

COACHELLA VALLEY WATER DISTRICT

Advanced Metering Infrastructure Pilot

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Executive Summary

Advanced Metering Infrastructure (AMI) may provide benefits across CVWD departments through an increased volume of timely and accessible data. Implementation of a comprehensive AMI program would involve multiple departments, and external contractors and vendors. There are many direct and indirect benefits CVWD could realize through an AMI program, however; to realize those benefits, there are significant resource demands to satisfy within a short timeframe.

The Advanced Metering Infrastructure (AMI) pilot project was approved as a strategic initiative because it integrates multiple aspects of CVWD's strategic plan. Specifically, the potential implementation of AMI directly relates to four of CVWD's six strategic goals:

1. Water Supply Sustainability
2. Exceptional Customer Service
3. Financial Stability
4. Infrastructure Investment and Management

For this pilot, CVWD tested three AMI solutions for one year, on 300 domestic meters in the Indian Ridge and Palmira communities. Both communities are within 2 miles of CVWD's Operations Building. Fifty (50) endpoints from each vendor were installed in each community. To increase customer engagement, CVWD solicited volunteers from the Indian Ridge Country Club community and received interest from seventy-five (75) customers. The AMI products were evenly distributed across the customers who volunteered to participate in the AMI pilot.

What is AMI

An AMI System automatically transmits readings from meters to Data Collection Units (DCUs) in the field and then to a utility's computer system. Readings are usually taken at a set interval (typically every 15 minutes) and transmitted to the computer system from one to four times per day, depending on the AMI system. Once received at the computer, readings can be extracted for billing and customer service purposes. As a result, a utility can improve process efficiencies and consumption analytics as the utility is able to perform processes remotely and collect multiple consumption readings per day, rather than one reading per month.

Several technical components are required for a properly functioning AMI system. An AMI system requires an encoded register be compatible with an endpoint or meter transmission unit (MTU). The MTU transmits data, through either radio or cellular, to a series of repeaters and ultimately to the DCU. The DCU will upload the data into the system's computer software, typically a cloud-based solution.

Current Meter Reading Methodology

CVWD currently has two processes to capture meter reads on a monthly basis. Currently, more than 94,000 meters are manually read each month by the Meter Reading division. This approach requires

meter readers to go to each physical location, lift lids, visually record register reads and enter them manually into a handheld device.

An additional 19,254 meters are read each month using drive-by Automatic Meter Reading (AMR) technology for hard-to-read locations. AMR allows meter readers to drive within the general vicinity of a water meter with a device mounted in the vehicle to collect meter reads via radio transmissions. CVWD saw efficiency improvements initially when manual meters were upgraded to AMR; however, CVWD has suspended the AMR program after CVWD encountered numerous challenges maintaining accurate reads as the AMR registers began to fail, on average, after eight to ten years in service. AMR technology enables CVWD to pull incremental consumption data (for example, every hour); however, staff has found the process time-consuming, the process depletes the AMR battery more quickly, and intermittently fails to work.

AMI Alignment with CVWD Strategic Goals

The AMI pilot project was adopted as a strategic initiative for FY2018-19 as it directly relates to four of CVWD's six Strategic Goals.

Water Supply Sustainability

AMI provides customers the ability to view their water use patterns and learn how much water they consume from indoor and outdoor activities. In addition, an AMI system provides faster awareness of water use issues on a property, such as a leak and/or high-consumption alert. With many CVWD customers residing in their home seasonally, AMI would give customers the ability to monitor their water usage regardless of their location.

Exceptional Customer Service

When customers have access to consumption data in near real-time, customers are able to see changes in water usage as they happen and prevent long-term problems rather than being made aware of consumption monthly. In addition, staff (Customer Service Representatives and Water Management Specialists) are able to utilize data to better alert customers of issues. AMI data may empower customers to be proactive and identify issues before high consumption leads to an unexpectedly high bill. Currently, customers typically do not know about a problem until they receive a high bill, which could be a month after the issue began. AMI enables customers to learn of high consumption issues within days.

Financial Stability

AMI data and alarms could improve revenue and minimize non-revenue water. CVWD could potentially receive alerts of customer leaks, tampering, or unresponsive AMI endpoints and address the issue within days as opposed to the month or more it may currently take between meter reads and/or customer bills. Revenue improvements resulting from AMI would result from proactive approaches to alarms and alerts generated by the AMI system. There are also cost savings from pumping less water if customer leaks are identified and corrected earlier.

Infrastructure Investment and Management

AMI data may improve infrastructure investment and management. AMI would provide extensive data on consumption patterns throughout the service area and that information could be utilized in asset management efforts to better target infrastructure investment needs.

AMI Deployment Considerations

Potential Cost to Implement

Initial estimates for a full AMI deployment and implementation range from \$40-\$50 million. Total cost depend on the AMI solution selected (radio, cellular, hybrid), method of purchase (buy or lease), method of installation (self-install or contract), portal features, deployment timeline, and other factors. These factors also significantly affect ongoing maintenance costs of any deployed AMI solution. A primary cost driver to note is the need to upgrade each water meter to a meter with an AMI compatible register. Currently there are more than 100,000 ¾" domestic water meters and all these would need to be replaced with AMI compatible meters to implement a system-wide AMI solution. Staff estimates that the cost to replace (purchase and install) the ¾" domestic water meters is \$20.65 million dollars.

Maintenance Commitments

Maintenance commitments could vary greatly depending upon how AMI is purchased; e.g. a lease agreement could put a majority of the maintenance responsibilities on the vendor, rather than on CVWD. Factors that affect maintenance costs include:

- The necessary replacement of all endpoints at the 10-year mark.
- For financial feasibility, it is recommended that the implementation be completed within a three-year period. Upon completion, CVWD should plan to replace all the meters based on the same criteria as the current proactive meter replacement program.
- Depending upon AMI communication type (cellular or radio), there may be additional infrastructure to install and maintain as well as ongoing service charges for data transmission.
- Due to the heat in our service area, CVWD may need to replace end-points more often than in a cooler climate area.

Impact to CVWD Staffing

Staff visited a number of agencies that have implemented AMI solutions and found that it is typical for workload to shift to other aspects within the utility and for staffing levels to remain constant. While there may be cost savings related to specific tasks, such as manually reading each meter monthly, other areas may see workload increases directly tied to AMI. Some examples of potential increased workload include:

- Operations and Information Systems work to maintain AMI infrastructure and data
- Field investigations conducted by Meter Reading to respond to leak and/or high consumption identified through AMI

- Contacting customers with ongoing leak or consumption issues
- Monitoring AMI data and reports
- Additional staff may be needed to service AMI equipment.
- Training for staff will be needed for additional equipment installed in the field, depending on the type of system that is implemented.
- Increased staff for alarm investigations (actual and false alarms).

For this reason, without a comprehensive analysis of AMI's impact on work across CVWD departments while accounting for potential increased workloads in other departments, it is difficult to estimate with confidence any potential savings from changes in staffing numbers or workload.

Potential costs and impacts to staff may be significant, but an AMI solution has the potential to deliver significant direct operational benefits and indirect or societal benefits.

Direct Operational Benefits

Increased Revenue Recovery

A result of replacing all meters within CVWD's service area within a short time period is that the meter population reading accuracy will significantly improve. Over time, meters are subject to wear like any mechanical device and many factors contribute to meter accuracy degradation. If all meters were replaced at once, in 20 years you can expect those meters to have an accuracy outside of acceptable ranges and a high failure rate. Based on CVWD's experience, the difference in the degradation rate of meters can have a large scale. For example, you may find a meter that completely stopped registering in 5 years opposed to a meter that has a 10% loss in accuracy over 20 years. Variables such as water quality, usage, flow rate, and pressure make it difficult to get a standard decline of accuracy. Staff perform random meter testing on consumption meters in the distribution system to find the estimated meter inaccuracy rate for water loss estimating. In FY2019-20, our test data for the COVE System suggest a 4.91% inaccuracy value and a loss of 1,495 million gallons.

Revenue recovery generated by meters that are more accurate is a result of an AMI deployment rather than caused by the AMI system itself. If CVWD's water meter population necessitated widespread replacement due to aging and widespread failures, an AMI deployment could be added to a large-scale meter replacement project. The increased revenue generated by replacing meters is a key driver to recover the costs of deploying an AMI solution.

Recognizing the impact that meter accuracy has on CVWD revenue, both the Operations and Service departments are undertaking proactive efforts to address aging and failing meters.

Proactive Meter Replacement Program

CVWD has implemented a Proactive Meter Replacement Program in an effort to reduce water loss, revenue loss and promote equitable billing for our customers. The program has evolved over the years; because of this, the replacement of our meters is not solely based on how many years the meter has been in service, which is typical of other replacement programs.

CVWD utilizes multiple data points to develop a list of meters that should be replaced each year. Currently the goal is a replacement rate of 5,000 meters per fiscal year, which is approximately 5% of active meters in the distribution system. The proactive meter replacement program is estimated to create an additional \$1.2 million in revenues per year. The data points used to create the meter replacement list for the year are listed below:

- Years in service
- Brand of meter
- Type of meter
- Weighted accuracy based on random meter testing throughout the system, for each size currently in service.
- Average annual consumption of the meter

Meter Audit & Customer Billing Identify Failed Meters

Since early 2020, the Service Department has undertaken a multi-pronged approach to improve revenue recovery. One initiative involves identifying accounts that are being under-billed, such as those with failed or under-registering meters. During FY 2020-21, as a result of these efforts, 1,306 failed meters were identified and replaced during the billing process. 206 meters were replaced in the first quarter of FY 2020, which resulted in increased revenue of \$132,441 in the first year since replacement. On a full-year basis, staff project meters replaced in FY 2020-21, as a result of this initiative, will generate over \$1 million in previously unbilled revenue.

For example, the Meter Reading department created a new “Meter Audit” task code to investigate accounts with suspected meter failures. This allows meter reading staff to flag accounts while in the field, with minimal impact to quota requirements. Meter reading staff applied techniques learned through various training sessions and have been able to identify 475 failed meters since implementation in March 2021.

Potential Cost Savings Achieved Through AMI

Meter Reading Automation

Some meter reading activities could be automated or performed remotely. In addition, meter reading accuracy could improve as the reads are automatically provided to CVWD on a set schedule, multiple times per day. The Meter Reading department goal is to maintain a 99.95% accuracy rate. Cost savings could be seen from decreased staff time spent re-reading meters, customer billing verifying reads, and reduced complaints to customer service of inaccurate reads.

Operational Efficiencies

Currently CVWD staff read a customer’s meter once per month. This reading provides CVWD with approximately 12 data points each year regarding each customer’s consumption. AMI would provide CVWD with up to 96 data points each day (4 reads each hour). The granularity of data could improve processes and efficiencies across CVWD departments. Some examples include:

- Customer bills could be generated and due on the same day each month. This could improve how revenues are tracked and reduce questions from customers who find it difficult to manage a bill due date that changes every month.
- Change of Ownership – When a customer moves out and a new customer moves in to a residence, a meter reader must visit the property one day to obtain the final read and possibly a different day for the new customer’s initial read. AMI could enable staff to access the final and initial read remotely, eliminating the need to visit the property at all to complete such tasks.
- Staff could provide customers with better information regarding when consumption is occurring and at what volumes when customers call with questions. Staff would expect to reduce the need to visit properties to troubleshoot issues, as the data should provide staff with the information needed to assist customers in the majority of calls.

Increased Safety for Field Personnel

With meter reads and other services being provided remotely by the AMI system, CVWD staff could see a reduction in time spent in the field, and on the road, where they may be at greater risk of injury. It is difficult to project how AMI would affect staff safety or worker’s compensation claims because workload could shift to other CVWD staff to maintain the AMI system or troubleshoot customer issues in the field.

Field Investigations

The ability of the AMI meter to detect consumption at much lower flow rates, combined with the customer’s ability to set their preferred alert parameters, led to various leak alerts in each of the three AMI agent portals. Meter reading investigated properties for issues when the AMI system generated a leak alert. If meter reading saw an issue at the front of the property or found movement on the meter, Customer Service contacted the customer to notify them of a potential issue at the property.

In addition, leak alerts that continued for more than 30 days at a rate of 10GPH or more were reviewed by Water Management. Staff was able to identify some water waste issues by more easily identifying irrigation times and when irrigation was on based on usage patterns.

Request for Account Review (RFAR) Policy

CVWD granted \$900,000 in FY2020-21 to customers who received large bills resulting from leaks and/or malfunctioning home equipment (toilets, pools, etc.). Current policy provides that charges for 60 days of consumption may be adjusted, so long as consumption returns to historical usage and the customer provides documentation that a repair has been made. The reason so many days may be adjusted is that customers are typically only notified of issues from their water bill that is received about every 30 days. With AMI, customers are notified of issues within 48 hours and the billing adjustment policy could be updated to reflect a responsibility on the customer to correct issues promptly upon notification from either the AMI system or CVWD staff.

Indirect (Customer/Societal) Benefits

While AMI technology may provide direct benefits such as improved data availability, there are also indirect benefits, those that are not easily quantified or measured, that AMI could create, such as:

Enhanced Customer Service

Staff will be better equipped with data to assist customers who have questions about their consumption history and patterns. The available data could increase transparency and improve customer perceptions of CVWD.

Inform Decisions on Water Consumption

Access to data could inform decision-making across CVWD departments. The data could improve Cost of Service Studies, water conservation goals, asset management, water loss auditing, and many others.

Customer Engagement

AMI is capable of providing a wealth of data to both customers and CVWD. Customers would have the ability to monitor consumption and set custom leak or consumption alarms. Customers only benefit if they register and engage with the customer portal. During the pilot, approximately 20% of customers registered for the customer portal (61/300). Of the customers that did register for the customer portal, 72% were customers that volunteered to participate in the AMI Pilot Project (44/61). CVWD would need to expend resources and strategies during any AMI deployment to encourage as many customers as possible to register and monitor their water consumption to take advantage of the benefit of AMI.

Another consideration is the potential that customers request to opt-out of an AMI program. During the pilot project three customers (1%) contacted CVWD to opt-out of the pilot project. CVWD would need to develop a policy to address customers who wish to opt-out of AMI. Customers have also requested to opt-out of the AMR meter program.

Product Feasibility

Product Performance

Each of the three AMI products appeared to function well at the predetermined install locations over the one-year pilot period. The install locations were all within 2 miles of the Operations building to minimize costs of the pilot; therefore, more research may be necessary to evaluate how each system would perform in more rural areas, should it be implemented district wide.

Internal Stakeholders

Staff found that AMI is a great tool to assist customers in finding leaks timely and avoid water waste. With AMI, CVWD is able to alert a customer promptly of a potential issue rather than waiting until customers receive their water bill. AMI data can be used to pinpoint when water use increased, and the customer may know what occurred that day, which helps in locating where the water waste could be located. AMI can empower customers to better manage their water use, however, of the customers Service contacted to alert of possible issues at their property, only a few were interested in how to access the information themselves. In some instances, customers would request staff call them back later that day to confirm if the water waste had been stopped.

Product Comparison:

	Benefits	Issues Found
Sensus	<p>Data is updated every 4 hours and on-demand reads are available.</p> <p>Reports are offered in Excel, CSV or PDF format.</p>	<p>End-points had difficulty pairing with the MasterMeter encoded registers because of the two connection points. Sensus now has a Nicor connection that would have avoided this issue. Staff encountered this issue with approximately 20 of the 100 units installed.</p> <p>The agent dashboard was not user friendly and was difficult to navigate.</p> <p>The alarm insight page went blank several times or displayed “Unavailable” errors on some of the accounts listed.</p> <p>The portal experienced technical issues where the leak alarm did not appear to match the consumption chart under the customer information tab.</p>
Neptune & WaterSmart	<p>No issues with installing or connecting to MasterMeter encoded registers and no major issues were reported with equipment failure in the field.</p> <p>Neptune utilized WaterSmart, an independent vendor, to provide the agent and customer portal for this pilot. The WaterSmart portal is user-friendly and easy to navigate.</p> <p>Provided a concise Leak Report on a consistent basis, possibly because the accounts selected did not show continuous use.</p>	<p>Leak or consumption alarms were created that in some instances lacked merit. Upon full deployment, system alerts (leaks, consumption, etc.) may be customized to threshold settings that are more accurate, and this would need to be done to ensure more accurate alarms are generated.</p> <p>Historical consumption trends can be difficult to navigate and view.</p> <p>The leak detection report is available in Excel format only.</p>
Badger	<p>No issues with installing or connecting to MasterMeter encoded registers</p> <p>Badger updated consumption data every 3 hours, was easy to view past consumption history, and also provided an easy to export Continuous Leak Report.</p> <p>The agent portal is user-friendly and provides an “At a Glance” view page displaying Communication Health, Device Health, Billing Reads, System Usage, Flow Health and Top Accounts by Usage on a single page.</p>	<p>Lost signal with two end-points, and due to manufacturing and/or shipping shortages, Badger were unable to replace them in a timely manner.</p>

AMI and State Regulations

Assembly Bill 1668 (AB1668) requires California to adopt long-term standards for the efficient use of water and establish specified standards for per capita daily indoor residential water use. The bill requires urban retail water suppliers to calculate an urban water use objective and update it annually. Senate Bill 606 (SB606) requires that urban water suppliers adopt an urban water management plan, and update it every 5 years. It also requires that urban water suppliers adopt and periodically review a water shortage contingency plan, as part of its urban water management plan.

Under the requirements of both bills and the plans that CVWD has adopted, there are certain conservation targets and mandates that must be met. During the development of these targets, there was some acknowledgement that having real time usage data can be beneficial, specifically when it comes to calculating the effects of seasonal population on indoor water use. However, CVWD currently utilizes budget based tiered rates, multiple meter classifications, and dedicated irrigation meters, which help to identify the different types of water use within our service boundaries. Additionally, Water Management and Billing conduct regular account reviews, which help us to identify customers that are using more than their budgeted water allotment, in order to target our efforts and programs to help keep the district in compliance with the conservation targets and mandates.

From interacting with the conservation staff of multiple water agencies that have partial or full AMI implementation, CVWD staff learned that their departments have seen a large increase in workload due to leak alerts. Many had so many alerts they were not able to call the customers directly and had to issue letters advising the customer of the issue. Only those alerts that involved extremely high water usage were addressed more immediately. As compared to the current process in place at CVWD, customers were not notified much more quickly of issues by utilizing the AMI technology. CVWD found approximately 20% of customers registered for access to the customer portal, however, that is due to a high percentage of registrations coming from individuals who volunteered to participate in the pilot. Among those who did not volunteer, registration was closer to 10%, which is more representative of other agency's experiences with AMI.

Options Moving Forward

The following are options to consider as potential next steps:

1. Status Quo

Staff could maintain the status quo and take no action with respect to deploying an AMI system. If CVWD decides to pursue an AMI deployment, CVWD may issue an RFP to the pre-qualified AMI vendors, those who participated in the pilot project, so long as AMI technology has not significantly changed since the pilot evaluation period.

2. Issue RFP for Comprehensive Cost-Benefit and Implementation Analysis

The above analysis is brief and general. Staff could pursue a consultant with expertise in evaluating AMI systems and task the consultant with developing a comprehensive cost-benefit analysis specific to

CVWD. The consultant's evaluation would include an evaluation based on the pre-qualified vendors pricing and technology (radio, cellular, combination). The study would also evaluate and recommend potential grant funding to offset AMI implementation project costs. Staff estimates a comprehensive study would cost up to \$250,000 and would require the issuance of a Request for Proposal.

3. Full Implementation

If directed, staff could begin working with Finance, Operations, and Engineering to begin budgeting full AMI deployment within the Capital Improvement Program. Staff would issue an RFP to the three pre-qualified vendors and award a contract based on a comprehensive review of the received bid packages.

4. Hybrid Model

Staff could evaluate the feasibility of implementing a hybrid AMI implementation. One possibility would be utilizing AMI at commercial or irrigation meters, and not residential. This could significantly reduce the costs; however, there could be cost of service impacts on these users, as there would be specific AMI costs that would need to be paid for by those receiving the benefits of AMI.

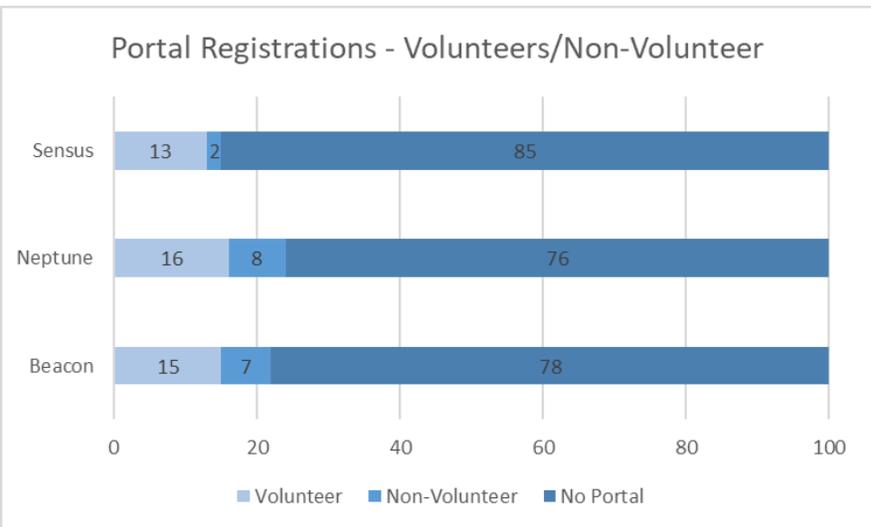
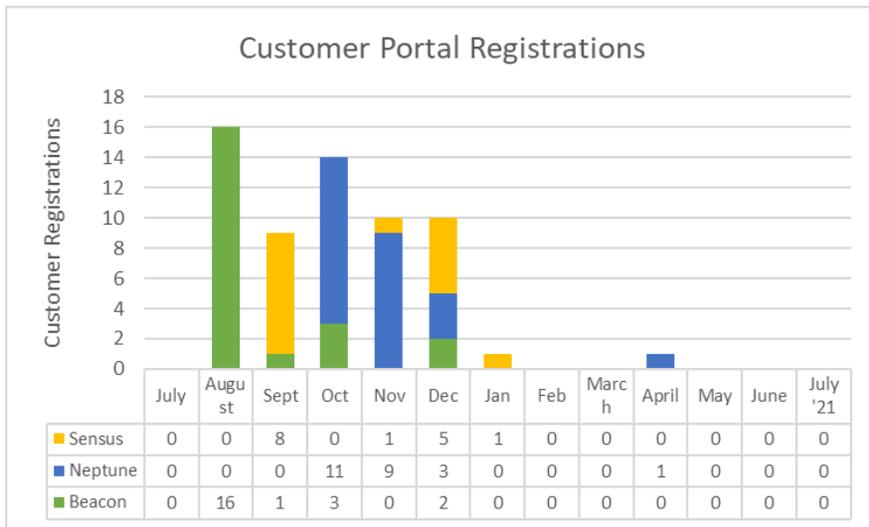
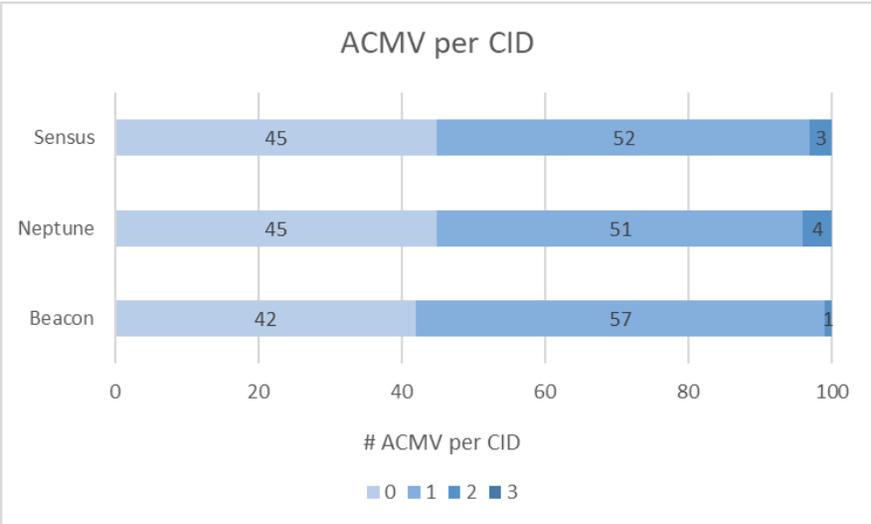
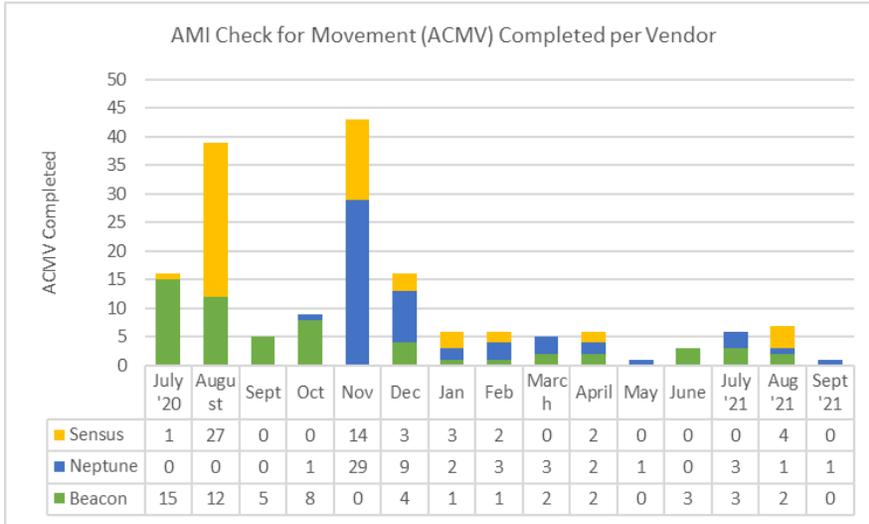
5. Consumer Market Devices

An increasing number of consumer products that monitor customer's water consumption through the Internet of Things (IoT) are becoming commercially available to customers. These products are often referred to as either a "flowmeter" or "Smart Leak Detector". The devices are installed and maintained by customers. The technology monitors a homeowner's water consumption, in addition to other data, dependent upon the product and installation type. The products utilize the customer's Wi-Fi and are able to provide data in "real-time" via mobile and/or web portals. CVWD could evaluate the products to promote through rebate programs or enter into partnerships with vendors or other third parties.

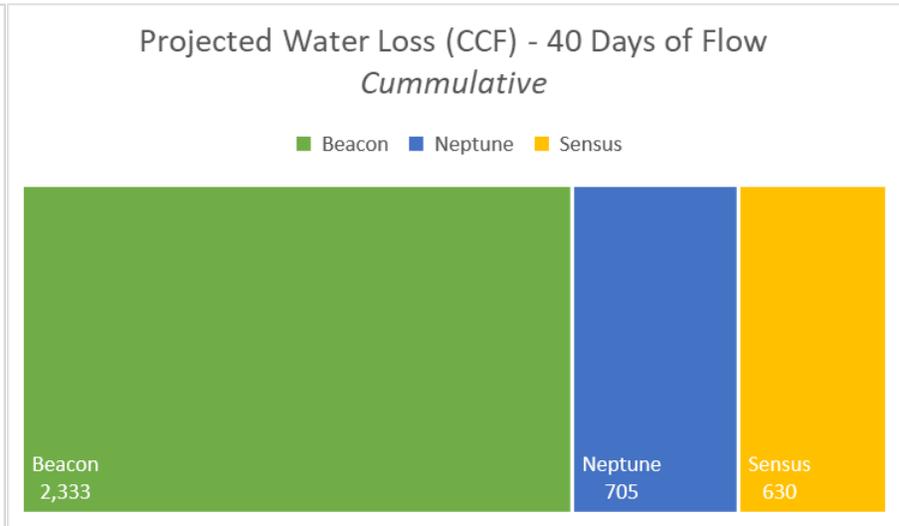
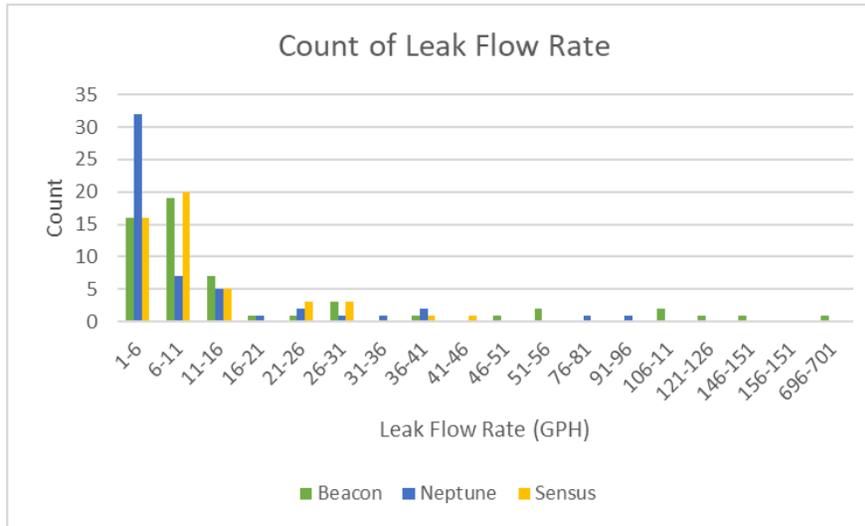
Attachments

- A. Data Dashboard
- B. Customer Survey and Feedback

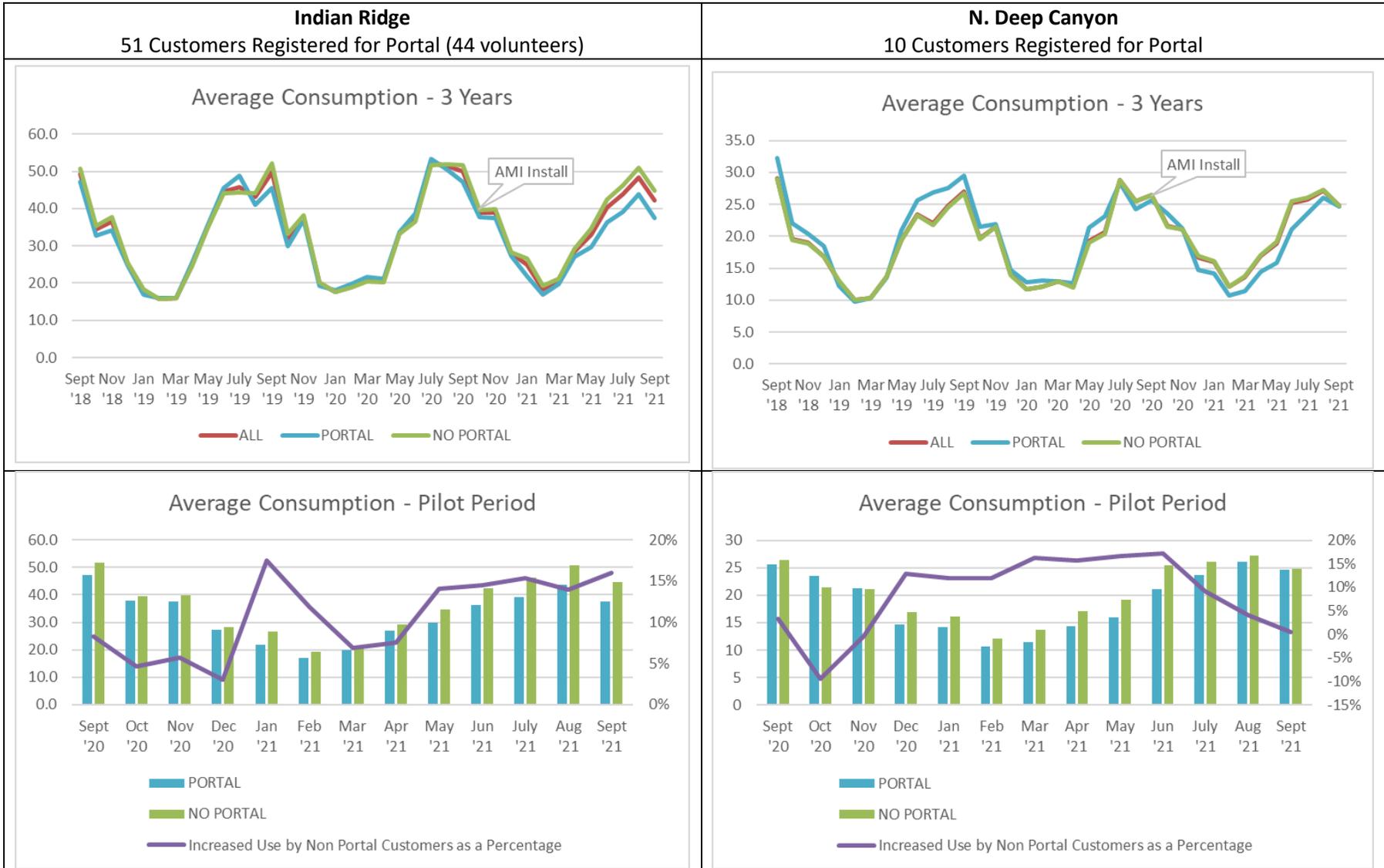
Attachment A – Data Dashboard



Attachment A – Data Dashboard

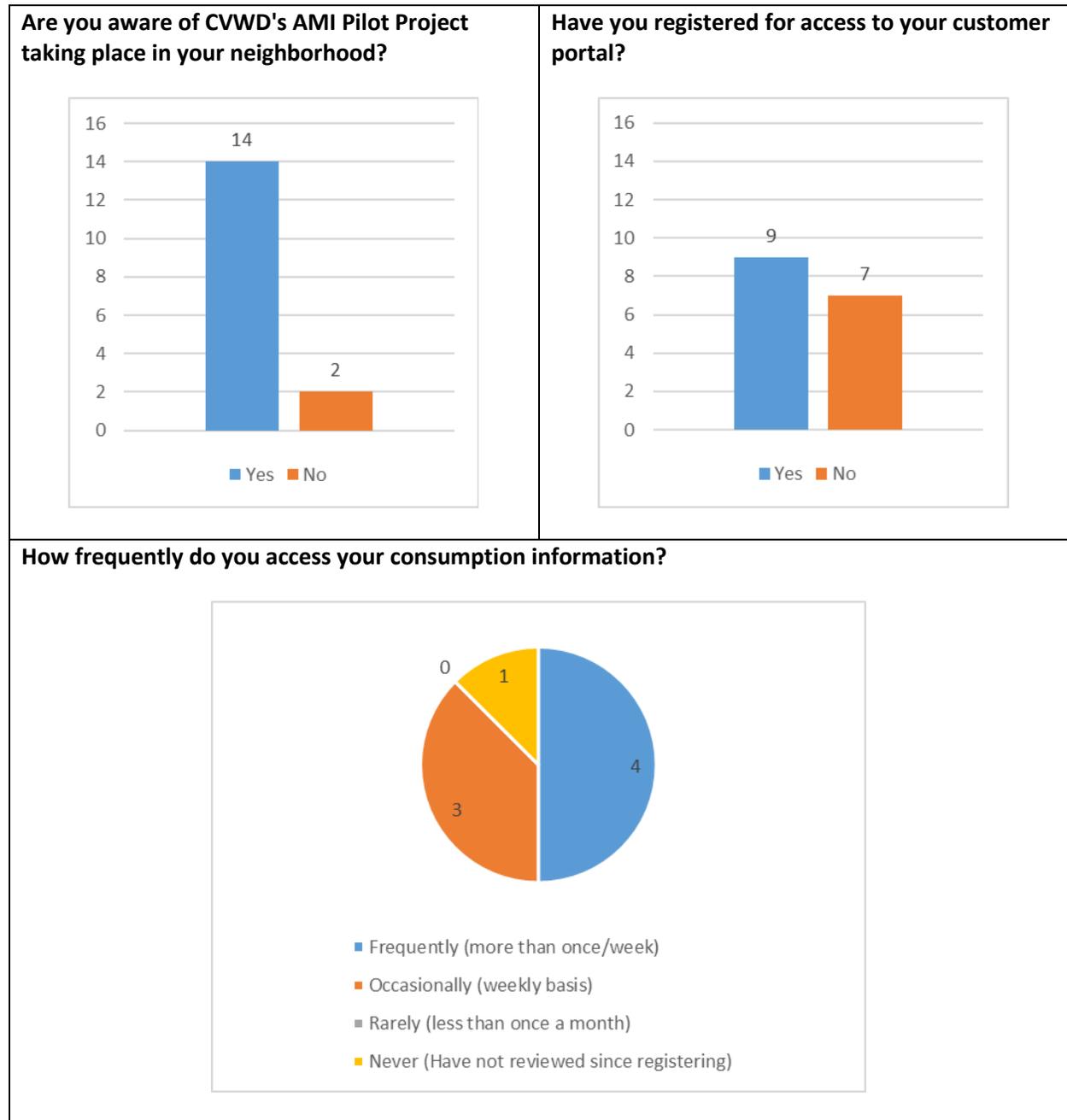


Attachment A – Data Dashboard



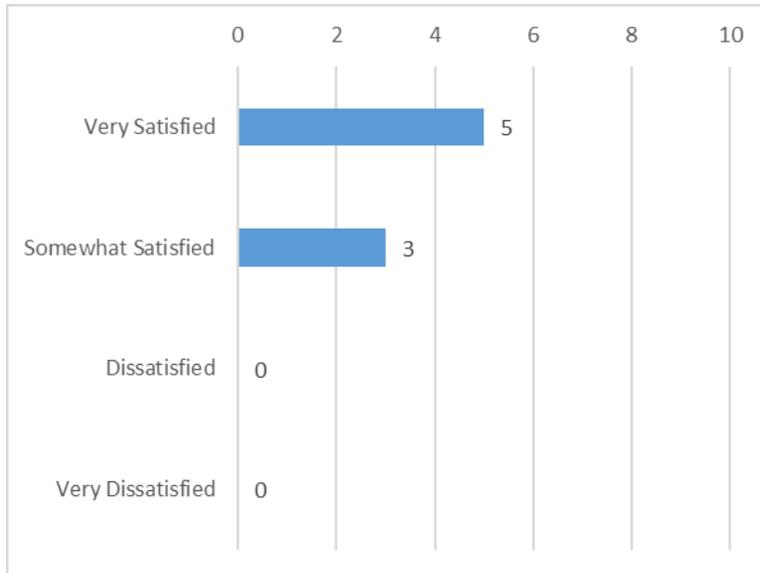
Attachment B – Customer Feedback

The customer satisfaction survey was initially distributed to participants via email in July 2021 and CVWD received fifteen responses (15/197). When CVWD notified customers via USPS in September 2021 that the pilot project was ending, a link to the survey was included in the letter. CVWD received one response because of those notification letters.

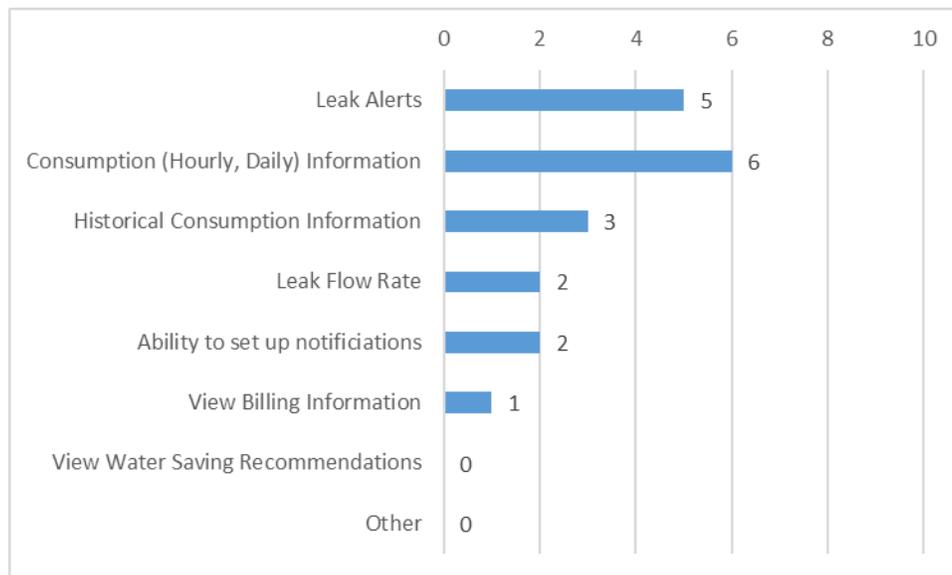


Attachment B – Customer Feedback

How satisfied are you the information provided in the customer portal?

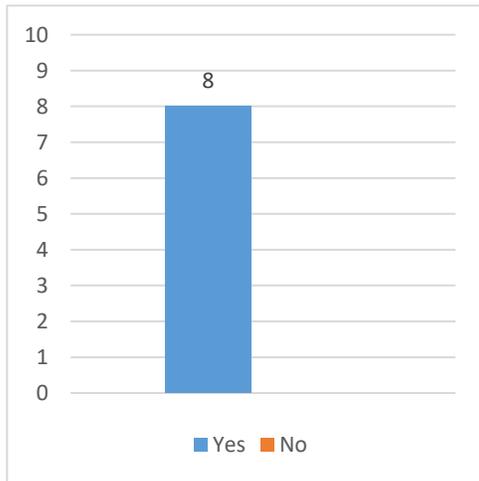


What information do you find useful in the customer portal (select up to 3)

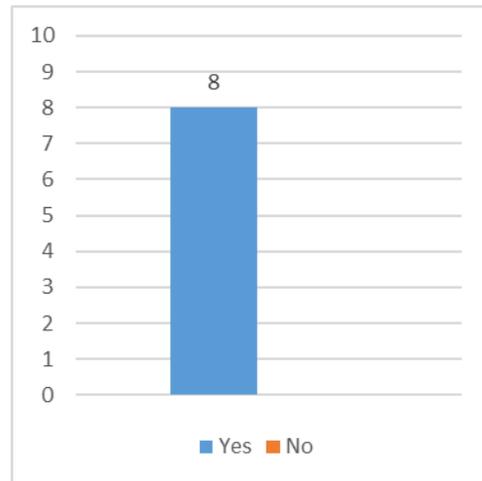


Attachment B – Customer Feedback

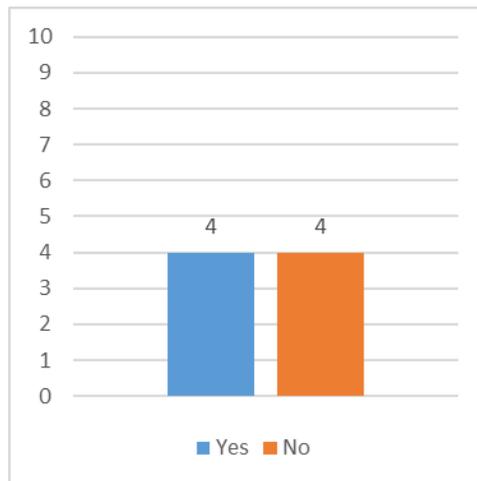
Do you find the information available in the customer portal useful?



Do you recommend CVWD pursue full implementation of the AMI system or alternative water monitoring technology?



If CVWD charged \$10 a month for access to water monitoring technology, such as AMI, would you enroll and recommend others to enroll?



Attachment B – Customer Feedback

Customer Comments:

What information do you wish was available on the customer portal?
It is well done
Notification that leak has been remedied
What changes have you made to your water consumption as a result of the AMI meter Installation at your property?
I have upgraded my sprinkler system and fine-tuned water flow
Presently, none
none
Adjusting, monitoring and repairing irrigation
more conscious of various consumption activities
Ability to monitor remotely what the gardeners are doing. Very valuable when we are gone for the summer.
General Comments
I like the service but should not have to pay extra as it benefits both the user and CVWD
\$10.00 per month seems high, I might be more interested at \$5
helps me notice if there are leaks since this is a 2nd home and we not there full time
The portal does not seem to update. My billing cycle data is from Oct. 2, 2020 and it shows 631% consumed. This is not useful data. Why isn't it being updated for each billing cycle?
Definitely agree CVWD should have smart meters installed for all households and businesses.
I volunteered for a test electronic water meter and App on my iPhone showing my daily & hourly water usage for the past year. I have a second home in Indian Ridge Country Club, 580 Snow Creek Canyon, CVWD Account 611331-416334. I set the alarm on the water meter App showing water usage over certain amounts during the past year. Using the house 2-3 weeks a month from Nov-June and not being there from July-Oct it's very difficult to notice a water leak other than once a month when I get my monthly bill. With the App and electric water meter I can check my water usage daily and notice a leak immediately. This happened twice during this past year. Once we had a sprinkler leak and once our sprinkler timer changed the time the water was on from 4 minutes a station to 40 minutes a station. Both times I called my gardener immediately and stopped use and loss of the excess water saving both money and precious water. I strongly recommend that CVWD continue to offer its customers the use of electronic water meters with an App that goes on a Smart Cell Phone to check for water leaks and loss of excess water. This will save lots of water and money over the future years.....thanks for listening
Deleting the Sensus monitoring program? I watched it daily to monitor my consumption. Will it be coming back ?