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WATER CAPACITY DEVELOPMENT AND PLANNING: A BENCHMARKING GUIDE FOR REGULATORY COMMISSIONS

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EXECUTIVE SUMMARY

The 1996 Amendments to the Safe Drinking Water Act (SDWA) extend the authority of the U.S. Environmental Protection Agency (U.S. EPA) beyond the realm of pure environmental regulation and into the financial, managerial, and technical "capacity" of drinking water utilities. The capacity development requirements are designed to halt the proliferation of service provision by suppliers with doubtful longer-term prospects and to strengthen the capabilities of existing suppliers. The requirements of the amended SDWA affect state primacy agencies and others, including state regulatory commissions. The federal legislation vests regulators with a set of potentially useful tools to analyze and promote the capabilities of proposed, new, and established suppliers of drinking water to meet customer needs. This report provides a benchmark that allows a commission to assess its present position relative to the capacity and capacity development criteria of the 1996 federal law. It also presents the results of an NRRI analysis of state commission water rules.

The concept of capacity invokes a systems orientation for new and existing water utilities. This approach acknowledges the significant components of the system and stresses the importance of their interaction and contribution to the success of the system as a whole. A three-tiered conceptual model for water system capacity, as called for by the U.S. EPA, is presented in this report and organized around the three goals of financial capacity, managerial capacity, and technical capacity. Successful systems are those that are able to satisfy each capacity goal singularly and all of the capacity goals in combination. Each of the three goals is further refined into a set of objectives that are designed to achieve the related goal. The conceptual model for drinking water system capacity is operationalized through specification and definition of a set of indicator variables for each of the objectives.

The report presents the results of an NRRI analysis of state commission water rules. The study looked specifically for indicators of capacity planning and capacity development. The results provide a "snapshot" view of state capacity provisions reflected in water rules, since these mechanisms and policies are evolving in response to the requirements of the 1996 Act and to individual state conditions. The aggregate findings indicate that, in general, commission water rules address many (but not all) of the capacity considerations in the 1996 Act and its implementation guidelines. At a minimum, commissions can use this information as a benchmarking tool for evaluating and reviewing their own rules. It could also stimulate consideration of commission responsibilities under the SDWA that are not currently present or fully addressed in their rules, practices, policies, or procedures. (Of course, rules are not the only indicator of commission authority.) Questions to be raised include:

- Are all three capacity goals equally important, or are some more important than others? All nine capacity objectives? All 37 capacity indicators?
- Is there an optimum mix or synthesis between and among the goals, and if so, what is it? Among the objectives? Among the indicators?
- Are all of the important capacity goals present in the conceptual model, and have they been sufficiently operationalized in the capacity framework? All the important capacity objectives?
- Do the indicator variables in the operationalized framework constitute a necessary and sufficient set of measures of a drinking water system's capacity or ability to develop capacity?
- Is a rules-based approach to drinking water quality that mandates capacity and capacity development more likely to achieve the desired results than alternate regulatory strategies?

U.S. EPA guidelines suggest that commissions are the "control points" for ensuring certain elements of a new or proposed drinking water system's capacity development.[1] However, the guidelines present a limited set of responsibility areas for commissions. Whereas commissions are vested with the authority for economic regulation, the U.S. EPA does not identify them as control points for many of the financial indicators in the capacity framework.[2] Additionally, it is not clear where the authority and subsequent control points exist for those financial indicators that are not assigned to state commissions, since these relationships are not fully articulated in the U.S. EPA guidelines. Furthermore, a compelling case can be made that commissions are not only responsible for, but have jurisdiction over, many of the other areas captured by indicators that fall under the headings of both technical and managerial capacity. Finally, it is not clear what level and scope of inter-agency communication and coordination need to exist to properly address the variables for which commissions are identified as control points for new systems.

Clarification and communication among commissions and other federal and state agencies responsible for capacity planning are clearly needed. Ultimately, the success of the capacity concept may very well depend as much on successful interagency coordination and communication as it does on the unilateral implementation of assigned tasks. Commissions may wish to consider which, if any, of the financial, technical, and managerial indicators play an integral role in meeting their traditional responsibilities, which indicators now require attention as mandated by the SDWA, and what level of communication and coordination needs to occur with other agencies on these issues.

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[1] The current control point discussions are limited to capacity development considerations for new or proposed systems. Control points for existing systems have not yet been forwarded by the U.S. EPA. It is likely, however, that a similar concept will emerge for existing systems in future U.S. EPA guidelines.

[2] The authority of the commissions is, of course, generally limited to privately owned utilities. The U.S. EPA's "control points" do not extend the role or authority of Commissions into nonjurisdictional utilities.

In summary, commissions may want to customize their own indicator taxonomy using, but not being limited by, the information provided by U.S. EPA and this report. A customized framework might add some indicators not present here, delete others, and provide differentiation with respect to their importance in achieving the goals and objectives identified by the commission. The development and implementation of a uniform state-specific framework and policy for all jurisdictional water utilities might simplify and streamline commission procedures, reduce uncertainty for regulated utilities, improve customer satisfaction, and enhance the provision of safe drinking water. Additionally, future U.S. EPA guidelines are likely to extend the lessons learned in designing and implementing capacity development programs for new and proposed systems into the arena of existing systems. Commissions may find it useful and productive to communicate their capacity development experiences to state primacy agencies and the U.S. EPA. This communication will serve to better inform the next generation of capacity initiatives.

There are undoubtedly many other questions and policy implications that may arise as a result of the information presented here. At a minimum, it is hoped that this data and analysis will further the discourse and development necessary for commissions to successfully design and implement the requirements for capacity planning and development.

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FOREWORD

Amendments to the Safe Drinking Water Act in 1996 expand the policy reach of the U.S. Environmental Protection Agency into areas where state regulators have direct policy concerns and legal jurisdiction. SDWA requirements for developing the technical, managerial, and financial capacity of new and existing water utilities present a challenge and an opportunity for commissions and environmental agencies. This report provides a valuable benchmark for commission action to assess and develop the capacity of jurisdictional utilities to serve their customers.

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Introduction

The Safe Drinking Water Act (SDWA) is the principal federal legislation governing the provision of drinking water in the United States. The initial law was enacted in 1974 (P.L. 93-523). The primary purpose of the Act was to establish comprehensive national standards for safe drinking water in order to ensure and protect public health. The 1974 Act set in motion a standards-based approach to regulating contaminants, both chemical and microbiological, in drinking water. The Act also mandated a multi-tiered approach to regulation that identified responsibilities for federal and state governments and for drinking water utilities. The SDWA has been amended numerous times since its inception in 1974. What has evolved is a tradition of standards and rules covering an increasing number of contaminants, stricter limits on contaminant concentrations, specification of treatment technologies, and monitoring and reporting requirements.

Amendments to the SDWA in 1996 made significant changes that affect all state regulatory commissions with jurisdiction over water utilities. President Clinton's remarks at the signing of the Act reflect the lofty goals for its impact:

> Today we helped to ensure that every family in America will have safe, clean drinking water to drink every time they turn on a faucet or stop at a public fountain. From now on our water will be safer and our country will be healthier for it.[3]

Whether universally safe and clean water is possible across the broad spectrum of consumers and conditions that exist in the United States is certainly debatable. What is not at question, however, is the federal government's continued commitment to improve public health through the regulation of drinking water. One advance and departure from

[3] Bill Clinton, Remarks By the President At Bill Signing Of The Safe Drinking Water Act Amendments of 1996.

traditional practice that arises from the SDWA as amended is a new policy orientation that goes beyond the contaminant-technology-monitoring and reporting scheme. The 1996 Amendments establish requirements for a programmatic focus on the "capacity" of drinking water utilities to comply with applicable drinking water standards. This new approach stresses the important role that the "health" and competency exhibited by individual drinking water utilities plays in their ability to be reliable and safe providers of such a vitally important product.

Administratively, the SDWA's multi-tiered approach towards assigning responsibilities for various design, implementation, and monitoring activities is maintained in the 1996 Amendments with respect to the capacity and capacity development provisions. While the majority of the requirements mandated by the latest amendments fall into the domain of state primacy agencies, there are also clear implications for state regulatory commissions and the drinking water utilities they regulate. Gaining an understanding of the nature and extent of the requirements should help commissions tailor effective programs within their jurisdictions. Additionally, identifying and utilizing efficient channels of communication and coordination with other agencies involved in the process will be an important part of both the initial and sustained capacity effort.

This report is designed to provide insight to public utility regulators regarding the new capacity development provisions of the SDWA. The report includes an overview and conceptual model of drinking water system capacity, an analytical framework with numerous indicators of capacity, an analysis of capacity development provisions currently reflected in commission water rules, and some recommendations and suggestions for regulators. Additionally, examples from two state capacity development programs are included.

Water System Capacity and Capacity Development

The 1996 Amendments to the SDWA formally recognize the link between safe drinking water and the protection of public health. Developing the capacity of new or proposed systems to achieve compliance with applicable standards and ensuring the continued capacity of existing systems to provide safe drinking water is seen as an integral and fundamental component of the provision and protection of public health in the United States. The Act requires, therefore, that state-level programs be designed and implemented to insure that drinking water systems develop the capacity to provide safe drinking water to their customers. It is expected, however, that the mandated requirements may exceed the capabilities of some public water systems (especially small systems) to provide safe drinking water and quality services.[4] To this end, the SDWA requires the United States Environmental Protection Agency (U.S. EPA) to develop implementation guidelines for states. The purpose of the guidelines is to assist the states with designing and implementing strategies and assessment techniques for drinking water systems' capacity development.[5] The U.S. EPA guidelines provide the following definitions:[6]

> **Water system capacity** refers to a water system's ability to consistently provide safe drinking water for its customers. To do that, a system must have the technical abilities, managerial skills, and financial resources to meet state and federal drinking water regulations. Technical, managerial, and financial capacity are individual yet highly interrelated dimensions of capacity.

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[4] In the SDWA Congress "finds that . . . . (1) safe drinking water is essential to the protection of public health; (2) because the requirements of the Safe Drinking Water Act (42 U.S.C. 300cf et seq.) now exceed the financial and technical capacity of some public water systems, especially small public water systems, the Federal Government needs to provide assistance to communities to help the communities meet federal drinking water requirements." *The Safe Drinking Water Act Amendments of 1996, U.S. Code,* vol. 42, sec. 3.

[5] Henceforth, "capacity" and "capacity development" may be referred to simply as "capacity;" with the understanding that usage relative to existing or new systems provides sufficient differentiation.

[6] U.S. Environmental Protection Agency, *Information for the Public on Participating with States in Preparing Capacity Development Strategies* (July 1998), EPA 816-R-98-009, 1-2.

Technical capacity refers to the physical infrastructure of the water system, including but not limited to the source water adequacy (including wells and/or source water intakes, treatment, storage, and distribution) and the ability of system personnel to implement the requisite technical knowledge.

Managerial capacity refers to the management structure of the water system, including but not limited to ownership accountability, staffing and organization, and effective linkages.

Financial capacity refers to the financial resources of the water system, including but not limited to revenue sufficiency, credit worthiness, and fiscal controls.

Water system capacity development is an effort by the states to help drinking water systems (primarily new or proposed systems) improve their finances, management, infrastructure, and operations so they can provide safe drinking water consistently, reliably, and cost-effectively. As a first step, each state is to prepare its own capacity development strategy. Although the details vary depending on the particular needs of the state's water systems, each strategy specifies how the state will identify and rank water systems that need assistance.

The new legislative emphasis on a water system's capacity—financial, managerial, and technical—to provide safe drinking water is an addition to historical practice that focused on a narrower contaminant-based scheme. It is, however, consistent with the tradition of standards and rule-based regulation that typify drinking water legislation. Predictably, the research agenda before the 1996 Amendments to the SDWA tended to focus largely on water quality as evidenced by physical and chemical measures. There were, however, some extensions into the financial "viability" of drinking water utilities.[7] The distinction between *viability* and *capacity* is, in this case, more than semantic. Viability evaluation was traditionally limited to the financial aspects of a utility. Viability also tends to invoke a "going concern" orientation in a financial and legal context. The newer capacity-based approach extends itself into the managerial and technical aspects of a

[7] See Janice A. Beecher, *Viability Policies and Assessment Methods for Small Water Utilities* (Columbus, OH: NRRI, 1991), and David W. Wirick with John Borrows and Steven Goldberg, *Evaluating Water Utility Financial Capacity with Ratio Analysis and Discounted Cash Flows* (Columbus, OH: NRRI, 1997).

water utility.[8] The concept of capacity invokes a systems orientation for new and existing water utilities. This approach acknowledges the significant components of the system and stresses the importance of their interaction and contribution to the success of the system as a whole.

Regardless of terminology, the SDWA has clearly expanded its policy reach beyond the traditional contaminant and treatment technology areas. This extension has moved U.S. EPA's authority beyond the realm of pure environmental regulation and into the financial, managerial, and technical aspects of drinking water utilities. The overlap of regulatory jurisdictions between environmental agencies and commissions merits consideration, as do the implications for the regulated community.

Another potentially significant addition to the Act established the Drinking Water State Revolving Loan Fund (DWSRF) to assist states with the financial burdens associated with capacity efforts and to provide a financial incentive to comply with the new federal regulations.[9] DWSRF dollars are available at below market rates for eligible water systems in states that have implemented an acceptable capacity development program. [10] The long-run efficacy of this policy instrument remains to be seen. There is little question, however, that the construction grants program and low interest loans were important tools used by the federal government and the states to achieve many of the improvements now

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[8] Beecher, 1991 introduces a policy framework for water system "viability" with technical, financial, and managerial elements. This work precedes the 1996 Amendments to SDWA and the U.S. EPA guidelines. It is good resource for the early development of the concept of viability.

[9] The SDWA provides capitalization grants to states in §130 (State Revolving Loan Funds). Additionally, it establishes eligibility criteria and reporting deadlines. Detailed information regarding the role of state regulatory commissions in DWSRF programs and the opportunities this represents is provided by John D. Borrows and Todd Simpson, *The Drinking Water State Revolving Loan Fund: A Guide for Regulatory Commissions* (Columbus, OH: NRRI, 1997).

[10] Equitable access to these funds is currently a matter of debate at the state, and federal level. As of this writing, 19 States have chosen to limit access to DWSRF funds to municipal drinking water companies, thereby denying access to investor owned utilities (IOUs). State-level DWSRF funding is based on a needs assessment of all drinking water utilities (including IOUs). It is conceivable, then, that states denying IOUs access to DWSRF dollars have more money available for municipal systems then they are entitled to based on the funding algorithm. A more important concern, however, is that the funds may in fact be denied to the very systems that need them the most – small IOUs.

touted by the wastewater community on the other side of the pipe. These sources of funds and the incentives they provided played a pivotal role in moving the nation's wastewater industry from primary to secondary treatment. The intent and hope is that the DWSRF funds will have a similar effect for drinking water plants with capacity issues.

A Framework for Analyzing Capacity

Figure 1 is a conceptual model for water system capacity.[11] This model is organized around the three goals of financial capacity, managerial capacity, and technical capacity. Successful systems, as the diagram indicates, are those systems that are able to satisfy each capacity goal singularly and all of the capacity goals in combination.

The conceptual model reveals that each of the three goals is further refined into a set of objectives that are designed to achieve the related goal. For example, the model establishes the linkage among the ownership accountability, staffing and organization, and effective external linkages of a utility as fundamental criteria to having the requisite managerial capacity to provide safe drinking water and quality services to customers.

The conceptual model for drinking water system capacity can be operationalized through specification and definition of a set of indicator variables for each of the objectives. The complete capacity framework is shown in Table 1. The U.S. EPA

[11] U.S. Environmental Protection Agency, *Information for State on Implementing the Capacity Development Provisions of the Safe Drinking Water Act Amendments of 1996* (July 1998), EPA 816-R-98-008, p. 14. The U.S. EPA model shows "Short and Long-term Planning" at the intersection of the technical, managerial, and financial capacity goals. Planning is certainly a key component of achieving and maintaining overall system capacity, but planning (and a variety of other tasks) can be conducted for any element of the model at various increments of time. The amended model presented here suggests that the overall system's capacity exists in the nexus between the technical, managerial, and financial aspects of the utility.

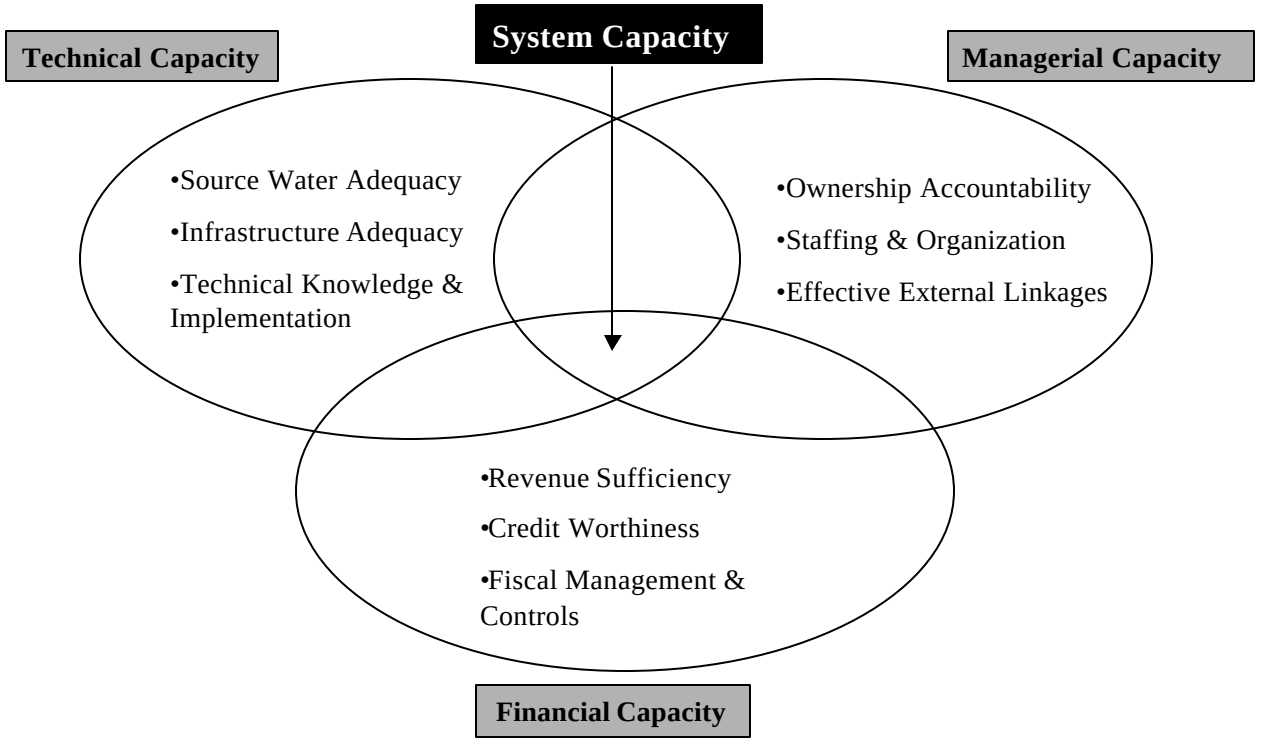

Figure 1: Conceptual model: Technical, managerial, and financial capacity.

Source: EPA 816-R-98-008

TABLE 1
CAPACITY TAXONOMY FOR DRINKING WATER SYSTEMS

GOAL	FINANCIAL CAPACITY			MANAGERIAL CAPACITY			TECHNICAL CAPACITY		
OBJECTIVE	**Revenue Sufficiency**	**Credit Worthiness**	**Fiscal Management & Controls**	**Ownership Accountability**	**Staffing & Organization**	**Effective External Linkages**	**Source Water Adequacy**	**Infrastructure Adequacy**	**Technical Knowledge & Implementation**
INDICATOR	Revenues vs. expenses	Credit rating	Books and records	Ownership identification	Identification of operator/manager	External resources	Source quality	Infrastructure condition	Operator certification
	Rate structure	Access to capital	Budgeting and reporting	Management information systems	Training and education	Intersystem communications	Source protection	Life expectancy	Operation and maintenance program
	Billing and collection	Financial ratios	Accounting practices		Qualified staff	Customer communications	Source reliability	Capital improvement plan	
	Revenue for depreciation and interest	Bonds and assurances	Asset valuation		Appropriate staff	Communication with regulators			
	Cost of service studies	Debt to equity ratio	Capital facilities plan		Procedures and policies				
			Management revenues		Regulatory knowledge				
			Investment strategy						

Source: Author's construct with input from EPA 816-R-98-008.

provides definitions and substantive guidance at each level of the capacity taxonomy.[12] Generally, the set of goals is designed to insure that each system will "achieve and maintain compliance with SDWA requirements."[13] Again, an inherent feature of the capacity concept is that various elements of the framework are related and interdependent, just as they were in the conceptual model. For example, source water quality, protection, and reliability are the primary indicators for the source water adequacy objective for drinking water utilities. Adequate source water is an important component of the larger goal of technical capacity, which further contributes to the overall capacity of the system. The extent to which a utility achieves these goals and objectives and complies with the requirements of SDWA, then, is dependent on the successful synthesis within and between all levels of the framework.

Data Analysis

The NRRI Capacity Database

The NRRI has designed and built a capacity database to further the analysis of state-level rules and regulations for drinking water utilities.[14] The current database includes input provided by 39 state regulatory commissions. The contributors to the NRRI capacity database are shown in Figure 2. The input provided by the commissions was of

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[12] See U.S. Environmental Protection Agency, *Guidance on Implementing the Capacity Development Provision of the Safe Drinking Water Act Amendments of 1996* (July 1998), EPA 816-R-98-006; EPA 816-R-98-008; EPA 816-R-98-009; and *Hypothetical State Programs for Ensuring that All New Community Water Systems and Non-Transient Non-Community Water Systems Demonstrate Technical, Managerial and Financial Capacity* (July 1998), EPA 816-R-98-010 for more specific detail.

[13] EPA 816-R-98-008, p. 9.

[14] The NRRI capacity database was expressly designed for research efforts relating to issues affecting commissions and regulated water utilities. The current design would not limit its extension into other "state-level" analyses that included non-regulated utilities.

four basic types: commissions' water rules, management audits, reports, and tariffs. The data were characterized according to the taxonomy specified in the

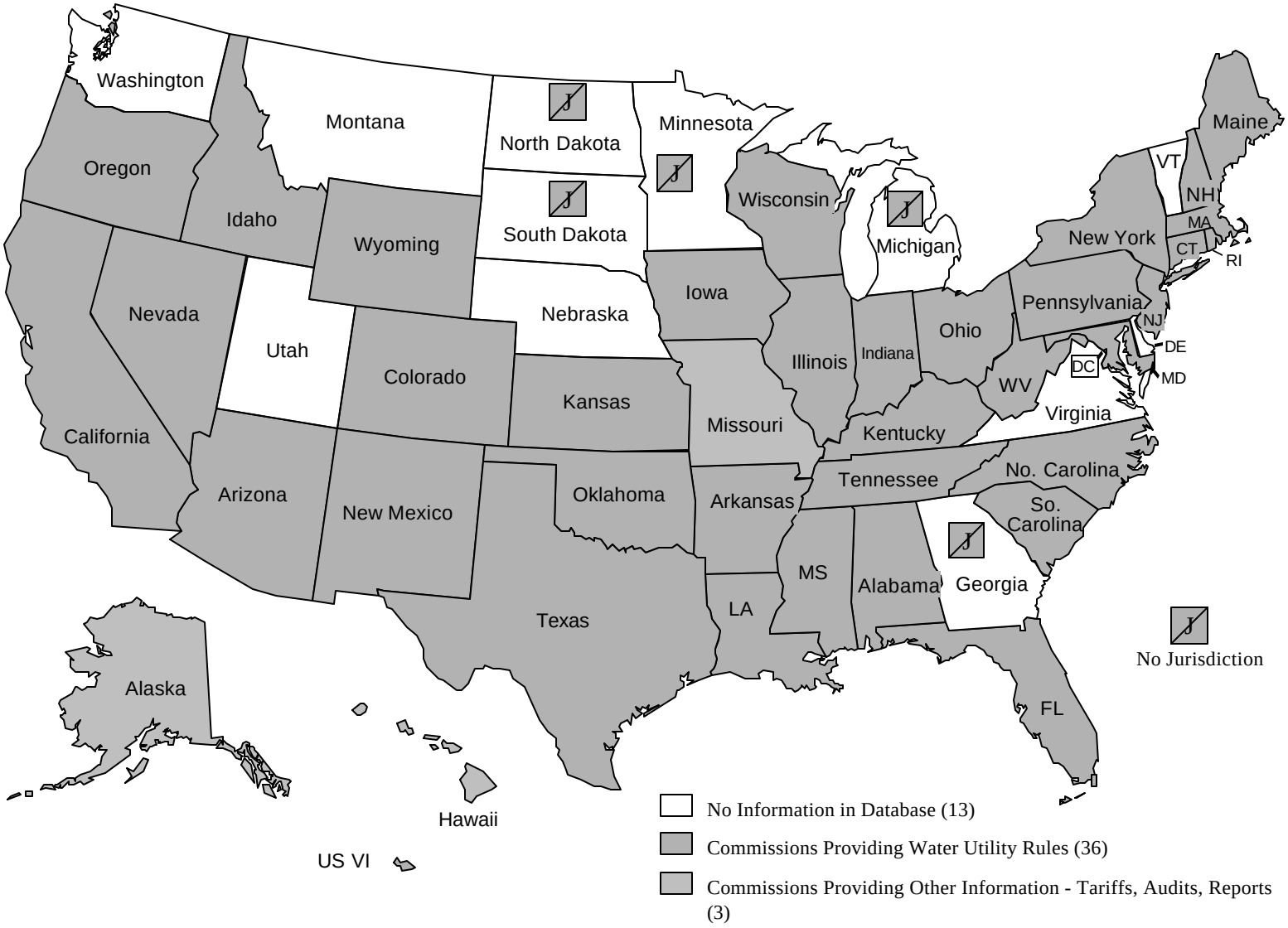

Figure 2: Sources of data for the NRRI capacity database.

capacity framework (Table 1). Classification of the data was achieved at the three levels (goals, objectives, and indicators) of the framework. Analysis was then possible between indicators, and, through aggregation, within and between objectives and goals. It is important to note that the database objectively accounts for each indicator's presence in a specific document only once. Subsequent or repeated occurrences were noted on the document but not incorporated into the database. Additionally, no attempt was made to subjectively judge, weight, or rank the sufficiency or extent to which a specific citation addressed the capacity issue. The database, therefore, reflects an objective breadth of indicator coverage but does not currently project the robustness within any indicator type. Using this scheme, therefore, it is not possible to infer any ordinal rankings or comparisons between state submissions.[15]

Observations

The documentation from the states varied in the amount and type of details present. This is especially evident for the various data sources (rules, audits, reports, and tariffs) that were provided. The most effective method for assuring that the data analyzed were commensurate was to segment the database to allow differentiation by input type. As the set of commission water rules provided by 36 of the 39 states in the NRRI capacity database was the most comprehensive, consistent and comparable, the analysis conducted for this study was limited to the data in the rules. Imposing this criterion established an upper bound of 36 responses for any indicator. The states providing water rules that were included in the database and the analysis are shown in Figure 2.

The overall distribution of capacity indicators observed in commission water rules is shown in Figure 3. Figures 4 through 10 facilitate comparisons involving the objectives and goals level of the framework. Observations from the distribution of the data can be

[15] Additionally, it was not the objective of this study to make between-state comparisons. This comparison is possible in theory, but additional data would be necessary to make the comparison meaningful with respect to the differences that exist between such things as state regulatory climates, economic conditions, political factors, and environmental considerations.

made at the various levels of the capacity taxonomy. This discussion will proceed from the most specific level of the taxonomy, the indicator level, and use this as the foundation upon which to proceed to the second tier of the taxonomy, the objectives level. The analysis will then move upward from the objectives level to the most general tier of the capacity framework, the goals level.

Indicators (Tier One)

Figure 3 facilitates the comparison of indicators across the entire set of responses. This figure contains the most detailed information currently available regarding the extent to which commissions address capacity parameters in their water rules. The capacity variables are organized ordinally within their respective objective categories. The objective clusters are further organized according to their appropriate capacity goal. An analysis of the information at this level of detail reveals that:

- None of the 37 capacity indicators was addressed by all 36 of the commission water rules. The maximum number observed for any indicator (communication with customers) was 32 of the 36 possible observations.

- Approximately 25 percent (9 of 37) of all indicators were accounted for by at least one half of the respondents. These indicators were billing and collections, rate structure, books and records, source water reliability, source water quality, infrastructure condition, operation and maintenance programs, communication with customers, and communication with regulators.

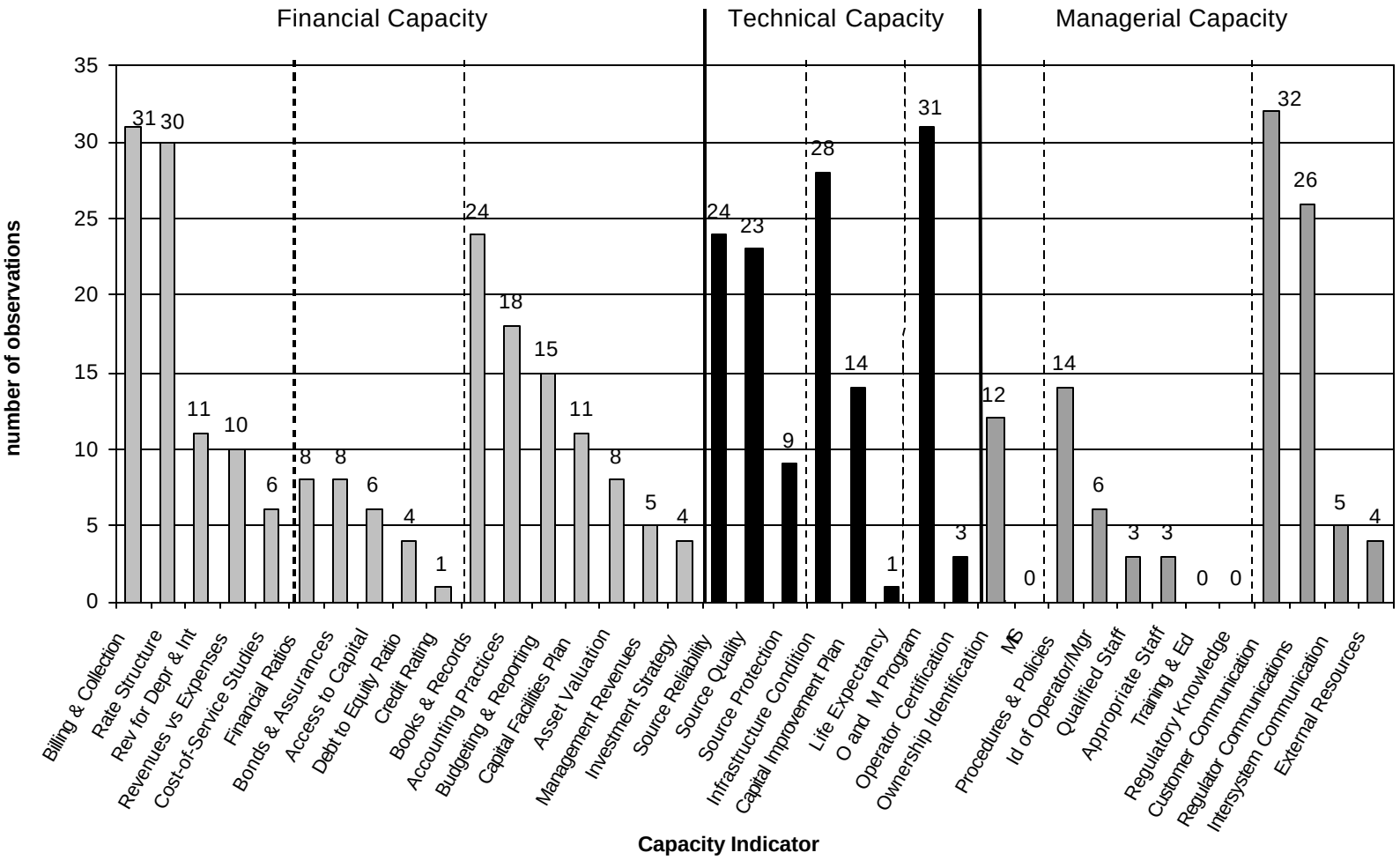

Figure 3: Distribution of capacity indicators observed in commission water rules (n_{max}=36).

- The most frequently observed indicator (32 observations) was for communication with customers. Billing and collections[16] and operation and maintenance programs were next with 31 citations, and rate structure was a close third with 30 observations in the data set.

- Approximately 57 percent (21 of 37) of the indicators were observed 10 times or less; with 3 indicators (management information systems, training and education, and regulatory knowledge) having no observations in the data set.

As previously noted, it is beyond the scope of this study to judge whether or not any set of water rules sufficiently addressed, either singularly or in the aggregate, the capacity requirements mandated by the SDWA. This analysis shows that commission water rules do cover many of the capacity indicators described in the U.S. EPA guidelines. The analysis also highlights the degree to which these indicators are represented in a reasonable sample of water rules. At a minimum, commissions can use this information as a benchmarking tool for evaluating and reviewing their own rules. It could also stimulate consideration of commission responsibilities under the SDWA that are not currently addressed in their rules, practices, policies, or procedures. Of course, rules are not the only indicator of commission authority. A state may have investigatory powers that allow it, after following due process, to find that a remedy is required in one or more aspects of water provisioning that is not necessarily covered by an existing rule. The absence of a specific rule, therefore, does not necessarily mean that a state has not or will not in the future monitor a utility's performance or require a utility to comply with the results of a "capacity" order.

[16] It is worth noting that there is a high degree of correlation between billing and collections and commission requirements for water companies to communicate with customers regarding billing and collections. Additionally, communications with regulators was typically specified as the preferred method of addressing disagreements between customers and the utility regarding billing and collections.

Objectives (Tier Two)

The intermediate tier of the capacity framework is organized around categories of capacity objectives. Figures 4 through 6 facilitate comparisons within and between the nine different objective categories. These figures ordinally relate the number of observations for each indicator within its appropriate category. A further refinement of the data is achieved through normalization. Normalizing the data allows proportional comparisons relative to the number of opportunities for indicators, objectives, or goals to be observed. For example, there are 17 financial capacity indicators versus 8 technical capacity indicators. Therefore, the potential for observing financial capacity is greater than for technical capacity. The figures reveal that:

- At a minimum, some capacity indicators were observed in all of the objective categories of the framework.

- There was significant variation observed in indicator coverage within the objective categories. For example, in the objective category infrastructure adequacy there were 28 observations for infrastructure condition, 14 for capital improvement plans, and only 1 for the life expectancy variable (see Figure 5). Figures 4 to 6 facilitate this form of analysis within objective categories.

- There was significant variation observed in the indicator coverage between objective categories. For example, the objective dealing with effective linkages accounted for 62 percent of the category total (see Figure 9). In this case the ownership accountability category at 22 percent and the staffing and organization category at 16 percent received considerably less attention. Figures 7 to 10 facilitate this form of analysis among objective categories.

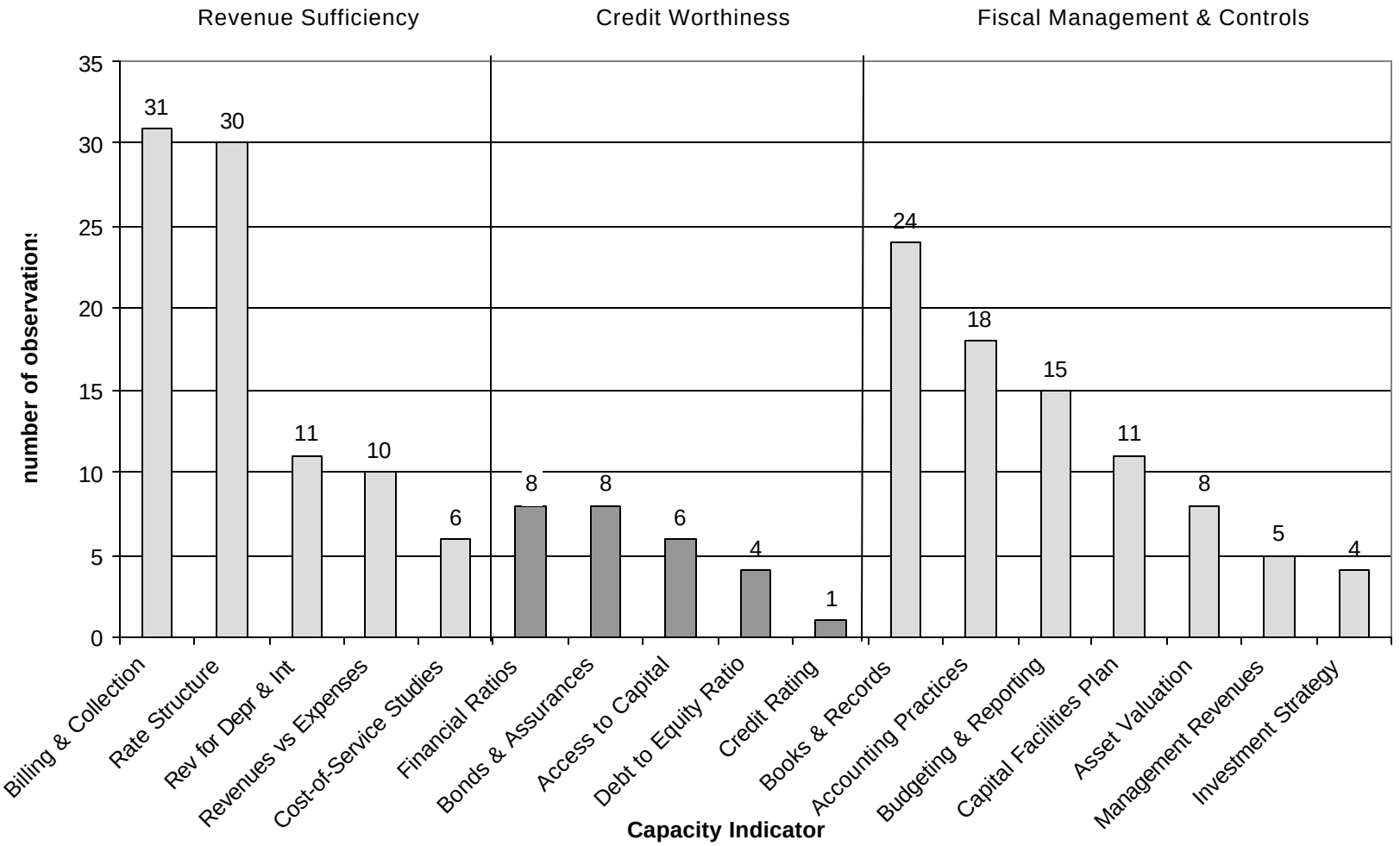

Figure 4: Distribution of financial capacity indicators (n_{max}=36).

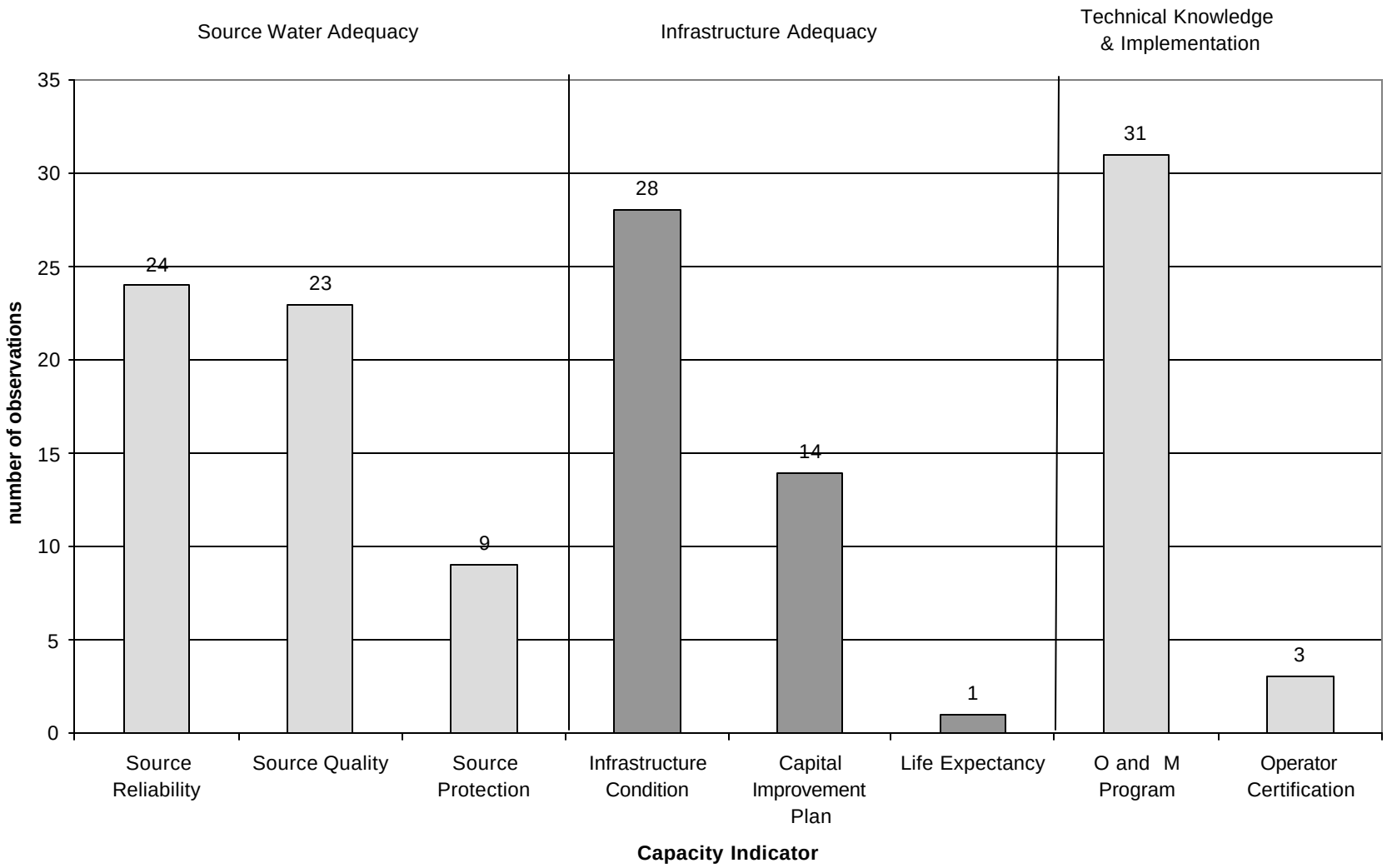

Figure 5: Distribution of technical capacity indicators (n_{max}=36).

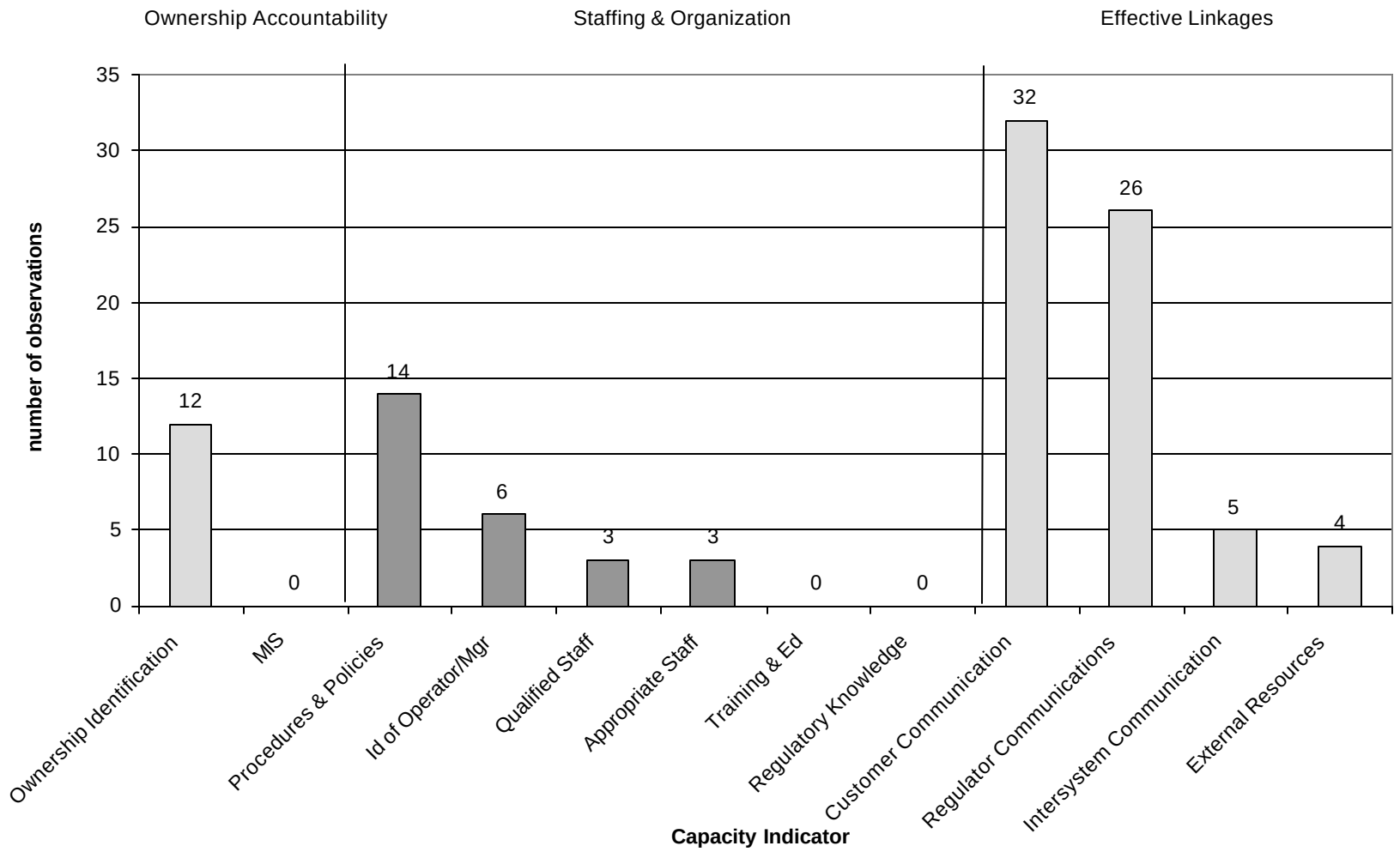

Figure 6: Distribution of management capacity indicators (n_{max}=36).

Goals (Tier Three)

The most aggregated level of analysis conducted in this study occurred at the goal tier of the framework. Again, Figures 7 to 9 can be utilized to compare the relative contribution of each objective within its associated capacity goal, but do not allow comparison between goals. Figure 10 can be used to compare the variation among the three types of capacity goals. The data in Figure 10, like that in Figures 7 to 9, is normalized. These figures indicate that:

- Within the financial capacity goal, Figure 7 shows that there was a distinct proportional emphasis on revenue sufficiency (50 percent) relative to that applied to fiscal management and controls (35 percent) and credit worthiness (15 percent).

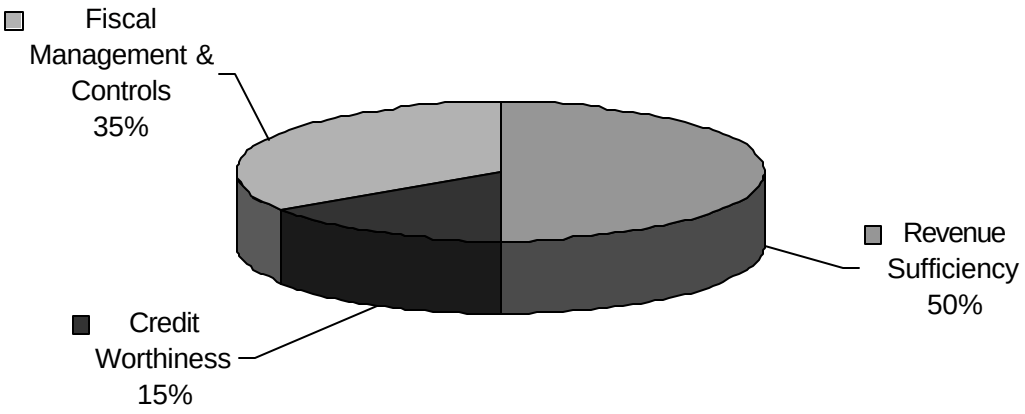

Figure 7: Financial capacity observations.
Proportionally adjusted by category (n_{obs}=200).

- Within the technical capacity goal there was less than 10 percent total variation among all three objective categories. Figure 8 reveals that source water adequacy was the most emphasized at 37 percent, while technical knowledge and implementation at 33 percent and infrastructure adequacy at 29 percent were relatively close.

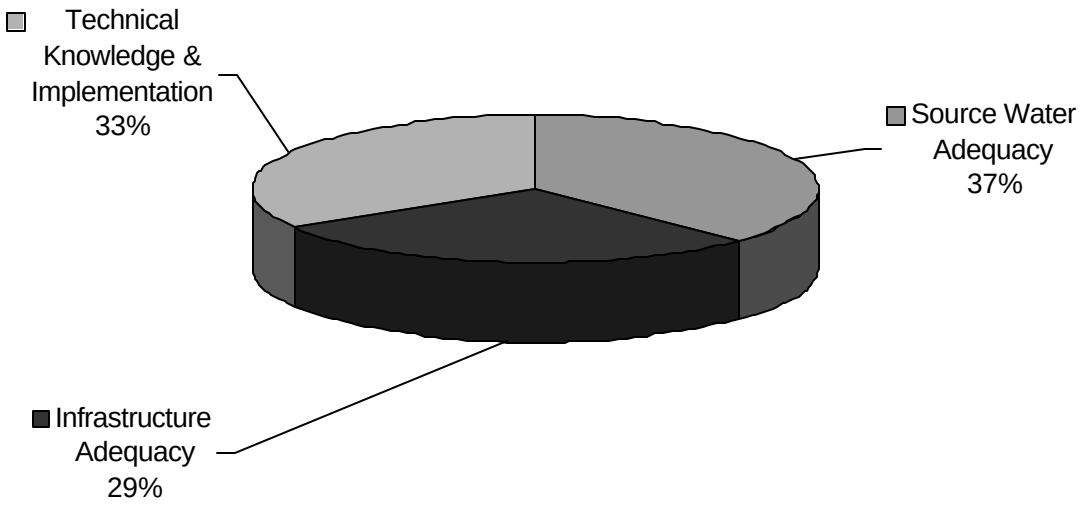

Figure 8: Technical capacity observations.
Proportionally adjusted by category (n_{obs}=133).

- Within the management capacity goal, Figure 9 depicts issues concerning effective linkages (62 percent) dominated those associated with ownership accountability (22 percent) and staffing and organization (16 percent).

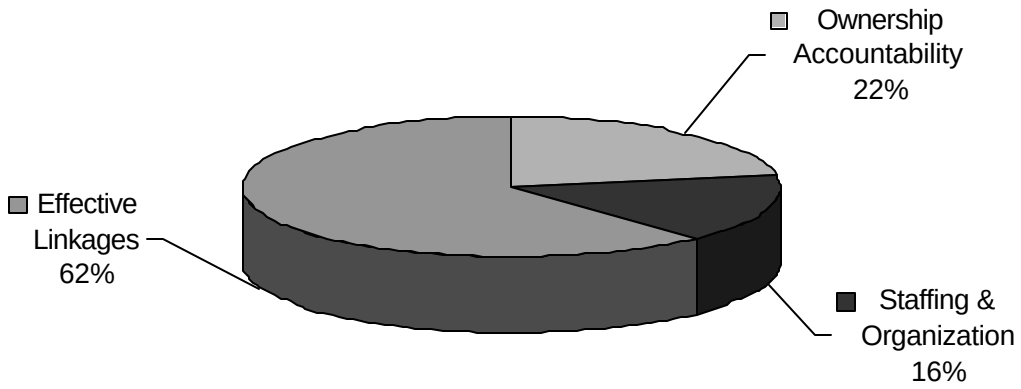

Figure 9: Managerial capacity observations.
Proportionally adjusted by category (n_{obs}=105).

Figure 10 shows that, when normalized, there was a distinct difference in the number of observations for all three capacity goals. However, at the highest level of aggregation, all three of the capacity goals were covered in the commission water rules within an approximate range of each other that varied by less than 20 percent. It is noteworthy that the data suggest commission water rules address technical capacity relatively more than either financial or managerial capacity. This finding is counterintuitive in that the traditional role of commissions has been oriented towards the financial and managerial aspects of a utility— technical aspects of providing safe drinking water have largely fallen under the jurisdiction of state primacy agencies.

One likely reason for this unexpected finding is offered by the specification of the capacity model itself. Some variables may be too closely related to other variables or exist as a subset of another variable in the taxonomy. For example, debt to equity ratios are certainly one type of financial ratios. Maintaining books and records and properly performing budgeting and reporting activities are closely related and can fall under the broader category of acceptable accounting practices. In this example it is foreseeable that five separate indicator variables may be subsumed by one or two variables in the actual rules.

Another feature of the analysis that may explain to the apparent focus on technical capacity in the audited water rules has to do with the depth of coverage provided. For example, a set of commission rules may go into considerable detail regarding billing and collections but only cursorily mention source water quality, protection, and reliability. Since the methodology used in this study would note each indicator once, regardless of differences in depth of coverage, the results would suggest incorrectly that three times more attention was applied to technical capacity than to financial capacity (three source water indicators to one revenue indicator).

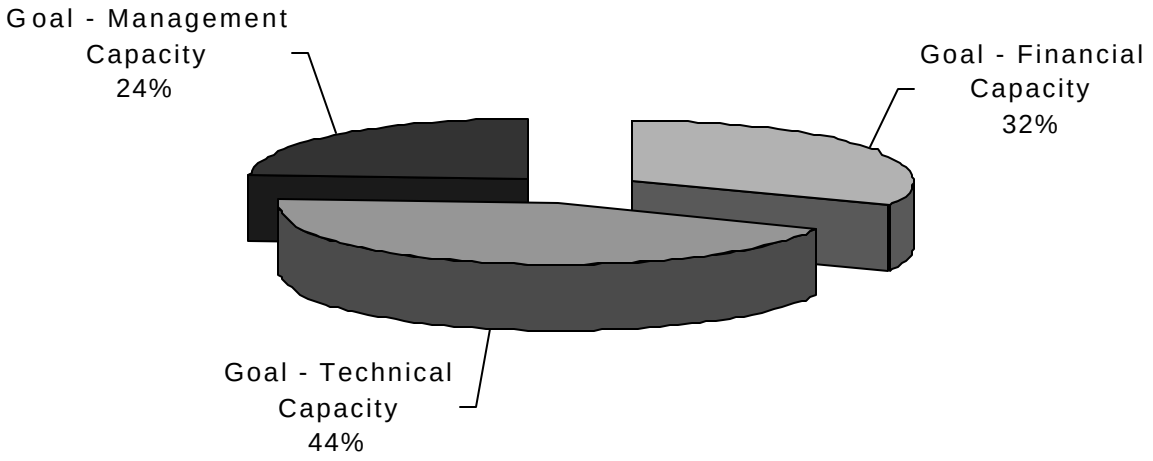

Figure 10: Variation between goals. Proportionally adjusted by capacity goal.

Regardless of inconsistencies in specification of relationships of variables and depth of coverage, the data show that existing commission water rules do cover a wide variety of the capacity indicators, objectives and goals suggested by the U.S. EPA guidelines. There are obviously many possible variations in the ways that successful capacity policies and programs can be constructed from some or all of the variables present in this model and through the addition of other variables that reflect state priorities and goals.

Policy Considerations

The 1996 Amendments to the SDWA have interjected a new policy parameter—capacity and capacity development—into the rules-based orientation of the Act. The intent of this analysis is to offer an objective vehicle for discussing the current status of commission water rules relative to this new set of requirements. It is beyond the scope of this study to determine what constitutes the "right" level or mix of capacity requirements in commission water rules. It is hoped, however, that the data and analysis presented here will facilitate informed discussions in the regulatory community not only about what the current status of capacity in drinking water utilities is but what it ought to be. Table 2 is offered as an example of the types of questions that may be meaningful to regulators as they continue to study and act on the implication of the 1996 Amendments. The table identifies consistently with the framework for analysis developed for this report the questions that regulators may ask themselves when considering the capacity guidelines forwarded by U.S. EPA.

TABLE 2
SALIENT QUESTIONS REGARDING SDWA CAPACITY REQUIREMENTS

LEVEL	QUESTION
Goals	Are all three capacity goals equally important, or are some more important than others?
	Is there an optimum mix or synthesis between and among the goals, and if so, what is it?
	Are all of the important capacity goals present in the conceptual model, and have they been sufficiently operationalized in the capacity framework?
	Is a rules-based approach to drinking water quality that mandates capacity and capacity development more likely to achieve the desired results than alternate regulatory strategies?
Objectives	Are all nine capacity objectives equally important, or are some more important than others?
	Is there an optimum mix or synthesis between and among related capacity objectives, and if so, what is it?
	Are all of the important capacity objectives present in the conceptual model, and have they been sufficiently operationalized in the capacity framework?
Indicators	Are all 37 capacity indicators equally important, or are some more important than others?
	Is there an optimum mix or synthesis between and among related capacity indicators, and if so, what is it?
	Do the indicator variables contained in the operationalized framework constitute a necessary and sufficient set of measures of a drinking water system's capacity or ability to develop capacity?

Source: Author's construct.

Another feature of SDWA that raises policy implications for utilities and regulators stems from the capacity guidelines developed by the U.S. EPA. The guidelines clearly acknowledge the commissions' "basis of authority" for economic regulation of utilities within their jurisdictions.[17] The guidelines also suggest that commissions are the "control points" for ensuring certain elements of a new or proposed drinking water system's capacity development.[18] However, the guidelines present a limited set of responsibility areas for commissions. Under the U.S. EPA construct commissions would serve as control points for insuring capacity development for new water systems in the areas shown in Table 3. Table 3 aligns the relevant elements from the capacity taxonomy (Table 1) with the control point information in order to depict the relationship between the responsibilities assigned to commissions in the U.S. EPA guidelines with those identified in the existing capacity framework.

The juxtaposition of prescribed control points with capacity indicators reveals several anomalies. Perhaps the most interesting is that, whereas commissions are vested with the authority for economic regulation, the U.S. EPA does not identify them as control points for many of the financial indicators in the capacity framework.[19] Additionally, it is not clear where the authority and subsequent control points exist for financial indicators that are not assigned to state commissions, since these relationships are not fully articulated in the U.S. EPA guidelines. Furthermore, a compelling case can be made that commissions are not only responsible for, but have

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[17] U.S. EPA's implementation guidance (EPA 816-R-98-006, p.22-23) identifies the minimum requirements for ensuring that all new community water systems (CWSs) and non-transient non-community water systems (NTNCWSs) demonstrate technical, managerial and financial capacity. Furthermore, States are required to have a "realistic" implementation schedule in place by October 1, 1999.

[18] The current control point discussions are limited to capacity development considerations for new or proposed systems. Control points for existing systems have not yet been forwarded by the U.S. EPA. It is likely, however, that a similar concept will emerge for existing systems in future U.S. EPA guidelines.

[19] The authority of the commissions is, of course, generally limited to privately owned utilities. The U.S. EPA's "control points" do not extend the role or authority of Commissions into nonjurisdictional utilities.

TABLE 3
CONTROL POINTS FOR STATE COMMISSIONS FOR INSURING CAPACITY DEVELOPMENT FOR NEW WATER SYSTEMS

Control Point	Related Indicators	Related Objectives	Related Goals
Certificate of convenience and necessity	None identified	None identified	None identified
Approval of system's investments (rate base)	Rate structure	Revenue sufficiency	Financial
	Investment strategy	Fiscal management and controls	Financial
	Capital improvement plan	Infrastructure adequacy	Technical
Approval of system's financial structure (debt and equity)	Debt to equity ratio	Credit worthiness	Financial
System planning requirements	Capital facilities plan	Fiscal management and controls	Financial

Source: Author's construct based on EPA 816-R-98-008, p. 20-21.

jurisdiction over, many of the other areas captured by indicators that fall under the headings of both technical and managerial capacity. Finally, it is not clear what level and scope of inter-agency communication and coordination need to exist to properly address the variables for which commissions are identified as control points for new systems.

Rather than limiting or encroaching on the traditional role of commissions, the U.S. EPA guidelines may expand commission oversight into new territory. For example, commissions are identified as control points for ensuring technical capacity via assessments of infrastructure adequacy. As indicated in Table 3, the guidelines suggest that commissions through their rate-making activities are control points for monitoring a

utility's capital improvement plans. This raises questions, once more, regarding "control points" and "bases of authority," as to whether this is a piecemeal or a unified approach to assuring capacity development across the entire spectrum of indicators, objectives, and goals. The assumption, once more, appears to be that other state or federal agencies are also involved in the process and responsible for various components of the model. Again, this highlights the need for clarification and communication among commissions and other federal and state agencies responsible for capacity planning.

There are several findings and implications for regulators and regulated utilities that merit attention. First, commissions are viewed as being responsible, as control points, for some (but not all) of the financial capacity indicators specified by the 1996 Amendments. Therefore, commissions may wish to consider exploring the extent to which the prescribed set of financial indicators suggested in the U.S. EPA guidelines meet state needs with respect to new system capacity development.

As specified, commissions are not identified by the U.S. EPA guidelines as having a basis of authority or control point responsibilities for technical capacity and managerial capacity issues for new drinking water systems. The exception to this is with respect to capital improvement plans. Commissions may wish to consider which, if any, of the technical and managerial indicators play an integral role in meeting their traditional responsibilities, which indicators now require attention as mandated by the SDWA, and what level of communication and coordination needs to occur with other agencies on these issues.

Jurisdictional issues, control point issues, and the avenues to communicate and coordinate with other agencies should be explored more fully. These requirements are suggested by the SDWA Amendments, but the mechanisms are not clear. Ultimately, the success of the capacity concept may very well depend as much on successful interagency coordination and communication as it does on the unilateral implementation of assigned tasks.

Within the control point areas assigned to commissions (see Table 3), a review of the water rules categorized in the NRRI capacity database indicates that only the rate

structure variable was addressed in more than 50 percent of commissions' water rules (see Figure 2). It is certainly possible that more general commission rules, policies, and procedures address the financial indicators called for in the guidelines. Commissions may wish to review the completeness of their rules for water utilities in light of the requirements imposed by the 1996 SDWA Amendments and the U.S. EPA guidelines.

Interjurisdictional issues may arise as a result of the capacity concept mandated in the SDWA and outlined in the capacity guidelines from U.S. EPA. The DWSRF is both the reward and the penalty associated with compliance within the new framework. At a minimum, commissions may want to ensure that utilities falling under their jurisdiction have equal access to the funds and receive an equitable portion of the state's overall DWSRF allotment.

Commissions may want to review the capacity indicator taxonomy at all levels. As posed, all indicators are created equal. When customized at the state level, it is unlikely that all of the indicators of system capacity will carry the same level of significance. It is even less likely that there is uniformity among states. Establishing a two-tiered system of indicators is a minimum step towards differentiating between the indicators and what they measure. Commissions should be able to assess which indicators measure necessary and required elements of system capacity at one level. The second level, then, might be used to identify optional measures that are important for some utilities but not necessarily for all.

In summary, commissions may want to customize their own indicator taxonomy using, but not limited by, the information provided by U.S. EPA and this report.
A customized framework might add some indicators not present here, delete others, and provide differentiation with respect to their importance in achieving the goals and objectives identified by the commission. The development and implementation of a uniform state-specific framework and policy for all jurisdictional water utilities might simplify and streamline commission procedures, reduce uncertainty for regulated utilities, improve customer satisfaction, and enhance the provision of safe drinking water. Additionally, future U.S. EPA guidelines are likely to extend the lessons learned in designing and

implementing capacity development programs for new and proposed systems into the arena of existing systems. Commissions may find it useful and productive to communicate their capacity development experiences to state primacy agencies and the U.S. EPA. This communication will serve to better inform the next generation of capacity initiatives.

There are undoubtedly many other questions and policy implications that may arise as a result of the information presented here. At a minimum, it is hoped that this data and analysis will further the discourse and development necessary for commissions to successfully design and implement the requirements for capacity planning and development.

Summary

The 1996 Amendments to the SDWA and the accompanying U.S. EPA guidelines have continued in the tradition of standards and rule-based strategies for regulation. Although not a departure from this scheme, the inclusion of the capacity development requirements in the amended SDWA does extend the influence of the Act into a new domain that proposes to regulate certain technical, managerial, and financial aspects of a utility. The Act imposes new requirements on state primacy agencies and other agencies, including state regulatory commissions. This report has given an overview of the concept of drinking water capacity and capacity development. The U.S. EPA implementation guidelines referenced in this report can be another valuable source of information for commissions on this topic even though the target audience is state primacy agencies.

The SDWA and the U.S. EPA's interpretation and implementation of it are important for reasons extending beyond the direct applicability of the Act. The Act and its implementation address, primarily, the expectations for utilities at the point of the initial service offering. The capacity development objectives are designed to halt the proliferation of service provision by suppliers with doubtful longer-term prospects. This is a laudable goal in itself, and the structure for implementation of the SDWA appears likely to have positive impact on the achievement of that objective. The effort expended in

developing procedures, analytical processes, and expertise to pursue this element of the SDWA vests the regulators with a set of tools that can be useful in analyzing and promoting the capabilities of established utilities in meeting the needs of their customers in the future. State commissions can serve as "control points" for many indicators and at all levels of the capacity framework that are appropriate and consistent with their general regulatory responsibilities. The necessity to communicate and coordinate with other state and federal control point agencies involved in the capacity issue holds the promise of improving operations and performance not only for water utilities but other regulated sectors as well. Using the skills and processes developed to meet the requirements of the SDWA for evaluating jurisdictional utilities at other appropriate junctures would have the advantage of introducing consistent expectations and extending the scope of the capacity monitoring initiative. In addition to introducing measures of the financial, technical, and managerial attributes for jurisdictional utilities, commissions may be able to utilize these skills and procedures to contribute to the evaluation of nonjurisdictional utilities through cooperative agreements with other state, federal, or local authorities. Meeting the criteria promulgated by the SDWA, then, may provide commissions with a foundation for ensuring that regulated water utilities have adequate technical, managerial, and financial capacity and/or are taking steps to develop capacity and the opportunity to leverage this concept into new applications.

It is beyond the scope of this study to determine the appropriateness of the capacity concept as mandated in the SDWA and translated by U.S. EPA. The lack of empirical evidence supporting the causal relationships between any level of the capacity framework and the provision of safe drinking water is an obvious shortcoming. The promulgation of agency rules without scientific or economic validation should raise a red flag for regulators and the regulated community alike. It should also serve as a strong signal for the need for further investigation and future work in this area. There are obvious questions that can and should be raised by commissions as they consider whether the model for capacity development is properly specified for their individual purposes and, to the extent possible, captures the correct capacity variables and their proper interactions. Even though there is

no empirical evidence for the conceptual design forwarded by U.S. EPA or offered here, there is at least an acknowledgment of an intuitive appeal to the concept in general. Another upside is that the requirements for capacity development are not completely codified and that both the legislation and U.S. EPA's guidelines encourage states to customize the framework to suit their specific needs. Hopefully, additional data and analysis will be possible as implementation of the provisions begins to occur. At that point it should become possible to make better judgments regarding the appropriateness of the approach and to refine and improve it as necessary.

APPENDIX A

EXCERPT FROM TEXAS CAPACITY DEVELOPMENT STRATEGY REPORT

Appendix A is an overview of one state-level strategy for developing and implementing a capacity development program. The University of New Mexico Environmental Finance Center assisted the Texas Natural Resource Conservation Commission (TNRCC) with the development of capacity criteria for new systems, existing systems, and systems seeking DWSRF funding. The program includes an implementation plan accompanied by strategies for stakeholder involvement and communications. Texas' approach to capacity development and planning reflects a high degree of integration between the state primacy agency and commission-oriented utility regulation. Water utilities are regulated by the Utility Rates and Services Section of the Water Utilities Division within TNRCC.

TABLE A-1
State of Texas Capacity Framework

System Type	Financial Capacity	Managerial Capacity	Technical Capacity
District	*Annual Financial Report:* Required to file audited financial report; report must certify that water district personnel received training required under the Public Funds Investment Act *Bond Approval:* review and approval before district issues bonds; includes financial review of ability of district to make debt service payments *Certificate of Convenience and Necessity: ONLY if serving in area certified to another system* *TNRCC publications for districts and newsletter* - "Water District Update;" also new district information packets *District Creation Review* to determine if project is feasible, practicable and a benefit to the land in district *Rate Approval/Rate Review:* ONLY if least 10% of rate payers petition TNRCC	*Annual Financial Report Required:* Audit reports must include management letters which may indicate internal control weaknesses; desk review of audit reports may indicate problems *Bond Approval:* review and approval before district issues bonds; review of resolutions of governing board *Consumer Assistance Staff:* records customer complaints and works with utilities and customers to get resolution *TNRCC publications for districts and newsletter* - "Water District Update" *Utility Assistance Team:* provides in-depth management assistance *Management Assistance:* Circuit Rider Program coordinated by Utility Assistance & Certification Team of Water Utilities Division *Small Town Environment Program (STEP):* Program to help communities take charge of their own projects and complete some of the construction using volunteer community labor	*Bond Approval:* review and approval before district issues bonds; engineering review of facilities to be purchased with bond proceeds *Enforcement Activities* against non-compliant systems; systems are notified and remedial efforts are tracked *Microbiological and chemical sampling and analysis results:* reports at various intervals *Operator Certification:* all PWS required to be operated under supervision of certified operator *Sanitary Survey Results:* conducted on annual basis *Surface Water Plant Evaluation* (CPE) to ensure optimal performance *Vulnerability Assessment* to determine risk of groundwater contaminants *Approval of engineering plans and specifications* before construction or improvements on new or existing system *Technical Assistance:* Circuit Rider Program coordinated by Utility Assistance & Certification Team of Water Utilities Division *The Texas Utilities Update:* Newsletter produced semi-annually by consumer and Utilities Assistance Section of Water Utilities Division

TABLE A-1 (Cont.) State of Texas Capacity Framework			
System Type	**Financial Capacity**	**Managerial Capacity**	**Technical Capacity**
Municipality	*Certificate of Convenience and Necessity:* ONLY if serving in area certified to another system *Rate Approval/Rate Review:* ONLY if serving outside city limits and if at least 10% of ratepayers petition TNRCC	*Small Town Environment Program:* Program to help communities take charge of their own projects and complete some of the construction using volunteer labor	*Enforcement Activities* against non-compliant systems; systems are notified and remedial efforts are tracked *Microbiological and chemical sampling and analysis results:* reported at various intervals *Operator Certification:* all PWS required to be operated under supervision of certified operator *Sanitary Survey Results:* conducted on annual basis *Surface Water Plant Evaluation* (CPE) to ensure optimal performance *Approval of engineering plans and specifications* before construction or improvements on new or existing system *Vulnerability Assessment* to determine risk of groundwater contaminants

TABLE A-1 (Cont.) State of Texas Capacity Framework			
System Type	**Financial Capacity**	**Managerial Capacity**	**Technical Capacity**
Investor Owned Utility **(IOU)**	*Annual Report Required* *Certificate of Convenience and Necessity required, both inside and outside city limits;* approval to obtain, amend, cancel or transfer a CCN. Approval may involve review of debt/equity, ability to provide continuous service, feasibility of obtaining service from another utility. *Tariff required outside city limit, and inside if city does not require its own:* includes service rate schedule, service rules, extension policy and emergency water ration plan; Commission must approve tariff *Approval* required for proposed sale, transfer, merger or lease of system *Rate Approval/Rate Review:* required to obtain approval before changing rates; review process includes site visit to inspect record keeping procedures, billing and collection (Non-profit homeowners' associations also required to file Rate Change Application)	*Utility Assistance Team:* provides in-depth management assistance *Consumer Assistance Staff:* records customer complaints and works with utilities and customers to get resolution	*Enforcement Action* against non-compliant systems; systems are notified and remedial efforts are tracked *Microbiological and chemical sampling and analysis results:* reported at various intervals *Operator Certification:* all PWS required to be operated under supervision of certified operator *Sanitary Survey Results:* conducted on annual basis *Surface Water Plant Evaluation* (CPE) to ensure optimal performance *Approval of engineering plans and specifications* before construction or improvements on new or existing system *Vulnerability Assessment* to determine risk of groundwater contaminants *Technical Assistance:* Circuit Rider Program coordinated by Utility Assistance & Certification Team of Water Utilities Division *Rate Approval/Rate Review:* required to obtain approval before changing rates; review considers technical aspects of system, including compliance record

TABLE A-1 (Cont.) State of Texas Capacity Framework			
System Type	**Financial Capacity**	**Managerial Capacity**	**Technical Capacity**
Water Supply Corporation **(WSO)**	*Certificate of Convenience and Necessity required:* approval to obtain, amend, cancel or transfer a CCN. Approval may involve review of debt/equity, ability to provide continuous service, feasibility of obtaining service from another utility Review before granting of transferring CCN. This may involve review of debt/equity, ability to provide continuous service, feasibility of obtaining service from another utility *Required to file Tariff:* includes service rate schedule, service rules, extension policy and emergency water ration plan; tariffs are for information purposes only - TNRCC does not have approval authority over rates *TNRCC Publication*	*Utility Assistance Team:* provides in-depth management assistance *Small Town Environment Program (STEP):* Program to help communities to take charge of their own projects and complete some of the construction using volunteer community labor *TNRCC Publications* *Consumer Assistance Staff:* records customer complaints and works with utilities and customers to get resolution	*Enforcement Action* against non-compliant systems; systems are notified and remedial efforts are tracked *Microbiological and chemical sampling and analysis results:* reported at various intervals *Operator Certification:* all PWS required to be operated under supervision of certified operator *Sanitary Survey Results:* conducted on annual basis *Surface Water Plant Evaluation* (CPE) to ensure optimal performance *Approval of engineering plans and specifications* before construction or improvements on new or existing system *Vulnerability Assessment* to determine risk of groundwater contaminants *Technical Assistance:* Circuit Rider Program coordinated by Utility Assistance & Certification Team of Water Utilities Division
Others Border Counties	*Certificate of Convenience and Necessity required:* approval to obtain, amend, cancel or transfer a CCN. Approval may involve review of debt/equity, ability to provide continuous service, feasibility of obtaining service from another utility	*Small Town Environment Program (STEP)*	

Source: The University of New Mexico Environmental Finance Center, *Capacity Development Strategy Report,* for the Texas Natural Resource Conservation Commission (August 29, 1997).

APPENDIX B

STATE OF CALIFORNIA CAPACITY CRITERIA

Appendix B exemplifies a state-level strategy for developing and implementing a capacity development program. The State of California Department of Health Services, Division of Drinking Water and Environmental Management has developed a set of documents detailing the technical, managerial, and financial (TMF) capacity criteria for community water systems and non-community water systems (transient and non-transient).

The California TMF program reflects a three-tiered capacity framework comprised of mandatory, necessary, and recommended indicators. Reporting requirements vary by indicator, system type, change in ownership status, and DWSRF activity. The guidelines identify the specific documentation that must be submitted as part of the TMF review. They also list the evaluation criteria that will be considered by the agency responsible for assessing the individual TMF capacity indicator. Noteworthy among these is the requirement that, for investor owned systems, the California Public Utilities Commission's review of the budget plan will be required to assess the "budget projection" indicator under financial capacity.

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