GAS DISTRIBUTION SYSTEM PRESSURE MONITORING

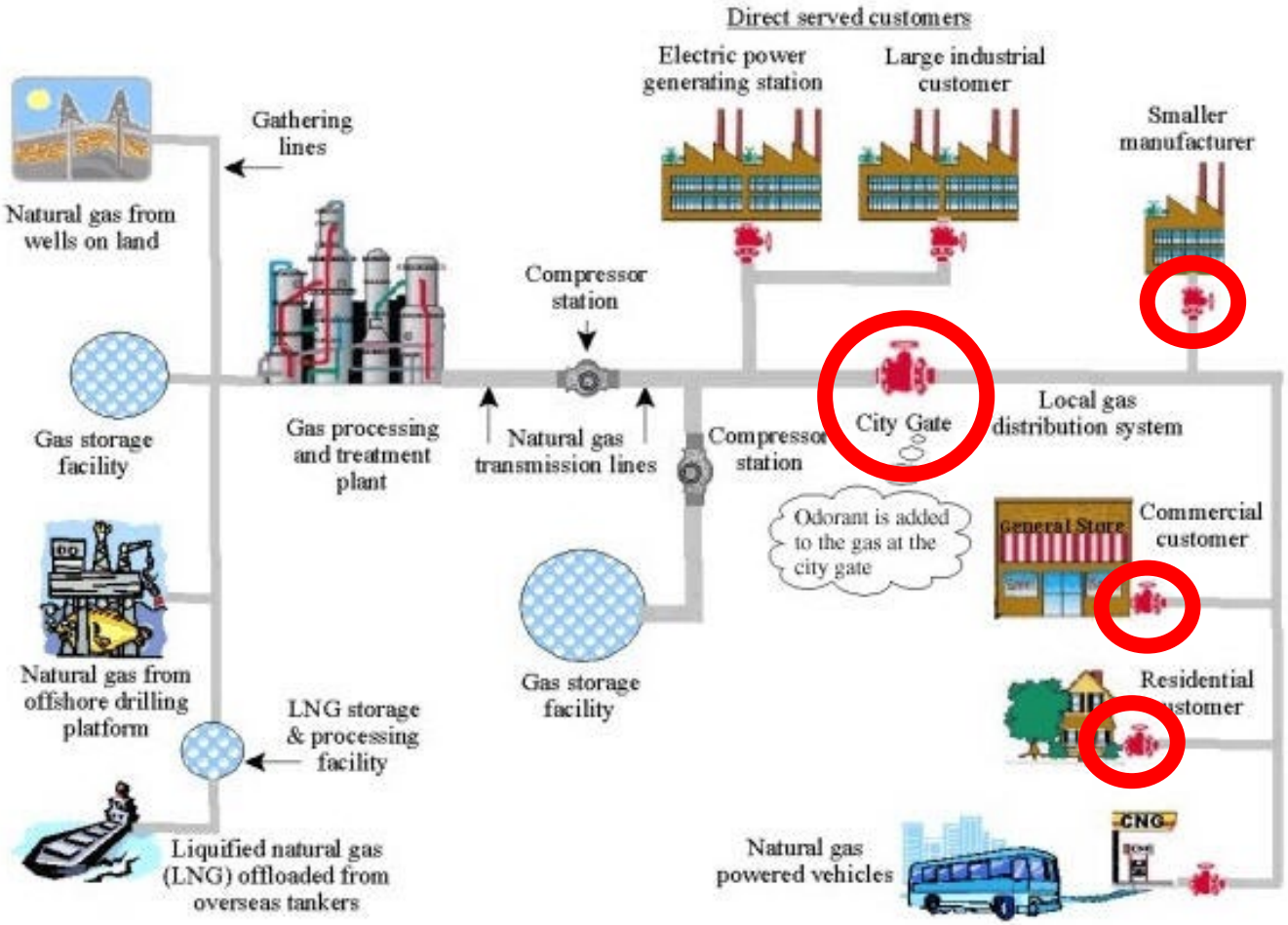
GARRETT COX (LINC ENERGY SYSTEMS)

WHY DO WE MONITOR?

- **SAFETY!**
  - Pressure monitoring of gas distribution systems is paramount to ensure the safety of gas company personnel and customers.
- Diagnostics
  - Pressure monitors can alert gas control operators and company personnel of issues before the consequences increase in magnitude (ie. Differential pressure monitoring of filters, meters, etc.., monitoring of worker/monitor pressure regulators, etc..)
- System Feedback
  - Continuous pressure monitoring of distribution systems during variable gas load conditions can alert company engineers to the need for system upgrades (gas pipe size, gas pressure, etc..) as demand increases downstream.

WHERE DO WE MONITOR?

- City Gate Stations
- Large End Users and Critical Processes
- System Tail Ends
- Residential Customers



HOW DO WE MONITOR?

- Pressure Transmitters
- Differential Pressure Transmitters
- Solar/AC/TEG Powered Pressure Monitors
- Battery Powered Pressure Monitors
- Solar/AC/TEG Powered EVCs
- Battery Powered EVCs
- Mechanical Chart Recorders

THE RIGHT TOOL FOR THE JOB

- **Pressure/Differential Pressure Transmitters (Typically 1P)**
  - Typically used at gate stations where RTUs are present and monitor the following:
    - Upstream, Intermediate, and Downstream pressures
      - Intermediate pressure data can diagnose upstream regulator failure
    - Filter DP
    - Meter DP
    - Odorant Bulk Storage Vessel Blanket Pressure
    - Metering pressure for USM, rotary, orifice or turbine meter

THE RIGHT TOOL FOR THE JOB

- Standalone Pressure Monitors (1P, 2P and 3P)
  - Solar/AC/TEG
    - Utilized in critical monitoring applications where continuous monitoring and communication with SCADA is required but reliable power is not available.
    - Communication achieved through wireless cell modem.
    - "Call-Out" available 24/7/365
    - Typically used for multi-pressure applications.
  - Battery Powered (1P, 2P)
    - Utilized further downstream from Solar/AC devices where Solar/AC is not feasible or is cost prohibitive.
    - Communication with SCADA is on a scheduled basis (Hourly, Daily, Weekly, etc.) or when an event has occurred (call-in on exception).
    - In some cases, there may be no communication to SCADA at all ("Digital Chart").
    - "Call-Out" available during preprogrammed windows or not at all.
    - Typically used for single-pressure applications, but some have options for 2P.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MIWI350


CAUTION
HOT SURFACES

THE RIGHT TOOL FOR THE JOB

- **Electronic Volume Correctors (EVCs)**
  - Although the primary function of the pressure input to an electronic volume corrector is for pressure correction of natural gas volume for customer billing, many EVCs allow for configuration of alarms for HI/LO pressure alarms and some can communicate with both billing and SCADA.
  - Monitoring pressure through EVCs allows for the consolidation of equipment without compromising the safety of the downstream gas system.
  - Many EVCs have options for 2P or 3P.


NATURAL
GAS
EMERGENCY
SHUTOFF


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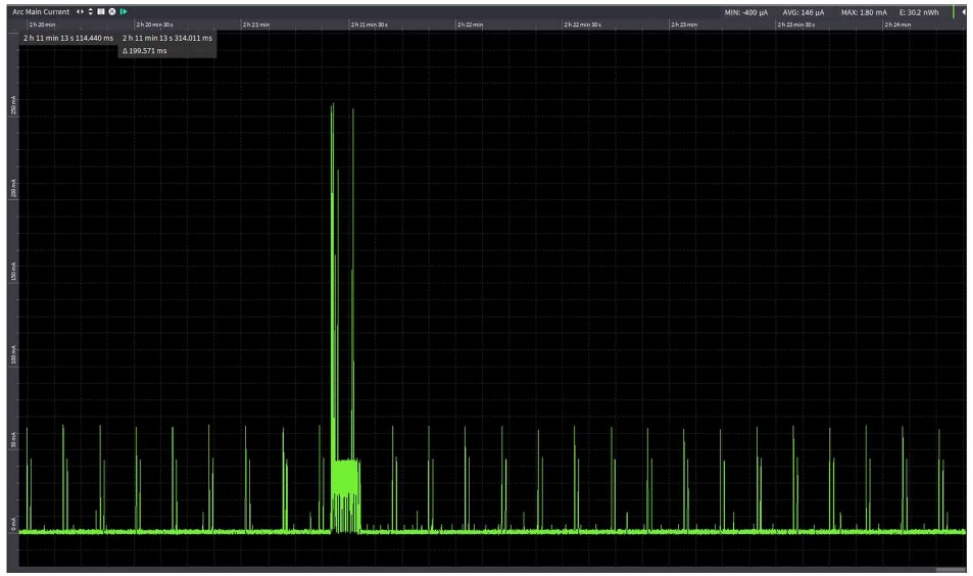
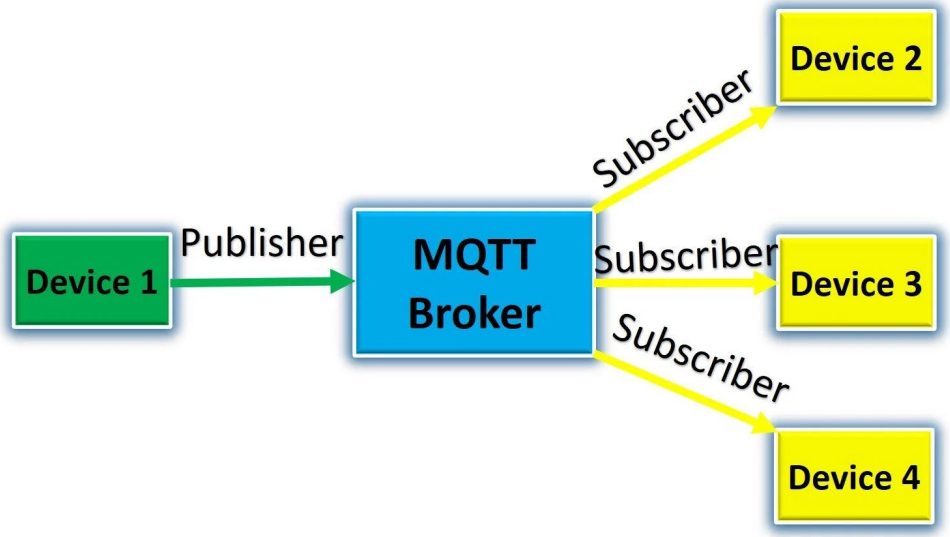
THE RIGHT TOOL FOR THE JOB

- **Battery Powered Pressure Monitors**
- Utilized at stations where power (AC/DC or Solar) is not available, not monetarily feasible or not conducive to the installation (ie. Tail-end residence, urban pressure cut stations, etc.)
- Continuous monitoring can be difficult due to expense of batteries and cost of battery exchanges on a scheduled basis.
- Many of these applications are call-in on exception only or are not equipped with communication equipment to conserve battery life.

LEVERAGING NEW TECHNOLOGY

- EDRX and MQTT
- New advances in wireless technology have allowed for greater visibility for tail end pressure monitoring devices with decreased battery life and lower cost of ownership.



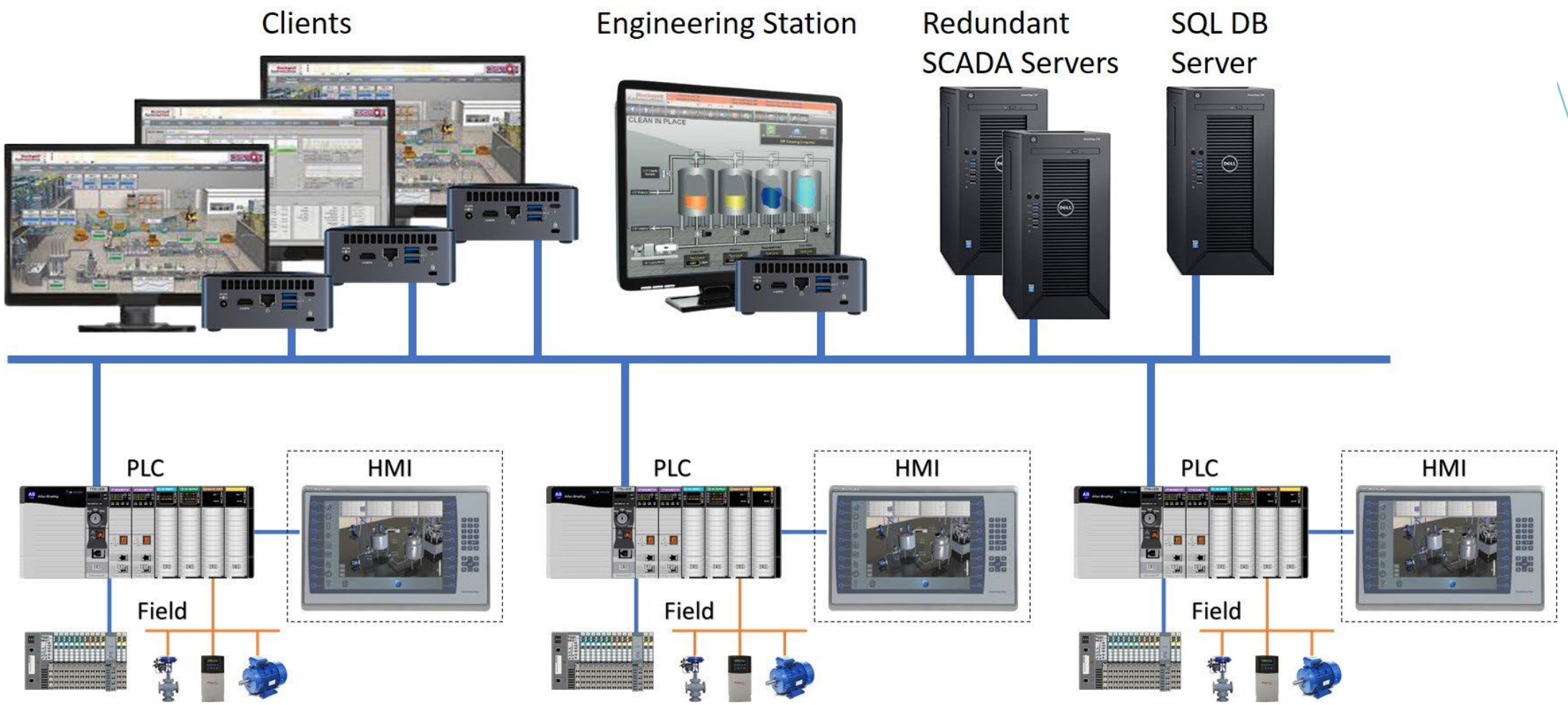


THE RIGHT TOOL FOR THE JOB

- **Mechanical Chart Recorders**
- Stand-alone pressure recorders that utilize a pen and paper to record pressure.
- Utilized at stations for record-keeping purposes, particularly at system tail ends.
- No communications, no alarm capabilities.

DATA STORAGE AND REPORTING

- SCADA
- Data received by RTUs from pressure transmitters is typically stored locally on company servers (depending on customer size), depending on the amount of data this can become costly to implement and maintain.
- Data from stand-alone pressure monitors or EVCs can also be sent remotely to SCADA and then stored on company servers.
- Singular source for data minimizes labor costs for data collection, front-end costs are high.


Clients
Engineering Station
Redundant SCADA Servers
SQL DB Server
CLEAN IN PLACE
PLC
HMI
Field
PLC
HMI
Field
PLC
HMI
Field

DATA STORAGE AND REPORTING

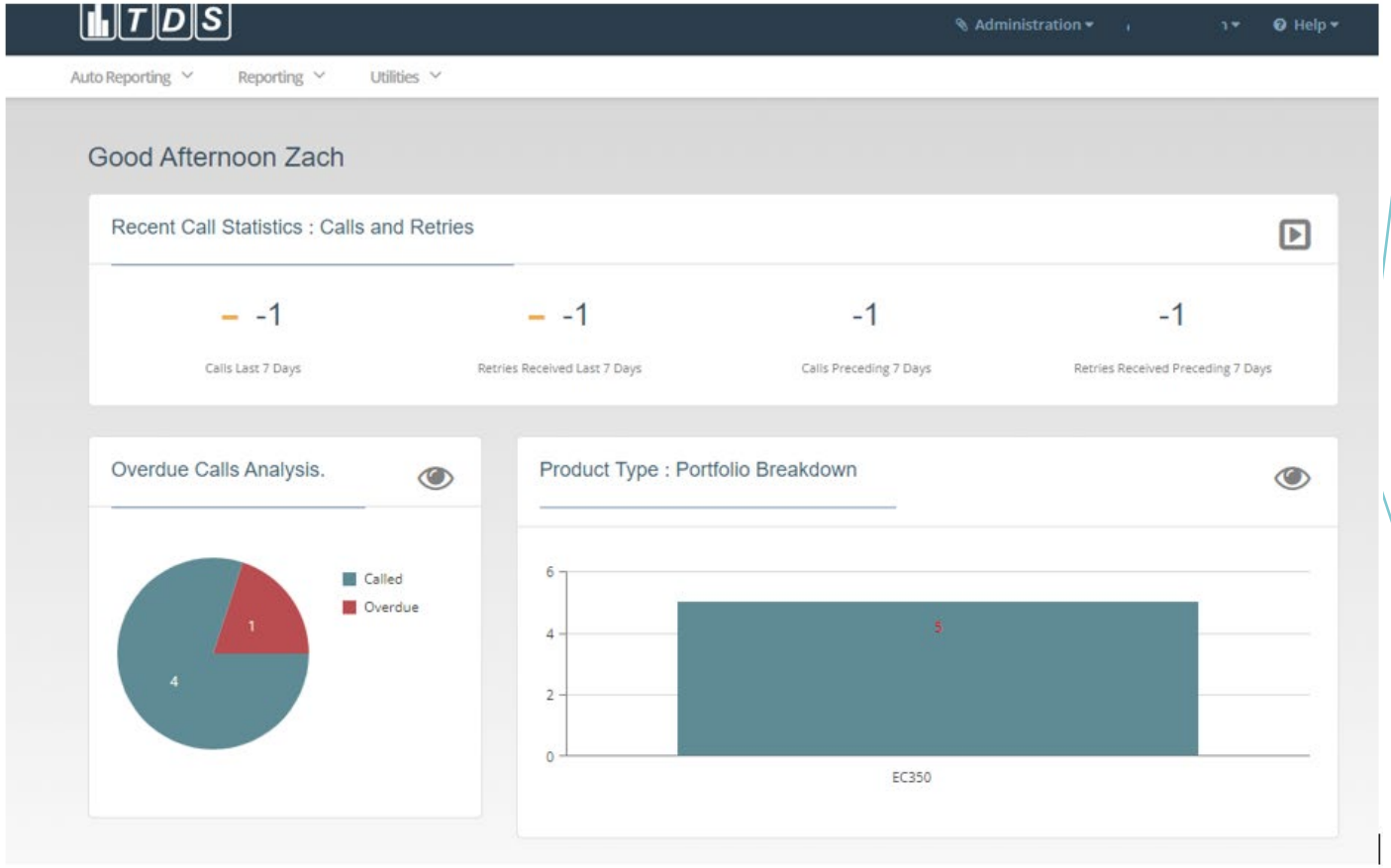
- **Local Storage**
- Many standalone pressure monitors and EVCs have audit trails that can be configured for different intervals (daily, hourly, monthly).
- These logs can be pulled at company-specified intervals for reporting purposes (Daily, Weekly, Monthly, Quarterly, etc..)
- Local storage at the device combined with call-in/alert on exception minimizes data storage costs, but labor costs are higher for in-field data collection.
- Without back-up data collection, there is risk of memory failure due to equipment fault (ie. Lightning strike, vandalism, theft etc..)

SiteID1	SiteID2	Log	Date	Time	Incremental Cor Vol	Incremental Unc Vol	P1 Interval Avg Press	Interval Avg Gas Temp
0	0	1	11/8/2022	0:00:00	3326	3380	0	68.4
0	0	1	11/8/2022	1:00:00	3325	3380	0	68.51
0	0	1	11/8/2022	2:00:00	3336	3390	0	68.48
0	0	1	11/8/2022	3:00:00	3327	3380	0	68.33
0	0	1	11/8/2022	4:00:00	3335	3390	0	68.52
0	0	1	11/8/2022	5:00:00	3327	3380	0	68.31
0	0	1	11/8/2022	6:00:00	3336	3390	0	68.4
0	0	1	11/8/2022	7:00:00	3332	3390	0	69.03
0	0	1	11/8/2022	8:00:00	3320	3380	0	69.45
0	0	1	11/8/2022	9:00:00	3329	3390	0	69.54
0	0	1	11/8/2022	10:00:00	3317	3380	0	69.76
0	0	1	11/8/2022	11:00:00	3326	3390	0	69.98
0	0	1	11/8/2022	12:00:00	3324	3390	0	70.34
0	0	1	11/8/2022	13:00:00	3323	3390	0	70.56
0	0	1	11/8/2022	14:00:00	3310	3380	0	70.9
0	0	1	11/8/2022	15:00:00	3318	3390	0	71.34
0	0	1	11/8/2022	16:00:00	3316	3390	0	71.59
0	0	1	11/8/2022	17:00:00	851	870	0	71.78

DATA STORAGE AND REPORTING

- **Third Party Storage**
- Some companies offer third-party data storage to ease the expense of SCADA infrastructure hardware and software.
- This allows for more robust data collection and monitoring without the burden of maintaining an entire data collection infrastructure.
- Customers can receive alarm notifications and automated formatted reports through these third-party platforms to streamline compliance requirements.
- Cost is typically per device.


Sunday
Sunday's Date 3/3/2024 1:00:00 AM
Day Consumption 705.216
Day Peak 29.543
Day Low 29.206
29.6
29.4
29.2
3 3:00 AM
6:00 AM
9:00 AM
12:00 PM
3:00 PM
6:00 PM
9:00 PM
000151
Monday
Monday's Date 3/4/2024 1:00:00 AM
Day Consumption 705.9391
Day Peak 29.674
Day Low 29.184
29.8
29.6
29.4
29.2
29.0
4 3:00 AM
6:00 AM
9:00 AM
12:00 PM
3:00 PM
6:00 PM
9:00 PM
000151
Tuesday
Tuesday's Date 3/5/2024 1:00:00 AM
Day Consumption 706.2459
Day Peak 29.608
Day Low 29.112
29.4
5 4:00 AM
6:00 AM
8:00 AM
10:00 AM
12:00 PM
2:00 PM
000151
Wednesday
Wednesday's Date 3/6/2024 1:00:00 AM
29.75
29.50
000151


TDS
Administration
Help
Auto Reporting
Reporting
Utilities
Good Afternoon Zach
Recent Call Statistics : Calls and Retries
-1
Calls Last 7 Days
-1
Retries Received Last 7 Days
-1
Calls Preceding 7 Days
-1
Retries Received Preceding 7 Days
Overdue Calls Analysis.
Called
Overdue
4
1
Product Type : Portfolio Breakdown
6
4
2
0
5
EC350

THANK YOU!

Linc Energy Systems

making a measurable difference