


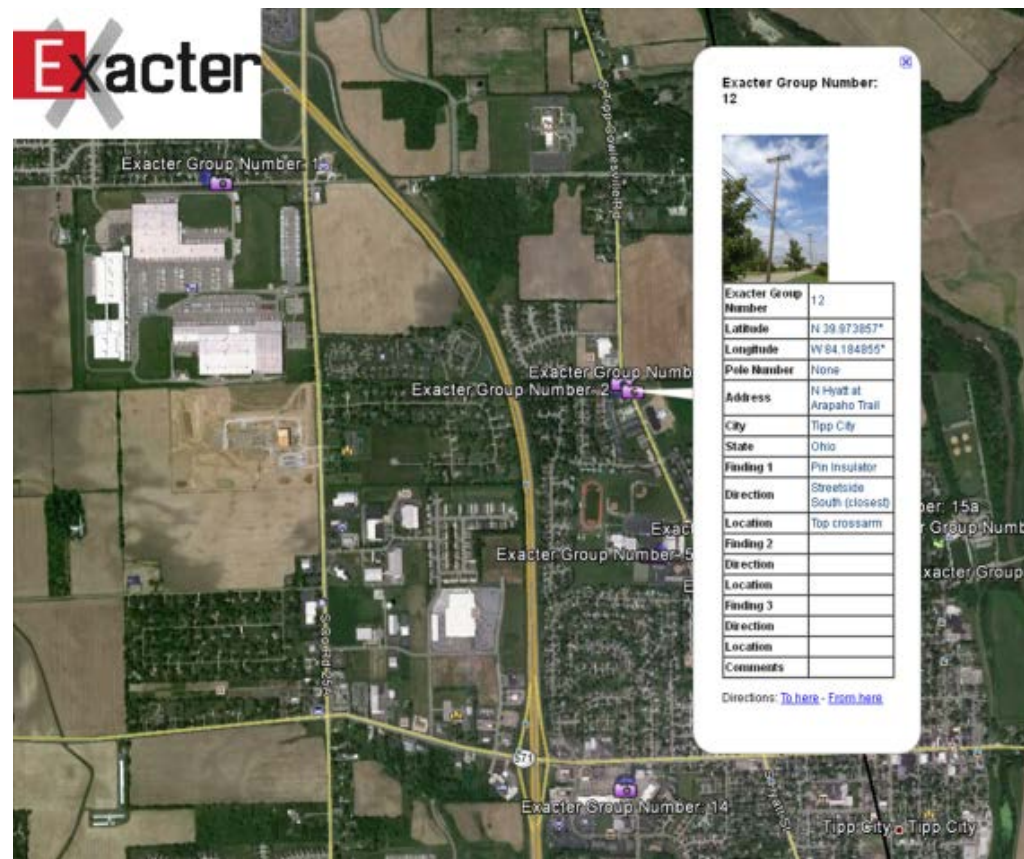
GIS Integrated Analytics for Preventive Maintenance and Storm Recovery

LISAT 2013

Presenter
John Lauletta
CEO/CTO

Grid Condition Assessment Maintenance Priorities for Improved System Resiliency and Reliability

- Based in Columbus, OH
- US Strategic Partners:
 - 
A Division of The Davey Tree Expert Company
 - 
A BETTER POINT OF VIEW
- Int'l Alliance Partners
 - Australia, Mexico, Canada
- 2 US Patents
- 2 million+ Poles Surveyed
- 3rd Party Validation
 - Dept of Energy (DOE)
 - Nat'l Elec. Testing Lab (NETL)
 - The Ohio State University



Exacter Reliability Services Process

Data Acquisition & Discrimination



RF emissions from arcing
(deteriorated) electrical components



Exacter sensor in vehicle/aircraft
collects the signals and then
discriminates and GPS locates arcing,
tracking and leaking electrical
components



Condition Assessment: Select Circuits and Design Survey

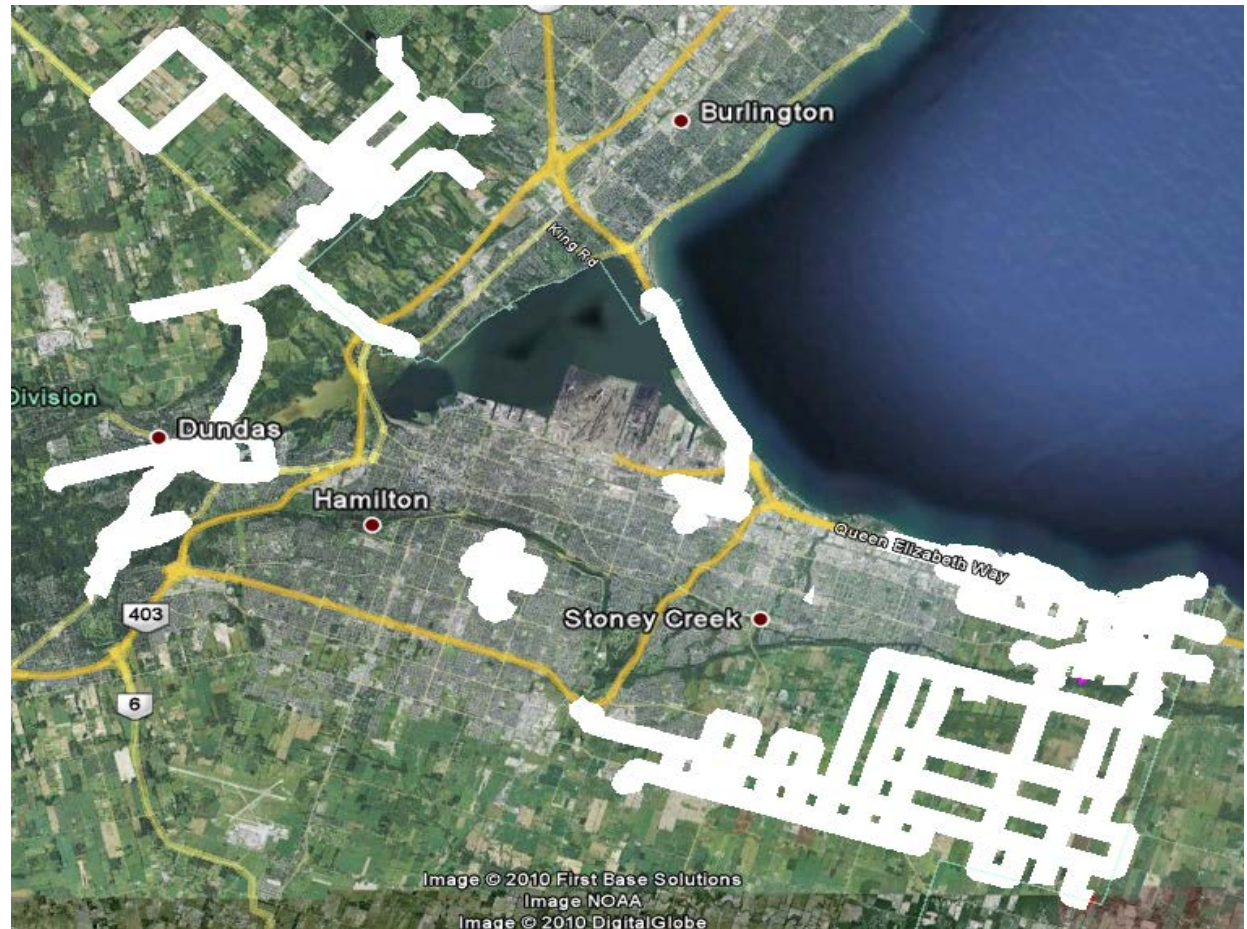
Following the selection of circuits to be included in the assessment, Exacter Data Specialists design specific survey routes using public access roadways. The EXACTER Sensor is sensitive in a 200 meter radius from the vehicle.



Condition Assessment: Monitor Survey Progress

While the survey is underway, the path of the survey vehicle, the WHITE trace, is monitored to insure that the circuits being assessed are completely studied.

Accuracy of results is improved by multiple passes of the same route over a four week period.



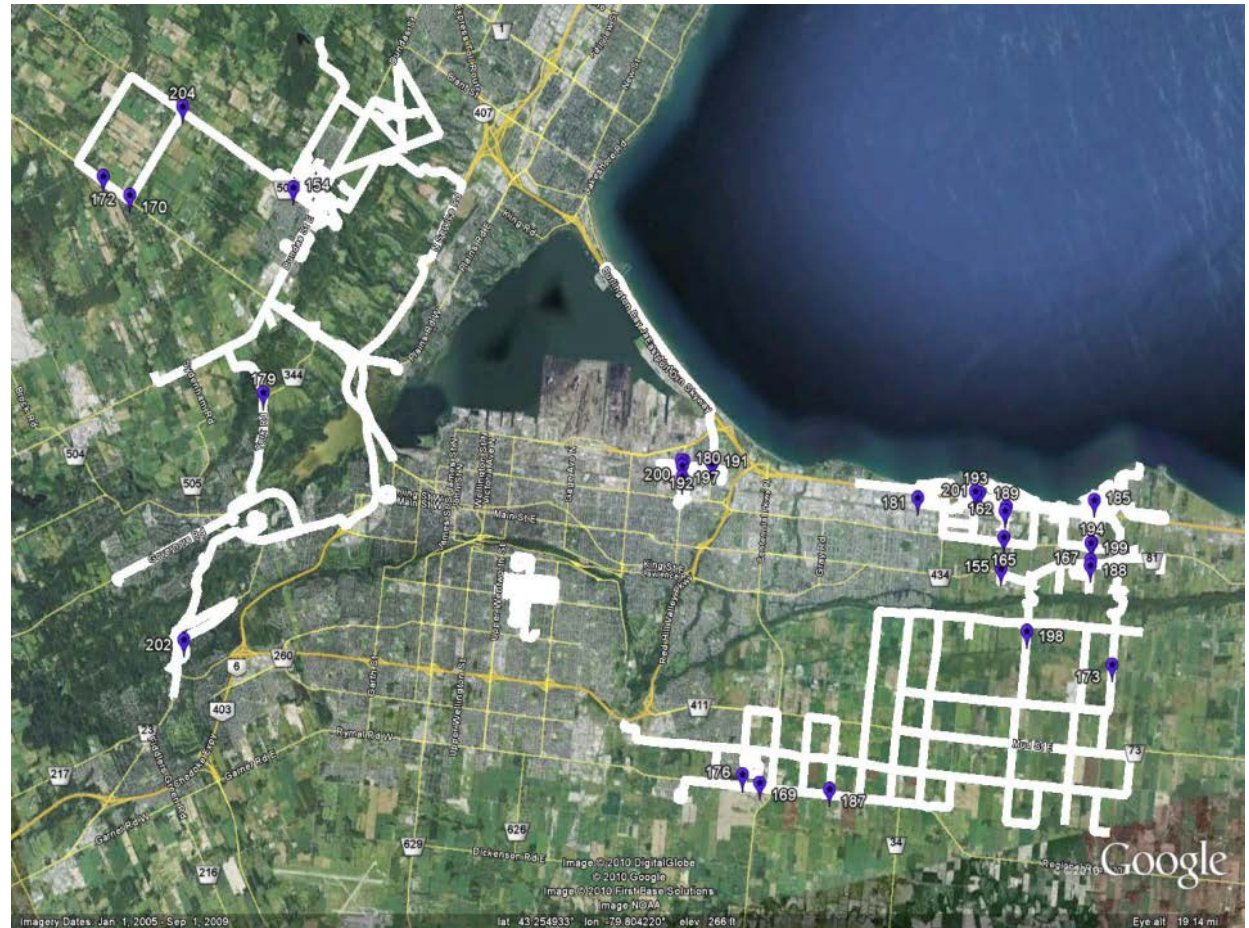
Condition Assessment: Real-time Failure Signature Analysis

Whenever the EXACTER Sensor locates a line emission that correlates to a Failure Signature a real-time study is completed. The 986 **RED** markers show all of the studies from the four-week survey process.



Condition Assessment: EXACTER Condition Assessment Results

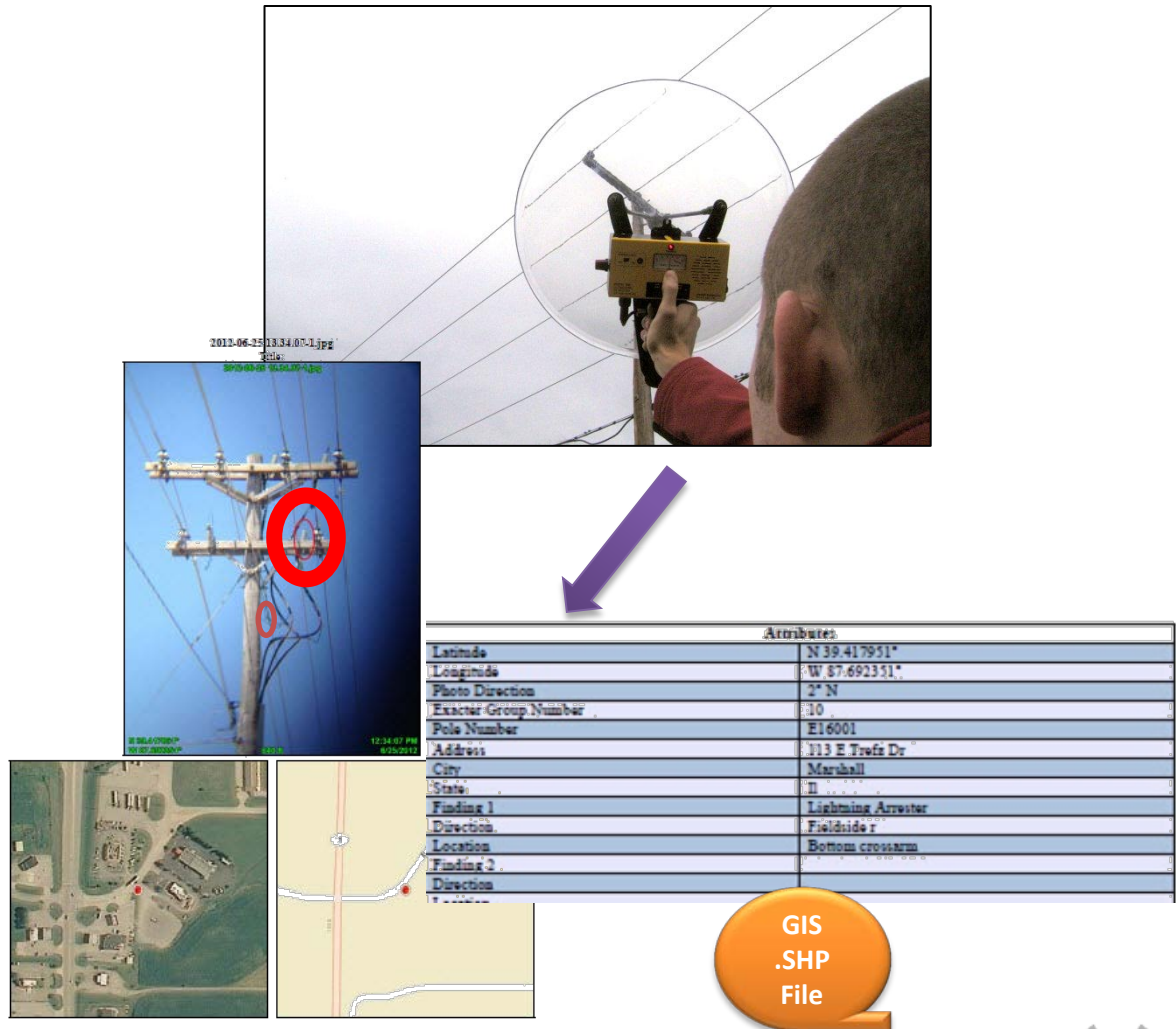
The 986 **RED** Failure Signature Events are studied by EXACTER Servers to create this result: 25 **BLUE** Maintenance Groups where a structure includes at least one weakened component.



Prioritized Maintenance Action: Select Equipment to Replace

Specific component(s) that are arcing, leaking or tracking on those structures that have been prioritized for repair are identified.

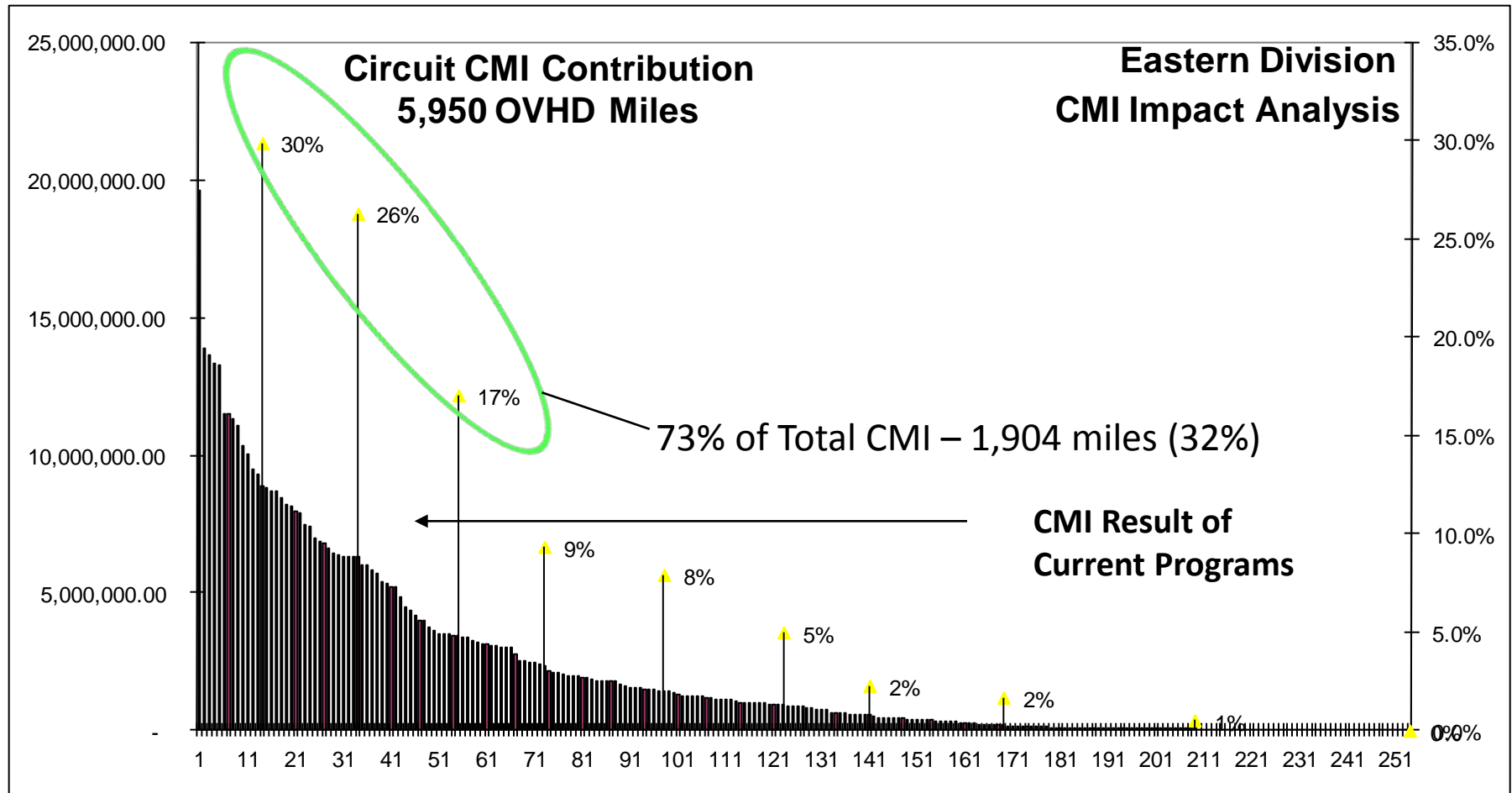
Photographs, Maps, Reports, and GIS Files are provided.



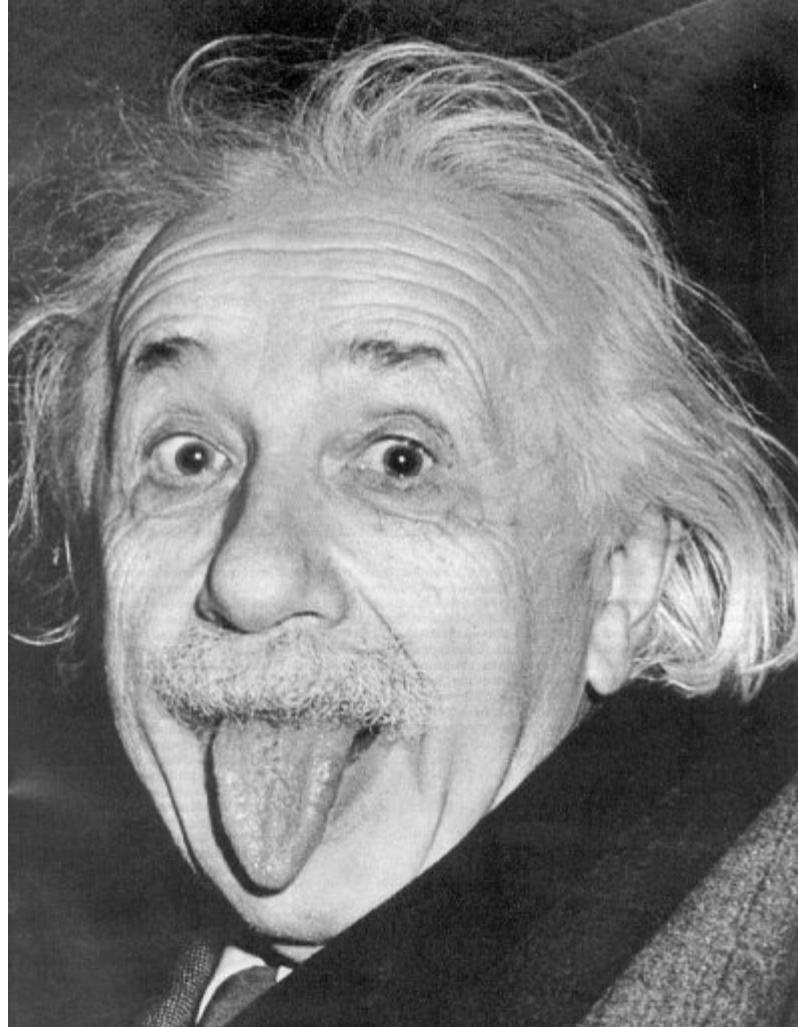
Attributes	
Latitude	N 39.417951°
Longitude	W 87.692331°
Photo Direction	2° N
Exactor Group Number	10
Pole Number	E16001
Address	113 E Trews Dr
City	Marshall
State	IL
Finding 1	Lightning Arrester
Direction	Fieldside r
Location	Bottom crossarm
Finding 2	
Direction	

GIS
.SHP
File

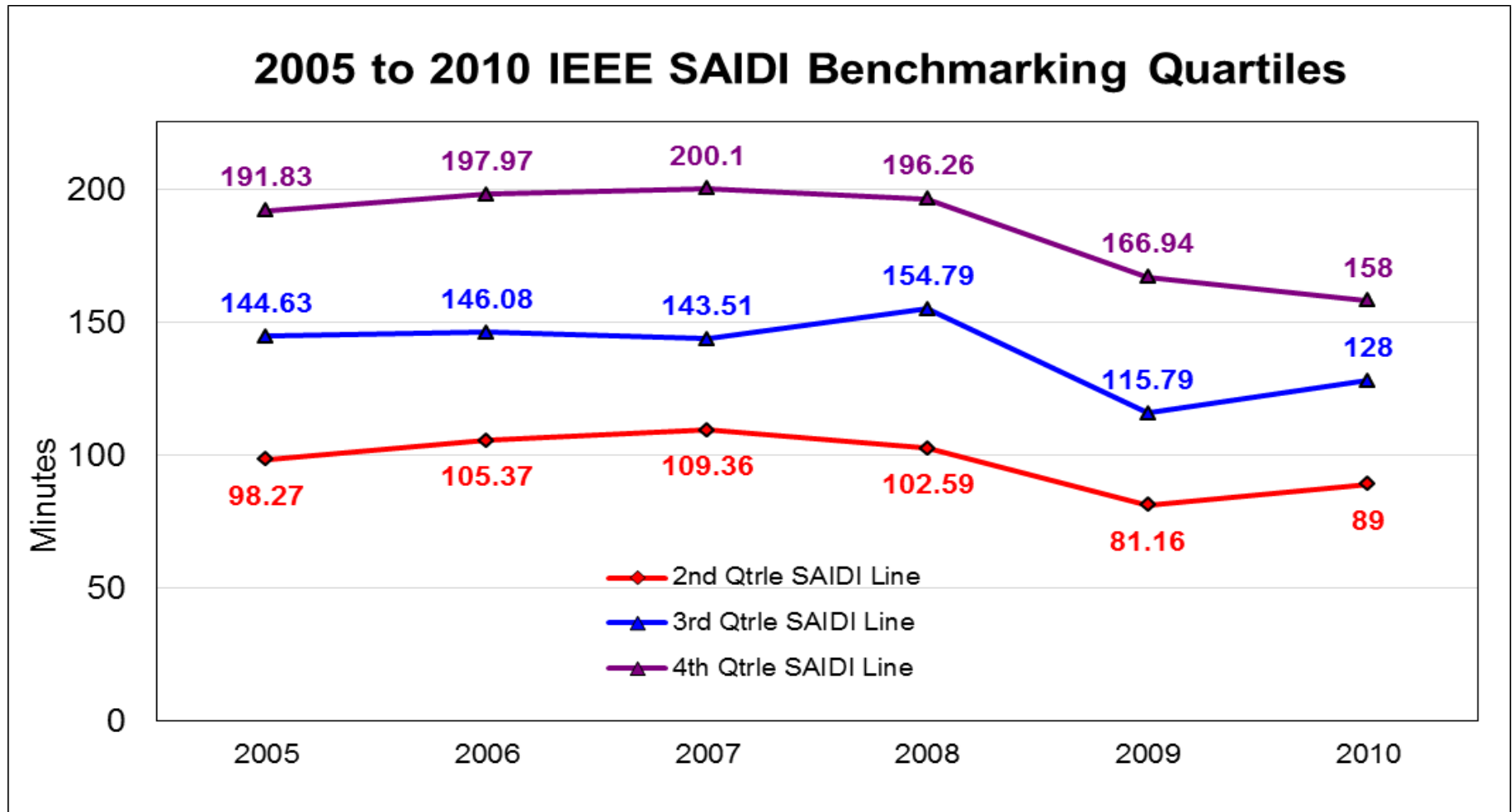
Example: Prioritized Worst Performing Circuit (WPC) Improvement Program



Its Not the Question that Changes. . .



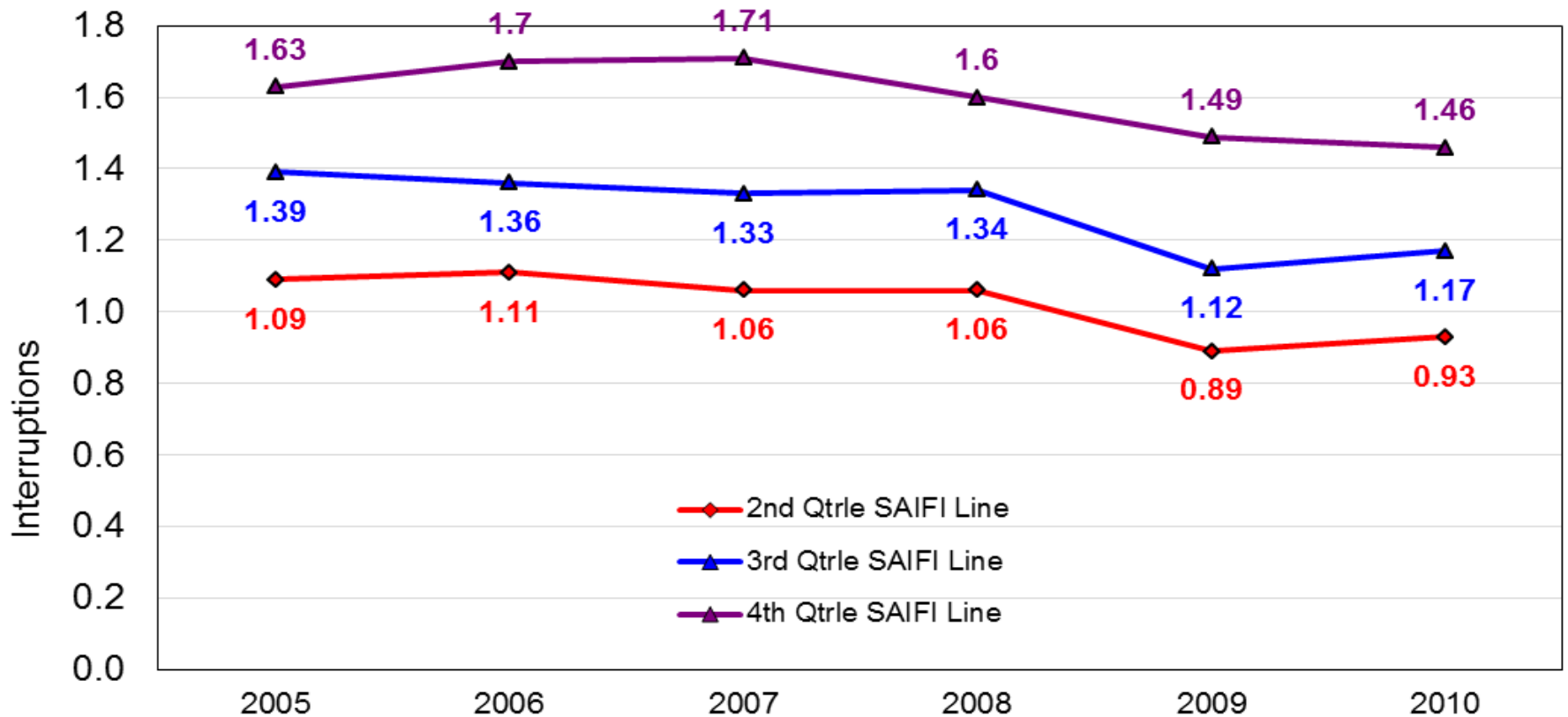
Sum of All Customer Interruption Durations Total Number of Customers Served



Total # of Customer Interruptions

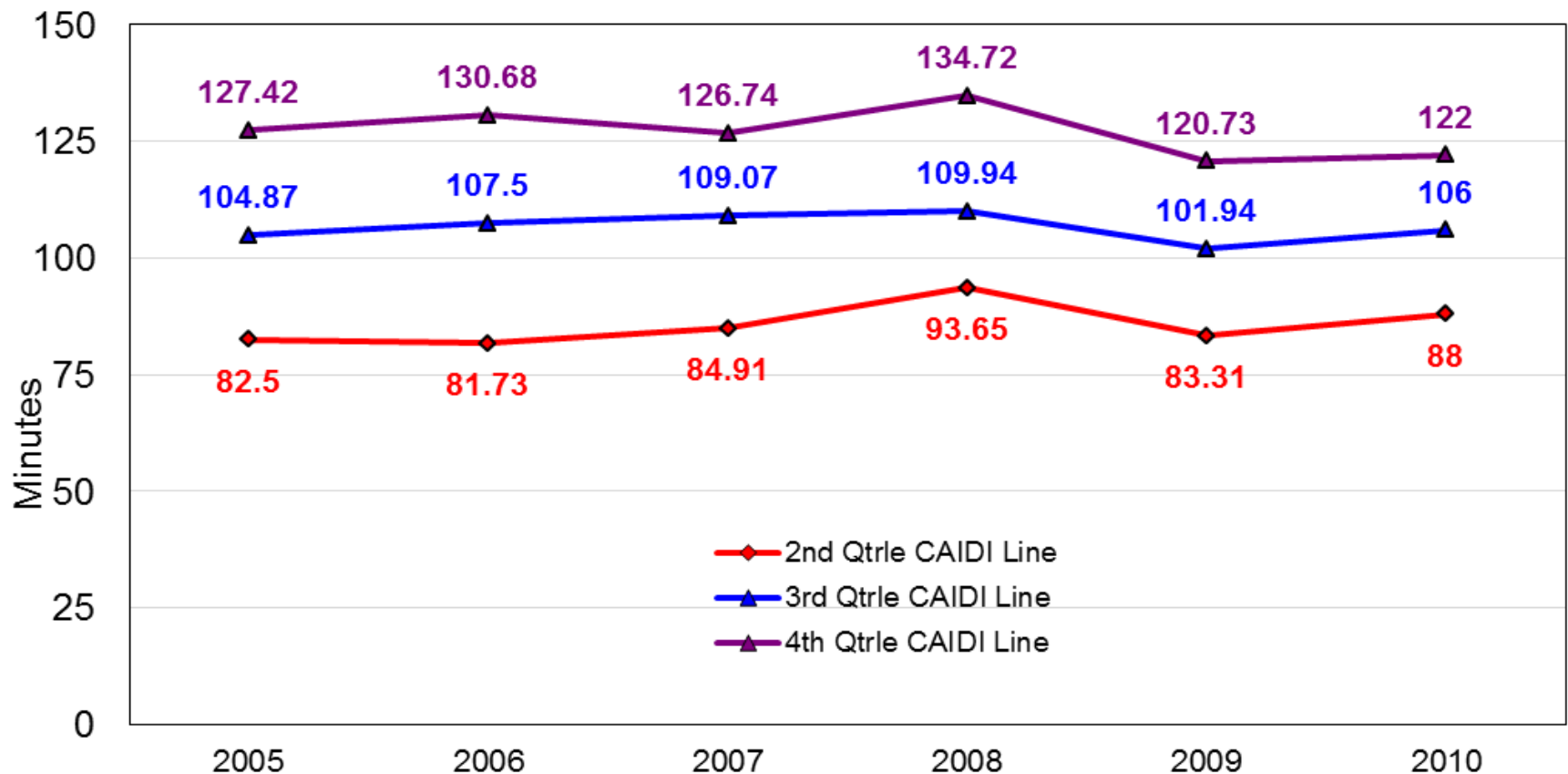
Total Number of Customers Served

2005 to 2010 IEEE SAIFI Benchmarking Quartiles

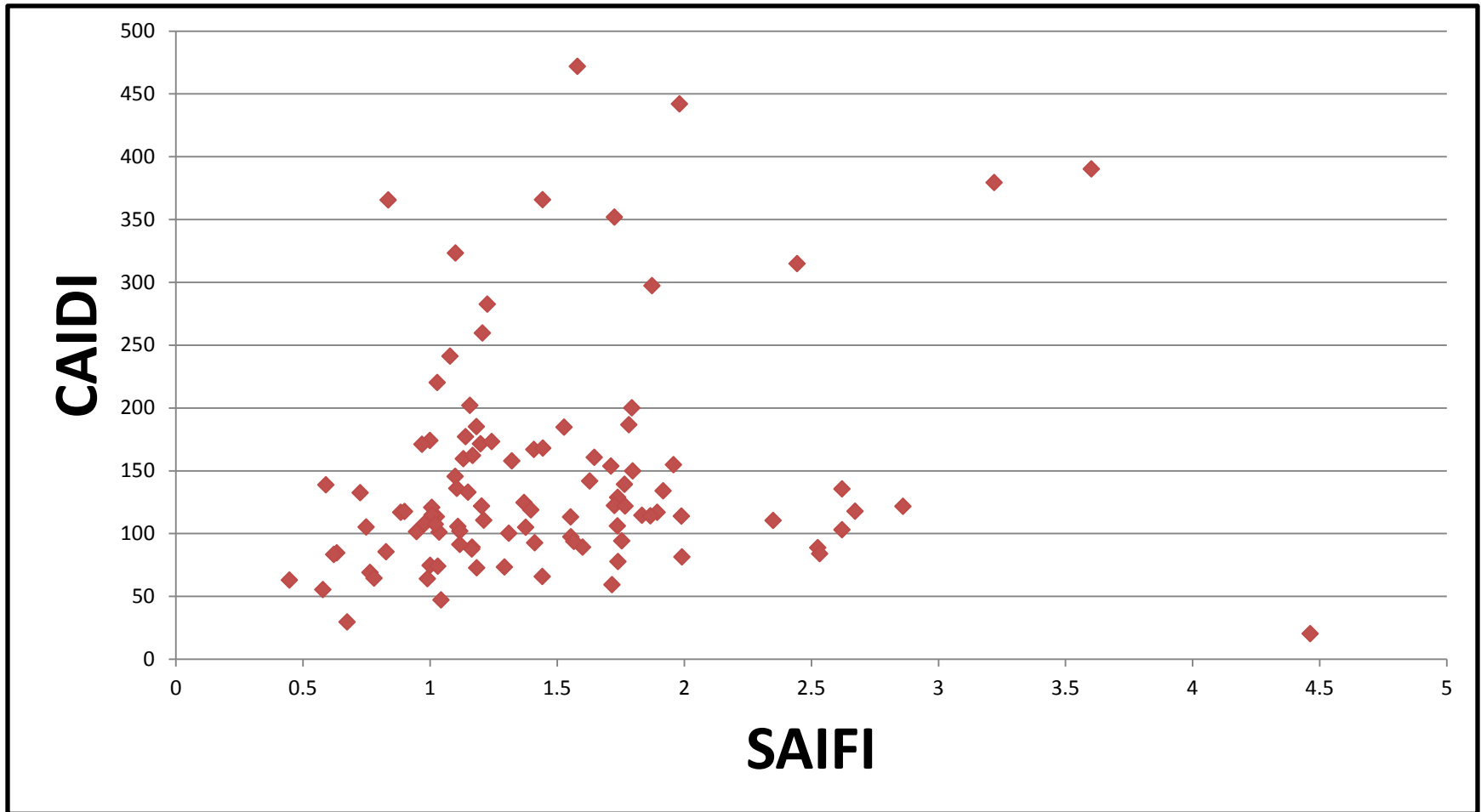


$$\frac{\text{Sum of All Customer Interruptions}}{\text{Total Number of Customer Interruptions}} = \frac{\text{SAIDI}}{\text{SAIFI}}$$

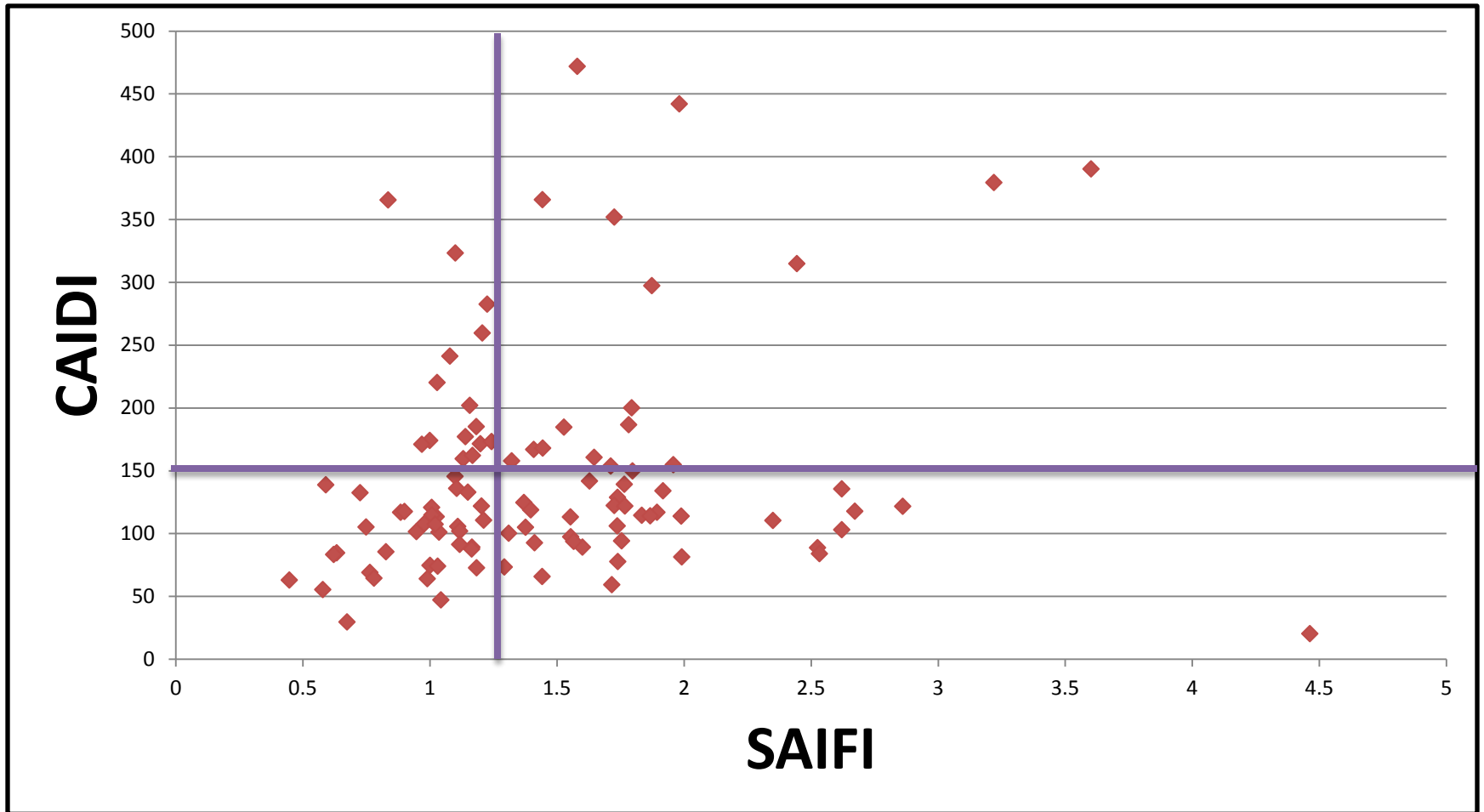
2005 to 2010 IEEE CAIDI Benchmarking Quartiles



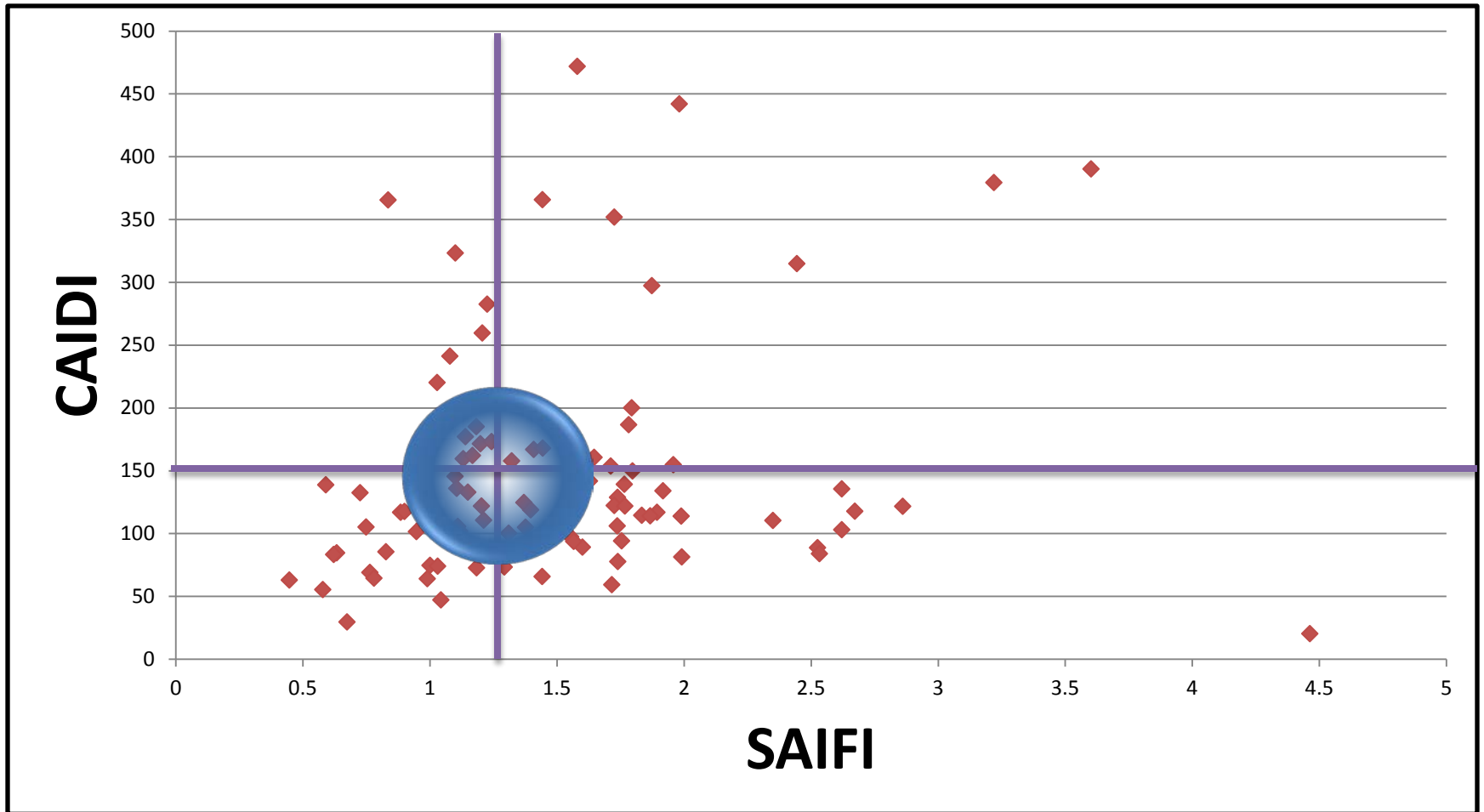
Flat Response = Challenges & Opportunities



Flat Response = Challenges & Opportunities

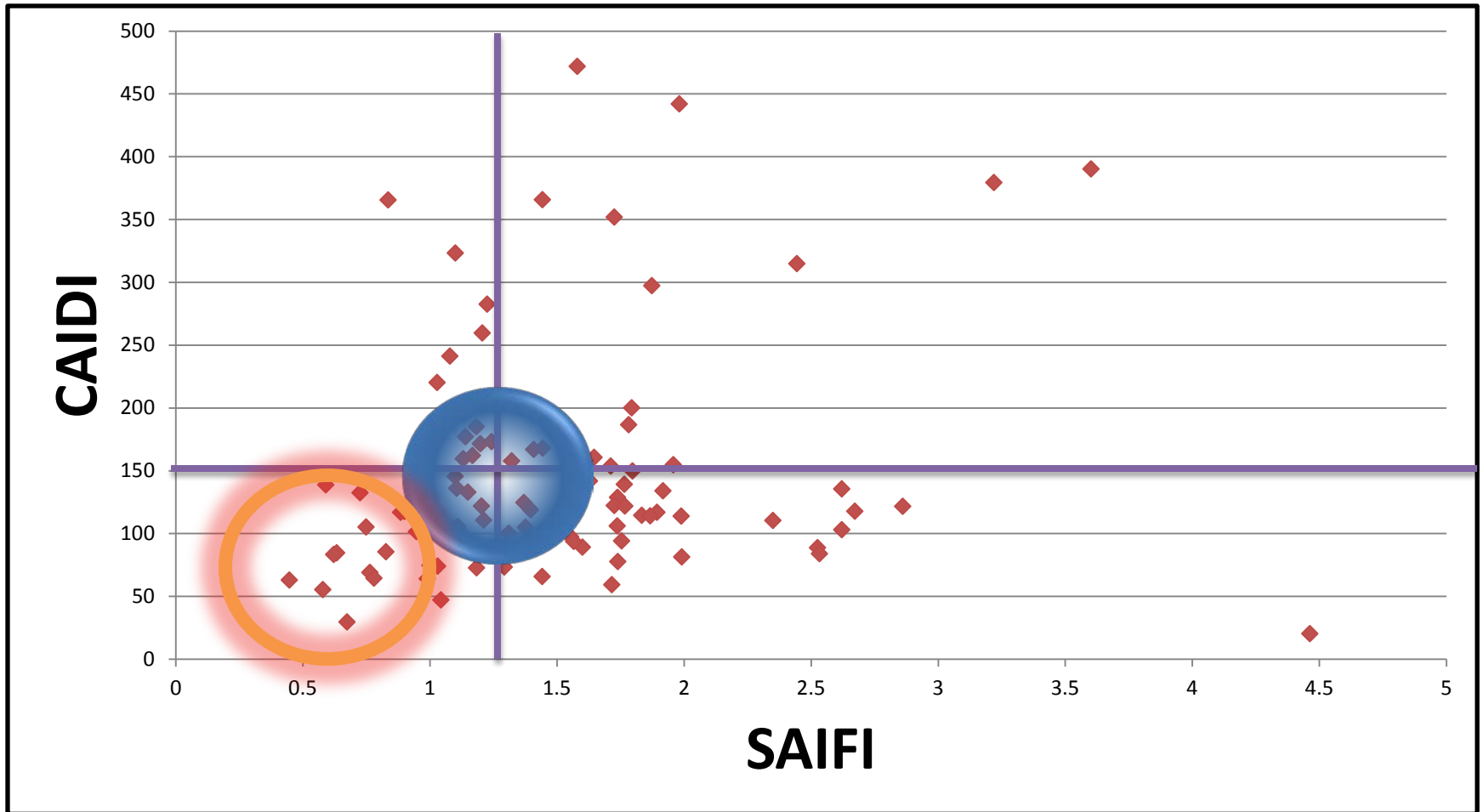


Target Performance



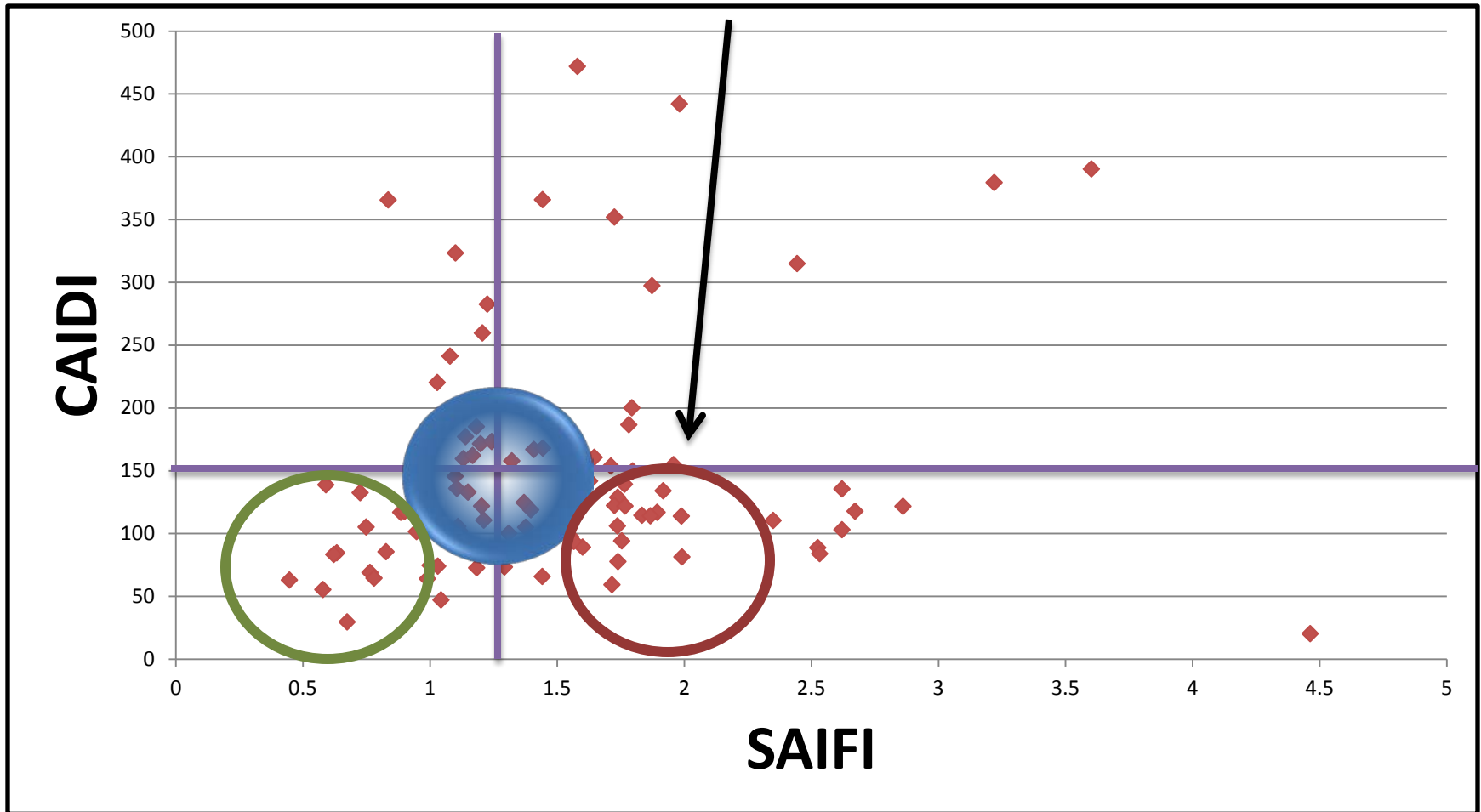
Top Decile

20 Years of Design Excellence



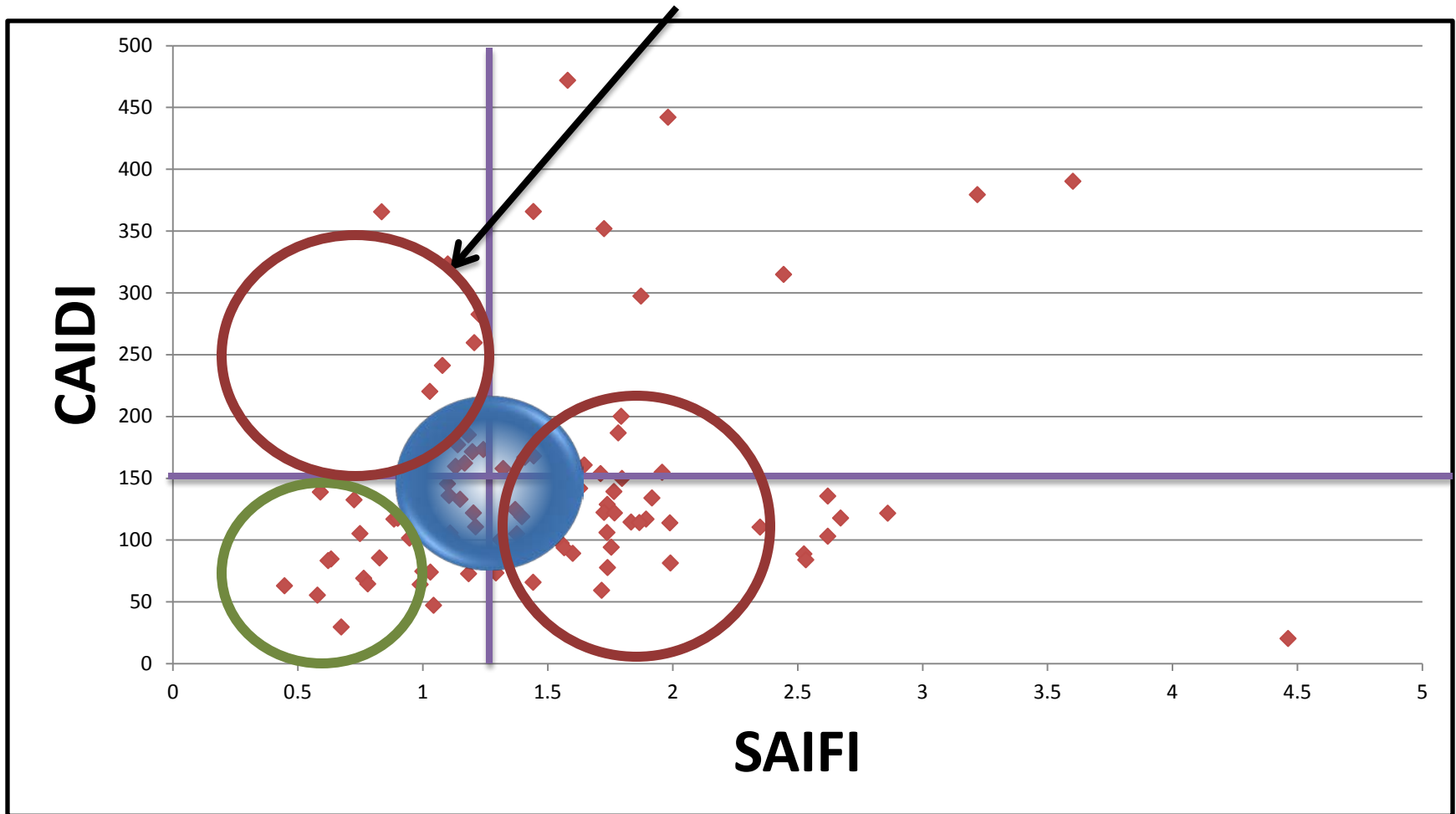
SAIDI Focus

O&M – Workforce Deployment

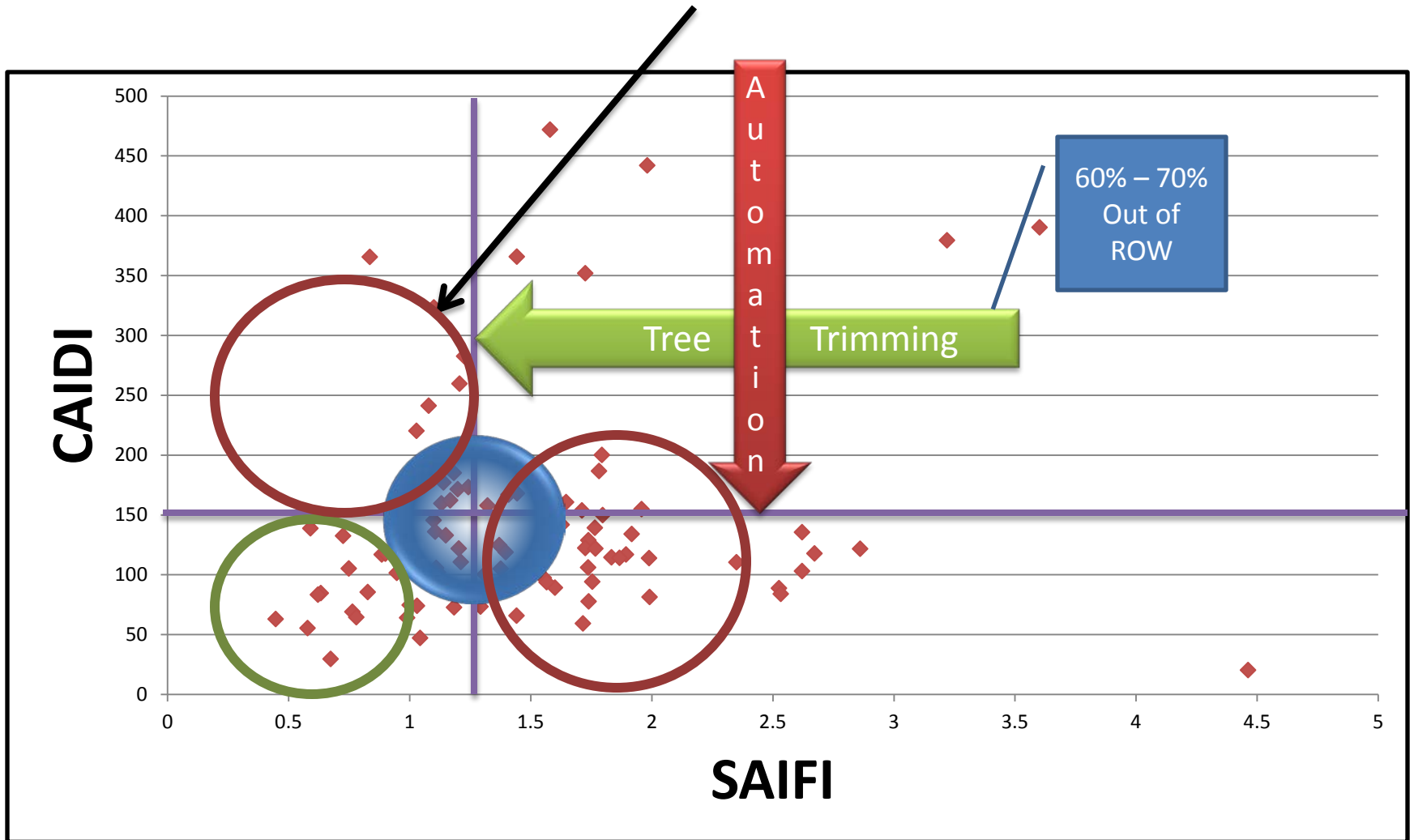


SAIFI Focus

Capital Intensive Programs

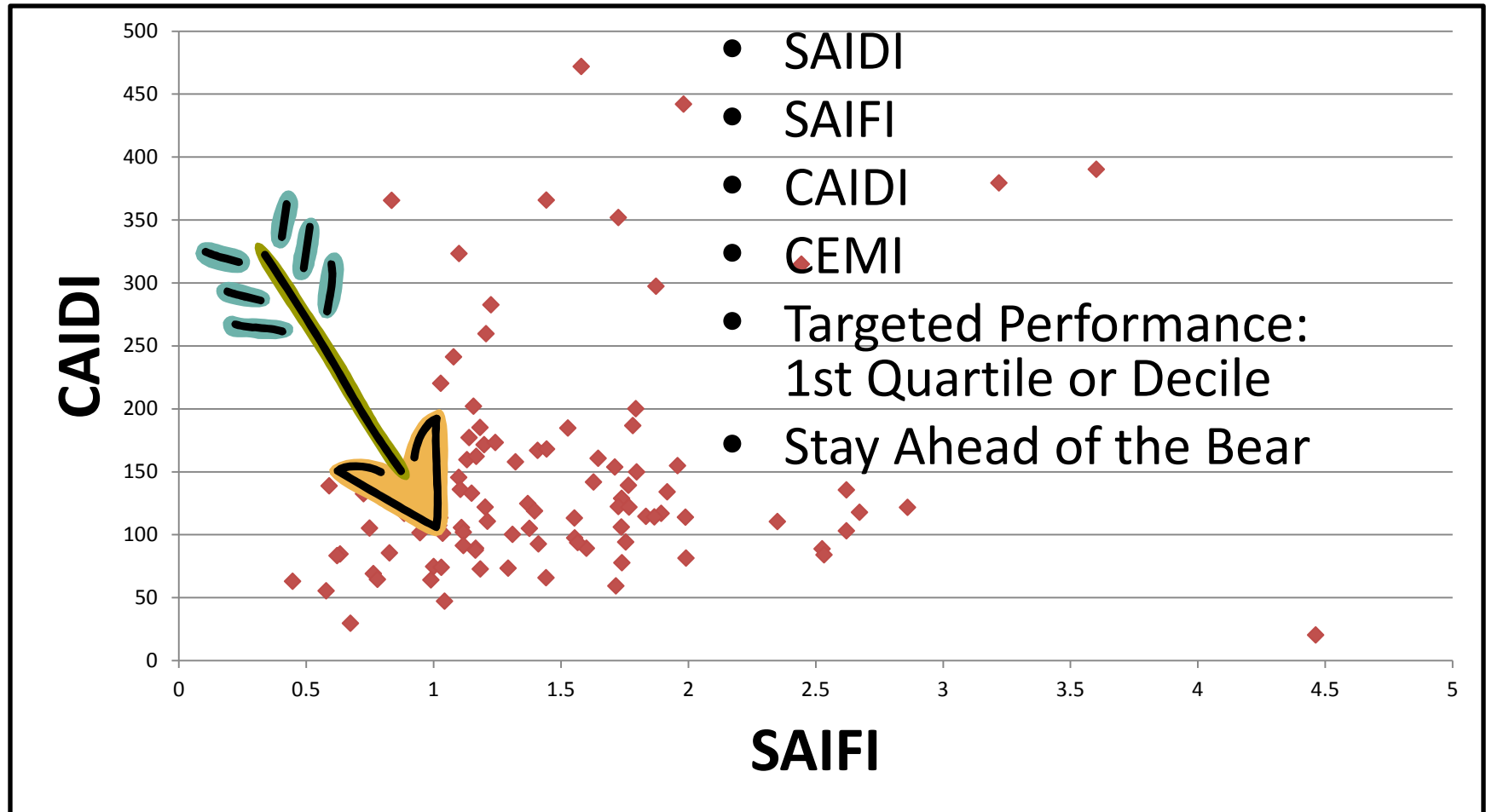


Strategies

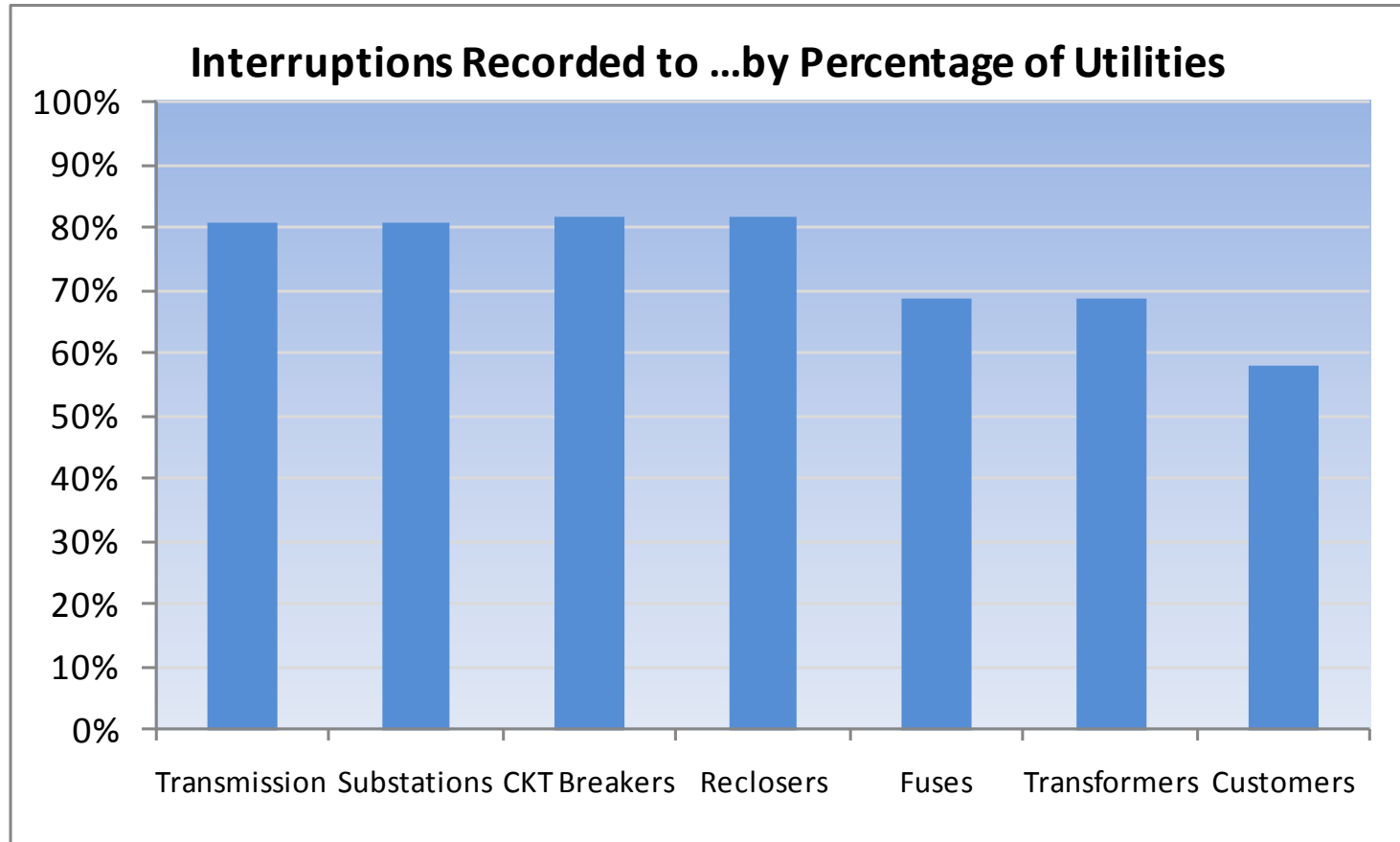


What is Being Attempted?

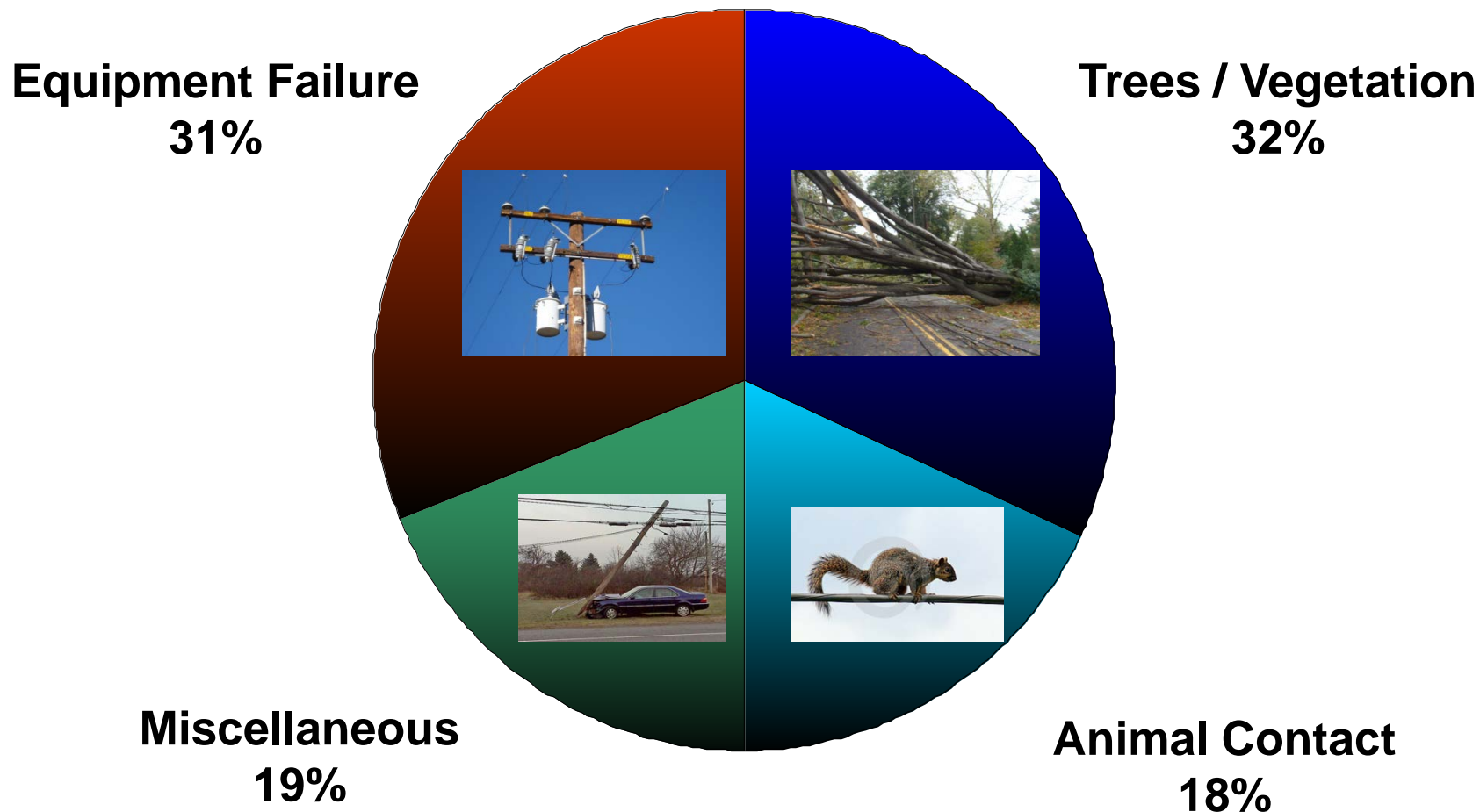
How Good Is Good Enough?



What Causes Interruptions?



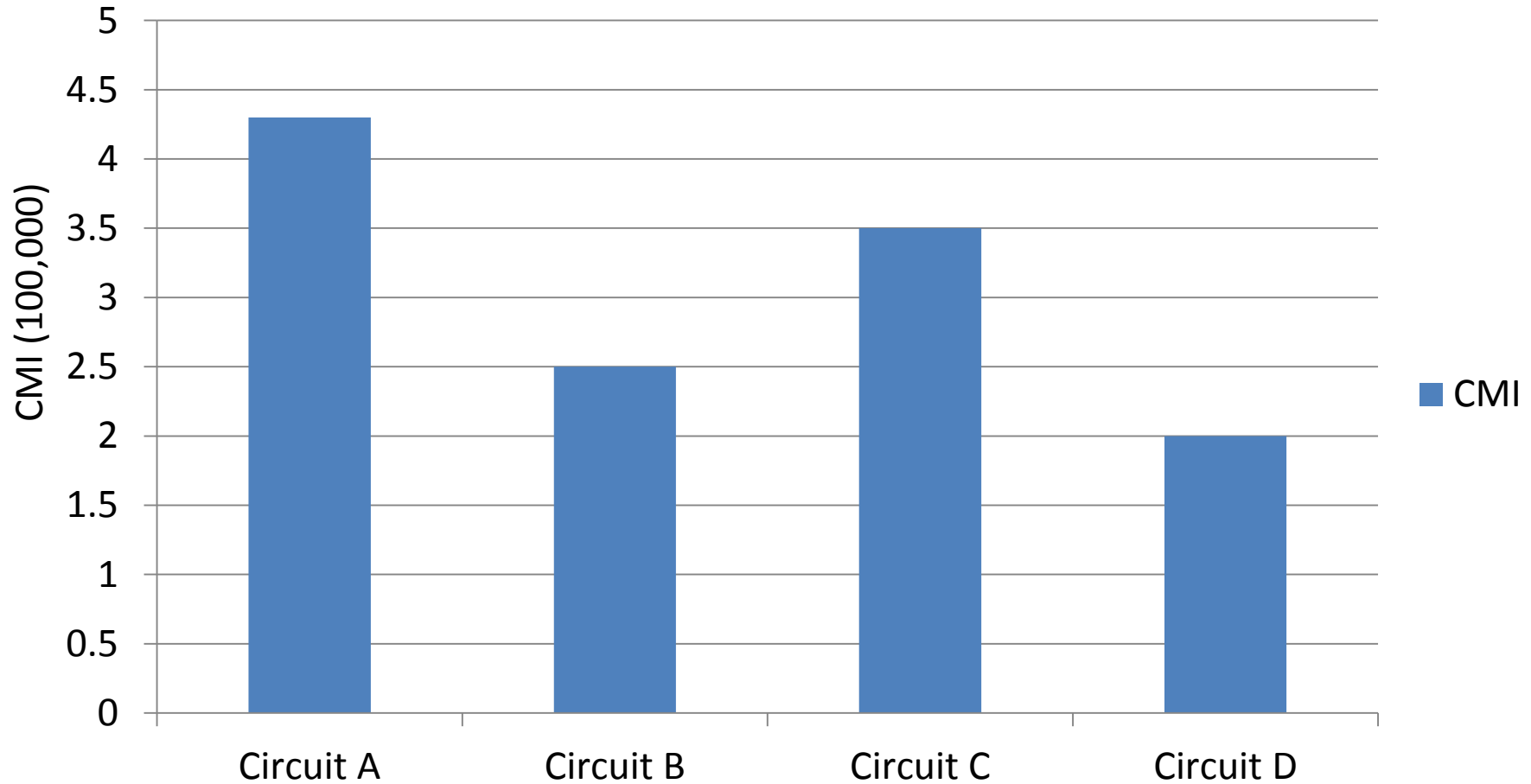
Non Storm-Related Outages on the Electric Distribution System



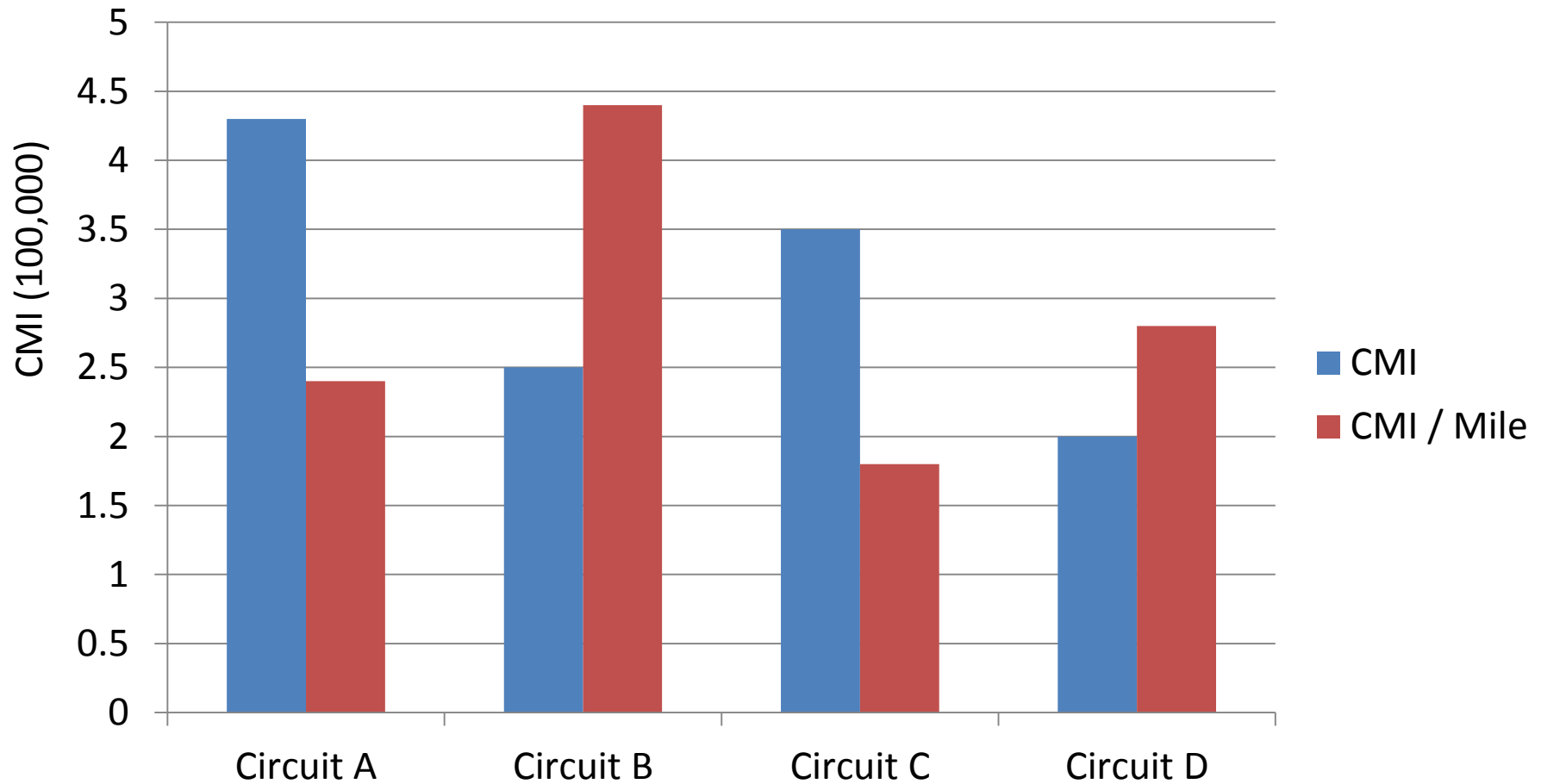
What is Important and Urgent?



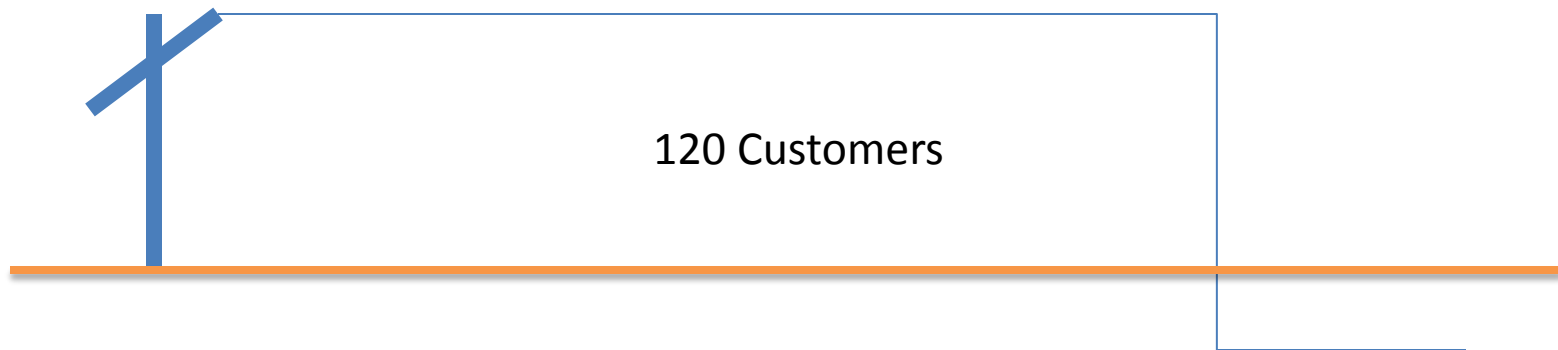
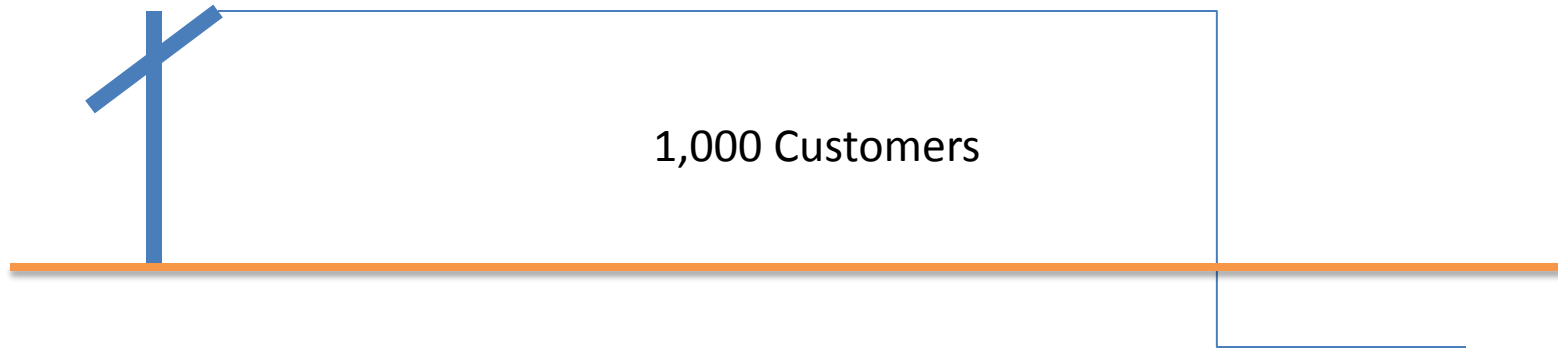
Important Selection



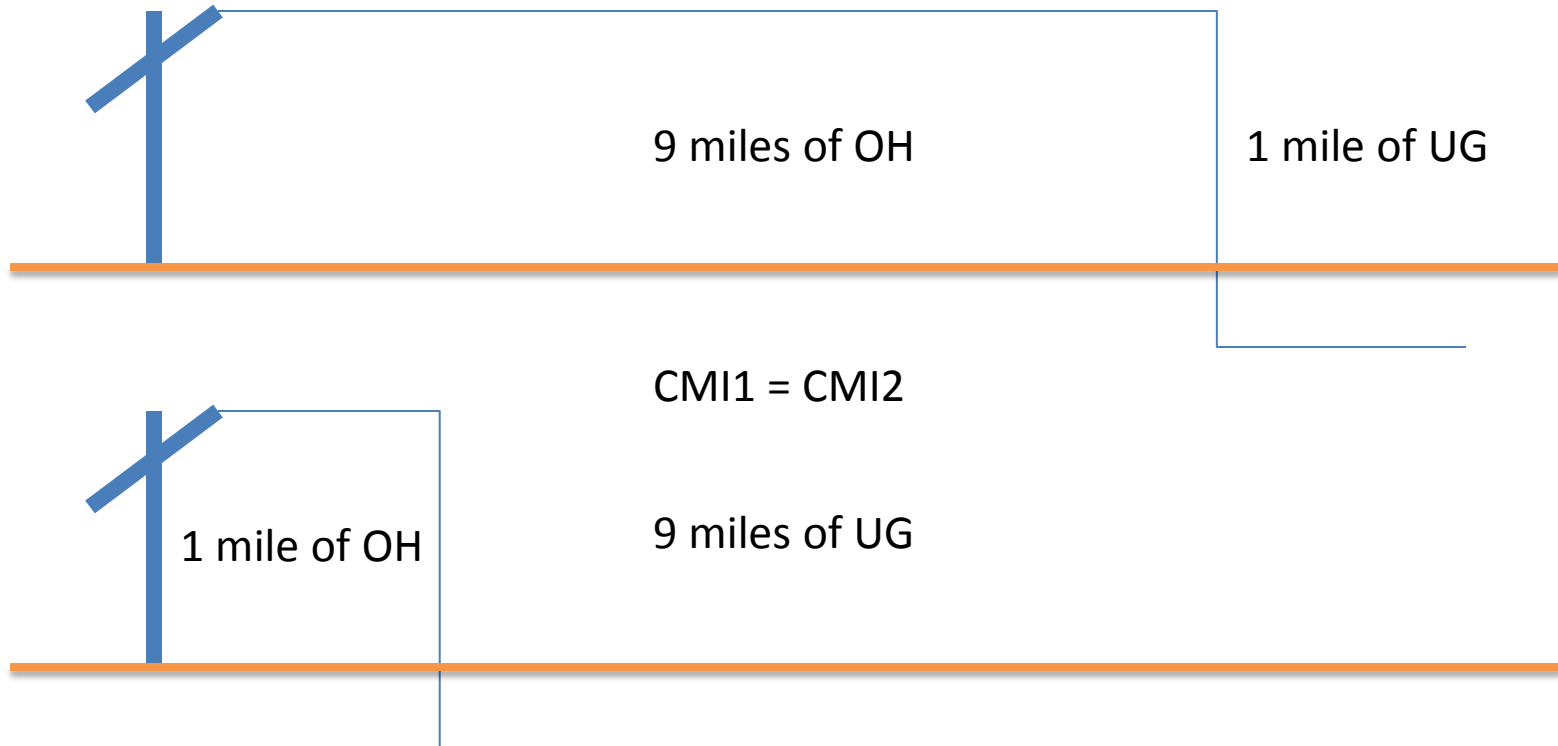
Optimized Selection



Circuit Connectivity



Circuit Physical Design



Circuit Critical Connectivity



Grid Operation Importance



Smart Grid
Control element



$CMI1 = CMI2$

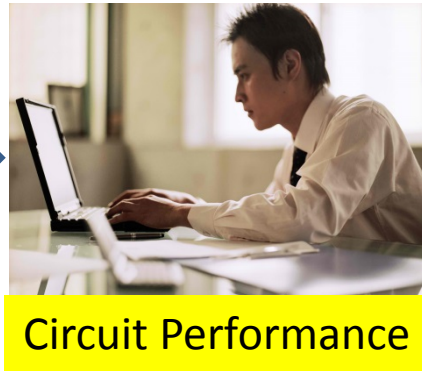


Residential
Distribution



Preventive Maintenance Decision Process

Budget



Circuit Performance



Grid Design



Asset Health



Critical Load



Connectivity

Predictive Analytics → Effective Preventive maintenance

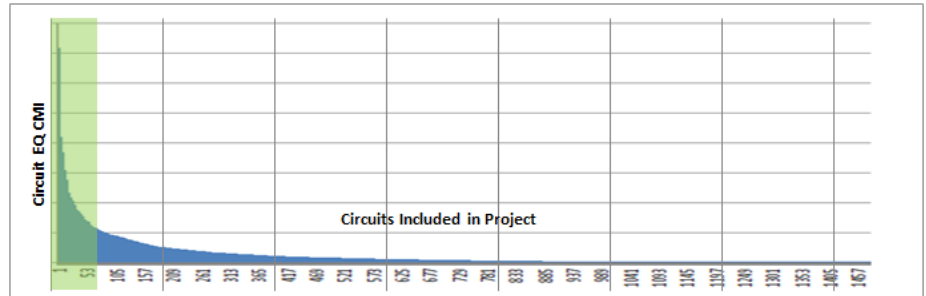
- Long Term Improvement in Reliability
 - Measurable
 - Documented
 - Repeatable
- Additional Value
 - GIS Data
 - OMS Systems
 - Software
- Complete Solution
 - Vegetation
 - Asset Data Collection
 - Predictive Maintenance



Example: Project Design



CIRCUIT RELIABILITY DATA (ytd July 2012)
DISTRIBUTION CIRCUIT ONLY
(Excluding 2.5b ME Days, ISO & Planned Outages)



Target CMI Ave EQ OH Minutes/mile: 3500
Include Unknown CMI? (Y/N):
CMI Reduction Opportunity: 14.8%

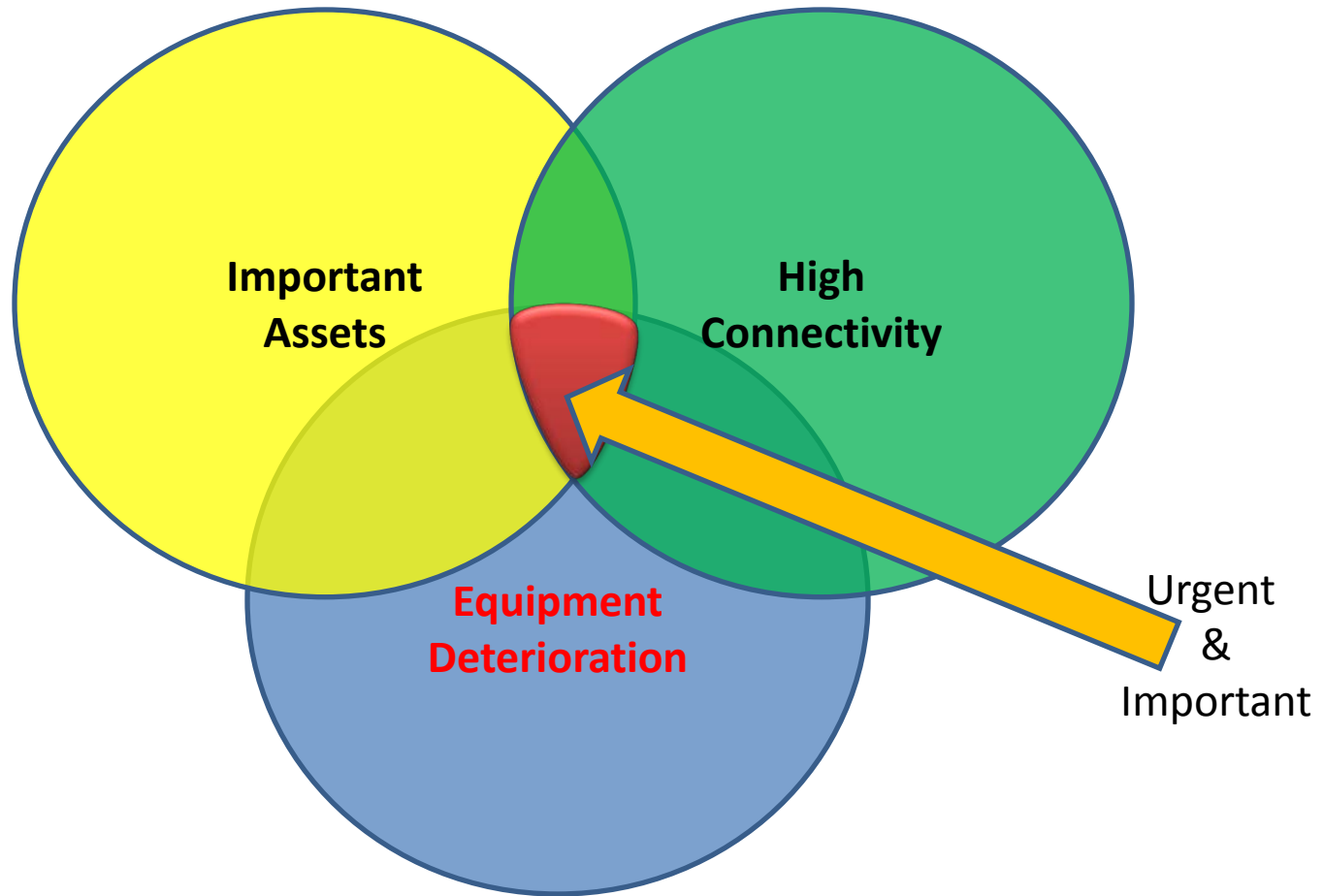
Prepared for:



	EXACTER \$/mile	Repair \$/mile	Total \$/mile	Project Cost	Cost / Customer
Enter Price per Mile	\$ 390.00	\$ 250.00	\$ 640.00	\$ 750,477	\$ 0.15
Project Subtotals	\$ 457,321.80	\$ 293,155.00			

All Company ---- Company Divisions ----	Project Circuits	Project Miles	% of	Division	% of	Include? (x)	Impact Factor
			Total OH Miles	OH EQ CMI	Total EQ OH CMI		
Circuit 1	-	-	0.00%	-	0%		none
	-	-	0.00%	-	0%		none
	24	366	0.33%	3,903,005	4%	X	16.66
	18	202	0.18%	1,591,197	2%	X	12.28
	-	-	0.00%	-	0%		none
Circuit 2	-	-	0.00%	-	0%		none
	-	-	0.00%	-	0%		none
	-	-	0.00%	-	0%		none
	13	304	0.27%	3,793,720	4%	x	19.52
	-	-	0.00%	-	0%		none
Circuit 3	28	300	0.27%	5,877,105	6%	x	30.56
	-	-	0.00%	-	0%		none
	-	-	0.00%	-	0%		none
	-	-	0.00%	-	0%		none
	-	-	0.00%	-	0%		none
Circuit 4	-	-	0.00%	-	0%		none
	-	-	0.00%	-	0%		none
	-	-	0.00%	-	0%		none
	-	-	0.00%	-	0%		none
	-	-	0.00%	-	0%		none
Totals	83	1172.6	1.06%	15,165,027.0	15%		13.91

Optimized Maintenance



Project Roadmap

DISCOVERY: Goals & Objectives

Goal Targets

- Reliability Indices
- Customer Experience
- Employee/Public Safety
- Enhanced Asset Information
- Targeted System Hardening
- Smart Grid Preparedness
- Strategic Line Rebuilds

Selection Criteria

- System CMI Analysis
- Cause Code Analysis
- Circuit Operations
- Customer Density/Complaints
- Circuit Length
- Outage Event Analysis

Who

- EXACTER and UTILITY

Timeline Target

- 2 to 4 weeks

Deliverables

- Circuit Data Delivery (Utility)

CONDITION ASSESSMENT: Data Collection & Reporting

Project Planning

- Territory Analysis
- Route Planning
- Survey Schedule
- Field Deployment
- Prioritize Desired Results

Field Data Collection - **EVENTS**

- Mobile Survey
- Data Collection & Analysis
-

Reporting - **GROUPS**

- Information Delivery

Who

- EXACTER

Timeline Target

- 4 weeks

Deliverables

- Condition Assessment Report/Information
 - GIS, Web, PDF, XLS, CSV

ANALYZE ASSET DATA: Target Maintenance Priorities

Conditions-Based Criteria

MAINTENANCE PRIORITY DECISIONS

- Asset Age
- Zone/Location
- Circuit Operations
- Voltage Class
- Apply Priority Goals
- Locate and photograph equipment matching utility goals

Goal-Based Criteria

- Map to defined goals during Discovery

Strategic Maintenance

- Issue Work Orders based on criteria

Who

- EXACTER and UTILITY

Timeline Target

- 1 to 3 weeks

Deliverables

- Selected field information for Work Order Creation

MEASURE PERFORMANCE:

Strategic Maintenance

- Issue Work Orders based on priority criteria

Measure Select Metrics

- Circuit CMI
- Cause Code Events
- Circuit Operations
- Customer Complaints
- Indices
- Utility Chosen Criteria

Who

- UTILITY

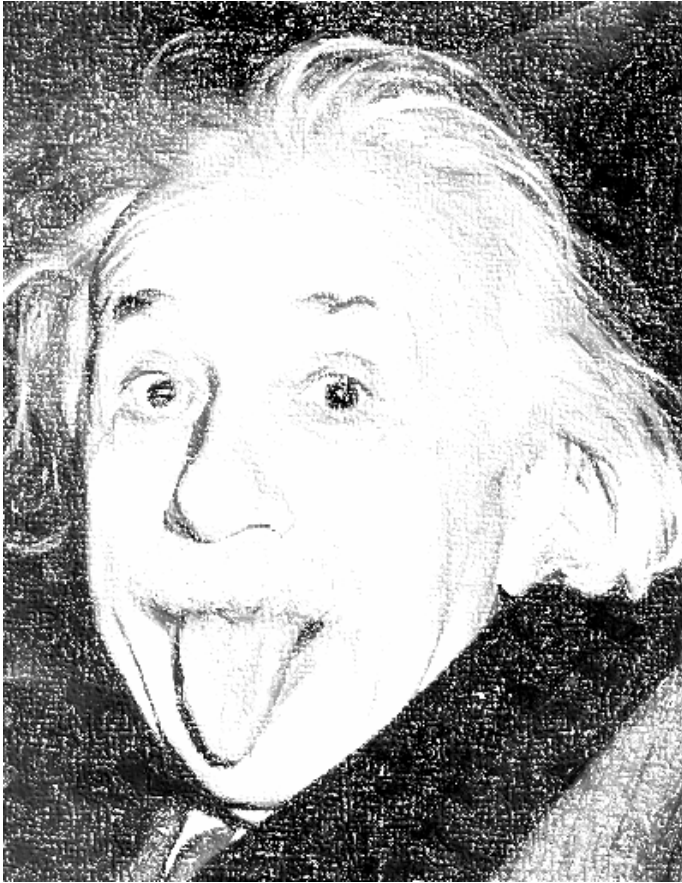
Timeline Target

- Up to 6 months

Deliverables

- Reporting

It's the Answers that Change



- Create the Objective
- Understand the Reliability Status in Detail Along with the Drivers
- Create a Top-Down Strategy
- Let the Engineers Do Their Work
- Build a Compelling Story – Great Engineering Does Not Speak For Itself
- Mitigate Outages or Avoid Failures

Q&A

VISION ANALYTICS

More Data + Detailed Analytics = Better Decisions

