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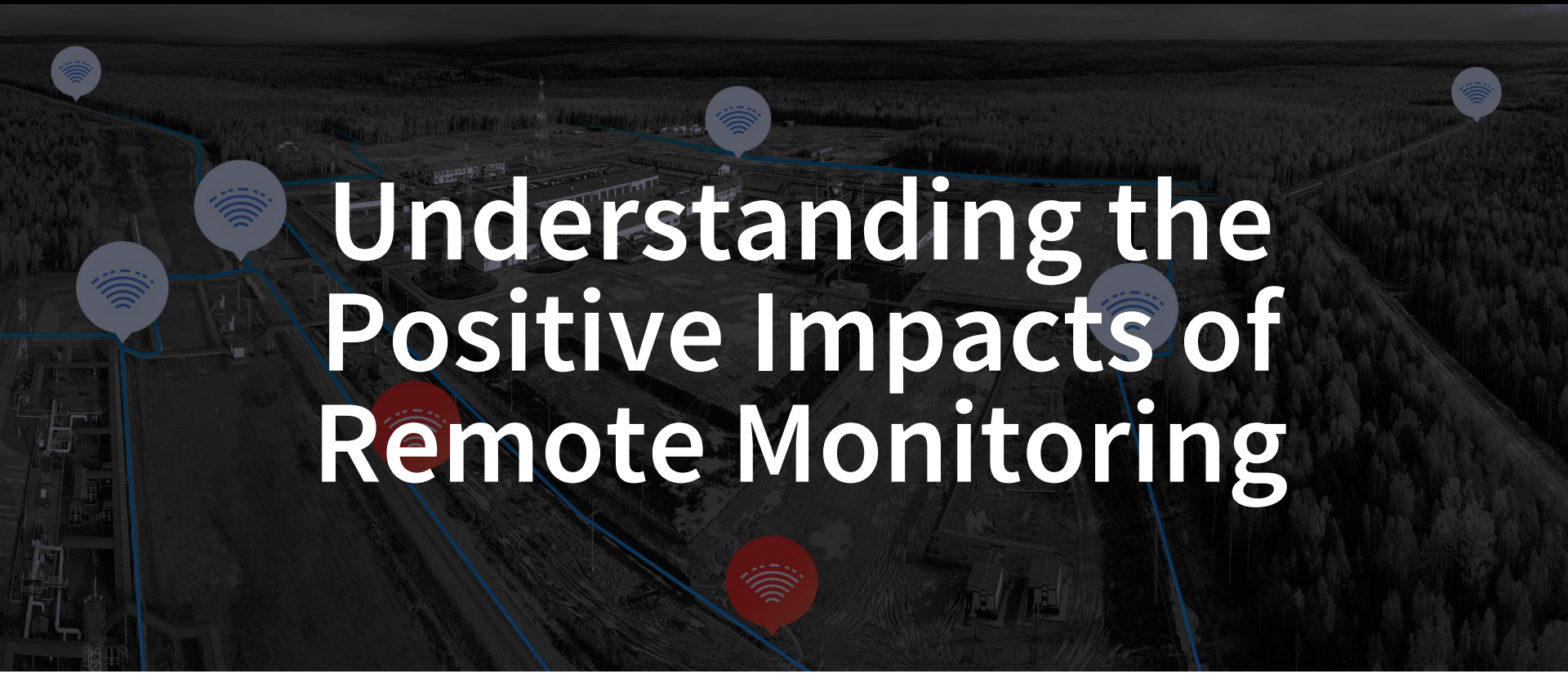

Understanding the Positive Impacts of Remote Monitoring

15th Annual KGA Expo

March 14th & 15th

Presentation Outline

Framing the Impacts:

1. Safety
2. Operating Improvements
3. Asset & Data Integrity
4. New Zero Emissions

Understanding Return on Investment

Q&A

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History of Remote Monitoring in Cathodic Protection

Mobiltex launched its first remote monitoring product for CP in 1991, helping its operating partners achieve ROI by deploying IoT technologies.

1st & 2nd Generation

- High power private radio networks
- Local hosted server
- Power hungry

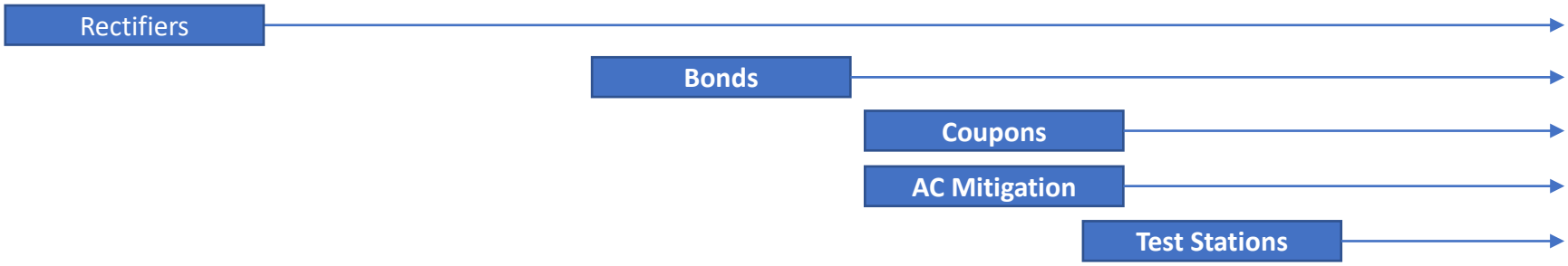
3rd Generation

- Cellular & Satellite Solutions
- Web-based data management
- Lower power, scalable solutions
- BT field configurations

4th Generation

- IoT-centric Cellular & Satellite Solutions
- Commercial Cloud data management
- Ultra low power for long autonomy
- Potential for analytics, visualization, insight

Assets and Applications



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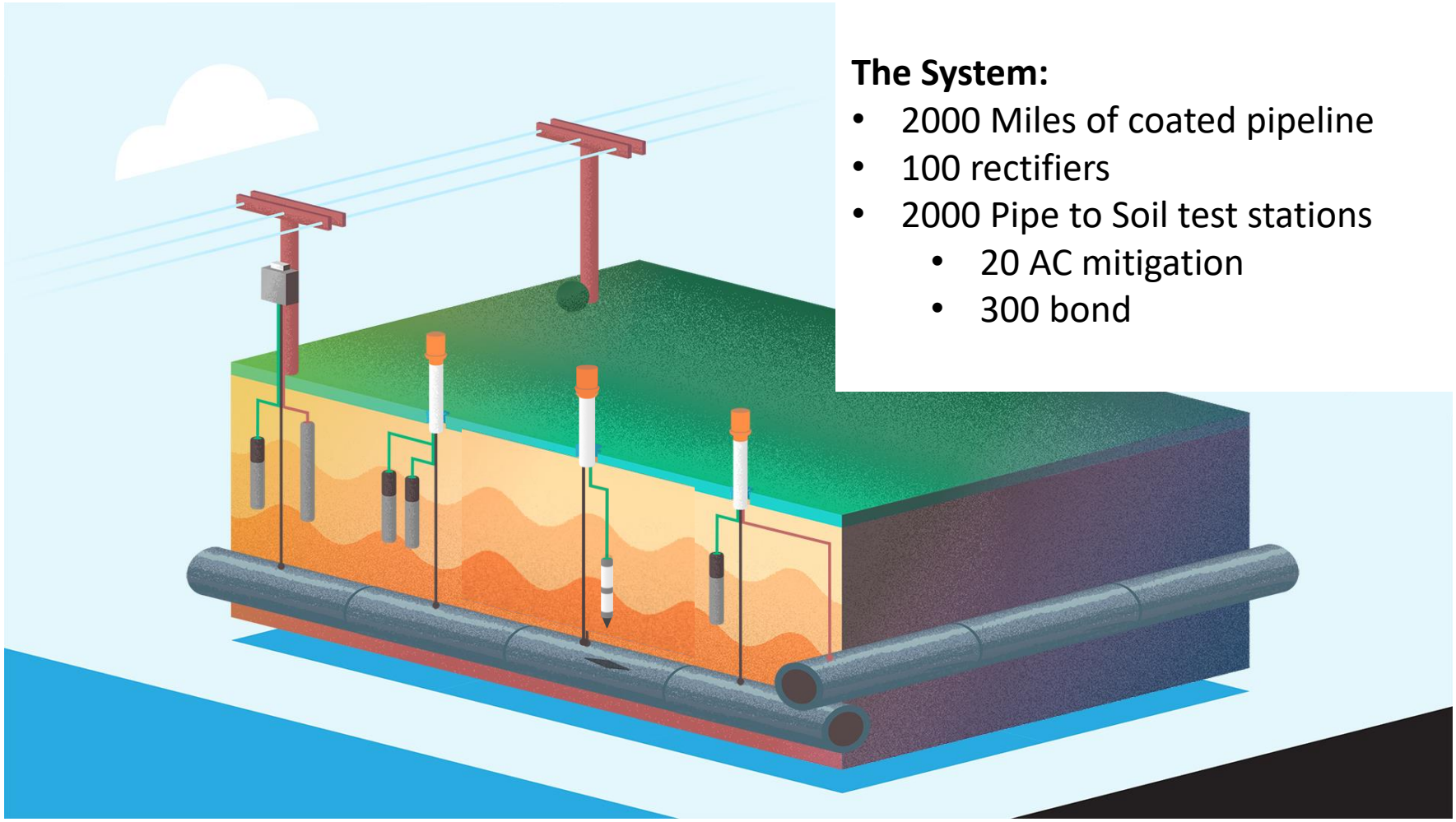
ROI Example - Inputs

Isolating key pain points helps prioritize key applications and select the appropriate technology



The System:

- 2000 Miles of coated pipeline
- 100 rectifiers
- 2000 Pipe to Soil test stations
  - 20 AC mitigation
  - 300 bond

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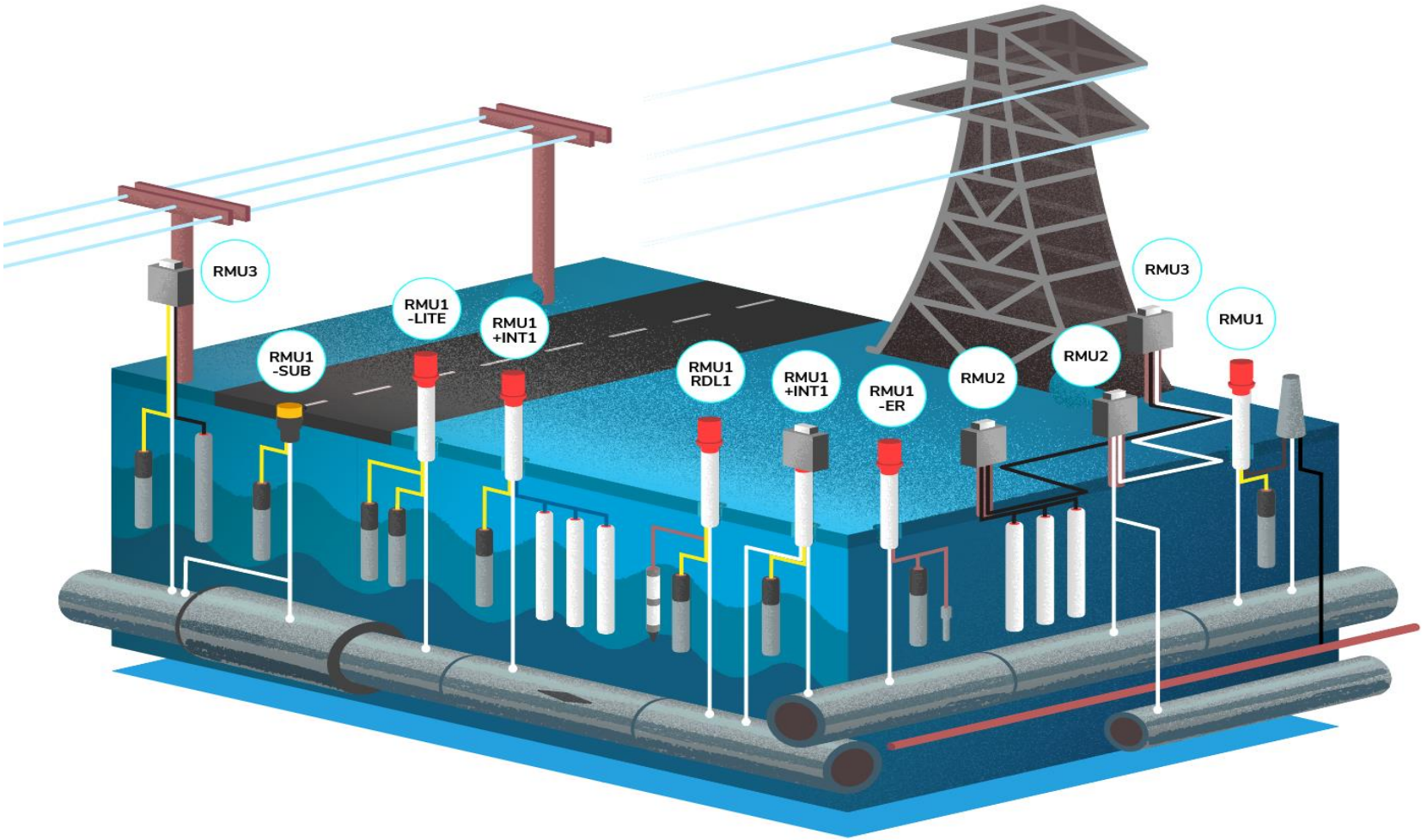
Typical Cathodic Protection



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Reading Requirements for CP Assets

Frequency of readings requirements has underpinned adoption of remote monitoring technology across a diverse base of assets.

	Sources of Data	Regulated Frequency	Owner Frequency
Fixed Assets	Rectifiers	Every 2 months	Monthly via SCADA
	Pipe-to-Soil Test Stations	Every 12 months	Every 12 months
	Critical and non-critical bonds	Critical (2 months), non (12 months)	Critical (2 months), non (12 months)
	CP Coupons (AC & DC)	Site & use-case specific	Site & use-case specific
	ER Probes	Site & use-case specific	Not Applicable
	Casings	Every 12 months	Not Applicable
	Other sensors	Site & use-case specific	Not Applicable
Survey	Annual Surveys	Every 12 months	Every 12 months
	Close Interval Survey	Every 3-10 years	As Required
	In-line Inspection	Every 3-10 years	Every 3-5 years
	Other Surveys	Every 3-10 years	As Required

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Impact of Cathodic Protection Remote Monitoring

Understanding the Key Impacts of Remote Monitoring

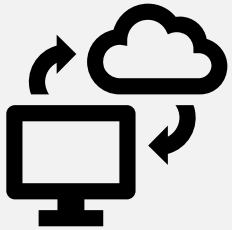
1

Safety

2

Operating Improvements

3



Asset & Data Integrity

4

Environmental

Return on Investment encompasses impact on Safety, Financial, Asset & Data Integrity, and Environmental

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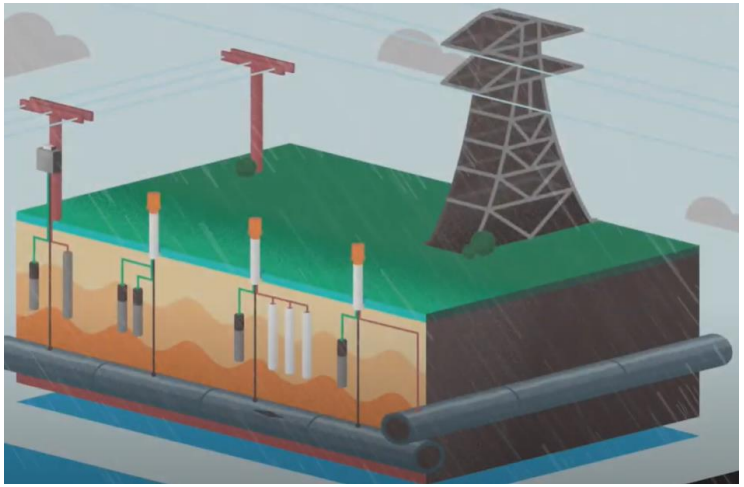
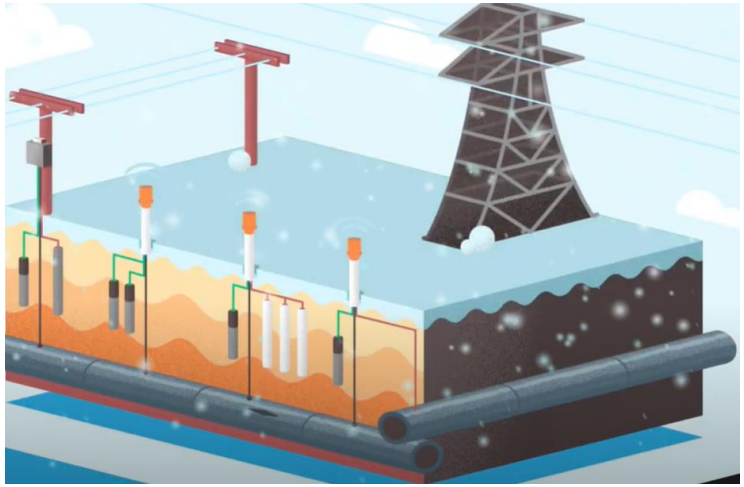
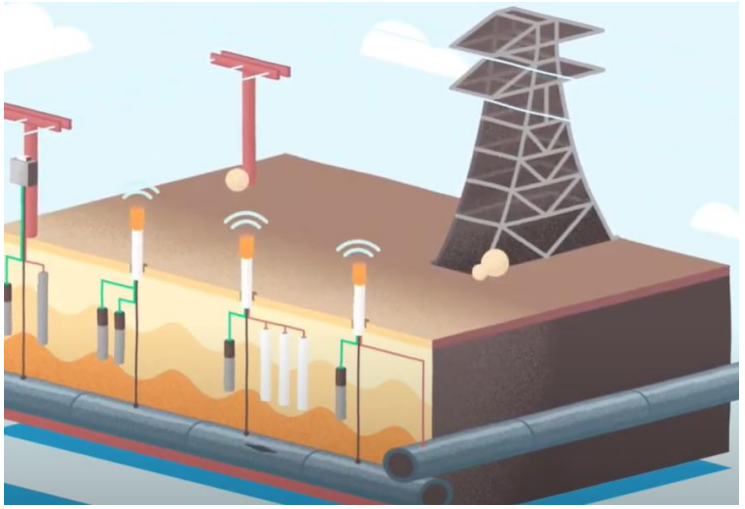
Impact #1
Safety

Accessing Remote Locations can be Hazardous

Pipelines, and the CP assets that protect them, span some of the most hospitable terrains on the continent, meaning that the simple act of accessing can present major safety hazards.







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AC Corridors, Traffic Exposure Norms of the Job

Furthermore, pipelines commonly placed in shared utility ROWs, and underneath major traffic arteries, present additional safety challenges for CP technicians to navigate.

Induced AC

Test Points in Traffic ROW

Source: Mobiltex partners & customers

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Impact #2
Operating Improvements

Operational Improvements

Understanding financial impact of monitoring by measuring operational efficiencies can be nuanced, extending beyond the obvious avoidance of manual data collection.

Operating Efficiency

- Avoid manual tasks (e.g., data collection, install interrupters)
- Reduce or eliminate admin
- Improved incident response via Alarms
- Proactive O&M
- Shift technician workload to high impact areas

Capital Efficiency

- Informed risk matrix
- Asset life extension (e.g., pipeline or groundbed)
- Capital planning & deferral

Increasingly impactful

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Operational Inputs – Key Considerations

This slide lays out some of the considerations that a customer should have related to the different CP applications (e.g., interruption vs. portable interruption), or RMU vendors (reliability, customer service)

Key Considerations:

Internal Project Management
Third-party Contractor Services
Technician Project Execution
Data Management / Documentation
Regulatory Compliance Requiremen
Safety Compliance & Requirements
Land Owner/3P Access
Traffic Control/Permit Cost
Remote Transport (Heli/UTV/Sled)
Subsistence/Lodging

- Coordinating with internal stake holders
- Subcontracting CP Monitoring
- Internal technicians' time if completing surveys internally
- Managing Data, hard copies into soft copies
- Facility Orientations, Permits
- Access for Farmers land or foreign facilities
- Traffic Management Plan
- Air Travel, Marine Travel, ATVs
- Other costs in addition to technician's time

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Examples of CP Applications

Considerations one has related to the different CP applications (e.g., interruption vs. portable interruption), or RMU vendors (reliability, customer service)

CP Scenarios But Not Limited to:

- Sacrificial systems embedded with impressed current systems meaning you may need to interrupt the sacrificial systems with the impressed (all GPS synced) in order to get your **true off** potentials.
- Foreign bonds which you may want to interrupt.
- Independent sacrificial systems which you want interrupted.
- Positive splitter panels with separate anode currents being monitored.
- Negative splitter panels with separate connections to multiple pipes that you want monitored.
- Structure to Soil Readings
- Dynamic DC Interference Capturing (DC Trains)
- AC Interference (Peak Loading Capture)
- Monitoring CP on Power Tower legs and anchors
- ASTs/UGTs External and Internal Tank CP monitoring
- Corrosion Rate monitoring
- AC / DC Coupon Monitoring

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Applications & Product Selection Considerations

Considerations one has related to the different CP applications (e.g., interruption vs. portable interruption), or RMU vendors (reliability, customer service)

Product Application Strength – Product Portfolio:

- Application elements:
  - Interruption vs. non-interrupting a bond or rectifier
  - P/S structure vs. depolarized coupon
  - ER probes
- Frequency of readings and data transmission
- Density of device deployment (criticality)
- Product breadth
  - Rectifiers, Critical Bonds, Splitter Panels, Interference Bonds, Coupons, AC Mitigation and More.

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Applications & Product Selection Considerations

Considerations one has related to the different CP applications (e.g., interruption vs. portable interruption), or RMU vendors (reliability, customer service)

RMU Product:

- Reliability
  - Battery power and expected life, Water Ingression
- Specific device features
  - Interruption or just monitoring
  - Number of channels
  - Frequency of readings
  - And Many More
- Form factor (installation)
  - Do you need a special junction box?
  - Can it fit the existing test stations?
- Communications technology
  - Simplex or Duplex
  - Cellular or Satellite
- Customer service

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Impact #3
Asset & Data Integrity

Data Integrity Enabled by Remote Monitoring

While automated data collection has largely helped bring higher volume of data into the CP industry, barriers remain in the way of broader systemic evolution.

	Sources of Data	Regulated Frequency	Desired for Operating / Performance Frequency
Fixed Assets	Rectifiers	Every 2 months	Daily or multiple per day
	Pipe-to-Soil Test Stations	Every 12 months	Weekly or semi-monthly
	Critical and non-critical bonds	Critical (2 months), non (12 months)	Daily or multiple per week
	CP Coupons (AC & DC)	Site & use-case specific	Daily or multiple per week
	ER Probes	Site & use-case specific	Weekly or semi-monthly
	Casings	Every 12 months	Weekly or semi-monthly
	Other sensors	Site & use-case specific	Daily or multiple per day
Survey	Annual Surveys	Every 12 months	Quarterly
	Close Interval Survey	Every 3-10 years	Quarterly
	In-line Inspection	Every 3-10 years	Annually
	Other Surveys	Every 3-10 years	Annually

Challenges:

- Reliability and cost of technology
- Efficiencies in managing larger quantities of data
- Preference for not knowing issues
- Criteria based regulatory vs. performance

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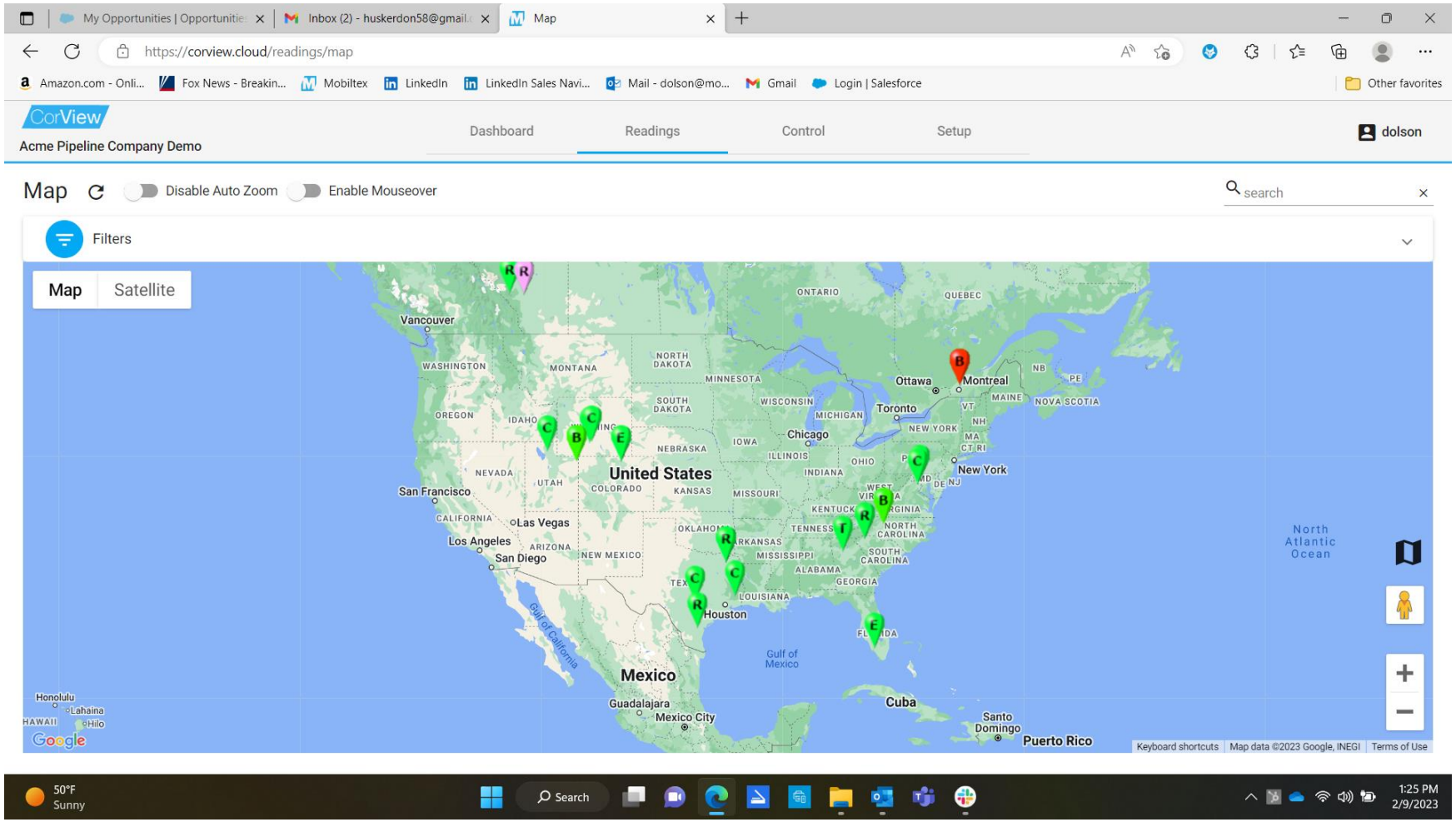
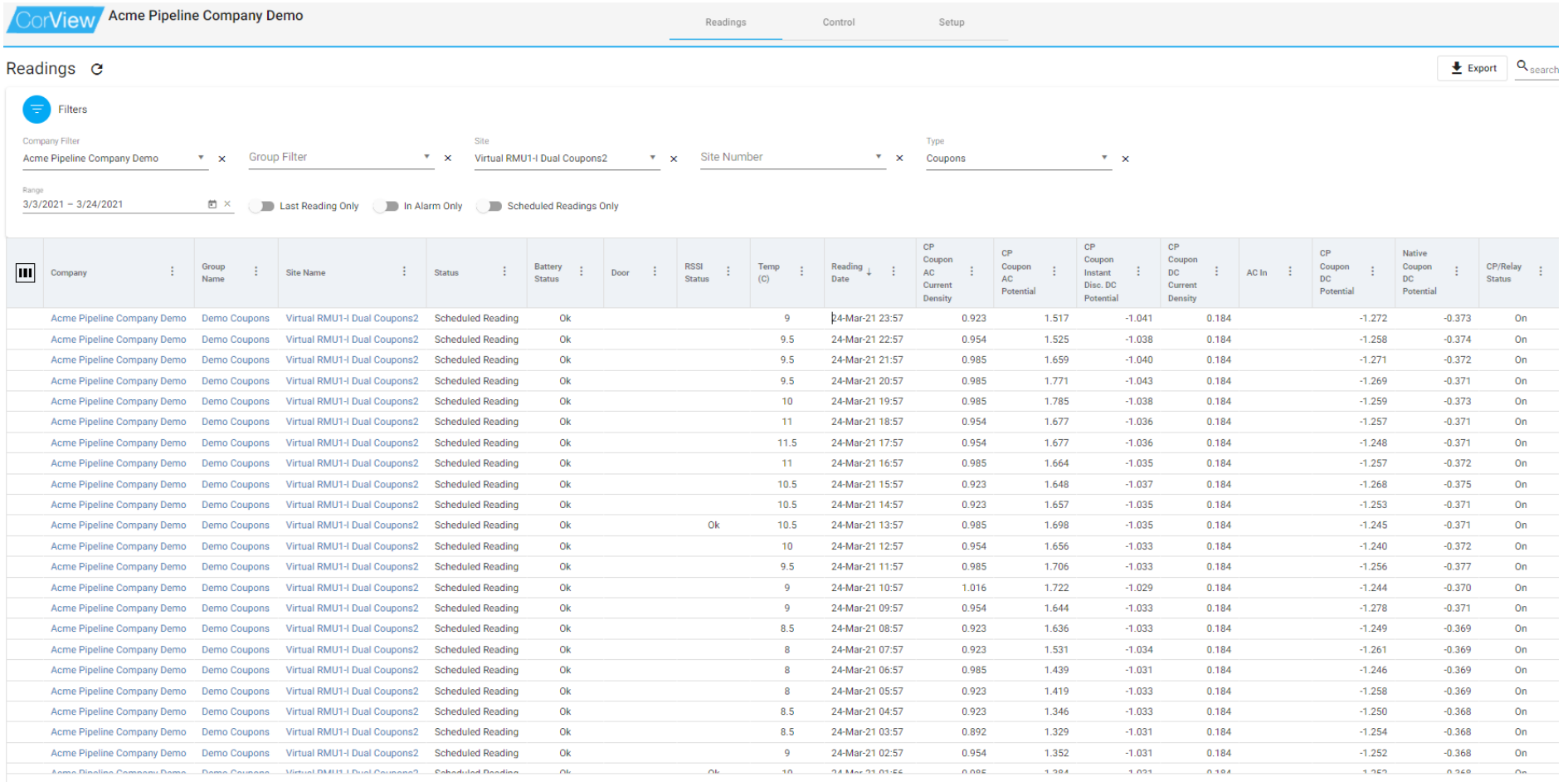
Map Page

Geolocating assets allows for management of National fleets, with regional users having ability to gain quick insights into status and performance of RMU & CP assets.



CorView.Cloud - Readings Table

Detailed insight into CP asset readings, trends, and alarms, while providing RMU status and condition for fleet management activities.



Company	Group Name	Site Name	Status	Battery Status	Door	RSSI Status	Temp (C)	Reading Date	CP Coupon AC Current Density	CP Coupon AC Potential	CP Coupon Instant Disc. DC Potential	CP Coupon DC Current Density	AC In	CP Coupon DC Potential	Native Coupon DC Potential	CP/Relay Status
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			9	24-Mar-21 23:57	0.923	1.517	-1.041	0.184		-1.272	-0.373	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			9.5	24-Mar-21 22:57	0.954	1.525	-1.038	0.184		-1.258	-0.374	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			9.5	24-Mar-21 21:57	0.985	1.659	-1.040	0.184		-1.271	-0.372	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			9.5	24-Mar-21 20:57	0.985	1.771	-1.043	0.184		-1.269	-0.371	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			10	24-Mar-21 19:57	0.985	1.785	-1.038	0.184		-1.259	-0.373	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			11	24-Mar-21 18:57	0.954	1.677	-1.036	0.184		-1.257	-0.371	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			11.5	24-Mar-21 17:57	0.954	1.677	-1.036	0.184		-1.248	-0.371	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			11	24-Mar-21 16:57	0.985	1.664	-1.035	0.184		-1.257	-0.372	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			10.5	24-Mar-21 15:57	0.923	1.648	-1.037	0.184		-1.268	-0.375	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			10.5	24-Mar-21 14:57	0.923	1.657	-1.035	0.184		-1.253	-0.371	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok		Ok	10.5	24-Mar-21 13:57	0.985	1.698	-1.035	0.184		-1.245	-0.371	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			10	24-Mar-21 12:57	0.954	1.656	-1.033	0.184		-1.240	-0.372	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			9.5	24-Mar-21 11:57	0.985	1.706	-1.033	0.184		-1.256	-0.377	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			9	24-Mar-21 10:57	1.016	1.722	-1.029	0.184		-1.244	-0.370	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			9	24-Mar-21 09:57	0.954	1.644	-1.033	0.184		-1.278	-0.371	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			8.5	24-Mar-21 08:57	0.923	1.636	-1.033	0.184		-1.249	-0.369	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			8	24-Mar-21 07:57	0.923	1.531	-1.034	0.184		-1.261	-0.369	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			8	24-Mar-21 06:57	0.985	1.439	-1.031	0.184		-1.246	-0.369	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			8	24-Mar-21 05:57	0.923	1.419	-1.033	0.184		-1.258	-0.369	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			8.5	24-Mar-21 04:57	0.923	1.346	-1.033	0.184		-1.250	-0.368	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			8.5	24-Mar-21 03:57	0.892	1.329	-1.031	0.184		-1.254	-0.368	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok			9	24-Mar-21 02:57	0.954	1.352	-1.031	0.184		-1.252	-0.368	On
Acme Pipeline Company Demo	Demo Coupons	Virtual RMU1-I Dual Coupons2	Scheduled Reading	Ok		Ok	10	24-Mar-21 01:56	0.985	1.384	-1.031	0.184		-1.252	-0.368	On

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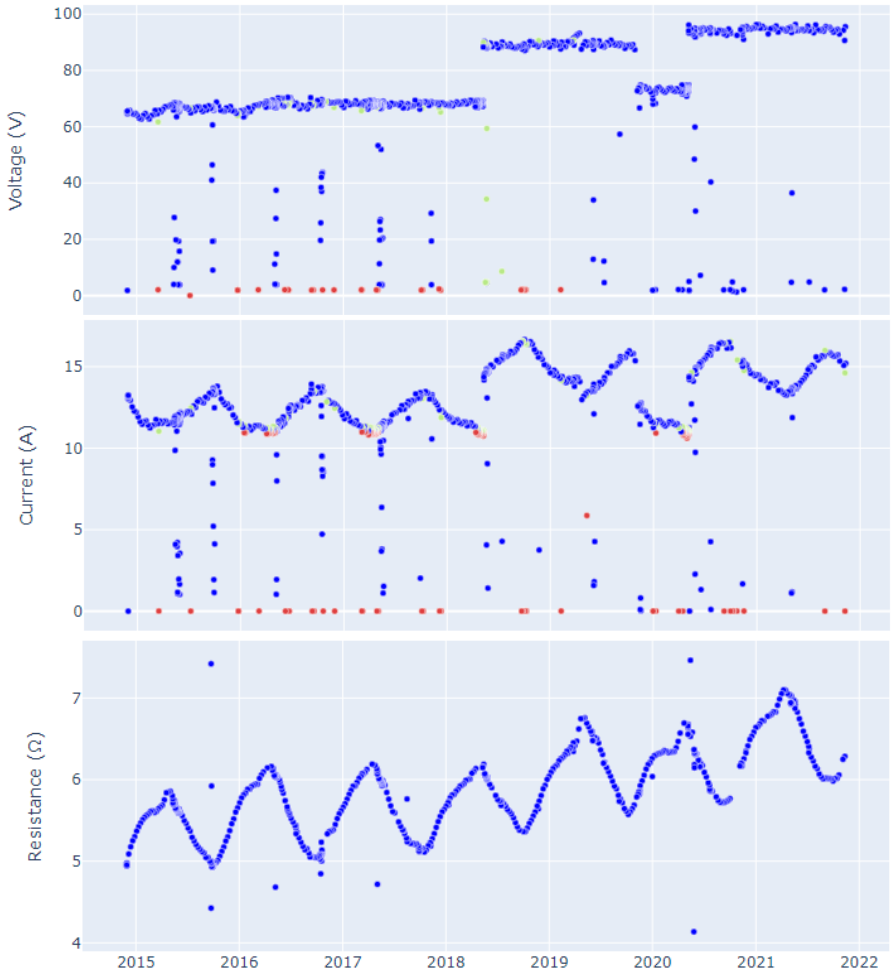
CP System Seasonality via Analytics

Core benefit of autonomous data collection is in creating visibility to CP system trends and performance that we've previously only guessed at.



Takeaways:

- Visibility into system performance previously unseen
- Seasonal effects critical to model for more informed analytics
- Groundbed system resistance one area of focus to inform O&M and capital spend
- Compliance programs can be improved; criteria selection and 'out-of-criteria' defense can be approached from novel data-driven angles.
- Enabled by device autonomy, robustness, reliability

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Impact #4
Environmental

Promote Sustainability, Safety, & Integrity

Environmental Impact

Eliminate emissions:

- CO2 emissions from reducing windshield time, helicopter access
- Fugitive gas emissions from leaks, bursts
- Established communications backbone across remote pipeline assets

Ensure product delivery is efficient, safe, and sustainable

*Compared with manual data collection, an install base of **20 RMUs offsets over 8.5 Metric Tons of CO2 emissions per year**, equal to the total annual energy consumption of 1 home.*

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Understanding the Return on Investment

Reviewing the Inputs

Understanding your network, the desired applications and selecting the appropriate technology is a key starting point for ROI.

Setting Up Cost Inputs

Internal Project Management	**Coordinating all aspects projects/programs	5000.00	Yearly
Third-party Contractor Services	**All cost associated with subcontractor services	80000.00	Yearly
Technician Project Execution	**Internal CP Engineers support and/or field time	3000.00	Yearly
Data Management / Documentation	**Internal/external manual data refinement + input	5000.00	Yearly
Regulatory Compliance Requiremer	**Internal/external manual data refinement + input	1000.00	Yearly
Safety Compliance & Requirements	**Safety program execution & documentation	1000.00	Yearly
Land Owner/3P Access	**Negotiating access to difficult and/or remote locat	2000.00	Yearly
Remote Site Transport (Heli/UTV/Sl	**All costs/equipment for seasonal remote access	20000.00	Yearly

Application Selection

Rectifier Monitoring (RMU3)	Rectifier	10	Out of Town	Cell
Rectifier Monitoring (RMU3)	Rectifier	5	In Town	Cell
Test Station P/S Monitoring (RMU1-LITE)	Test Station (Pipe-to-	25	In Town	Cell
Test Station P/S Monitoring (RMU1-LITE)	Test Station (Pipe-to-	75	Out of Town	Cell
Test Station Monitoring (RMU1)	Bond: Critical - Test P	10	In Town	Cell
Test Station Monitoring (RMU1)	Bond: Non-Critical - T	40	Out of Town	Cell

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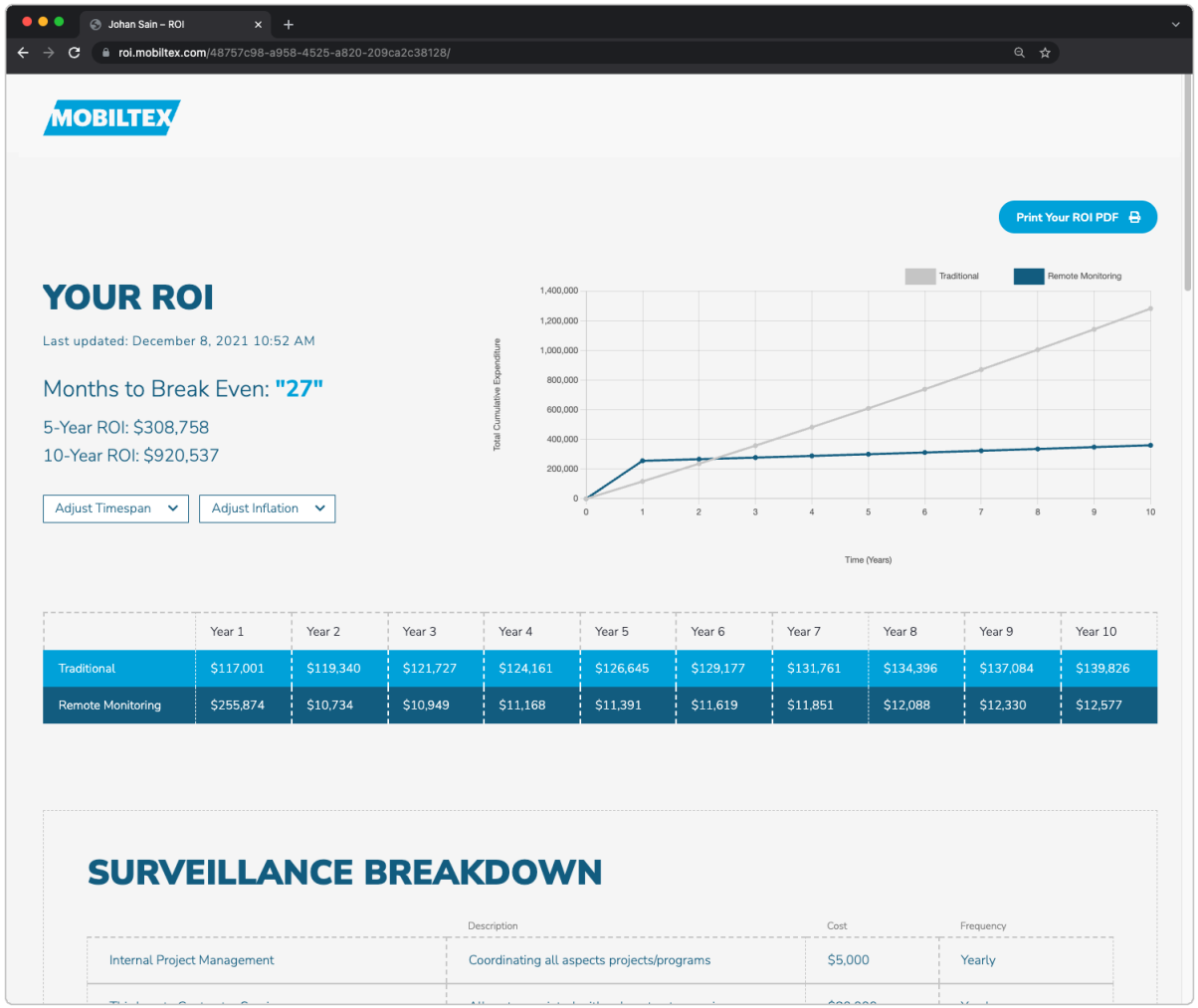
Understanding the Output

Return on Investment Calculation



	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Traditional	$117,001	$119,340	$121,727	$124,161	$126,645	$129,177	$131,761	$134,396	$137,084	$139,826
Remote Monitoring	$255,874	$10,734	$10,949	$11,168	$11,391	$11,619	$11,851	$12,088	$12,330	$12,577

Takeaways:

Tangibles:

- Short interval to realizing full ROI
- Benefits: Traditional vs. Remote Monitoring
- Reduced OPEX
- Insulated against labor or budget challenges

Intangibles:

- Reduction of risk associated with required field work
- Asset integrity & CAPEX deferral
- Environmental

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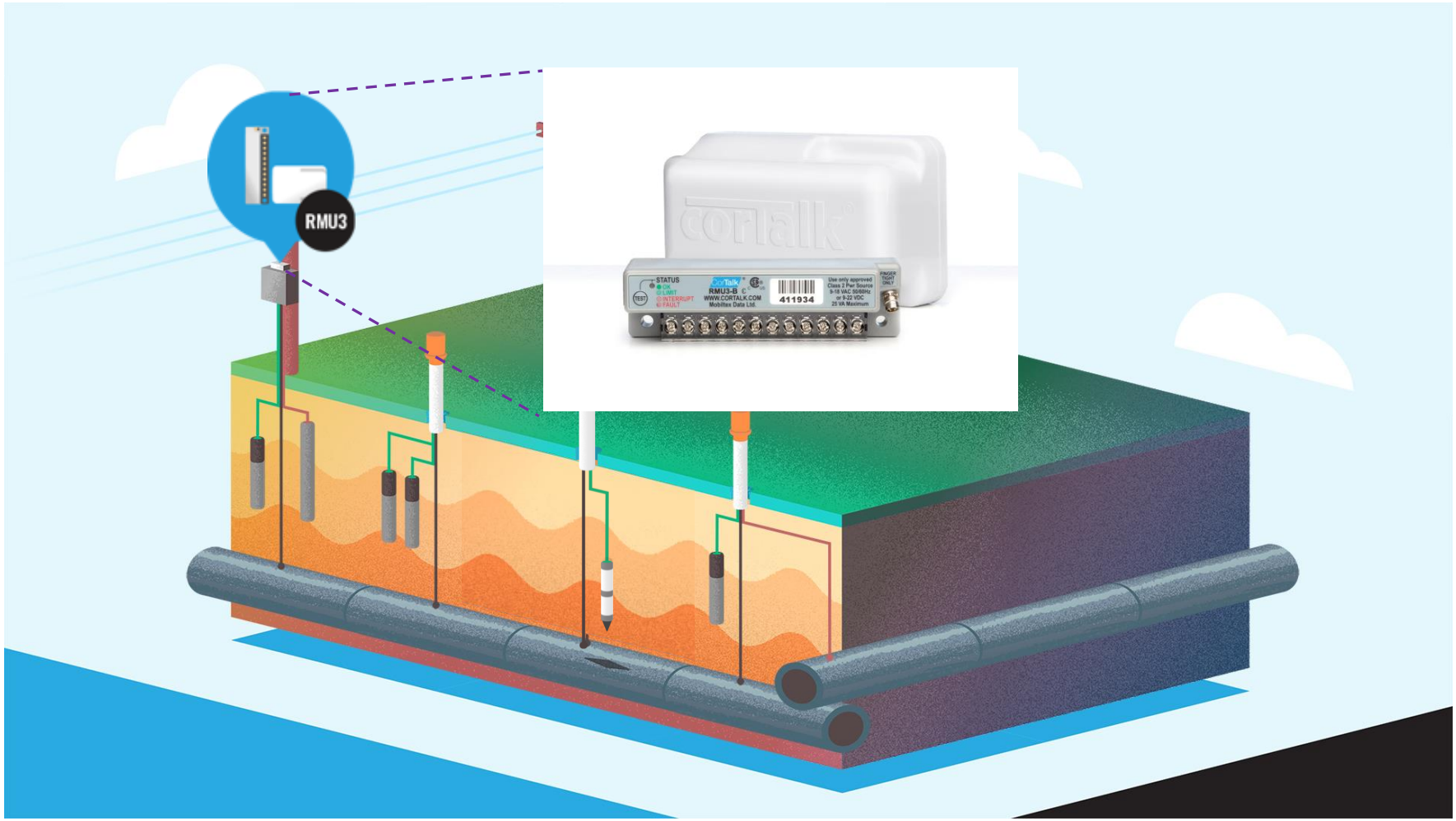
Remote Interruption of Rectifier with RMU3



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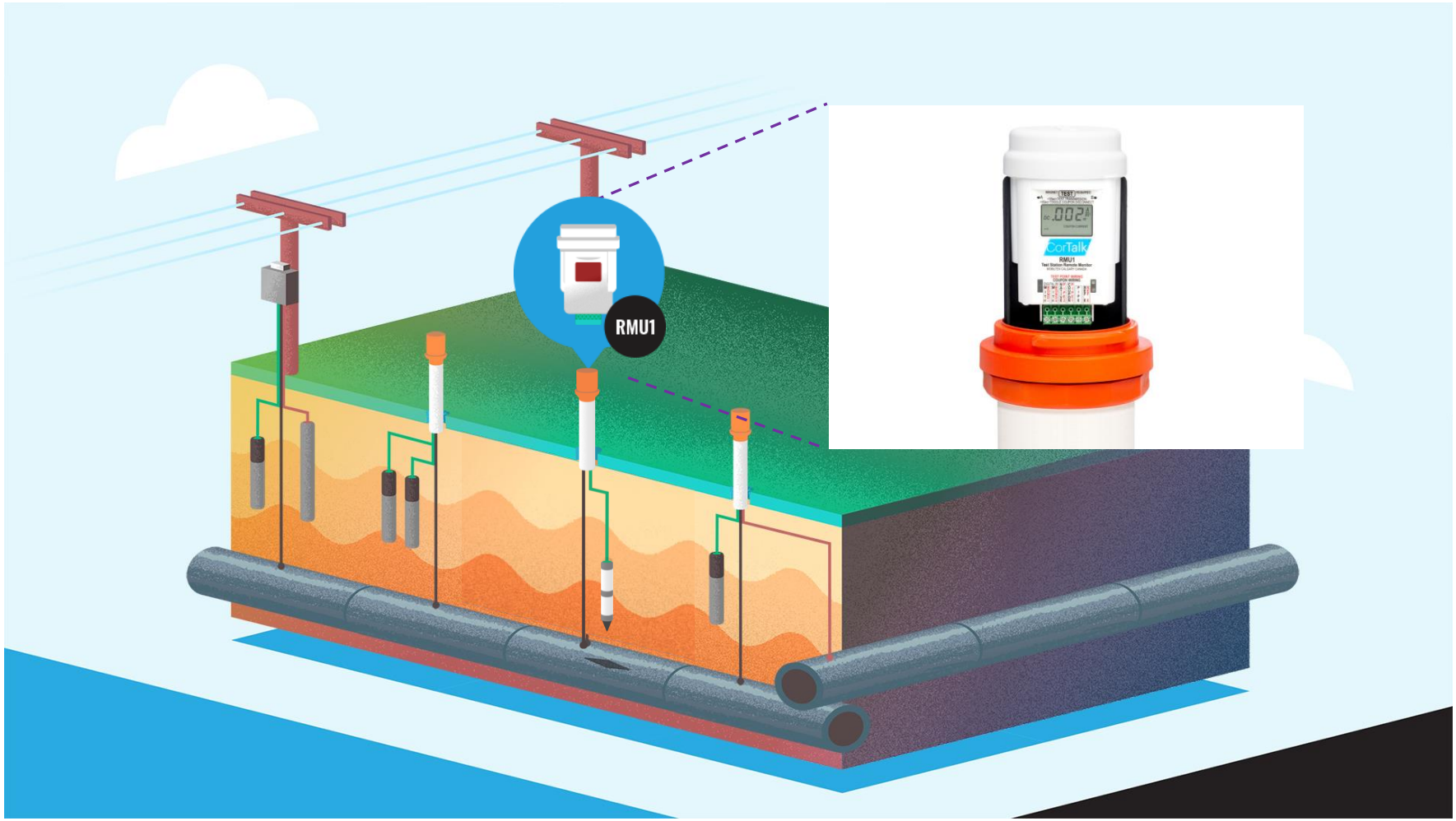
Remote Monitoring Coupon with RMU1



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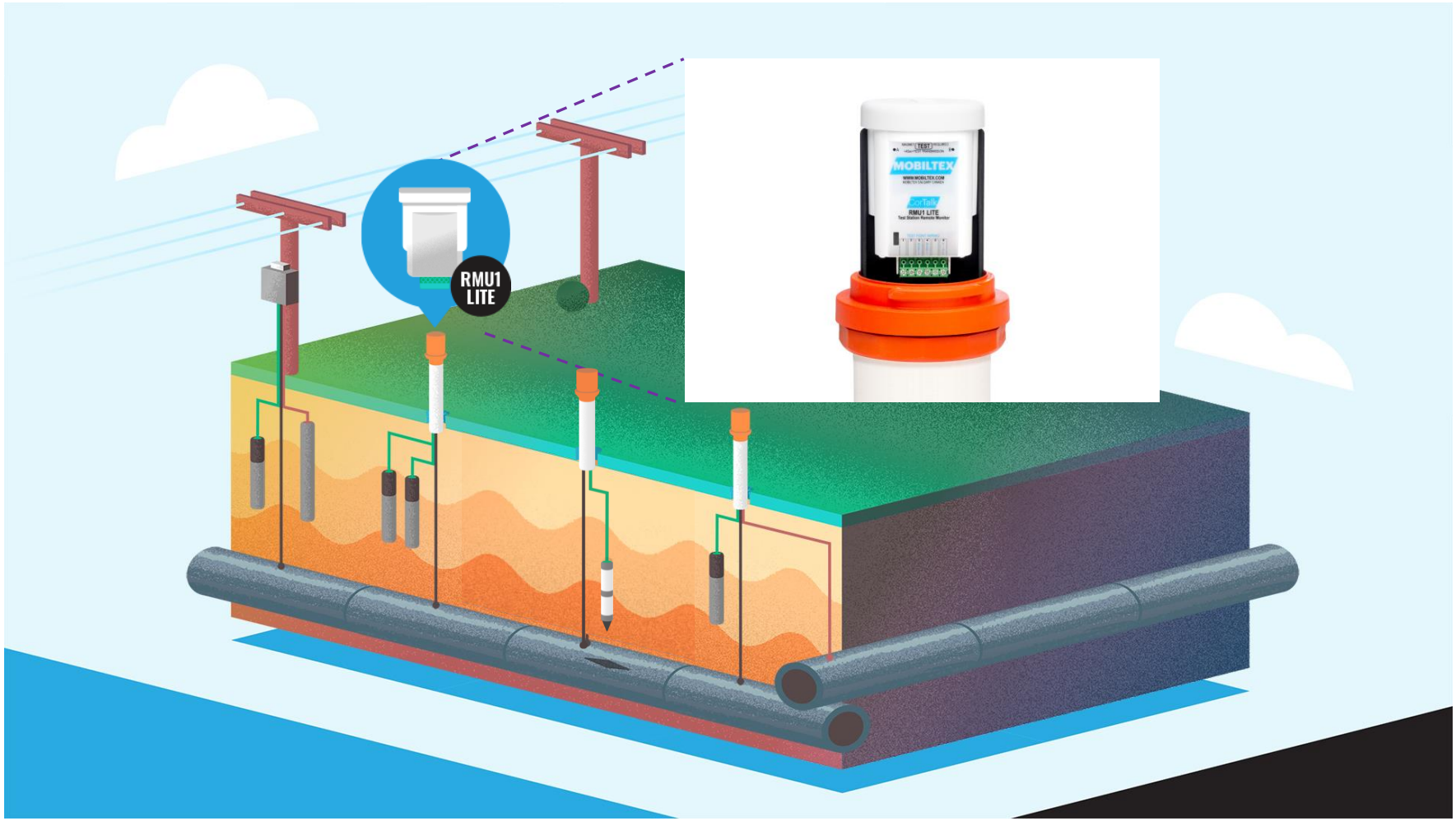
Remote Test Station Monitoring with RMU1-LITE



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WE'RE THERE.

35+ YEARS
OF MONITORING INNOVATION

>160K MILES
OF PIPELINE MONITORED

~200
MAJOR ORGANIZATIONS ASSETS PROTECTED