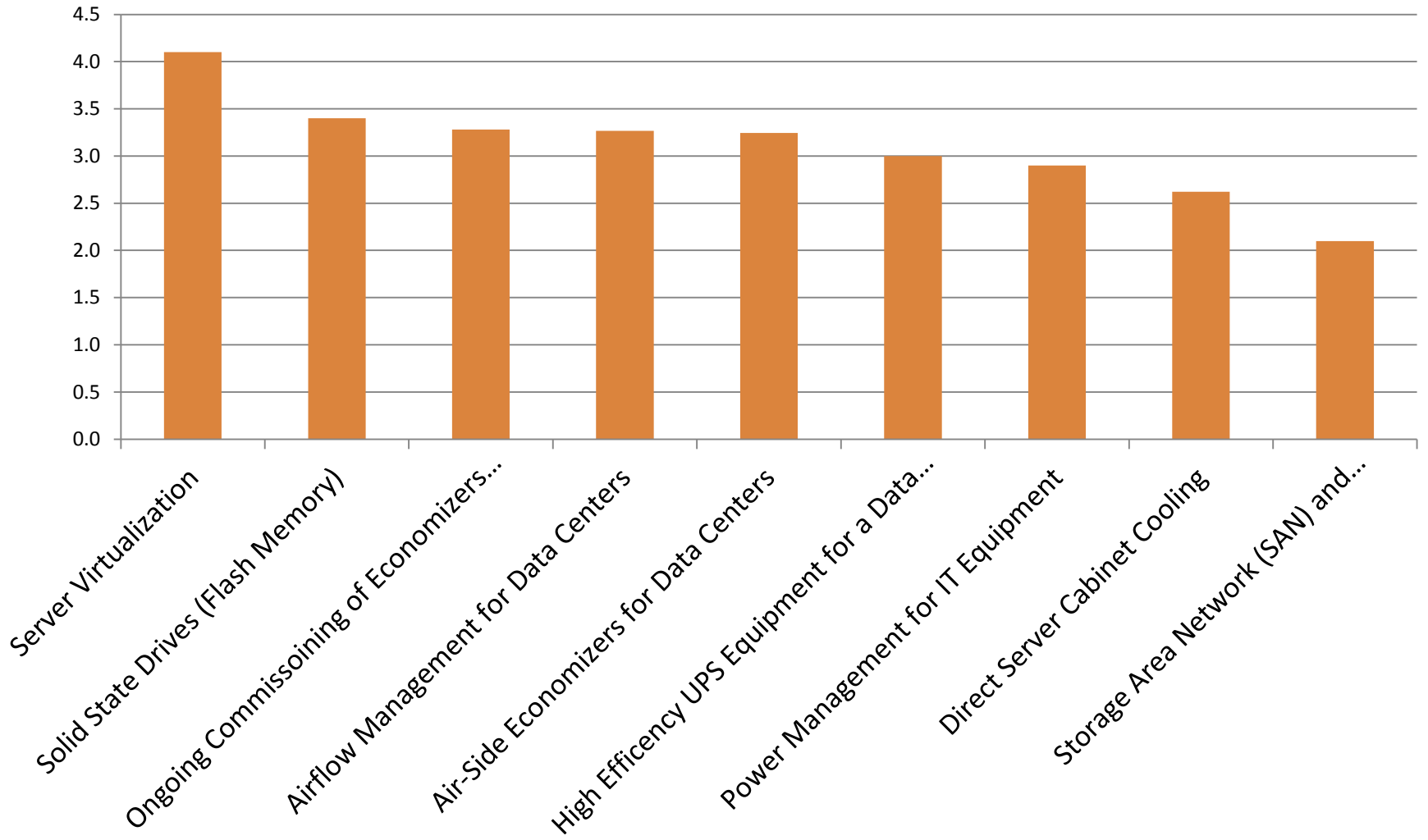


Welcome IT TAG members

# IT TAG Agenda – December 5, 2013

- Present scoring results
- Discussion, comments
- Discussion - Incentives and training discussion

# Total Scores



# IT Equipment and Power Management

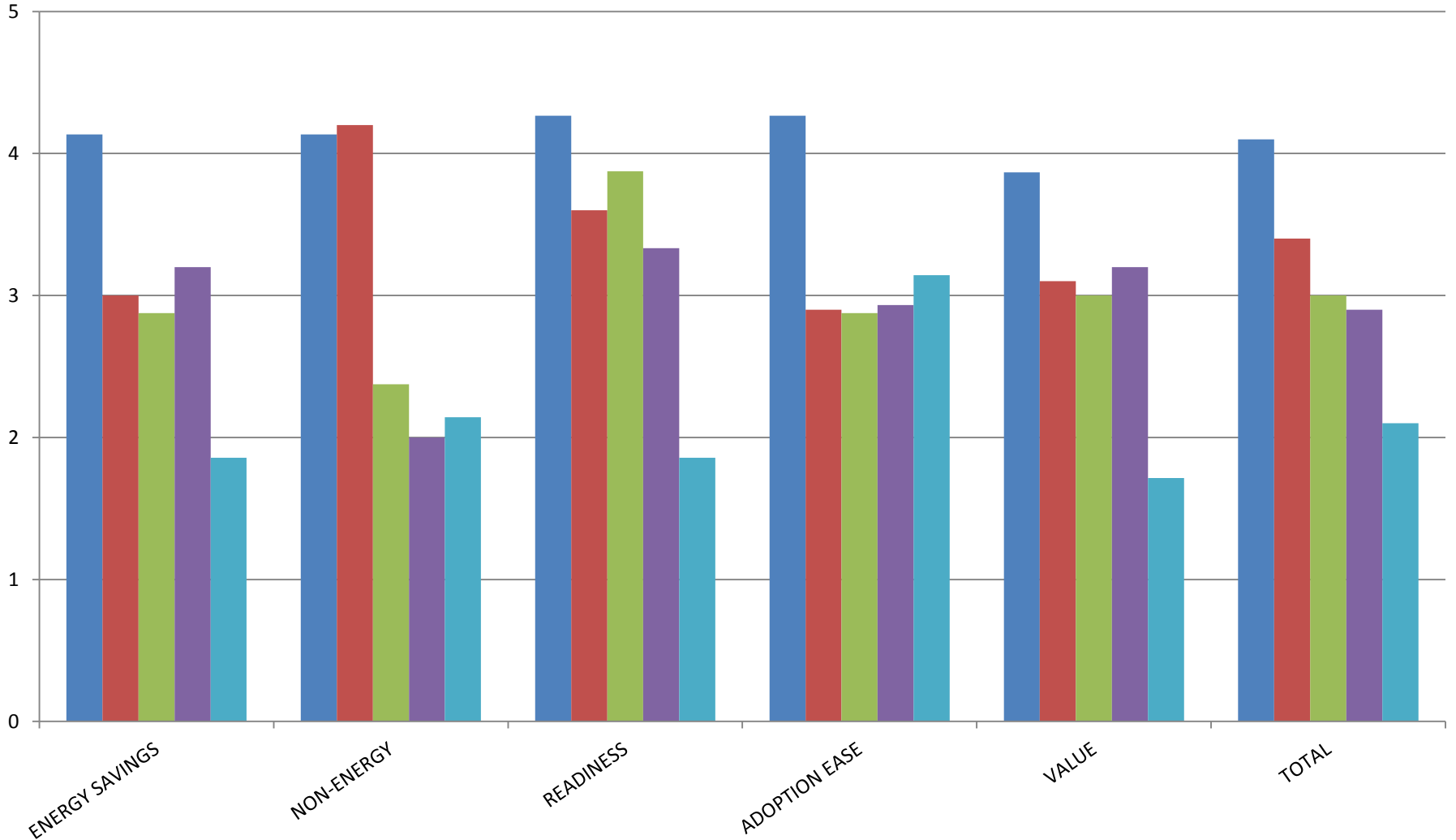
<b>Legend</b>
<b>1st place</b>
<b>2nd place</b>
<b>3rd place</b>

SCORES	Server Virtualization	Solid State Drives (Flash Memory)	High Efficiency UPS Equipment for a Data Center	Power Management for IT Equipment	Storage Area Network (SAN) and Network Core Consolidation
ENERGY SAVINGS	4.1	3.0	2.9	3.2	1.9
NON-ENERGY	4.1	4.2	2.4	2.0	2.1
READINESS	4.3	3.6	3.9	3.3	1.9
ADOPTION EASE	4.3	2.9	2.9	2.9	3.1
VALUE	3.9	3.1	3.0	3.2	1.7
<b>TOTAL</b>	<b>4.1</b>	<b>3.4</b>	<b>3.0</b>	<b>2.9</b>	<b>2.1</b>

SCORES	Server Virtualization	Solid State Drives (Flash Memory)	High Efficiency UPS Equipment for a Data Center	Power Management for IT Equipment	Storage Area Network (SAN) and Network Core Consolidation
ENERGY SAVINGS	1	3	4	2	5
NON-ENERGY	2	1	3	5	4
READINESS	1	3	2	4	5
ADOPTION EASE	1	4	5	3	2
VALUE	1	3	4	2	5
<b>TOTAL</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

# E3T 2013 IT TAG: IT Equipment and Power Management

- Server Virtualization
- High Efficiency UPS Equipment for a Data Center
- Storage Area Network (SAN) and Network Core Consolidation
- Solid State Drives (Flash Memory)
- Power Management for IT Equipment



# HVAC

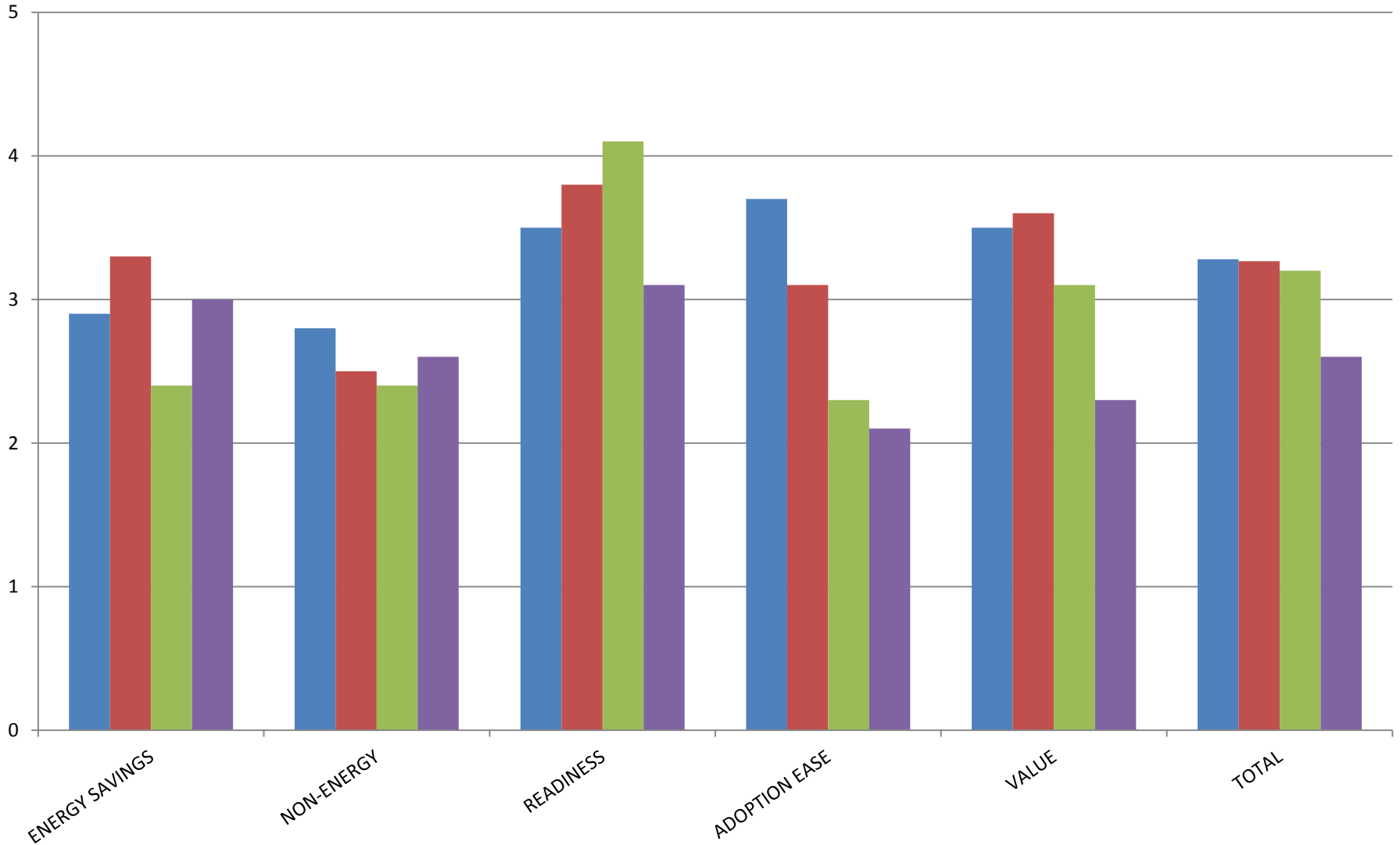
<b>Legend</b>
<b>1st place</b>
<b>2nd place</b>
<b>3rd place</b>

SCORES	Ongoing Commissioning of Economizers in a Data Center	Airflow Management for Data Centers	Air-Side Economizers for Data Centers	Direct Server Cabinet Cooling
ENERGY SAVINGS	2.9	3.3	2.4	3.0
NON-ENERGY	2.8	2.5	2.4	2.6
READINESS	3.5	3.8	4.1	3.1
ADOPTION EASE	3.7	3.1	2.3	2.1
VALUE	3.5	3.6	3.1	2.3
<b>TOTAL</b>	<b>3.3</b>	<b>3.3</b>	<b>3.2</b>	<b>2.6</b>

SCORES	Ongoing Commissioning of Economizers in a Data Center	Airflow Management for Data Centers	Air-Side Economizers for Data Centers	Direct Server Cabinet Cooling
ENERGY SAVINGS	3	1	4	2
NON-ENERGY	1	3	4	2
READINESS	3	2	1	4
ADOPTION EASE	1	2	3	4
VALUE	2	1	3	4
<b>TOTAL</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>

# E3T 2013 IT TAG: HVAC Scoring

- Ongoing Commissioning of Economizers in a Data Center
- Airflow Management for Data Centers
- Direct Server Cabinet Cooling
- Air-Side Economizers for Data Centers



# Top 9 ETs

SCORES	Server Virtualization	Solid State Drives (Flash Memory)	Ongoing Commissioning of Economizers in a Data Center	Airflow Management for Data Centers	Air-Side Economizers for Data Centers	High Efficiency UPS Equipment for a Data Center	Power Management for IT Equipment	Direct Server Cabinet Cooling	Storage Area Network (SAN) and Network Core Consolidation
ENERGY SAVINGS	4.1	3.0	2.9	3.3	4.2	2.9	3.2	3.0	1.9
NON-ENERGY	4.1	4.2	2.8	2.5	2.4	2.4	2.0	2.6	2.1
READINESS	4.3	3.6	3.5	3.8	4.1	3.9	3.3	3.1	1.9
ADOPTION EASE	4.3	2.9	3.7	3.1	2.3	2.9	2.9	2.1	3.1
VALUE	3.9	3.1	3.5	3.6	3.1	3.0	3.2	2.3	1.7
<b>TOTAL</b>	<b>4.1</b>	<b>3.4</b>	<b>3.3</b>	<b>3.3</b>	<b>3.2</b>	<b>3.0</b>	<b>2.9</b>	<b>2.6</b>	<b>2.1</b>



# Ongoing Commissioning of Economizers in a Data Center

## Energy Savings

### Benefits

- Allows persistent economizer savings

### Barriers

- Highly variable
- Dependent on each site
- Depends on existing status of economizer operation.
- Most small server rooms and localized data centers don't feature economizers...

## Non-Energy Benefits

- Longer useful life of cooling equipment

## Readiness

### Benefits

- Plenty of vendors and service providers probably can do this

### Barriers

- Unknown if providers are ready and offering service in NW
- Not easy measure for utility incentives
  - difficult to verify
  - data center economizers and FDD likely required in 90.1-2013

# Ongoing Commissioning of Economizers in a Data Center

## Adoption Ease

### Benefits

- No real barrier
- Can be done with data center dashboards, digital economizers and FDD
- assumes an economizer in place

## Value

### Barriers

- No market
- Difficult to design prescriptive program

### Other

- Combine data center economizers and continuous commissioning into one measure
  - continuous commissioning must be done with economizer
  - ensures that economizer savings persist.

# Airflow Management in Data Centers

## Energy Savings

### Benefits

- Savings from reduced airflow (through installation or use of VFDs)
- Mechanical cooling energy use can be reduced
- Quite good

### Barriers

- Difficult to measure, calculate, and capture as prescriptive measure
- BC Hydro Power Smart has never claimed savings from ECM
- Need to conduct full M&V to validate
- Must be implemented with other measures – by itself does not save much

## Non-Energy Benefits

- Better performance and more uniform cooling by the HVAC system.
- Recaptures cooling capacity, allows higher utilization of facility
- Eliminates hot spots
- Additional cooling capacity

# Airflow Management in Data Centers

## Readiness

### Benefits

- Products and individual ETs readily available and accepted in marketplace
- Techniques well known

### Barriers

- Few vendors specialize in airflow management.
- Most efforts installed piecemeal or by a knowledgeable vendor, not by an organization that specializes in a holistic approach to airflow management.
- IT staff managers not motivated to make necessary changes to facilities.
- Very site specific solutions

## Adoption Ease

### Benefits

- Fairly easy to correct air management issues

### Barriers

- Only applicable to facilities with dedicated cooling systems – thus larger server rooms/localized data center sector
- Very site specific
- very time-consuming to contain and balance airflow

# Server Virtualization

## Energy Savings

### Benefits

- For existing programs - good, tested savings estimates
- Smaller energy footprint
- Savings per unit very good.
- Energy savings known and quantifiable
- Can be generalized for a prescriptive rebate program model.
- Very reliable.
- Opportunity for small in-building DCs.

### Barriers

- Free ridership
- Market already moving this direction
- Market soon saturated
- Already standard practice
- Savings not reliable
- Savings lost if new servers not properly sized
- Energy savings estimates based on 2005 - 2007 EPA study data.
- Savings depend on server consolidation ratios

# Server Virtualization

## Non-Energy Benefits

- Driven by business needs beyond energy savings.
- Performance, space and power constraints drive measure
- Centralized management. Reliability opportunities
- provisioning of new computer resources in minutes, avoids delays in procuring new physical assets
- Increase processing capacity

## Readiness

### Benefits

- Technology ready
- Competitive OEM market and IT server provider community supports utility incentive program delivery.
- Already mature and widely used in most data centers

### Barriers

- Not really "emerging", but well proven – hasn't achieved market adoption for small in-building DCs
- Saturation may be reached quickly.
- Replacement efforts have existed a while

# Server Virtualization

## Adoption Ease

### Benefits

- Use of technology is easy
- Should be considered standard practice for new server deployments.

### Barriers

- Needs a lot of IT upgrades
- Lengthy implementation times and labor intensive.
- Convincing IT personnel to shift to a different data center or remove back-up servers
- Pushback from IT personnel based on actual or perceived reliability.
- Difficulty migrating existing servers to virtual servers

## Value

### Benefits

- Performance, space and power constraints drive measure
- Good value with significant long term benefits for utilities.
- Utility opportunity is to accelerate adoption in existing applications and equipment in smaller to mid-size data centers.
- Great return on investment, but requires up front capital for new servers - reduce maintenance and energy costs will quickly pay back though

# Solid State Drives (Flash Memory)

## Energy Savings

### Benefits

- Savings significant (in right application)
- Lower energy use = more savings.
- SSD has significant energy savings potential for all storage tiers.

### Barriers

- Reliability unclear
- Flash drive storage is still expensive.
- For most applications, non-existent savings
- No real savings compared to the same amount of HDD
- Short-stroked HDD appears to have more energy savings benefits than SSD.
- Only special cases yield savings

## Non-Energy Benefits

- May happen anyway as costs drop.
- Benefits may be great enough for it to happen for other reasons.
- Faster transfer speeds and lower latencies.
- Can displace a lot of gear.
- Can push up processing speeds and equipment accessibility.
- Improved performance and limited short-stroke HDD applications may drive this measure
- No moving parts, Little impact to shock, vibration
- Lifetime based on write-endurance
- Increased response time but bandwidth into drive may be the same –may not be a noticeable benefit to end user.



# Solid State Drives (Flash Memory)

## Readiness

### Benefits

- More attractive as costs come down
- Public good programs can help accelerate this.
- SSDs can usually be installed in pre-existing systems.
- Applicable market is so limited, vendors may be ready for any uptake.
- Equipment commercially available
- On-board products and storage array equipment exist.

### Barriers

- Difficult to assess.

## Adoption Ease

### Benefits

- IT managers can specify SSD use in new purchases
- Fairly easy to switch in certain applications
- Utilize SSD for high I/O applications. Tier 0 – between memory (RAM) and storage (drives)

### Barriers

- Alternative back up will be needed.
- Long term storage capability has not been proven.
- Expensive
- Must be carefully applied in right circumstances
- Not sure how well it will work in a server environment.
- Not a good retrofit opportunity.

## Value

### Benefits

- Pushes up speeds
- Great Performance
- Value will increase as costs come down.
- Best solution for very high speed access,
- Value comes from non energy benefits

### Barriers

- Expensive way to save energy.
- Not best solution for most basic storage needs

# Thank you!!!

We appreciate your expertise,  
time and energy to make this a  
successful TAG!