



IEEE Benchmarking Update

EEI Spring Meeting

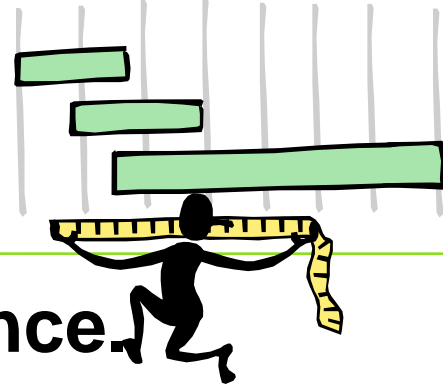
Manuel Gonzalez

Updated 5/3/2006 with more information

Industry Guidelines Developed

- ◆ **Project undertaken by IEEE/PES T&D Committee Distribution Subcommittee Working Group on System Design in 1991**
- ◆ **IEEE Trial-Use Guide for Electric Power Distribution Reliability Indices published in 1999 (IEEE Std 1366-1998)**
- ◆ **Reaffirmed in 2001**
 - ◆ **IEEE Guide for Electric Power Distribution Reliability Indices published in 2001 (IEEE Std 1366, 2001 Edition)**
- ◆ **IEEE Guide for Electric Power Distribution Reliability Indices to be published in 2004 (IEEE Std 1366-2003)**

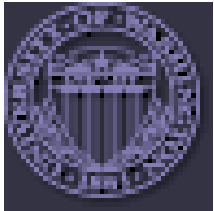
Why Use 1366-2003



- ◆ **Sound Basis for Measuring Performance.**
- ◆ **A clearer view of performance, both on a**
 - ◆ **Daily basis and**
 - ◆ **During Major Events**
- ◆ **Can form a solid basis for review of operational effectiveness, decision making and policy making.**
- ◆ **More consistent benchmarking.**

Methodology Development

- ◆ **IEEE WG on System Design, that has over 130 members, developed the “2.5 Beta methodology” in IEEE Std 1366 - 2003.**
 - ◆ **Members include utility employees, regulatory staff, employees from manufacturers, consultants and academics.**
 - ◆ **Seven members stepped up to perform the analysis.**



Foundations of the Process

- ◆ **Definition must be understandable by all and easy to apply.**
- ◆ **Definition must be specific and calculated using the same process for all utilities.**
- ◆ **Must be fair to all utilities.**
 - ◆ **Large and small, urban and rural....**
- ◆ **SAIDI was chosen as the indicator...**
 - ◆ **because it is size independent and**
 - ◆ **it is the best indicator of system stresses beyond those that utility's staff, build and design to minimize.**

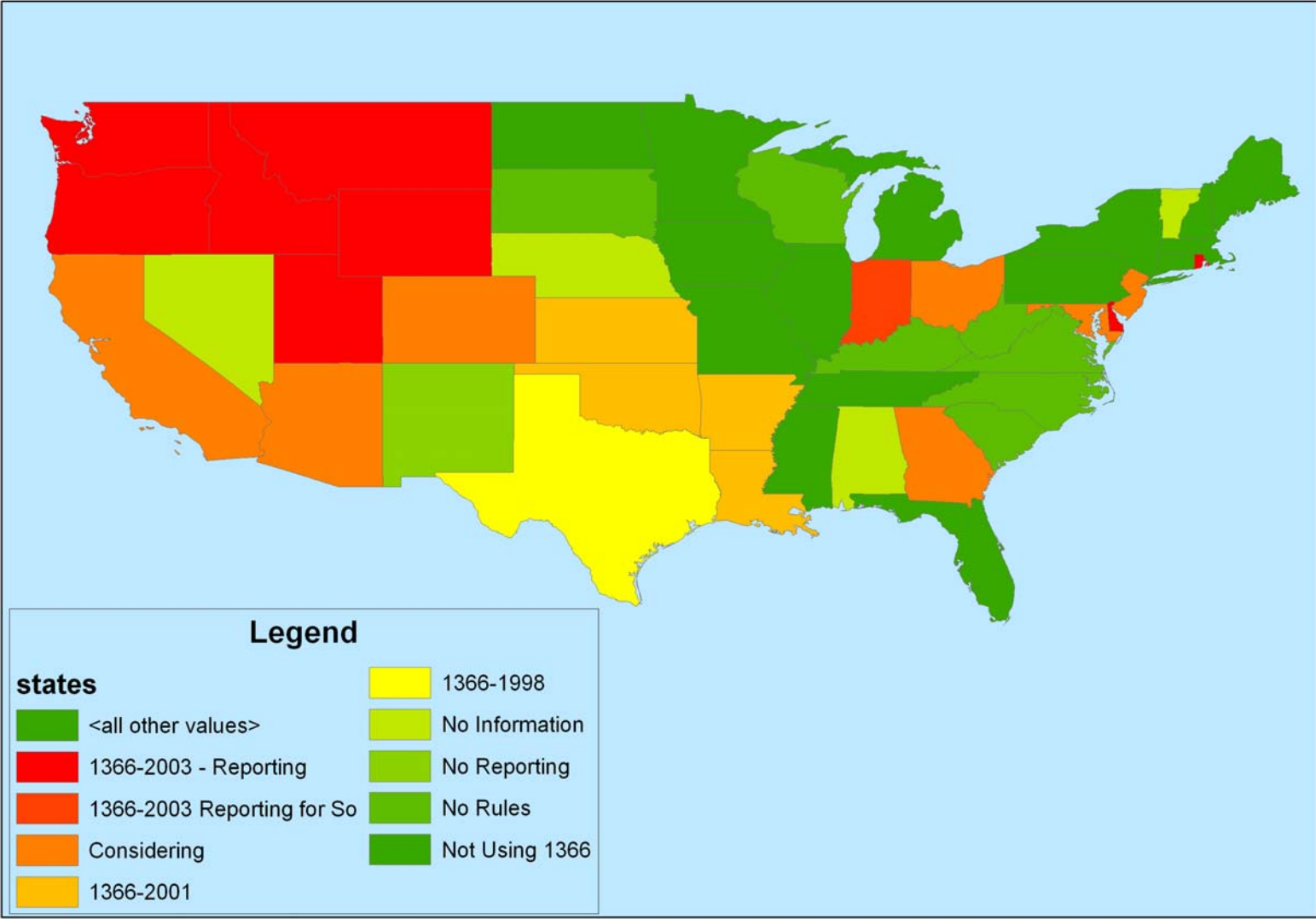
Two Categories for Measurement

- ◆ The 2.5 Beta Methodology allows segmentation of reliability data into **two** distinct sets for review.
 - ◆ One set represents those events of such a reliability magnitude that a **crisis mode** of operation is required to adequately respond. (**major events**).
 - ◆ The other set represents the reliability impact of those events that a company has built the system to withstand and staffed to respond to in a manner that does not require a crisis mode of operation. (**day-to-day operation**).

Benefits of the Approach

- ◆ **Adoption of the 2.5 Beta methodology**
 - ◆ **will allow for consistent calculation of reliability metrics,**
 - ◆ **provide companies and commissions with a more accurate indication of a Company's controllable service quality results,**
 - ◆ **allow a clear review of company response to crisis mode events, and**
 - ◆ **provide a less distorted indication of the reliability results for companies of all sizes.**

State Regulator 2006



Source: IEEE WG membership survey

State	IEEE Status	Comment
Alabama	No Information	0
Alaska	No Information	0
Arizona	Considering	0
Arkansas	1366-2001	Utility has to provide its definition of a "major event" when reporting reliability indices in a biannual quality of service report. AEP does not use the 2.5 beta methodology, mostly for continuity with past reporting.
California	Considering	Adopted for Pacificorp. Considering for others, but docket is not yet open
Colorado	Considering	QSP negotiations in progress, so far regulators are agreeing to use of 1366-2003.
Connecticut	Not Using 1366	UI - A major storm is declared when the number of restoration steps exceeds the 98.5 percentile of all days in the most recent four years. All reliability data associated with interruptions beginning on that qualifying day would be excluded, even if the interruptions extend into subsequent days. CLP - The exclusion is based on the # of trouble spots per division within the company.
Delaware	1366-2003 - reporting	State has officially adopted the use of IEEE 1366-2003 for indices reporting purpose effective January 1, 2005.
Florida	Not Using 1366	The Florida Public Service Commission allows outage exemptions based on a 'Named Storm' classification. This mainly includes all Hurricanes but may be expanded based on petition from an affected utility experiencing unusual outages caused by any extreme weather condition.
Georgia	Plan to use	Reported for the first time in 2005. Did not use 1366, but told regulators they would be using 1366-2003 in 2006.

State	IEEE Status	Comment
Hawaii	Not Using 1366	0
Idaho	1366-2003 Reporting	At least for Pacificorp
Illinois	Not Using 1366	They report all outages
Indiana	1366-2003 Reporting for Some	The Indiana Administrative Code 170 IAC 4-1-23 was amended in September of 2004. A working group of utilities could not develop consensus on the definition of a "major event" during the development process. With the amendment, each utility must submit its definition of major event with its annual reliability report. AEP uses the 2.5 beta method since no annual reporting was required until 09/2004, after IEEE 1366-2003. Cinergy does not
Iowa	Not Using 1366	Major event will be declared whenever extensive physical damage to transmission and distribution facilities has occurred within an electric utility's operating area due to unusually severe and abnormal weather or event and: 1. Wind speed exceeds 90 mph for the affected area, or 2. One-half inch of ice is present and wind speed exceeds 40 mph for the 3. Ten percent of the affected area total customer count is incurring a loss of service for a length of time to exceed five hours, or 4. 20,000 customers in a metropolitan area are incurring a loss of service for a length of time to exceed five hours.
Kansas	1366-2001	0
Kentucky	No Rules	No formal reporting
Louisiana	1366-2001	Has an explicit definition of "major event" in the General Order in Docket U-22389 that is very similar to that used by TX, "A catastrophic event that exceeds the design limits of the electric power system, such as an extreme storm. These events shall include situations where there is a loss of service to 10% or more of the customers in a region, and where full restoration of all affected customers requires more than 24 hours from the beginning of the event."

State	IEEE Status	Comment
Maine	Not Using 1366	0
Maryland	Considering	IEEE is not adopted at this time, there are dialogues between utilities and state regulator on this subject.
Massachusetts	Not Using 1366	15% of the territory over the storm
		New reporting requirements were established in Case No. U-12270 effective February, 2004. These requirements do not even use traditional IEEE indices. Additionally, the specified definition of "Catastrophic conditions" means either of the following: (i) Severe weather conditions that result in service interruptions for 10% or more of a utility's customers. (ii) Events of sufficient magnitude that result in issuance of an official state of emergency declaration by the local, state, or federal government."
Michigan	Not Using 1366	
Minnesota	Not Using 1366	This state accepts Xcel's Definition and is based on number of daily outages
Mississippi	No Information	0
State	IEEE Status	Comment
Missouri	No Mandated Storm Definition	0
Montana	1366-2003 - reporting	For utilities that are using 1366-2003, the commission wants them to report indices on that basis. 38-2-187-adp.pdf. Administrative Rules of Montana (ARM) 38.5.8601 to 38.5.8619.
Nebraska	No Information	0
Nevada	No Information	0

State	IEEE Status	Comment
New Hampshire	Not Using 1366	0
New Jersey	Considering	IEEE is not adopted at this time, there are however working groups among utilities and state regulator working on this subject currently.
New Mexico	No Reporting	0
New York	Not Using 1366	0
North Carolina	No Rules	0
North Dakota	Not Using 1366	This state accepts Xcel's Definition and is based on number of daily outages
Ohio	Considering	Each utility has its definition of "major storm or comparable term" approved by the commission for submitting reliability indices in accordance with Electrical Service and Safety Standards (ESSS), rules 10 and 11. AEP does not use 2.5 beta because historical targets were set using another definition and AEP has not had an opportunity to update its Ohio targets because of some other proceedings. The PUCO staff has circulated several questionnaires and my opinion is that they appear to be interested in mandating the 2.5 beta methodology in the next revision to the ESSS Rules.
Oklahoma	1366-2001	has an explicit definition of "major event" in Chapter 35. Electric Utility Rules. This definition is similar to AR and TX and is, "a catastrophic event that exceeds the design limits of the electric power system, such as an extreme storm, tornado or earthquake. These events shall include situations where there is a loss of service to 10% or more of the customers in a region, and where full restoration of all affected customers requires more than 24 hours from the beginning of the event." This commission has asked a few questions about the 2.5 beta methodology since (and even while) updating its rules in July of 2004.
Oregon	1366-2003 - Reporting	For Pacificorp

State	IEEE Status	Comment
Pennsylvania	Not Using 1366	Outages lasting 24 hours or more that were caused by a single weather event. The event was severe enough to make the local news broadcasts.2) Major event storms are those that affect 10% or more of PPL's total customer base. The effects of these events, upon petition to and approval of the PUC, are excluded from PUC and internal metrics.
Rhode Island	1366-2003 - reporting	0
South Carolina	No Rules	0
South Dakota	No Rules	0
Tennessee	No Rules	No rules
Texas	1366-1998	Has an explicit definition of "major event" in substantive rule 25.52. It seems to be based on an old 1366 definition and is, "Interruptions that result from a catastrophic event that exceeds the design limits of the electric power system, such as an earthquake or an extreme storm. These events shall include situations where there is a loss of power to 10% or more of the customers in a region over a 24-hour period and with all customers not restored within 24 hours."
Utah	1366-2003 - reporting	For reporting purposes for all IOUs.
Vermont	No Information	0
Virginia	No Rules	Has no rulemaking based requirement, but does issue an annual reliability questionnaire to the utilities. The definition of "major storm" is one of the questions. AEP has not used the 2.5 beta methodology in Virginia, but has contemplated "making the switch" for a couple of years.
Washington	1366-2003 - Reporting	At least for Pacificorp, Otherwise 5% of total cust wo service. Commission asking for IEEE 1366-2003
Washington DC	1366-2003 - Reporting	DC has adopted the use of IEEE 1366-2003 for the purpose of calculating the indices and establishing performance standards.

State	IEEE Status	Comment
West Virginia	No Rules	No rules
		(10) "Major catastrophic events" means train wrecks, plane crashes, or explosions that are beyond the utility's control and result in widespread system damages causing customer interruptions that affect at least ten percent of the customers in the system or in an operating area and/or result in customers being without electric service for durations of at least 24 hours.(11) "Major storm" means a period of severe adverse weather resulting in widespread system damage causing customer interruptions that affect at least ten percent of the customers on the system or in an operating area and/or result in customers being without electric service for durations of at least 24 hours.
Wisconsin	No Rules	
Wyoming	1366-2003 - reporting	At least for PacifiCorp
BC Canada	Considering	This year is the first year that utilities are proposing/negotiating using the Normalized reporting numbers to our commission. It appears that this approach will be accepted by the BCUC. Currently, BC Hydro is using the Beta 2.5 method for data normalization.

Benchmarking

- ◆ **Data is Never exactly the same!**
- ◆ **Two main reasons for differences:**
 - ◆ **Data Collection Process/System Differences**
 - ◆ **Exclusion Criteria Differences (Basis)**
- ◆ **IEEE 1366-2003**
 - ◆ **addresses data basis issues by clearly defining the rules.**
 - ◆ **It **DOES NOT** address the data collection issues**

The following slides...

- ◆ **Show company performance using the IEEE 2.5 Beta method to segregate data into:**
 - ◆ **Day-to-Day operating Indices vs.**
 - ◆ **Performance considering the whole customer experience (All)**
- ◆ **79 companies total with 57 companies returning supporting details**
 - ◆ **Customer density, use of step restoration, computerized reporting system, connected model, level of devices recorded.**
 - 98% of utilities use step restoration
 - 98% of utilities use a computerized reporting system
 - 74% of utilities had a connected model
 - 68% can record to the customer level
 - 93% can record to the transformer level

Classification

- ◆ **Urban, Suburban, Rural**
 - ◆ **Rural ≤ 50 cust/mi or 31 cust/km**
 - ◆ **Suburban > 50 cust/mi < 150 cust/mi**
 - ◆ **Urban ≥ 150 cust/mi or 93 cust/km**
- ◆ **Small, Medium, Large**
 - ◆ **Small $\leq 100,000$ customers**
 - ◆ **Medium $> 100,000$ and $< 1,000,000$ customers**
 - ◆ **Large $\geq 1M$ customers**
- ◆ **53,521,263 customers represented in US & Canada**

Classification of Respondents

- ◆ **Small = 30 companies**
- ◆ **Medium = 30 companies**
- ◆ **Large = 19 companies**

Supporting details available only for a subset of respondents.

Respondents

- ◆ **105 Companies** have responded at some time
- ◆ **2004 Survey**
 - ◆ **79 responded in 2004**
 - 57 provided details

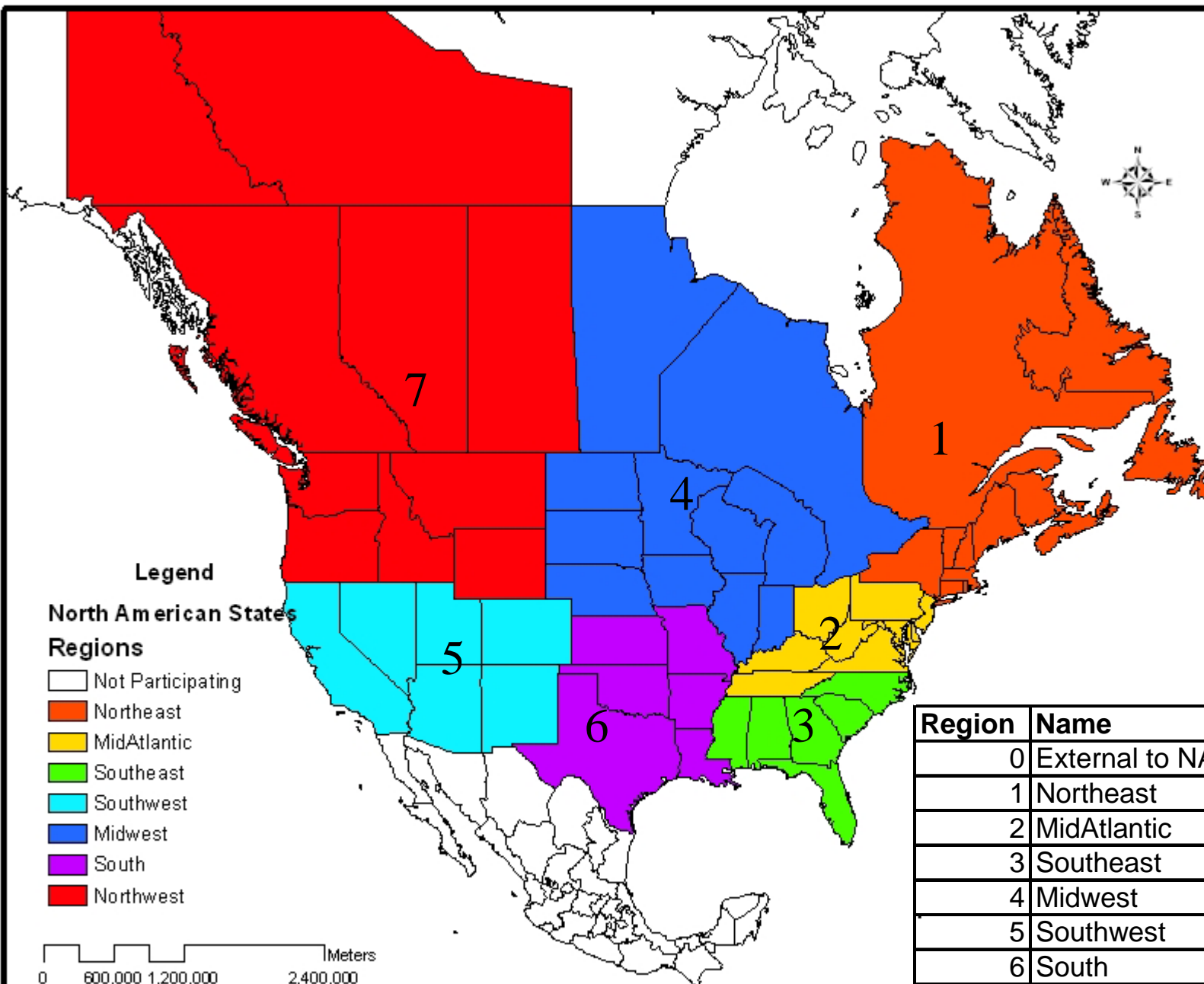
Without Co 8 - 2004						
Quartile	SAIDI IEEE	SAIDI AII	SAIFI IEEE	SAIFI AII	CAIDI IEEE	CAIDI AII
1	73.94	137.04	0.90	1.10	70.57	89.43
2	115.49	168.78	1.21	1.47	91.58	119.20
3	161.96	313.23	1.50	2.07	112.72	169.35
4	313.23	1113.20	3.66	4.73	472.81	472.81

Company 8

Company 8 provided district and company data. The top table shows the results including all of company 8. The bottom table shows the results without company 8.

All Respondents 2004						
Quartile	SAIDI IEEE	SAIDI AII	SAIFI IEEE	SAIFI AII	CAIDI IEEE	CAIDI AII
1	61.20	90.85	0.76	1.01	71.48	82.36
2	96.63	143.25	1.03	1.22	89.43	106.23
3	142.73	267.32	1.35	1.77	104.77	138.21
4	313.23	1113.20	3.66	4.73	472.81	472.81

Without Co 8 - 2004						
Quartile	SAIDI IEEE	SAIDI AII	SAIFI IEEE	SAIFI AII	CAIDI IEEE	CAIDI AII
1	73.94	137.04	0.90	1.10	70.57	89.43
2	115.49	168.78	1.21	1.47	91.58	119.20
3	161.96	313.23	1.50	2.07	112.72	169.35
4	313.23	1113.20	3.66	4.73	472.81	472.81



- Legend**
- North American States**
- Regions**
- Not Participating
 - Northeast
 - MidAtlantic
 - Southeast
 - Southwest
 - Midwest
 - South
 - Northwest

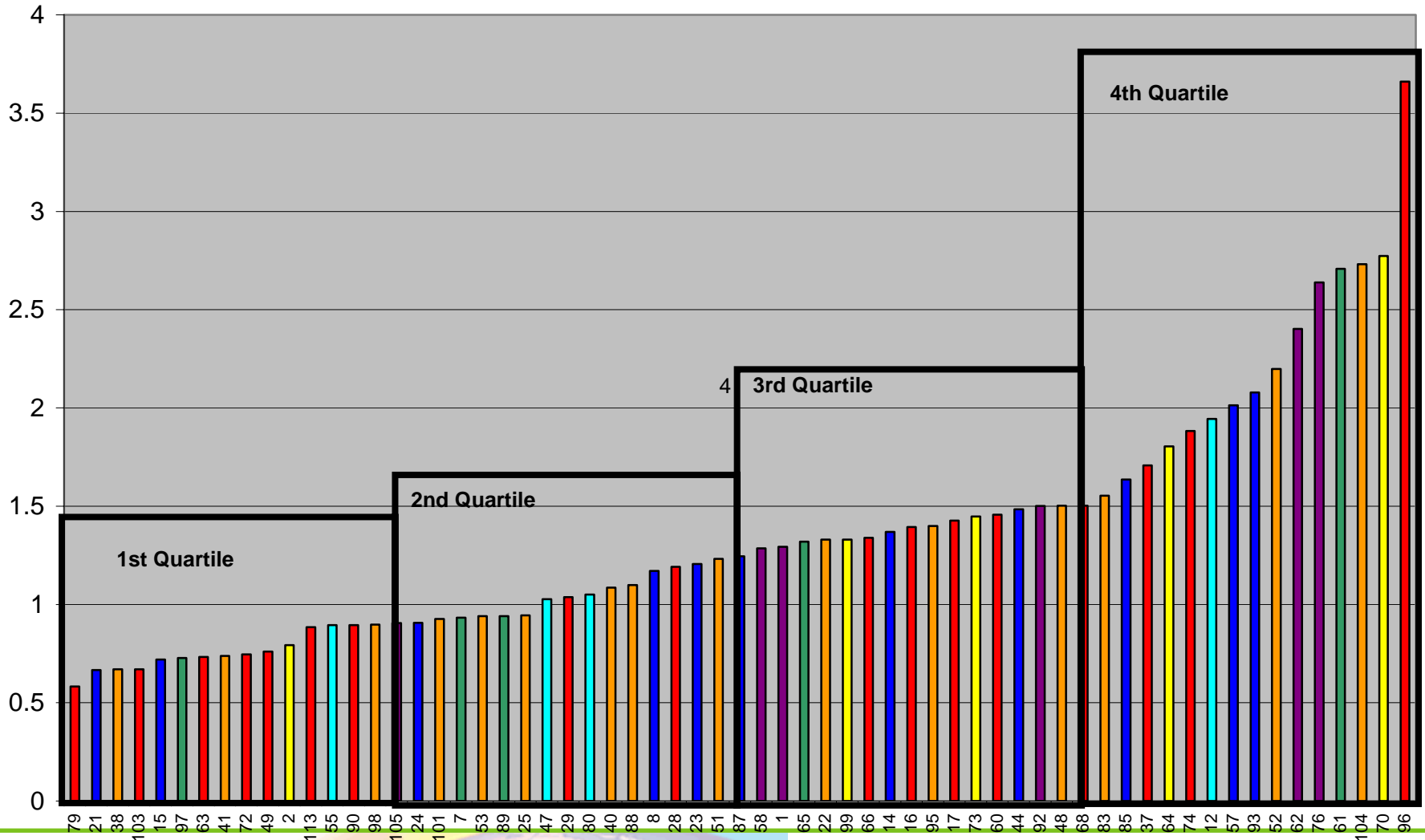
0 600,000 1,200,000 2,400,000 Meters

IEEE Benchmark

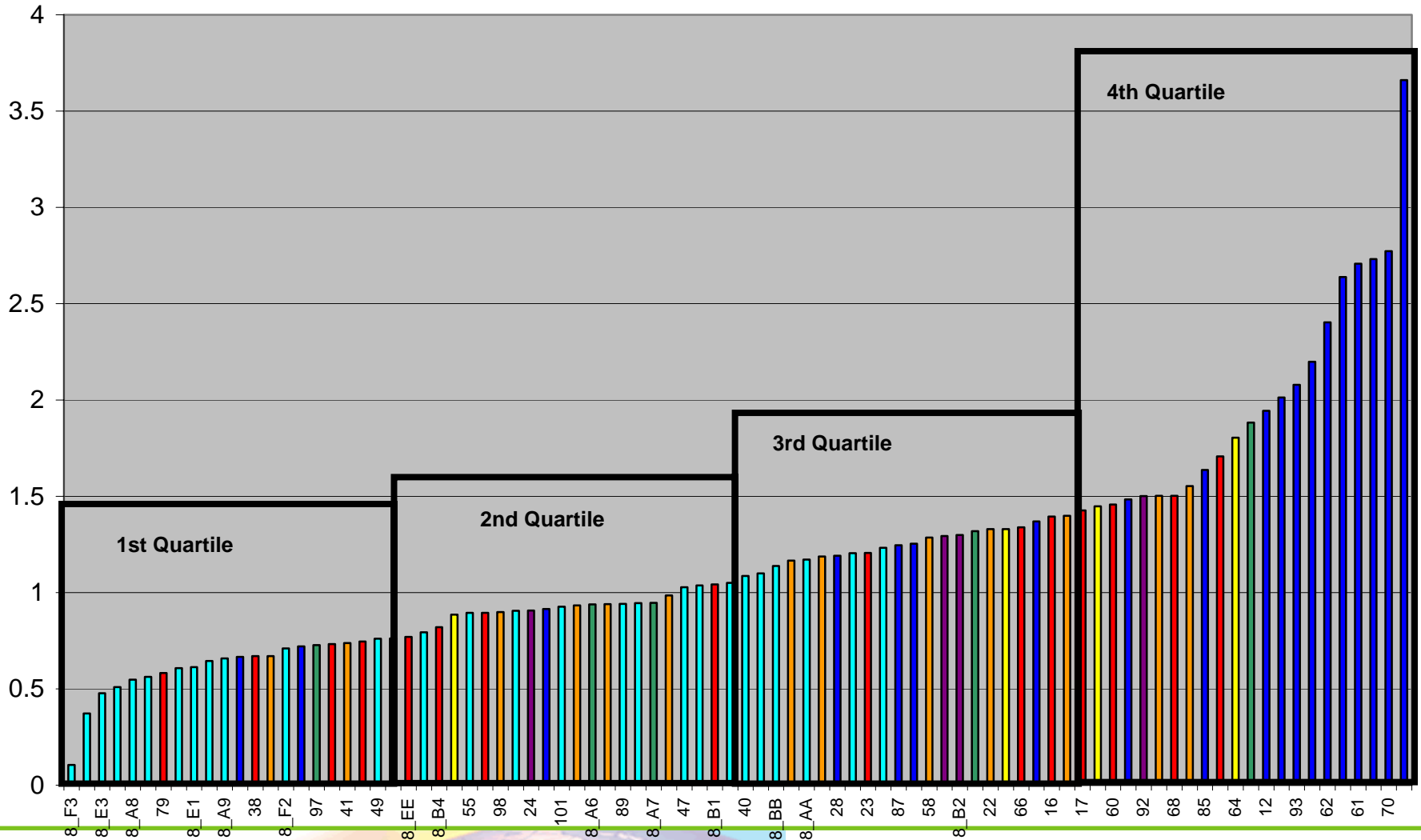
Region	Name	# Co
0	External to NA	1
1	Northeast	13
2	MidAtlantic	5
3	Southeast	5
4	Midwest	27
5	Southwest	8
6	South	4
7	Northwest	14
	2004 Total	78



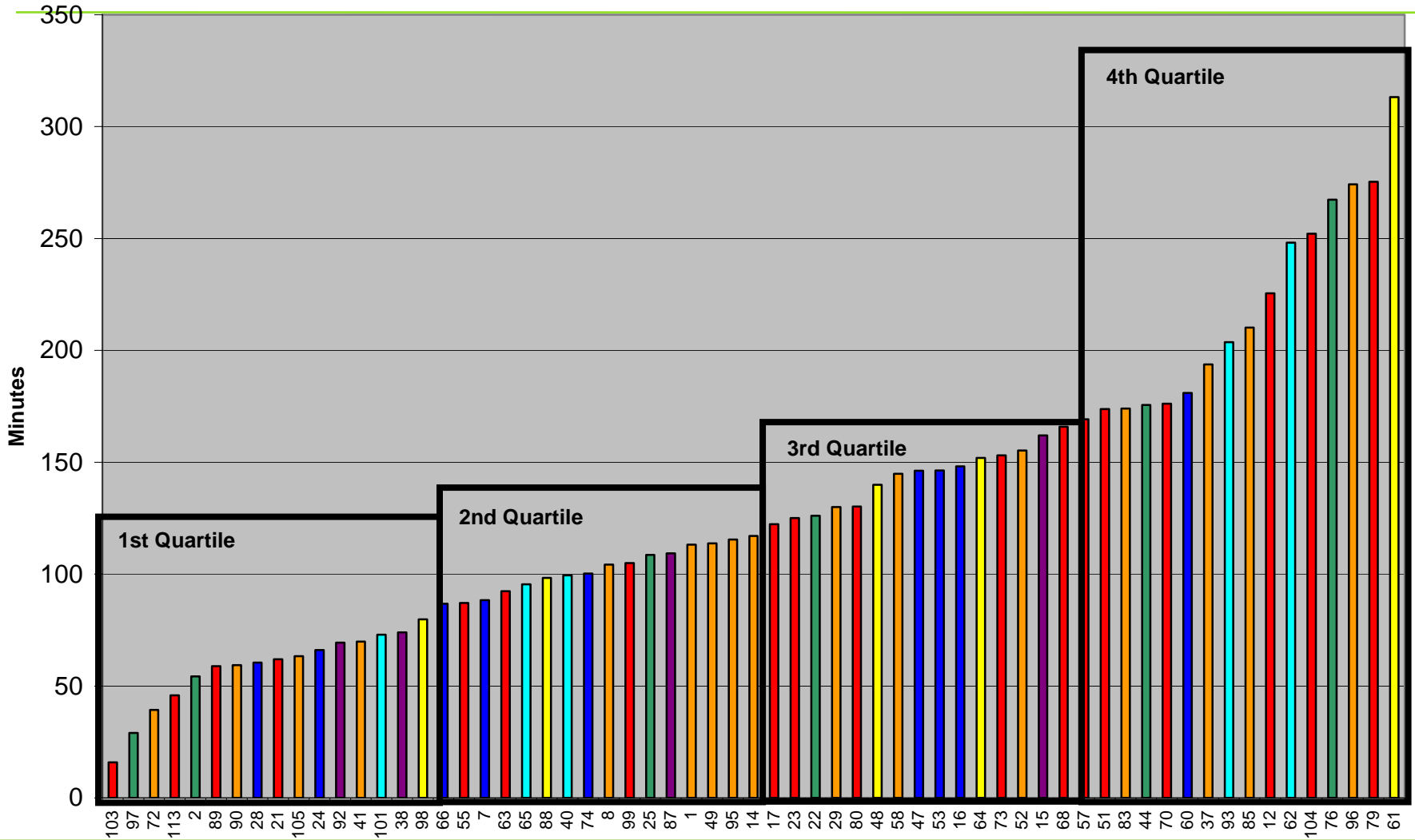
SAIFI IEEE



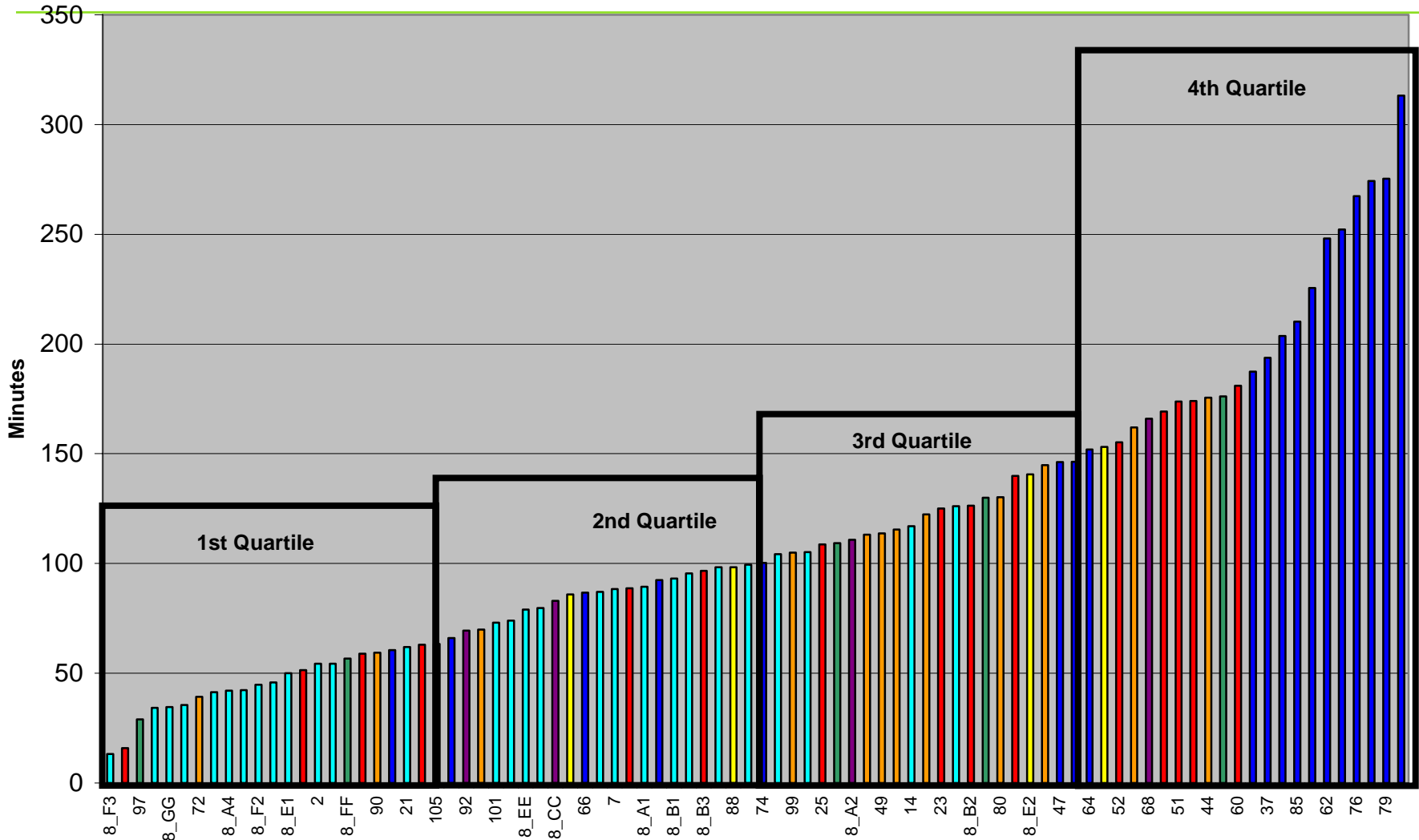
SAIFI IEEE



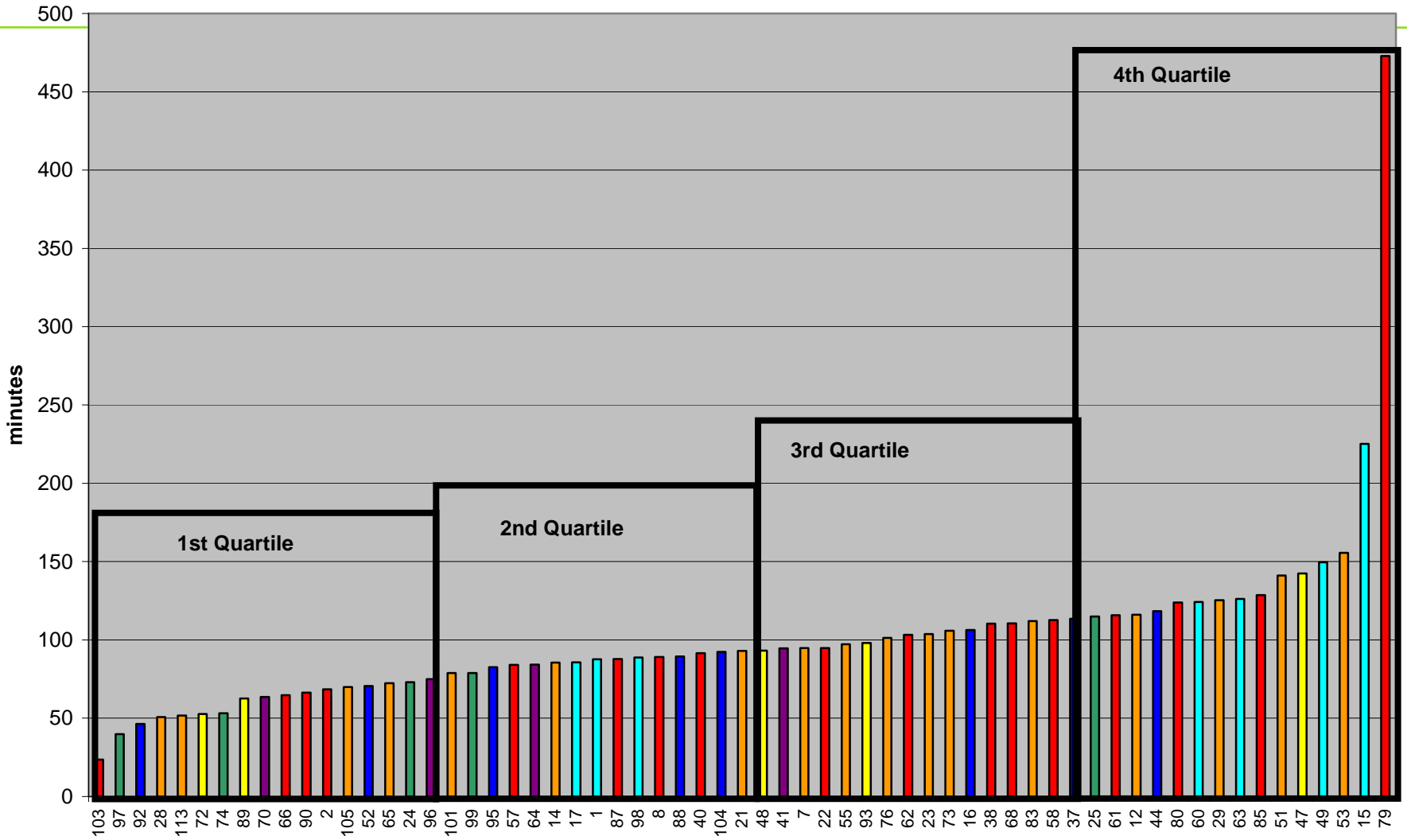
SAIDI IEEE



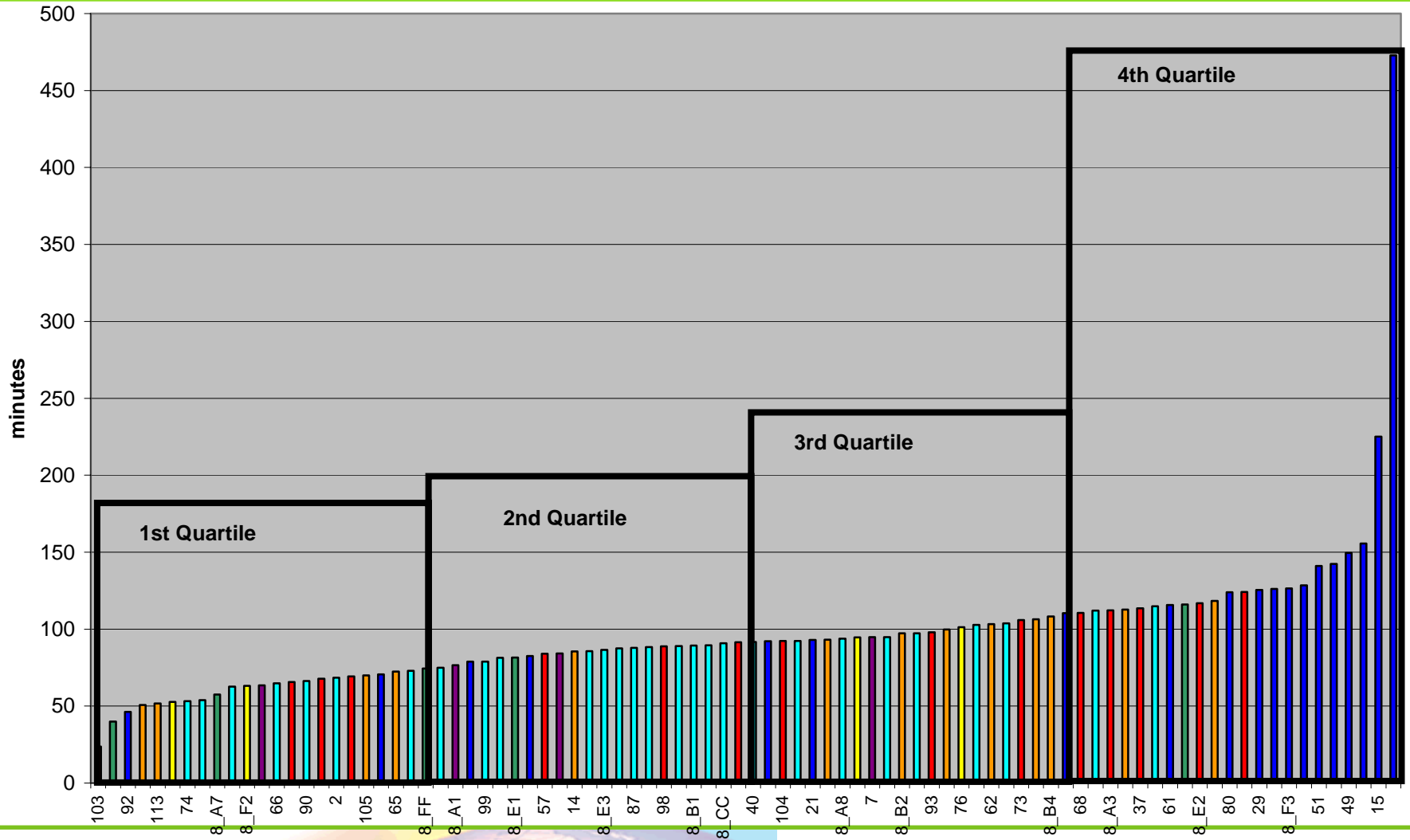
SAIDI IEEE



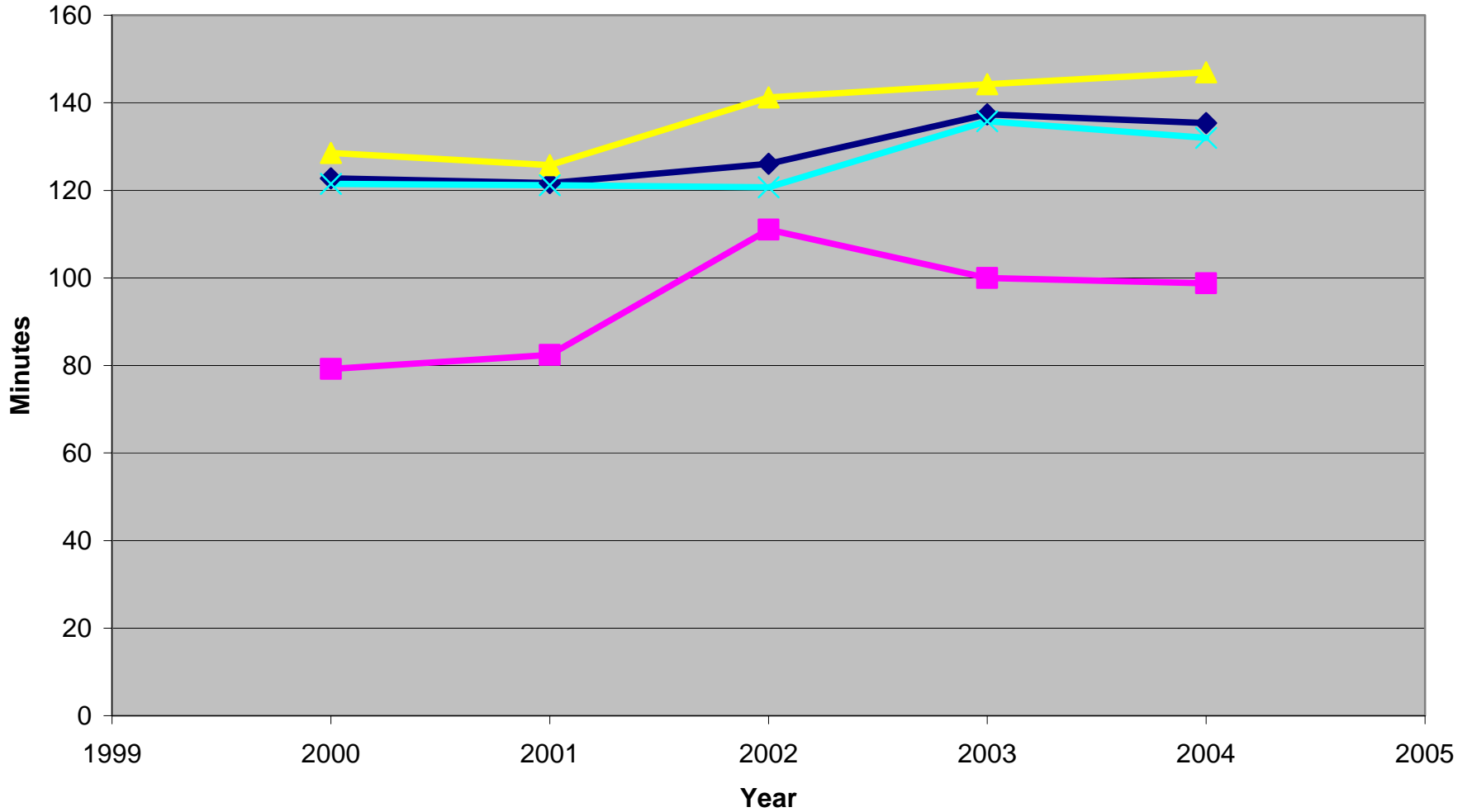
CAIDI IEEE



CAIDI IEEE

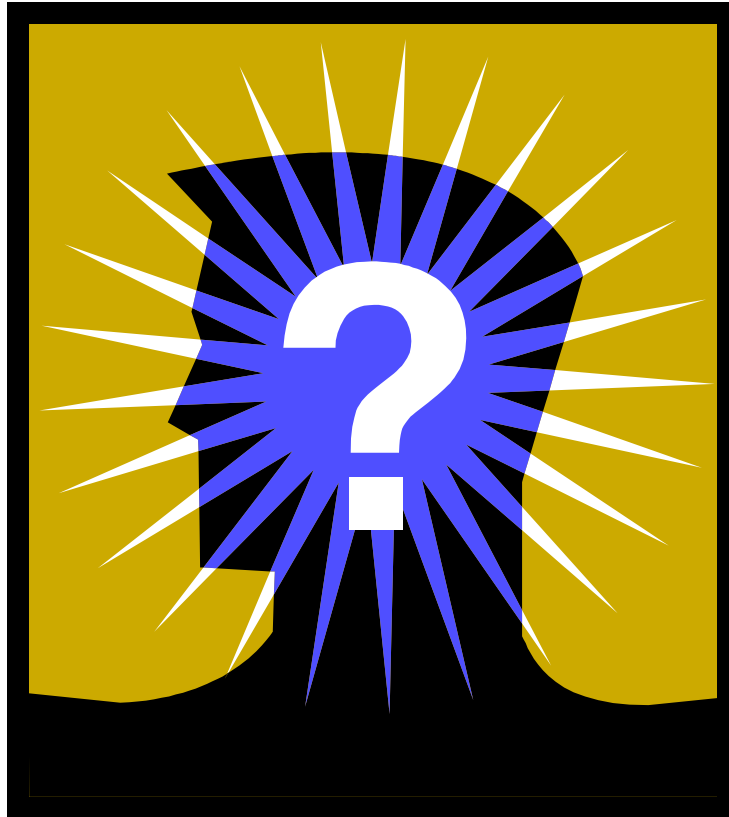


SAIDI IEEE Events Trends



◆ All Companies ■ Small Companies ▲ Medium Companies ✕ Large Companies

Questions...



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