Item 9: Data Center Refresh Update

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Finance & Audit Committee Meeting

ERCOT Public
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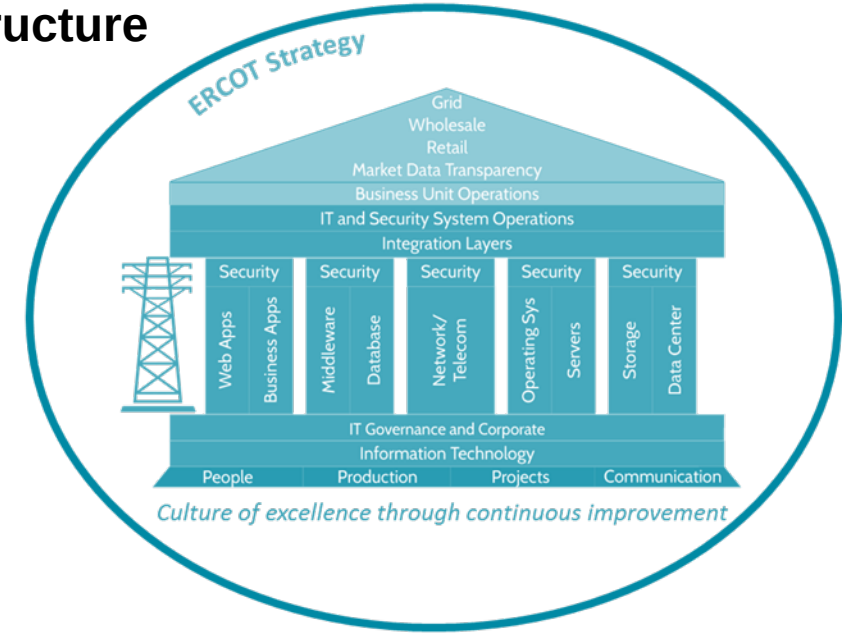
ERCOT : Critical Role

- **Grid, Wholesale, Retail and Market Data Transparency functions**
  - Manage 90% of Texas electric load
  - Perform financial settlement for the wholesale bulk power market
  - Administer retail switching for 7+ million premises
  - Up to 1 million reports and extracts delivered daily

- **Requires reliable and secure IT Infrastructure**
  - 400+ business applications
  - 3400+ compute servers
  - 4+ petabytes of storage
  - Redundant high speed fiber networks
  - Wide Area Network (WAN) for MPs
  - 3 active data centers (2 production, 1 test)



ERCOT : Reliable, Cost Effective

- **IT Infrastructure approaching end-of-life and support**
  - Increased risk of failure
  - Vendor support limited
  - Greater risk for compliance and security gaps
  - Higher operating costs

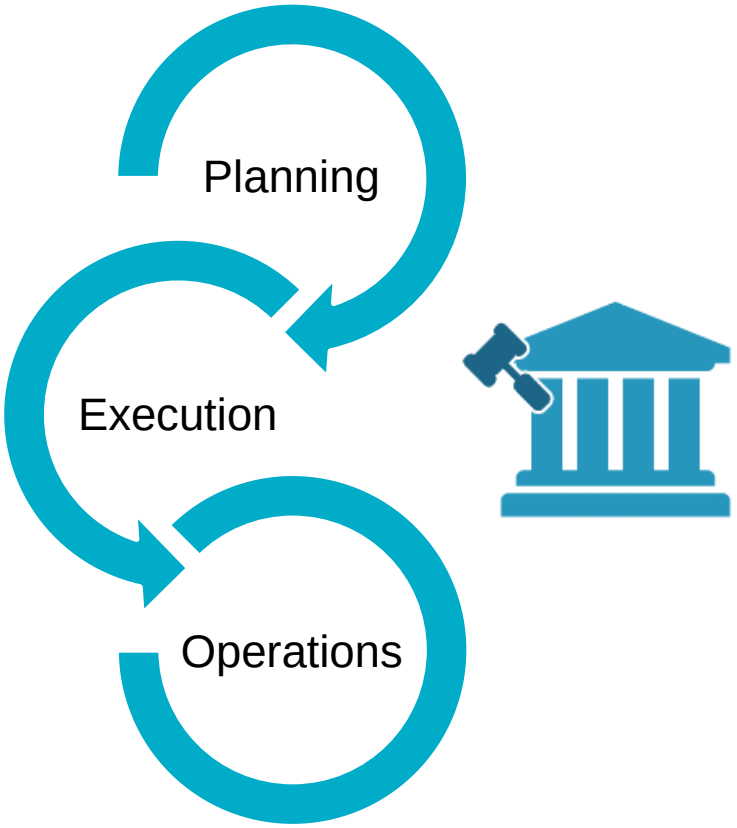
- **Technology refreshes are needed to support reliability**

- **Funding was approved in 2015 with ERCOT's fee request**

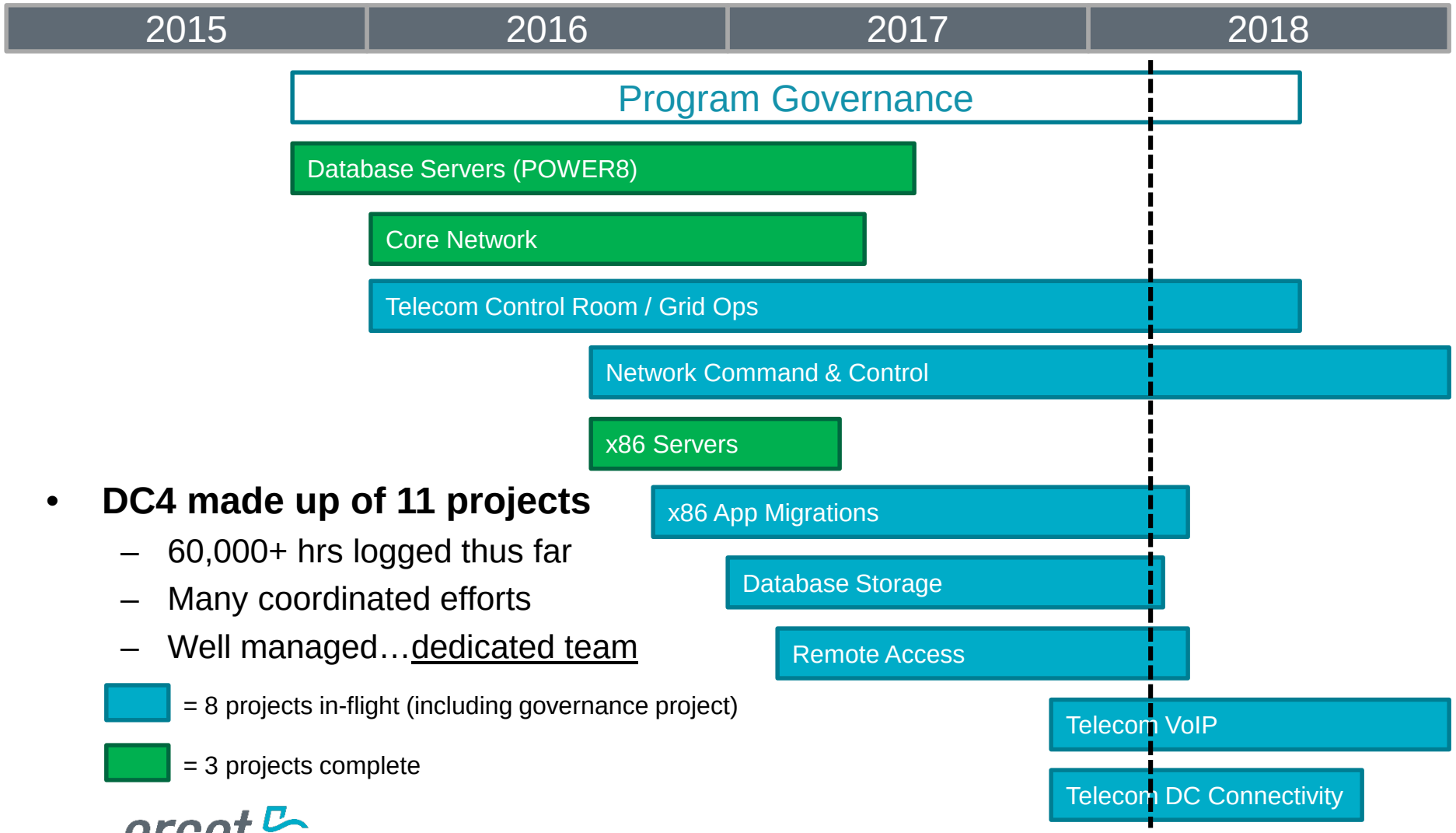
- **Scope defined to replace technology approaching end-of-life and support**
  - Includes Network, Telecommunications, Servers and Storage

Data Center Refresh : Approach

- **Governance Established**
  - Executive Steering Committee
  - CIO, COO, CFO and CCO
- **Plan Vetted**
  - Charter, scope and plan reviewed
  - Architected to improve resiliency
  - Third party review
  - Communication Plan
- **Procurement Best Practices Followed**
  - Vendor symposium
  - RFPs from competing vendors
  - Knowledge-based negotiation
- **Migration Process Validated**
  - Tested migration patterns and repeatable workflows



Data Center Refresh : Timeline



- **DC4 made up of 11 projects**
  - 60,000+ hrs logged thus far
  - Many coordinated efforts
  - Well managed…dedicated team

= 8 projects in-flight (including governance project)

= 3 projects complete

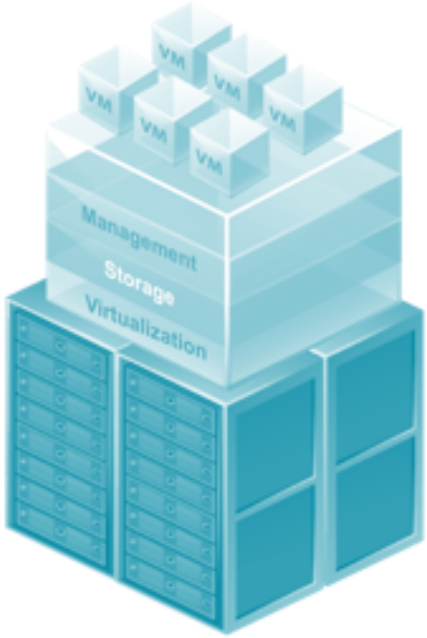
Data Center Refresh : Status

Scope	Schedule	Budget
Green	Green	Green

- **DC4 is tracking to plan**
  - No major risks or issues to report
  - 90% of new technology deployed
  - 85% of systems have been migrated
  - No “unplanned” outages

- **Approved budget is trending favorable**
  - 91% of new technology investments under contract
  - 74% of the $48 million budget spent thru 2017
  - Forecast to be on budget or slightly below budget

- **New technology is performing as expected**



Data Center Refresh : Migration Results

Improved Performance

- **Market Management Systems (MMS)**
  - Database Load from 18 to 9 min (50% faster)
- **Credit Monitoring & Management (CMM)**
  - Daily Calculation from 2 hr to 30 min (75% faster)
- **Wholesale (Settlements and Billing)**
  - DAM Settlement from 52 to 33 min (37% faster)
  - RTM Settlement from 30 to 12 min (60% faster)
  - Data Aggregation from 3 to 2 hr (33% faster)
- **Data Integration**
  - Transaction backlogs have been eliminated
- **Market Data Transparency (MDT)**
  - Several data extracts and reports reduced from 8+ to 4 hr (50% faster)

More Efficient Management

- **Infrastructure organized by Line-of-Business**
  - Grid, Commercial, Corporate, Mgmt and Telecom
- **Improved configuration management**
  - Hardware and firmware consistent across environments and patching practices simplified
- **Reduced the overall unit cost of hardware**

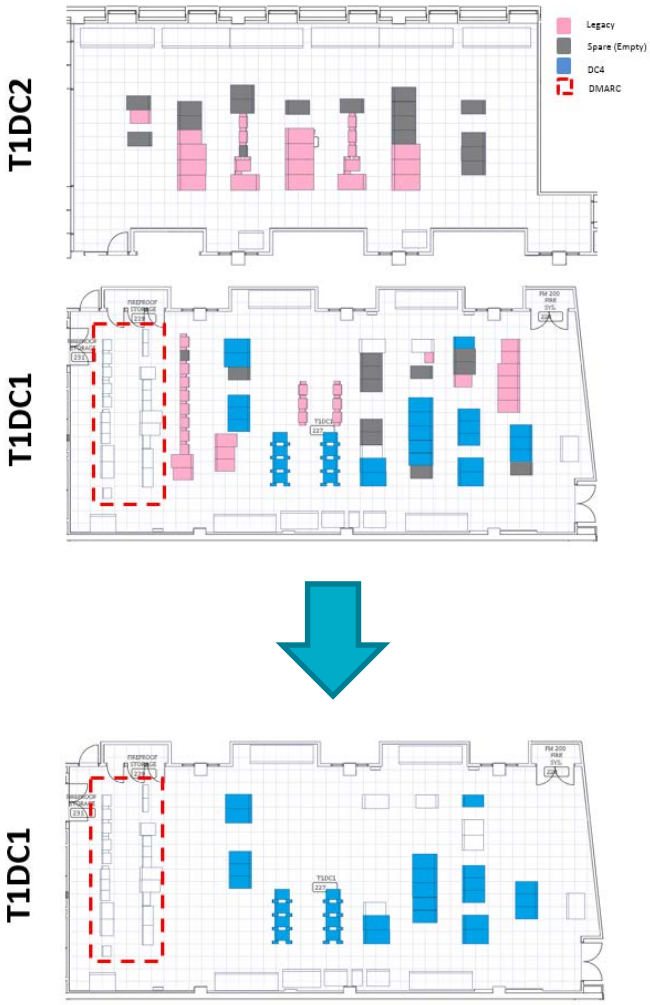
Type	Before $	DC4 $	% Change
x86 Sever	$1,442	$836	42% reduction
POWER Server	$25,820	$8,004	69% reduction
Storage	$6,840	$2,394	65% reduction

- **Reduced the overall hardware footprint**
  - Reduced physical server count by 400+ (we are now 91% virtualized across all environments)
  - Achieved a 2:1 data compression ratio moving to Flash Storage (i.e. solid-state drives)

Data Center Refresh : Floor Space Consolidation

- **Test Data Center floor space will be consolidated after migrations**
  - Fewer racks and servers
  - Reduced power and cooling requirement
  - Optimized space utilization
  - Increased resiliency and scalability
  - Estimated $40K reduction in annual power costs

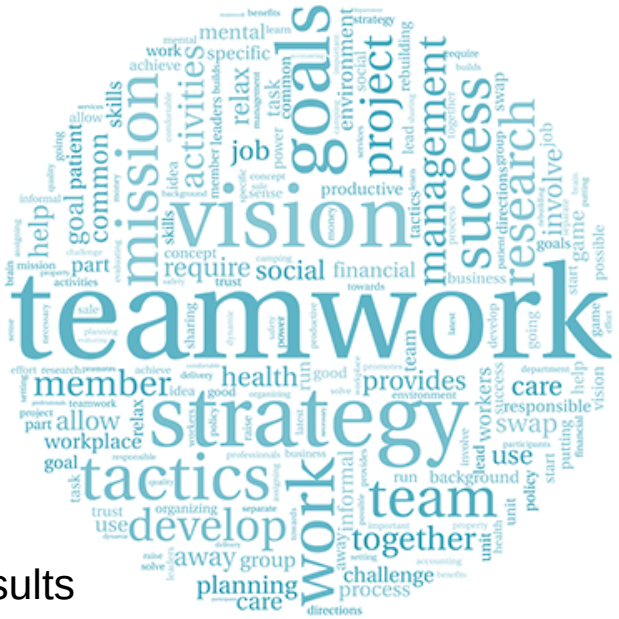
Metric	TCC1 Before DC4	TCC1 After DC4	Net
Rack Count (#)	161	56	Reduction of 105
Floor Space (Sq.ft)	5,401 Sq.ft	3,100 Sq.ft	Reduction of 2,301 Sq.ft
Power (kW) Requirement	165.9 kW	45 kW	120.9 kW reduction
Cooling (kW) Capacity	592 kW	261 kW	331 kW reduction
Power Cost (kWh/month)	$14,400 / mo.	$11,000 / mo.	Reduction of $3,400 / mo.



Data Center Refresh : Key Takeaways

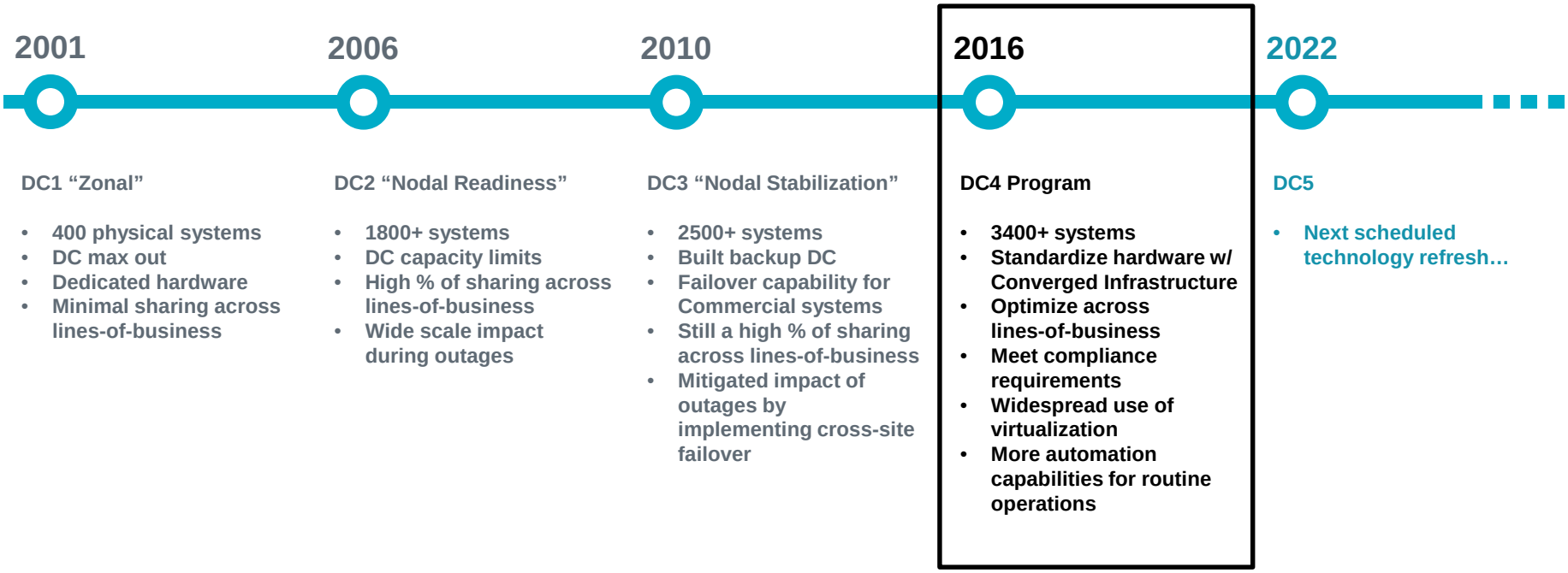
- **ERCOT plays a critical role and requires reliable technology**
  - ERCOT remains committed to its mission and operational excellence

- **DC4 is replacing ERCOT's aging IT Infrastructure**
  - Ensuring continued reliability and support
  - Minimizing impact of failures
  - Lowering operating and maintenance costs
  - Supporting future growth and new capabilities



- **DC4 is a Success Story!!**
  - Tracking on schedule, scope and budget
  - Team continues to successfully deliver on projected results
  - Planning to complete in 2018

Data Center Refresh : Roadmap



- **Finish DC4 in 2018…and start preparing for DC5**

Questions