CHG&E Innovation Project:
Pressure Reducing Regulator App and Data Collection

William Brandt
Director Field Operations
Central Hudson
wbrandt@cenhud.com

Alice Burns
Director Client Services
Celerity Consulting
aburns@consultcelerity.com
www.consultcelerity.com
866-224-4333
Regulated transmission and distribution utility serving approximately 300,000 electric customers and 79,000 natural gas customers.

Defined service territory of New York State’s Mid-Hudson River Valley, from the suburbs of metropolitan New York City north to the Capital District at Albany.
Celerity Consulting Group, Inc.

Customers
- GIS and Mapping
- Engineering
- Operations
- Field Services
- Construction
- Damage Prevention
- Environmental
- Quality Assurance
- Audit
- Regulatory/Legal

Expertise
- Pipeline Integrity
- Materials Tracking and Traceability
- GPS/Facilities Asset Data Collection
- Regulatory Compliance
- Records Management and Quality
- Regulatory Requests
- Claims and Litigation

Services
- Records Management Records Compliance
- Pipeline Integrity Support
- Field Data Collection
- Data Integration
- Field Services Support
  - Application Development
  - Technical / Help Desk Staff
- Regulatory / Legal Response
CHG&E Innovation Project: Pressure Reducing Regulator App & Data Collection - Idea

<table>
<thead>
<tr>
<th>Innovation/Idea Sponsor:</th>
<th>William Brandt, Director Field Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Objective:</td>
<td>Collect CHG&amp;E Regulator information – map location, and collect materials information - make, model, size, condition. Determine feasibility of collecting Regulator data across entire system.</td>
</tr>
<tr>
<td>Project Scope:</td>
<td>Configure Celerity’s VeriLine Data Capture Platform to collect Regulator information. Use VeriLine mobile application for field data collection work, and web-based portal for QCing data and reporting collection results.</td>
</tr>
</tbody>
</table>
CHG&E Innovation Project: Pressure Reducing Regulator App & Data Collection - Approach

Current Innovation Project Stage

- **Project Scope**
- **Requirements Planning**
- **Visual Workflow Mock Ups**
- **Mock Ups Walk Through**
- **Build Alpha Version**
- **Test Alpha Version**
- **Build Beta Version**
- **Baseline Services Collection Project**
- **CHG&E Maintenance Version Release**
CHG&E INNOVATION PROJECT: VERILINE REGULATOR APP & DATA COLLECTION PROJECT
VeriLine Regulator Mobile Application
Find/Filter Job Location
VeriLine Regulator Mobile Application

Investigate Regulator to Record Attributes & Location

This is YOU based on blue GPS dot of the Tablet device used

This FLAG is where you want to navigate to
VeriLine Regulator Mobile Application
Physically Navigate to and Locate Regulator(s)
VeriLine Regulator Mobile Application
Add Regulator
Photo Array
- Meter Set/Regulator Relationship
- Regulator close up – Make/Model/Vent Direction
- Vent Condition
- Tags, Other markings
## VeriLine Regulator Portal

### Analytics and Reporting

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# VeriLine Regulator Portal

## Analytics and Reporting

## Table

<table>
<thead>
<tr>
<th>Object ID</th>
<th>Reg...</th>
<th>Address</th>
<th>Make</th>
<th>Model</th>
<th>Size</th>
<th>Ven...</th>
<th>Vent Cond</th>
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<td>243926</td>
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<td>2” and over</td>
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<td></td>
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<td>1813C</td>
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<td>Piped</td>
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<td>American</td>
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<td>Down</td>
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<td>Down</td>
<td>Screened</td>
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<td>Down</td>
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<td>210478</td>
<td>82</td>
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<td>American</td>
<td>1813C</td>
<td>3/4” x 1”</td>
<td>Down</td>
<td>Screened</td>
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</table>
VeriLine Regulator Portal
Analytics and Reporting

**Investigations Completed**
- 180 Complete
- 37 Incomplete
- 449 New

**Make & Model**
- 66 American / 1813
- 49 Itron / B42R
- 18 Fisher / S102
- 15 American / 1813C
- 14 American / GC/Research
- 12 Actaris / B42R
- 8 American / Recollect
- 7 Fisher / GC/Research
- 5 GC/Research / GC/Research
- 3 Fisher / Recollect
- 2 Recollect / Recollect
- 2 American / S102
- 1 American / B42R
CHG&E INNOVATION PROJECT: LESSONS LEARNED FROM PRESSURE REDUCING REGULATOR DATA COLLECTION
CHG&E Innovation Project: Pressure Reducing Regulator Data Collection - Results

### Collection Results

<table>
<thead>
<tr>
<th>Flag Description</th>
<th>Flag</th>
<th>Athens</th>
<th>Catskill</th>
<th>Coxsackie</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>New</td>
<td>Red</td>
<td>22</td>
<td>297</td>
<td>347</td>
<td>665</td>
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<tr>
<td>Visited</td>
<td>Yellow</td>
<td>21</td>
<td>201</td>
<td>0</td>
<td>221</td>
</tr>
<tr>
<td>Complete</td>
<td>Green</td>
<td>21</td>
<td>180</td>
<td>0</td>
<td>201</td>
</tr>
<tr>
<td>Visited, Incomplete</td>
<td>Yellow</td>
<td>0</td>
<td>19</td>
<td>0</td>
<td>19</td>
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<tr>
<td>QC’ed, Marked Incomplete*</td>
<td>Yellow</td>
<td>1</td>
<td>19</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>Address Research</td>
<td>Orange</td>
<td>1</td>
<td>7</td>
<td>0</td>
<td>8</td>
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<tr>
<td>Screen Condition – Open, Damaged</td>
<td></td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

*Recollection recommended to improve data and photo array*
### CHG&E Innovation Project: Pressure Reducing Regulator Data Collection - Timeline

<table>
<thead>
<tr>
<th>Mon 2/6</th>
<th>Tues 2/7</th>
<th>Wed 2/8</th>
<th>Thurs 2/9</th>
<th>Fri 2/10</th>
<th>Sat 2/11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Athens</td>
<td>Catskill</td>
<td>Catskill</td>
<td>No Collection Due to Weather Conditions</td>
<td>Catskill</td>
<td>Catskill</td>
</tr>
<tr>
<td>Client Briefing AM</td>
<td>Resume Collection</td>
<td>Collect-AM/PM</td>
<td></td>
<td>Collect – Late AM/PM</td>
<td>Collect – AM/PM</td>
</tr>
<tr>
<td>Start Collection PM</td>
<td>2 Resources</td>
<td>2 Resources</td>
<td></td>
<td>3 Resources</td>
<td>3 Resources</td>
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</tbody>
</table>

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<table>
<thead>
<tr>
<th>Date</th>
<th>Temp Hi/Low</th>
<th>Snow</th>
<th>Precipitation</th>
<th>Conditions</th>
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</thead>
<tbody>
<tr>
<td>Sun 2/5</td>
<td>37/22</td>
<td>0</td>
<td>0</td>
<td>Cloudy</td>
</tr>
<tr>
<td>Mon 2/6</td>
<td>33/25</td>
<td>0</td>
<td>0</td>
<td>Partly Cloudy</td>
</tr>
<tr>
<td>Tue 2/7</td>
<td>35/27</td>
<td>0.53 in</td>
<td>0.3 in</td>
<td>Freezing Rain; Rain</td>
</tr>
<tr>
<td>Wed 2/8</td>
<td>44/29</td>
<td>0.09 in</td>
<td>0</td>
<td>Partly Sunny</td>
</tr>
<tr>
<td>Thurs 2/9</td>
<td>31/7</td>
<td>0.62 in</td>
<td>11.2 in</td>
<td>Snow</td>
</tr>
<tr>
<td>Fri 2/10</td>
<td>23/3</td>
<td>0.07 in</td>
<td>1.0 in</td>
<td>Partly Cloudy</td>
</tr>
<tr>
<td>Sat 2/11</td>
<td>34/20</td>
<td>0.06 in</td>
<td>0.8 in</td>
<td>Partly Cloudy</td>
</tr>
</tbody>
</table>
CHG&E Innovation Project: Pressure Reducing Regulator Data Collection - Weather

Thurs 2/9
Zero Locations

Collection Cancelled Due to Storm
CHG&E Innovation Project: Pressure Reducing Regulator Data Collection - Logistics

Location Navigation
- Distance to location 3 min shortest, up to 35 min plus longest
  Meter Set latitude and longitude was not always accurate

Outdoor Collection
- Average 3-5 minutes per location once on site
- Average of 6 per hour per person depending on address location clustering
- 5% re-collection rate (goal for full collection is 3% or less)

Indoor Collection
- Average 15-30 minutes or longer per location once “let in”
- Higher degree of customer interaction
- Average 2-4 per hour depending on customer interaction
CHG&E Innovation Project:
Pressure Reducing Regulator Data Collection - Maintenance

- Maintenance Call Ins:
  - CHG&E response time was excellent for call ins - within 15 minutes
  - Maintenance/Repairs:
    - Customer meter replaced
    - Flange tightened
    - One investigation - leak within tolerance, damaged screen replaced
- Identified need to develop process and report to send “periodically” to Central Hudson to facilitate maintenance repairs of broken screens, damage to regulators (or meter sets), or other issues discovered
- Notification of project/work was sent to Dispatch and on-call Maintenance personnel to expect call outs - critical element of project
# CHG&E Innovation Project: Pressure Reducing Regulator Data Collection – Data Quality

<table>
<thead>
<tr>
<th>Section</th>
<th>Instructions</th>
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</thead>
<tbody>
<tr>
<td><strong>Location Verification</strong></td>
<td>Request Meter Number info from Customer Service</td>
</tr>
<tr>
<td><strong>Meter/Regulator Relationship</strong></td>
<td>Make sure in focus, full frame</td>
</tr>
<tr>
<td><strong>Make/Model-Front</strong></td>
<td>Take at 90 degree angle</td>
</tr>
<tr>
<td><strong>Make/Model-Back</strong></td>
<td>Back side and front side</td>
</tr>
<tr>
<td><strong>Regulator Size</strong></td>
<td>In and Out Pipe – quality photo of the threads</td>
</tr>
<tr>
<td><strong>Vent Direction</strong></td>
<td>Take at 90 degree angle</td>
</tr>
<tr>
<td><strong>Vent Condition</strong></td>
<td>Selfie Mode</td>
</tr>
<tr>
<td><strong>Additional Photos -Markings</strong></td>
<td>Any and all markings – close up, all sides</td>
</tr>
</tbody>
</table>
CHG&E Innovation Project: Pressure Reducing Regulator Data Collection - Results

Collection Results
- Some challenging to navigate
  - Few addresses from GIS – definitely off
- Some address research required on the fly (call to Ernie)
  - (e.g., 200 block Wildwing Park Lane ((marked as Extension as example))
  - How to handle these situations in providing revised address information back to CH?

Remaining Work
- Re-collect 19 YELLOW Flags (Incomplete)
- Re-collect those re-marked NEW during QC of data/photos
- Collect 297 still marked New
- For 221 locations visited in Pilot, go back and recollect GPS location using higher accuracy GPS device

Procedure Update
- Develop specific Indoor collection procedure and examples
- Request METER NUMBER information from Customer Service to validate location (take photo as “address” verification)
- Process for handling locations walked by where saw meter/regulator but location not provided by GIS (not a Flag on the map ((e.g., Austin Acres corner property))

New - Red
Complete - Green
Incomplete, Re-Collect - Yellow
Address Research - Orange

200+ Visited
3 Maintenance Calls
1 Police Interaction
CHG&E Innovation Project: Pressure Reducing Regulator Data Collection - Results

Mix small town, Main Street, rural neighborhoods, apartment complexes, strip mall, large campus (school, hospital, care facility) and light-industrial locations

<table>
<thead>
<tr>
<th>Address 1</th>
<th>Address 2</th>
<th>Address 3</th>
<th>Address 4</th>
<th>Address 5</th>
<th>Address 6</th>
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<td>Residential</td>
<td>Residential</td>
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<td>![Address 1 Image]</td>
<td>![Address 2 Image]</td>
<td>![Address 3 Image]</td>
<td>![Address 4 Image]</td>
<td>![Address 5 Image]</td>
<td>![Address 6 Image]</td>
</tr>
<tr>
<td>3 min</td>
<td>5 min</td>
<td>6 min*</td>
<td>2 min</td>
<td>5 min*</td>
<td>3 min</td>
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<td>25929</td>
<td>35520</td>
<td>26675</td>
<td>14845</td>
</tr>
<tr>
<td>Green Flag</td>
<td>Green Flag</td>
<td>Green Flag</td>
<td>Green Flag</td>
<td>Green Flag</td>
<td>Green Flag</td>
</tr>
<tr>
<td>Address check with Central Hudson. Actual address is XXXX Park Lane not Extension. Develop process for resolving addresses and provide correct data back to Central Hudson.</td>
<td>Maintenance call in. Central Hudson responded within 15 minutes and tightened flange.</td>
<td>Large complex took a while to navigate and find regulator. Time on location was about 15 min total. Consider development of a location visual to help guide to meter/regulator.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CHG&E Innovation Project: Pressure Reducing Regulator Data Collection - Workflow

PLANNING & LOGISTICS
- Obtain GIS & Meter Set Data
  - Extracts from Client
- Work and Route Planning
- Work Assignment

IT SERVICES & DEVELOPMENT
- Integrate Data into App
- Normalize Data for Routing / Assignment

DATA COLLECTION TEAM
- Navigate to Assigned Area
- Find/Filter Address NEW
- Verify Address & Complete Job Information

QUALITY CONTROL
- Dangerous Conditions
  - Stop Work & Notify Supervisor
  - QC Records
  - Incomplete
    - Required Photos Not Sufficient as Taken
    - Fields Can Not Be Determined from Photo Array
    - Photo Quality Poor
- QC Records

REPORTING
- Ad Hoc Reports
- Prepare Weekly Maintenance Conditions Report
- Prepare Data for GIS Export

TEAM ACTIONS
- Record Regulator Data
- Take Photos
- Update Record Status
- Send Back to Field
- Client to Notify When Complete
CHG&E Innovation Project:
Pressure Reducing Regulator Data Collection - Recommendations

- **Equipment Use**
  - 8”-10” Tablet Size (map zoom in/out)
  - Tablet with hot swappable batteries
    - Ideal battery life = 8-10 hours life min per battery
    - Carry 2-3 spare batteries when walking route
  - Intrinsically safe device
  - Highest available NIT value – sun/glare conditions
  - Configure and optimize camera settings and picture quality/size
  - Mophie-style battery charger with long/short cable to stay “charged” while walking route
  - Vehicle base battery charging station capable of charging 2-3 batteries at same time
  - Cellphone range extender to boost signal in “poor” cell service areas
  - External GPS device for higher accuracy “blue dot” (where you are)

- **Application**
  - Offline app mode required for “poor” cell service areas
  - Photo array as an option depending on Date Technician experience and QC process

- **Staff, Navigation, and Data**
  - Indoor team – requires more training and expertise
  - Driving - use separate GPS device to navigate from location to location
  - Paper map backup with job address list (in order)
  - Normalize and standardize street addresses is difficult/impossible
  - Customer Service data - request meter number asset ID and address
PROPOSED PRESSURE REDUCING REGULATOR DATA COLLECTION
42,944 LOCATIONS
CHG&E Innovation Project:
Proposed Pressure Reducing Regulator Data Collection
- Project Team

Assumptions:
- 42,944
- Outside @ 6 per hour
- Indoor @ 4 per hour (3,000 Indoor)
- 48 Week Project
CHG&E Innovation Project:
VeriLine Regulator Version 2 Proposed Updates

• Feature and Workflow Enhancements to Increase Productivity
  – Dispatch/work assignment
  – Job Information screen – categories to mark visit/incomplete and reason (e.g.,
    dangerous conditions, pet issue, incomplete photos/unavailable)
  – Show next nearest address location when mark “meter complete”
  – Portal - map view of regulator locations
  – Prescribe format for the maintenance condition report and email function
  – Maintenance update workflow – repair/change out regulator, open and edit
    record that has existing regulator data

• Additional Equipment Testing
  – Higher accuracy GPS location capture device
  – Cellular signal extender

• Data/Address Verification
  – Request Customer Services data – CIS meter asset number, service PIP
William Brandt, Central Hudson
wbrandt@cenhud.com

Alice Burns, Celerity Consulting
aburns@consultcelerity.com
866-224-4333