

# Chapter 8

Reduce Water Demand – Increase  
Water Use Efficiency



## Table of Contents

---

<b>8.1</b>	<b>Agricultural Water Use Efficiency.....</b>	<b>8-4</b>
8.1.1	Findings and Recommendations .....	8-5
8.1.1.1	Findings .....	8-5
8.1.1.2	Recommendations .....	8-8
8.1.2	Imperial Region Conditions .....	8-8
8.1.2.1	IID/MWD 1988 Water Conservation Program .....	8-9
8.1.2.2	Quantification Settlement Agreement Water Conservation Program .....	8-11
8.1.2.3	Fallowing .....	8-14
8.1.3	Opportunities .....	8-18
8.1.3.1	System Efficiency Conservation Opportunities .....	8-19
8.1.3.2	On-Farm Efficiency Conservation Opportunities.....	8-20
8.1.3.3	Temporary, Voluntary Fallowing .....	8-21
8.1.3.4	Fallowing, Crop Selection and Yield Reduction .....	8-21
8.1.4	Constraints .....	8-21
8.1.5	Relation to Other Strategies.....	8-22
8.1.6	Support for Adapting to Climate Change .....	8-23
<b>8.2</b>	<b>Renewable Energy Water Use Efficiency .....</b>	<b>8-23</b>
8.2.1	Findings and Recommendations .....	8-24
8.2.1.1	Findings .....	8-24
8.2.1.2	Recommendations .....	8-25
8.2.2	Imperial Region Conditions .....	8-26
8.2.2.1	Local .....	8-26
8.2.2.2	State .....	8-27
8.2.2.3	Federal .....	8-29
8.2.2.4	Joint State and Federal.....	8-29
8.2.3	Opportunities .....	8-31
8.2.3.1	Best Management Practices for Power Plant Cooling Water Use .....	8-31
8.2.3.2	Treat Cooling Water to Improve Quality .....	8-31
8.2.3.3	Manage and Coordinate Changes in Land Use .....	8-31
8.2.3.4	Economic Incentives.....	8-31
8.2.4	Constraints .....	8-32
8.2.5	Relation to Other Strategies.....	8-34

## Table of Figures

---

Figure 8-1. IID/MWD Conservation Transfer Program Yield (1990-2009).....	8-10
Figure 8-2. QSA Conserved Water, Volume at Imperial Dam (KAF 1990-2011), USBR Decree Accounting .....	8-10

## Tables

---

Table 8-1. IID Pre-QSA Water Conservation Programs and Projects .....	8-14
Table 8-2. IID/MWD Water Conservation Agreements, Program, and Projects .....	8-16
Table 8-3. IID/MWD Water Conservation Projects and Yield (AF) .....	8-18
Table 8-4. IID System Conservation Yield (AFY) .....	8-18
Table 8-5. Potential Water Sources Currently Not Designated for QSA/Transfer Agreements .....	8-19



## Chapter 8. Reduce Water Demand — Increase Water Use Efficiency

---

The California Water Plan acknowledges the importance of reducing water demand and for increasing water use efficiency by of the different types of water users. As described in Chapter 5, IID's senior Colorado River water rights provide a stable and reliable supply to the Imperial Region. Chapter 5 also discussed how annual agricultural demands can vary; resulting in times when water demand may exceed available supply (overrun) for a particular calendar year. Areas in the Imperial Region outside of the IID service area that are reliant on groundwater must also conserve water to make best use of the available groundwater supply and to avoid or mitigate overdraft. Chapter 7 described alternative water supply projects and strategies to increase supply to meet current and future demands.

This chapter discusses water conservation and water use efficiency strategies to reduce water demand. The Imperial IRWMP water supply goal includes an objective to protect surface water rights by implementing water conservation measures that demonstrate reasonable beneficial use of the available supplies and are consistent with established industry standards, and state and federal requirements. The Imperial Water Forum reviewed three water use efficiency resource management strategies to reduce water demand:

- Renewable Energy
- Agriculture
- Urban (Municipal, Commercial, and Industrial)

Water use efficiency implies doing the same water using activity (agriculture, energy production) but with less water; for example, getting the same level of agricultural production and economic output using less water. The Reduce Water Demand management objective is related to urban best management practices and agricultural efficiency water management practices that increase water use efficiency. BMPs and EWMPs are specific to the particular types of water use.

Other resource management strategies that would reduce agricultural water demand are temporary fallowing land, referred to as crop idling by CDWR, and permanent land retirement. However, these are not regarded as water use efficiency practices, because they reduce agricultural activity or output and have related socioeconomic impacts. State regulations require urban water users to adopt BMPs and agricultural water users to adopt cost-effective EWMPs; USBR regulations require that the water conservation plan show how the irrigation district is addressing specific water use efficiency practices; and both state and federal regulations require reasonable, beneficial use. The state has worked with trade groups and agencies to define industry-specific technology, standards and regulatory requirements for BMPS and EWMPs specific to the type of water use, and these are evolving with technology and experience.

Practices that reduce agricultural water demand, while maintaining or even increasing farm production, have been implemented by IID and farmers since the 1940s. Additional implementation of such practices is central to IID's plans for reducing water use in the Imperial Valley to meet QSA/Transfer Agreements obligations. Under the QSA/Transfer Agreements it is possible for IID water users to experience supply/demand imbalances (underruns and overruns). The short term response to supply/demand imbalances is through fallowing as defined by the IID Equitable Distribution Plan. Fallowing is being used to provide SDCWA transfer and Salton Sea mitigation flows from 2003-2017.<sup>1,2</sup>

What is less well defined is how the Region's forecasted, long term MCI water demands (mainly due to geothermal development) will be met without reductions to the supply or reliability of supply to current users. Increases in future MCI demands in the IID water service area are expected to increase the total water demands to levels that exceed historical use. Increased demands could be met through water conservation by current water users or through land use changes that reduce water demand (e.g., agricultural land converted to municipal).

Changes to land use, whether temporary (crop idling, e.g., voluntary fallowing; or conditional use permit, e.g., solar development) or permanent (irrigated land retirement, e.g., growth of the urban footprint) are referenced in this chapter and discussed in more detail in Chapter 11, Practice Resources Stewardship and Other Strategies, which includes a proposal for how IID might account for and apportion for in-valley MCI use water made available by increased water use efficiency or as a result of changes in land use. Changes in land use in the Imperial Region could increase or decrease annual water demands. Reductions or increases in annual demand need to be accounted for and could have negative or positive effects on existing and new users. Land use decisions have an effect on water management, and water management decisions have an effect on land use planning, making it important for Imperial County and the Cities and IID to develop consistent policies and standards.

## 8.1 AGRICULTURAL WATER USE EFFICIENCY

Since the 1940's IID and Imperial Valley growers have worked aggressively to implement system-wide and on-farm water conservation measures. These measures are documented in IID's 2007 Water Conservation Plan. Additional water conservation efficiency strategies are identified in IID's *Efficiency Conservation Definite Plan* (Definite Plan) (Davids Engineering 2007)<sup>3</sup> and *System Conservation Plan and Delivery Measurement Description* (System Conservation Plan) (IID 2009), while adaptive management is being used to modify these plans as practices and conditions change. To support integration of the existing plans, these three plans that define the Imperial Region agricultural water use efficiency strategies and are incorporated by reference and made part of the Imperial IRWMP. Updates to these

---

<sup>1</sup> QSA by and among IID, MWD, and CVWD, Exhibit C. 10 Oct 2010.

<<http://www.iid.com/Modules/ShowDocument.aspx?documentid=882>> (p 39 of 44)

<sup>2</sup> On September 13, 2011, IID board of directors approved a resolution presented by General Manager Kevin Kelley to petition the State Water Resources Control Board to amend its 2002 water order regarding mitigation water for the Salton Sea from 2014-2017

<sup>3</sup> Due to terms in the QSA, on-farm conservation efforts were not start until 2017. Attempts are being made to start on-farm conservation as early as 2013 if agreed to by the QSA JPA.

plans as well as changes resulting from adaptive management will be incorporated by reference in future Imperial IRWMP updates.<sup>4</sup>

Together, the Definite Plan and System Conservation Plan, as being adapted, define how IID and Imperial Valley growers will conserve water to be transferred out of the Imperial Region under the QSA/Transfer Agreements. Under the QSA/Transfer Agreements, historical levels of agricultural production are to be maintained and only water conserved through efficiency practices would be transferred. However, to address impacts of the IID/SDCWA transfer, fallowing of agricultural land has been included to meet SWRCB requirements for Salton Sea mitigation (2003-2017). Fallowing has also been used for payback of inadvertent overruns and to meet early QSA commitments and other opportunities, such as Intentionally Created Surplus. For a description of the Fallowing Program, see Section 8.1.2.3, below, and Chapter 11.

The Imperial IRWMP baseline assumes full implementation of the QSA/Transfer Agreements reduction in use by IID, and other practices detailed in the IID 2007 Water Conservation Plan (IID 2007); and that future agricultural consumptive use does not change, but that overall agricultural deliveries are reduced through on-farm and IID system conservation efficiency projects such as those documented in these plans.

### **8.1.1 Findings and Recommendations**

Preliminary findings were drafted by the Demand Management Work Group and Water Forum.

#### **8.1.1.2 Findings**

Until IID's QSA transfer requirements (water use reductions) are met, other potential on-farm and system improvement/practices are held in reserve due to the uncertainty related to program water yield and verification.

- **Definite Plan and System Conservation Plan Implementation.** By 2026 and for the term of the QSA/Transfer Agreements, IID has to conserve the full additional 303,000 acre-feet per year under these plans at an estimated average cost of \$300 per acre-foot
  - Definite Plan and System Conservation Plan programs represent over \$300 million of investment in system and on-farm improvements by IID and Imperial Valley growers and owners, respectively, in return for the transfer and sale of water to agencies in the South Coast and Coachella Valley of up to 303,000 acre-feet per year of conserved water through increased system and on-farm efficiency that does not decrease agricultural production. Without an agreement regarding returns from the purchase of conserved water and protecting IID water rights, this level of investment would be neither possible

---

<sup>4</sup> SB7x-7 (Steinberg) adopted by the state legislature in 2009 requires agricultural water suppliers to measure the volume of water delivered to customers and to have a pricing structure based on least in part on quantity of water delivered. The measurement requirements do not apply to IID during the period the QSA is in effect (CWC 10608.8(d)).

- (e.g., if these costs were to be distributed to IID rate payers in the Imperial Region) nor politically acceptable.
- The most cost-effective conservation measures have already been implemented, or will be implemented to meet QSA/Transfer Agreements obligations. Thus, potential conservation projects that remain are costly. In addition, the potential water yield is uncertain, because yield of the planned measures will not be known with certainty until the measures proposed for the QSA/Transfer Agreements have been implemented and the monitoring and measurement history is available.
- **Achievable System Efficiency Conservation and On-Farm Fallowing.** Of the potential water conservation projects only a limited amount of additional yield is achievable (Table 8-1):
    - System efficiency conservation projects not currently planned for implementation as part of the Definite Plan and System Conservation Plan could provide as much as 38,700 acre-feet per year: 30,000 acre-feet per year from full system automation and 8,000 acre-feet per year from not-built QSA projects (both can be built in phases, but would have to be built in conjunction with System Conservation Plan construction), and 700 acre-feet per year from additional canal lining projects.
    - The cost for system efficiency conservation is estimated to be \$1,211 per acre-foot for 38,000 acre-feet per year and \$1,196 per acre-foot for 38,700 acre-feet per year. These projects were identified from materials used in the review and development of the Interim Water Supply Policy and from the Definite Plan.
    - While 38,700 acre-feet per year from full IID system automation may be available, water yield will be uncertain until a history of operation for the QSA projects has been observed
    - Of the identified not-built QSA projects in the near- to mid-term, canal lining could provide 700 acre-feet per year of water for MCI use.
    - Cost for on-farm fallowing is estimated to vary from over \$165 per acre-foot in 2012<sup>5</sup> to an anticipated \$350/AF, and could exceed \$500 per acre-foot as the program ramps up. Water yield from fallowing depends on the acreage of land fallowed by willing growers or owners, the historic use on each parcel, and how much that use can be reduced using new practices.
    - Incentives for on-farm participation can be performance/result and/or conservation practice payment based. The degree of participation that might occur is unknown. This uncertainty makes it hard to quantify firm yield of additional water that could be apportioned to MCI uses. Fallowing is not an agricultural water use efficiency practice.
  - **Infeasible Actions.** Agricultural conservation actions determined not applicable or feasible include:
    - Replacing concrete-lined canals with pipelines to reduce evaporation (about 650 acre-feet per year) is a non-feasible option due to high costs.

---

<sup>5</sup> Cost of 2012-2013 Fallowing Program: \$125/AF to participants plus \$40/AF for program administration

- Reduction in tilewater is not considered a conservation opportunity, because of leaching requirements to manage salts and maintain crop productivity.
- Crop selection is a grower decision made in response to market conditions. Any related water conservation would be hard to verify and defend, and this is not considered an agricultural water use efficiency practice.
- Yield reduction could involve eliminating one irrigation and one cutting on alfalfa, which might achieve 0.5 acre-feet per acre per year at a cost similar to fallowing (over \$500 per acre-foot). Potential exists to conserve up to 50,000 acre-feet per year from alfalfa, as over 100,000 acres of alfalfa are grown in the valley. However, the level of acreage enrolled in the QSA on-farm programs would likely limit enrollment in such a program. Enrollment would be influenced by the payment incentive offered, and would need monitoring for compliance. This could be part of a longer-term Imperial IRWMP adaptive management strategy to be reconsidered once the QSA on-farm efficiency program is fully implemented and an operational history is available to gauge the success of the agricultural water efficiency conservation efforts. Any practice that results in yield reduction is not considered an efficiency practice.
- **Voluntary Fallowing – not an agricultural water use efficiency practice.** A well-managed fallowing program could provide water for new in-valley MCI uses; however, substantive political, economic and environmental constraints need to be addressed to ensure third-party effects and impacts are addressed.
  - Through 2012-2013 (and perhaps through 2017), IID will continue the Fallowing Program started in 2003 to meet interim SDCWA water transfer and Salton Sea mitigation requirements. The Fallowing Program would require enrollment of around six percent of farmable Imperial Valley land to produce 135,000 acre-feet (27,000 acres) for 2012, and 150,000 acre-feet per year (30,000 acres) for 2013-2017.<sup>6</sup> In 2018, the Fallowing Program ends. As a result, fallowing to produce MCI supply in the years before 2018 is constrained. After that time, fallowing could be implemented, and the resulting water use reduction quantified and apportioned to new MCI uses.
  - Acreage constraint: From 2018 on, QSA on-farm efficiency conservation efforts are projected to require 300,000 acres to meet the 200,000 acre-feet per year target; voluntary fallowing would require 12,000 acres to provide 60,000 acre-feet per year; this would mean a total of up to 334,000 acres enrolled in voluntary programs out of 475,000 farmable acres in the IID water service area.
  - IID would have to develop programs and policies to accommodate temporary or long-term fallowing as part of a managed in-valley water exchange. Long-term fallowing would damage farming infrastructure.
  - The cost of water from fallowing could rise to over \$400/AF,<sup>7</sup> and water yield is related to the amount of land fallowed by willing growers or owners.

---

<sup>6</sup> Source: QSA By and Among IID, MWD and CVWD, Exhibit C  
<<http://www.iid.com/Modules/ShowDocument.aspx?documentid=882>> (p39 of 44)

<sup>7</sup> Fallowing that is not part of the Salton Sea mitigation program could have environmental impacts, adding an estimated \$40/AF to the cost of the program.

- No IID or Imperial County policies were identified that would prohibit fallowing for purposes of providing water for non-agricultural in-valley uses, but significant political challenges and potential third-party and environmental effects must be addressed if expansion of current fallowing program were to be considered.

#### **8.1.1.2 Recommendations**

- 1) Proceed with implementation of the Definite Plan and System Conservation Plan actions planned as part of the QSA/Transfer Agreements, evaluate the program once there is an operational history, and use an Imperial IRWMP adaptive management strategy to plan additional measures for implementation to produce “new” water for MCI use once the effectiveness of the program can be better measured – after 2020.
- 2) Move forward to finance and construct the ‘not-built’ QSA projects as a near-to mid-term solution to provide measurable water for industrial use. These projects could provide up to 8,000 acre-feet per year for future MCI uses; to be included in some type of water exchange; or to cover water included in the Interim Water Supply Policy.
  - a) Aggressively develop a funding mechanism and policies that can be put in place to allow for use of this conserved water for purposes of mitigation for the potentially significant environmental impacts associated with increased industrial water demands for geothermal projects or other projects already in the Imperial County Planning queue.
  - b) Reserve on-farm efficiency conservation beyond that anticipated in the Definite Plan to meet QSA/Transfer Agreements requirements from further consideration as part of the Imperial IRWMP program; cannot be considered as a potential source for future MCI supplies.
- 3) Additional on-farm efficiency conservation has to be integrated with implementation of Definite Plan projects and/or should be part of a longer-term Imperial IRWMP adaptive management strategy to be reconsidered once the Definite Plan has been implemented and an operational history is available by which to gauge the yield of the agricultural water efficiency conservation efforts.
- 4) Review the development of an in-valley fallowing program that expands on or modifies the current Fallowing Programs.
  - a) Developing such a program should involve the full participation and input of the Imperial Region stakeholders. Fallowing for in-valley uses and economic development could provide a sure method to reduce agricultural demand and apportion water to new industrial uses but only if a program can be designed that is fair, equitable, mitigates for any third-party and environmental effects, and is voluntary with the support of the farm community. This needs to be closely tied to the development of funding and policy alternatives.

#### **8.1.2 Imperial Region Conditions**

As noted above, IID and local growers have been active since the 1940s in testing and implementing agricultural water use efficiency strategies which are now estimated to conserve at least 400,000 acre-feet per year of water. IID is also a charter member of the Agricultural Water Management Council.<sup>8</sup>

---

<sup>8</sup> The Agricultural Water Management Council is a non-profit organization established in 1996 dedicated to bringing together all

IID's 2007 Water Conservation Plan (IID 2007) meets state and federal requirements for planning and implementation of appropriate agricultural conservation measures to conserve water, and documents the reasonable and beneficial use of the available supplies. The water conservation plan is updated every five years to comply with federal and state requirements. The history of the IID's water conservation programs is described in detail in the 2007 Water Conservation Plan. IID's pre-QSA programs are listed herein in Table 8-1.

IID's 2010 Annual Water Report (IID 2010) explains how QSA/Transfer Agreements conservation goals are to be achieved. The QSA stipulates that IID must increasingly reduce its Colorado River Priority 3a water use, until by 2026 (and through 2037 or 2047),<sup>9</sup> its reduction totals 487.2 KAFY. To achieve that reduction, IID must conserve and transfer out of the Imperial Region a total of 408,000 acre-feet per year, 105,000 from the IID/MWD 1988 Water Conservation Program and an additional 303,000 from other QSA water conservation activities.<sup>10</sup> The additional amount is from AAC Lining (67,600) and for Misc. PPRs (11,500). IID/MWD Water Conservation Program project construction was completed in December 1997. As described in detail in the 2009 QSA Annual Report (IID 2009b) and summarized below, IID is making progress in implementing efficiency conservation activities to meet the additional 303,000 acre-feet per year needed by 2026.

#### **8.1.2.1 IID/MWD 1988 Water Conservation Program**

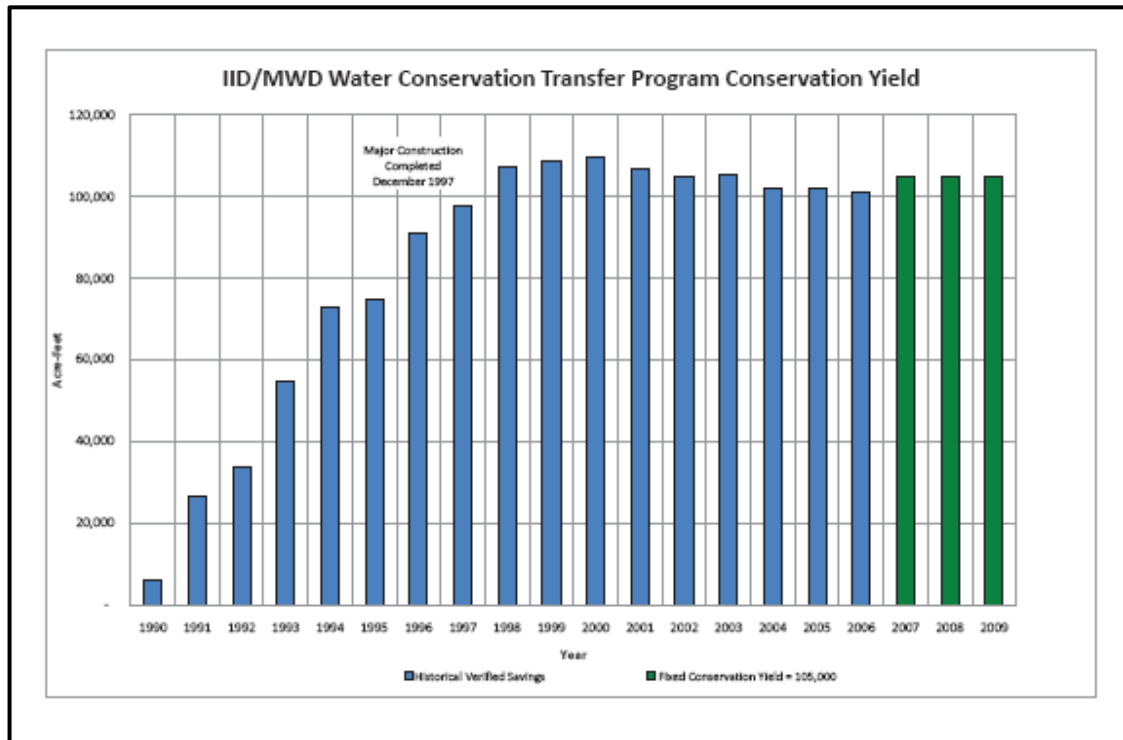
January 1990 marked the inception of construction activities by IID to implement 15 projects identified in the landmark December 1988 IID/MWD Water Conservation Agreement between IID and the Metropolitan Water District of Southern California (MWD) and in the December 1989 Approval Agreement between IID and MWD, Palo Verde Irrigation District and Coachella Valley Water District (CVWD). These agreements provided for MWD to invest in construction, operation and maintenance of water conservation projects in exchange for the conserved water. A total of just under \$96.5 million dollars (1988 equivalent dollars) was invested in project construction to conserve nearly 110,000 acre-feet per year, with budgeted 1999 O&M of nearly 5.6 million dollars (\$127/AF, 1988\$). The IID/MWD Water Conservation Program included improvements to the IID Water Control Center, non-leak headgates, canal lining, automated and centrally controlled structures, regulating reservoirs, interceptor canals and reservoirs, 12-hour water delivery scheduling, tailwater recovery systems, on-farm irrigation systems, and conservation verification. The IID/MWD programs and projects are summarized in Table 8-2. Figure 8-1 shows the history of water conserved under the IID/MWD water conservation program through 2009.

---

interested parties in agricultural water management with the expressed goal to achieve greater water management efficiency.  
<<http://www.agwatercouncil.org/>>

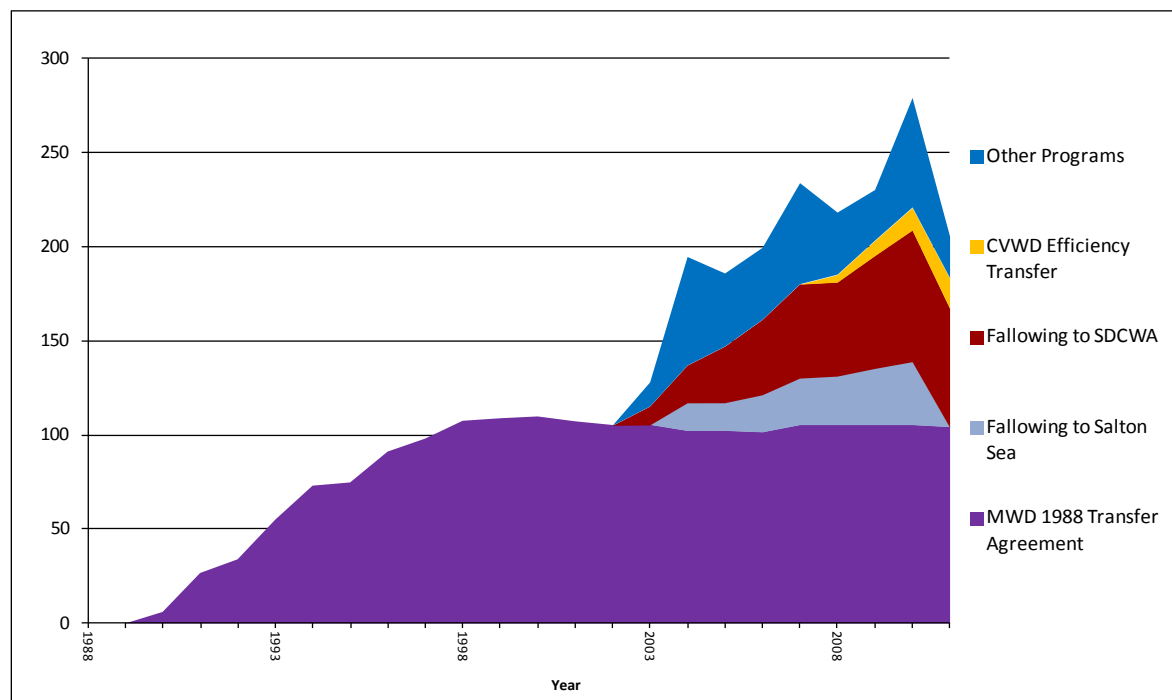
<sup>9</sup> Assumes SDCWA does not elect termination in year 35 of the QSA when its wheeling agreement with MWD ends.

<sup>10</sup> In addition, under the QSA/Transfer Agreements, any IID overruns must be paid back through extraordinary conservation (see IRWMP Chapter 5). As of 2011, overruns have been paid back with reductions in use resulting from fallowing.



**Figure 8-1. IID/MWD Conservation Transfer Program Yield (1990-2009)**

Source: 2009 QSA Annual Report (IID, 2009b)



**Figure 8-2. QSA Conserved Water, Volume at Imperial Dam (KAF 1990-2011), USBR Decree Accounting**

Source: IID QSA Annual Reports and USBR Decree Accounting Reports

### **8.1.2.2 Quantification Settlement Agreement Water Conservation Program**

The QSA and Related Agreements were signed on 10 October 2003. The QSA /Transfer Agreements and associated schedule for water conservation and transfer commitments were discussed in detail in Chapter 5. IID's 2009 QSA Annual Report (IID 2009b) documents the conservation and transfer accounting from 2003 through 2009. Figure 8-2 shows volume by program of water IID conserved under the QSA for 2003 to 2009.

As mentioned above, IID is implementing the Definite Plan, System Conservation Plan and water management activities as part of the QSA water conservation program. These plans provide a roadmap for conserving water while providing flexible, reliable service to growers, and recommend a mix of on-farm and system projects to best meet IID's water transfer obligations set forth in the QSA. An on-farm water conservation goal of 200,000 acre-feet per year and a system conservation program goal of 103,000 acre-feet per year will meet the 303,000 needed for QSA transfer commitments beyond the IID/MWD program.

The Definite Plan was designed with public outreach and grower involvement to develop both on-farm and system water conservation strategies. On-farm efficiency conservation projects are to be voluntarily implemented by farmers to reduce tailwater runoff.

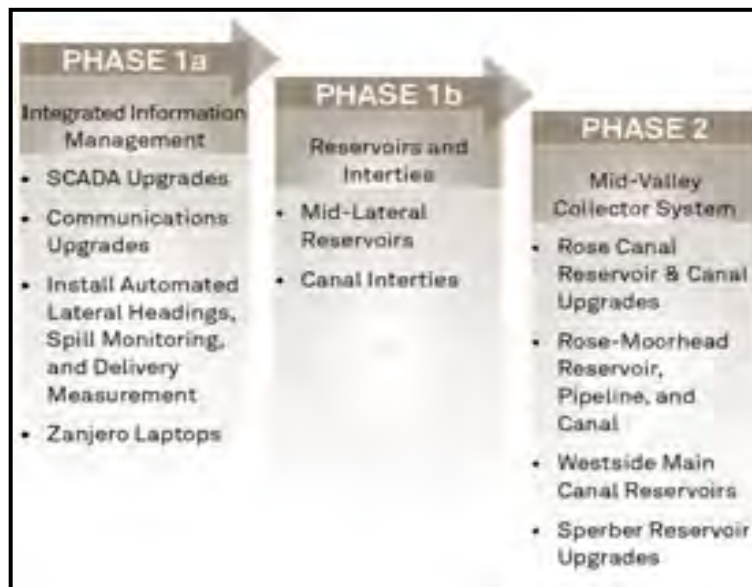
The System Conservation Plan, as explained on IID's website:

*The System Conservation Program is a defined integrated package of system improvements to existing infrastructure and construction of new facilities designed to conserve water through targeted operational spill reductions, and to enable the scale of water delivery operations required to achieve the on-farm conservation goals in the Efficiency Conservation Definite Plan.*

*The SCP has been developed as a targeted strategy for capturing and reusing operational spill from laterals within the IID service territory. Water conservation savings generated from the implementation of these efficiency improvements are required to fulfill water transfer obligations under the QSA and related agreements.*

#### **Program Phasing**

*The implementation of the SCP within IID is organized around three major phases of work.*



*Phase 1a consists of the major Integrated Information Management components of the program including SCADA system upgrades, communication system upgrades, Zanjero laptops, and a set of automated lateral headings, spill monitoring, and delivery measurement units. This phase is proceeding with the development and issuance of two separate Work Packages described further below: 1a-1/3 and 1a-2.*

*Phase 1b consists of the construction of the mid-lateral reservoir and canal intertie elements of the SCP. This phase is not proceeding at this time.*

*Phase 2 consists of the Mid-Valley Collector System projects, including the Rose Canal Reservoir, Rose-Moorhead Reservoir, Westside Main Canal Reservoir, various pumped and pipeline connections, and upgrades to the Sperber Reservoir. This portion of the SCP will not proceed until after Phase 1b is complete so the effectiveness of water savings under Phase 1a and 1b can be measured before proceeding. It is possible that Phase 2 elements may change significantly based on the spill reduction performance of the Phase 1a and 1b elements.*

*Work Package 1a-1/3 is comprised of two major components: Supervisory Control and Data Acquisition system, and a number of Flow Monitoring & Control Devices. This package also includes the requirement for long-term Operational Maintenance of the installed devices. This package will utilize the design-install-maintain contracting mechanism.*

*The SCADA component is comprised of physical radio frequency equipment and data processing equipment on each of the devices, as well as the software and hardware that collect, analyze and process the data sent from the devices, which includes the graphical interface on zanjero*

*laptops and the graphical interface in the Water Control Center. The contractors will develop detailed plans and specifications to upgrade IID's existing SCADA system. The major elements involved in the development of the system are as follows:*

- *Design, configuration, integration, implementation, and maintenance of the central SCADA software package and associated peripheral equipment for the SCP project sites and all sites currently monitored by the existing SCADA system.*
- *Programming, testing, commissioning of the automated SCP field sites not included in other bid packages.*
- *Configuration and maintenance of a remotely accessible zanjero application. Development of the application will be by IID.*

*Flow Monitoring & Control Devices are comprised of following elements:*

<b><i>Element</i></b>	<b><i>Approximate No.</i></b>
<i>Farm Deliveries</i>	
<i>Lateral Headings</i>	<i>233</i>
<i>Spill/Flow Monitoring</i>	<i>147</i>
<i>Canal Gates</i>	<i>70</i>
<i>Non-Leak Gates</i>	<i>20</i>

*This Work Package will provide for the selection of one vendor that will design, install and maintain all the elements in two stages: Part 1 and Part 2. Part 1 will provide for the design of all the elements and for the installation of a limited number of elements. The limited number of elements in Part 1 will be based on available funding and so that performance of the vendor's design can be verified prior to execution of the full system contract. Part 1 will include farm deliveries associated with two zanjero runs. Part 2 of the contract will include furnishing canal gates to the future RFP Packages 1b and 2.*

*Work Package 1a-2, the Communication System, is comprised of the radio frequency links that will provide acceptable signal quality to each end field device, microwave links and fiber backbone that will transport the SCADA data from the gates and other field devices to the Water Control Center. The communication system may also potentially include the voice requirements of the IID, including both water and energy personnel business voice needs. This package will utilize design-install.*

*The Communications System design will be coordinated with the design for the SCADA system. The construction phase will require the vendor to conduct a performance verification program that will implement delivery gate monitoring via SCADA data along the same two zanjero runs.*

### **Program Schedule**

*Only Work Package 1a-1/3 and Work Package 1a-2 are scheduled to be completed and issued for proposals/bidding before the end of 2011 with construction proceeding in early 2012. As these facilities are constructed and made operational, and as future funding becomes available, IID will determine which elements of the remaining phases (Phases 1b and 2) will be required and/or if other elements such as additional system automation will be employed.*

Source: IID website: System Conservation Program. 4 Jul 2012.

[<http://www.iid.com/index.aspx?page=205>](http://www.iid.com/index.aspx?page=205)

When fully implemented, Definite Plan and System Conservation Plan programs will represent an investment of over \$300 million in on-farm and system efficiency conservation improvements.

IID staff is working with local growers and other stakeholders adapt and modify plans and to implement that will enable IID to meet QSA/Transfer Agreement requirements, including inadvertent overrun payback. Results of these efforts will be included in IID's Annual Water Report and Water Conservation Plan updates and in future IRWMP updates.

### **8.1.2.3 Fallowing**

Fallowing to meet QSA obligations and respond to supply and demand imbalance is discussed in the 2009 IID QSA Annual Report. Crop Idling (fallowing) and Irrigated Land Retirement are resource management strategies could reduce agricultural demand, but they both reduce agricultural water use and productivity, so are not a practice for improving agricultural water use efficiency which posits that agricultural productivity is maintained. Crop Idling and Irrigated Land Retire are discussed in Chapter 11, Practice Resources Stewardship.

**Table 8-1.IID Pre-QSA Water Conservation Programs and Projects**

Conservation project	Year	Activity summary
On-farm tile drainage	1940-present	IID and USDS Soil Conservation Service design and install tile drainage systems.
AAC seepage recovery, Drain 2	1947-present	AAC seepage returned to the canal.
AAC seepage recovery, Drain 1	1948-present	AAC seepage returned to the canal.
AAC seepage recovery, Drain pumps 4, 5, 6, 11, 12 and 34	1951-present	AAC seepage returned to the canal.
Line canals and laterals	1954-present	Concrete lining 3,679 miles of canals, laterals and head ditches.

Imperial Integrated Regional Water Management Plan  
Chapter 8. Reduce Water Demand-Increase Water Use Efficiency

**Table 8-1. IID Pre-QSA Water Conservation Programs and Projects, continued**

Conservation project	Year	Activity summary
Water distribution system automation	1958-present	Install telemetry system with automated structures on upper reaches of main canals (1958) Develop SDADA system (1990's).
Drain pipelines	1962-present	Installed 119 miles of drain pipe by 2006.
East Highline seepage recovery	1967-present	Construct 12 pumps for seepage recovery.
Regulating reservoir construction and operation	1976-1988	Singh (1976), Sheldon (1977), Fudge (1981), Sperber (1983), Carter (1988), total storage capacity of 1,619 AF.
13-point water conservation program	1976-1987	Program to reduce tailwater, canal seepage and operational spill.
Water Conservation Advisory Board	1979-present	Form 15-member board to make water conservation recommendations to the IID Board of Directors.
21-point water conservation program	1980-1987	Board adopts policies and procedures for water orders, delivery system operation and charges for excessive water use.
Water conservation program	1981-present	Personnel hired to staff the water conservation program.
Irrigation scheduling program	1981-present	Assist growers to reduce on-farm tail and tile water losses.
Aquatic weed control	1981-present	Support research, build and operate fish hatchery to produce sterile triploid grass carp to feed on hydrilla and reduce clogs to canals and drains.
Field irrigation evaluations	1982	Improve on-farm irrigation management.
Modified demand irrigation trial	1984	Terminate water orders up to four hours before or after regular 24-hr end time.
Irrigation training program	1984	Support growers and irrigators to reduce volume of on-farm tailwater.
IID water conservation plan	1985-1987	Plan with yearly updates.
East Highline seepage study	1985-1989	IID/USBR study to identify water conservation opportunities.
Tailwater recovery demonstration program	1985-1990	Five-year demonstration of 5 tailwater-return and recovery systems.
12-hour delivery program	1986; 1989-present	Program for 12-hour water delivery schedule and ordering.
Lateral fluctuation study	1986, 1987	Study of causes and effects of water level fluctuation in open channel irrigation to identify conservation opportunities.
Irrigation field trials	1987 and 1988	Determine effect of testing soil moisture conditions.
15-point water conservation program	1987-present	Replaced the 13-point and 21-point water conservation programs.
Non-crop irrigation demand reduction program	1991-1992	Limit on length of time water could be applied to lands that were not seeded (i.e., could be flooded).
Crop specific modified irrigation pilot program	1991	Evaluate removal of irrigation water from alfalfa during the period August 1-October 15, 1991
Concrete lining rehabilitation	2003-2006	IID received a \$2.5 million, 3-year matching grant
IID water management system (WMS)	2006	IID contracted with consultants to develop WMS to manage water ordering/delivery/operations, reduce manual procedures, and manage response to QSA requirements by improved tracking of water and system performance.

**Table 8-1. IID Pre-QSA Water Conservation Programs and Projects, continued**

Conservation project	Year	Activity summary
Canal automation	2005	USBR grant for use in automation of 10 headings and 15 gates.
TMDL water quality monitoring	2005	SWRCB grant for water quality monitoring for TMDL program.
AAC flow monitoring	2006	USBR grant to install flow measurement and monitoring.
Equitable distribution plan study	2006-present	Study to distribute water during supply and demand imbalance.
Tailwater education program	2007-present	Provide technical support to growers, monitoring and evaluate tailwater for 3 consecutive irrigations.

Source: Abstracted from IID 2007 Water Conservation Plan, Table 30

**Table 8-2.IID/MWD Water Conservation Agreements, Program, and Projects**

Conservation Project	Year	Activity Summary
<b>Agreements</b>		
IID/MWD Water Conservation Agreement	1988-present	Provides for water conservation projects to be constructed by IID, including lining the AAC. Conservation savings of 106,110 acre-feet per year. MWD funded all costs for 15 of the 17 projects in return for having conserved amount of Colorado River water available for diversion to its Colorado River Aqueduct.
1989 Approval Agreement among IID, MWD, PVID and CVWD	1989-present	Approval Agreement called for a Water Conservation Measurement Committee (WCMC) to provide an orderly basis, among the parties, for verification of amount of water conserved.
Second Amendment to 1988 Agreement	2007-present	IID, MWD, et al. agree that the amount transferred is 105,000 acre-feet per year.
<b>Programs and Projects</b>		
IID/MWD Water Conservation and Transfer-Construction	1990-1998	Project construction, water conservation studies completed. (IID, 2000)
IID/MWD Water Conservation and Transfer – Delivery	1990-2005	Transfer for each calendar year.
	2007-present	IID is to transfer 105K acre-feet per year to MWD.
Augmentation Program, (Projects 1 and 2)	See Table 8-3	IID construct Carter Reservoir and completes South Alamo Canal Lining Phase I to make conserved water available to MWD.
Lateral Interceptors. (Projects 3, 8, 17)	See Table 8-3	Three interceptor projects constructed.
Reservoirs (Projects 1, 3, 4, 8, 9, 17)	See Table 8-3	Two regulating reservoirs, four interceptor reservoirs and pumping plant constructed.
Concrete Lining – Main and Lateral Canals. (Projects 5, 7, 10, 11, and 16)	See Table 8-3	Line 197 miles of lateral canals and 13.3 miles of main canals (South Alamo II, Vail Supply, Rositas, and Westside Main)
12-Hour Delivery, (Project 9)	See Table 8-3	Delivery requirement changed from 24-hour order to 12-hours to provide flexibility and match on-farm crop requirements.
Non-Leak Gate, (Project 12)	See Table 8-3	Developed 19 sites. (5 subsequently removed).
Irrigation Water Management (Project 14)	1995-present	Irrigation evaluations are performed using portable water level sensors to monitor delivery and tailwater flow on selected fields.

**Table 8-2. IID/MWD Water Conservation Agreements, Program, and Projects, continued**

Conservation Project	Year	Activity Summary
System Automation, (Project 15)	See Table 8-3	Water Control Center (WCC) was constructed to house computer-based monitoring equipment, including workstations, map board, file and database servers, and centralized communications equipment; field site improvements were upgrade of 63 water control sites (34 major and 6 minor sites, 23 overshot gates); SCADA system was developed to monitor and operate IID's irrigation distribution system.
Additional Irrigation Water Management (Project 18)	See Table 8-3	25 tailwater recovery systems, serving 6,779 acres, were installed; first TRS began operation in June 1991, last installation was completed in August 1995
<b>Conservation Verification Program</b>		
Systemwide Monitoring (SWM)		Program developed to identify and explain trends in IID system performance as a function of operational environment within which IID/MWD conservation projects operate.
Water Information System (WIS)		To collect and process flow data needed in support of water conservation verification, an automated data collection, quality control, processing and retrieval system was developed; generates daily, monthly, calendar year and water year tables, summary tables and charts that are available and/or are presented in annual reports.

Source: Abstracted from IID 2007 Water Conservation Plan, Table 31

**Table 8-3. IID/MWD Water Conservation Projects and Yield (AF)**

Project No.	Project Name	Delivery Dates	HSV 2005 <sup>1</sup>
1	Robert F. Carter (Trifolium) Reservoir	1990-present	3,880
2	South Alamo Canal Lining, Phase I	1990-present	510
3	Plum-Oasis (Lateral) Interceptor	1993-present	6,750
4	Bernard Galleano (Z) Reservoir	1992-present	4,490
5	South Alamo Canal Lining, Phase II	1991-present	900
e	Lateral Canal Lining	1991-present	24,250
8	Trifolium Interceptor	1998-present	12,990
9	12-Hour Delivery	1991-present	21,060
10	Vail supply Canal Lining	1992-present	10
11	Rositas Supply Canal Lining	1992-present	130
12	Non-Leak Gates	1991-present	630
14	Irrigation Water Management	1995-2002	14,720
15	System Automation	1991-present	260
16	Westside Main Canal Lining, North	1992-present	7,640
17	Mulberry-D (Modified East Low line) Interceptor	1996-present	3,720
18	Additional Irrigation Water Management	1992-present	3,880
	Total		101,940

Source: 2007 IID Water Conservation Plan, Table 34. Historical Verified Savings (HVS) for Water Year 2005 are available for delivery to in calendar year 2006. Effective January 1, 2007, by agreement, total water available to MWD is 105K acre-feet per year with continued operation of tailwater return systems or implementation of a potable water conservation program

### 8.1.3 Opportunities

Table 8-4 presents potential water sources for conserved water that is not expected to be included in the QSA/Transfer Agreements programs. Water conservation from these potential sources may not be cost-effective as compared to other sources identified in the IRWMP that could be used to meet forecasted future demands. The Imperial IRWMP is based on the assumption that IID will implement projects needed to conserve 303,000 acre-feet per year of water required for the QSA/Transfer Agreements at an estimated average cost of \$300 per acre-foot. Projects that could result in additional water savings and be directed to new MCI users would be in addition to those projects actions – and would be at a higher per acre-foot cost.

**Table 8-4. IID System Conservation Yield (AFY)**

Project		2005	2006
AAC Seepage Recovery	1964-1994 avg~ 23,300	~18,800	~25,300
EHL Seepage Recovery	1967-1994 avg~ 14,350	12,644	12,857
12-Hour Delivery Program	Program savings go to IID/MWD Program		

Source: 2007 IID Water Conservation Plan Table 33. Values are based on pump readings; for 2005 and 2006 no readings were available for 3 pumps on Mexico side of AAC (estimates for those pumps were based on prior years' data).

Note: Seepage from portions of the AAC and EHL are pumped back into the respective canals. AAC recovered seepage is included in reported flow at AAC Mesa Lateral 5. EHL recovered seepage is part of IID's net in-valley water supply.

**Table 8-5. Potential Water Sources Currently Not Designated for QSA/Transfer Agreements**

	Maximum (AFY)	Average Cost Estimate (\$/AF)	Constraints
<b>System Conservation Projects</b>			
Full IID system automation	30,000	\$1,376	SCP Construction Schedule
Not-built QSA projects	8,000	\$590	
Additional canal lining	700	\$416	
<i>System Total</i>	<i>38,700</i>	<i>\$1196</i>	
<b>Voluntary On-Farm Conservation Projects</b>			
TRS, drip, linear move, etc	60,000	\$481	Acreage in QSA programs, see Note 4
<b>Temporary, Voluntary Fallowing (Not an AWUE measure)</b>			
Voluntary starting in 2018	60,000	\$500 and up	Acreage in QSA programs, see Note 4

Table Notes:

1. Full IID system automation and not-built QSA project costs include \$67/AF for administration and \$90/AF for environmental mitigation.
2. On-farm conservation cost range varies with the farmer payment option.
3. On-farm conservation and fallowing programs are likely mutually exclusive – cannot add 60K acre-feet per year on-farm + 60K acre-feet per year fallowing
4. Acreage constraint: QSA on-farm efforts are anticipated to require 150 KAC 400 KAC to meet targeted 200K acre-feet per year; Voluntary Fallowing (above) requires 12 KAC to meet 60K acre-feet per year; Voluntary On-farm projects (above) are anticipated to require 45 KAC to 120 KAC to meet 60K acre-feet per year; this would mean a total of 195 KAC to 520 KAC enrolled in voluntary programs, out of 475 KAC farmable acres in IID service area.
5. Mitigation requirements (community impacts, environmental impacts, etc) for these water sources are unknown.

Source: IID Agricultural Water Management Section. July 2012.

### 8.1.3.1 System Efficiency Conservation Opportunities

When compared to other alternative sources to manage supplies and meet future demands, the most cost-effective system conservation projects are not-built QSA projects (8,000 AF at \$590 per acre-foot) and additional canal lining (700 acre-feet per year at \$416 per acre-foot). Not-built QSA projects also include a small number of seepage and operational spill recovery projects.<sup>11</sup>

Full system automation which involves projects that would establish delivery system controls is not cost-effective (\$1,376) as compared to other efficiency conservation improvements or alternatives to manage the Colorado River water supply. Until the System Conservation Plan is fully operational, it is difficult to determine if there are further opportunities for system automation improvements.

As part of the 1988 IID/MWD program, IID conducted seepage analysis on the main and lateral canals, and any reaches with seepage recovery costs of \$200 per acre-foot or less (1988\$) were lined as part of the program. In the mid-1960s, IID installed cost-effective seepage recovery systems on the All-

<sup>11</sup> Temporary, voluntary fallowing is discussed in Chapter 11, Practice Resource Stewardship since it is not an agricultural water use efficiency strategy.

American and East Highline canals. Canal lining and seepage recovery were both investigated for the Definite Plan which concluded, “Lateral canal lining and other more involved delivery system changes appeared to offer either limited savings or exceed available revenue or both.” Main canal seepage occurs on two of IID’s three main canals, the East Highline and the Westside Main both of which are wide and flat and very expensive to line. The Definite Plan evaluation shows seepage recovery systems to be a much more cost effective and practical way to conserve main canal seepage. In April 2009, IID completed major construction on all 22 QSA seepage recovery systems on the East Highline and Westside Main canals. The potential for further conservation by seepage recovery (beyond QSA) is not cost-effective at this time.

Additional system conservation projects are part of IID’s contingency to meet requirements of the QSA/Transfer Agreements and cannot be included in the Imperial IRWMP agricultural water use efficiency strategy. The potential for additional savings can be revisited as part of the Imperial IRWMP adaptive management strategy and update process.

### **8.1.3.2 On-Farm Efficiency Conservation Opportunities**

Under the Definite Plan, on-farm efficiency conservation projects are to be implemented on a voluntary basis by Imperial Region farmers or landowners. Participants will not receive funds to install projects; rather IID will pay them for the amount of water conserved with funds IID receives from SDCWA for transferred water. On-farm water conservation is directly related to the number of farmed acres implementing conservation practices. Net irrigated area in the Imperial Valley is about 475,000 acres,<sup>12</sup> and the Definite Plan projected that 300,000 acres (or 63 percent of irrigated acreage) would have to implement conservation measures to meet the targeted 200,000 acre-feet per year of on-farm water conservation.<sup>13</sup> Assuming that owners and growers on 84 percent of the irrigated area were able and willing to implement conservation projects, 100,000 acres would be available on which to implement practices for the Imperial IRWMP. Performance/result-based payment incentives and/or conservation practice payment incentives could be used to attract to participation.

Specific practices to be implemented would depend upon what is most efficient and cost effective for the farmer. Having a total of 400,000 acres enrolled in on-farm programs (200,000 for the QSA and 100,000 for the Imperial IRWMP) may not be realistic; and potential future savings for an Imperial IRWMP on-farm agricultural water use efficiency program cannot be determined with any certainty at this time.

Although the Imperial IRWMP on-farm conservation measures would be the same as those described in the Definite Plan, the cost per acre-feet of conserved water is likely to be higher, because the most feasible projects would be implemented by growers first. The Definite Plan estimated the cost of the

---

<sup>12</sup> This is the area with an irrigation history eligible to participate in IID Definite Plan on-farm programs. IID website. 5 Jul 2012. IID Annual Inventory of Areas Receiving Water Years 2011, 2010, 2009.

<<http://www.iid.com/Modules/ShowDocument.aspx?documentid=5607>>.

<sup>13</sup> In 2012, analysis by IID Agricultural Water Management section has led to projections of 195 KAC to 520 KAC enrolled in voluntary programs, out of 475 KAC farmable acres in IID service area.

on-farm water conservation at \$241 to \$290 per acre-foot depending on farmer payment option at the 200,000 acre-feet per year level; incremental costs for an additional 60,000 acre-feet per year could range from approximately \$343 per acre-foot to \$619 per acre-foot depending on the incentive mechanism selected and including mitigation costs associated with reduction in drain flow and impacts to related habitat.<sup>14</sup> (See Table 8-4.)

Although the projected costs may be feasible, the level of grower participation beyond 200,000 acre-feet per year for the QSA cannot be predicted. The effects of the on-farm program needs to be assessed to evaluate the realistic potential for further on-farm water savings. Additional on-farm conservation is not considered a viable program for inclusion in the Imperial IRWMP until such time as the Definite Plan program has been further implemented.

#### **8.1.3.3 Temporary, Voluntary Fallowing**

Temporary, voluntary fallowing is discussed in Chapter 11, Practice Resource Stewardship and Other Strategies.

#### **8.1.3.4 Fallowing, Crop Selection and Yield Reduction**

Two related agricultural water management strategies, fallowing and changes to crop selection, could temporarily reduce agricultural water demand, and the water be apportioned to other uses in the short-term or in response to a supply/demand imbalance. These would not increase agricultural water use efficiency on-farm. Chapter 11, Practice Resources Stewardship and Other Strategies provides discussion of these strategies.

### **8.1.4 Constraints**

The major constraints to implementing agricultural water use efficiency measures for the IRWMP are: 1) high marginal cost for on-farm and system improvements beyond those needed for the QSA programs, and 2) level of participation in the on-farm program.

The remaining on-farm and system conservation opportunities are less cost-effective in terms of the unit cost for water conserved (dollars per acre-foot) than most of the measures to be implemented under the Definite Plan and System Conservation Plan and than those identified in the IRWMP. On-farm water conservation also requires voluntary participation by farmers within IID. The level of participation is unknown. For purposes of this version of the Imperial IRWMP, it would be remote and speculative to identify how much additional water could be conserved until the QSA water conservation program is more fully implemented. The Imperial IRWMP is to identify a firm, verifiable, and sustainable water supply, some of which could be provided through demand reduction and efficiency conservation by

---

<sup>14</sup> IID Definite Plan Appendix 4 Section 4.e., Tables 1 and 4. 15 March 2012.  
<<http://www.iid.com/Modules/ShowDocument.aspx?documentid=798>>

users, but until the QSA water conservation program is more fully implemented and water volumes are verified, opportunities for additional on-farm or delivery systems improvements are unknown and anticipated to be limited.

Verifying conserved savings and monitoring the performance is part of the IID program (2009 QSA Annual Report, p 15). Monitoring and tracking program performance to identify potential additional conservation opportunities is part of the Imperial IRWMP and adaptive management strategy.

### ***8.1.5 Relation to Other Strategies***

**Increase Water Supply** – If additional water conservation savings are to be invested in, the “new” water would be apportioned for use by IID within the Imperial Region. The Imperial IRWMP is not seeking additional agricultural conservation for transfers out of the Region.

**Water Transfers** – Agricultural water conservation savings from the 1988 IID/MWD Program and 2003 QSA/Transfer Agreements were or will be transferred out of the Region in exchange for assurances to IID and the Imperial Region regarding water rights and reasonable and beneficial use determinations under the 417 Process, and for funding to implement the conservation and efficiency measures (IID/MWD program) or for payment for transferred water (QSA transfer programs).<sup>15</sup>

**System Reoperation** – IID system reoperation is part of the System Conservation Plan.

**Salt and Salinity Management** –Salt management is part of the IID system operation (drainage system) and on-farm water management by growers (tile drainage and other leaching). The need to apply water to leach salts carried by the Colorado River out of the root zone and maintain productivity is part of the reasonable and beneficial use of irrigation water.

**Ecosystem Restoration** – Changes in agricultural water use efficiency could reduce drain water and require mitigation. This could add mitigation costs in the range of \$40 to \$67 per acre-foot to the cost of a program to reduce agricultural demands through improvements to on-farm or delivery system efficiency.<sup>16</sup>

**Other Strategies** – Crop Idling for Water Transfers (Fallowing) and Irrigated Land Retirement, conditional use permits for solar development, urban growth.

---

<sup>15</sup> California Water Plan, Agricultural Water Use Efficiency RMS (CWP Update 2009 Vol. 2, Chapter 2): “For some water supplies, funding for water use efficiency comes from the ability to transfer water, such as in the Colorado River Region. While transfer to urban areas may reduce the amount of water available to grow crops, they [such transfers] are expected to play a significant role in financing future water use efficiency efforts.”

<sup>16</sup> If agricultural water use efficiency reduces the amount of water in the IID drains tile drainage water will then become a larger part of the water in the drain system. Other problems will then surface such as higher levels of selenium in the drain water which is currently diluted by surface run-off into the drains. See 2012 Imperial IRWMP Chapter 5)

### **8.1.6 Support for Adapting to Climate Change**

Agricultural water use efficiency strategies to achieve the reduce water demand management objective would allow the Imperial Region to maximize use of IID's Priority 3a Quantified Amount and improve the ability for the Imperial Region to respond to variable climate conditions. Regardless of the long-term effects of climate change to Colorado River flows, whether to increase or decrease the flows, agricultural demand management would help the Imperial Region respond to vulnerabilities related to climate change, make maximum beneficial use of existing entitlements, and meet Imperial IRWMP objectives.

## **8.2 RENEWABLE ENERGY WATER USE EFFICIENCY**

CDWR resources management strategies to reduce water demand did not include a specific renewable energy strategy. The Water Forum developed a separate Imperial Region's renewable energy water-use efficiency strategy because the industry represents a significant economic development opportunity to the Region, has the largest forecasted increase in future water demand, and requires a reliable long-term supply that does not impact agriculture.

The Imperial County General Plan (Imperial County, 2003) identifies the economic development potential of the renewable energy industry and established a future water demand of 180,000 acre-feet per year. The Imperial IRWMP forecasted future renewable energy water demands with conservation as 146,000 acre-feet per year. This assumes a 20 percent water conservation savings consistent with the state's goal for 20 percent conservation by the year 2020. The largest consumptive use for geothermal and solar thermal generation is for cooling water. Reducing water demand for imported Colorado River water is, therefore, related to improving water use efficiency for the cooling process. Solar Photovoltaic facilities have limited water demands for domestic water use and for washing panels and have a potential to decrease water demand.

A reliable water supply for renewable energy industry demand could come from the following:

- Capital projects to extend existing Colorado River supplies (e.g., recycled water, desalination of brackish groundwater, groundwater banking of underruns)
- Conservation by existing users and managed apportionment
- Demand reduction that results from changes in land use:
  - Temporary changes include crop idling, referred to as fallowing in the Imperial Region
  - Permanent changes through irrigated land retirement by rezoning land from agricultural to urban uses or other measures such as a conservation easement
- A combination of capital projects, and programs and policies to reduce current water demand and reapportion water to new users

In developing their findings and recommendations, the Water Forum discussed the current local, state, and federal policy environment; water conserving technologies; and the opportunities and constraints to meet the future water demands for the renewable energy industry.

### **8.2.1 Findings and Recommendations**

The findings and recommendations related to Renewable Energy Industry water-use efficiency, alternative supplies for cooling water, use of conserved water and related policies were presented to the Demand Work Group and Water Forum to inform their discussions. In December 2010 and January 2011, the Demand Work Group reviewed and discussed the draft findings and recommendations, prior studies and technical information, state requirements for cooling water for energy facilities, and a range of management strategies. Meetings were also held by the energy stakeholder interest group to discuss the states Renewable Energy Action Team recommended best management practices for desert environments (REAT, 2011), prior studies, and the draft findings and recommendations. Based on the work group and energy stakeholder interest group input, revised draft findings and recommendations were then presented to the Water Forum in February 2011. Changes were made and the re-drafted findings and recommendations were further discussed by the Water Forum in March 2011 and the energy stakeholder interest group meeting in April 2011. Final draft findings and recommendations were reviewed and adopted by the Water Forum in June 2011.

#### **8.2.1.2 Findings**

##### **Impacts, Benefits, and Mitigations**

- Renewable energy provides economic benefits to the Imperial Region.
- A goal of the Imperial IRWMP is to optimize the use of available supplies and/or to create additional water supplies to address increased MCI demands, and mitigate impacts where needed.
- Renewable energy projects that result in intensification of water use could have a negative effect on agricultural water supplies unless mitigated. MCI demands are granted a higher reliability by IID and are less subject to cut back in response to overruns or shortages on the Colorado River.
- To the extent that water is proposed for power plant cooling, the developer shall demonstrate that alternative water supply sources and alternative cooling technologies are unavailable, environmentally undesirable, or economically unsound.

##### **Best Management Practices for Geothermal/Renewable Water Sources, Cooling Alternatives, and Other Uses**

- State policy supports the use of dry or hybrid cooling to conserve water in desert environments.
- Dry cooling technology has limits and is not presently cost-effective in the Imperial Region.
- Hybrid cooling should be encouraged if Colorado River water is used in order to demonstrate reasonable beneficial use of Colorado River entitlements.
- The feasibility of changing wet cooled plants to dry or hybrid cooled plants may be cost

prohibitive for the remaining life of the plant.

- A critical factor for conserving water used for cooling and other uses is the water quality. The higher the incoming water quality, the more cooling cycles can occur, resulting in both less use and reduced wastewater discharge.
- Use of recycled municipal water or desalination of brackish water for cooling and other uses in lieu of Colorado River water would mitigate for potential impacts to current agricultural water users, and would demonstrate reasonable beneficial use of Colorado River entitlements.
- Storage of Colorado River water in a groundwater bank would provide a supply for renewable/geothermal energy water use and could serve to mitigate or eliminate impacts to existing agricultural water users.
- Use of recycled municipal water or desalination of brackish water for cooling purposes could provide multiple regional benefits. Project, program, and policy recommendations should be developed through the Imperial IRWMP process.
- Encouraging use of recycled municipal water for cooling and other uses could support local communities by providing a source of revenue to upgrade treatment plants so as to improve water quality.
- Recycled municipal water or desalinated brackish water maybe cost-effective when compared to the price of water from voluntary fallowing, and would serve to mitigate third party impacts to agriculture.
- Industrial customers shall be required by IID to follow appropriate water-use efficiency BMPs, including but not limited to those established by the California Urban Water Conservation Council and California Energy Commission, as well as other water-use efficiency standards, adopted by the District or local government agencies. (Interim Water Supply Policy (IWSP No. 11). IID may prescribe additional or different Best management practices for certain categories of Municipal and Industrial Water Users (IWSP No. 12).

#### **8.2.1.3 Recommendations**

- Integrate Geothermal/Renewable Energy Water Use Efficiency Resource Management Strategies with related strategies (Increase Water Supply and Practice Resource Stewardship) as part of the Imperial IRWMP to address geothermal/renewable energy water needs, promote economic development and ensure mitigation of any environmental and third party effects.
- The lead jurisdiction agencies (IID, Imperial County, and the Cities) need to work together during project review to ensure that direct, indirect, and cumulative impacts of individual energy projects are adequately evaluated with input from agriculture and other local stakeholders. Potential impacts could occur to agriculture and agricultural water supplies; habitats and flows in IID drains, the Alamo River, New River and/or Salton Sea, IID facilities, DACs, and other impacted stakeholders. If needed, appropriate levels of mitigation are to be formulated, and implementation of such mitigation measures are to be made conditions of the IID, County, and the Cities approval and permits.
- The Imperial IRWMP should compare the cost of developing new water supplies, efficiency conservation, voluntary fallowing, or other measures related to coordinated land use/water supply (e.g., apportioning water saved when land use changes), including mitigation costs if

required.

- Imperial IRWMP should recommend local policies and standards for geothermal/renewable Best management practices that are consistent with the Renewable Energy Action Team Report.
- Imperial IRWMP should recommend a consistent review process to ensure that geothermal/renewable energy projects have mitigated all impacts and meet the local, state and federal agency BMP requirements.

## **8.2.2 Imperial Region Conditions**

Chapter 4 discussed the geothermal resources, existing or proposed geothermal and solar facilities, and land use management plans that could influence where renewable energy facilities could be located. This section reviews the local, state, and federal planning environment and policies.

### **8.2.2.2 Local**

CDWR standards seek to integrate local land use planning and water management activities. Imperial County has the land use authority and is the lead agency for reviewing and approving renewable energy projects consistent with the Imperial County General Plan, conducting environmental review, and coordinating with other agencies. If the project boundaries are in the City, the City is the lead agency and will coordinate with other agencies, if needed. IID is the regional wholesale water management agency with the authority to develop water supply plans; review changes in the place, volume and type of water use; assign contracts and to apportion the Colorado River supply within its service area. Regional cities and other water agencies are the retail water management agencies with their own authorities and responsibilities. IID is a responsible agency during the land use permitting and development review process and is required to consult with the County and Cities during development review. IID also must rely on the Imperial County project environmental impact reports to support its discretionary decision on water use by proposed renewable energy projects.

### **County General Plan**

The Imperial IRWMP is to be consistent with the Imperial County General Plan and support the County in meeting the goals and objectives. The County General Plan has policies to protect agriculture and agricultural water supplies, while also working to create economic development opportunities through promoting and locating renewable energy facilities. Imperial County General Plan – Geothermal/Alternative Energy and Transmission Element (Imperial County, 2006) was implemented to guide land use decisions and approvals involving renewable energy.

Imperial County General Plan supports and encourages the full, orderly, and efficient development of Geothermal/Alternative Energy Resources, while at the same time preserving and enhancing possible agricultural, biological, human, and recreational resources (Goal 1). In addition, the General Plan seeks to minimize impacts to agricultural lands and biological resources (Goal 2) by carefully analyzing the potential impacts on agricultural and biological resources from each project (Objective 2.4). Geothermal/Alternative Energy Operations are required to efficiently utilize water (Goal 3) in order to

maintain at least the present level of agricultural production while encouraging efficient water use (Objective 3.1).

The Geothermal/Alternative Energy Element states that geothermal development will have first priority of conserved and/or excess water over other uses which the County has jurisdiction (Objective 3.2). The County also encourages the efficient utilization of water in Geothermal/Alternative Energy Operations, and fosters the use of non-irrigation water (Objective 3.3). The County also recognizes that subsidence could be an issue (Goal 4) and requires alternative energy to have no net impacts detrimental to existing land uses (Objective 4.1) and that energy projects be responsible for monitoring potential subsidence (Objectives 4.3 and 4.4). IID has documented subsidence in IID canals and drains. Steps are needed to oversee and manage water extraction to reduce existing and eliminate future subsidence.

Conditional Use Permit language for several of the local geothermal plants state that “permittee shall diligently pursue the development of alternative sources to replace the use of irrigation water.” Renewable energy project proponents have been in discussions with the cities in the Imperial Region regarding development or upgrade of wastewater treatment plants to provide recycled municipal wastewater.

### **IID Plans and Programs**

IID plans and programs influence how much water is available in a year’s supply and demand imbalance, and how water is to be apportioned to new renewable energy projects.

The 2009 IID Interim Water Supply Policy (IWSP) provides for apportionment of up to 25,000 acre-feet per year for development of renewable energy industries and establishes a pricing structure. The IWSP defers to IID’s Integrated Water Resources Management Plan to define the long-term source of supply. IWSP fees and assessments are to be used to fund capital projects to produce new supplies and for other IID programs to mitigate any impacts to third parties and ensure that a firm and verifiable supply is available for the renewable energy industry.

IID 2009 regulations for Equitable Distribution Policy (EDP) define the response to a supply/demand imbalance and potential overruns. The IID Board of Directors can declare a supply/demand imbalance and apportion supplies.

### **8.2.2.3 State**

State and federal policy promote development of the renewable energy industry and create market incentives for geothermal, wind and solar project development in the Imperial Region.<sup>17, 18</sup> The Governor has issued Executive Orders (S-14-08; S-21-09) to expedite development of Renewable

---

<sup>17</sup> Governor Schwarzenegger signed Executive Order S-14-08 in 2008 establishing California’s goal of increasing renewable energy generated electricity and directed joint collaboration between the California Energy Commission (CEC) and Department of Fish and Game (CDFG) to expedite Renewable Portfolio Standard (RPS).

<sup>18</sup> United States Department of Interior (USDOI) Secretary Kenneth Salazar issued Secretarial Order 3285 in March 2009 to make renewable energy production, development, and delivery one of USDOI’s highest priorities

Portfolio Standards, also requiring the California Energy Commission (CEC) to define required best management practices for water-use efficiency at renewable energy facilities.

State laws related to use of water supplies by renewable energy projects could influence local renewable energy projects, as follows:

- SB/610 and SB 221<sup>19</sup> require lead agencies like Imperial County or the CEC to prepare and review a Water Supply Assessments (WSA) for projects that would require significant amounts of water. This further requires definition of the firm water supply to be committed; consultation between County and IID; evaluation of impacts and third party effects; and making of findings.
- Porter-Cologne Water Quality Control Act and Division 7 of the California Water Code. Section 13550 mandates that recycled water be used for power plant cooling purposes instead of potable water, provided the following conditions exist:
  - The source of recycled water is of adequate quality and is available in sufficient quantity and reasonable cost.
  - The use of recycled water does not adversely affect any existing water right.
  - The use of recycled water does not impact public health.
  - The use of recycled water will not degrade downstream water quality or harm plant life, fish, or wildlife.
- State Water Resources Control Board Resolution 75-58 Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Power Plant Cooling.<sup>20</sup> *This policy requires that power plant cooling water should come, in order of priority, from the following:*
  - Wastewater being discharged to the ocean.
  - Ocean water.
  - Brackish water from natural sources or irrigation return flow.
  - Inland waste waters of low total dissolved solids (TDS).
  - Other inland waters.
- State Water Resources Control Board Resolution 77-1 – Policy with Respect to Water Reclamation in California. This policy specifically addresses wastewater and encourages its reuse rather than disposal
- California Department of Health Services requires the use of tertiary treated, disinfected effluent in cooling towers<sup>21</sup>

The California Division of Oil, Gas, and Geothermal Resources (CDOGGR) does not have any specific regulations governing the use of surface water for power plant use, but they work in conjunction with the State Water Quality Control Boards (SWQCB) to enforce the existing standards and policies.

---

<sup>19</sup> SB 610 (Chapter 643, Statutes of 2001) and SB 221 (Chapter 642, Statutes of 2001)

<sup>20</sup> A copy of the policy is available on the IID Board's website: [www.swrcb.ca.gov/plnspols/wqplans/pwrplant.doc](http://www.swrcb.ca.gov/plnspols/wqplans/pwrplant.doc)

<sup>21</sup> CDHS regulations, "Purple Book," Sect. 13552.8. Recycled water for floor trap priming, cooling towers, and air conditioning." Available at: <<http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Recharge/Purplebookupdate6-01.PDF>>

The CEC has produced facility siting and permitting for renewable energy facilities that are intended to help land use agencies like the Imperial County with developing land use and general plan policies for locating plant facilities and transmission lines (CEC 2010).

#### **8.2.2.4 Federal**

As noted in Chapter 4, federal land management plans impacting the renewable energy industry are also being updated or are in development. There is the potential to locate geothermal and solar power projects on Federal lands. The U.S. Bureau of Land Management (USBLM) has a Geothermal Resource Leasing Program that has undergone environmental review (USBLM, 2008) and could affect water demands for geothermal projects on Federal lands.

BLM and the U.S. Department of Energy (USDOE) are also taking actions to facilitate solar energy development in compliance with federal orders, mandates, and agency policies that promote renewable energy. The Solar Energy Development Programmatic Environmental Impact Statement (EIS) is being prepared by the USDOE and USBLM in order to assess environmental impacts associated with the development and implementation of programs that would facilitate utility scale solar energy development on USBLM-administered lands in six southwestern states, including California (USBLM 2011). USBLM and USDOE are working jointly as lead agencies to prepare the Programmatic EIS to evaluate the proposed USBLM program. Once adopted, the PEIS could expedite the siting of facilities on federal lands in the Imperial Region.

The USBLM is also updating its Land Management Plan for the Imperial Sand Dunes Recreation Area (USBLM, 2010b) and defining land that would be available for solar, wind, or geothermal leasing. The preferred alternative identifies roughly 38,000 acres for wind, solar, or geothermal development. Pending adoption of the federal plans and certification of the PEIS, locating renewable energy facilities on federal lands is problematic and can result in delays to project implementation.

The lack of final federal policy and environmental compliance requirements on federal lands creates an incentive for locating facilities on private lands in the Imperial Region where the County is the lead agency.

#### **8.2.2.5 Joint State and Federal**

The Renewable Energy Action Team (REAT)<sup>22</sup> is a combined state and federal effort that produced the guidance document titled “Management Practices and Guidance Manual: Desert Renewable Energy Projects” (REAT 2011). In December 2010, the California Energy Commission (CEC) adopted the REAT report to serve as state policy for renewable energy facilities subject to their review and permitting. The purpose of the REAT report is to identify BMPs for renewable energy industry and provide a basis for

---

<sup>22</sup> REAT includes CDWR, California Energy Commission, California Department of Fish and Game (CDFG), U.S. Department of Interior Bureau of Land Management (USBLM), and Fish and Wildlife Service (USFWS).

developers, local, state, and federal agencies to be consistent when reviewing and permitting project thus avoiding project delays.

The REAT report encourages local agencies like IID and Imperial County to adopt local BMPs for cooling water to consider when permitting and authorizing projects under their respective jurisdictions. Guidance and BMPs are suggestions, not requirements, for project developers and/or public agencies to help reduce permitting timelines and to enhance and maximize environmental protections. The REAT BMPs are presented below.

The REAT report points to the Warren-Alquist Act (CEC, 2009) that reiterates state water policy in terms of conserving water and using alternative sources of water supply:

*It is further the policy of the state and the intent of the Legislature to promote all feasible means of energy and water conservation and all feasible uses of alternative energy and water supply sources.*

The CEC has delegated projects below 50 MWh to Imperial County for review. CEC reviewed larger projects consistent with the State Water Board policy and the Warren-Alquist Act. The REAT report states that the CEC:

*...will approve the use of fresh water for cooling purposes by power plants which it licenses only where alternative water supply sources and alternative cooling technologies are shown to be 'environmentally undesirable' or 'economically unsound.'*

CEC defines “environmentally undesirable” to mean the same as having a significant adverse environmental impact and “economically unsound” to mean the same as economically or otherwise infeasible. Specific local policy to define “significant adverse environmental impact” and “economically or otherwise infeasible” would help expedite local project review and permitting.

The REAT report identifies strategic actions to address major significant issues related to development of renewable energy projects. The REAT report states:

*The project will use air-cooling technologies for thermal power plant cooling.*

Further in the document, geothermal BMPs for water use that are specific to the Imperial Valley acknowledge that:

*For binary geothermal plants located: a) In the Imperial Valley, minimize water use for power plant cooling by using hybrid (wet-dry) cooling technology. Use wet cooling only during extremely hot temperature conditions in summer. (Hybrid cooling technology has had limited application to date, but is commercially available.). Use a degraded or reclaimed water source for the wet-cooling portion of the hybrid cooling system's operation. (pg 78).*

### **8.2.3 Opportunities**

#### **8.2.3.1 Best Management Practices for Power Plant Cooling Water Use**

The County and IID could adapt or adopt the REAT BMPs for the Imperial Region and adopt local policies, requirements, and standards to reduce cooling water demand.

#### **8.2.3.2 Treat Cooling Water to Improve Quality**

Cooling water demands are in part based on water quality. Pre-treatment, whether on-site or off-site of the power plant or by a public agency or the power plant developer, would allow for more cooling cycles as compared to use of water of lesser quality.

#### **8.2.3.3 Manage and Coordinate Changes in Land Use**

Improve coordination of the development review process by integrating IID's water supply plans and policies and city and county land use plans (general plan) and policies of Imperial County as applied to the renewable energy industry BMPs would:

- Ensure implementation of water-use efficiency measures and best management practices
- Expedite renewable energy project review and approval.
- Support economic development
- Help meet Imperial IRWMP goals and objectives.

Land use changes could result in either intensification of water use and increased demands above historical uses (e.g., locating geothermal on previously uncultivated open space lands), or could result in saving water that could be managed and apportioned by IID (e.g., agricultural to solar; agricultural to urban). IID could develop accounting procedures to track changes in water use that result from changes in land use.

#### **8.2.3.4 Economic Incentives**

Inverse block rate structures, like those used in the IID Interim Water Supply Policy, could continue to be used to provide an economic incentive to conserve water, and to provide revenue to invest in groundwater banking/storage or other capital projects to increase or extend the Colorado River supply (recycling, desalination). Such structures and projects could also be used to fund new projects and programs to mitigate impacts to historic users when apportioning water or managing shortage under the existing or expanded fallowing program (crop idling).

Economic evaluations would help define the marginal cost of water and the least cost mix of investments in capital projects, demand management/conservation, apportioning water and mitigating

existing users. This would help identify the cost of providing water to the Imperial region, determine ability and willingness to pay, and set investment priorities. If solutions are not affordable based on ability and willingness to pay, the Imperial Region could consider finding willing partners to invest in local solutions using a model similar to the QSA.

### **8.2.4 Constraints**

Discussion with the Water Forum, Demand Management Work Group, and Geothermal Energy Stakeholders Group members identified the following issues and constraints to developing integrated energy water-use efficiency measures, BMPs, and meeting renewable energy industry demands through strategies that reduce cumulative regional water demands.

- No standard procedure or guidelines for submitting water supply assessments.
- Lack of local policies or inconsistent policies regarding BMPs for cooling water supply sources and for cooling water use conservation.
- Other than the Interim Water Supply Policy, no alternative water supplies have been firmly identified.
- Other than 2009 regulations for EDP and 2012 Temporary Land Conversion and Fallowing Policy (TLCFP), no mechanisms currently exist for IID to exchange or apportion water between use sectors or users; or between current and future users except if EDP supplies decrease.
- Impacts to historic water users need to be evaluated and mitigated.
- Uncertainty in water supply, price for water, and costs to mitigate environmental or third party effects, and this impedes economic development of renewable energy projects.

Based on discussion with work groups, the Water Forum, and individual stakeholders there are differences in perspective between the water use communities that could pose constraints to developing an integrated solution. A summary of the different water user perspectives was developed.

#### **Cities**

- Current wastewater plants are out of compliance with water quality standards.
- Limited financial resources to upgrade wastewater plants to current standards or to fund tertiary treatment or recycling. Inability to raise water treatment and sewer rates.
- Cities are looking for willing partners with a need for water and resource money to upgrade wastewater plants for reuse of the wastewater.

#### **Agricultural Industry**

- The renewable energy industry, IID, and Imperial County need to recognize potential impacts to historic water users and the agriculture industry, and mitigate impacts by requiring use of alternative supplies or compensating current users for loss of supply.
- The agricultural industry is the historical user of water and the base of the local economy. Growers want to protect the agricultural water supply, but also recognize the need for economic development and jobs.
- There is a desire to continue to maintain the difference in the price points for water between the agricultural rate and what others are willing to pay for water (as in the EDP and IWSP).

- New users must pay for new water supplies; cover the costs of new supplies and/or to mitigate for third party impacts that would allow for reapportioning water for new uses.
- No more fallowing of land for other types of non-agricultural water uses should be allowed unless there is fair compensation.

#### **Renewable Energy Industry Stakeholder Comments**

- Needs certainty in supply and cost in order to make investment decisions and obtain lender support.
- Needs certainty in the standards, requirements and review process to avoid costly delays and establish realistic schedules.
- Ag rates are inexpensive.
- Renewable industry provides economic benefits.
- Recycled water is a potentially cost-effective supply and secondary use of the Colorado River water.
- There is plenty of water in most years, let industry put water to use and reduce underruns.

Other constraints to implementing efficient water use cooling systems and to develop alternative supplies are related to:

- Limited data and information on cooling cost; and for engineering and economic feasibility of cooling technology used to conserve water.
- Relatively high cost to develop projects for secondary uses of Colorado River water (as compared to current agricultural and municipal rates).
- Limited political will or agreement to put additional costs and requirements on the energy industry that represent an economic growth opportunity for the economically distressed Imperial Region.
- Limited coordination of land use and water management decisions, resulting in conflicts between the County and IID, and inconsistent policies.
- Lack of accounting for changes in land use and of a program to apportion water savings or mitigate supply impacts to historic users.
- Limited ability for further conservation by agriculture or municipal users.

Engineering and economic data and information are insufficient to define economical or otherwise infeasible BMPs; and/or a discrepancy regarding the interpretation of the available information. The data from private entities is considered proprietary. The lack of price certainty for alternative supplies to the Colorado River make it hard for the energy industry, IID, and Imperial County to compare the cost-effectiveness of cooling water-use efficiency/conservation and alternative water supplies. At present, decisions regarding economically or otherwise infeasible BMPs are up to the project proponent who must prioritize investments in either water supply development or conservation technology (cooling system) based on their ability and willingness to pay; market conditions; business model, and other information that may be considered proprietary.

In the absence of new water supplies or regional plans to apportion the existing supply, renewable energy industry interests will independently negotiate and develop supply solutions; seek to obtain

water from outside the Imperial Region, and/or fund engineering and economic studies to demonstrate that the alternate cooling systems to conserve water and/or alternative supply requirements are not economical or technically feasible.

### **8.2.5 Relation to Other Strategies**

- **Increase Water Supply** – New water supplies are needed to provide for the increased demands for the renewable energy industry and avoid impacts to agriculture and current users.
- **Agricultural Water Use Efficiency, Urban Water Use Efficiency** – Agricultural or urban water conservation could provide water for renewable energy industry for cooling. The renewable energy industry needs to demonstrate reasonable and beneficial use to protect Colorado River entitlements.
- **Crop Idling/Fallowing, Irrigated Land Retirement** – Both strategies could provide a source of water for the renewable energy industry if impacts are mitigated and the water is managed through an apportionment program by IID, such as in the EDP and TLCFP.
- **Land Use Planning and Management** – Locating solar facilities on lands zoned for agriculture would temporarily free up water that could be apportioned to renewable energy industry by IID under contract, but the program would need to ensure water was available to return the property to agricultural use. Integrating land use and water management policies and consistent standards for renewable energy would reduce conflicts and expedite permitting. IID 2009 EDP, 2012 TLCFP and Imperial County proposed solar ordinance are steps in this direction.



