TEXAS CENTER
FOR POLICY STUDIES

WATER FOR STEAM ELECTRIC POWER GENERATION:

PLANNING OR PIE IN THE SKY?

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EXECUTIVE SUMMARY

The Texas Water Plan projections for steam electric power generation (SEPG) provide a stark example of how the planning process often fails to live up to its potential to guide the state to a sustainable water future.

This report shows that the regions often ignored reasonable guidance from the TWDB that would have resulted in substantially lower projected SEPG demand, and thus total projected demands for water, over the 50-year planning horizon. Instead, many of the regional planning groups have included unsubstantiated projections for future water demand by steam electric plants. More troubling, TWDB has failed to push back against these inappropriate projections and failed to adopt rules that would direct the regions to substantiate the SEPG water demand. Finally, the process for developing SEPG water demand projections is essentially disconnected from the reality of how many new power plants Texas might actually need or expect over the next 50 years *and* where those plants *should* be located from an available water supply perspective.

Introduction

According to the 2012 State Water Plan, SEPG water use in 2010 made up less than 4% of total state water use. The 2012 plan projects that SEPG will make up about 7.5% of total water demand in 2060, increasing from 730,000 acre-feet in 2010 to 1,620,000 acre-feet in 2060.

This additional 890,000 acre-feet of water, however, accounts for over 10% of the total of 8,325,000 acre-feet of additional statewide need projected for 2060. It could be a substantial contribution to the $53 billion dollar price tag of the plan.

Part of the problems with these projections is the starting point. The 2012 plan projected a demand of 730,000 acre-feet in 2010, yet actual figures were 449,000 in 2010 and 482,000 in 2011.

Moreover, for the next round of planning, TWDB has provided estimated projections for SEPG use that adopt and, in some case, increase the 2012 plan's projections when all indications are that the projections should be far less. For example, TWDB now projects 2020 statewide SEPG demand at 1,010,000 acre-feet, more than double the 482,000 acre-feet of water TWDB says was used for SEPG in 2011, which was a very hot, dry, high use year. With the boom in natural gas and renewable energy, and with the few new coal, gas or nuclear plants now being proposed to be in operation in Texas in the next 7 years, one can reasonably question whether these projections reflect on the ground reality. The exercise in projecting needs appears to be based on outdated assumptions about what type and where new electric generating plants will be built in Texas and significant errors in projection methodology.

As a 2008 report from the Bureau of Economic Geology (BEG) pointed out, past water plan projections for SEPG use, upon which most of the current projections are based, have been significantly overstated in most basins. The BEG reports explains that the projections in the 2006 state plan were too high because they were based on a 2003 report which has a major error.

There is one major factor that describes why the previous steam-electric demand is much higher than the [BEG] estimate in Table 3.4. This discrepancy is based upon using too large of an average water consumption rate for existing steam-electric power plants.
See BEG report at page 59.

Comparing projections and actual use (Figure 1) over the last 15 years shows the extent to which the planning process has over-estimated demands for this sector.

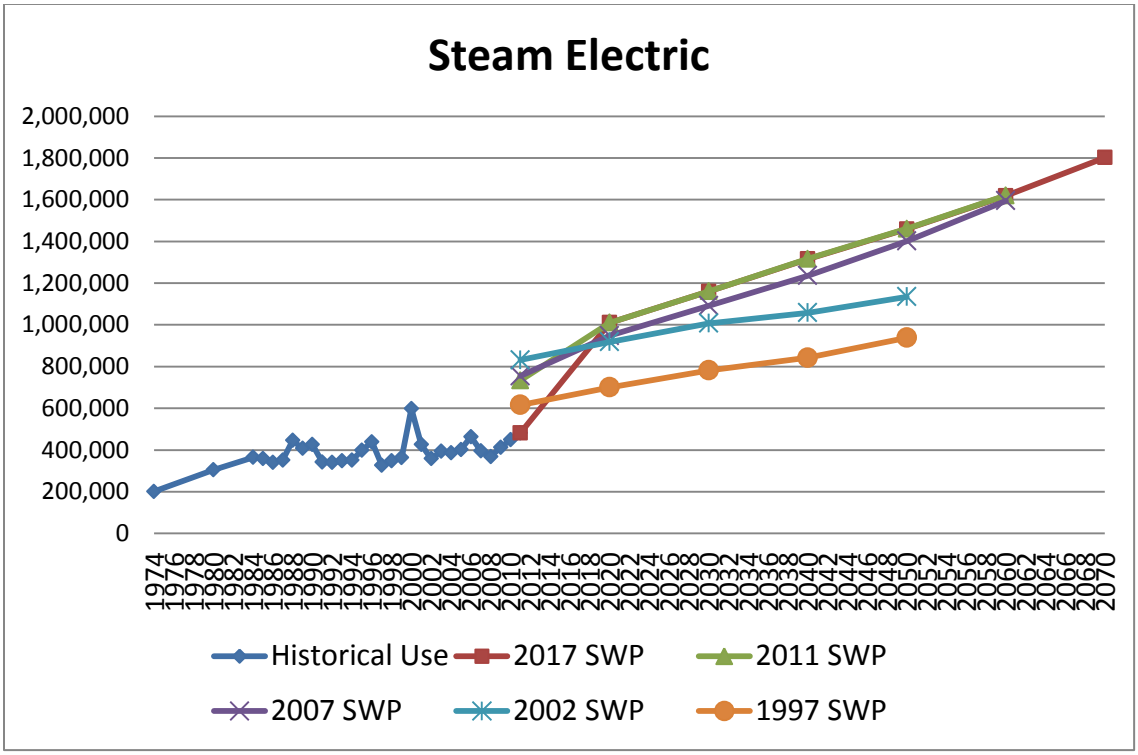

Figure 1. Historical and projected SEPG water demand (acre-feet)

History of SEPG Water Demand Projections

A look at the history of how SEPG demand projections were developed provides some insight into how this situation arose. As shown above, SEPG projected demand increased substantially between the 2002 and 2007 state water plans after 2030. This increase appears to be tied to a 2003 report prepared by a group of investor-owned electric power utilities which predicts that water demand for SEPG will be higher than projected in the 2002 water plan after 2030. See Appendix D of "Power Generation Water Use in Texas for the years 2000 through 2060," by Representatives of Investor-Owned Utility Companies of Texas, 2003.[1]

This report had three scenarios for projected SEPG demand: high, medium and low. The SEPG projections in the 2007 state plan generally track the medium range scenario, which is what this report recommended.

[1] http://www.twdb.texas.gov/publications/reports/contracted_reports/doc/2001483396.pdf .

For development of the 2012 state water plan, TWDB provided the regional groups with the 2008 BEG report, "Water Demand Projections for Power Generation in Texas, mentioned above.

This report projected SEPG water demands for eight different scenarios, for each region and for each decade. Under the BEG's analysis, any of its scenarios, except the very highest demand scenario for the year 2060, resulted in lower projected demands for SEPG than in the 2012 regional and state plans. The BEG's highest demand scenario projected use of 1.6 million acre-feet for 2060, but this was the only year that BEG's projections were higher than the 2012 projections. As shown in Figure 2, BEG's other projections are all lower, and the low scenarios ranged from 800,000 to 900,000 acre-feet for 2060.

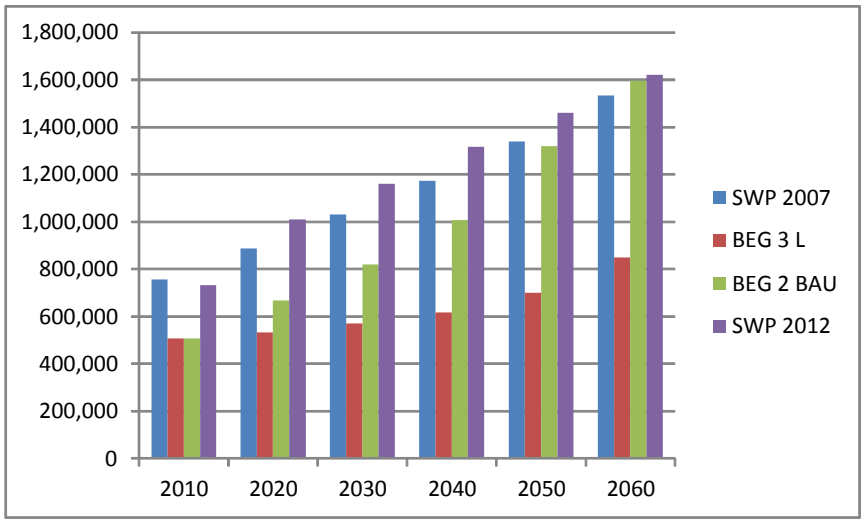

Figure 2. BEG 3L is the BEG report's lowest demand scenario, while BEG 2 BAU is the highest demand scenario.

If the 2030 demand figures are compared, the total demand in the 2012 state plan is over 1,000,000 acre-fee. That is also true for the 2007. The highest demand scenario projected by BEG projected is 820,000 acre-feet/year. The low demand figure for 2030 is 570,000 acre-feet/yr.

It is important to note also that BEG's highest demand scenario is based on a number of factors that, taken together, would not appear to reflect current or likely future reality, including:

1) Texas continues business as usual for power generation and does not put in place any measures to significantly reduce electricity consumption,

2) new and existing power plants do not adopt the type of more efficient new technologies for cooling ,

3) natural gas prices go much higher than they are now compared to other fuels *and coal again is the major source of new SEPG, and*

4) carbon dioxide capture is required for power plants

Despite the availability of these BEG projections in 2008, most regional plans developed for the 2012 state plan started with the figures from the 2007 plan and in many cases increased the demands, rather taking the lower BEG numbers for the highest use scenario.[2]

The projections for Region C, shown in Figure 3, illustrate the variability in the use figures and provide a good example of the high projections for SEPG demand in the 2012 plan:

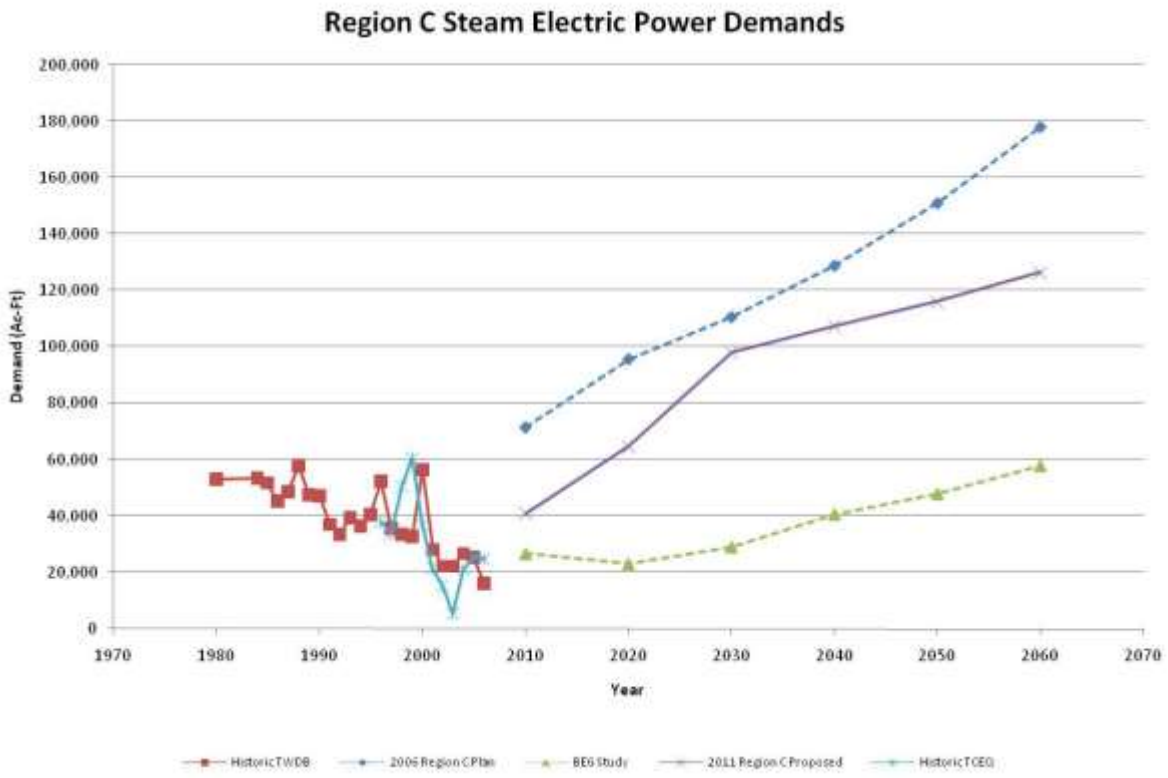

Figure 3. Region C Steam Electric Actual Use and Projected Demands

The BEG figures in Figure 3 are for its highest demand scenario.

SEPG Projections for Demands for the 2016/2017 Plan

Unfortunately, TWDB has adopted the high SEPG demands from the 2011/2012 regional and state plan as the starting point for the 2016/2017 planning process.

Region G [3]provides one example of why this approach is a significant problem, The 2011 Region G plan (developed for the 2012 state plan), projected a need for more than 145,000 acre-feet of new water for SEPG in the region. It projects an increase in SEPG annual demand from about 170,000 acre-feet in 2010 to about 315,000 acre-feet in 2060. That is approximately 40% of the 370,000 acre-feet of water

[2] For an evaluation of the water use at specific coal-fired power plants in Texas, see Water for Coal-Fired Power Generation in Texas: Current and Future Demands.

[3] All regional plans can be found at http://www.twdb.texas.gov/waterplanning/rwp/plans/2011/index.asp.

projected for new demands for all water uses for 2060 in Region G. For 2030, the Region G plan projected a demand of 254,000 acre-feet for SEPG, compared to the BEG low scenario of 141,000 acre-feet and a high scenario of just 219,000 acre-feet that year.

Among the reasons that the 2030 and 2060 demand projections are high is the inclusion of a new power plant in Nolan County. In fact, the Region G plan included a proposal for the Cedar Ridge reservoir in the Brazos River Basin to supply 20,000 acre-feet per year of water for that power plant by 2020.

The new steam electric power plant at the time of the 2011 regional plan was one proposed by Tenaska. In its comments on the draft 2011 region G plan, Tenaska stated:

> Current design … calls for the use or air cooled condenser technology with an anticipated maximum water demand of 2000 acre-feet/year. However, the … design could shift to a more efficient and less expensive wet cooling if sufficient water supply can be secured …. Under the wet cooling case, water usage on the order of 12,000 acre-feet/year would be anticipated. Although Tenaska currently has no plans to expand…[it] might expand at some point…. Consequently the 20,000 acre-feet/year earmarked for steam-electric demand in Nolan County … seems reasonable. (Appendix Q to Region G plan, Attachment D.)

Tenaska subsequently announced that it was abandoning its proposed plant in Nolan County.

Thus, the Region G's projected demand for this power plant was at a minimum very conservative, at ten times what a dry cooling plant would have required. It is hard to see how 20,000 acre feet was t was justified.

Worse, however, TWDB has recommended that the region the water demand figure that includes this Nolan County demand in the current round of planning, despite the Tenaska cancellation Under TWDB rules and guidance, Region G can now retain that 20,000 acre-foot projected demand, despite Tenaska's announcement, and without providing any justification for the 20,000 acre-feet.

TWDB rules only require a justification for a new project, one that has *not been included* in the projected demand figures that TWDB provide to the region. If the local sponsor still hopes to build this reservoir and attract some new water user, there will not likely be any pressure from TWDB to drop this 20,000 demand as no longer justified.

TWDB Rules and Guidance for SEPG projections

The high demand projections for SEPG are not just a result of desires of regional planning groups or utilities for significant expansion of SEPG or some other such incentives. They also result from a failure of the TWDB to provide a reasonable set of rules or guidelines to regional groups to require or even encourage a serious evaluation of projected water demands for SEPG. The fact that many regional planning groups simply adopted or raised their 2006 projections for their 2011 plans despite the BEG finding of significant errors, suggests the rules and guidance did nothing to bring projections back to reality for the 2011-12 planning process. They will not likely do so for the 2016 planning either.

The TWDB rules and guidance for the 2006 and 2011 rounds of regional planning did not require the regional groups to justify their projected water demands or proposed new SEPG capacity.[4]

While the TWDB guidelines for the 2016 have some good language that might suggest a harder look at projections is needed, the rules and guidelines for the 2016-17 planning process are not likely to help, especially since TWDB essentially recommended using the 2012 projections as the starting point for this next round of planning.

The agency's new guidance[5] provides some indication that TWDB understands that projections should be based on reality, not dreams. It requires that the regions desiring to increase projected demands above those provided by the board provide:

> *Documentation of plans for an industrial facility [including a steam electric power plant] to locate in a county at some future date will include the following data:*
>
> > *a. Confirmation of land purchased for the facility or lease arrangements for the facility….*
> >
> > *c. The proposed construction schedule for the facility including the date the facility will become operational ….*

The guidance does not, however, require such information from any regional planning groups that is satisfied with the figures TWDB provides as the start of the planning process. In this case, TWDB basically provided the 2012 projections. No justification is required for those figures. Thus, the errors in the 2006 regional plans that were identified in 2008 by the BEG, but nevertheless carried over to the 2011 regional plans, can just continue to be ignored in the 2016 regional plans.

In fact, even if the PUC or the electric power industry were to conclude that the entire state needs only eight new power plants, TWDB would apparently accept sixteen, or even more, if each of the sixteen regional planning groups projected at least one new steam electric power plant in its region. There is no effort to bring the planning process for SEPG back to reality.

Moreover, neither TWDB's rules or guidance create any incentives for regional planning groups to consider or move toward better conservation of water in the steam electric power sector.

Continued reliance on the unsubstantiated and over-projected SEPG demands in the 2012 plans distorts the Texas demand/supply gap and undermines the credibility of the state plan. It will likely continue to lead to proposals for unneeded reservoirs or other costly water strategies.

A Quick Look at Supplies

Interestingly, in its 2003 report on water demands for SEPG, the representatives of the investor-owned utility companies provide an analysis of the existing supplies. Even with the erroneous and inflated demand projections in that report, the report still predicts that total existing supplies for SEPG will

[4] See Appendix A for a more detailed discussion of the TWDB rules and guidelines.

[5] Section 2.3 page 12 of TWDB First Amended General Guidelines for Regional Water Plan Development*:* for the 2016-17 planning process (see Appendix A)

exceed all of the demands for SEPG until 2037. That is also true for the SEPG demands in the 2012 state water plan although total demands are expected to exceed supplies a few years earlier.

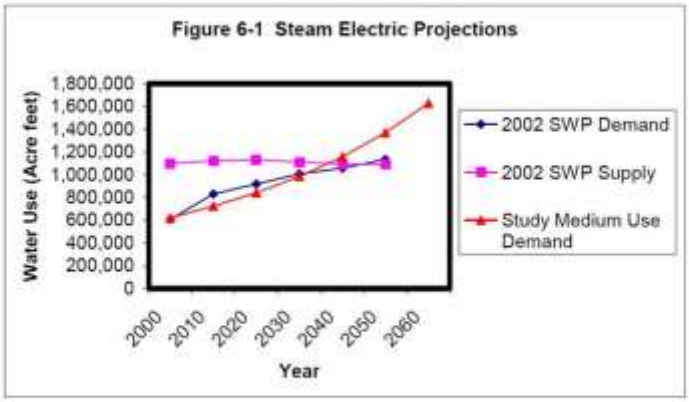

Figure 4. Supply v Demand for SEPG; from 2003 Utility Report

As shown in Figure 4, for the next 15 to 20 years, significantly longer using BEG projections, all new SEPG demands could be met with existing supplies, if new plants were located where the water is available. Such planning and siting, however, is not what Texas has historically done as part of its water or other economic development planning.

Texas is missing opportunities to reduce demands for water and, thus, reduce the price tag of water for the future. More discussion of the supply side of the water planning process will be provided in a future TCPS paper.

Appendix A: TWDB Water Planning Rules and Guidance related to Steam Electric Power Generation

I. Rules and Guidance for the 2011 Regional Planning Process and 2012 State Water Plan:

A. TWDB Rules

§357.7. Regional Water Plan Development.

(a) Regional water plan development shall include the following. . . .

(2) . . . current and **projected … water demands**. Results shall be reported:

(A) by . . .

(iv) categories of water use (including …s**team electric power generation . . .**) for each county or portion of a county in the regional water planning area. If a county or portion of a county is in more than one river basin, data shall be reported for each river basin;

(B) for each wholesale water provider by category of water use (municipal . . . **steam electric power generation . . .)** for each county or portion …**.** The wholesale water provider's current contractual obligations to supply water must be reported in addition to any demands projected for the wholesale water provider;

(3) evaluation of adequacy of current water supplies legally and physically available to the regional water planning area for use during drought of record. The term "current" means water supply available at the beginning of this task . . . . Results of evaluations shall be reported:

(A) by . . .

(iv) categories of water use (including . . . **steam electric power generation** . . . .

(B) for each wholesale water provider by category of water use . . . .

(4) water supply and demand analysis comparing:

(A) water demands as developed in paragraph (2)(A) of this subsection with current water supplies available to the regional water planning area as developed in paragraph (3)(A) of this subsection to determine if the water users identified in paragraph (2)(A) of this subsection in the regional water planning area will experience a surplus of supply or a need for additional supplies. … Other results shall be reported by . . . categories of water use (including . . . **steam electric power generation** . . .) for each county or portion of a county in . . . .

(5) using the water supply needs identified in paragraph (4) of this subsection, water management strategies to be used during the drought of record to provide sufficient water supply to meet the needs identified in paragraph (4) of this subsection as follows:

(A) Water management strategies shall be developed for . . . categories of water use (. . . **steam electric power generation**,) for each county or portion . . . .

Thus, there were no requirements that projected water demands be justified as reasonable demands. There were no requirements for how a regional planning group develops reasonable projections for demands.

B. TWDB's General Guidelines for 2011 Regional Water Plan Development

2.0 Population and Water Demand Projections

Water Demand Projections

…. Entities may also request changes to water demand projections for other water user groups, including irrigation, livestock, and manufacturing, assuming they provide verifiable supporting data and documentation to their respective planning group and the TWDB. **The TWDB is currently engaged in a study with the Bureau of Economic Geology at the University of Texas at Austin to revise and/or verify steam-electric water demands for each planning region. Results of this study should be available by September of 2008; at which time, the TWDB will disseminate results to each planning group for review and comment.**

(Emphasis added.)

II. Rules and Guidance for the 2016 Regional Planning Process and 2017 State Water Plan:

A. TWDB Rules

31 TAC §357.31: Projected Population and Water Demands

(a) RWPs shall present projected . . . water demands by WUG[6] . . . .

[6] **Water User Group (WUG)**--Identified user or group of users for which water demands and water supplies have been identified and analyzed and plans developed to meet water needs. These include:

(A) Incorporated Census places of a population greater than 500, including select Census Designated Places, such as significant military bases or cases in which the Census Designated Place is the only Census place in the county;

(B) Retail public utilities providing more than 280 acre-feet per year for municipal use;

(C) Collective Reporting Units, or groups of retail public utilities that have a common association;

(D) Municipal and domestic water use, referred to as county-other, not included in subparagraphs (A) - (C) of this paragraph; and

(E) Non-municipal water use including manufacturing, irrigation, **steam electric power generation**, mining, and livestock watering for each county or portion of a county in a RWPA.

(b) RWPs shall present projected water demands associated with WWPs[7] by category of water use, including municipal, manufacturing, irrigation, **steam electric power generation**, mining, and livestock for each county or portion of a county in the RWPA . . . .

(c) RWPs shall report the current contractual obligations of WUG and WWPs to supply water in addition to any demands projected for the WUG or WWP. Information regarding obligations to supply water to other users must also be incorporated into the water supply analysis in §357.32 of this title (relating to Water Supply Analysis) in order to determine net existing water supplies available for each WUG's own use. . . .

(f) … water demand projections shall be presented for each planning decade for each of the above reporting categories.

B. TWDB's First Amended General Guidelines for 2016 Regional Water Plan Development

2.0 . . . Water Demand Projections. . . .

Draft non-population related water demand projections (e.g. mining, . . . steam-electric power, and livestock) were made available for review and comment by RWPGs in late 2011.

TWDB staff, in conjunction with . . . (TCEQ) . . . (TPWD), and . . . (TDA) will prepare draft . . . water demand projections for all water demands including . . . steam-electric power . . . . TWDB staff will update … water demand projections for all associated Water User Groups (WUGs) and provide these draft projections to RWPGs for their review and input . . . . TWDB will directly populate the Regional Water Planning Application (DB17) with all WUG-level draft projections and make related changes to DB17 if adjustments are approved by the TWDB.

The TWDB will consider requests for changes to draft population and draft water demand projections if warranted. Entities wishing to adjust draft projections shall address their requests through their respective RWPG. If the RWPG concurs, it will submit a request to the EA of the TWDB for consideration.

(Emphasis added.)

2.3 Industrial (Manufacturing, Steam-Electric, Mining . . .) Water Demand Projections Industrial Water Use:

[7] **Wholesale Water Provider (WWP)--**Any person or entity, including river authorities and irrigation districts, that has contracts to sell more than 1,000 acre-feet of water wholesale in any one year during the five years immediately preceding the adoption of the last regional water plan. The regional water planning groups shall include as wholesale water providers other persons and entities that enter or that the regional water planning group expects or recommends to enter contracts to sell more than 1,000 acre-feet of water wholesale during the period covered by the plan.

Industrial water use is defined as water used in the production process of manufactured products, steam-electric power generation, and mining activities, including water used by employees for drinking and sanitation purposes.

Criteria: One or more of the following criteria must be verified by RWPG and the EA for consideration of revising the industrial water use projections:

a. An industrial facility which has recently located in a county and may not have been included in the Board's database. Documentation and analysis must be provided that justify that the new industrial facility will increase the future industrial water use for the county above the industrial water use projections. Exhibit C, Page 12,

b. An industrial facility has recently closed its operation in a county.

c. Plans for the construction of an industrial facility in a county at some future date.

Data Requirements: The RWPG must provide the following data associated with the identified criteria for justifying any adjustments to the industrial water use projections.

1. The quantity of water used on an annual basis by an industrial facility that has recently located in a county and was not included in the Board's database.

2. The North American Industrial Classification (NAIC) of the industrial facility that has recently located in a county. The NAIC is the numerical code for identifying the classification of establishments by type of activity in which they are engaged as defined by the U.S. Office of Management and Budget and is a successor of the Standard Industrial Classification (SIC).

3. Documentation of plans for an industrial facility to locate in a county at some future date will include the following data:

a. Confirmation of land purchased for the facility or lease arrangements for the facility.

b. The quantity of water required by the planned facility on an annual basis.

c. The proposed construction schedule for the facility including the date the facility will become operational.

d. The NAIC for the planned facility.

(Emphasis added.)