10 Things To Know About Reliability

Latest developments in T&D reliability

Dan O'Neill, Director, Navigant Consulting

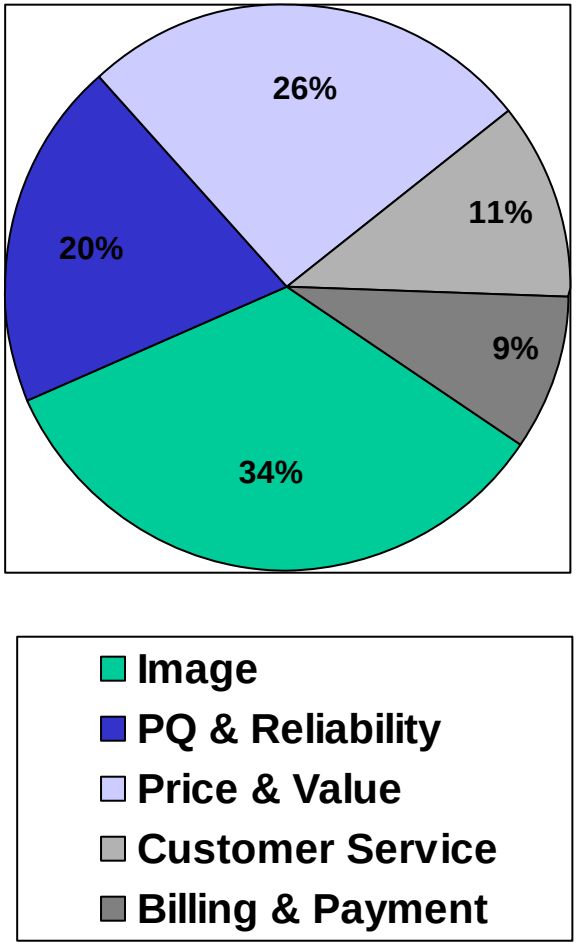
EEI Customer Operations Executive Workshop
Vancouver, BC
April 30, 2002

Ten things to know about electric reliability

1. Know what satisfies your customer
2. Know what satisfies your regulator
3. Know how to manage the media
4. Know what is failing and why
5. Know what you are spending and why
6. Know how to protect the backbone
7. Know how to manage vegetation
8. Know when something is about to fail
9. Know when and where to replace
10. Know where to draw the line

1. Know what satisfies your customer

- Image is a major component
  - May sometimes be affected by reliability
  - Especially by a “big bad event” (media circus)
- Power Quality & Reliability is only about 20%
  - Would need +5 points to move overall by +1 point
- Attributes of PQ & Reliability:
  - Frequency
  - Duration
  - Information about outage
- Attitudes about outages
  - Non-storm vs. storm
  - Public facilities vs. homes
  - Influenced by other components, e.g., price
  - Different for different customers

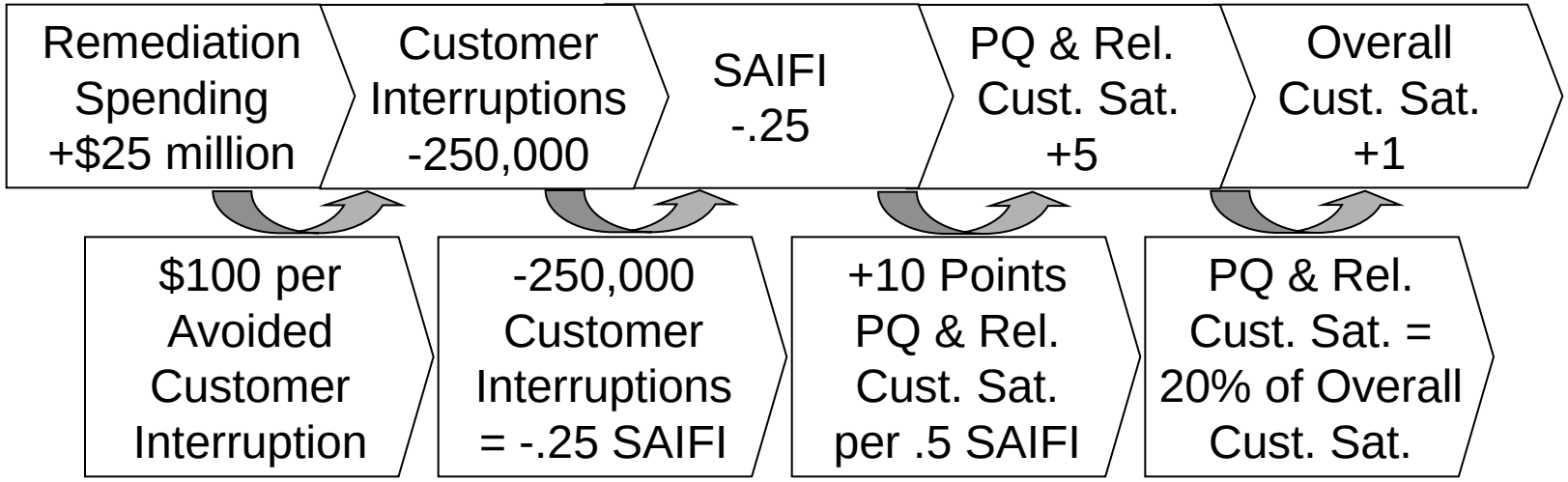


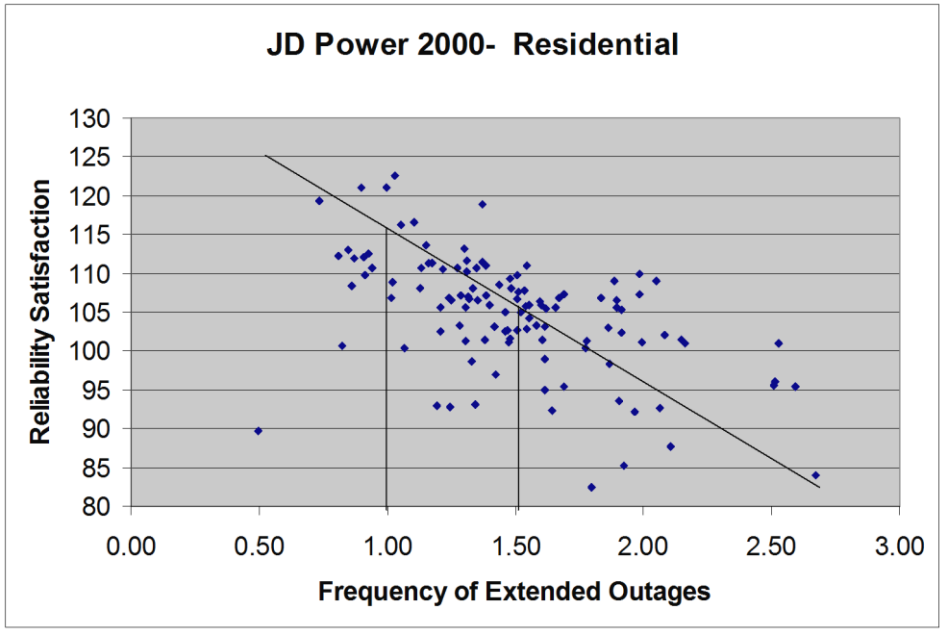
Source: JD Power & Associates, with Navigant Consulting, 2000 Residential Survey

Navigant CONSULTING, INC.

It might take $25 million to buy one point of overall satisfaction

For a 1 million-customer utility…





This would be like paying 250,000 customers $100 for each interruption

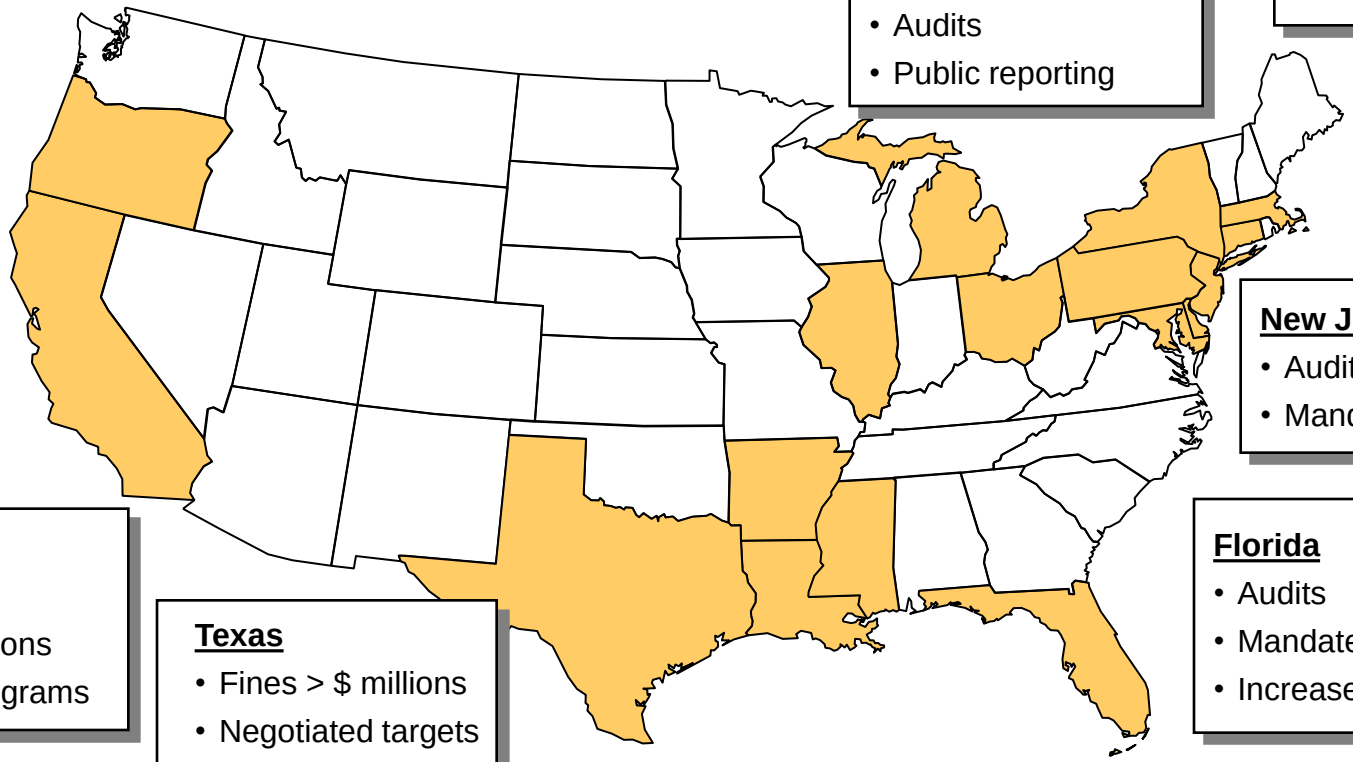
Source: JD Power & Associates, with Navigant Consulting

Navigant CONSULTING, INC.

2. Know what satisfies your regulator

Regulators are supposedly agents of the customer

Number of states with <u>new</u> electric reliability rules



<u>Illinois</u>
- Increased spending
- Mandated programs
- Audits
- Public reporting

<u>New York</u>
- PBR
- Public reporting

<u>New Jersey</u>
- Audits
- Mandated programs

<u>Florida</u>
- Audits
- Mandated programs
- Increased spending

<u>California</u>
- PBR
- Fines > $ millions
- Mandated programs

<u>Texas</u>
- Fines > $ millions
- Negotiated targets
- Public reporting
- Audits

Source: Article by Navigant Consulting Inc.'s Dan O'Neill, Public Utilities Fortnightly, March 1999, updated

Navigant CONSULTING, INC.

Just managing SAIDI is no longer good enough

The trend is toward more reporting and more mandated programs

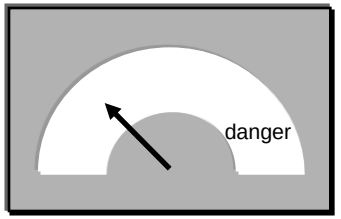
- Commissions and customers are no longer satisfied with good performance on system averages like SAIDI, SAIFI and CAIDI

- Many of the new regulations require reporting of performance on worst circuits, with negotiated targets for improvement, e.g., what was proposed by the Texas PUC:

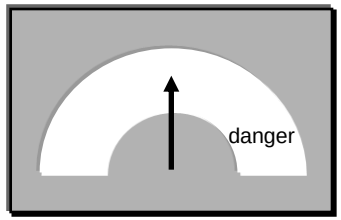
	SAIFI	SAIDI	Compliance
– ‘Minimum acceptable	3.8	315	98.5%
– ‘Target’	2.6	158	90.0%

- What they really want is *customer satisfaction*, few complaints, and not even small ‘pockets’ of consistently poor performance ($CEMI_n$)

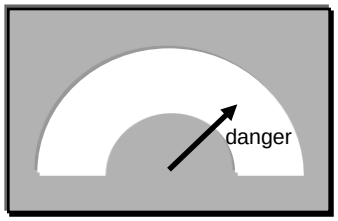
SAIDI / SAIFI



Worst Circuits



Complaints



Many companies don’t even measure ‘worst pockets’ now

Navigant CONSULTING, INC.

3. Know how to manage the media

They influence customers and regulators

Chicago Tribune

Chicagoland South

50c NEWSSTAND

Friday, August 13, 1999

DOWNTOWN BLACKOUTS

Power fails, sparks fly

"They have neglected their infrastructure for too long. . . . We are sick and tired of them, and they had better change."

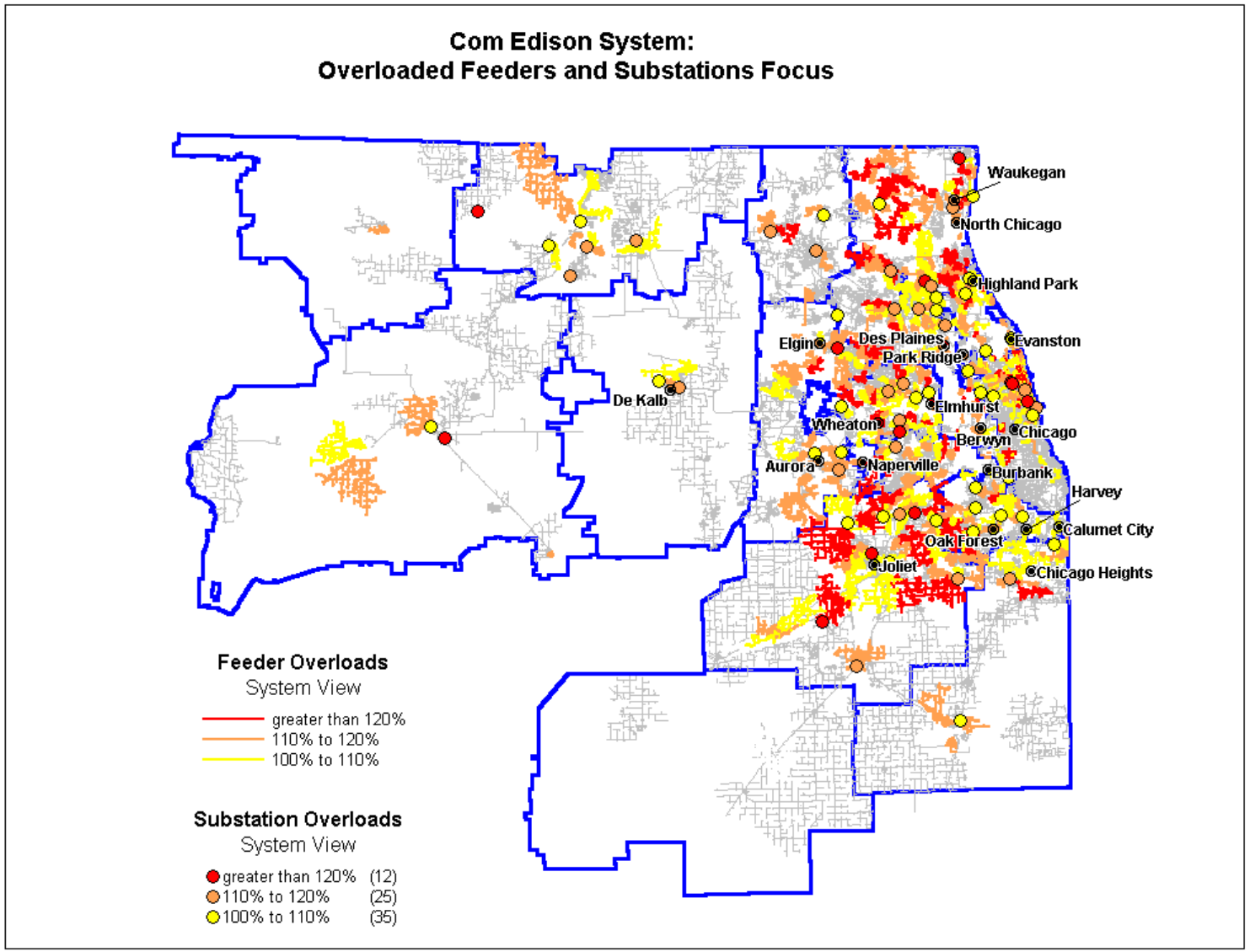
Mayor Richard Daley

Image courtesy of CLTV

"This level of service under these conditions is a disgrace to us. It's a personal disgrace to me. I will not tolerate it, and you will not have to."

But don't think it is all of matter of spin. ComEd had real issues

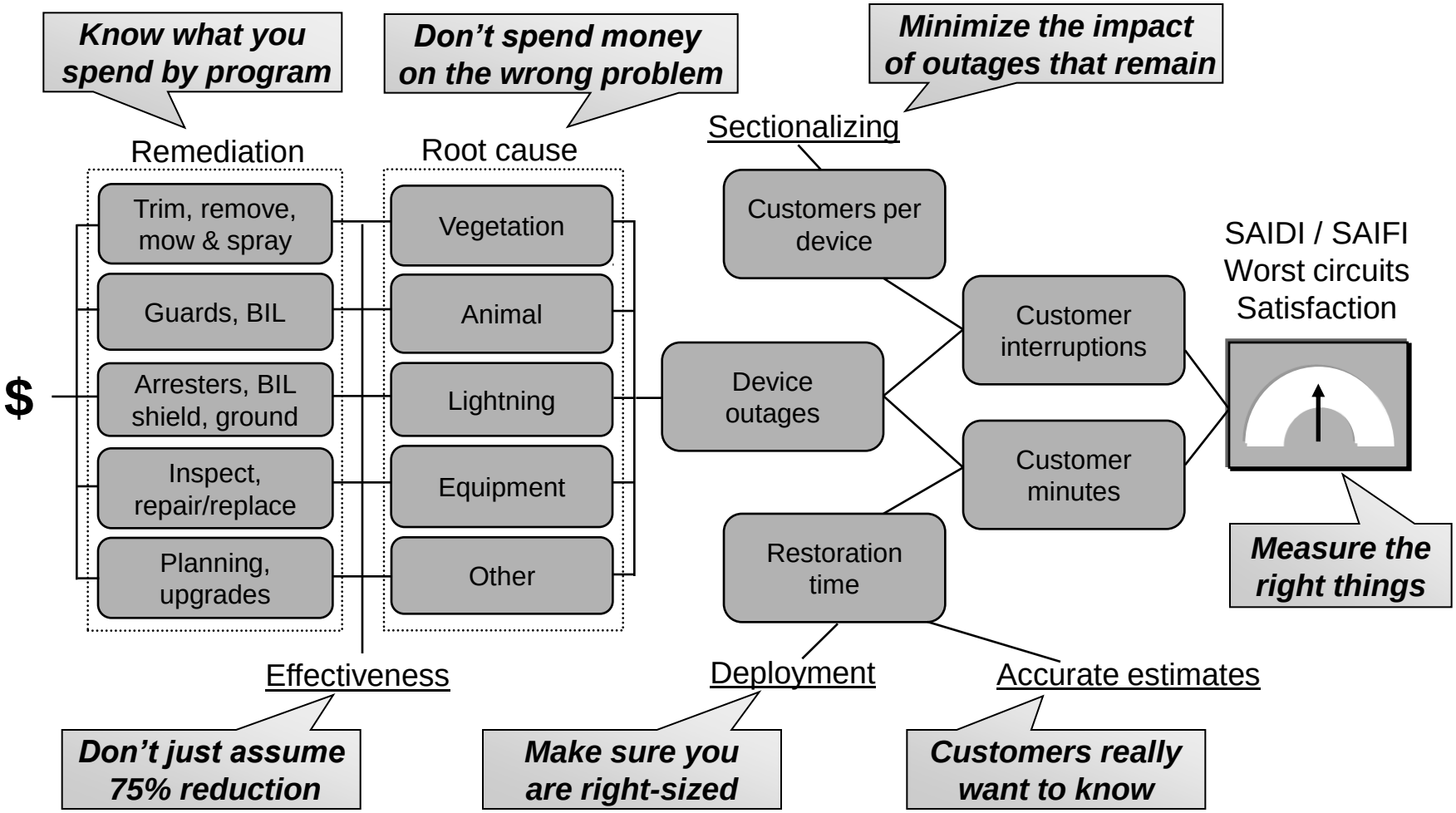
Many of its substations and circuits had been overloaded by growth



How much would it take to buy 3 points of image satisfaction?

- Include all media areas: national, regional, local
  - What if you make the news in USA Today?
- Include all media channels:
  - TV
  - Radio,
  - Print (newspapers, trade journals, etc.)
  - Internet
- Include public relations
  - Become a ‘good’ source for reporters
  - Provide speakers to clubs
- Include company contact
  - Bill inserts
  - Customer service representatives
  - Even tree trimming

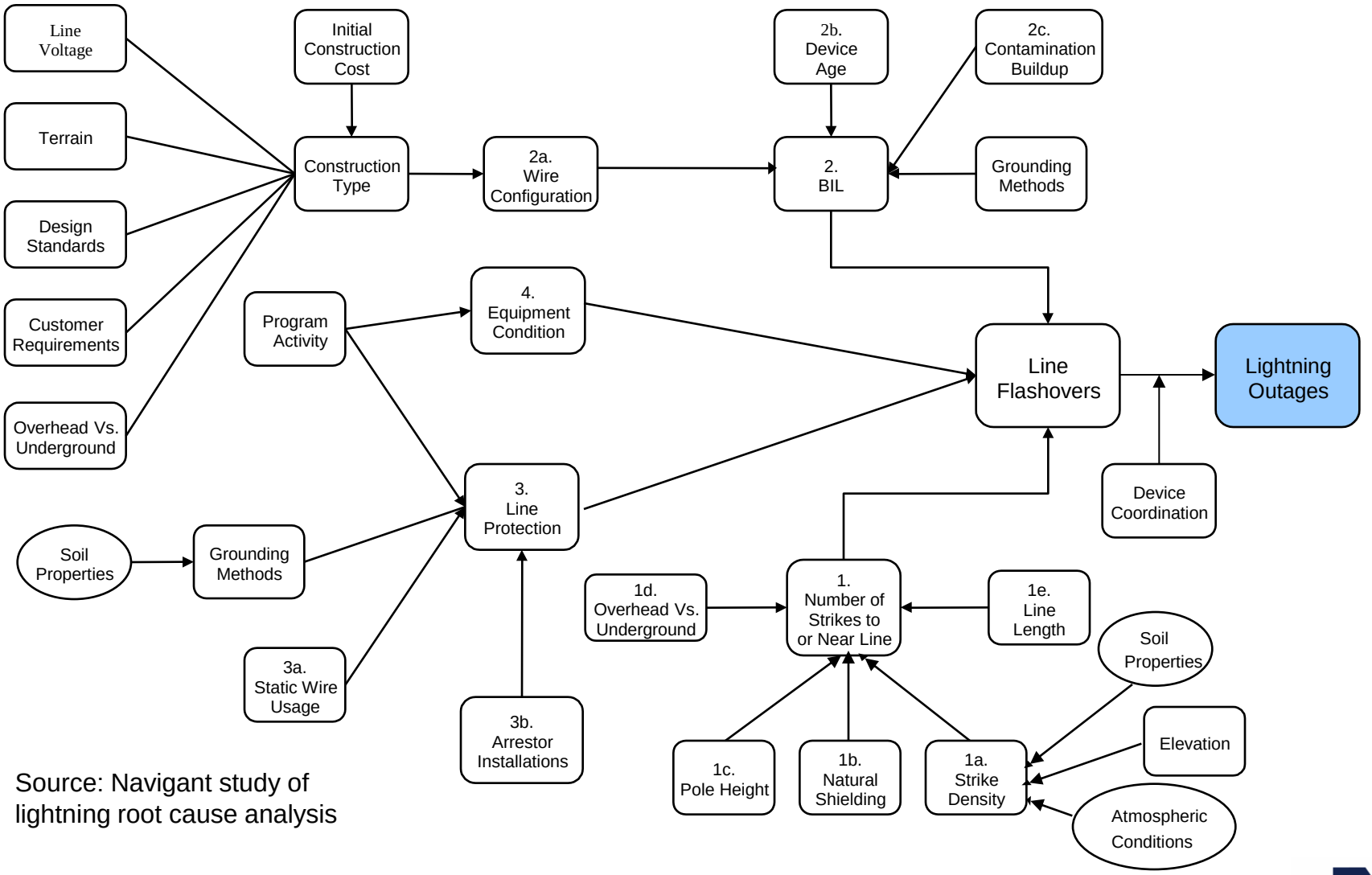
4. Know what is failing…



Navigant CONSULTING, INC.

…and why

"We spent money on lightning remediation, and found the problem was conductor slap"



Source: Navigant study of lightning root cause analysis

Navigant CONSULTING, INC.

5. Know where you are spending your money…

	Units	Units remediated per mile	Cost per unit	Cost per mile
Trim – contact	trees	85	$40	$3,400
Trim – broken limb	trees	10	$500	$5,000
Lightning	3 arresters	3.3	$1,500	$5,000
Wind	spans	4	$1,250	$5,000
Pole-top	pole-tops	5	$1,000	$5,000
Squirrel	3 guards	2	$500	$1,000
Underground	cable feet	5,280	$35	$185,000
Reconductoring	spans	35	$4,000	$140,000

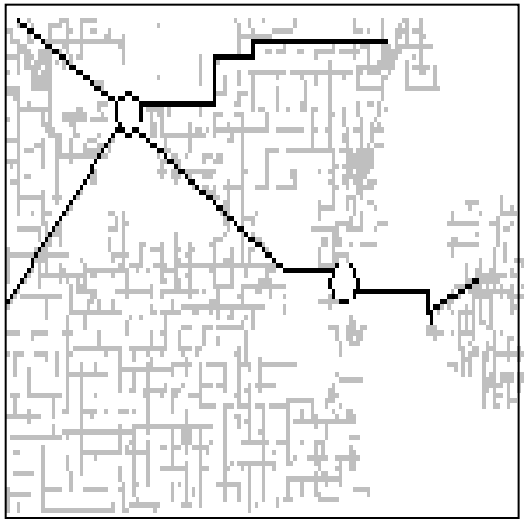
Note: Program costs and outage reduction factors are approximate, based on typical cost-effective projects. Some projects might require more, and as a result would not typically be done first. Note also that tree programs are recurring (especially trim for contact), while other programs tend to be more permanent. The present value of $3,500 per mile every 3 years for 30 years at 10% discount is $21,500 per mile.

…and why

	Remediation program cost per mile		Customer interruptions per mile		Outage reduction factor		Cost per avoided CI
Example	$5,000	÷ (	100	x	50%	) =	$100
Squirrel	$1,000		10		50%		$200
Trim – contact	$3,500		100		50%		$70
Trim – removal	$5,000		100		50%		$100
Lightning	$5,000		100		50%		$100
Wind	$5,000		100		50%		$100
Pole-top	$5,000		100		50%		$100
Underground	$185,000		1,000		100%		$185

Note: Program costs and outage reduction factors are approximate, based on typical cost-effective projects. Some projects might require more, and as a result would not typically be done first. Note also that tree programs are recurring (especially trim for contact), while other programs tend to be more permanent. The present value of $3,500 per mile every 3 years for 30 years at 10% discount is $21,500 per mile. Underground programs will generally not be cost-effective for system SAIFI and should be addressed as worst pocket programs. An exception may be failure-prone exit cables for urban mainline, which may be covered by worst circuit programs.

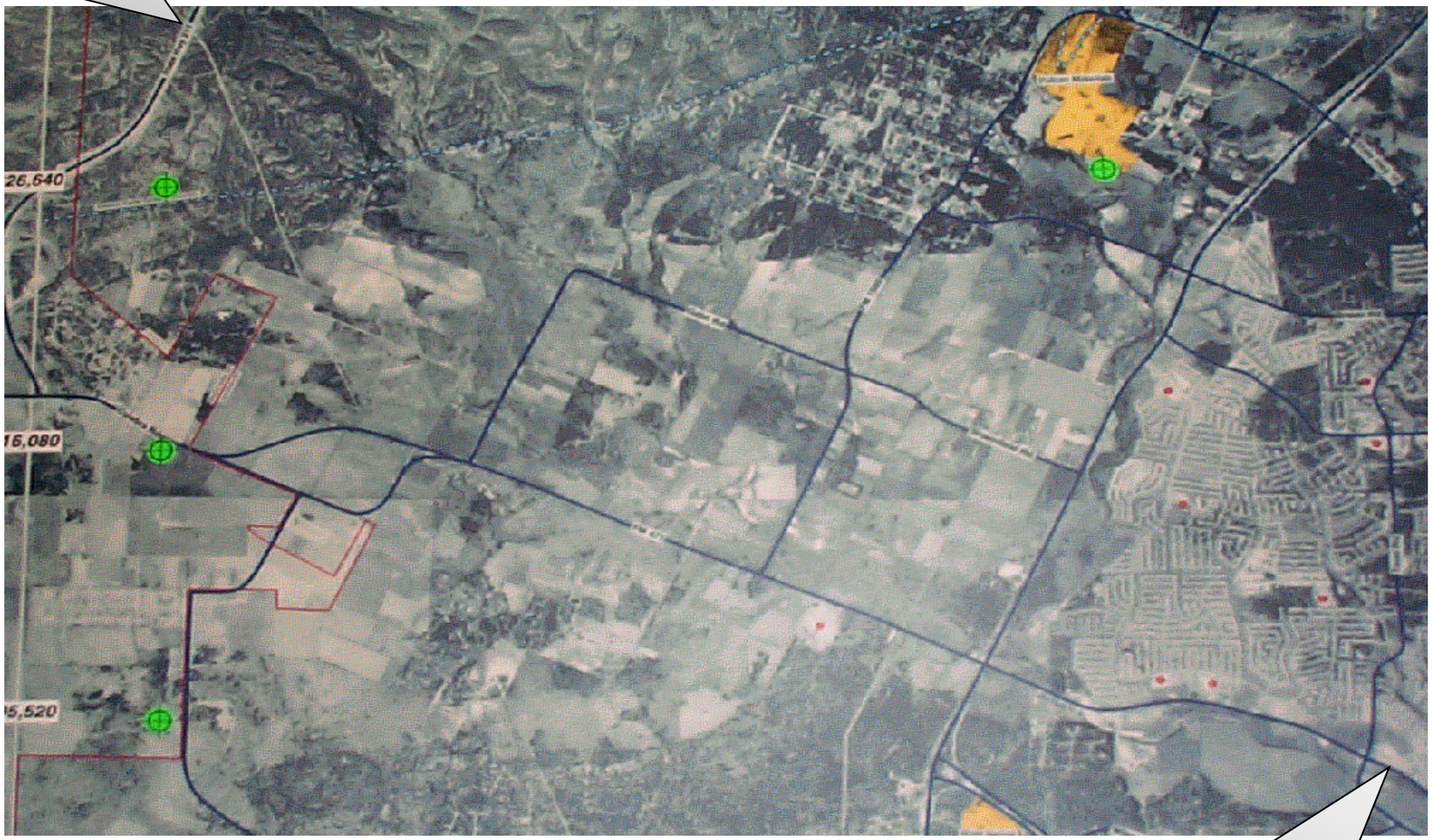
6. Know how to protect the backbone



- The old philosophy: let the circuit breakers work
  - May be still a good idea in storms
- Harden the backbone with extra
  - Tree trimming, especially overhang and danger trees
  - Lightning protection
  - Animal guards on switches, taps
  - Line inspection/repair
- Fuse unfused taps off the backbone
  - Target feeders with multiple lockouts
- Sectionalize the backbone into smaller zones
  - Target the feeders with the most customer interruptions
  - Save 50 percent of customer interruptions with 1.5 switches per feeder
  - Avoid lengthy patrol time
  - Consider automatic or remotely operated

Know how to protect the backbone

If this line is unfused, an outage here…



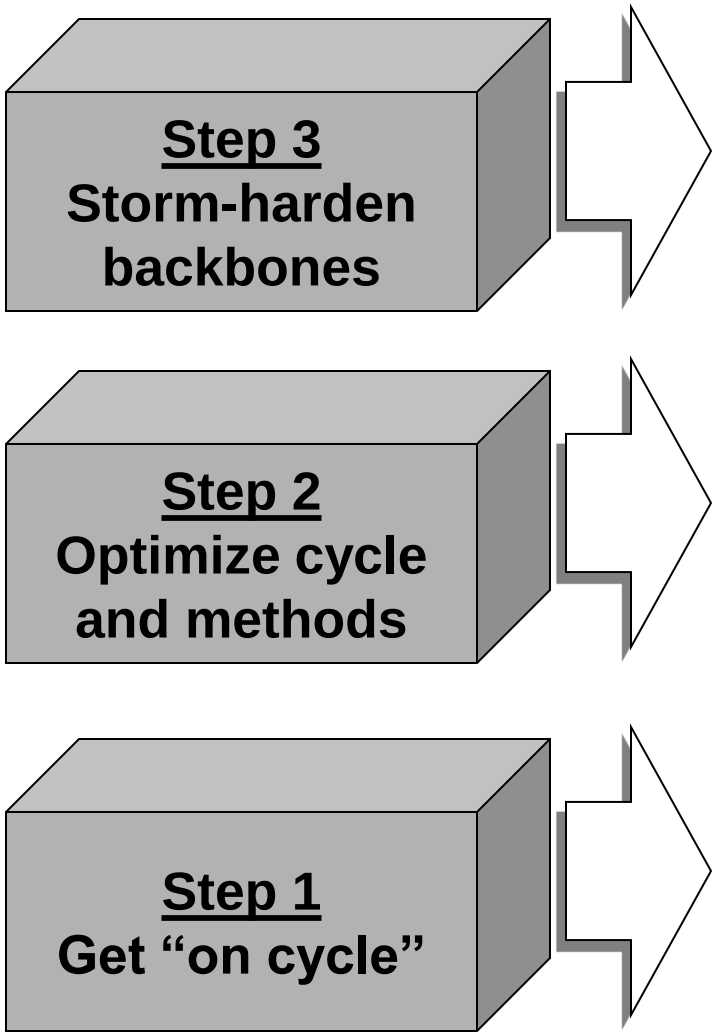
…puts lights out for everyone back to here

Navigant CONSULTING, INC.

7. Know how to manage vegetation

Utilities may take vegetation management in 'steps'

Advancing to the next step each time through the cycle



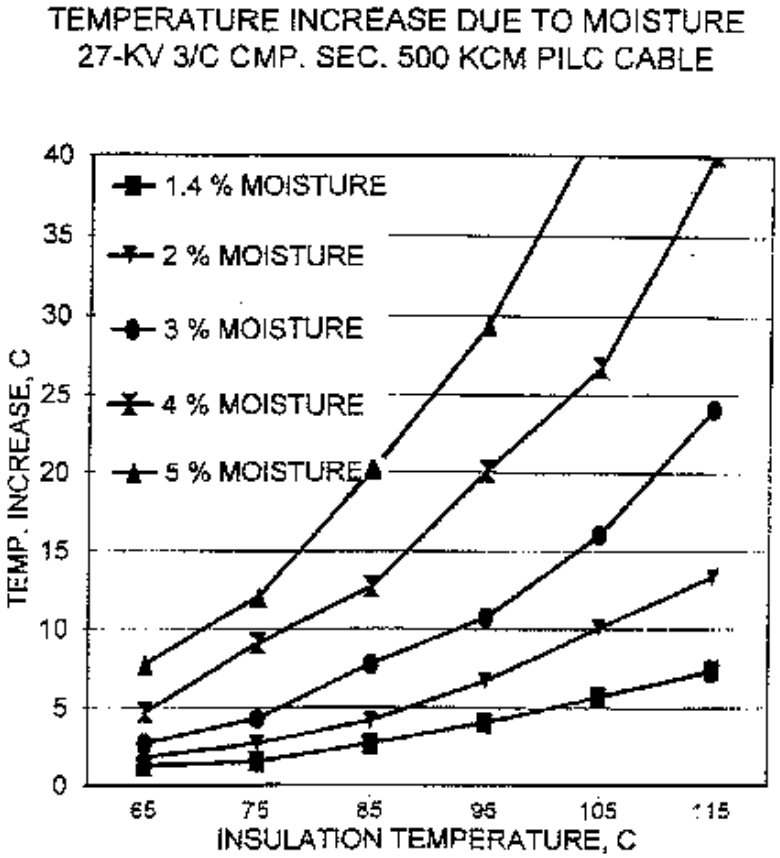
Source: See article by Danny Taylor and Dan O'Neill in April, 2002 T&D World

8. Know when something is about to fail

"Just-in-time" maintenance is the Holy Grail of utility reliability

Time is money, so deferral is key

- Trees
  - Do mid-cycle inspection
- Weather
  - Predict the severity of storms and prepare
- Overhead lines
  - Inspect for imminent failure
- Underground cable
  - Map partial discharges
- Substations
  - Test for gas in oil, trip time, power factor
  - Monitor operations, faults on circuit breakers
- Lines
  - Use smart relays to tell you what is happenin
- Infrared
  - See hot spots (and cold spots that should be hot)

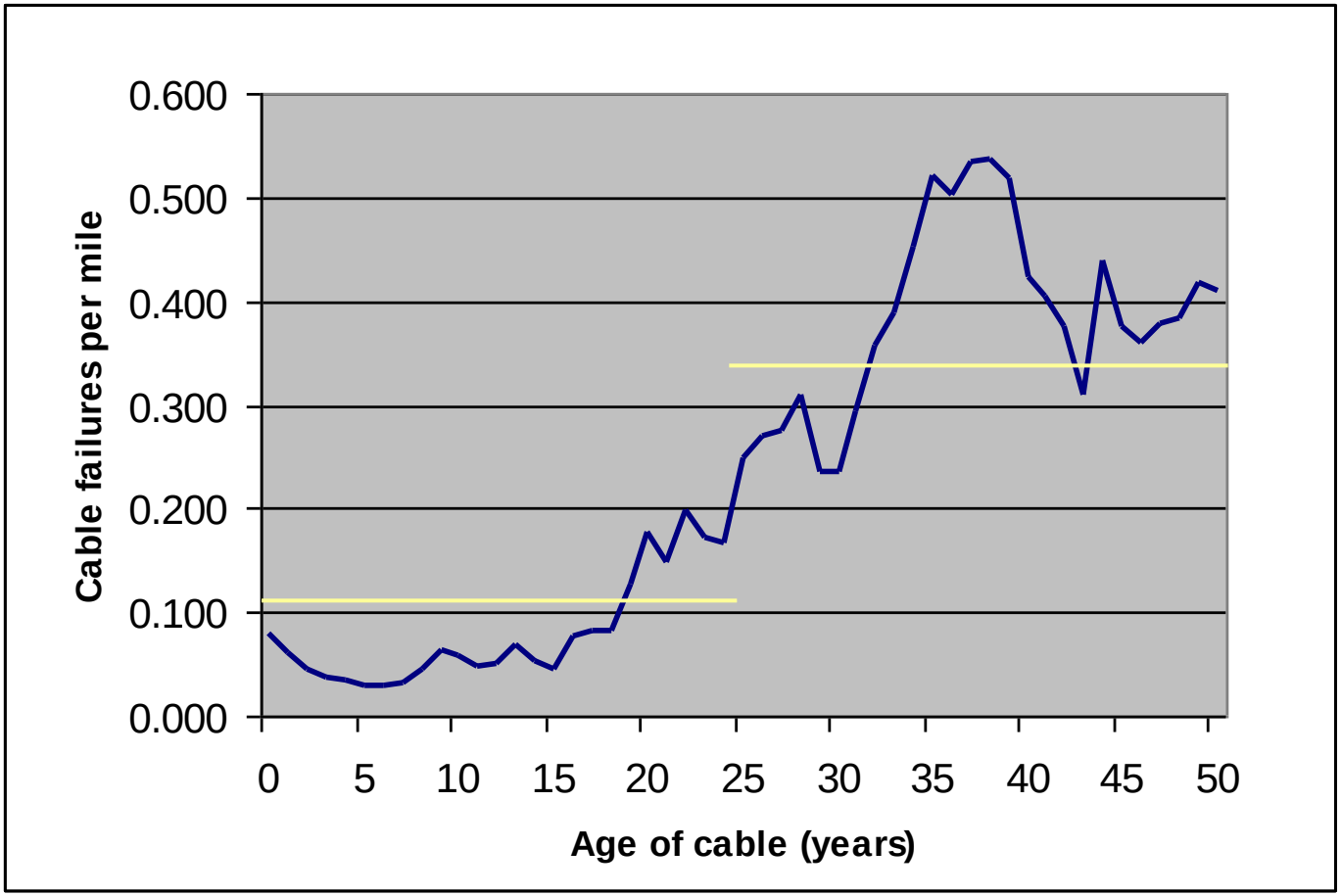


Navigant CONSULTING, INC.

9. Know when and where to replace

Age is a poor proxy – use other indicators of failure, and try life extension

Age-based programs must replace a lot of good to get the bad



Although a failure rate difference of 3x is significant, some conditions provide 10x, e.g., 250' cable sections that have failed 3 times in the last 5 years fail at 6.0 per mile

Which is worse?

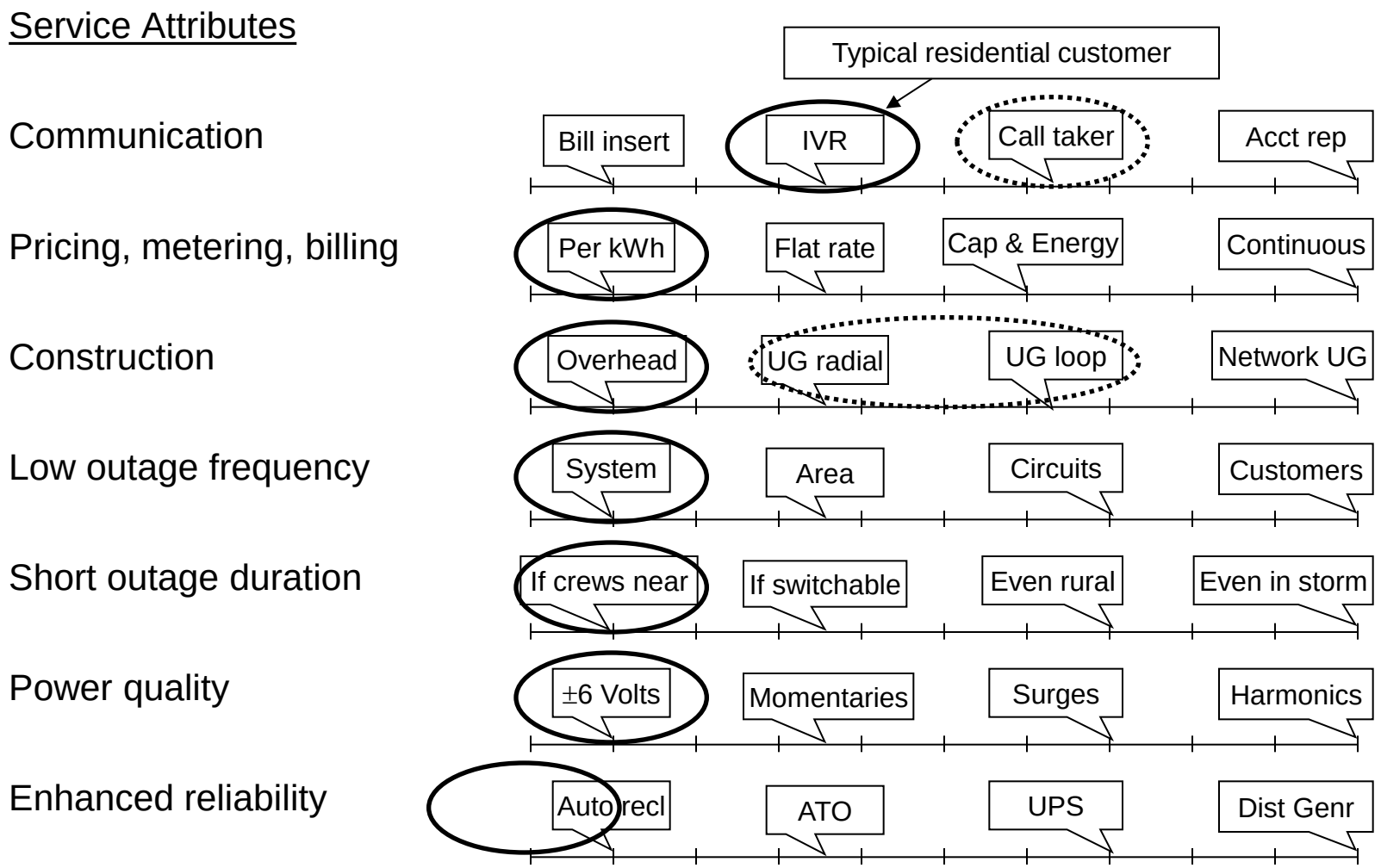
A program that replaces assets at 1/2% per year, I.e., a 200-year replacement program?

OR

A program that inspects 10% of assets per year, and rejects(replaces) 5% of those inspected?

10. Know where to draw the line

Your rates are based on certain options on the continuum of service



Navigant CONSULTING, INC.

What steps would it take to unbundle distribution?

Regulatory Trends	Know what local, state and federal regulators are doing nationwide, and get ready to begin a dialog starting from where your regulators are now
Customer Satisfaction	Use existing and new surveys to learn what service will satisfy customers and to test their reactions to possible plans for unbundling and choice
Locate the Problems	Using various measures of performance, locate and determine the root cause of the problem areas that could not meet a basic service level
Cost Out the Solutions	Determine what it would take to achieve the basic service level in each area, and be ready with long-term transition plans or alternatives
Pilot Unbundling	After discussing with regulators and customers, develop unbundling and choice programs and pilot them in areas that are open to the ideas
Keep the Ball Rolling	Get a groundswell of successful pilots, with customers and regulators praising the success of the concepts

You can get there from here, or you can let others drive you somewhere else!

Questions and answers

Navigant CONSULTING, INC.

DANIEL E. O'NEILL

Director, T&D Reliability & Operations Practice

200 Wheeler Road, Suite 400
Burlington, MA 01803

1043 Lenox Crest NE
Atlanta, GA 30324

Office: (404) 816-5647
Mobile: (404) 307-3661
Admin: (781) 564-9730
Fax: (404) 841-9460
DONeill@navigantconsulting.com

Taking reliability programs to the 'next level'