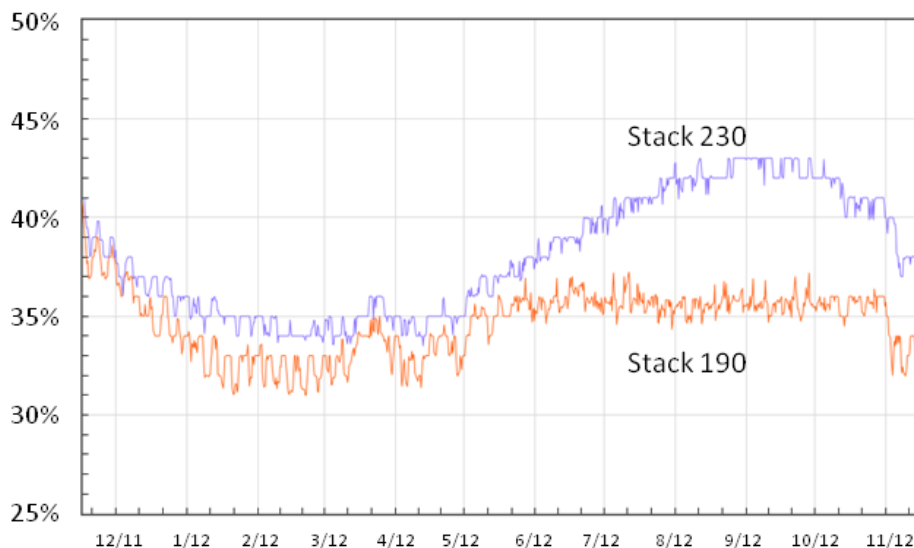


## National Archives extends life expectancy of its textual records at its College Park facility AND saves energy at the same time

In September 2011 the humidity set points for the National Archives at College Park (Archives II/AII) textual stacks were adjusted to allow a range of 30-50%. Previously, the humidity was held nearly constant at  $45 \pm 3\%$  year-round at  $68 \pm 2^\circ$  F. NARA building engineer Gary Simmons, Physicist Mark Ormsby from the Conservation division and staff of NARA buildings services contractor LB&B developed the new settings after exploring various scenarios for improving the storage environment for the records while reducing energy costs. This report shows the results for Fiscal Year (FY) 2012 using utility data compiled by NARA engineer Ngan Pham, together with environmental data from the stacks. Compared to the previous year, the Archives II utility costs fell by over \$650,000 while the new conditions will help the records to last about 20% longer.

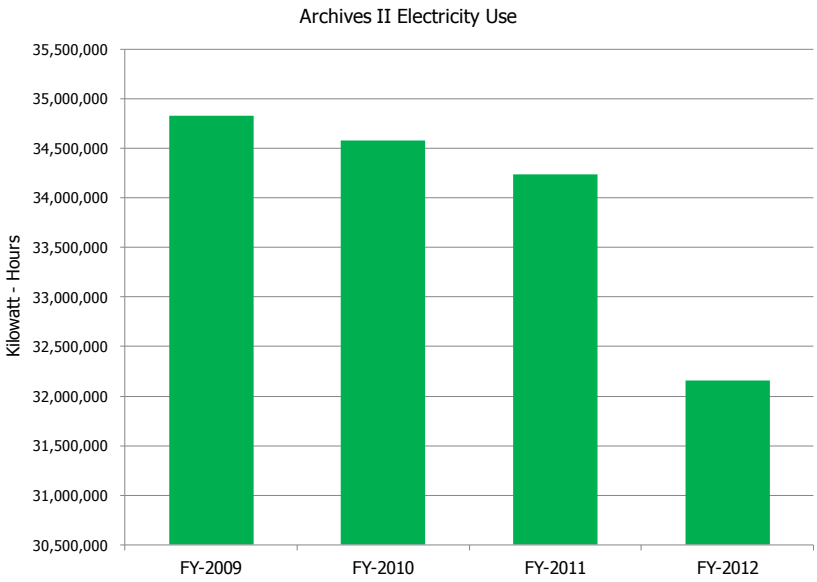
The graph below shows the humidity data for a full year of readings starting in November 2011. In stack 230 (blue) the humidity rose during the summer. This was the expected behavior, but this type of rise happened in only a few stacks. Most areas behaved like stack 190 (red), where the humidity dropped steadily through the fall and then remained surprisingly low through the summer.



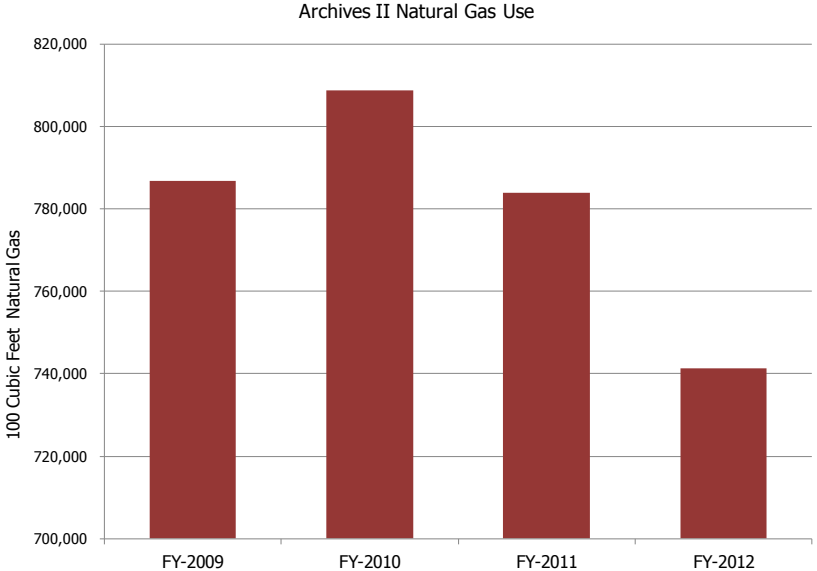
The table below shows the FY12 average temperature, humidity, dew point, and time-weighted preservation index (TWPI) values for 21 stacks that use chilled water for dehumidification. The average RH is 36%, which is lower than expected. This low RH slows down the aging of the records. The benefit of the change can be evaluated with the Time Weighted Preservation Index (TWPI), which gives an estimate of the aging rate using a model that incorporates the temperature and humidity data. Based on the TWPI model, on average the records in the textual stacks will last about 20% longer at these new conditions than they would have at the previous 45% RH setpoint. In addition, for the year all stacks had a TWPI of 56 or above, which is the minimum value compatible with NARA archival storage requirements. (NARA Directive 1571).

Location Dataset	Date Range	T °F	%RH	DP °F	TWPI
STACK 130 - A03195	11/17/2011 to 11/18/2012	66.4	38	39.7	67
STACK 150 - A02822	11/16/2011 to 11/18/2012	68.5	37	41.1	61
STACK 170 - A02707	11/16/2011 to 11/18/2012	70.2	33	39.4	61
STACK 190 - A02861	11/16/2011 to 11/18/2012	69.1	35	39.9	60
STACK 230 - A03111	11/17/2011 to 11/18/2012	68.7	38	41.8	58
STACK 231 - A02785	11/17/2011 to 11/18/2012	67.6	37	40.6	63
STACK 250 - A02773	11/16/2011 to 11/18/2012	69	37	41.3	58
STACK 270 - A02841	11/16/2011 to 11/18/2012	69.1	35	40.3	60
STACK 290 - A02832	11/16/2011 to 11/18/2012	68.9	36	40.6	60
Stack 330 - A03112	11/17/2011 to 11/18/2012	69	37	41.3	58
STACK 331 - A02728	11/17/2011 to 11/18/2012	66.7	38	40.2	65
STACK 350 - A02539	11/16/2011 to 11/18/2012	69.5	36	41	57
STACK 370 - A02703	11/16/2011 to 11/18/2012	69.8	35	40.7	58
STACK 390 - A02834	11/16/2011 to 11/18/2012	68.7	36	40.6	61
STACK 430 - A02700	11/17/2011 to 11/18/2012	68.9	35	40.1	61
STACK 450 - A02809	11/16/2011 to 11/18/2012	69.2	37	41.5	56
STACK 470 - A02704	11/16/2011 to 11/18/2012	68.6	35	39.6	62
STACK 530 - A02794	11/17/2011 to 11/18/2012	68.7	36	40.3	61
STACK 550 - A03102	11/16/2011 to 11/18/2012	67.3	39	41.5	62
STACK 570 - A02758	11/16/2011 to 11/18/2012	68.4	35	39.9	63
STACK 650 - A03199	11/17/2011 to 11/18/2012	68.7	37	41.2	59
Average (21 locations)		68.6	36.3	40.6	60.5

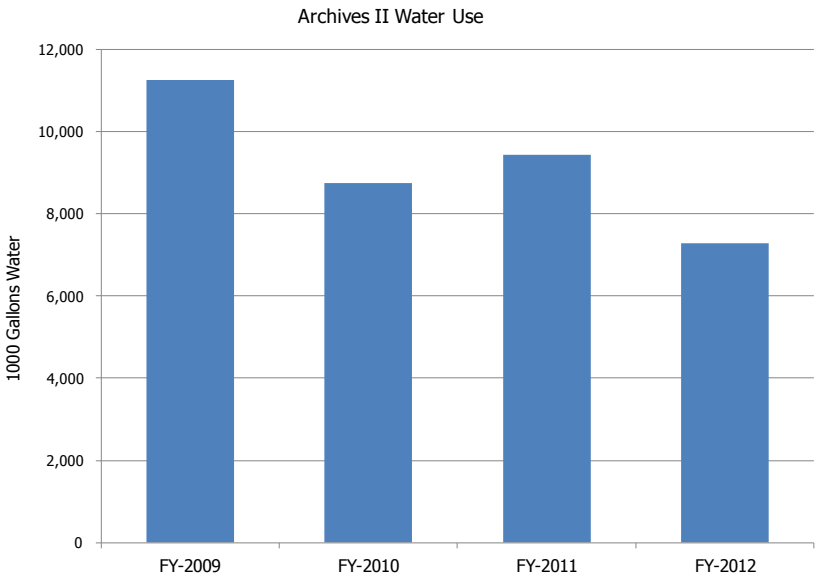
The new RH setpoints also reduced utility use at Archives II. Since the air was not being humidified up to 45% during the winter there was less demand for water and natural gas for steam. During the summer the humidity in most stacks was well below 50%. This meant that there was less electrical demand on the chillers for dehumidification. The charts below compare electricity, natural gas, and water use over the past four fiscal years.



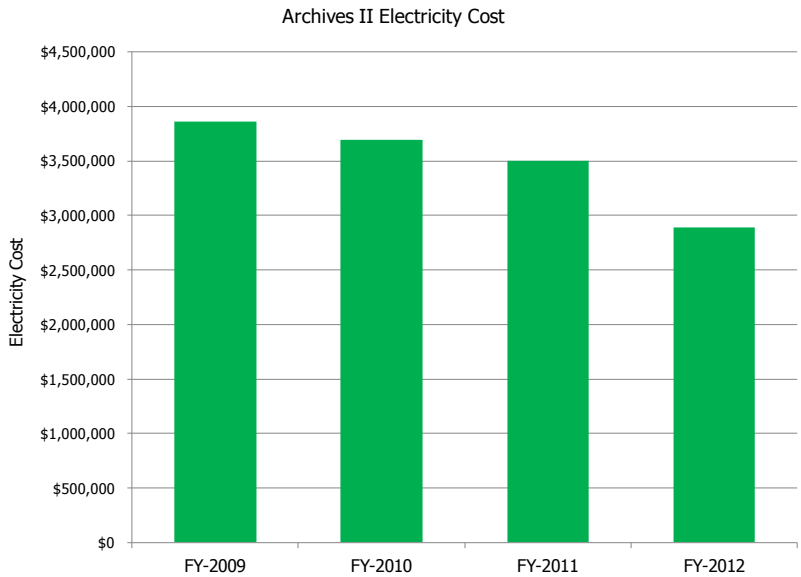
Electricity use in FY 2012 was 6.1% lower than FY 2011.



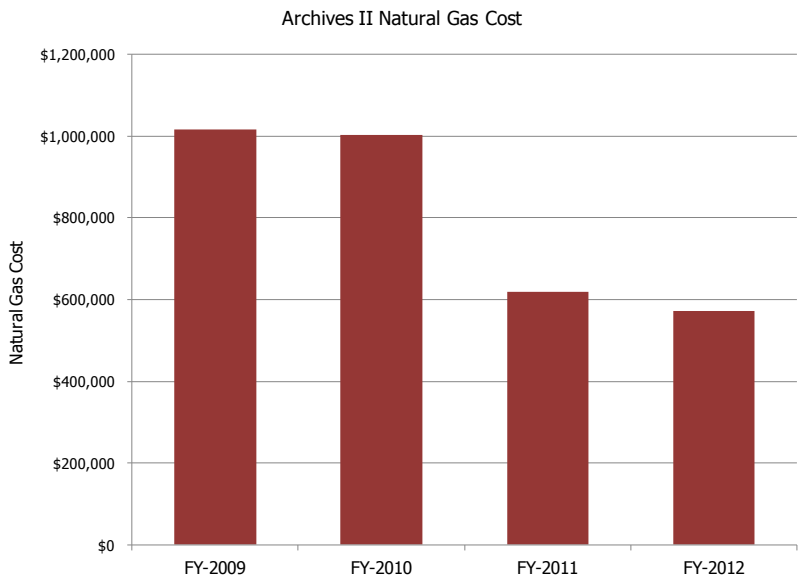
Natural gas use in FY 2012 was 5.4% lower than FY 2011.



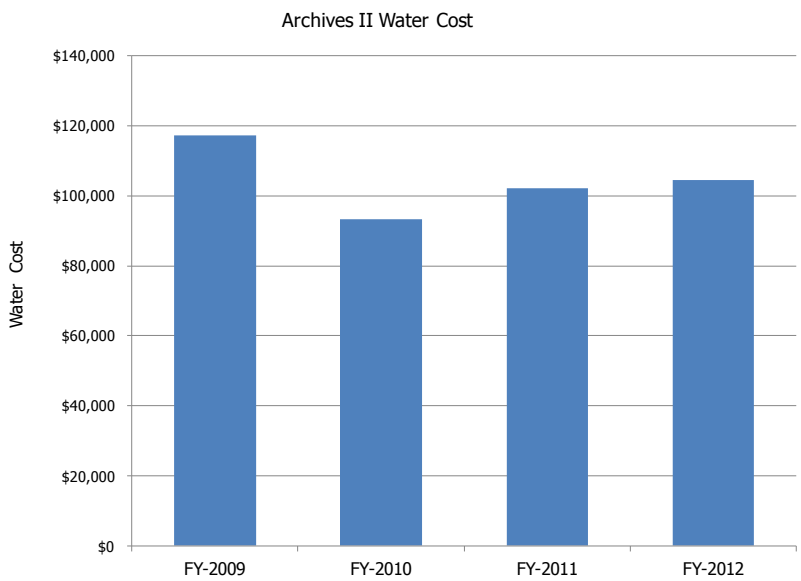
Water use in FY 2012 was 22.8% lower than in FY 2011.



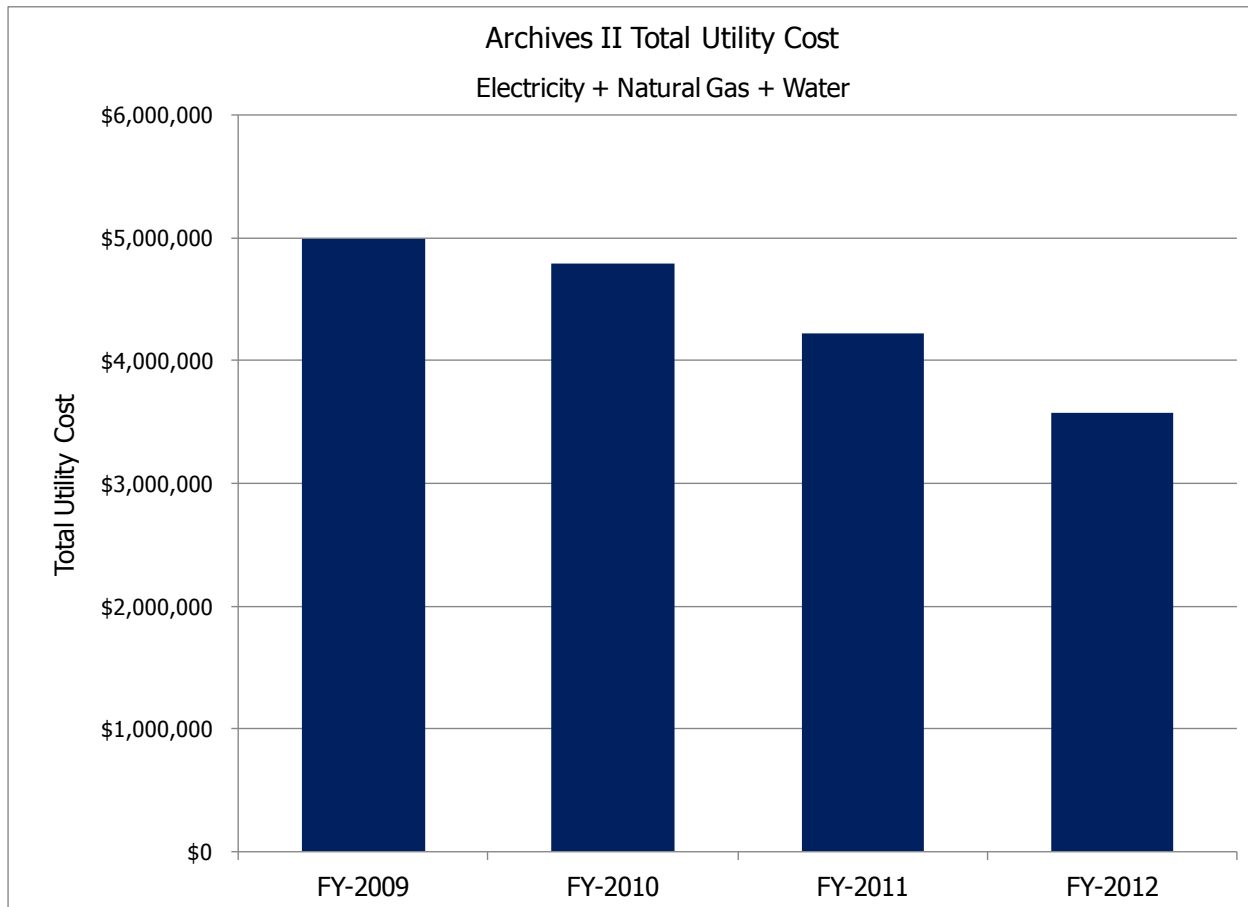
Electricity cost in FY 2012 was 17% lower than FY 2011 in part because of a 10% lower charge per KW-HR.



Natural gas cost in FY 2012 was 7.7% lower than FY 2011. The steep drop after FY 2010 was due to a 40% lower charge per cubic foot. The price was approximately constant during 2011-2012.



Water cost in FY 2012 was 2.4% higher than in FY 2011 even though water use declined. The charge per gallon increased by 33% in FY 2012.



The combined utility costs in FY 2012 were about \$650,000 lower than in FY 2011, a savings of over 15%. The decrease between FY 2010 and FY 2011 was mainly due to a steep drop in the price for natural gas.

While the new setting undoubtedly contributed significantly to this savings, it is difficult to estimate exactly how much energy was saved solely due to these changes because different components of the HVAC system are interconnected. In addition, this experiment is just one of many energy-saving steps implemented at Archives II, as NARA Facilities Director Mark Sprouse discussed at [NARA's 2011 Preservation Conference](#). NARA is building on this success through a new Energy Savings Performance Contract that will enhance efficiency at 14 facilities and also further improve the HVAC system at Archives II.

5/23/2013