NERC

NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Task Force Report:

Generating Availability Data System:

Mandatory Reporting of Conventional Generation Performance Data

to ensure the reliability of the bulk power system

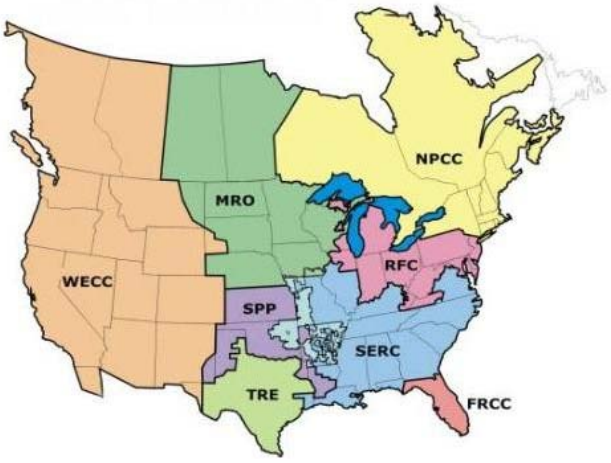
February 18, 2011

116-390 Village Blvd., Princeton, NJ 08540
609.452.8060 | 609.452.9550 fax
www.nerc.com

NERC's Mission

The North American Electric Reliability Corporation (NERC) is an international regulatory authority to evaluate reliability of the bulk power system in North America. NERC develops and enforces Reliability Standards; assesses adequacy annually via a 10-year forecast and winter and summer forecasts; monitors the bulk power system; and educates, trains, and certifies industry personnel. NERC is the electric reliability organization in North America, subject to oversight by the U.S. Federal Energy Regulatory Commission (FERC) and governmental authorities in Canada.[1]

NERC assesses and reports on the reliability and adequacy of the North American bulk power system divided into the eight Regional Areas as shown on the map below (see Table A). The users, owners, and operators of the bulk power system within these areas account for virtually all the electricity supplied in the U.S., Canada, and a portion of Baja California Norte, México.



Note: *The highlighted area between SPP and SERC denotes overlapping regional area boundaries: For example, some load serving entities participate in one region and their associated transmission owner/operators in another.*

Table A: NERC Regional Entities

FRCC Florida Reliability Coordinating Council	**SERC** SERC Reliability Corporation
MRO Midwest Reliability Organization	**SPP** Southwest Power Pool, Incorporated
NPCC Northeast Power Coordinating Council	**TRE** Texas Reliability Entity
RFC Reliability*First* Corporation	**WECC** Western Electricity Coordinating Council

[1] As of June 18, 2007, the U.S. Federal Energy Regulatory Commission (FERC) granted NERC the legal authority to enforce Reliability Standards with all U.S. users, owners, and operators of the bulk power system, and made compliance with those standards mandatory and enforceable. In Canada, NERC presently has memorandums of understanding in place with provincial authorities in Ontario, New Brunswick, Nova Scotia, Québec, and Saskatchewan, and with the Canadian National Energy Board. NERC standards are mandatory and enforceable in Ontario and New Brunswick as a matter of provincial law. NERC has an agreement with Manitoba Hydro, making reliability standards mandatory for that entity, and Manitoba has recently adopted legislation setting out a framework for standards to become mandatory for users, owners, and operators in the province. In addition, NERC has been designated as the "electric reliability organization" under Alberta's Transportation Regulation, and certain reliability standards have been approved in that jurisdiction; others are pending. NERC and NPCC have been recognized as standards setting bodies by the *Régie de l'énergie* of Québec, and Québec has the framework in place for reliability standards to become mandatory. Nova Scotia and British Columbia also have a framework in place for reliability standards to become mandatory and enforceable. NERC is working with the other governmental authorities in Canada to achieve equivalent recognition.

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Executive Summary

Introduction

The electric industry is projecting an unprecedented change in the existing North American resource mix of over one million megawatts (MW) as it reduces the use of coal-fired units, while increasing gas-fired, variable energy resources (wind, solar), nuclear, and demand/energy efficiency resources. Industry must make an ongoing effort to redefine practices such as technology behavior, operating characteristics, and optimal planning approaches with the evolution of the resource mix to properly assess reliability and improve performance analysis. NERC's Generating Availability Data System (GADS) has been used to collect equipment performance voluntarily from generator owners for over three decades. The data is used to calculate important performance statistics and supports bulk power trend analysis by providing information on forced outages, maintenance outages, planned outages, and deratings.

The North American Electric Reliability Corporation's (NERC) mission is to ensure the reliability of the North American bulk power system.[2] With that responsibility, NERC and its stakeholders require accurate data provided in a timely fashion to assess projected bulk power system reliability as well as analyze its ongoing performance and reliability risk for individual, regional, and interconnection-wide planning. The GADS database is vital to support NERC in its assessment of bulk power system reliability. However, industry participation is voluntary. Therefore, in June 2010, the NERC Planning Committee (PC) created the Generating Availability Data System Task Force (GADSTF) to "*review and recommend whether Generation Owners on the NERC Compliance Registry should report GADS data on a mandatory basis.*"[3] Further, the GADSTF was asked to investigate what data reported to GADS should be mandatory and how to make GADS reporting mandatory.

This report focuses on conventional generation (fossil, nuclear, hydro/pumped storage, combined cycle, etc.) data being collected on a voluntary basis as a way to measure any deficiencies to the current approach and benefits from mandatory data collection. Variable energy resources, such as wind and solar, will be assessed in a separate, future report.

Analysis of Voluntary and Mandatory GADS Conventional Generation Reporting

Generating unit performance information/data is critical to determining Planning Reserve Margin requirements and performance trends, especially as the mix of resources begins to include more contribution from new resource types like wind or other intermittent sources. Therefore, sufficient information/data must be gathered to obtain a complete historical assessment and to understand unit life-cycle performance. Currently, however, not all Generator Owners contribute conventional generation data to GADS. With voluntary data submittal, data provided by generator owners represent over 72.4 percent of the existing capacity (20 MW and larger) in North America. This means that nearly 291 GW of capacity is excluded from GADS design and performance data. Table ES-1 below compares the data collected through GADS, and the data provided for capacity requirements in the *Long-Term Reliability Assessment* (LTRA).

[2] NERC has been appointed as the electric reliability organization (ERO) for the United States and has similar authority in Canada and Mexico

[3] As identified by the GADSTF scope. See Appendix 1 of this report.

All Regions are affected by missing data to GADS, particularly Northeast Power Coordinating Council (NPCC), Texas Reliability Entity (TRE), and Western Electric Coordinating Council (WECC), which are missing more than 30 percent of the GADS generation. GADS is missing nearly 25 percent and 80 percent of the existing generation from the U.S. and Canada respectively.

Table ES-1
Percent of Reported Units by Region in North America
Conventional Units 20 MW or Larger

Region	2010 LTRA "Existing Certain" (Summer) Capacity (MW)	2009 GADS Summer NDC (June - August) Reported Capacity (MW)	% GADS MW Reported
FRCC	50,548	43,640	86.3%
MRO	53,815	44,672	83.0%
NPCC	152,047	54,477	35.8%
RFC	210,489	201,632	95.8%
SERC	245,148	185,309	75.6%
SPP	54,081	43,215	79.9%
TRE	85,581	57,471	67.2%
WECC	203,923	133,529	65.5%
	1,055,632	**763,945**	**72.4%**

The United States government tracks new power plants entering service through the Energy Information Administration (EIA) Form 860. During the period of 2000-2008, GADS is missing almost 49 percent of the new capacity entering service in the US.

In addition, for those units that report to GADS, design/unit population information is not routinely updated, and vetting of data submittals for completeness is not performed.

Without complete reporting, performance measures are created from samples of an incomplete and unverified population with unknown statistical certainty and confidence levels. Evidence clearly shows that voluntary data submittal cannot support NERC's need to measure and assess historical or projected unit performance. The existing GADS database is incomplete, missing performance data and design data from generator owners and operators from key areas. With incomplete data from generator owners and operators, it is impossible to quantify their impacts on bulk power system reliability.

Conclusions and Recommendations

The GADSTF recommends that mandatory GADS reporting for conventional generating units begin January 1, 2012. GADS data will be due 30 days after each calendar quarter. The first mandatory data will be from January 1 to March 31, 2012 and will be due to NERC no later than April 30, 2012. GADS data will be collected from all generator owners on the NERC Compliance Registry under NERC's *Rules of Procedure* Section 1600, *Requests for Data or Information*.

This recommendation will improve NERC's reliability assessments and performance analysis, while not overburdening the industry. Further, this recommendation balances NERC's current approach to collect similar information on the bulk power system infrastructure, such as bulk transmission and demand response performance data through Transmission Availability Data System (TADS) and Demand Response Availability Data System (DADS). Like these existing systems, GADS data will continue to be confidential under NERC's *Rules of Procedure*, Section 1500: *Confidential Information.*

1. Introduction

Background

Currently, the North American supply-side resource mix consists of over one million MW. The electric industry is now projecting an unprecedented change in the existing resource mix as it reduces the use of coal-fired units, while increasing gas-fired, variable energy resources (wind, solar), nuclear and demand/energy efficiency resources. Some of this change is driven by discovery of new natural gas resources, current United States Environmental Protection Agency (EPA) rulemaking, existing environmental regulations, state/regional driven resource initiatives, and also the potential for federal carbon initiatives. In addition, a structural change in infrastructure is projected to change with the implementation of smart grid devices and systems.

This evolution in resource mix will require the electric power industry to gain experience with generating resource technology behavior, operating characteristics, and optimal planning approaches in order to properly assess reliability or improve performance analysis. NERC's mission is to ensure the reliability of the North American bulk power system. With that responsibility, NERC and its stakeholders require high quality, accurate data provided in a timely fashion to assess the projected bulk power system reliability and analyze its ongoing performance for individual, Regional and interconnection-wide planning. Further, as new technologies are integrated into the bulk power system, a complete set of design, event, performance, and renewable data will be critical to planners and operators for use in resource adequacy and operations planning to ensure bulk power system reliability.

Reliability Assessment Improvement

Projections of system demand and resources are used to assess whether sufficient resources will exist to meet extreme weather conditions, accommodate demand forecast errors, and remain capable of responding to unexpected generating unit forced outages. Some sub-regions use the data to develop reserve requirements to be purchased in the capacity market.

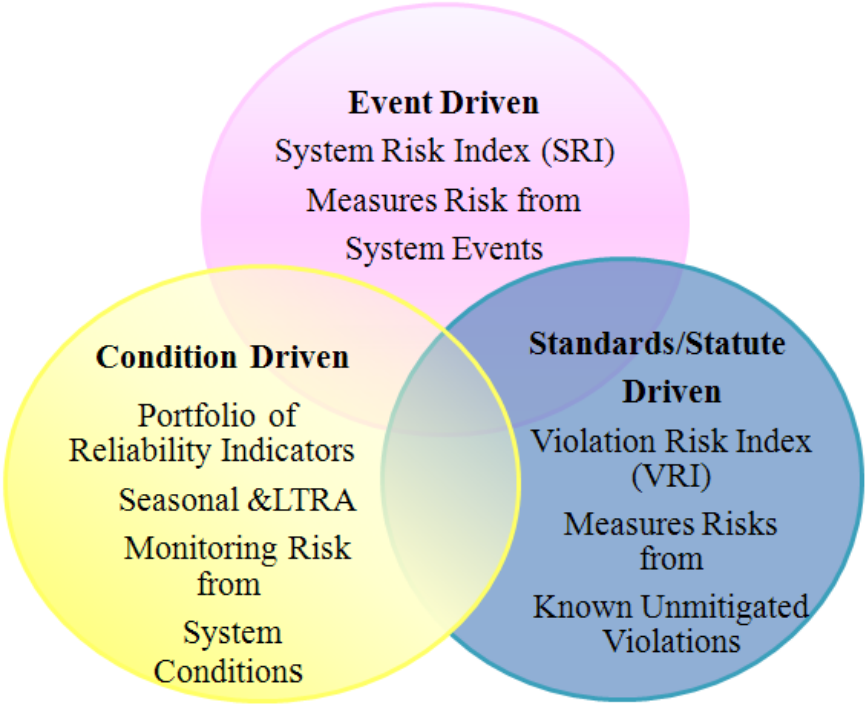
Understanding the performance of existing and new resource technologies is essential to comprehending the reliability of the projected bulk power system in North America. NERC and its stakeholders need to understand how measurements of projected system reliability, such as expected un-served energy, change with the resource mix, and associated infrastructure to understand resource availability/performance. Timely provision of accurate and well-vetted unit performance data is essential, especially as the resource mix is projected to transition through an unprecedented change.

Performance Analysis Improvement

NERC is developing a portfolio of risk information to quantify bulk power system reliability, including condition-driven reliability indicators,[4] standards/statute-driven violation risk measures,[5] and event-driven risk indices,[6] as illustrated in Figure 1-1.

[4] The details of reliability indicators are available at http://www.nerc.com/docs/pc/rmwg/RMWG_Metric_Report-09-08-09.pdf
[5] Detailed standards/statute-driven risk measure proposals are available at http://www.nerc.com/filez/pmtf.html
[6] See NERC's TADS, GADS and Event Analysis Databases

Figure 1.1
Conceptual Risk Model for Bulk Power System



Performance and risk analysis is vital to support NERC's key goal of spotlighting key areas for reliability improvement through trend evaluation and root-cause analysis. For example, historically, to avoid events that present risk, the bulk power system has been designed using deterministic criteria to limit the magnitude of events. This deterministic criterion is based upon experienced engineering judgment. This "defense in depth" approach can benefit from risk-informed prioritization, which accommodates the changing nature of the bulk power system, providing feedback on performance improvement activities.

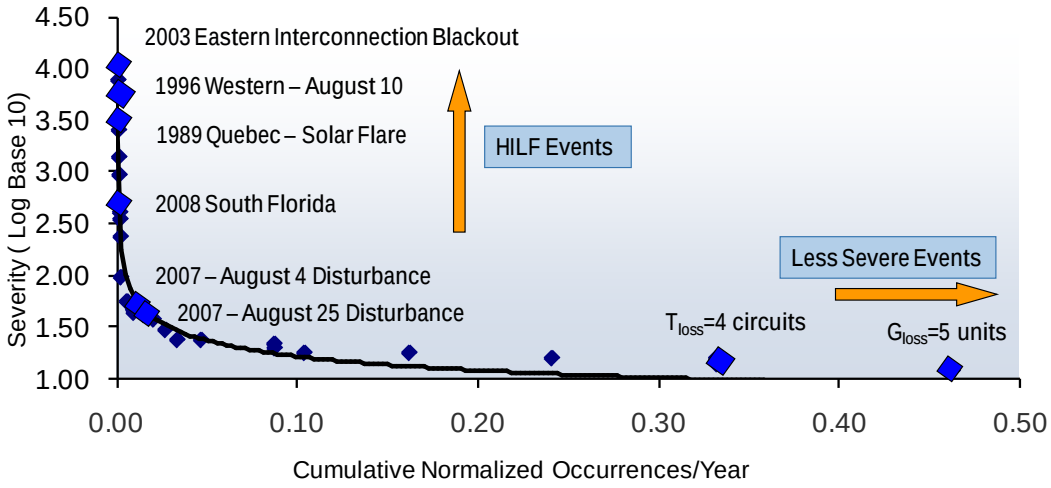
This effort also uses historical event data to develop a severity metric risk measurement tool to establish the bulk power system's characteristic performance curve. This curve would then be applied prospectively for particular risk events and performance assessments as well as providing groundwork for developing cost avoidance parameters. Performance data for transmission facilities and generating units is critical to develop a family of risk severity curves representative of interconnection performance against this reference curve. Further, risk analysis can support prioritization of NERC's Reliability Standards and compliance activities.

A family of curves focused on structural issues (i.e. interconnection), components issues (i.e. generation, transmission, etc.), and trend evaluations (grouping events by causes) can be developed. This approach has been used by NERC to develop a Severity Risk Curve (See Figure 1-2).[7]

[7] http://www.nerc.com/docs/pc/rmwg/Integrated_Bulk_Power_System_Risk_Assessment_Concepts_Final.pdf

Figure 1-2

Example - Bulk Power System Risk Assessment for Risk-Significant Events



The occurrence of these events (events/year) are derived from existing databases, including disturbance analysis, Generating Availability Data System (GADS), Transmission Availability Data System (TADS), and the electricity supply & demand (ES&D) databases. The vertical logarithmic axis of the curve displays integrated severity values. This curve is created by taking all recorded risk events and using a risk event severity scale to determine the risk event's severity. Then the risk events are sorted in descending order and what has emerged is a power distribution curve. In other words, events are ranked by relative severity levels to quantify the impact. Impact is measured in multiple dimensions, including load loss (as a proxy for customers) and loss of facilities (generators, transmission circuits and transformers). These measures provide a numerical ranking to determine which events are more important to maintaining system reliability.

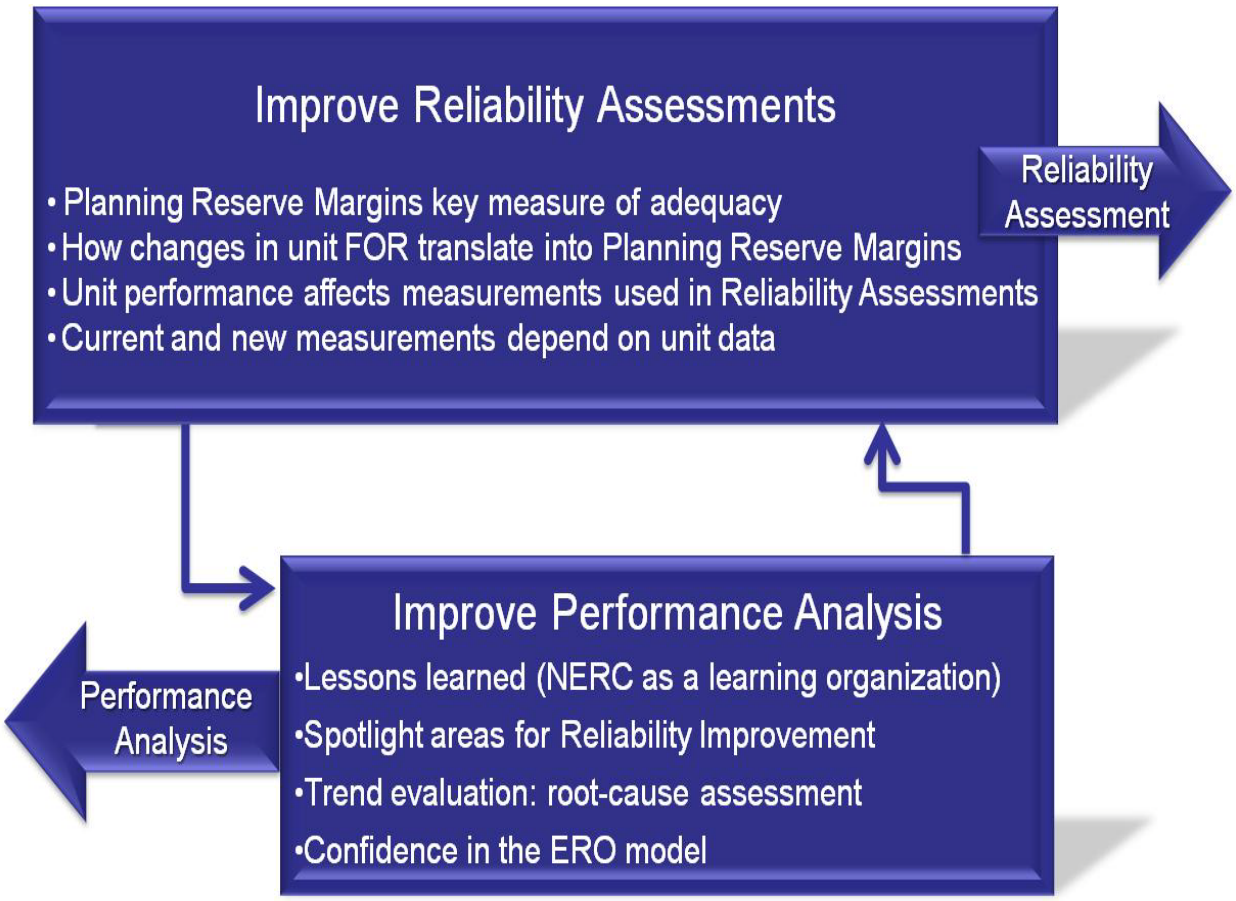
To calculate and measure both event-driven and condition-driven risk, detailed event, and performance information is vital. The data needed for this analysis must be collected on a consistent basis and thoroughly vetted with full, up-to-date representation of the component population.

High Quality/Complete Data for Planning and Maintaining Reliability

In order to have a more complete and accurate picture of the generation side of the equation, it is vital to have a broader, higher population of availability data from generating units in all parts of the NERC footprint. The inadequate population of availability data from generating units within the current GADS database cannot provide a full representation for resource planners and operators to analyze and project to a high degree of accuracy the future of bulk power system requirements. Only a mandatory generation database can provide the missing data to support this very important task. GADS data is critical to ongoing improvements required to sustain reliability assessments and performance analysis (See Figure 1-3).

Figure 1-3

GADS improves Reliability Assessments & Performance Analysis



GADS Data Collection: Voluntary versus Mandatory Reporting

NERC introduced GADS in 1982. This series of databases is used to voluntarily collect, record, and retrieve operating information for improving the performance of electric generating equipment. It also provides assistance to those researching the vast amounts of information on power plant availability stored within its database. The information is used to support equipment reliability and availability analyses and decision-making by GADS data users such as system planners, generation owners, assessment modelers, manufacturers, contract, and regulatory organization, etc[8]. Reports from GADS are now used by many countries for benchmarking and analyzing electric power plants and their performance. It has become an international standard for collection of generation performance data with 11 million outage records available and accessible for studies relating to improved generator reliability.[9]

GADS collects the equipment problems by classes of outage and then calculates important statistics like Equivalent Forced Outage Rates (EFOR) and Equivalent Forced Outage Rate – Demand ($EFOR_d$). By

[8] See Appendix VII for examples of GADS applications to the industry over the last 29 years.

calculating these statistics using IEEE 762 procedures[10], the analyst has high confidence that the numbers are calculated in a uniform process using an industry-approved method. Analysis of GADS data supports access to trends by providing information on forced, maintenance and planned outages and deratings. However, incomplete datasets with reduced populations creates a high degree of uncertainty, which significantly reduces and weakens the industry's ability to understand and meet performance targets.

Further, GADS collects information on fuels burned and fuel switching activities (coal to gas, oil to gas, and bio-fuels to other fuels) to expand the data analysis flexibilities of resource planners and others. For example, the design database shows the changes in unit performance as new environment equipment is added or removed. It has the capability to record the impact of turning a base-loaded unit into cycling operating mode due to increased renewable units coming on line. Unexplored analyses like age, unit designs, fuel-switching, and others physical changes are also collected in GADS.

Currently, GADS is a voluntary database. However, it has now become vital to support NERC in its assessment of future bulk power system reliability, assessment of its current state, as well as the determination of the benefits if the NERC data request was converted from voluntary to mandatory.

In June 2010, the PC created the Generating Availability Data System Task Force (GADSTF). As identified in its scope*, "The Generating Availability Data System (GADS) Task Force (TF) will review and recommend whether Generation Owners on the NERC Compliance Registry should report GADS data on a mandatory basis".* Further, the GADSTF was asked to investigate if GADS reporting should be mandatory and if so, what data should be mandatory. This change would convert the current voluntary reporting of design, event and performance data to mandatory reporting.

As a first step, this report focuses on the current data collected on a voluntary basis to understand if there is a need for mandatory reporting of generation in North America. Further, the task force[11] initially focused on conventional generation (fossil, nuclear, hydro/pumped storage, combined cycle, etc.) and not renewable (wind and solar) units. These variable energy resources will be covered in a future report.

Information on generating unit performance is a critical measure needed to determine Planning Reserve Margin requirements, especially as the mix of resources begins to include more contribution from new resource types like wind or other intermittent sources. Therefore, sufficient information/data must be gathered to obtain a complete historical assessment and to understand unit life-cycle performance. At the same time, it would not be efficient to collect data that has no long-term value to resource planners or to generation operators. Therefore, the GADSTF was given additional guidelines for their work:

1. The task force should focus on and capture the types of data that are clearly linked to improvements in grid reliability.
2. The task force should strive to identify the optimum mechanics or methods that manage data such that mandatory reporting burdens are minimized.
3. The value of task force efforts and the results should be clearly visible to those who provide the data, as well as those regulatory entities who manage and administer the data.

[9] For GADS Data Reporting Instruction, see http://www.nerc.com/page.php?cid=4|43|45

[10] The Institute of Electrical and Electronic Engineers' (IEEE) Standard 762, "Definitions for Reporting Electric Generating Unit Reliability, Availability and Productivity"

[11] See Appendix I for the GADS Task Force scope and Appendix VII for the Task Force Roster.

Task Force Organization

The GADSTF was initially divided into four subgroups for this review, as shown below, and asked to address the eight questions included in Appendix II:

1. **Design** records characteristics of the major equipment at each unit such as manufacturer, model number, number of fans or pumps, and other relevant information (see Appendix E of the GADS Data Reporting Instructions).[12]
2. **Event** records contain detail information about when and to what extent the generating unit could not generate power. There are certain elements of the event records that are currently required reporting; other parts are optional reporting. See Section III of the GADS Data Reporting Instructions.
3. **Performance** records track monthly generation, unit-attempted starts, actual starts, summary event outage information and fuels. See Section IV of the GADS Data Reporting Instructions.
4. **Renewable Units** database tracks wind energy production and causes of wind plant output reductions on a monthly basis. The system can be adapted to collect wind information for other reporting time periods.

Following the Resource Issues Subcommittee (RIS) review, it was decided that renewable units would be investigated under a separate report and removed from this report. GADSTF reports on each of the remaining three subgroups (design, event and performance) are located in Appendix IV of this report. It should be noted that not all GADSTF recommendations could not be justified (certain units excluded from event reporting, for example) and, therefore, were not accepted by the RIS. After further review by the appropriate subgroups, those unjustified recommendations were dropped. All other recommendations are listed in this report in Chapter 3.

Report Organization

The following chapters of this report are:

- Analysis of the 2009 unit populations contained in the GADS database to the 2010 Long-Term Reliability Assessment (LTRA) data to justify mandatory GADS reporting.
- Report conclusions and recommendation.
- Proposed schedule for mandatory reporting

This report contains a number of appendices to support the recommendation of mandatory GADS. These appendices are located at the back of the report.

[12] The GADS Data Reporting Instructions are located at http://www.nerc.com/page.php?cid=4|43|45

2. Analysis of Voluntary versus Mandatory GADS Conventional Generation Reporting

The 2010 LTRA data was used to compare against the 2009 GADS summer reports. At the time of this report, the 2010 GADS data was not complete and the summer (June-August 2010) data for all GADS units was not available. Therefore, the 2010 LTRA and the 2009 GADS data were two most recent datasets. The LTRA Existing Certain (summer) Capacity was compared against the GADS Net Dependable Capacity (NDC).

In Table 2.1 below, only units 20 MW and larger were selected from the two databases. The reason for 20 MW and larger is that the GADSTF recommends that data on the performance of these units should collected on a mandatory basis as it is important to make comparisons against the unit MW size and unit types requested in the Section 1600.

Table 2.1 shows a comparison between the LTRA and GADS for each region. Both the U.S. and Canada are represented in this Table. For some regions, the LTRA and GADS data are very similar, such as RFC, and may be attributed to Regional Transmission Organization/Independent System Operator (RTO/ISO) market rules requiring submittal of GADS data to the RTO/ISO. However, other regions' LTRA data are quite different from GADS like the NPCC, WECC, and TRE regions. These differences can only be contributed to the lack of voluntary reporting by the generating companies or incomplete reporting of all units by reporting companies. For example, one GADS reporting company reports their fossil and nuclear generating units to GADS but not their gas turbines, combined cycles, or hydro units. Missing and incomplete reporting translates to the missing generation. Table 2.1 shows that just 72.4 percent of the MWs reporting to GADS are in the LTRA dataset. This equates to 291.7 GW missing in GADS.

Table 2.1
Percent of Reported GADS Data by Region in North America
Conventional Units 20 MW and Larger

Region	2010 LTRA "Existing Certain" (Summer) Capacity (MW)	2009 GADS Summer NDC (June - August) Reported Capacity (MW)	% GADS MW Reported
FRCC	50,548	43,640	86.3%
MRO	53,815	44,672	83.0%
NPCC	152,047	54,477	35.8%
RFC	210,489	201,632	95.8%
SERC	245,148	185,309	75.6%
SPP	54,081	43,215	79.9%
TRE	85,581	57,471	67.2%
WECC	203,923	133,529	65.5%
	1,055,632	**763,945**	**72.4%**

When the data is divided between the US and Canada, the capacity reported to GADS from the US is 78.6 percent and 23.7 percent from Canada. See Tables 2.2 and 2.3. The majority of Canadian generating

companies have reported to the Canadian Electricity Association (CEA) for years. CEA data reporting is voluntary like GADS. As a result, GADS and CEA are teaming together to convert the CEA event data to GADS format so it can be added to GADS. There is still some work by CEA to gather performance information for GADS. The work to move CEA data to GADS has been transpiring for several years but it is hoped the CEA work will be completed in 2011 because of the need for GADS to be mandatory and many Canadian generating companies follow the NERC *Rules of Procedure.*

Table 2.2
Percent of Reported GADS Data by Region
Conventional Units 20 MW and Larger in the United States

Region	US 2010 LTRA "Existing Certain" (Summer) Capacity (MW)	US 2009 GADS Summer NDC (June - August) Reported Capacity (MW)	US Units % Capacity Reported To GADS
FRCC	50,548	43,640	86.3%
MRO (US)	45,158	44,672	98.9%
NPCC (US)	65,012	35,571	54.7%
RFC	210,489	201,632	95.8%
SERC	245,148	185,309	75.6%
SPP	54,081	43,215	79.9%
TRE	85,581	57,471	67.2%
WECC (US)	179,001	123,814	69.2%
	935,018	**735,324**	**78.6%**

Table 2.3
Percent of Reported GADS Data by Region
Conventional Units 20 MW and Larger in Canada

Region	Canada 2010 LTRA "Existing Certain" (Summer) Capacity (MW)	Canada 2009 GADS Summer NDC (June - August) Reported Capacity (MW)	Canada Units % Capacity Reported To GADS
MRO (Canada)	8,657	0	0.0%
NPCC (Canada)	87,035	18,906	21.7%
WECC (Canada)	24,922	9,715	39.0%
	120,614	**28,621**	**23.7%**

In Table 2.4, unit types in the Electricity Supply and Demand (ES&D) database, used to support NERC's LTRA, were compared to the GADS unit-type data. Comparison results show that the majority of missing existing generation in GADS (42.9 percent) is combined cycle facilities, the most popular newly constructed unit for capacity in North America. In addition to the combined cycle units, almost 55 percent of all existing hydro/pumped storage units, over 30 percent of existing gas turbines, and 14 percent of the existing fossil generation are not in GADS. These results point to GADS missing important generating units.

Table 2.4
Percent of Missing GADS Data by Unit Types
Conventional Units 20 MW and Larger In North America

Types of Generating Units	Percent of Missing Capacity in GADS Compared to Long-Term Assessment Data
Combined cycle generation	42.9%
Gas turbine - simple cycle	31.3%
Hydro-Pumped storage	54.7%
Fossil	14.3%
Nuclear	13.6%

The United States government tracks new power plants entering service through the Energy Information Administration (EIA) Form 860. During the period of 2000-2008, the EIA reported that 4,531 generating units totaling 296,200 MW started commercial operation. During the same period, 1,059 units with 151,437 MW were reported to GADS. GADS is missing almost 49 percent of the new MWs entering service in the US. (Please see Table 2.3 below.) GADS records show that only 7 new units were reported by the Canadian reporting companies (749 MW total).

Table 2.5
Percent of Missing New Generating Units Not Reporting to GADS
Conventional Units 20 MW and Larger in the United States

Number of New , Commercial - operating Generating Units in GADS (2000-2008)	Total NDC MW Capacity from New Commercial Units in GADS (2000-2008)	Number of New, Commercial-operating Generating Units in EIA Form 860 (2000-2008)	Total MW Capacity from New Commercial Units in EIA Form 860 (2000-2008)	Percent of New, Commercial-operating Unit MW Capacity Missing in GADS
1,059	151,437	4,531	296,200	48.9%

There is one other important part of the missing capacity to check. In Table 2.6, we look at five major types of units and their contribution to each region. The Table shows the percent of capacity missing from GADS. The percent may look large because the LTRA and GADS capacity are not close to each other. But the important is look at the amount of capacity different. If the missing capacity for each unit type is small (say, less than 500 MWs), then the representation of that group by unit type is not important and can be excused. That unit type is well represented by the existing voluntary collected capacity in GADS. However, if there is a large difference (greater than 2,000 MW) missing, then there is a major problem that cannot be excused and there is a need to close the gap between the two LTRA and GADS numbers. In reviewing Table 2.6, there are problems of major capacity gaps in all 8 regions. Thus there is need for increased reporting is all the regions, some more than others.

In summary, the majority of missing GADS data is from new, commercial units and new generating unit technologies. We also missing large amounts of capacity from older units in GADS are various technologies needed to better evaluate the generation mix for most regions. We can only conclude that without the missing units, we are working with incomplete, inadequate data for completely analyzing regional reliabilities. Measuring bulk power system reliability severity and risks from events is limited or impossible with the incomplete data submittal currently experienced.[13]

[13] 2010 Long-Term Reliability Assessment, section on severity risk curves

Table 2.6:
Comparison of LTRA and GADS by Region and Unit Type
Conventional Units 20 MW and Larger in North America

Region	Types of Generating Units	MW in LTRA Report by Region and Unit Type	MW in GADS by Region and Unit Type	Percent of Missing Capacity in GADS Compared to LTRA
FRCC	Combined cycle generation	16,692	15,144	9.3%
	Gas turbine - simple cycle	6,702	6,498	3.0%
	Hydro-Pumped storage	0	0	0.0%
	Fossil	23,301	18,073	22.4%
	Nuclear	3,853	3,925	-1.9%
MRO	Combined cycle generation	5,427	3,165	41.7%
	Gas turbine - simple cycle	8,087	10,270	-27.0%
	Hydro-Pumped storage	8,634	2,560	70.3%
	Fossil	27,650	25,179	8.9%
	Nuclear	4,017	3,498	12.9%
NPCC	Combined cycle generation	26,325	6,028	77.1%
	Gas turbine - simple cycle	6,619	3,645	44.9%
	Hydro-Pumped storage	57,382	8,364	85.4%
	Fossil	38,941	28,050	28.0%
	Nuclear	22,780	8,390	63.2%
RFC	Combined cycle generation	21,617	23,033	-6.6%
	Gas turbine - simple cycle	35,585	30,888	13.2%
	Hydro-Pumped storage	5,781	5,555	3.9%
	Fossil	114,642	109,292	4.7%
	Nuclear	32,864	32,864	0.0%
SERC	Combined cycle generation	32,743	19,059	41.8%
	Gas turbine - simple cycle	43,822	25,632	41.5%
	Hydro-Pumped storage	20,557	7,176	65.1%
	Fossil	115,265	99,680	13.5%
	Nuclear	32,761	33,762	-3.1%
SPP	Combined cycle generation	10,318	5,796	43.8%
	Gas turbine - simple cycle	8,531	3,225	62.2%
	Hydro-Pumped storage	2,563	2,405	6.2%
	Fossil	31,509	30,629	2.8%
	Nuclear	1,160	1,160	0.0%
TRE	Combined cycle generation	25,675	11,319	55.9%
	Gas turbine - simple cycle	4,032	3,128	22.4%
	Hydro-Pumped storage	365	0	100.0%
	Fossil	50,418	38,100	24.4%
	Nuclear	5,091	4,924	3.3%
WECC	Combined cycle generation	49,537	24,059	51.4%
	Gas turbine - simple cycle	19,031	7,645	59.8%
	Hydro-Pumped storage	66,787	47,415	29.0%
	Fossil	59,036	46,080	21.9%
	Nuclear	9,532	8,330	12.6%
TOTAL		**1,055,632**	**763,945**	**27.6%**

3. Conclusions and Recommendations

Conclusions

GADS is vital to measure generation reliability and performance information used in modeling energy resources and providing NERC committees, subcommittees, working groups and task forces data for:

- Reliability Assessment reports and modeling;
- Loss-of-load expectation (LOLE) studies and modeling;
- Understanding how the changes in resource availability/performance translate into required Planning Reserve Margins as the resource mix and associated infrastructure changes;
- Understanding the performance of existing and new resource technologies is essential to comprehending the reliability of the projected bulk power system in North America;
- The use of historical event data to develop a severity metric risk measurement tool to establish the bulk power system's characteristic performance curve;
- Calculation and measurement of both Event and Condition-Driven risks, detailed event and performance information;
- Monitor impacts of transmission outages on generators and generator outages on transmission; and
- Power plant benchmarking, equipment analysis, design characteristics, projected performance, avoid long-term equipment/unit failures, etc.

Collection of identified generation performance data should be mandatory:

- Only 72.4 percent of the conventional generating units in North America report to GADS. 78.6 percent report GADS data from the US; 23.7 percent report from Canada. This equates to 291.7 GW missing in GADS.
- Almost 50 percent of the new units entering service from 2000 to 2008 do not report to GADS. This represent 145 GW of new technology not reported to GADS for use in Reliability Assessments, resource planning, unit performance benchmarking, and other important activities.
- Large amounts of hydro-Pumped storage, combined cycle and gas turbines are missing from each of the eight Regions. These units are needed to analyze the reliability of the bulk power system.

Recommendations

The specific recommendations are as follows:

- The task force recommends that GADS data be provided for conventional generating units (not variable energy resources such as wind and solar) from all Generator Owners on the NERC

Compliance Registry, following Section 1600, *Requests for Data or Information* under NERC's *Rules of Procedures*.

- GADS data confidentiality will be covered under NERC's *Rules of Procedure* Section 1500, *Confidential Information.*
- The ten types of conventional generating units will be required under the mandatory rule:
    - Fossil steam including fluidized bed design;
    - Nuclear;
    - Gas turbines/jet engines (simple cycle and others modes);
    - Internal combustion engines (diesel engines);
    - Hydro units/pumped storage;
    - Combined cycle blocks and their related components (gas turbines and steam turbines);
    - Cogeneration blocks and their related components (gas turbines and steam turbines);
    - Multi-boiler/multi-turbine units;
    - Geothermal units; and
    - Other miscellaneous conventional generating units (such as variable fuel – biomass, landfill gases, etc) used to generate electric power for the grid and similar in design and operation as the units shown above and as defined by the GADS Data Reporting Instructions.
- Generator Owners shall report their GADS data to NERC as outlined in the GADS Data Reporting Instructions (Appendix III) for design, event and performance data for generating unit types listed above for units greater than 20 MVA and generating facilities greater than 75 MVA.[14] Generator Owners not listed on NERC's Compliance Registry may report to GADS on a voluntary basis.
- There will be a one-time effort by non-reporting generating companies to develop or modify existing computer data collection program outputs into GADS required formats.[15] The GADSTF recommends specific data fields (listed in Appendix III of this report) in the design, event and performance records be required reporting and other data fields be voluntary. NERC will set up their edits to insure all required fields are completed. The generating companies will be responsible that the required fields are completed accurately.
- Uniformity of data collection format is essential. All GADS data shall be collected using the GADS Data Reporting Instructions. The Data Reporting Instructions will be updated annually and each reporting company will be required to follow the latest Reporting Instructions for the current

[14] The 20 MVA and 75 MVA thresholds are consistent with the *Statement of Compliance Registry Criteria (Revision 5.0)* - http://www.nerc.com/files/Statement_Compliance_Registry_Criteria-V5-0.pdf

[15] The GADSTF believes that equipment outage data is already collected by plant personnel, although they may not adhere to GADS requirements.

year.[16] All questions or needs for interpretation of the reporting instruction interpretations will be coordinated with NERC staff and the GADSTF.

- In-house review of GADS data by the reporting generating company has always been strongly encouraged under voluntary data reporting. Each reporting generating company shall continue to be responsible for collecting, monitoring, updating and correcting their own GADS design, event, and performance data. Each generating company shall be responsible to setting a review process that meets these important needs. For example, the cause codes and verbal descriptions should be reviewed and identify the same problem. The type of outage must follow the rules described in IEEE 762 "Definitions for Reporting Electric Generating Unit Reliability, Availability and Productivity "and the GADS Data Reporting Instructions.
- Up-to-date design data is essential for many generating plant analyses. Generating companies shall review and update their design data annually or as recommended by NERC staff using the design time-stamping process. The first set of updates to the design data is recommended for 2011 to include a voluntary update as to the current unit design. Industry will be encouraged to voluntarily review and list changes to each generating unit during the 2005-2010 periods.
- NERC shall track ownership changes as generating units are sold to other operating companies. These changes will include the name of the new owners and the date of generating unit transfer.
- Proposed or projected generating units retirement dates shall not be collected in GADS.

[16] Updates will follow the Section 1600 process.

4. Action Plan for Mandatory Data Collection

The GADSTF recommends that mandatory GADS reporting for conventional generating units beginning January 1, 2012. GADS data will be due 30 days after each calendar quarter. The first mandatory data will be from January 1 to March 31, 2012 and will be due to NERC no later than April 30, 2012. GADS data will be due at the end of April, July, October, and January each year after the first data submittal. Year-to-date GADS event and performance data in GADS format is required for each submittal for all units.

The following implementation schedule is proposed.

Action	Proposed Schedule
Report review by Resource Issues Subcommittee	January 13, 2011
Send report to PC and RIS for comments	January 20, 2011
Deadline for the PC and RIS to return comments	February 4, 2011
Call with RIS to discuss PC/RIS comments and how to address them. Approval by RIS.	February 10, 2011
Send final draft to RIS	February 14, 2011
Posting of final version for PC March 2011 Agenda	February 18, 2011
Approved by Planning Committee to seek Section 1600 Request	March 8-9, 2011
Prepare FERC documents and send to FERC	March 18, 2011
FERC Comment Period (21 days) complete	April 8, 2011
Public Posting Period (45 days) complete	May 25, 2011
Review of Comments after public posting complete	May 31, 2011
Approval by Planning Committee for Implementation per Section 1600	September 13-14, 2011
Training for Data Submittal	October-November, 2011
Board of Trustees approval	November 3, 2011
Appeal (30 days) complete	December 2, 2011
GADS Mandatory starts	January 1, 2012
GADS Mandatory Data Due (First Quarter of 2012)	April 30, 2012

Appendix I: GADS Task Force Scope

Purpose

The Generating Availability Data System Task Force (GADSTF) will review and recommend whether Generator Owners on the NERC Compliance Registry should report GADS data on a mandatory basis.

Background

NERC began collecting and analyzing power plant outage information in 1982. Since its inception, GADS has collected more than 11 million outage records used for benchmarking existing unit performance and support of bulk power system reliability. More than 5,300 generating units report to GADS annually. GADS data collection and assessment provides the basis for much of North America's development of probabilistic resource adequacy assessments.

Data submittal to GADS[17] is currently voluntary and most (75 percent) but not all North American electric generating owners provide data.

Activities

To accomplish its purpose, the GADSTF will perform the following activities:

1. Review GADS and determine what data currently collected by GADS is needed to support and improve bulk power system reliability.
2. Determine if collection of the data identified above should be mandatory by Generation Owners on the NERC Compliance Registry to support bulk power system reliability.
3. If GADS were made mandatory, recommend whether a Section 1600 data request should be used or a new standard should be developed.
4. Define data access to individual GADS unit data.

The GADSTF will target provision of its recommendations to the Planning Committee at its December 2010 meeting.

Membership

The GADSTF members will be comprised of one Generator Owner and one Resource Planner from each Region (16 members in total). A NERC staff member will be assigned as the secretary.

Governance

The GADSTF will report to the Resource Issues Subcommittee of the NERC Planning Committee.

Meetings

Face-to-face meetings will be held as needed. Conference calls and Web meetings will be used to address focused topics.

[17] GADS data gathering definitions are based on the IEEE Standard 762, "Definitions for Reporting Electric Generating Unit Reliability, Availability and Productivity."

Appendix II: GADS Task Force Subgroup Questions

The GADSTF leadership asked participants to consider the past and future of GADS with these questions in mind:

1. Has GADS been useful in the past? GADS has been collected by NERC since 1982. There are many uses of the data for plant engineers, generating staff members, system planners, independent service operators, architect engineers, government agencies, and others. There are a number of free public reports issued to show the performance of various types of generating plants (fossil, nuclear, gas turbine, etc.) such as *Generating Availability Report* (GAR) and the software pc-GAR. With this in mind, review the uses of GADS data and ask:
    a. Does your ISO use GADS to measuring unit $EFOR_d$ and performance?
    b. Does GADS data help you to review poor unit designs/performance and help you to determine what makes generating units more reliable?
    c. Does GADS help to review unit benchmarking for realistic unit goals and performance?
    d. Does GADS assist your work in evaluate unit design and equipment reliability?
2. Is it essential now?
    a. Is the same information needed today as new plants are being constructed?
    b. Is unit performance by independent service operators and dispatch still a valuable tool?
3. Is it worth the time, cost, and effort to continue collecting its data?
4. If there were no GADS, would it be missed?
5. Review GADS and determine the data required to support and improve bulk power system reliability.
6. Determine what should be provided to NERC on a mandatory basis to support bulk power system reliability.
7. For the data that is mandatory, identify the appropriate course of action towards data collection: Section 1600 *Requests for Data Information* or through the NERC Standard process.
8. Are the GADS Data Release Guidelines still valid?[18] Define data access for individual GADS unit data. The GADSTF will review the Release Guidelines approved in by the NERC Board of Trustees in the 1980s to determine:
    a. If not valid, what modifications are required towards determining appropriate access?
    b. Should GADS data be opened to allow individual Regional Entity reports?

[18] The GADS Data Release Guidelines are in Appendix I of the GADS Data Reporting Instructions.

Appendix III: GADS Task Force Design, Event, and Performance Recommendations

	Design - Fossil Steam Record Fields	GADSTF Recommendation
1	Identification (Utility and number ID, unit name)	All Parts Required
2	Date the Unit Entered Service	All Parts Required
3	Unit Loading Characteristics at Time of Unit's Design	All Parts Required
4	Design and Construction Contractors	Voluntary
5	Boiler - Manufacturer	All Parts Required
6	Boiler - Enclosure	All Parts Required
7	Boiler - Nameplate Conditions	All Parts Required
8	Boiler - Fuel Firing System	All Parts Required
9	Boiler - Type of Circulation	All Parts Required
10	Boiler - Circulation System	Voluntary
11	Boiler - Type of Furnace Bottom	All Parts Required
12	Boiler - Furnace (Surface) Release Rate	Voluntary
13	Boiler - Furnace Volumetric Heat Release Rate	Voluntary
14	Boiler - Primary and Secondary Design Fuels (All parts required except fuel characteristics)	Not All Parts Required
15	Boiler - Fuel Oil Forwarding System	Voluntary
16	Boiler - Burner System (General)	Voluntary
17	Boiler - Burner Management System	Voluntary
18	Boiler - Fuel Oil Burner Supply System (In-plant)	Voluntary
19	Boiler - Igniter System (All parts required except manufacturer and type)	Not All Parts Required
20	Boiler - Coal Handling Systems - Yard Area	Voluntary
21	Boiler - Coal Feeders for Pulverizers or Coal Mills	Voluntary
22	Boiler - Pulverizer or Coal Mill Capability (All parts required except flow rate, minimum and type)	Not All Parts Required
23	Boiler - Primary Air System (All parts required except manufacturer, drive and type)	Not All Parts Required
24	Boiler - Exhausters for Pulverizers or Coal Mills (All parts required except drive manufacturer, minimum and type)	Not All Parts Required
25	Boiler - Balanced Draft or Pressurized Draft	All Parts Required
26	Boiler - Forced Draft Fan System (All parts required except manufacturer, drive manufacturer, minimum and type)	Not All Parts Required
27	Boiler - Induced Draft Fan System (All parts required except manufacturer, drive manufacturer, minimum and type)	Not All Parts Required
28	Boiler - Gas Recirculating Fan System	Not All Parts Required

	Design - Fossil Steam Record Fields	GADSTF Recommendation
	(All parts required except manufacturer, drive manufacturer, minimum and type)	
29	Boiler - Primary Air Heating System (All parts required except manufacturer)	Not All Parts Required
30	Boiler - Secondary Air Heating System (All parts required except manufacturer)	Not All Parts Required
31	Boiler - Soot Blowers	Voluntary
32	Boiler - Bottom Ash Handling System	Voluntary
33	Boiler - Mechanical Fly Ash Precipitator System	Voluntary
34	Boiler - Electrostatic Precipitator	All Parts Required
35	Boiler - Baghouse Fly Ash System (All parts required except booster fan manufacturer, booster fan drive manufacturer and type)	Not All Parts Required
36	Boiler - Fly Ash Transport System	Voluntary
37	Flue Gas Desulfurization (FGD) Manufacturer	All Parts Required
38	FGD Installation Date	All Parts Required
39	FGD Cycle Type	All Parts Required
40	FGD Absorbing Reagents	Voluntary
41	FGD Flow Rates	Voluntary
42	FGD By-pass Capacity	All Parts Required
43	FGD Modules	All Parts Required
44	Scrubber/Absorber Tower Type	All Parts Required
45	FGD Fans (All parts required except fan manufacturer, fan drive manufacturer, minimum and type)	Not All Parts Required
46	Scrubber Recycle (Liquid) Pumps	Voluntary
47	Stack Gas Reheater Methods	Voluntary
48	FGD Primary Mist Eliminator	Voluntary
49	Steam Turbine - Manufacturer (All parts required including manufacturer of each steam turbine section)	All Parts Required plus
50	Steam Turbine - Enclosure	All Parts Required
51	Steam Turbine - Nameplate Rating in MW	All Parts Required
52	Steam Turbine - Type of Steam Turbine	All Parts Required
53	Steam Turbine – Manufacturer's Building Block or Design Codes	All Parts Required
54	Steam Turbine - Steam Conditions	All Parts Required
55	Steam Turbine - High, Intermediate, and Low Pressure Sections	All Parts Required
56	Steam Turbine - Governing System	All Parts Required
57	Steam Turbine - Lube Oil System	Voluntary
58	Generator - Manufacturer	All Parts Required
59	Generator - Enclosure	All Parts Required
60	Generator - Ratings and Power Factor	All Parts Required

	Design - Fossil Steam Record Fields	GADSTF Recommendation
61	Generator - Cooling System	All Parts Required
62	Generator - Hydrogen Pressure	All Parts Required
63	Exciter - Configuration	All Parts Required
64	Auxiliary Systems - Main Condenser	All Parts Required
65	Auxiliary Systems - Condenser Cleaning System	Voluntary
66	Auxiliary Systems - Condensate Polishing System	Voluntary
67	Auxiliary Systems - Condensate Pumps (All parts required except manufacturer, drive manufacturer and minimum)	Not All Parts Required
68	Auxiliary Systems - Condensate Booster Pumps (All parts required except manufacturer, drive manufacturer and minimum)	Not All Parts Required
69	Auxiliary Systems - Feedwater (Boiler Feed) Pumps (All parts required except manufacturer, drive manufacturer and minimum)	Not All Parts Required
70	Auxiliary Systems - Feedwater (Boiler Feed) Pump Drives	All Parts Required
71	Auxiliary Systems - Startup Feedwater (Boiler Feed) Pumps (All parts required except manufacturer, drive manufacturer and percent capacity)	Not All Parts Required
72	Auxiliary Systems - High Pressure Feedwater Heaters (All parts required except manufacturer)	Not All Parts Required
73	Auxiliary Systems - Intermediate Pressure Feedwater Heaters (All parts required except manufacturer)	Not All Parts Required
74	Auxiliary Systems - Low Pressure Feedwater Heaters (All parts required except manufacturer)	Not All Parts Required
75	Auxiliary Systems - Deaerator Heater	All Parts Required
76	Auxiliary Systems - Heater Drain Pumps	Voluntary
77	Auxiliary Systems - Circulating Water Pumps (All parts required except manufacturer drives)	Not All Parts Required
78	Auxiliary Systems - Cooling Tower and Auxiliaries (All parts required except manufacturer, drive manufacturer and booster pump information)	Not All Parts Required
79	Balance of Plant - Main Transformer	All Parts Required
80	Balance of Plant - Unit Auxiliary Transformer	All Parts Required
81	Balance of Plant - Station Service Transformer	All Parts Required
82	Balance of Plant - Auxiliary (Start-up) Boiler	Voluntary
83	Balance of Plant - Auxiliary Generator	Voluntary
84	Balance of Plant - Plant Process Computer	Voluntary
85	CEMS - General	Voluntary
86	CEMS - Pollutant Gas and Diluent Gas Analyzers/Monitors	Voluntary
87	CEMS - Flue Gas Flow Monitors	Voluntary
88	CEMS - Data Acquisition and Reporting System	Voluntary
89	Selective Non-Catalytic Reduction System (SNCR)	Not All Parts Required

	Design - Fossil Steam Record Fields	GADSTF Recommendation
	(All parts required except injector type and location and gas type)	
90	Selective Catalytic Reduction System (SCR) (All parts required except reactor type, injector type and location, gas type)	Not All Parts Required
91	Catalytic Air Heaters (All parts required except injector type and location and gas type)	Not All Parts Required

	Design - Fluidized Bed Record Fields	GADSTF Recommendations
1	Identification (Utility and number ID, unit name)	All Parts Required
2	Date the Unit Entered Service	All Parts Required
3	Unit Loading Characteristics at Time of Unit's Design	All Parts Required
4	Design and Construction Contractors	Voluntary
5	Boiler – Manufacturer	All Parts Required
6	Boiler – Enclosure	All Parts Required
7	Boiler - Nameplate Conditions	All Parts Required
8	Boiler - Fuel Firing System	All Parts Required
9	Boiler - Method of Solid Feed to the Boiler	All Parts Required
10	Boiler - Type of Circulation	All Parts Required
11	Boiler - Circulation System (All parts required except manufacturer, drive manufacture, and type)	Not All Parts Required
12	Boiler - Heat Exchanger	Voluntary
13	Boiler - Char Reinjection System (All parts required except separation temperature, liner, pressure, type)	Not All Parts Required
14	Boiler - Design Parameters	Voluntary
15	Boiler - Furnace (Surface) Release Rate	Voluntary
16	Boiler - Furnace Volumetric Heat Release Rate	Voluntary
17	Boiler - Primary and Secondary Design Fuel, Sorbents, and Non-sorbent (All parts required except fuel characteristics)	Not All Parts Required
18	Boiler - Fuel Oil Forwarding System	Voluntary
19	Boiler - Burner Management Systems	Voluntary
20	Boiler - Fuel Oil Burner Supply System (In-plant)	Voluntary
21	Boiler - Burner Systems (All parts required except duct burner type, BTU rate)	Not All Parts Required
22	Boiler - Solid Fuel Handling Systems - Yard Area (All parts required except manufacturer)	Not All Parts Required
23	Boiler - Solid Fuel Crushers	Voluntary
24	Boiler - Solid Fuel Feed to Boiler (All parts required except type, manufacturer, drive manufacturer, feeder information)	Not All Parts Required
25	Boiler - Secondary Fuel Feed (other than coal)	Voluntary
26	Boiler - Sorbent Crusher or Pulverizer Capability (All parts required except type, manufacturer, drive manufacturer, sorbent feeder information)	Not All Parts Required
27	Boiler - Sorbent Feed System to Boiler (All parts required except type, manufacturer, drive manufacturer, feeder information)	Not All Parts Required
28	Boiler - Bed Material Injection Feed System	Not All Parts Required

	Design - Fluidized Bed Record Fields	GADSTF Recommendations
	(All parts required except type, manufacturer, drive manufacturer, feeder information)	
29	Boiler - Balanced Draft or Pressurized Draft	All Parts Required
30	Boiler - Primary Air (Forced Draft) Fan System (All parts required except manufacturer, type)	Not All Parts Required
31	Boiler - Induced Draft Fan System (All parts required except manufacturer, type)	Not All Parts Required
32	Boiler - Secondary Air Fan System (All parts required except manufacturer, type)	Not All Parts Required
33	Boiler - Primary Air Heating System (All parts required except manufacturer)	Not All Parts Required
34	Boiler - Secondary Air Heating System (All parts required except manufacturer)	Not All Parts Required
35	Boiler - Soot Blowers	Voluntary
36	Boiler - Bed Material Coolers (All parts required except manufacturer and cooler type)	Not All Parts Required
37	Boiler - Bed Material Handling System (All parts required except manufacturer)	Not All Parts Required
38	Boiler - Char Disposal System (All parts required except manufacturer)	Not All Parts Required
39	Boiler - Electrostatic Precipitator	All Parts Required
40	Boiler - Baghouse Fly Ash System	Voluntary
41	Boiler - Fly Ash Transport System	Voluntary
42	Steam Turbine - Manufacturer (All parts required including manufacturer of each steam turbine section)	All Parts Required plus
43	Steam Turbine - Enclosure	All Parts Required
44	Steam Turbine - Nameplate Rating in MW	All Parts Required
45	Steam Turbine - Type of Steam Turbine	All Parts Required
46	Steam Turbine – Manufacturer's Building Block or Design Codes	All Parts Required
47	Steam Turbine - Steam Conditions	All Parts Required
48	Steam Turbine - High, Intermediate, and Low Pressure Sections	All Parts Required
49	Steam Turbine - Governing System	All Parts Required
50	Steam Turbine - Lube Oil System	Voluntary
51	Generator - Manufacturer	All Parts Required
52	Generator - Enclosure	All Parts Required
53	Generator - Ratings and Power Factor	All Parts Required
54	Generator - Cooling System	All Parts Required
55	Generator - Hydrogen Pressure	All Parts Required
56	Exciter - Configuration	All Parts Required
57	Auxiliary Systems - Main Condenser	All Parts Required
58	Auxiliary Systems - Condenser Cleaning System	Voluntary

	Design - Fluidized Bed Record Fields	GADSTF Recommendations
59	Auxiliary Systems - Condensate Polishing System	Voluntary
60	Auxiliary Systems - Condensate Pumps (All parts required except manufacturer, drive manufacturer and minimum)	Not All Parts Required
61	Auxiliary Systems - Condensate Booster Pumps (All parts required except manufacturer, drive manufacturer and minimum)	Not All Parts Required
62	Auxiliary Systems - Feedwater (Boiler Feed) Pumps (All parts required except manufacturer, drive manufacturer and minimum)	Not All Parts Required
63	Auxiliary Systems - Feedwater (Boiler Feed) Pump Drives	All Parts Required
64	Auxiliary Systems - Startup Feedwater (Boiler Feed) Pumps (All parts required except manufacturer, drive manufacturer and percent capacity)	Not All Parts Required
65	Auxiliary Systems - High Pressure Feedwater Heaters (All parts required except manufacturer)	Not All Parts Required
66	Auxiliary Systems - Intermediate Pressure Feedwater Heaters (All parts required except manufacturer)	Not All Parts Required
67	Auxiliary Systems - Low Pressure Feedwater Heaters (All parts required except manufacturer)	Not All Parts Required
68	Auxiliary Systems - Deaerator Heater	All Parts Required
69	Auxiliary Systems - Heater Drain Pumps	Voluntary
70	Auxiliary Systems - Circulating Water Pumps (All parts required except manufacturer drives)	Not All Parts Required
71	Auxiliary Systems - Cooling Tower and Auxiliaries (All parts required except manufacturer, drive manufacturer and booster pump information)	Not All Parts Required
72	Balance of Plant - Main Transformer	All Parts Required
73	Balance of Plant - Unit Auxiliary Transformer	All Parts Required
74	Balance of Plant - Station Service Transformer	All Parts Required
75	Balance of Plant - Auxiliary (Start-up) Boiler	Voluntary
76	Balance of Plant - Auxiliary Generator	Voluntary
77	Balance of Plant - Plant Process Computer	Voluntary
78	CEMS - General	Voluntary
79	CEMS - Pollutant Gas and Diluent Gas Analyzers/Monitors	Voluntary
80	CEMS - Flue Gas Flow Monitors	Voluntary
81	CEMS - Data Acquisition and Reporting System	Voluntary
82	Selective Non-Catalytic Reduction System (SNCR) (All parts required except injector type and location and gas type)	Not All Parts Required
83	Selective Catalytic Reduction System (SCR)	Not All Parts Required
84	(All parts required except reactor type, injector type and location, gas type)	

	Design - Fluidized Bed Record Fields	GADSTF Recommendations
85	Catalytic Air Heaters	Not All Parts Required
	(All parts required except injector type and location and gas type)	

	Design - Nuclear Record Fields	GADSTF Recommendations
1	Identification (Utility and number ID, unit name)	All Parts Required
2	Date the Unit Entered Service	All Parts Required
3	Reactor Manufacturer, type, temperatures, pressures	All Parts Required
4	Primary loop or recirculating pump manufacturer	Voluntary
5	Primary loop or recirculating pump type drives	All Parts Required
6	Steam generator manufacturer	All Parts Required
7	Control rods, shim, weight of uranium, enrichment, etc	Voluntary
8	Fuel type	All Parts Required
9	Fuel cladding material	Voluntary
10	Containment type	All Parts Required
11	Architect/Engineer	Voluntary
12	Steam Turbine - Manufacturer	All Parts Required plus
	(All parts required including manufacturer of each steam turbine section)	
13	Steam Turbine - Enclosure	All Parts Required
14	Steam Turbine - Nameplate Rating in MW	All Parts Required
15	Steam Turbine - Type of Steam Turbine	All Parts Required
16	Steam Turbine – Manufacturer's Building Block or Design Codes	All Parts Required
17	Steam Turbine - Steam Conditions	All Parts Required
18	Steam Turbine - High, Intermediate, and Low Pressure Sections	All Parts Required
19	Steam Turbine - Governing System	All Parts Required
20	condenser Manufacturer (All parts required except manufacturer)	Not All Parts Required
21	Type cooling water	Voluntary
22	Cooling water origin	All Parts Required
23	Number of condensate pumps	All Parts Required
24	Condensate pump manufacturer	Voluntary
25	Number of circulating water pumps	All Parts Required
26	Circulating water pump manufacturer	Voluntary
27	Number of secondary loop or single loop feed pumps	All Parts Required
28	Number of spare feed pumps which are same size	All Parts Required
29	Number of spare or startup feed pumps which smaller than one	All Parts Required
30	Normal feed pump manufacturer	Voluntary
31	Normal feed pump type drive	All Parts Required
32	Normal feed pump, enter	All Parts Required
33	Normal feed pump maximum speed in RPM	All Parts Required
34	Number of feed water heaters on high side of feed pump	All Parts Required
35	High pressure feed water heater manufacturer	Voluntary
36	Number of feed water heaters on low side of feed pump	All Parts Required

	Design - Nuclear Record Fields	GADSTF Recommendations
37	Low pressure feed water heater manufacturer	Voluntary
38	Computer system supplier	Voluntary
39	Number of computer	Voluntary
40	Computer system capability	Voluntary
41	generator Manufacturer	All Parts Required
42	Generator type	All Parts Required
43	Generator Type	All Parts Required
44	Nameplate power factor in percent	All Parts Required
45	Cooling medium, stator/rotor	All Parts Required
46	Cooling method, stator/rotor	All Parts Required
47	Hydrogen pressure in PSIG at nameplate MVA	All Parts Required
48	Number of exciters required by the unit	All Parts Required
49	alternator rectifier	All Parts Required
50	Type normal exciters	All Parts Required
51	Type drive for normal exciters, if rotating	All Parts Required
52	Number of spare exciters available to the unit	All Parts Required
53	if more than 50% of generator is outdoors	Voluntary

	Design - Hydro/Pumped Storage Record Fields	GADSTF Recommendations
1	Identification (Utility and number ID, unit name)	All Parts Required
2	Date the Unit Entered Service	All Parts Required
3	Hydro or Pumped Storage	All Parts Required
4	Turbine/Pump manufacturer	Voluntary
5	Turbine/Pump impulse type	All Parts Required
6	Turbine/Pump reaction type	All Parts Required
7	Turbine rated head to nearest foot	All Parts Required
8	Turbine rated speed to nearest RPM	All Parts Required
9	Turbine rating in horsepower to nearest 100 hp	Voluntary
10	Turbine runner, type	All Parts Required
11	Number of buckets/blades per runner	Voluntary
12	Governor type	All Parts Required
13	Turbine bearing type	All Parts Required
14	Thrust bearing location	All Parts Required
15	Guide bearing, location	All Parts Required
16	Nameplate rating of unit (MVA times power factor)	All Parts Required
17	Generator Manufacturer	All Parts Required
18	Generator type	All Parts Required
19	Generator Type	All Parts Required
20	Nameplate power factor in percent	All Parts Required
21	Cooling medium, stator/rotor	All Parts Required
22	Cooling method, stator/rotor	All Parts Required
23	Hydrogen pressure in PSIG at nameplate MVA	All Parts Required
24	Number of exciters required by the unit	All Parts Required
25	alternator rectifier	All Parts Required
26	Type normal exciters	All Parts Required
27	Type drive for normal exciters, if rotating	All Parts Required
28	Number of spare exciters available to the unit	All Parts Required
29	if more than 50% of generator is outdoors	Voluntary

	Design - Diesel Record Fields	GADSTF Recommendations
1	Identification (Utility and number ID, unit name)	Voluntary
2	Date the Unit Entered Service	Voluntary
3	Diesel engine manufacturer	Voluntary
4	Fuel, type (design)	Voluntary
5	Cylinders, number per engine	Voluntary
6	Cycle, type	Voluntary
7	Startup system, type	Voluntary
8	Time for normal cold start to full load in seconds	Voluntary
9	Time for emergency cold start to full load in seconds	Voluntary
10	Coolant, type	Voluntary
11	Generator Manufacturer	Voluntary
12	Generator type	Voluntary
13	Generator Type	Voluntary
14	Nameplate power factor in percent	Voluntary
15	Cooling medium, stator/rotor	Voluntary
16	Cooling method, stator/rotor	Voluntary
17	Hydrogen pressure in PSIG at nameplate MVA	Voluntary
18	Number of exciters required by the unit	Voluntary
19	alternator rectifier	Voluntary
20	Type normal exciters	Voluntary
21	Type drive for normal exciters, if rotating	Voluntary
22	Number of spare exciters available to the unit	Voluntary
29	if more than 50% of generator is outdoors	Voluntary

	Design - Gas Turbine/Jet Engines Record Fields	GADSTF Recommendations
1	Identification (Utility and number ID, unit name)	All Parts Required
2	Date the Unit Entered Service	All Parts Required
3	Engine manufacturer	All Parts Required
4	Engine type	All Parts Required
5	Engines, number per unit	All Parts Required
6	Expander turbines, number per unit if applicable	Voluntary
7	Type expander, if applicable	Voluntary
8	Cycle type	Voluntary
9	Startup system	All Parts Required
10	Startup type	Voluntary
11	Type of Fuel(s) that will be used	All Parts Required
12	Enter (1) if sound attenuators located at inlet	Voluntary
13	Enter (1) if sound attenuators located at outlet	Voluntary
14	Enter (1) if sound attenuators located in building enclosures	Voluntary
15	Time for normal cold start to full load in seconds	All Parts Required
16	Time for emergency cold start to full load in seconds	All Parts Required
17	Black start capability	All Parts Required
18	Do you have Selective Non-catalytic Reduction (SNCR)	All Parts Required
19	SNCR reagent	Voluntary
20	SNCR injection equipment location	Voluntary
21	Number of SNCR injectors	Voluntary
22	SNCR carrier gas type	Voluntary
23	SNCR carrier gas total flow rate (thousands of lbs. /hr.)	Voluntary
24	SNCR carrier gas pressure at nozzle (psi)	Voluntary
25	SNCR carrier gas nozzle exit velocity (thousands of ft. /sec.)	Voluntary
26	Do you have Selective Catalytic Reduction (SCR)	All Parts Required
27	SCR reactor	Voluntary
28	SCR reagent	Voluntary
29	SCR ammonia injection grid location	Voluntary
30	SCR duct configuration	Voluntary
31	SCR Catalyst Element Type	Voluntary
32	SCR catalyst support material	Voluntary
33	SCR catalytic material configuration	Voluntary
34	SCR catalyst surface face area (thousands of square feet)	Voluntary
35	SCR catalyst volume (thousands of cubic feet)	Voluntary
36	Number of SCR catalytic layers	Voluntary
37	SCR catalytic layer thickness (1/1000 inches)	Voluntary
38	SCR sootblower type	Voluntary
39	SCR sootblower manufacturer	Voluntary
40	Catalytic Air Heater (CAH) element type	Voluntary
41	CAH catalyst material	Voluntary
42	CAH catalyst support material	Voluntary
43	CAH catalyst material configuration	Voluntary

	Design - Gas Turbine/Jet Engines Record Fields	GADSTF Recommendations
44	CAH catalyst material total face area (thousands of square feet)	Voluntary
45	CAH catalyst material open face area (thousands of square feet)	Voluntary
46	CAH catalyst material layer thickness (1/1000 inches)	Voluntary
47	Generator Manufacturer	All Parts Required
48	Generator type	All Parts Required
49	Generator Type	All Parts Required
50	Nameplate power factor in percent	All Parts Required
51	Cooling medium, stator/rotor	All Parts Required
52	Cooling method, stator/rotor	All Parts Required
53	Hydrogen pressure in PSIG at nameplate MVA	All Parts Required
54	Number of exciters required by the unit	All Parts Required
55	alternator rectifier	All Parts Required
56	Type normal exciters	All Parts Required
57	Type drive for normal exciters, if rotating	All Parts Required
58	Number of spare exciters available to the unit	All Parts Required
59	if more than 50% of generator is outdoors	Voluntary

	Design - Combined Cycle Block Record Fields	GADSTF Recommendations
1	Identification (Utility and number ID, unit name)	All Parts Required
2	Date the Unit Entered Service	All Parts Required
3	Block Loading Characteristics at Time of Design	All Parts Required
4	Design and Construction Contractors	Voluntary
5	Total Nameplate Rating of all units in the block (in MW)	All Parts Required
6	Does the block have co-generation (steam for other than electric generation) capabilities	All Parts Required
7	What is the number of gas turbines/jet engines per Heat Recovery Steam Generator (HRSG)	All Parts Required
8	What is the number of gas turbines/jet engines - Heat Recovery Steam Generator (HRSG) Trains	All Parts Required
9	Total number of gas turbines/jet engines in block	All Parts Required
10	Total number of Heat Recovery Steam Generator (HRSG) in block	All Parts Required
11	Total number of Steam Turbines in block	All Parts Required
12	Identification	All Parts Required
13	Date the gas turbine/jet engine Entered Service	All Parts Required
14	Design and Construction Contractors	Voluntary
15	Gas turbine/jet engine nameplate rating in MW	All Parts Required
16	Engine manufacturer	All Parts Required
17	Engine type	All Parts Required
18	Expander turbines, number per unit if applicable	Voluntary
19	Type expander, if applicable	Voluntary
20	Engine Cycle type	Voluntary
21	Engine Startup system	All Parts Required
22	Engine Startup type	Voluntary
23	Engine Type of Fuel(s) that will be used	All Parts Required
24	Enter (1) if sound attenuators located at inlet	Voluntary
25	Enter (1) if sound attenuators located at outlet	Voluntary
26	Enter (1) if sound attenuators located in building enclosures	Voluntary
27	Time for normal cold start to full load in seconds	Voluntary
28	Time for emergency cold start to full load in seconds	Voluntary
29	Black start capability	All Parts Required
30	Engine Model Number (MS 7001EA, W501AA, FT4A11, etc.)	All Parts Required
31	Selective Non-catalytic Reduction equipment?	All Parts Required
32	SNCR reagent	Voluntary
33	SNCR injector type	Voluntary
34	SNCR injection equipment location	Voluntary
35	Number of SNCR injectors	Voluntary
36	SNCR carrier gas type	Voluntary
37	SNCR carrier gas total flow rate (thousands of lbs. /hr.)	Voluntary
38	SNCR carrier gas pressure at nozzle (psi)	Voluntary
39	SNCR carrier gas nozzle exit velocity (thousands of ft. /sec.)	Voluntary

	Design - Combined Cycle Block Record Fields	GADSTF Recommendations
40	Selective Catalytic Reduction equipment?	All Parts Required
41	CR reactor	Voluntary
42	SCR reagent	Voluntary
43	SCR ammonia injection grid location	Voluntary
44	SCR duct configuration	Voluntary
45	SCR Catalyst Element Type	Voluntary
46	SCR catalyst support material	Voluntary
47	SCR catalytic material configuration	Voluntary
48	SCR catalyst surface face area (thousands of square feet)	Voluntary
49	SCR catalyst volume (thousands of cubic feet)	Voluntary
50	Number of SCR catalytic layers	Voluntary
51	SCR catalytic layer thickness (1/1000 inches)	Voluntary
52	SCR sootblower type	Voluntary
53	SCR sootblower manufacturer	Voluntary
54	CAH element type	Voluntary
55	CAH catalyst material	Voluntary
56	CAH catalyst support material	Voluntary
57	CAH catalyst material configuration	Voluntary
58	CAH catalyst material total face area (thousands of square feet)	Voluntary
59	CAH catalyst material open face area (thousands of square feet)	Voluntary
60	CAH catalyst material layer thickness (1/1000 inches)	Voluntary
61	Generator - Manufacturer	All Parts Required
62	Number of generators per gas turbine/jet engine	All Parts Required
63	Generator - Enclosure	Voluntary
64	Generator - Ratings and Power Factor	All Parts Required
65	Generator - Cooling System	All Parts Required
66	Generator - Hydrogen Pressure	All Parts Required
67	Exciter - Configuration	All Parts Required
68	Enter the unit code information for each GT/Jet that supplies heat energy to this single HRSG.	All Parts Required
69	HRSG - Manufacturer	All Parts Required
70	HRSG - Enclosure	Voluntary
71	HRSG - Nameplate Steam Conditions When fired situation	All Parts Required
72	HRSG - Nameplate Steam Conditions When unfired situation	All Parts Required
73	Is the HRSG top-supported (pressure parts hang like in a utility boiler) or bottom-supported?	Voluntary
74	Does the HRSG have vertical or horizontal heat exchangers?	Voluntary
75	Is the duct insulation is cold-casing (insulation on the inside of the duct) or hot casing (insulation on the outside of the duct)?	Voluntary
76	HRSG Supplemental Firing (duct burners)	All Parts Required
77	HRSG bypass capabilities	All Parts Required

	Design - Combined Cycle Block Record Fields	GADSTF Recommendations
78	Does the HRSG have a drum or is it once-through design?	All Parts Required
79	HRSG - Circulation System	Voluntary
80	HRSG – Duct Burner System (General)	Voluntary
81	HRSG – Duct Burner Management System	Voluntary
82	Auxiliary Systems - Feedwater (HRSG Feed) Pumps (All parts required except operating speed, minimum number, percent of capacity)	Not All Parts Required
83	Auxiliary Systems - Feedwater (HRSG Feed) Pump Drives	All Parts Required
84	Auxiliary Systems - Startup Feedwater (HRSG Feed) Pumps	Voluntary
85	Auxiliary Systems - High Pressure Feedwater Heaters	Voluntary
86	Auxiliary Systems - Intermediate Pressure Feedwater Heaters	Voluntary
87	Auxiliary Systems - Low Pressure Feedwater Heaters	Voluntary
88	Auxiliary Systems - Deaerator Heater	Voluntary
89	Auxiliary Systems - Heater Drain Pumps	Voluntary
90	Steam Turbine Identification (utility-unit codes)	All Parts Required
91	Does steam turbine have bypass capability?	All Parts Required
92	Steam Turbine - Manufacturer	All Parts Required
93	Steam Turbine - Enclosure	Voluntary
94	Steam Turbine - Nameplate Rating in MW	All Parts Required
95	Steam Turbine - Type of Steam Turbine	All Parts Required
96	Steam Turbine – Manufacturer's Building Block or Design Codes	All Parts Required
97	Steam Turbine - Steam Conditions	All Parts Required
98	Steam Turbine - High, Intermediate, and Low Pressure Sections	All Parts Required
99	Steam Turbine - Governing System	All Parts Required
100	Steam Turbine - Lube Oil System	Voluntary
101	Generator - Manufacturer	All Parts Required
102	Generator - Enclosure	Voluntary
103	Generator - Ratings and Power Factor	All Parts Required
104	Generator - Cooling System	All Parts Required
105	Generator - Hydrogen Pressure	All Parts Required
106	Exciter - Configuration	All Parts Required
107	Auxiliary Systems - Main Condenser (All parts required except condenser manufacturer and ejector manufacturer)	Not All Parts Required
108	Auxiliary Systems - Condenser Cleaning System	Voluntary
109	Auxiliary Systems - Condensate Polishing System	Voluntary
110	Auxiliary Systems - Condensate Pumps (All parts required except manufacturer, drive manufacturer, and minimum)	Not All Parts Required
111	Auxiliary Systems - Condensate Booster Pumps	Not All Parts Required

	Design - Combined Cycle Block Record Fields	GADSTF Recommendations
	(All parts required except manufacturer, drive manufacturer, and minimum)	
112	Auxiliary Systems - Circulating Water Pumps (All parts required except manufacturer, drive manufacturer, and minimum)	Not All Parts Required
113	Auxiliary Systems - Cooling Tower and Auxiliaries (All parts required except manufacturer, drive manufacturer, and booster pump information)	Not All Parts Required
114	Balance of Plant - Main Transformer	All Parts Required
115	Balance of Plant - Block Auxiliary Transformer	All Parts Required
116	Balance of Plant - Station Service Transformer	All Parts Required

	Design - Miscellaneous Record Fields	GADSTF Recommendations
1	Identification (Utility and number ID, unit name)	All Parts Required
2	Date the Unit Entered Service	All Parts Required
3	Energy source	All Parts Required
4	Energy medium	All Parts Required
5	Enter (1) if header unit	All Parts Required
6	Enter (1) if non-condensing steam turbine	All Parts Required
7	Nameplate MW Rating of the unit	All Parts Required
8	SELECTIVE NON-CATALYTIC REDUCTION SYSTEM (SNCR) reagent	All Parts Required
9	SNCR injector type	Voluntary
10	SNCR injection equipment location	Voluntary
11	Number of SNCR injectors	Voluntary
12	SNCR carrier gas type	Voluntary
13	SNCR carrier gas total flow rate (thousands of lbs. /hr.)	Voluntary
14	SNCR carrier gas pressure at nozzle (psi)	Voluntary
15	SNCR carrier gas nozzle exit velocity (thousands of ft. /sec.)	Voluntary
16	SELECTIVE CATALYTIC REDUCTION SYSTEM (SCR) reactor	Voluntary
17	SCR reagent	All Parts Required
18	SCR ammonia injection grid location	Voluntary
19	SCR duct configuration	Voluntary
20	SCR Catalyst Element Type	All Parts Required
21	SCR catalyst support material	Voluntary
22	SCR catalytic material configuration	Voluntary
23	SCR catalyst surface face area (thousands of square feet)	Voluntary
24	SCR catalyst volume (thousands of cubic feet)	Voluntary
25	Number of SCR catalytic layers	Voluntary
26	SCR catalytic layer thickness (1/1000 inches)	Voluntary
27	SCR sootblower type	Voluntary
28	SCR sootblower manufacturer	Voluntary
29	CATALYTIC AIR HEATERS (CAH) element type	Voluntary
30	CAH catalyst material	Voluntary
31	CAH catalyst support material	Voluntary
32	CAH catalyst material configuration	Voluntary
33	CAH catalyst material total face area (thousands of square feet)	Voluntary
34	CAH catalyst material open face area (thousands of square feet)	Voluntary
35	CAH catalyst material layer thickness (1/1000 inches)	Voluntary
36	Total nameplate rating in MW	All Parts Required
37	Type electrical output	All Parts Required

Event Record Fields	GADSTF Recommendations
Utility and unit identifier (like GADS utility-unit code)	Required
Year of event	Required
Event number	Required
Report Revision Code	Voluntary
Event Type – Forced Outages (U1, U2, U3), Forced Deratings (D1, D2, D3), Planned Outages (PO), Planned Deratings (PD), Maintenance Outage (MO), Maintenance Deratings (D4), Reserve Shutdown (RS), Start-up Failure (SF), Non-curtailing (NC)	Required
Start Date – Date of Event Initiation	Required
Start Time – Time of Event Initiation	Required
End Date – Date of Event Completion	Required
End Time – Time of Event Completion	Required
MW Reduction – Number of MWs Derated (For Deratings Only)	Required
Dominant Derating Code	Voluntary but strongly recommended
System/Component Cause Code	Required
Cause Code Amplification Code	Required for transmission events only; strongly recommended for all other events.
Time Work Started	Voluntary
Time Work Ended	Voluntary
Event Contribution Code	Voluntary
Problem Alert	Voluntary
Man-hours Worked	Voluntary
Verbal Description	Voluntary but strongly recommended

Performance Record Fields	GADSTF Recommendation
Utility and unit identifier (like GADS utility-unit code)	Required
Year of event	Required
Month of performance reporting	Required
Monthly Unit Capacity (GMC, GDC, NMC, NDC - one or more)	Required
Gross Generation in MW	Voluntary
Net Generation in MW	Required
Loading Characteristic (base loaded, cycling, etc)	Voluntary
Number of attempted unit starts	Required
Number of actual unit starts	Required
Service Hours (SH)	Required
Reserve Shutdown Hours (RSH)	Required
Pumping hours	Required
Synchronous Condensing Hours	Required
Total Available Hours (SH +RSH + Pump + Synchronous)	Required
Planned Outage Hours (POH)	Required
Forced Outage Hours (FOH)	Required
Maintenance Outage Hours (MOH)	Required
Extension Hours to planned and maintenance outages	Required
Total Unavailable Hours (POH+FOH+MOH+MEH + PEH)	Required
Period Hours (Available hours + unavailable hours)	Required
Primary type of fuel (coal, gas, etc)	Required
Primary fuel quality, heat content, percent ash, etc	Voluntary

Appendix IV: GADS Task Force Subgroup Reports

DESIGN SUBGROUP REPORT

GADS design data contains a list of major and key physical equipment in the power plants. The design data includes commercial operating date, MW size of units, the steam or gas turbine manufacturer, the number of boiler pumps, and types and kinds of environmental equipment to name a few. Design data is used for filtering units for reports and analysis of the GADS event and performance records.

Design Subgroup Report – Discussions

The GADSTF Design Subgroup was tasked with reviewing and recommending whether GADS data should report on a mandatory basis, to evaluate current design documents, and to make recommendations for additions, modifications or deletions to those documents.

GADS design data is used heavily in filtering event and performance data results in the GADS analysis software program pc-GAR and other GADS software products. It is also essential in reliability assessments, loss-of-load expectations, and other models of generation performance. Without accurate design data, it is impossible to isolate performance characteristics of peer units for benchmarking, goal-setting, checking reliability of plant designs, monitoring generation aging, etc.

The Design Subgroup's main activities:

1. Review GADS design data and determine what data currently collected is needed to support and improve bulk power system reliability;
2. Review GADS design data and determine what data not currently collected is needed to support and improve bulk power system reliability;
3. Determine if collection of GADS design data identified above should be mandatory, in whole or in part, for Generation Owners on the NERC Compliance Registry; and
4. Determine whether periodic reviews/confirmations of GADS design data should be required for Generation Owners on the NERC Compliance Registry.

GADS Reporting – Voluntary or Mandatory?

The Design Subgroup discussions began with the topic of mandatory verses voluntary reporting of GADS data. Specifically, should Generation Owners/Operators on NERC's Compliance Registry report all, portions, or none of their data on a mandatory basis? The consensus within the group was that reporting of GADS data should be mandatory, with enforcement in accordance with Section 1600, *Requests for Data or Information,*[19] under the NERC *Rules of Procedure*.

[19] http://www.nerc.com/files/NERC_Rules_of_Procedure_EFFECTIVE_20100903.pdf

Design Data Forms – Too Much Data?

The Design Subgroup next discussed whether or not too much design data was requested regardless of whether reporting of GADS data was determined to be mandatory or voluntary. In general, it was agreed that many of the Design Data Forms requested more information than would reasonably be required to ensure grid reliability. To address this issue, two courses of action were discussed:

1. Determine what should be provided to NERC on a mandatory basis to support bulk power system reliability.
2. For the data that is mandatory, identify the appropriate course of action towards data collection: Section 1600 *Requests for Data Information* or through the NERC Standard process.
3. Are the GADS Data Release Guidelines still valid?[20] Define data access for individual GADS unit data. The GADSTF will review the Release Guidelines approved in by the NERC Board of Trustees in the 1980s to determine:
    a. If not valid, what modifications are required towards determining appropriate access?
    b. Should GADS data be opened to allow individual Regional Entity reports?

Regarding Question 2, many group members agreed that any data previously submitted was likely out-of-date given equipment and plant changes completed over time (e.g., installation of dense packs, installation of selective catalytic reduction equipment, flue-gas scrubbers, etc.). In addition, design data updates have likely been "lost in the shuffle" during changes in plant ownership and/or plant management. The Design Subgroup determined that a periodic review of design data was a best-practice that should be encouraged and/or required.

There were other important topics discussed by the Design Subgroup to the move towards mandatory reporting:

- Design Subgroup members recommend that Retirement Dates shall not be added to Design Data Forms due to the market-sensitive nature of that information. In any event, retirement dates are typically not known well in advance of actual retirement. Design Subgroup members agreed; however, that Change of Ownership Date should be added to design data forms.
- Design Subgroup members recommend that Regional Entities be allowed to receive GADS data for the units within their Regions, as long as data confidentiality is maintained.
- The reporting burden (time) impact of the overall GADS data collection process could not be accurately quantified by Design Subgroup members due to the number of people involved in the GADS data collection and reporting process, the varying "event intensity" from week-to-week, season-to-season, etc. Suffice it to say that there are already a significant number of staff hours devoted to GADS data collection and reporting. Nonetheless, the Design Subgroup unanimously agreed that most of the Generation Owners would continue to collect and report the information whether or not it was made mandatory. Thus, the incremental impact of mandatory reporting on the industry is reasonable.

[20] The GADS Data Release Guidelines are in Appendix I of the GADS Data Reporting Instructions.

- Design Subgroup members recommend that solar data be collected in a manner similar to wind data. The amount of solar generation will only increase over time, comprising a growing percentage of the nation's power supply. The variable nature of this and other renewable resources (such as wind) could negatively impact the reliability of the grid if their performance was not monitored and analyzed using GADS or similar-type databases in a way that is consistent with what is done for other generators.

- Design Subgroup members recommend that all GADS reporting be uniform by following the GADS Data Reporting Instructions and NERC's interpretation of that document. This will remove any problems relating to GADS data being reported to more than one entity. Design Subgroup members recommend that periodic standardized training be conducted for all persons involved in the GADS data collection and reporting process. Standardized training materials shall be provided by NERC in order to ensure delivery of a consistent message and compilation of consistent data.

- All persons involved in the determination of cause codes, event descriptions, etc. shall be knowledgeable in plant operations and maintenance for their units and have a demonstrated attention to detail. More specifically, these persons shall not be someone with little or no familiarity with the physical units for which they're reporting (with the possible exception of data entry clerks whose sole responsibility is the input of that information into a computer application).

- Internal "double-checking" of data within the reporting generating company shall be encouraged as a best-practice, but should not be required. Reporting accuracy and data verification is the responsibility of the reporting entity, and any submissions made should not be auditable beyond standard error-checking routines already in-place.

Design Subgroup Report – Summary Recommendations

The GADSTF Design Subgroup made several recommendations:

1. Reporting of GADS data submittal should be mandatory to ensure a complete data set, enhancing the statistical validity of any conclusions drawn from it, in accordance with Section 1600, *Request for Data or Information,* of the NERC *Rules of Procedure*, under which NERC cannot impose penalties for failure to comply with a request. Enforcement should not be through the standards processes. The Design Subgroup's recommendation to make reporting to GADS mandatory is based on the belief that NERC will not audit or review reporting for compliance and no fines/penalties will be levied if data is not submitted in a timely fashion.
2. The reporting Generator Owner/Operator entity will determine the necessary level of data review and verification required to meet the GADS reporting requirement.
3. If reporting of GADS data does become mandatory, reporting requirements should be specified based on a unit's MW size. The criteria presented in NERC's *Statement of Compliance Registry Criteria* would be a logical starting point for discussion.
4. Continued quarterly reporting of data is considered acceptable regardless of unit size.

5. Design Subgroup members recommend that Regional Entities be allowed to review GADS data for the units within their Regions, as long as data confidentiality is maintained (i.e., as long as Regional offices are held to the same confidentiality standards as NERC).
6. The Design Subgroup reviewed the design data and determined some design data fields should be mandatory and others voluntary reporting. Marked-up fields showing mandatory/voluntary recommendations for each field were submitted as part of the Subgroup's minutes. A summary of the design recommendations by unit type can be found in Appendix III.
7. GADS Design Data Forms are out of date, both in terms of content and currency. Design Data Forms should be modified and updated to reflect current manufacturers, technologies, etc. Design Data Forms should be reviewed and updated periodically (five-year cycle). The first recommended update would be January 1, 2012, depending upon process timelines. It would be helpful if design data were available on-line for the reporting Generator Owner to review/modify the data (similar to event and performance data), minimizing or eliminating paperwork burden.
8. Design Subgroup members recommend that Retirement Dates not be included in the Design Data Forms due to the market-sensitive nature of that information. In any event, retirement dates are typically not known well in advance of actual retirement.
9. Design Subgroup members agreed that Change of Ownership Dates for each generating unit and major equipment category should be added to the Design Data Forms.
10. Design Subgroup members recommend that all reporting conform to one standard so that one data set could be submitted to multiple entities as desired or required.

EVENT SUBGROUP REPORT

Event data is a very important part of GADS. Within event data, GADS collects the dates, times, types, and reasons for power plant outages. Without event data, GADS cannot produce key statistics used by resource planning, independent service operators, and other reliability experts. Within the last 28 years, 11 million event records have been collected. These records assisted in the increased availability and power output from both individual units and classes of generating units.

Event Subgroup Report – Discussions

The task of the GADSTF Events Subgroup was to determine if GADS event data or some portion thereof, should become mandatory for all generating units such that the reported data could be used by NERC and other appropriate entities for conducting studies relating to bulk power system reliability.

Early in the discussions of the Event Subgroup, a poll of the participants led to a group consensus to move toward some degree of mandatory GADS collection effort. Although GADS data has been voluntary since inception in 1982, about 77 percent of all participants in North America today file GADS event data. Additionally, the proposed process for making GADS mandatory will be governed by the NERC *Rules of Procedure* Section 1600 rather than the standards procedure, which might incorporate compliance penalties. Hence, mandatory reporting of events would not fall under financial penalties, but would follow the same rules applicable to TADS (Transmission) and DADS (Demand Response).

Initially the discussions revolved around deciding what criteria should be used to determine what threshold of event reporting should be made mandatory. Several suggestions were made ranging from MVA ratings to various MW size ranges for each generating unit type. The Subgroup then shifted focus and returned to look at the activities that they had agreed to address as a Subgroup and decided that answering those questions would help lead to the group's final recommendation to the GADS Task Force.

Has GADS Event Data Been Useful in the Past?

GADS has been useful not only to the registered generation entities, but also to the system planners and research participants in the Event Subgroup. Usefulness of this event data consisted of various facets from both reliability and business perspectives.

From a reliability standpoint, the reported data is useful to NERC and other appropriate entities in conducting studies relating to bulk power system reliability. Planners use GADS events data in long and short-term planning. The data is used to trend generating unit performance for like type, size and fuel. Calculations and models across the bulk power system need to have a consistent database, such as GADS events, for their source of information.

From a business perspective, the data provides a justifiable means to replace equipment, conduct vendor analysis on equipment, pinpoint areas of further development and research, and compile benchmarking data and analysis. Hence, the group determined that GADS has been useful in the past and will continue to be a worthwhile database in the future.

Is GADS Event Data Essential Now?

First and foremost, having event data required in a unified format like GADS would allow for consistent reporting and standardization across all registered generation entities within NERC. In determining whether collecting event data is essential now or not, several theories were offered. Today, the cause codes and amplification codes provide significant details and description. Highly important and fundamental statistics provided by GADS, such as Equivalent Forced Outage Rate (EFOR) for base-load generating units and Equivalent Forced Outage Rate – Demand ($EFOR_d$) for peaking and cycling units cannot be calculated without event data. Hence, the group determined that collecting event data is essential. However, more details could be helpful and could be obtained by simply extending the allowed field length for descriptions.

If events data is made mandatory, the Events Subgroup recommends that NERC work with other Regional Entities that also require event data similar to GADS to have data collected only once and shared among interested parties (e.g. NERC could share with the Independent System Operators and Regional Transmission Operators). This would alleviate the collection of this same data in more than one way.

Is GADS Event Collection Worth the Effort?

In the discussions by the Events Subgroup, the following quote was brought up with regard to this section, "*If you can't measure it, you can't improve it*." Collecting the events data is one way of measuring the grid and generating units so that you can improve their overall performance. Moreover, there is something to be said for standardization and a means of consistent reporting of data.

In determining whether collecting event data is worth the time, cost, and effort to continue, the resounding answer across the utilities was a big "YES". Reporting events data as prescribed by GADS leads to unified reporting across the industry. Since it is the registered generating entities that would have to collect and enter the event data, it was decided to only let the registered generating entities have input on this question as they would be tasked with performing the work. There was agreement across the participants that this is the only way to currently maintain this type of data and to arrive at the key indicators used in utility generation measures. Making reporting of events data mandatory would keep a consistent database across the grid and enhance reliability as efforts are made to improve the GADS measures.

Would GADS Event Data Be Missed?

If GADS was not required, either voluntary or mandatory, would it be missed? As the Event Subgroup pondered this question, there was discussion that without GADS, industry data would no longer be concise or consistent and thus not useful. In fact, the registered generating entities would have a "hodge-podge mess" of data across the industry. This would definitely not help or support a reliable grid. Benchmarking would be difficult, as what would a utility compare against? Having the consistent reporting that GADS offers would definitely be missed by all who use the database today.

Importance of GADS Event Data to Reliability

The next question addressed by the Events subgroup was how important GADS event data is to supporting and improving bulk power system reliability. One utility mentioned that they use the data to determine how much installed reserve margin is necessary for load. Data is used in modeling of generating units.

Planners use the events data for both long-term and short-term planning purposes. It is used to develop forced outage data to determine resources necessary, based upon historical event histories. GADS event data is the foundation for generation studies, and needs to be as thorough and robust as possible.

Data is used for trending units of like type, MW size, and fuel. Models and calculations need to have the events data as their source of information.

The general consensus from Generator Operators and Resource Planners alike was that the events data is important and supportive to improving the bulk power system. This was just another supporting point for requesting that the data be made mandatory.

Necessary Level of Mandatory GADS Event Reporting

Based upon the answers to all of the other discussions and activities, the answer to the final question was an automatic fall-out response. The consensus was that the event data reporting should be considered mandatory to support the reliability of the bulk power system. Based on prior discussions, the question was posed to the Events Subgroup whether the registered generating entities would support making the NERC GADS events reporting mandatory to the same level as what unit levels are required by the NERC Compliance Registry. The answer led to the following recommendation by the Events Subgroup.

Event Subgroup Report – Recommendations

The Events Subgroup of this GADSTF has established a set of recommendations regarding the mandatory reporting of event data to GADS. These recommendations are provided based upon their perceived impact on the current and future state of the bulk power system and are twofold. The first set of recommendations pertains to the type of generating stations, units, and facilities that should or should not comply with a mandatory event reporting policy. The second set of recommendations identifies which types of data should be collected under a mandatory policy and which should not.

Generating Stations, Units, and Facilities

The Events Subgroup recognized that different types of units have different types of operating characteristics and therefore, have varying impacts on the bulk power system. Due to this reality, the Events Subgroup recognized that some types of generating units would greatly benefit from having an industry database of event data while others could still function reliably in its absence. With that in mind, the Events Subgroup has recommended the following types of generating stations, units, and facilities be assigned to a mandatory event data reporting policy:

- Hydro: ≥30MW Gross Maximum Capacity (GMC);
- Fossil Steam: ≥20MW GMC;
- Nuclear: All;

- Combustion/Gas Turbine (CT/GT) and Combined Cycle (CC) with a Commercial Date on or after January 1, 1980: ≥75MW GMC; and
- All Others: ≥20MW GMC.

All other stations, units, and facilities are still strongly encouraged to report event data to NERC; however, they will continue to remain on a voluntary basis.

(NOTE: As of November 17, 2010: The GADSTF Event Subgroup recommended here that some units should be excluded from reporting event data to GADS, namely hydro units between 20-30 MW and combustion/gas turbines and combined cycle units commercial between before 1980 and less than 75 MW. The NERC Resources Issue Subcommittee (RIS) felt there was no justification for excluding these specific types and sizes of units. Therefore, all units 20 MW GMC shall report GADS events. The leadership of the Event Subgroup was contacted by NERC and accepted the RIS recommendation to include all units 20MW GMC or larger to report GADS event data.)

Event Data and Fields

In addition to different types of units having varying impacts on the reliability of the bulk power system, the Events Subgroup also recognized that different types of data also have varying impacts on the reliability of the bulk power system. The Events Subgroup recognized event data fields as potentially having the most significant impact on the bulk power system and should be mandatory reported. There are other event record fields that are strongly recommended/voluntary reporting but are not recommended as mandatory. A list of all event fields and their recommended importance can be found in Appendix III.

Moreover, the Events Subgroup recommends that reporting of unit event information is considered good utility practice, regardless of size.

PERFORMANCE SUBGROUP REPORT

GADS performance records collect monthly summaries of unit starts/attempted starts, hours of operation and outage, and fuels used by each generating unit.

Performance Subgroup Report – Discussions

The Performance Subgroup was tasked with two primary questions:

1. Should GADS performance reporting be mandatory?
2. If so, what fields should be mandatory?

Should GADS Performance Reporting Be Mandatory?

In this discussion, the majority of Performance Subgroup members voted it should be mandatory reporting. The reasons why it should be mandatory follow:

1. Knowing the historical performance/availability characteristics of the generating units in the system will be of assistance to System Planners, Balancing Authorities and Regional Entities for use within their resource adequacy calculations.
2. Knowing Forced Outage Rates of units assists System Planners, Balancing Authorities and Regional Entities by helping them study and plan for contingencies (Operational Reliability).
3. Knowing starting reliability assists System Planners, Balancing Authorities and Regional Entities in determining how many fast-start peaking units are needed to call on in a spinning situation.

There were some members of the Performance Subgroup that were against mandatory reporting. Their questions were:

1. What will be the enforcement mechanisms?
2. What will be the auditing mechanism?
3. Other various unintended consequences of the word “mandatory”.

Many of the questions about enforcement and auditing of the GADS data were addressed at the GADSTF face-to-face meeting in Atlanta. At that meeting, a series of slides reviewed the function of NERC if Section 1600 of the *Rules of Procedure* were used to make GADS mandatory. Some highlights are:

- NERC will make use of the mechanisms it has available for both U.S. and Canadian entities (notices, letters to CEO, requests to trade associations for assistance, peer pressure, etc.) to gain compliance with the NERC *Rules of Procedure*. Failure to comply could also be grounds for suspension or disqualification from NERC membership. Whether or not NERC chooses to use that mechanism will likely depend on the facts and circumstances of each case. Finally, if NERC’s efforts fail to succeed in getting its United States-registered Generation Owner to report their GADS data, then NERC will notify the US Federal Energy Regulatory Commission (FERC).
- NERC cannot impose penalties for a failure to comply with a data request.

One of the concerns of the Performance Subgroup is potential actions by FERC for non-compliance. Possible FERC actions for non-compliance are:

- Under section 215 of the *Federal Power Act*, FERC has jurisdiction over all users, owners, and operators of the bulk power system within the United States.
- FERC could treat a failure by a U.S. entity to comply with an approved data request as a violation of a rule adopted under the Federal Power Act and use its enforcement mechanisms in Part III of the *Energy Policy Act* of 2005.

The FERC action resulting from a "violation" of a Section 1600 data request has not been tested at this time. There have been at least four Section 1600 data requests released by NERC (Transmission Availability Data System - TADS, Demand Response Availability Data System, DADS, Adequate Level of Reliability (ALR) 3-5, and Critical Infrastructure Protection (CIP 002-4)).

Should Performance Reporting Become Mandatory, Which Fields Should Be Required?

The Performance Subgroup addressed what current GADS data fields should be required reporting if GADS was mandatory. Primarily, the general fields that should be mandatory are the following types:

- Unit Identifier;
- Month/Year of the report;
- Unit Capacity (Net Maximum or Net Dependable);
- Net Generation;
- Starting reliability (starts and attempted starts);
- The month summary of hours currently collected by GADS; and
- Primary type of fuel.

A specific, detailed list of performance fields that would be required or voluntary reporting can be found in Appendix III. The Performance Subgroup saw no need for any additional fields to be added.

Performance Subgroup Report – Recommendations

The GADSTF Performance Subgroup recommends that:

- Required data reporting timing should remain quarterly.
- Unit retirement dates should be collected after the official retirement is announcement.
- The release of GADS data to regional offices should follow the existing GADS Data Release Guidelines found in Appendix I of the GADS Data Reporting Instructions.
- The impact of GADS data collection in hours-per-week varies. If GADS data was not mandatory, the reporting entities would probably still collect performance and outage data but it may not be as detailed or structured.
- Solar data should be collected if the facility meets the MW size guidelines recommended by the GADS Solar Data Collection Working Group.
- There will always be some differences between GADS Data Reporting Instructions and generation reporting instructions released by the individual Independent System Operator and Regional Transmission Operators. NERC should coordinate with the individual ISO/RTO's to

minimize these differences, but the GADS Data Reporting Instructions should remain the benchmark.

- The accuracy of the GADS data should be checked by the individual companies internally before it is released. The GADS logic editing programs are adequate for screening many data errors. If additional GADS training is needed, then the individual companies should provide it either in-house or contact NERC for assistance.

Appendix V: *Rules of Procedure* Section 1600 Justification

Under Section 1600 of the *NERC Rules of Procedure*, specific information must be provided for a series of six questions. With regards to the request for the NERC Generating Availability Data System (GADS), the following responses address this specific information:

1. **Description of the data or information to be requested, how the data or information will be used, and how the availability of the data or information is necessary for NERC to meet its obligations under applicable laws and agreements.**

There are three data/information categories currently being collected by the Generating Availability Data System (GADS) for the ten unit types described below. These data shall continue to be collected under Section 1600 of the *Rules of Procedure*:

- **Design** records characteristics of the major equipment at each unit such as manufacturer, model number, number of fans or pumps, and other relevant information. See Appendix E of the GADS Data Reporting Instructions.
- **Event** records contain detailed information about when and to what extent the generating unit could not generate power. There are certain elements of the event records that are currently required reporting; other parts are optional reporting. See Section III of the GADS Data Reporting Instructions.
- **Performance** records track monthly generation, unit-attempted starts, actual starts, summary event outage information and fuels. See Section IV of the GADS Data Reporting Instructions.

The types of generating units for this Section 1600 rule are conventional, non-renewable (not wind or solar) units currently reported to GADS as described in its GADS Data Reporting Instructions. Ten types of units for mandatory reporting are namely,

- Fossil steam including fluidized bed design;
- Nuclear;
- Gas turbines/jet engines (simple cycle and others modes);
- Internal combustion engines (diesel engines);
- Hydro units/pumped storage;
- Combined cycle blocks and their related components (gas turbines and steam turbines);
- Co-generation blocks and their related components (gas turbines and steam turbines);
- Multi-boiler/multi-turbine units;
- Geothermal units; and

- Other miscellaneous conventional generating units (such as variable fuel – biomass, landfill gases, etc) used to generate electric power for the grid and similar in design and operation as the units shown above and as defined by the GADS Data Reporting Instructions.

There are several hundred data fields collected by GADS in the design, event, and performance records. A full list of each field is show in Appendix III of the GADS Task Force Report. This Appendix also lists the data fields that shall be reported on a mandatory basis and those that should be voluntary submission.

The NERC's mission is to ensure the reliability of the North American bulk power system. With that responsibility, NERC and its stakeholders require high quality, accurate data provided in a timely fashion to assess projected bulk power system reliability and analyze its ongoing performance for individual, regional and interconnection-wide planning. In the coming years, the evolution in resource mix will require the industry to gain experience with technology behavior, operating characteristics, and optimal planning approaches in order to properly assess reliability or improve performance analysis. As new technologies are integrated on the bulk power system, a complete set of design, event, and performance power plant data will be critical to ensure bulk power system reliability.

The need for GADS data is required for the following NERC and Regional Entity activities:

- Reliability Assessment reports and modeling;
- Loss-of-load Expectation studies and modeling;
- As the resource mix and associated infrastructure changes, NERC and its stakeholders will need to understand how the changes in resource availability/performance translate into required Planning Reserve Margins;
- Understanding the performance of existing and new resource technologies is essential to comprehending the reliability of the projected bulk power system in North America;
- Historical event data to develop a severity metric risk measurement tool to establish the bulk power system's characteristic performance curve;
- To calculate and measure both Event Driven and Condition Driven risk, detailed event and performance information;
- Monitoring the impact of transmission outages on generators and generator outages on transmission; and
- Power plant benchmarking, equipment analysis, design characteristics, projected performance, avoid long-term equipment/unit failures, etc.

NERC introduced the Generating Availability Data System (GADS) in 1982. This database is currently supported by voluntary data submittals. Currently not all registered Generator Owners provide GADS data. With voluntary data submittal, data provided by generator owners represent over 72.4 percent of the existing capacity in North America for generating units 20 MW and larger as shown in Table Appendix V-1.

Table Appendix V-1
Percent of Reported GADS Data by Region in North America
Conventional Units 20 MW and Larger

Region	2010 LTRA "Existing Certain" (Summer) Capacity (MW)	2009 GADS Summer NDC (June - August) Reported Capacity (MW)	% GADS MW Reported
FRCC	50,548	43,640	86.3%
MRO	53,815	44,672	83.0%
NPCC	152,047	54,477	35.8%
RFC	210,489	201,632	95.8%
SERC	245,148	185,309	75.6%
SPP	54,081	43,215	79.9%
TRE	85,581	57,471	67.2%
WECC	203,923	133,529	65.5%
	1,055,632	**763,945**	**72.4%**

Current voluntary practices have resulted in a number of concerns:

- Design data has not been kept up to date and reduces the ability to measure performance analysis.
- Incomplete or no data submission significantly diminishes the metric quality and timeliness, affecting the accuracy of analysis and results suspect.
- Analysis of generator classes incomplete due to the gaps in design data and unit population. Therefore assessment of unit performance, such as those important for system balancing, may lack credibility.

In Table Appendix V-2, the unit types in the Electricity Supply and Demand (ES&D) database, used to support NERC's Long-Term Reliability Assessments (LTRA), were compared to the GADS unit-type data. The results of this comparison show that the majority of missing existing generation in GADS (42.9%) is combined cycle facilities, the most popular newly constructed unit for capacity in North America. In addition to the combined cycle units, almost 55 percent of all existing hydro/pumped storage units, over 30% of existing gas turbines, and 14 percent of the existing fossil generation are not in GADS. This equates to 291.7 GW missing in GADS.

Table Appendix V-2
Percent of Missing GADS Data by Unit Types
Units 20 MW and Larger in North America

Types of Generating Units	Percent of Missing Capacity in GADS Compared to Long-Term Assessment Data
Combined cycle generation	42.9%
Gas turbine - simple cycle	31.3%
Hydro-Pumped storage	54.7%
Fossil	14.3%
Nuclear	13.6%

In further examinations of the missing 27.6 percent, each NERC Region was examined to view the make-up of the missing unit types. The Regional Entities with 30 percent or more missing generation in GADS included Northeast Power Coordinating Council (NPCC), Western Electric Coordinating Council (WECC), and Texas Reliability Entity (TRE). However, each Regional Entity contributed to missing generation needed for GADS analyses and work.

A good portion of the missing 27.6 percent of generating units from GADS equates to new, commercial units and new generating unit technologies needed for completely analyzing regional reliabilities. See Table Appendix V-3. Measuring bulk power system reliability severity and risks from events is limited or impossible with the incomplete data submittal currently experienced[21].

Table Appendix V-3
Percent of Missing New Generating Units Not In GADS
Units 20 MW and Larger in the United States

Number of New , Commercial - operating Generating Units in GADS (2000-2008)	Total MW Capacity from New Commercial Units in GADS (2000-2008)	Number of New, Commercial-operating Generating Units in EIA Form 860 (2000-2008)	Total MW Capacity from New Commercial Units in EIA Form 860 (2000-2008)	Percent of New, Commercial-operating Unit MW Capacity Missing in GADS
1,058	152,352	4,531	296,200	48.6%

In summary, the existing GADS database is incomplete, missing performance data from generator owners and operators from key areas, such as the Northeast, Texas and the Western states. This limits NERC's ability to measure the severity risk affects from transmission/generation outages. For example, for years there has been a need to measure the impact of transmission outages on generating plants and vice versa. With incomplete data from generator owners and operators, it is impossible to quantify their impacts on bulk power system reliability.

[21] 2010 Long-Term Reliability Assessment, section on severity risk curves

To address this need, focused on bulk power system reliability improvement, a complete set of generation and transmission outage data must be available. The transmission database is now in place to record all transmission outages; we now need a complete record of generator outages, which can be captured in the GADS database.

Key statistics and trends used for reliability assessments and performance analysis, such as Loss of Load Expectations (LOLE), trending, and other analyses cannot be relied upon without both GADS event and performance data. ***Without complete reporting, these statistics are now created from an incomplete and unverified sample determined by each industry analyst.***

In order to have a more complete and accurate picture of the generating resources in North America, it is vital to have a broader and full population of generating units in the NERC footprint. The inadequate population of availability data from generating units within the GADS database cannot provide a full representation for resource planners and operators to analyze and project to a high degree of accuracy the future of bulk power system requirements. Further, performance analysis would not be possible without a complete and industry supported generation database. ***GADS data is critical to ongoing improvements required to sustain reliability assessments and performance analysis.***

2. A description of how the data or information will be collected and validated.

GADS created a set of Data Reporting Instructions for describing the process for data collection. The GADS Data Reporting Instructions was introduced in 1982 and has been the key instruction manual of GADS ever since that time. The Data Reporting Instructions provides a clear, precise set of documents to collect GADS design, event, and performance records in a complete and accurate manner. It is reviewed annually and updated as needed to meet industry needs. Annual meetings of data reporters are conducted to introduce and instruct in Data Reporting Instruction concepts.

NERC provides a set of electronic software programs to collect, edit and report GADS design, event, and performance records to GADS. The GADS editing programs were first introduced in 1982 and are reviewed and updates as needed. A data collection system, much like that provided for NERC's Transmission Availability Data System (TADS), will be provided for data collection and data verification. The existing data verification software tool will be used to create this advanced data collection and verification system.

3. A description of the entities (by functional class and jurisdiction) that will be required to provide the data or information ("reporting entities").

Generator Owners on the NERC Compliance Registry with generating units that, (a) meet the MVA requirements in the *Statement of Compliance Registry Criteria (Revision 5.0)* which are excerpted below, and, (b) which are one of the ten unit types described in Question #1 above will be required to report GADS data for their units per this Section 1600 request. For U.S. Generating Owners, non-compliance with this mandatory reporting requirement is a violation of the *Federal Power Act* and may have serious legal repercussions. For Canadian entities that are also NERC members, the NERC membership agreement requires them to abide by NERC's *Rules of Procedure*, and Section 1600 is part of that body of rules.

Statement of Compliance Registry Criteria (Revision 5.0)

- III(c) Generator Owner/Operator:

- III.c.1 Individual generating unit > 20 MVA (gross nameplate rating) and is directly connected to the bulk power system, or;
- III.c.2 Generating plant/facility > 75 MVA (gross aggregate nameplate rating) or when the entity has responsibility for any facility consisting of one or more units that are connected to the bulk power system at a common bus with total generation above 75 MVA gross nameplate rating, or;
- III.c.3 Any generator, regardless of size, that is a black start unit material to and designated as part of a transmission operator entity's restoration plan, or;
- III.c.4 Any generator, regardless of size, that is material to the reliability of the bulk power system *[Exclusions: A generator owner/operator will not be registered based on these criteria if responsibilities for compliance with approved NERC Reliability Standards or associated requirements including reporting has been transferred by written agreement to another entity that has registered for the appropriate function for the transferred responsibilities, such as a load-serving entity, G&T cooperative, or joint action agency as described in Sections 501 and 507 of the NERC Rules of Procedure].*

  As a general matter, a customer-owned or operated generator/generation that serves all or part of retail load with electric energy on the customer's side of the retail meter may be excluded as a candidate for registration based on these criteria if, (i) the net capacity provided to the bulk power system does not exceed the criteria above or the Regional Entity otherwise determines the generator is not material to the bulk power system and (ii) standby, back-up, and maintenance power services are provided to the generator or to the retail load pursuant to a binding obligation with another generator owner/operator or under terms approved by the local regulatory authority or the Federal Energy Regulatory Commission, as applicable.].

4. The schedule or due date for the data or information.

- The GADS Task Force recommends that mandatory GADS reporting for all generating units as outlined in this proposal (Question #1) under NERC *Statement of Compliance Registry, (Revision 5)* shall begin, subject to approval by the NERC Board of Trustees , on January 1, 2012. GADS data will be due 30 days after the end of each quarter year (April 30, July 30, October 30 and January 30).
- The first mandatory GADS data will encompass January 1 to March 31, 2012 and will be due to NERC no later than April 30, 2012.
- Year-to-date GADS event and performance data is required for each submittal as described in the GADS Data Reporting Instructions.

5. A description of any restrictions on disseminating the data or information (e.g., "confidential," "critical energy infrastructure information," "aggregating" or "identity masking").

In the past, GADS information has remained confidential under the *GADS Data Release Guidelines*. This document was first approved by the NERC Board of Trustees in 1981 and has had very little modification since that time. GADS data will continue to be confidential under NERC's *Rules of Procedure*, Section 1500: *Confidential Information.* Data submitted by Generation Owners (GOs) would be classified as confidential in accordance Section 1500, including procedures that address a request for the release of confidential information. In addition, GADS public reports will not inadvertently release confidential information by the display of regional or NERC information from which a GO's confidential information could be ascertained. For example, if the GO in a Region is the only owner of assets in a particular generator class, the metrics on that data would not be released if the GO's name and its confidential information could be identified. The exception is if the GO voluntarily provides NERC permission to do so, which NERC will seek. However, if the identity of the GO in the previous example could not be identified in a NERC-wide report that combines the data from all reporting GOs, that report would not violate the confidentiality of that GO's data, and the NERC-wide report containing information on the Voltage Class would be released.

6. An estimate of the relative burden imposed on the reporting entities to accommodate the data or information request.

Most Generator Owners already collect generation outage data on their units. Therefore, there will be little or no additional work to report the outage data to GADS.

The impact of GADS data collection in hours-per-week will vary. The time for data collection depends on the type of unit, number of units per station, the condition of the unit, and other factors. The important note is that the reporting entities still collect event and performance data but it may not be as detailed or structured.

For the 27.6 percent of generation not currently reporting to NERC GADS, there may be some cost in collecting the existing data, re-formatting the information into the uniform GADS format before submitting the data to GADS. GADS can provide some free software for data collection in the proper format as needed. There may be some additional cost to train non-reporting entities in the GADS nomenclature and reporting procedures. However, in most cases, the data is already being collected by the majority of generation owners. Thus the burden of transferring the required information of GADS should be minimal.

Appendix VI: GADS Data Release Guidelines

Introduction

NERC Generating Availability Data System (GADS) contains information which can be broadly classified into two categories: design data, which is descriptive of equipment physical and operational characteristics, and performance and event data, which constitutes a record of equipment availability over a period of time. The design data is unrestricted, and available to power generators, manufacturers and equipment suppliers, architect-engineers and consultants, industry organizations (EEI, EPRI, INPO, etc.), federal governmental organizations, and state and local governmental organizations.

To avoid the potential misuse of individual equipment data, the performance and event data are restricted and available only as specified in these guidelines.

Data Release Guidelines

Unless expressly permitted in the following sections, data by power generator, pool, Region, or specific unit will be provided only with the authorization of the appropriate power generator, pool, or Region. ("Power generators" are any owners or operators of electric generating units owned/operated by investor-owned, independent power project (IPP), municipals, cooperative, federal, state, and every other group of electric providers.) Special reports or studies which describe or rank power generators, pools, or Regions by performance or other attributes — and in which specific units, power generators, pools, or regions are identifiable either by inclusion or exclusion -- will be provided only with the authorization of the appropriate power generators, pools, or regions. Obtaining these approvals is the responsibility of the requester.

The "standard publication" mentioned in the following paragraphs is that approved and recognized as such by the NERC Planning Committee. The current publication is the *Generating Availability Report* and the GADS brochure. The latest versions can be downloaded from the NERC web site: http://www.nerc.com/page.php?cid=4|43|47.

Power Generation Representatives

Power generator owners/operators who report GADS data for all units outlined in the *GADS Data Reporting Instructions* Figure III-1 (shown as "required" for the different unit types) may receive any special data analyses, data analysis-type software products like pc-GAR or standard publication without restriction, except that large amounts of power generator, pool, Region, or specific unit data will be provided only with the permission of the appropriate power generator, pool, or Region. Power generator representatives are understood to refer to employees of the member power generators, power pools, or Regional Entities.

Power generator owners/operators who do not report any GADS data or only part of the full sets of unit data as outlined in the *GADS Data Reporting Instructions* Figure III-1 (shown as "required" for the different unit types) may only receive standard publications but will not receive any special data analyses or data analysis-type software products like pc-GAR.

Manufacturers and Equipment Suppliers

Manufacturers and equipment suppliers may receive the standard publication. They may also receive individual analyses and outage records concerning the equipment they supplied, as well as total unit performance statistics. National, regional, or local summary analyses of the manufacturer's or equipment supplier's equipment compared to all others as a group can be provided. These analyses may collectively review all competitors, but will not identify an individual competitor; nor will they rank competitors, power generators, pools, or regions without their specific authorization.

Architect-Engineers and Consultants

Architect-engineers and consultants may receive the standard publication. They may also receive individual analyses and outage records concerning the equipment they designed or installed, as well as total unit performance statistics for those same units. National, regional, or local grouped units summary analyses on the performance of the architect-engineer's or consultant's units compared to all others as a group can be provided. These analyses may collectively review all competitors but will not identify an individual competitor; nor will they rank competitors, power generators, pools, or regions without their specific authorization. If an architect-engineer or consultant is under contract to a power generator client, that architect-engineer or consultant may receive any information the power generator may receive, as long as the client power generator is identified and approves.

Industry Organizations (EEI, EPRI, INPO, etc.)

Industry organizations such as EEI, EPRI, and INPO may receive the standard publication. They may also receive any analyses that do not identify individual units, power generators, pools, or regions.

Federal Governmental Organizations

Federal governmental organizations may receive the standard publication. They may also receive any analyses that do not identify individual units, power generators, pools, or regions.

State and Local Governmental Organizations

State and local governmental organizations may receive the standard publication. They may also receive any analyses that do not identify individual units, power generators, pools, or regions. Responses to requests for unit, power generator, pool, or regional specific data will be coordinated through the appropriate power generator(s), pool(s), or NERC region(s).

Non-Industry Organizations

Non-industry organizations may receive the standard publication. They may also receive any analyses that do not identify individual units, power generators, pools, or regions. Responses to requests for unit, power generator, pool, or regional specific data will be coordinated through the appropriate power generator(s), pool(s), or region(s).

Foreign Correspondents

Foreign correspondents may receive the standard publication. They may also receive grouped analyses at the discretion of the NERC staff.

Subsequent Use of Data

Publication or re-transmittal by those who have received GADS data, reports, or analyses specific to individual or identifiable units, power generators, pools, or regions is considered a matter separate and distinct from requesting such data for the internal use of the requester. As such, authorization for publication must be expressly obtained by the requester from the appropriate power generator(s), pool(s), or NERC region(s), and NERC.

Responding to Requests

All requests must be submitted in writing and will be answered on a timely basis with special attention given to requests identified as urgent.

Appendix VII: Examples of GADS Helping the Electric Industry

GADS started collecting data from the generating companies in North America in 1982. This unique series of databases is used to collect, record, and retrieve operating information for improving the performance of electric generating equipment. It also provides assistance to those researching the vast amounts of information on power plant availability stored in its database. The information is used to support equipment reliability and availability analyses and decision-making by GADS data users. Since that time, more than 11 million event records have been gathered and used to help answer the many questions that could not be answered by any other database.

We have learned that the *value* of performance data is far greater than the combined *cost* of collecting the data plus the *risk* of sharing the data. By sharing the data, GADS is able to help the electric industry in many ways such as:

- Benchmarking
- Configuration Optimization
- Generation Planning
- Operations
- Goal Optimization
- Maintenance Planning
- Risk Management
- Catastrophic Event Reduction
- Life Management
- Equipment Design

The following are just a few examples of the uses of GADS by the North American generating companies over the last 29 years.

Testing the Performance of Balanced Draft and Pressurized Coal-fired Boilers

The GADS staff wrote a technical paper, analyzing the performance differences of coal-fired pressurized and balanced draft boilers used in electric generation. The paper also looked at the difference in unit performance for units converted from pressurized to balance draft operation. The report showed a four percent lower forced outage rates with balanced draft. One generating company checked the data in the paper, reviewed their fleet, and determined to convert one unit with a five-year expected return on investment. The conversion payback was two years instead of five, much better than expected. The same utility then converted six other units with the same result – quick payback and lower, fewer forced outages on the boiler.

Benchmarking - Setting Realistic Performance Goals

Several generating companies contacted GADS regarding performance goals for various generating units in their fleet. General performance statistics mixed old and new units, various MW sizes, different operating conditions, and equipment designs into numbers not acceptable to management of the plant personnel. GADS staff used its benchmarking talents and data to create statistics and performance goals acceptable to both parties.

Benchmarking – Prioritizing Areas of Generating Plant Improvement

Annually, GADS provides a software product that allows companies to review the various types of outages experienced and help them view trends of equipment outages, from the boiler as a whole to the motors on its pulverizers. This information allows generating companies to document where they can spend their limited resources to make the units more dependable and cut outages for increased generating times.

Is Redundant Equipment Needed in Power Plants?

For many years, generator owners installed extra equipment in their plants with the thought that it would make the plant more reliable. The cost of spare pumps, pulverizers, fans, and other equipment was very costly to install and maintain. GADS design data allows owners and architect engineers to review the histories of such plants so they can determine if the spare equipment is really necessary in the design and modeling phase of the unit, not in the operation phase. This GADS option has saved electric companies millions of dollars in expenses.

Predicting Generating Unit Reliability

This method for predicting generating unit reliability is based on GADS design characteristics, operational factors, and maintenance and plant improvement activities. The method uses the 11 million GADS records as a basis for modeling power plants and analyzing plant operations. It has been used to predict new installations as well as analyze changes to unit performance as new equipment is added or retrofitted to existing units.

Generating Unit Availability Following Planned Outages

This report describes the daily performance of generating units during their first week of service immediately following planned outages. It is a follow-up study to "Frequency and Severity of Forced Outages Immediately Following Planned or Maintenance Outages." The GADS data was used to prove that there are a number of forced events following all planned outages and that generating owners and dispatchers need to spread out the time between units moving from planned outages to service. If the two units are not spaced properly, then there is a high probability of both units off-line at the same time.

Impact of Flue Gas Desulfurization (FGD) Systems

This GADS report analyzes the availability losses experienced by coal- and lignite-fired steam generating units equipped with flue gas desulfurization (FDG) systems. It also analyzes the impact FGD systems have on unit output and annual energy and manpower requirements. The report shows that units with no by-pass scrubbers have much higher forced outage rates than those units with by-pass capabilities. It also shows that units with by-pass capabilities generally have a higher Equivalent Availability Factor (EAF) than those without EAF because of the extra maintenance crews. When the crew is not working on the FGD, then they are working in the plant and assist in keeping the plant work order list short.

Seasonal Performance Trends

This report compares peak season and annual equivalent forced outage rates for fossil-steam generating units. It shows that generating units are more dependable and experience a lower number of forced outages in the summer than in winter. Many companies take spring planned outages to prepare for the summer months. GADS data shows that those units with spring outages are more dependable and do have fewer outage events during the summer peak than those who take fall outages.

The Generating Availability Data System (GADS): Applications and Benefits

A number of generating companies contributed to a report that describes electric generating unit availability improvement programs that are used in the industry and the analysis techniques. Most of the programs start with GADS data for pin-pointing problem areas and documenting experiences recorded in GADS. This information allows companies from repeating problems others have experienced in the past.

High Impact – Low Probability (HILP) Studies

The GADS staff has conducted a number of studies locating HILP events. HILP events are rare events that result in long forced outages lasting weeks and years. Boiler explosions, generator groundings, cooling tower collapse, and contaminated condensate water supplies are a few examples of HILP events. GADS has the capability to calculate time-between-failure and time-to-repair events over its 29 years of histories, totaling more than 11 million events (experience) but its reporting members.

Appendix VIII: GADS Task Force Roster

Level	Name	Address	Phone / E-Mail
Chair	Ben Crisp Director System Planning and Regulatory Performance	Progress Energy Florida 6565 38th Avenue North St. Petersburg, FL 33710	(727) 344-4190 ben.crisp@pgnmail.com
TRE **Generation Owner**	Joel Firestone Head of Reliability Assurance	Direct Energy 919 Congress Avenue Suite 1300 Austin, TX 78701	(512) 320-7908 (512) 480-8083 Fx Joel.Firestone@directenergy.com
TRE **Resource Planner**	Kenneth McIntyre Manager Operation and Planning Standards Compliance	Electric Reliability Council of Texas, Inc. 2705 West Lake Drive Taylor, TX 76574	(512) 248-3969 (512) 248-3969 Fx kmcintyre@ercot.com
FRCC **Resource Planner**	Benjamin Borsch	Progress Energy Florida	(727) 384-7565 benjamin.borsch@pgnmail.com
FRCC **Generation Owner**	Howard Ferguson	NextEra Energy	(561) 691-2135 howard.ferguson@nexteraenergy.com
MRO **Generation Owner**	Katie Ege	Great River Energy	(763) 445-5815 kege@grenergy.com
MRO **Resource Planner**	Karolanne M. Hoffman	Dairyland Power Coop.	(608) 787-1249 kmh@dairynet.com
NPCC **Generation Owner**	Dean Ellis Senior Manager - Transmission	Dynegy 4 London Avenue New Windsor, NY 12553	(518) 280-1482 (713) 356-2910 Fx dean.ellis@dynegy.com
NPCC **Resource Planner**	Peter Wong Manager, Resource Adequacy	ISO New England, Inc. One Sullivan Road Holyoke, MA 01040-2841	(413) 535-4172 (413) 540-4203 Fx pwong@iso-ne.com
RFC **Generation Owner**	Chris Bubash	Dayton Power & Light Co.	(937) 259-7853 chris.bubash@dplinc.com
RFC **Resource Planner**	Paul D. Kure Senior Consultant, Resources	ReliabilityFirst Corporation 320 Springside Drive Suite 300 Akron, OH 44333	(330) 247-3057 (330) 456-3648 Fx paul.kure@rfirst.org

SERC **Resource Planner**	Gary S. Brinkworth, P.E. Senior Manager	Tennessee Valley Authority 1101 Market Street MR3K-C Chattanooga, TN 37402	(423) 751-2193 gsbrinkworth@tva.gov
SERC **Generation Owner**	Robin Wells Sr. Compliance Engineer	LG&E Building 8th Floor Louisville, KY 40202	(502) 627-2715 (502) 217-2221 Fx robin.wells@lge-ku.com
SPP **Generation Owner**	Scott Gronwold Senior Engineer - Operations	Midwest Generation 440 S. LaSalle Street Suite 3500 Chicago, IL 60605	(815) 207-5909 sgronwold@mwgen.com
SPP **Resource Planner**	Bryce Bowie Planning Analyst, Engineering Administration	Southwest Power Pool 415 N. McKinley Little Rock, AR 72205	(501) 688-1758 (501) 821-3245 Fx bbowie@spp.org
WECC **Generation Owner**	Scott Flake Manager, Power Generation	Sacramento Municipal Utility District	sflake@smud.org
WECC **Resource Planner**	Robert Wolaver, P.E. Senior Manager, Energy Resources	Tri-State G & T Association, Inc.	(303) 452-6111 rwolaver@tristategt.org
Observer	Mark Ahlstrom CEO	WindLogics Inc. 1021 Bandana Boulevard East Suite 111 St. Paul, MN 55108	(651) 556-4262 (651) 556-4210 Fx Mark.Ahlstrom@windlogics.com
Observer	Fred Beasom Production Assurance Fleet Lead Time in Wind	FPL Energy 7021 Oak Creek Road Mojave, CA 93501	(661) 824-8972 fred_beasom@fpl.com
Observer	Mike Davis	Sacramento Municipal Utility District 6201 S Street Sacramento, CA 95817	(916) 732-5154 mdavis@smud.org
Observer	Lou De Luca	FPL Energy 700 Universe Boulevard Juno Beach, FL 33408	(561) 691-2842 lou_deluca@fpl.com
Observer	Sal DellaVilla CEO	Strategic Power Systems, Inc. 11121 Carmel Commons Boulevard Suite 100 Charlotte, NC 28226	(704) 544-5501 (704) 554-5505 Fx sal.dellavilla@spsinc.com
Observer	Leeth DePriest	Southern Company Services, Inc. 42 Inverness Center Parkway BIN 481 Birmingham, AL 34242	(205) 992-7929 mldeprie@southernco.com

Observer	Lester Gant, Jr. Mechanical Engineer	Tennessee Valley Authority 1101 Market Street Chattanooga, TN 37402-2802	(423) 751-2353 (423) 751-8927 Fx lgant@tva.gov
Observer	Daniel Gent Manager, Performance Excellence & Benchmarking	Canadian Electricity Association 350 Sparks Street Suite 1100 Ottawa, Ontario K1R 7S8	(613) 688-2959 (613) 230-9326 Fx gent@electricity.ca
Observer	Carlos Gonzalez-Perez Director Reliability Systems and Market Operations	OATI 2300 Berkshire Lane North Minneapolis, MN 55441	(763) 201-2090 (763) 553-2813 Fx carlos.gonzalez-perez@oati.net
Observer	Brian Hollingshaus Project Manager	Electric Power Research Institute 1300 W. WT Harris Boulevard Charlotte, NC 28262	(704) 595-2579 bhollingshaus@epri.com
Observer	Benjamin Lagrange	GE Energy	(864) 254-3755 benjamin.lagrange@ge.com
Observer	Susan Leonard Analyst-Performance Reporting	Progress Energy Carolinas 3401 Hillsborough Street Raleigh, NC 27607	(919) 546-4066 (919) 546-3406 Fx susan.leonard@pgnmail.com
Observer	Davey C. Lopez Regulatory & Economic Studies	Midwest ISO, Inc.	(317) 249-5109 dlopez@midwestiso.org
Observer	Steve MacDonald Shift Supervisor	Oglethorpe Power Corporation 4050 Big Texas Valley Road Rome, GA 30165	(706) 290-5401 steve.macdonald@opc.com
Observer	Elizabeth Majeau Director, Generation and Environment	Canadian Electricity Association 350 Sparks Street Suite 1100 Ottawa, Ontario K1R 7S8	(613) 230-9326 majeau@electricity.ca
Observer	Toni Martinez Reporting Compliance Analyst	Xcel Energy, Inc. 1800 Larimer Street Suite 1300 Denver, CO 80202	(303) 294-2512 (303) 294-2328 Fx toni.martinez@xcelenergy.com
Observer	Glen Masters Principle Program Manager	Institute of Nuclear Power Operations	(770) 644-8746 mastersig@inpo.org
Observer	Bridget McKenney Wind Reliability & Analysis Database Lead	Sandia National Laboratories P.O. Box 5800 Albuquerque, NM 87185	(505) 844-1235 blmcken@sandia.gov
Observer	Ken Millick Production Operations Technologist	FirstEnergy Corp. 76 South Main Street 13th Floor Akron, OH 44308-1890	(330) 384-5018 (330) 384-5791 Fx

Observer	Brian K. Pillittere, P.E. Plant Engineer	Tenaska Alabama II Partners, LP 3305 Country Road 26 Billingsley, AL 36006	(205) 755-2135 bpillittere@tenaska.com
Observer	David Pomian Senior Engineer	PJM Interconnection, L.L.C. 955 Jefferson Avenue Valley Forge Corporate Center Norristown, PA 19403-2497	(610) 635-3474 pomiad@pjm.com
Observer	James P. Pratico Analyst	New York Independent System Operator 3890 Carman Road Schenectady, New York 12303	(518) 356-6249 (518) 356-6208 Fx jpratico@nyiso.com
Observer	Mohammad Raza Manager, RAM	Alstom Power Brown Boveri Strasse 7 5401, Baden	+41 (56) 205 9743 mohammad.raza@power.alstom.com
Observer	Ray E. Rowen Generation M & O Technician	Lincoln Electric System 11th & O Streets P.O. Box 80869 Lincoln, Nebraska 68501-0869	(402) 420-8182 rrowen@les.com
Observer	Ilya Slutsker	OATI 2300 Berkshire Lane North Minneapolis, Minnesota 55441	(763) 201-2090 ilya.slutsker@oati.net
Observer	Christopher Vachovetz Project Manager, Data Management	Institute of Nuclear Power Operations	(770) 644-8681 vachovetzcj@inpo.org
Observer	Jana Zwiesler	Westar Energy 818 South Kansas Avenue P.O. Box 889 Topeka, Kansas 66601	(785) 575-8288 Jana.L.Zwiesler@westarenergy.com

Appendix IX: NERC Staff Roster

North American Electric Reliability Corporation
116-390 Village Boulevard
Princeton, New Jersey 08540-5721

Telephone: (609) 452-8060
Fax: (609) 452-9550

Name	Title	E-Mail
Mark G. Lauby	Director of Reliability Assessment and Performance Analysis	609-524-7077 mark.lauby@nerc.net
G. Michael Curley*	Manager of GADS Services	801-756-0972 michael.curley@nerc.net
Ronald J. Niebo	Reliability Assessment Coordinator	609-524-7017 ron.niebo@nerc.net
Joanne M. Rura	GADS Services Coordinator	609-524-0613 joanne.rura@nerc.net
Jessica Bian	Manager, Performance Analysis	609-524-7024 Jessica.bian@nerc.net

*NERC Staff Coordinator for the GADS Task Force.