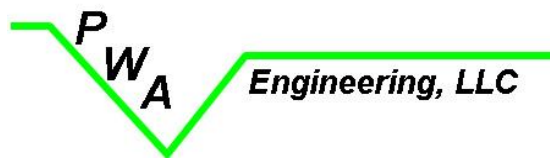


**ENERGY CONSUMPTION STUDY FOR
PERMANENTLY SPLIT CAPACITOR MOTORS
VERSUS ELECTRICALLY COMMUTATED MOTORS
IN VAV BOXES LOCATED IN BUILDING 329 LANGLEY
AIR FORCE BASE**

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PWA Engineering participated in a pilot study with 1CES Langley Air Force Base to determine the actual power usage of existing Permanently Split Capacitor (PSC) motors vs. the actual power usage of the ECM programmable variable speed motors located within four (4) Variable Air Volume (VAV) boxes arranged in series from Building 329 at Langley Air Force Base. Phase one of the study included the collection of actual energy consumption data from the current PSC motors for a period 26 days. All data was collected from the dedicated main breaker supplying power to the four (4) VAV motors using a real time data logger amp probe. During the first four (4) days of data collection, real power data was collected at one (1) minute intervals. Initial results determined that the power consumption for the four (4) PSC VAV motors was relatively constant at 1.2 Kw (Figure 1). For the remaining twenty-two (22) days of the study, real power data was collected at intervals of five (5) minutes. Energy consumption results were still relatively constant at 1.2 Kw.

During the second phase of the study, RPM readings were obtained from the existing PSC motors by using a tachometer. Individual PSC motor RPM data was recorded so the new ECM motors could be set to the identical RPM upon replacement. PSC motor RPM ranged from 1000 to 1050 RPM. One (1) ¼ HP existing PSC motor and three (3) existing 1/3 Horse Power (HP) PSC motors were replaced with four (4) 1/3 HP ECM motors. All ECM replacement motors were programmed to match the existing RPM of the PSC motor from which it replaced. Real power consumption data was again collected via the real time data logger amp probe for a period of three (3) hours at thirty (30) second intervals. Energy consumption data indicated that the new ECM motors only consumed about 900 watts of energy, which is about 25 percent less energy consumption than that of the PSC motors (Figure 2).

During the third and final phase of the study, all four (4) ECM motors were programmed to operate at 500 RPM, which is approximately one half of their designed RPM, to simulate hours of building non-occupancy. A set point of 500 RPM was established so that there would be ample air flow to areas being supplied by the VAV boxes while achieving a greater reduction in energy consumption. Data was collected at 30 second intervals during the time each individual ECM motor was reprogrammed to the reduced RPM. As each motor was reduced in RPM, real power data also indicated a significant decrease in energy consumption. Once all four ECM motors were reduced by approximately one half of the designed RPM, energy consumption dropped from 900 watts to approximately 170 watts, which is approximately an 86 percent energy consumption reduction from the 1.2 Kw of power being consumed by the prior PSC motors (Figure 3).

FIGURE 1
PSC REAL POWER CONSUMPTION DATA
COLLECTED AT ONE MINUTE INTERVALS

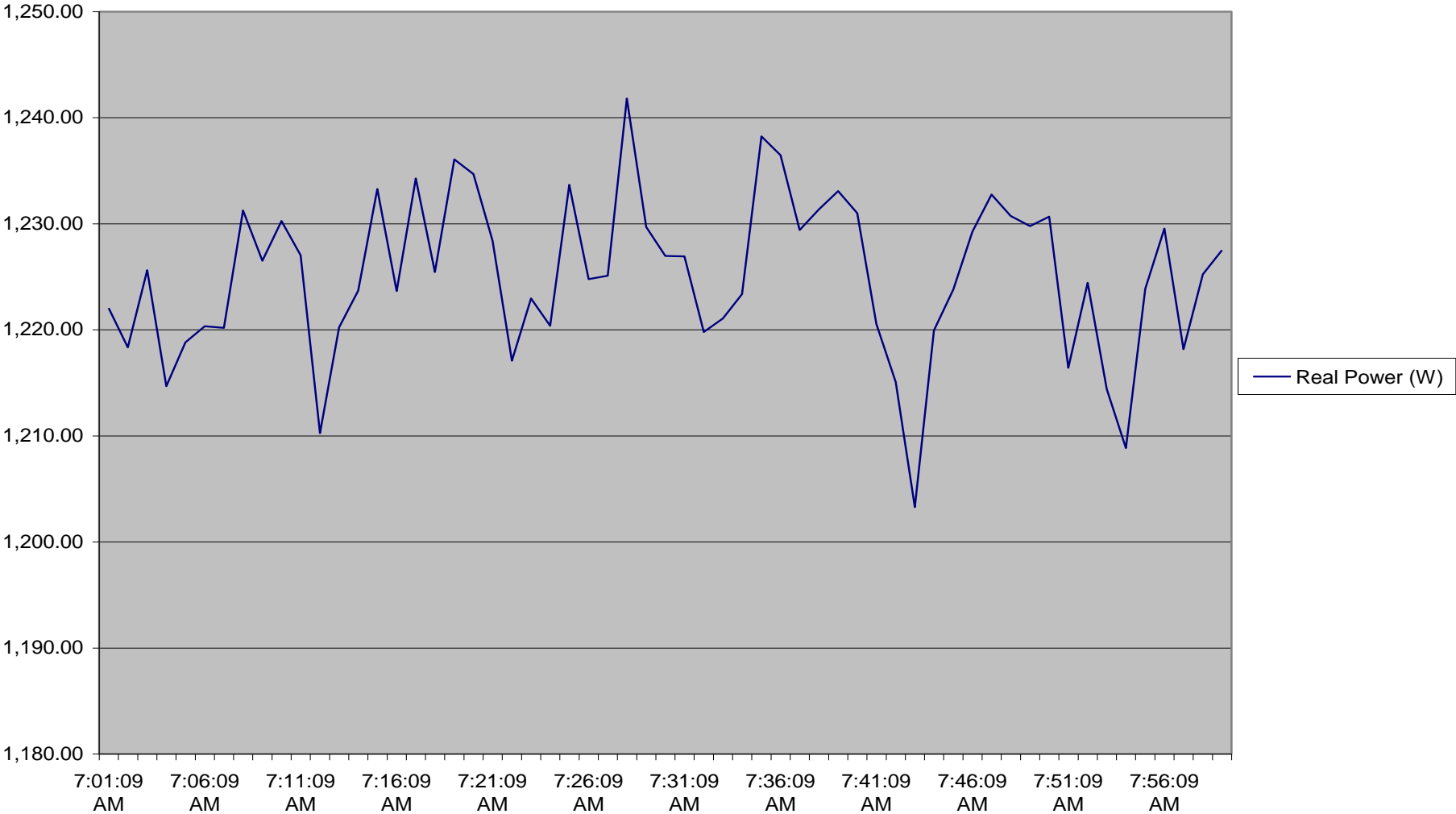


FIGURE 2
ECM REAL POWER CONSUMPTION OPERATING
AT THE ORIGINAL RPM OF THE PSC MOTORS

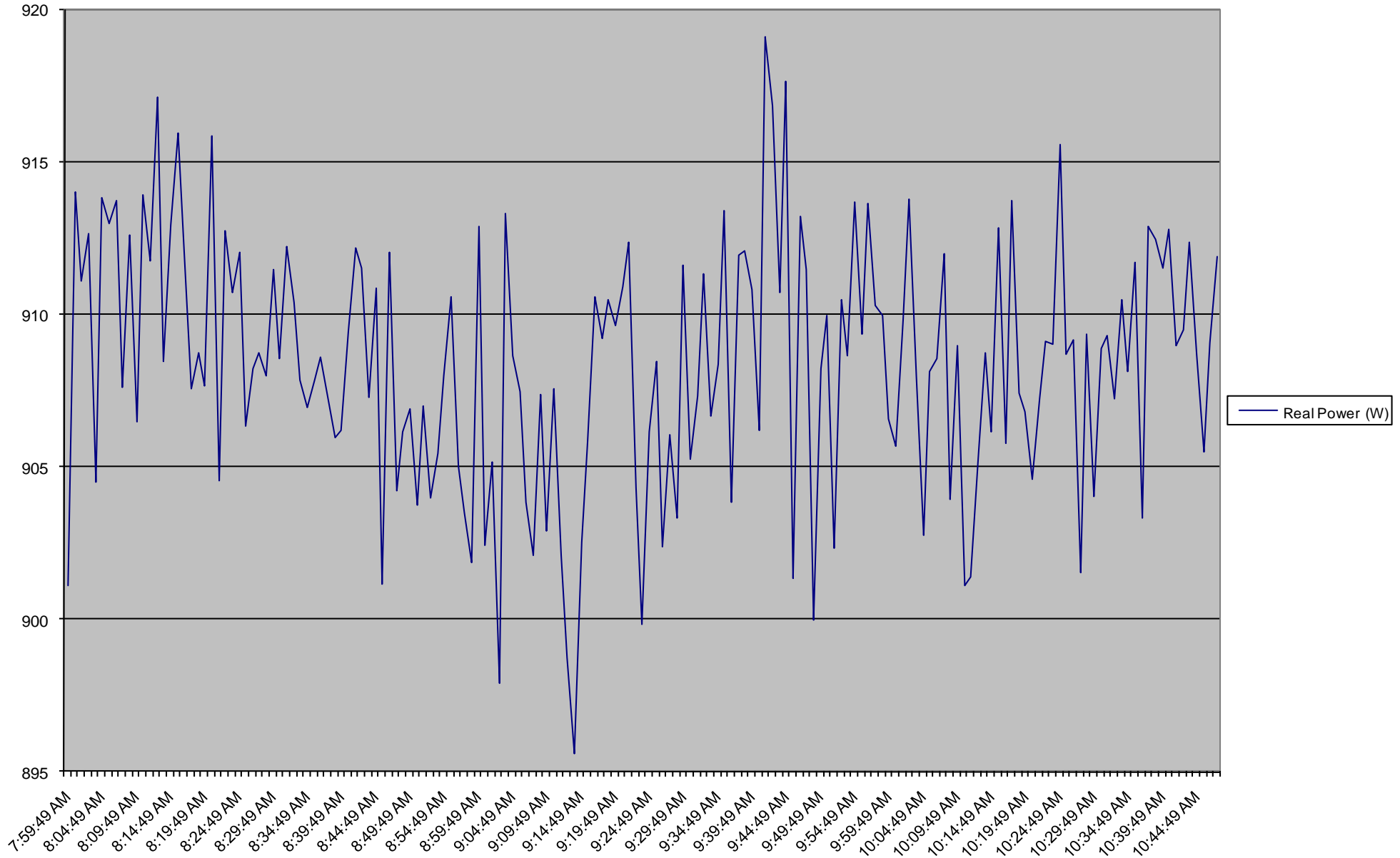


FIGURE 3
ECM REAL POWER CONSUMPTION AS THE
RPM ARE REDUCED FROM 1000 RPM TO 500 RPM

