System Operations and Integrity Management

Kern River Gas Transmission Company
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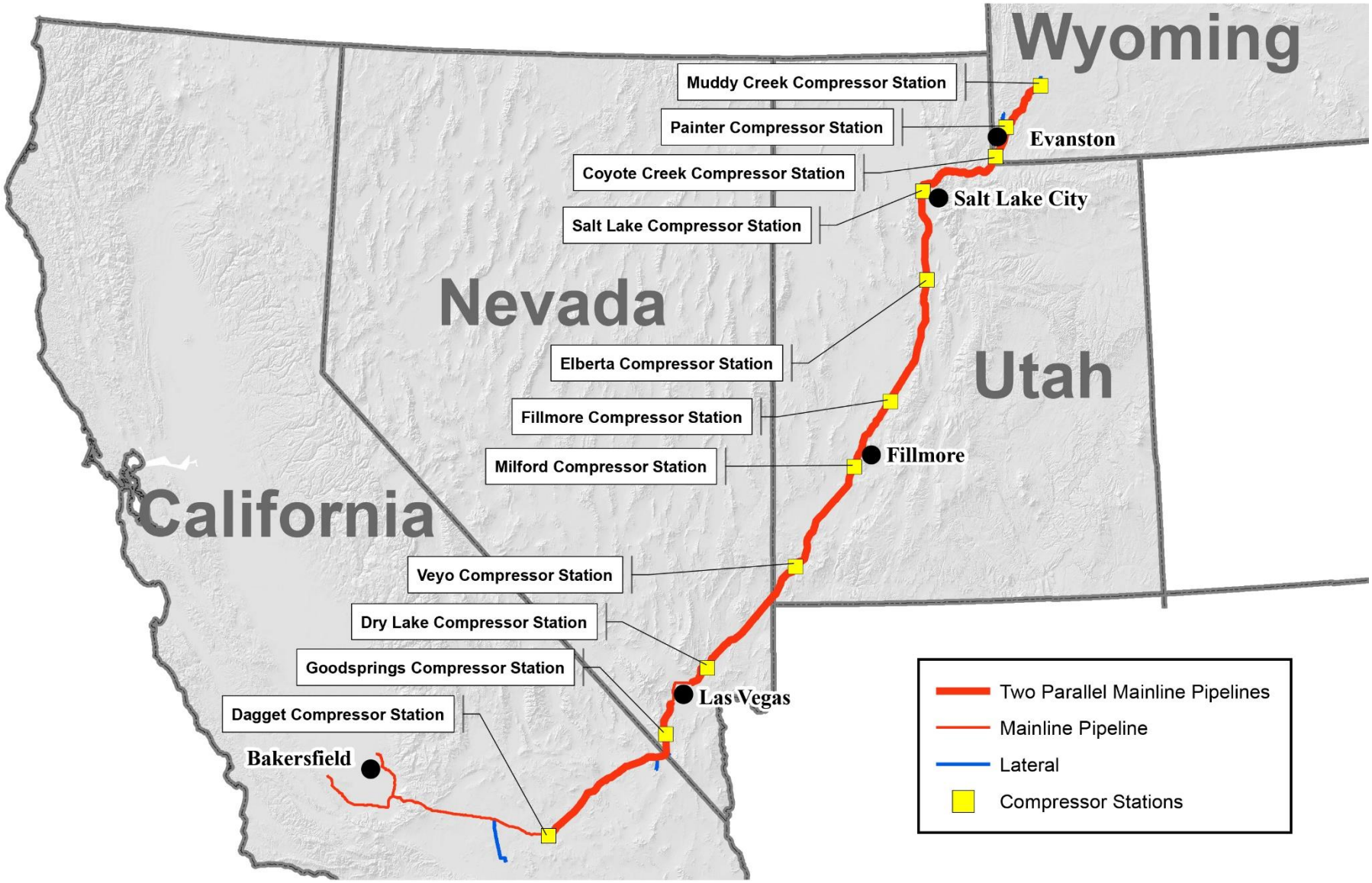
Kern River
GAS TRANSMISSION COMPANY
A BERKSHIRE HATHAWAY ENERGY COMPANY

Pipeline System



Kern River

- Started serving customers in February 1992
- Operates an interstate natural gas pipeline extending from southwest Wyoming to Southern California:
  - Approximately 1,717 miles of natural gas pipeline, of which more than 1,300 miles is 36-inch diameter pipe
  - 2.17 billion cubic feet per day design capacity
  - 11 compressor stations totaling 383,500 horsepower
  - 20 receipt meter stations
  - 83 delivery meter stations
- System designed and constructed using modern steel, fusion-bonded epoxy coating and state-of-the-art corrosion control and automation technology
- During its 30-year history, Kern River has experienced only one event that caused a significant impact to primary firm service
  - The event occurred due to improper design of support structures at a relief valve installation on the Kern River-Mojave Common Facilities
  - Following the event, Kern River reviewed all other relief valve installations and determined there were no issues

Mainline System History

Original System	724,449 Dth/d
2002 Expansion	124,500 Dth/d
2003 Expansion	906,626 Dth/d
2010 Expansion	145,000 Dth/d
Apex Expansion	266,000 Dth/d
Total system design capacity	2,166,575 Dth/d

System Advantages

- 100% of the Kern River system is looped from Opal to the North Las Vegas area and from south of Las Vegas to the Daggett area; the Kern River-Mojave Common Facilities 42-inch mainline is also looped for 82.2 miles of the total 118.5 miles
  - Gas flows down one of the two pipelines when a segment is taken out of service during outages
- Kern River accesses multiple supply basins through 19 receipt points
  - Multiple receipt points in southwestern Wyoming provide access to gas supplies in the Rocky Mountains
    - Kern River also has indirect access to western Canada, San Juan Basin and Denver-Julesberg Basin gas supplies
  - Goshen receipt point provides access to gas supplies in the Piceance Basin in Colorado and Uinta Basin in Utah
  - Salt Cove receipt point provides access to bio-gas produced in central Utah
  - DagMoj receipt point provides access to gas supplies in the Permian, Anadarko and San Juan Basins via Mojave Pipeline
  - 17Z Oxy receipt point provides access to Elk Hills gas supply in California
  - Freemont Peak receipt point provides access to gas supplies that can be received from PG&E's intrastate pipeline system

Supply Flow Options

System Operations

- Gas control center
  - Located in Salt Lake City and staffed 24/7
  - A fully functional off-site redundant control center is maintained and available if evacuation of the Salt Lake gas control center is required
- SCADA system
  - All compressor station, meter station and automated mainline valve equipment remotely monitored and controlled from Kern River's gas control center
    - Accelerates the response time to an emergency and minimizes the potential impact to Kern River operations and to the public
- Real-time model
  - Monitors system efficiency
  - Is integrated with Kern River's SCADA system
  - Helps identify potential problems on the pipeline system
- Rigorous gas quality monitoring and Kern River tariff enforcement
  - Gas control monitors and strictly enforces gas quality requirements
  - Monitoring and control of gas quality is a part of Kern River's internal corrosion prevention program

System Operations

- Mainline valves
  - 80% of mainline valves located in looped segments are connected to both the mainline and loop line upstream and downstream of valve settings
    - Allows Kern River to bypass sections of the pipeline for maintenance or repair activities while maintaining service on remainder of the system
    - Reduces impact to flows during pipeline outages
  - Automated and remotely operated valves located in high consequence areas accelerate the response time to an emergency and minimize the potential impact to Kern River operations and to the public
- Meter stations
  - Connected to both mainline and loop line
  - Automatic switchover from either line as necessary
- Backhaul
  - If necessary, Kern River has backhaul flow capabilities from multiple California receipt points to meter stations located in Southern California, Nevada and Utah, which enhances Kern River's operational reliability

Compression

- Compressor stations
  - All turbine engines are sourced from the same manufacturer
  - There are one to six compressor units at each station
  - The Muddy Creek facility has two independent compressor stations, which reduce impacts to operations during outages
- Compressor maintenance
  - Preventive – each compressor engine is maintained and inspected annually and replaced after approximately 35,000 operating hours
- Maintenance modeling
  - Modeling is completed for each station in advance of individual unit outages to reduce the impact to system flows
- Spare turbine engine
  - In the unlikely event of a turbine engine failure Kern River has a spare engines that are compatible with 22 of 25 units on the system
  - The spare turbine engine can be placed into service in 48 to 72 hours
- Kern River has a service agreement with the turbine/compressor manufacturer for emergency events
- Extensive spare parts inventory for compression and pipeline needs
  - Critical and long-lead-time items
  - Warehoused along the pipeline system

Pipeline Integrity Programs

- Integrity management
  - Continuous effort to improve pipeline system integrity while minimizing impacts to the environment, the public and employees
  - Meets or exceeds requirements of U.S. Department of Transportation code
  - Process includes preventive and mitigative measures, data integration, threat identification, risk assessment, integrity assessments (in-line inspection and direct assessment) and remediation, identification of high consequence areas and management of change
- Corrosion control
  - Cathodic protection system to prevent corrosion and metal loss on the pipeline
  - Alternating current mitigation to prevent pipeline corrosion in areas with close proximity to high voltage power lines
  - Interference bonds from third-party facilities to reduce corrosion risk from stray currents
  - Internally coated pipe helps with prevention of internal corrosion

Internal Pipeline Inspections

- In-line inspections (ILI)
  - 99.7% of Kern River's pipeline system is capable of in-line inspections
    - All portions of the Kern River main line and loop line are inspected at four-year intervals
    - Kern River's use of a magnetic flux leakage and caliper tool with speed control increases accuracy and detection capability for internal and external metal loss of the pipeline wall and identification of pipe wall anomaly features such as internal corrosion, external corrosion and dents
    - Kern River compares data between consecutive in-line inspection runs on each segment to define any changes
    - Assists in identifying anomalies for excavation and direct examination
    - Measures pipeline wall deformation features including dents, ovalities and wrinkles
    - A control valve on the tool minimizes the impact on operation of the system during in-line inspection tool runs
  - In 2021, Kern River began its fifth round of inspections since 2004

Pipeline Inspections and Programs

- Close-interval surveys
  - Completed in conjunction with in-line inspections at four-year intervals
    - Verifies that cathodic protection system is protecting the pipeline from corrosion
    - Detects electrical interference
    - Identifies potential shorted casings and other potential interference issues with the cathodic protection
  - Kern River has completed three rounds of systemwide close-interval surveys since 2009
- Pipeline depth-of-cover surveys
  - Completed in conjunction with in-line inspections at four-year intervals to ensure the pipelines are adequately covered
- External and internal corrosion direct assessments
  - Addresses portions of the system that are not capable of in-line inspection
  - Assessments are completed at seven-year intervals to identify and address potential issues

DC Voltage Surveys and Excavations

- Direct current voltage gradient (DCVG) surveys
  - Completed at four-year intervals in areas where temperature conditions could adversely impact pipeline coating integrity
    - Locates coating defects and identifies areas for direct examination and coating repair
    - Improves the condition of pipeline coating and reduces the threat of corrosion
- Excavation campaign
  - More than 750 physical pipe integrity excavations have been completed to verify the integrity of the pipeline since September 2004
    - Confirms the in-line inspection tool is accurate
    - Inspects anomalies identified by in-line inspections and performs repairs if necessary
    - Inspects coating conditions and repairs pipeline coating if necessary
    - Completes direct examinations of pipeline segments that are not capable of in-line inspection

Monitoring and Prevention Programs

- Patrols are conducted to monitor physical surroundings of the pipeline and third-party activity along the pipeline system
  - Aerial patrols are completed two times per month
  - Ground patrols are completed five days per week in Las Vegas
  - Ground patrols are completed three to five days per week in the Salt Lake City area
- Damage prevention
  - Common Ground Alliance best practices are integrated into Kern River's policies and procedures
  - Strict encroachment monitoring policies require a Kern River representative on site when a third party is working in Kern River's easement
- Public awareness program
  - Provides pipeline safety and damage prevention awareness to various stakeholders:
    - General public
    - Public officials
    - Emergency responders
    - Contractors