
- Difficulties in realizing wholesale market product revenue streams for distributed storage – the “bundled applications” problem
- Discuss risks/barriers to storage adoption and where existing risk mitigation measures fall down
- Recommendations for policy/research steps
  - Alternative business models
  - Accelerated research into life span and failure modes
  - Possible insurance schemes for mitigating technology risk

# Storage as a Generation Asset – business model issues

- What is it's capacity value?  Ability to access capacity markets
- "Duration" rules for various products (load following, reserves) that fail to exploit the value of fast limited energy resources.  (i.e. FERC 755 for other products)
- Storage not explicitly considered in Integrated Resource Plans or Renewable Integration Studies today
  - Difficulties in modeling / co-optimizing in existing tools;  storage force-fit into same buckets as conventional resources
- Market design and market clearing algorithms today operate to maximize "economic surplus" NOT to minimize cost to consumer.  (common misunderstanding).  Rarely is storage charging and discharging both co-optimized.  Market models of resource performance constraints are derived from conventional unit models – do not reflect storage well.
- Accessible markets (esp regulation) are "thin" and subject to price collapse upon entry of new "price taker' capacity (e.g. storage)
- Realization of "storage time arbitrage" as a market product would violate the "economic surplus" market paradigm with unintended consequences

# Storage as a Regulated Cost Recovery Asset

- Technology Risk (life span, premature failure as a technology type risk) are barriers to adoption. Utilities and regulators wary of risk of early write-off
  - Established major suppliers can mitigate this with warranty but start-ups not seen as safe
  - Insurance expensive if available at all due to lack of underwriting historical data
- As a regulated asset, storage cannot access wholesale market product revenue.
- Example: storage used to smooth PV on a distribution feeder. The utility cannot harvest potential revenues from market participation nor the economic benefits of time arbitrage. The former are simply "lost" and the latter accrue to the consumer.
- Possible solution: Reliability PPA for distributed storage
  - Utility procures the reliability service of PV smoothing, etc.
  - Storage operator has the asset technology risk but is able to participate in wholesale markets
  - Disadvantageous for today's regulated utility - capital asset is transferred to OPEX.
  - Financing for storage asset depends upon long term PPA – regulatory approval for such can be problematic

# Transmission Congestion Relief – Unique Problems

- If storage is a “merchant” asset exploiting congestion – the act of relieving congestion destroys the value
- If (today) procured via PPA, typically is looked at as a generator
  - Duration requirements and capacity factors work against storage
- Storage as a congestion relief – especially for contingency constraint induced congestion – has real potential benefits. But current practices do not exploit storage.
- Ability to use the storage asset to provide other wholesale market products still a question – depending upon ownership.

# Community Energy Storage - CES

- Distributed small scale storage for local reliability
  - Utility owned
  - End user owned  (no model for multiple end users to share common asset today)

www.dnvkema.com