Caprock CO$_2$ Flood

2015 CO2 Conference

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Dec 11, 2015
Forward-Looking Statement

Statements made by representatives of Legacy Reserves LP (the “Partnership”) during the course of this presentation that are not historical facts are forward-looking statements. These statements are based on certain assumptions made by the Partnership based on management’s experience and perception of historical trends, current conditions, anticipated future developments and other factors believed to be appropriate. Such statements are subject to a number of assumptions, risks and uncertainties, many of which are beyond the control of the Partnership, which may cause actual results to differ materially from those implied or expressed by the forward-looking statements. These include risks relating to financial performance and results, availability of sufficient cash flow to pay distributions or make payments on our notes and execute our business plan, prices and demand for oil and natural gas, our ability to replace reserves and efficiently exploit our current reserves, our ability to make acquisitions on economically acceptable terms, and other important factors that could cause actual results to differ materially from those anticipated or implied in the forward-looking statements. Please see the factors described in the Partnership’s Annual Report on Form 10-K for the year ended December 31, 2013 in Item 1A under “Risk Factors” and subsequent filings with the Securities and Exchange Commission. The Partnership undertakes no obligation to publicly update any forward-looking statements, whether as a result of new information or future events.

Any reserve information pertaining to assets acquired after December 31, 2013 and presented herein is based on our internal evaluation and interpretation and has not been independently verified or estimated.
Legacy Ownership WI/NRI:
Rock Queen: 99.95%/79.3%
Drickey Queen: 100%/78.1%

Field discovery: 1940
Waterflood Started: 1959
CO2 Flood Started: 2011
Queen Sand @ 3100’
Net Pay 12-20’
Porosity ~20%

Field Area: 7100 Acres
Total Field OOIP ~ 140 MMBO
RQU + DQU ~ 110 MMBO
PUD OOIP: 90.0 MMBO
PRB OOIP = 20.0 MMBO
1. HIGH QUALITY RESERVOIR
2. EXCEPTIONAL CONTINUITY OF PAY
3. IMPERMEABLE SEAL ABOVE AND BELOW
4. GREAT RESPONSE TO DATE
5. FIELD ONLY 25% DEVELOPED
6. CURRENT CHALLENGES (COMPRESSION AND CAPTIAL)
7. REMEDY AND PLAN FORWARD
Great Waterflood Response => Highly Connected, Quality Reservoir

Combined Primary and Secondary Production History (Rock and Drickey Queen Units)

- **Initiated waterflood in Caprock Field in 1956**
- **Peak oil rate >8,400 BO/d**
- **2016 CO₂ injection planned in Drickey Queen Unit**
- **CO₂ injection begins in Rock Queen Unit**
- **Historical**
- **Projected**

**Primary 1953 - 1959**
- 18% of OOIP
- ~16 MMBO

**Secondary Production 1960 - 2011**
- 18% of OOIP
- ~16 MMBO

**CO₂ 2011+**
- 12.5% of OOIP
- ~11 MMBO

**Tertiary**
- 49% of OOIP
- ~43 MMBO
Geology Discussion

Strike/Dip
RQU 320 core
1’ contour pay map
QUEEN SAND STRUCTURE

Regional strike: ~ 26 deg.
Dip: ~ 45'/mile or ~ 1/2 degree southeast
QUEEN SAND: thickness of high porosity sands

NET PAY > 20% POROSITY
RQU 320 Core
18% Avg Porosity
172mD Avg Perm

Anhydrite top seal
High Quality Sand Pay
Tight Siltstone bottom seal
QUEEN SAND MAIN PAY ZONE

DENSE ANHYDRITE = CAPROCK + TOP SEAL

SHARP, EROSIONAL CONTACT

MAIN PAY SAND phi = 26.5, k = 768, So = 9.6

INTERBEBDED SAND/ANHYDRITE

LOWER PAY SAND

REMNANT LOW ANGLE LAMINATED BEDDING IN SS

DENSE ANYDRITE = BASAL SEAL

DENSE SILSTONE/ANHYDRITE

TOP

BASE
UV light oil saturations

MAIN PAY SAND, THICK, MASSIVE, CONTINUOUS
LOG DEPTH 3057-3062

INTERMEDIATE ZONE, ANHYDRITE CEMENT
LOG DEPTH 3062-3067

LOWER PAY SAND, MASSIVE WITH MINOR ANHYDRITE
LOG DEPTH 3067-3070

LOWER POROSITY ZONE, ANHYDRITE INTERBEDS
LOG DEPTH 3070-3073
Caprock Field
Chaves County, NM
W-E Stratigraphic X Section 1
Rock Queen Unit
Datum: Seven Rivers Marker
Drickey Queen Unit W-E: Excellent Continuity

**Caprock Field**
Chaves County, NM

**W-E Stratigraphic X Section 1**
Drickey Queen Unit

Datum: Seven Rivers Marker
S-N through RQU and DQU: Excellent Continuity

Caprock Field
Chaves County, NM

S-N Stratigraphic X Section 1
Drickey and Rock Queen Units

Datum: Seven Rivers Marker
Development Pattern OOIP

Average Pattern Values:
Net pay = 16.0’
Porosity = 16.5%
Soi = 70%
Area = 80ac.
Bo = 1.15

Avg OOIP = 1.009 MMBO per pattern
Total OOIP in Proved flood area = 88.8 MMBO

Legacy sees 10-15% upside to OOIP based on further mapping, core analyses and flood performance.
Typically two 3/8” external capstrings are banded to the tubing string.

Clean CO2 is injected down one capstring for gas lift operations. Port for gas lift is typically just above the pkr.

Fresh water and/or chemical is injected down the other capstring to prevent tubing restrictions (i.e. salt plugs, paraffin buildup, etc.). FW/chemical is typically injected down thru the pkr and out the bottom of the tailpipe.
Reservoir Model

Analog curves
Dimensionless model
History match
Surveillance
Analog Field Data: Sandstone Reservoirs

- Continuous pay, no faulting or natural fractures, similar perm, porosity and thickness to Caprock.

- Caprock tertiary endpoint RF of 12.5% is conservative compared to the top four analogs.

- Two analogs nearby in Permian, three in OK, one in MS, four in Rockies.

<table>
<thead>
<tr>
<th>Field</th>
<th>Reservoir</th>
<th>OOIP (MMBO)</th>
<th>Depth (ft)</th>
<th>Thickness (ft.)</th>
<th>Porosity (%)</th>
<th>Perm (md)</th>
<th>Swi (%)</th>
<th>Recovery Factors</th>
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<tbody>
<tr>
<td>Caprock</td>
<td>Queen Sand</td>
<td>88.8</td>
<td>3100</td>
<td>16</td>
<td>20%</td>
<td>100</td>
<td>30%</td>
<td>49%</td>
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<tr>
<td>Monell Unit</td>
<td>Almond Sand</td>
<td>100</td>
<td>4500</td>
<td>25</td>
<td>20%</td>
<td>30</td>
<td>40%</td>
<td>59%</td>
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<tr>
<td>Two Freds East</td>
<td>Bell Canyon</td>
<td>51</td>
<td>4820</td>
<td>18</td>
<td>20%</td>
<td>33.4</td>
<td>43%</td>
<td>59%</td>
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<tr>
<td>North Ward Estes</td>
<td>Yates/Queen</td>
<td>1250</td>
<td>2600</td>
<td>100</td>
<td>16%</td>
<td>37</td>
<td>50%</td>
<td>53%</td>
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<tr>
<td>Postle</td>
<td>Upper Morrow</td>
<td>300</td>
<td>6100</td>
<td>28</td>
<td>16%</td>
<td>65</td>
<td>40%</td>
<td>51%</td>
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</tbody>
</table>
Reserves Overview: 12.5% Analog Curve

**Net Reserves:**
- PDP = 2,200 MBO @ 12.5% RF
- PUD = 5,700 MBO @ 12.5% RF
- PRB = 1,861 MBO @ 12.5% RF
- Total = 9,761 MBO

**Pattern Count by Reserve Class**
- PDP: Phase 1/Pilot = 27
- PUD: Phase 2-6 = 61
- Total Proved = 88
- PRB: Phase 7-8 = 20
- Total Proved+PRB = 108
Pat 87 early inefficiencies due to 40 acre injectors, now stopped.
RQU Patterns: Actual vs Model

- Model 12.5% RF
- Average curve for 29 patterns (N&S HCPV)
RQU Patterns: Actual vs average curves
Pats 308 and 309 have no northern producer yielding high GOR.
Caprock Field WAG Ratio

RQU Patterns

Challenge #1
Taking Min CO2 to Lower Capex

Wag ratio Nov ~1.0

Total Injection, %HCPV

29 Pats Actual
Challenge #2

- Compressor Downtime
- Curtailed CO2 Purchases
- Gas Lift Inefficiencies
- Proc rate lower 2015
RQU Dimensionless Oil Recovery

RQU CO2 Patterns: Actual vs Model

Cum Incremental Oil Recovery, %OOP

Total injection, %HCPV

- 29 PATT Incr Oil RF
- Model 12.5%
Current Challenges

- COMP. DOWNTIME => LOWER PR RATE
- MIN. CO2 PURCH => HIGHER WAG RATIO
- 2 WELLS DOWN W/ CASING LEAK
- GLVOLS TOO HIGH => LOWER PR RATE
Model Results: History Match RQU Oil

Close match on CUM volumes since CO2 flood inception

- Model is working
  - GOR under control
  - Utility good
  - Newer patterns outperforming
- Solve current issues
- Get back on rate time curve
Caprock 2015 Compressor Monthly Percent Runtime

BIGGEST CURRENT ISSUE

- Comp 1
- Comp 2
- Comp 3
- Target

Graph showing monthly percent runtime for three compressors (Comp 1, Comp 2, Comp 3) and a target line. The graph highlights the biggest current issue.
Fixing Compressor Downtime

Current compression:

Comp #1 – 6 MMCFD Rental Unit
Comp #2 – 6 MMCFD Rental Unit
Comp #3 – 16 MMCFD Rental Unit

April 2016 Compression

Comp #1 – Released
Comp #2 – Released
Comp #3 – 16 MMCFD Lease to Own w/ US Bank
Comp #4 – 25 MMCFD – Lease to Own w/ US Bank

W/O Rental Co For Repair

Company Mechanic repairs on site

OH YEAH!
Total Model Overview: Proved RQU+DQU

Caprock Total PDP + PUD

- Oil-Model
- CO2 Recycle-Model
- CO2 Purch-Model
- Oil - Actual
- DCQ
- CO2 Purch - Actual
- Pat CUM
- Comp Capacity
APPENDICIES
Northwest Shelf Depositional Environment

Summary

- Northwest Shelf reservoirs consist primarily of dolostones, limestones and sandstones deposited in restricted shallow-marine shelf or back-reef environments.
- Carbonate and evaporate deposition dominated during sea-level highstands; siliciclastic deposition dominated during lowstands.
- Traps are largely stratigraphic, formed by evaporitic or dolomitic / anhydrite updip porosity plugs.
- In the Upper San Andres, Grayburg and Upper Guadalupian formations, reservoirs are principally oriented along an east to west trend in northern Eddy and central Lea Counties.

<table>
<thead>
<tr>
<th>System</th>
<th>Northwest Shelf</th>
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<tbody>
<tr>
<td>Permian</td>
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<td>Rustler</td>
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<tr>
<td></td>
<td>Salado</td>
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<td></td>
<td>Tansill</td>
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<tr>
<td></td>
<td>Yates</td>
</tr>
<tr>
<td></td>
<td>Queen</td>
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<tr>
<td></td>
<td>Grayburg</td>
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<td></td>
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<td>Blineberry</td>
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<td></td>
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<td></td>
<td>Atoka</td>
</tr>
<tr>
<td></td>
<td>Morrow</td>
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</table>
Overview

- Add 10 full patterns in Drickey Queen Unit
- Add 5 partial patterns in Rock Queen Unit
- Add 28 producers
- Add 15 injectors
- Lay Trunk Lines to DQU
- Satellite & Battery work
- Well work – drilling and conversions
- Lay flow lines and lateral lines for patterns

Total Capital for Phase 2 Expansion

- **$19.2 MM** - Total Phase 2 Expansion Capital
- **$10.1 MM** – Facility Capital
- **$9.1 MM** – Well Work Capital

Facilities Capital Detail

- **$1.0 MM** - Install trunk line
- **$0.5 MM** – Upgrade and expand DQSU Battery
- **$0.7 MM** - Build 1 new satellite and expand 1 existing satellite
- **$6.8 MM** – Install individual well flow/injection lines
- **$1.0 MM** – Install Compressor
- **$0.1 MM** – Upgrade vent at RQU Battery

Well Work Capital Detail

- **$4.2 MM** - Drill 13 Producers
- **$3.0 MM** - Drill 10 Injectors
- **$0.5 MM** – Convert 5 WIW to Producers
- **$0.3 MM** – Convert 5 WI to WAG inj.
- **$0.8 MM** – Install gas lift in 8 producers
- **$0.3 MM** – re-enter 2 producers

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**Pattern Legend**

- PDP - Pilot Area, 2011–2013 (19)
- PDP - Phase 1, 2014–2015 (8)
- PUD - Phase 2, 2016 (5)
- PUD - Phase 3, 2017 (13)
- PUD - Phase 4, 2018 (12)
- PUD - Phase 5, 2019 (11)
- PUD - Phase 6, 2020 (10)
- PROB - Phase 7, 2021 (2)
- PROB - Phase 8, 2022 (8)
### Caprock Total Development Capital Estimate

<table>
<thead>
<tr>
<th>YEAR</th>
<th># of Patterns</th>
<th># OF WELLS</th>
<th>Drill Wells</th>
<th>Other</th>
<th>Conversions</th>
<th>Well Work</th>
<th>Gathering &amp;Trunk lines</th>
<th>Compressor &amp; Facilities</th>
<th>TOTAL COSTS</th>
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<tr>
<td>2016</td>
<td>15</td>
<td>43</td>
<td>23</td>
<td>2</td>
<td>18</td>
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<td>$6,880,000</td>
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<td>2018</td>
<td>12</td>
<td>29</td>
<td>15</td>
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<td>13</td>
<td>$5,760,000</td>
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<td>2019</td>
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<td>4</td>
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<td>$4,120,000</td>
<td>$3,520,000</td>
<td>$350,000</td>
<td>$7,990,000</td>
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#### South
- Year 2016: 13 patterns, 30 wells
- Year 2017: 8 patterns, 18 wells

#### North
- Year 2016: 13 patterns, 30 wells
- Year 2017: 8 patterns, 18 wells

**GRAND TOTAL:** 82 patterns, 196 wells

### Rock Queen Unit Total Development Capital Estimate

<table>
<thead>
<tr>
<th>YEAR</th>
<th># of Patterns</th>
<th># OF WELLS</th>
<th>Drill Wells</th>
<th>Other</th>
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<td>0</td>
<td>0</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td>2019</td>
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<td>$100,000</td>
<td>$160,000</td>
<td>$0</td>
<td>$260,000</td>
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#### South
- Year 2016: 13 patterns, 30 wells
- Year 2017: 8 patterns, 18 wells

**GRAND TOTAL:** 20 patterns, 49 wells

### Drickey Queen Sand Unit Total Development Capital Estimate

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<tr>
<th>YEAR</th>
<th># of Patterns</th>
<th># OF WELLS</th>
<th>Drill Wells</th>
<th>Other</th>
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<th>Gathering &amp;Trunk lines</th>
<th>Compressor &amp; Facilities</th>
<th>TOTAL COSTS</th>
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<tr>
<td>2016</td>
<td>10</td>
<td>28</td>
<td>13</td>
<td>2</td>
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<td>2017</td>
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<td>8</td>
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<td>$9,600,000</td>
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<tr>
<td>2020</td>
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<td>21</td>
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<td>0</td>
<td>11</td>
<td>$4,020,000</td>
<td>$3,360,000</td>
<td>$350,000</td>
<td>$7,730,000</td>
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#### South
- Year 2016: 13 patterns, 30 wells
- Year 2017: 8 patterns, 18 wells

**GRAND TOTAL:** 62 patterns, 147 wells
Water disposal

- Need for future disposal
  - As Drickey Queen waterflood is converted to CO2 flood, SWD may be needed

- Several zones within the San Andres have potential for water disposal or ROZ oil recovery

- 5 older deep wells have DST recoveries of up to 2520’ of sulphur water or salt water, indicating high permeability as well as potential ROZ oil

- Approximately 60 wells penetrate the San Andres Formation in the vicinity of Rock Queen and Drickey Queen Units. Of these, 4 are within the boundaries of the units.
WATER DISPOSAL / ROZ

GRAYBURG
SAN ANDRES
POROUS POTENTIAL ROZ
POROUS WET
GLORIETA

DST 900' zw
DST 720' zw
DST 2520'' zw
QUEEN SAND (Guadeloupian) is regionally extensive, highly productive in SE New Mexico.

Oil at Caprock is trapped by a porosity pinchout to the NE updip; a marginal gas cap exists to the NE updip of Unit.

Downdip field limit is an oil/water contact at approx +1310’ above SL. (regional dip ½ deg SE)

Potential for residual oil saturation below this contact exists to the east of field.

Queen gross thickness within the field = 12-20 ft; sand is continuous across the entire field.

Net thickness is determined by porosity occlusion by Anhydrite cement, and is 10 to 18’ within the field.

Queen sand contains lithic fragments and feldspars, resulting in high gamma ray response.

Sand consists mainly of angular fine grained quartz and lithic fragments, cement is anhydrite and dolomite.

Excellent permeability observed in Legacy core: 10-768 mD, avg 172 mD

Excellent porosity: 10-28%, avg 15.8%

Pay zone is capped by a regional thick anhydrite, and underlain by a regional tight siltstone, providing excellent containment for CO2 flood.

Queen sand extends laterally over entire unit area with no faults or tight baffles yielding excellent horizontal sweep efficiency for CO2 flood.
RQU 320 Core
18% Avg Porosity
172mD Avg Perm

- Fine grained, angular quartz and lithic fragments
- Patchy anhydrite cement
- Rock fragments (brown) make up ~30-50% of the grains
- Porosity (>25%) is blue epoxy
- Traces of anhydrite cement; otherwise little cement

Massive dolomite
Angular quartz, fine but poorly sorted
Rock fragments (granitic?)
Porosity (blue)
Tank Size: OOIP Determination

**Reservoir:**
- Impermeable solid seal on top and bottom of Queen pay
- Available modern openhole porosity logs on new drills
  - Clear indication of sand on PE curve
  - Clear interval boundaries seen on density-neutron and microlog
  - Very scalable to CNL and older Neutron count logs

**OOIP Methodology:**

1. Log data
   - Neutron curves from modern logs used to transform CNL and old neutron count logs for porosity mapping field wide

2. Core on RQU 320 to verify reservoir data
   - Remapped entire field on 1” contour interval
   - Porosity values from 320 core and logs through field match well
   - Flat Sw used across field due to low dip of 1/2 degree
   - Bo 1.15

**Results:**
- Legacy mapped OOIP for RQU + DQU is 108.9 MMBO.
- PDP+PUD planned development of 88 total patterns is 88.8 MMBO
- PRB reserves of 20.2 MMBO using additional 20 patterns
Development Model Overview

1. Define CO2 Flood Remaining Oil Target
   A. Floodable Tank Size
      • Logs, Core, MBAL
   B. Top and Base of Target Oil Bearing interval
      • Log database and ~80 producer histories (perf’d interval)
      • RQU 320 Core
   C. Remaining Oil Saturation after Waterflood
      • MBAL, Primary and Secondary CUM to date…..

2. CO2 Flood Development Plan
   A. Develop existing 80 acre 5-spot waterflood well locations in 7 CO2 expansion phases
   B. Deepen wells through Queen pay to cover base of remaining commercial oil target
   C. Redrill producers and injectors with poor wellbores to improve conformance
   D. Maintain water curtain/monitor wells in undeveloped areas
      • Future utility as injectors or producers in expansion
   E. Investigated water disposal zones as waterflood converts to CO2

3. Define Recovery Efficiency Curves
   A. Establish analog projects with similar geologic and operating conditions
      • Monell, Two Freds, North Ward Estes, Postle identified as key analogs

4. Define Pattern Processing Speed (Production Rates)
5. Define Project Costs
Overview of surveillance process

- **Data**
  - Operators > TotalRod > Oilfield Manager (OFM)
  - Capture daily and monthly production/injection data
  - Acquire static and dynamic BHPs as needed

- **Tools**
  - OFM – Pattern analysis
  - TotalRod - daily data database

- **Flood management guidelines**
  - Initial CO2 slugs – target of 20%-30% HCPV
  - Reservoir pressure > MMP ~ 1,100 psia
  - Pattern Balancing – Injection withdrawal ratios (IWR) >=1.0
  - Water-Alternating-Gas (WAG) ratios of 1:2 or drier
  - Processing rate of > 1.2% HCPV per month

- **Performance tracking**
  - WAG tracking tool – WAGs reviewed and adjusted periodically
  - Pattern Reviews out in the field conducted quarterly
- CUM volumes are poor match in early time due to measurement error of produced gas.
- Facility issues at Sat 11 have been fixed.
Model Results: History Match and Projection RQU Gas Inj

- Data from first CO2 inj Feb 2011
- Good History match
- Gas Rec curve adjusted for measurement to match this data

- CUM volumes injected match model