Item 4.2: Operations Report (March – April 2018)

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Board of Directors Meeting

ERCOT Public
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Summary – March 2018

Operations

- The preliminary Settlements hourly peak demand of 46,799* MW on March 26 was higher than the day-ahead mid-term load forecast peak of 46,587 MW for same operating hour.
  - The operational instantaneous peak demand was 47,104 MW (telemetry).

- Day-ahead load forecast error for March was 2.11%

- ERCOT issued 11 notifications:
  - One Advisory issued for the delayed deadline for the posting of the DAM solution for Operating Day March 08,2018 due to long solution time
  - One Advisory issued for the delayed deadline for the posting of the DAM solution for operating day March 10, 2018 due to long internal price validation processing time
  - Two Advisories issued due to ERCOT's Voltage Security Assessment Tool is currently unavailable
  - One Watch issued due to a forced outage of Eagle Pass DC Tie
  - One Watch issued due to HRUC not completing for HE05 due to timeline deviation
  - Three Watches issued due to forced extension of Eagle Pass DC Tie
  - One Watch issued due to a post-contingency overload in Far West Texas
  - One Watch issued for the Rio Grande Valley due to local congestion in the Rio Grande Valley

Planning Activities

- 340 active generation interconnection requests totaling 68,477 MW, including 32,897 MW of wind generation, as of March 31, 2018. Six additional requests and an increase of 1,079 MW from February 28, 2018.

- 20,890 MW wind capacity in commercial operations as of April 1, 2018.

*Per Demand and Energy Report as of 05/07/18

Summary – April 2018

Operations

- The preliminary Settlements hourly peak demand of 47,885* MW on April 24 was higher than the day-ahead mid-term load forecast peak of 46,255 MW for the same operating hour.

  - The operational instantaneous peak demand was 48,359 MW (telemetry).

- Day-ahead load forecast error for April was 1.77%

- ERCOT issued 2 notifications:

  - One Watch issued for the Eagle Pass DC Tie due to a trip

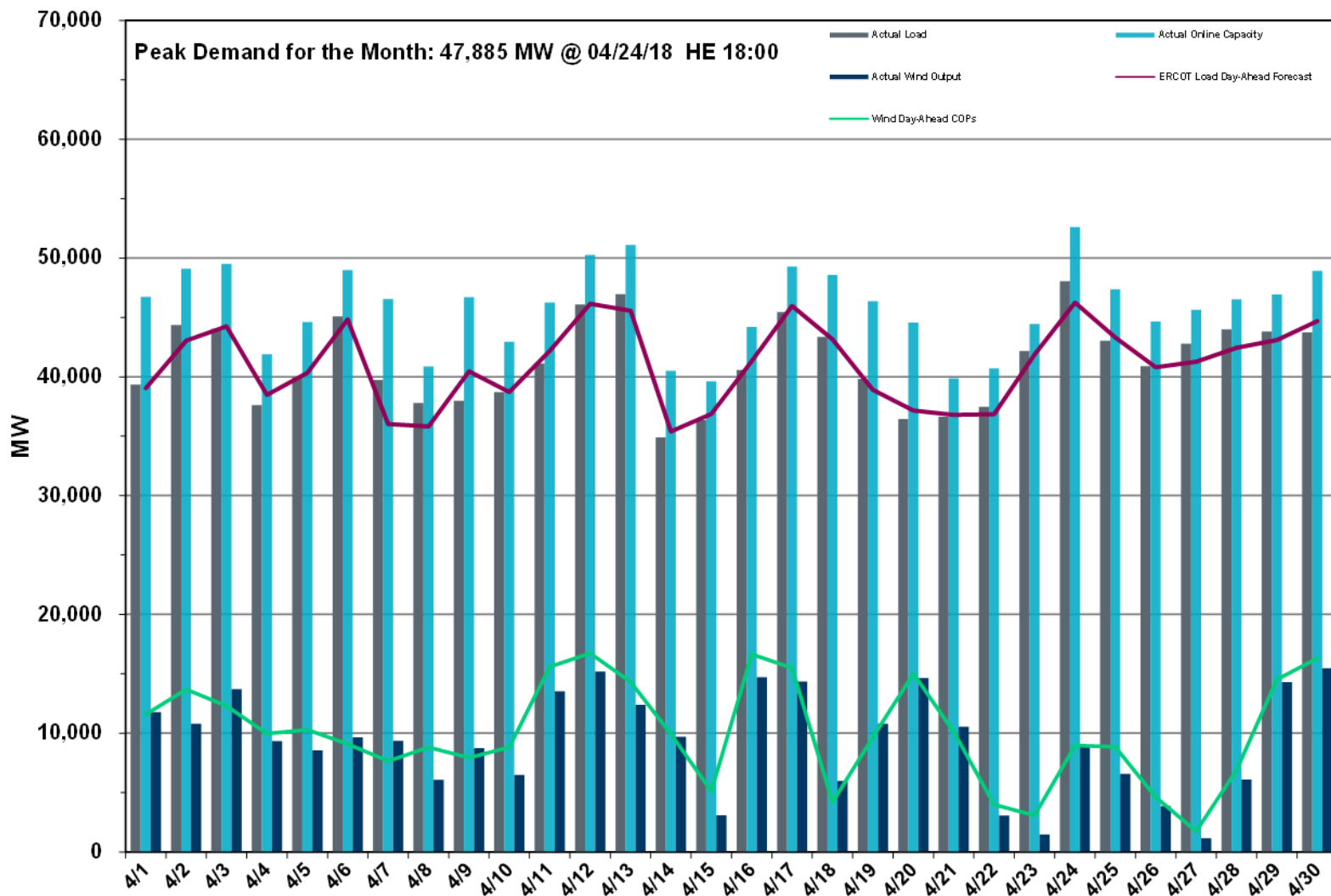 - One Watch issued for the Railroad DC Tie due to the Tie being de-rated to 150MW

Planning Activities

- 349 active generation interconnection requests totaling 71,620 MW, including 33,427 MW of wind generation, as of April 30, 2018. Nine additional requests and an increase of 3,143 MW from March 31, 2018.

- 20,890 MW wind capacity in commercial operations as of May 1, 2018.

*Per Demand and Energy Report as of 05/07/18

Daily Peak Demand: Hourly Average Actual vs. Forecast, Wind Day-Ahead COPs & On-Line Capacity at Peak – March 2018
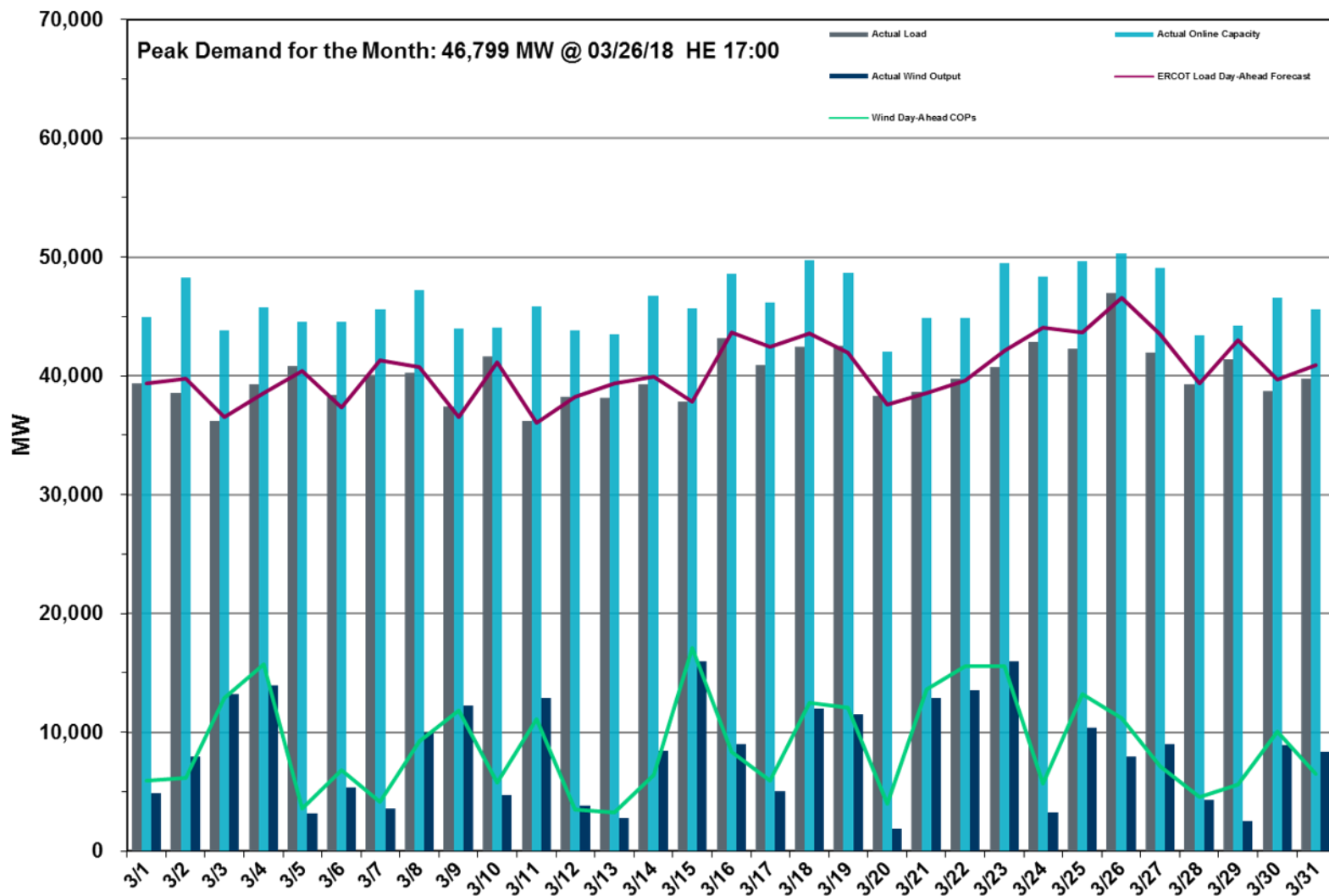
Peak Demand for the Month: 46,799 MW @ 03/26/18 HE 17:00

Daily Peak Demand: Hourly Average Actual vs. Forecast, Wind Day-Ahead COPs & On-Line Capacity at Peak – April 2018

Peak Demand for the Month: 47,885 MW @ 04/24/18 HE 18:00

Legend:
- Actual Load
- Actual Wind Output
- Wind Day-Ahead COPs
- Actual Online Capacity
- ERCOT Load Day-Ahead Forecast

Market Statistics – March 2018

Market Statistics	March 2017	March 2018	2017 Average	2018 YTD Average
Percentage of Real-Time load transacted in the Day-Ahead Market[1]	89%	91%	90%	91%
Average 'ERCOT Hub Average 345 kV Hub' Settlement Point Price in Day-Ahead Market ($/MWh)	24.14	23.06	26.63	30.54
Average 'ERCOT Hub Average 345 kV Hub' Settlement Point Price in Real-Time ($/MWh)	21.48	18.83	26.61	28.11
Average East Houston Fuel Index Price ($/MMBtu)	2.88	2.69	2.98	3.20

[1] The metric is defined as the net withdraw of DAM transactions at Load Zones (including energy purchases, sales, and point-to-point transactions) by Counter-Parties that represent physical Load, divided by the total real-time Load.

Market Statistics – April 2018

Market Statistics	April 2017	April 2018	2017 Average	2018 YTD Average
Percentage of Real-Time load transacted in the Day-Ahead Market[1]	89%	87%	90%	90%
Average 'ERCOT Hub Average 345 kV Hub' Settlement Point Price in Day-Ahead Market ($/MWh)	25.91	23.08	26.63	28.78
Average 'ERCOT Hub Average 345 kV Hub' Settlement Point Price in Real-Time ($/MWh)	27.91	21.96	26.61	26.65
Average East Houston Fuel Index Price ($/MMBtu)	3.12	2.83	2.98	3.11

[1] The metric is defined as the net withdraw of DAM transactions at Load Zones (including energy purchases, sales, and point-to-point transactions) by Counter-Parties that represent physical Load, divided by the total real-time Load.

Operational Performance Measures – March 2018

Performance Measure	Target Met	Further Information
Retail Transaction Performance *(Target 98%)*	*Yes*	• Retail transaction processing performance was near 100%.
Settlements Performance *(Target 99%)*	*Yes*	• 100% timely statement and invoice posting.

Operational Performance Measures – April 2018

Performance Measure	Target Met	Further Information
Retail Transaction Performance *(Target 98%)*	*No*	**93.50% - Days Affected: March 29, 2018 to April 6, 2018 - The receipt and processing of certain retail transactions were delayed due to a material system outage of a third-party service provider that processes transactions on behalf of some Load-Serving Entities (LSEs). The party experiencing the outage is not an ERCOT Market Participant or Vendor.
Settlements Performance *(Target 99%)*	*Yes*	• 100% timely statement and invoice posting

Operational Dashboard – March & April 2018

Metric	Trending as Expected	Further Information
Day-Ahead Schedule	*Yes*	• Normal level of market activity and liquidity • Loads appear to have hedged against exposure to Real-Time prices • The calculation method for the load hedging metric was updated starting in November 2017
Day-Ahead Electricity And Ancillary Service Hourly Average Prices	*Yes*	• Hourly average prices correctly reflect the opportunity cost of energy
Day-Ahead vs Real-Time Load Zone Settlement Point Price (Hourly Average)	*Yes*	• Day-Ahead & Real-Time prices for different Load Zones reflect relative transmission congestion
Day-Ahead vs Real-Time Trading Hub Settlement Point Price (Hourly Average)	*Yes*	• The average energy price across the system reflects marginal offers and scarcity pricing impacts
Day-Ahead Reliability Unit (DRUC) Commitment Monthly Summary	*Yes*	• Capacity committed by the DRUC process indicates the level of out of market activity needed Day-Ahead to maintain reliability • No Resources were committed in DRUC in this period

Operational Dashboard – March & April 2018

Metric	Trending as Expected	Further Information
Hourly Reliability Unit Commitment (HRUC) Monthly Summary	*Yes*	• Capacity committed by the HRUC process indicates the level of out of market activity needed during the Operating Day to maintain reliability • No resources were committed in March • One Resource was committed in April to resolve congestion
Supplemental Ancillary Service Market Monthly Summary	*Yes*	• Normal trend indicates that deliverability was not a major concern
Non-Spinning Reserve Service Deployment	*Yes*	• Non-Spin was deployed in April (4/11, 4/12, 4/25) due to address local voltage issues and congestion.
Congestion Revenue Rights Price Convergence	*No*	• CRRs continued the recent trend of having significantly higher DAM values than auction costs.

Operational Dashboard – March 2018

Metric	Trending as Expected	Further Information
Retail Transactions	Yes	• Seasonal variations in transaction volumes trending as expected.
Advanced Metering	Yes	• 98.6% of ERCOT load settled with 15-minute interval data. • 7.1M Advanced Metering System (AMS) Electric Service Identifier (ESIID)s included in settlement as of March 2018.
Settlement Dollars	Yes	• As of settlement of Operating Day 03/31/2018, the daily average settlement dollars for March 2018 are $12.66M, which is down from $13.61M in February 2018 and down from March 2017 which had an average of $13.34M.
Revenue Neutrality	No	• As of settlement of Operating Day 03/31/2018, Revenue Neutrality uplift is a charge of $17.14M, which is up from a $0.74M charge in February 2018 and down from a $26.24M charge in March 2017.
Market-Based Uplift to Load	No	• As of settlement of Operating Day 03/31/2018, the market-based uplift to load is a charge of $18.00M, as opposed to a $0.25M charge in February 2018 and a charge of $34.14M in March 2017.

Operational Dashboard – April 2018

Metric	Trending as Expected	Further Information
Retail Transactions	*Yes*	• Seasonal variations in transaction volumes trending as expected.
Advanced Metering	*Yes*	• 98.7% of ERCOT load settled with 15-minute interval data. • 7.1M Advanced Metering System (AMS) Electric Service Identifier (ESIID)s included in settlement as of April 2018.
Settlement Dollars	*Yes*	• As of settlement of Operating Day 04/30/2018, the daily average settlement dollars for April are $13.73M, which is up from $12.66M in March 2018 and down from April 2017 which had an average of $15.39M.
Revenue Neutrality	*Yes*	• As of settlement of Operating Day 04/30/2018, Revenue Neutrality uplift is a charge of $2.10M, which is down from March 2018 which was a charge of $17.14M and down from April 2017 which was a charge of $9.88M.
Market-Based Uplift to Load	*Yes*	• As of settlement of Operating Day 04/30/2018, the market-based uplift was a credit of $1.07M, as opposed to a charge of $18.00M in March 2018 and a charge of $25.76M in April 2017.

Select Project Highlights – (as of 05/23/2018)

Project	Trending as Expected	Further Information

CRR Framework Upgrade – Improves the ability to support and maintain the CRR system by upgrading the User Interface framework and its related components to current versions	*No*	The project is in Execution and not trending to schedule.
		• The team continues to address the outstanding defects and production readiness activities that delayed the production go-live.
		  ○ The delay is caused by increased time for defect resolution and retest cycles. Vendor is adding new roles to mitigate risk.
		  ○ The team is currently working with the vendor to address defects and to reforecast the project schedule; testing will continue through June 2018.
		• ERCOT has defined stability criteria that must be met before we declare readiness for go-live. ERCOT will provide the market with at least 60 days' notice prior to the production release once the stability criteria are met.

2015 CMM NPRRs and Tech Refresh – Combines CMM NPRRs, a technical refresh and new Treasury functionality into a single project to gain efficiencies	*Yes*	The project is in Execution and is trending to schedule and budget.
		• Phase 1 is in Execution and includes delivery of the CMM technical refresh along with the majority of the Credit-related NPRRs. This Phase is tracking to revised schedule and budget targets.
		  ○ Phase 1A is complete (NPRRs 648, 683, 743, 760 and 800 via the existing CMM application).
		  ○ Phase 1B development and FAT efforts continue to focus on delivery of the technical refresh along with related in-scope NPRRs. Go-live planned for R6 2018 (December).
		• Phase 2 (NPRR829) planning will commence Q3 2018.
		• Phase 3 planning will commence upon completion of Phase 2.

SCR781 RARF Replacement – Allow Market Participants to electronically submit, review, and make online changes to data ERCOT requires of them. This is the first phase of a multi-phased project approach. Phase 1 will define the overall requirements, but only focus implementation on resource asset and network modeling data collected via ERCOT's Resource Asset Registration Form (RARF)	*No*	The project is in Execution and trending behind schedule and under budget for Stage 1.
		• Multiple stages will be delivered on this initiative with the first stage tracking for delivery in Q4 2018 now.
		  ○ This initiative along with the GINR project is being delivered within a single framework known as RIOO (Resource Integration and Ongoing Operations).
		  ○ Due to the resource dependency on GINR the timeline for this effort has been extended. ERCOT is currently pursuing alternate resourcing approaches and we anticipate having an updated staffing plan by Aug 2018.
		  ○ Critical architecture work (e.g. data architecture, technical architecture) is in progress and progressing on schedule.
		  ○ Some components of development (front-end and integration systems) were originally planned to start late first quarter or early second quarter but are now rescheduled to begin in the fourth quarter to accommodate the Generation Interconnect (GINR) project resource needs.

Select Project Highlights – (as of 05/23/2018) – continued

Project	Trending as Expected	Further Information
Training Facility – Construct and furnish the Training Facility. The scope of the project includes building construction, roads and walks, Landscaping, IT infrastructure, telecommunications and furnishings	Yes	The project is in Execution and tracking to approved schedule and budget. • Structural steel in progress • The team continues to work with the Building Architect and 3rd party vendors to finalize interior finishes. • Video Wall selected and ordered (shipping estimated at 16 weeks) • Corporate Wireless project scope extended to include Training Facility
Identity & Access Management – Replaces the current identity and access management (IAM) system, improving access control and the user experience	Yes	The project is in Execution phase and is tracking to approved schedule and budget. • Migration to iTest in progress • Integration with Workday on track • Role data mining in progress • User Interface updates on track • Functional and integrated testing begins in June
IT Change and Configuration Management Phase 2 –Identify and address critical improvements of the initial IT Change and Configuration Management implementations to increase throughput, reduce complexity, and fulfill support for the remainder of ERCOT's non-NERC classified systems	*Yes*	The project is in the Execution Phase and tracking to the revised schedule and budget • Operations support alignment with production deliveries in progress • Operating systems and software discovery for data center environments in progress • Integration between the Change Management and Configuration Management applications in progress • Development and functional testing for Infrastructure and Application workflows completed • Report development and delivery on track

Select Project Highlights – (as of 05/23/2018) – continued

Project	Trending as Expected	Further Information

Data Center 4.0 Optimization (DC4) Program – Replace the aging data center infrastructure with modernized infrastructure technologies to minimize the impact of failures, support future business growth, deliver highly automated next-generation infrastructure services, and ensure sustained reliability	*Yes*	The remaining active DC4 projects are tracking to the approved schedule and budget:
		
		• Telecom-Control Room & Grid Ops Project (Execution) – Control Room builds are underway with the Go-Live occurring at the latter part of June.
		
		• Network-Command & Control Project – includes the purchase and deployments of network load balancing appliances, network logging systems, and a network analysis tool:
		  o Stage 1 (Closing) – the load balancing solution has been deployed for the global network.
		  o Stage 2 (Execution) – the deployment of the new logging system is underway, with the Go-Live occurring in late August.
		  o Stage 3 (Execution) – the deployment of the new network analysis tool is underway, with the Go-Live occurring in mid-August. The local network load balancing solution deployment will be completed in late September.
		
		• Application Migration Project – an eight stage migration project, where application and databases from legacy systems are migrated to the new converged infrastructure systems:
		  o Stage 1 (Closing) – virtual-to-virtual (V2V) system migrations for this stage have been completed.
		  o Stage 2 (Closing) – physical-to-virtual (P2V) system migrations for this stage have been completed.
		  o Stage 3 (Closing) – application migrations that require IP address changes under this stage have been completed.
		  o Stage 4 (Execution) – SQL database cluster builds, with their associated database migrations, for this stage have been completed. This stage will move to Closing in late May.
		  o Stage 5 (Closing) – Legacy Linux systems that require P2V migrations for this stage have been completed.
		  o Stage 6 (Execution) – Migration of all MSE related applications is being planned, with the migration completion schedule for late July.
		  o Stage 7 (Closing) – network attached storage file system migrations have been completed.
		  o Stage 8 (Execution) – this stage includes the remaining project migrations that are not part of the first 7 stages. At the current time, all migrations for this stage have been completed, but this stage will remain open for any additional migrations needed that were not planned in the first 7 stages.

Select Project Highlights – (as of 05/23/2018) – continued

Project	Trending as Expected	Further Information

Data Center 4.0 Optimization (DC4) Program – Replace the aging data center infrastructure with modernized infrastructure technologies to minimize the impact of failures, support future business growth, deliver highly automated next-generation infrastructure services, and ensure sustained reliability	*Yes*	The remaining active DC4 projects are tracking to the approved schedule and budget:
		
		 • Storage-DB Install and Migration – includes the purchase and deployment of database storage hardware and the migration of databases and file systems:
		
		     o Stage 1 (Closing) – All new database storage, backup database appliances, and upgrades to the existing tape backup system have been deployed.
		
		     o Stage 2 (Execution) – migrations of all databases and files systems are complete, with storage hardware decommissions near complete. The storage monitoring solution will be deployed in late May. The DB Snap Manager solution deployment will be completed in mid-June.
		
		 • Remote Access (Execution) – The remote access production builds are complete. Operational Testing is near complete. Production cutovers to the new remote access system have been completed.
		
		 • Telecom-Corporate Voice System – includes the purchase and deployment of the voice firewall systems and the enterprise voice over IP solution:
		
		     o Stage 1 (Closing) – the voice firewall systems deployment have been completed.
		
		     o Stage 2 (Planning) – this stage includes the purchase and deployment of the voice over IP solution and will be in planning until mid November.
		
		 • Telecom-Data Center Connectivity (Execution) – the purchase of the replacement hardware responsible for connecting the fiber channel network between data centers is complete. Installation of this equipment will begin in August.
		
		 • MV90 Hardware Refresh (Planning) – this project is currently planning the replacement of the MV90 smart meter telemetry system. Planning will end in mid-July.

Appendix

The *ERCOT Monthly Operational Overview* is posted on or about the 15th of the following month to (http://www.ercot.com/committees/board/)