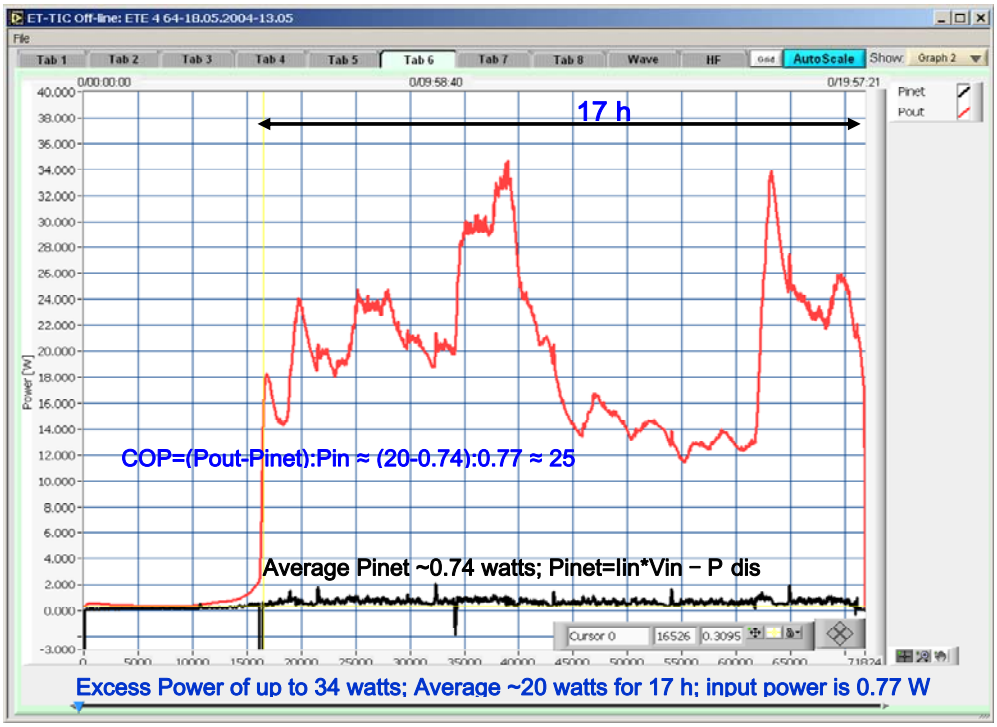
Meeting with Energetics Technology Staff

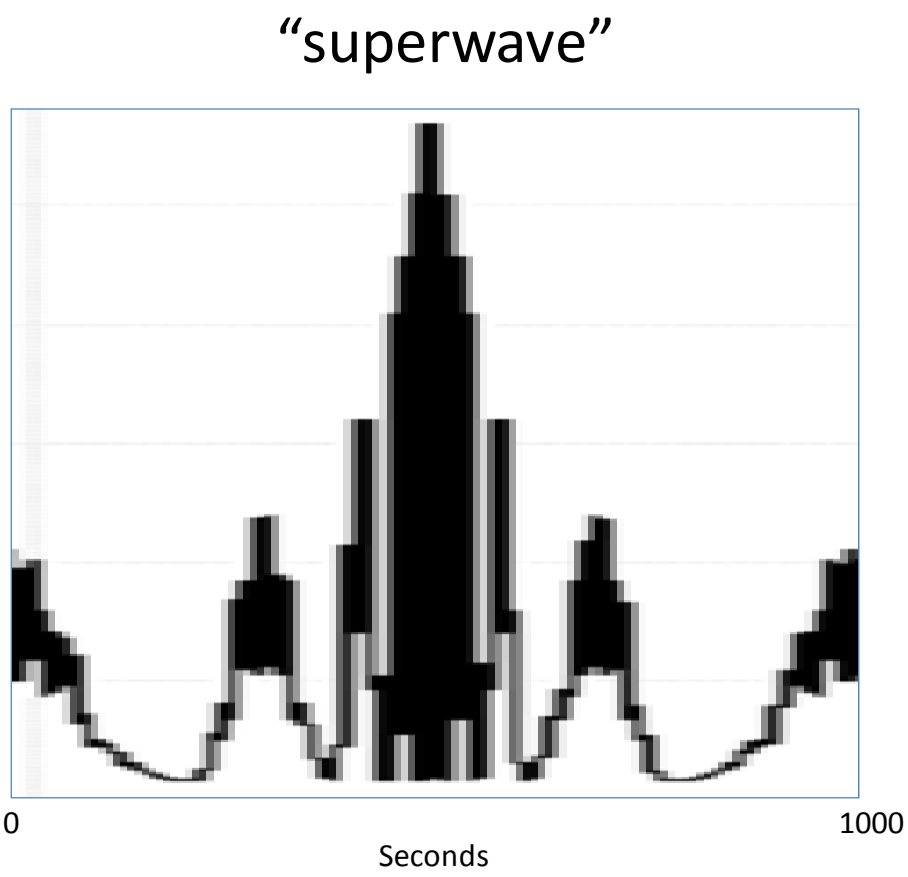
On Tuesday morning, 12 August, I met with about 6-7 staff of Energetics Technologies to discuss various details of Experiment 64 (#64). Present were Ehud Greenspan, Shaul Lesin, Arik El-Boher and several engineers/technicians, including a lady who actually performed most of the measurements on #64. The principal results are given in the figure below (Fig. 11 in the report).



One can see the rather astonishing result that the power gain is of the order 25, many times greater than the "excess heat" (2-3 times) observed by others from time to time. (I remarked that the "ragged" nature of both Pout and Pin suggested that "something was breaking down." Several heads nodded in agreement, indicated this is an issue they were thinking about also) My questions focused on how the input power/energy is measured rather than on calorimetry. Energetics computes the I-V product determined by measuring the current flowing through the cell and the net potential across it. As explained to me, I and V are independently digitally sampled and multiplied together 50,000 times per sec (bandwidth = 50 kHz, sample interval = 20 microseconds). Each series of data is then averaged over one second (in retrospect, it's not clear to me exactly how they did this…was a "running average" computed or was one second's worth of data stored and then digitally averaged? This needs to be clarified). In the words of the authors, this one-second average value is "…stored in a buffer of 60 seconds. Every 2 seconds 2 new average values are entering and the two oldest values are leaving the buffer. This means, every 2 second (sic) the computer is averaging the buffer." I could not get clarification on what they meant by the last sentence. It implies the total amount of data over a run is not stored and thus unavailable for post-mortem. I urged they redesign to store every electrical

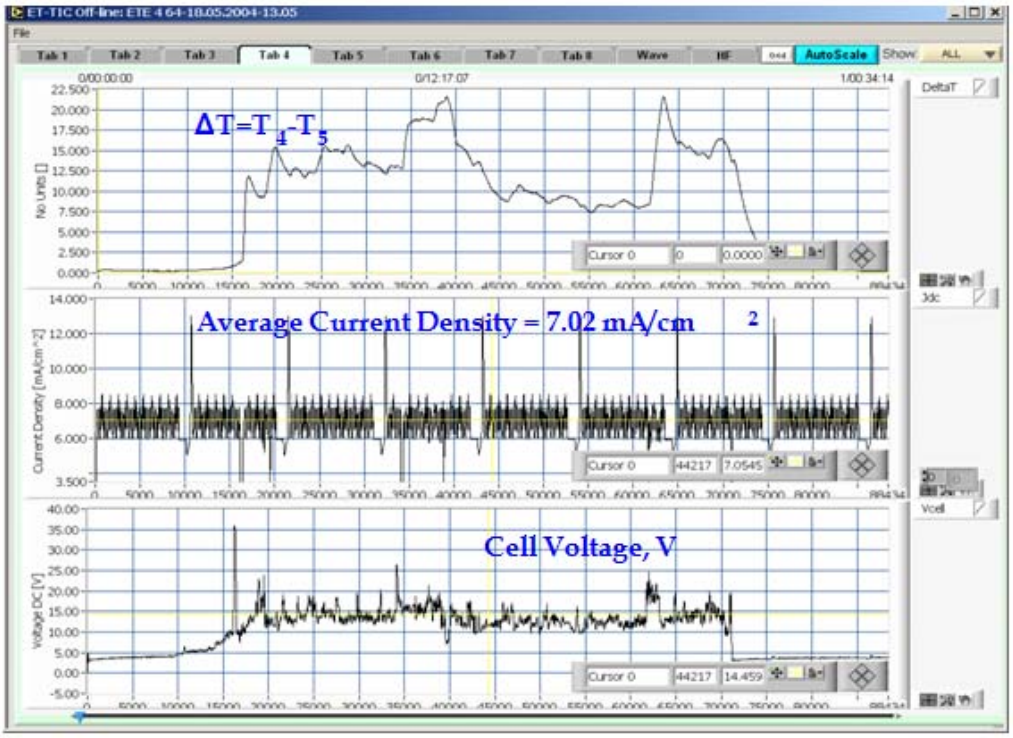
measurement taken during a run…with today's storage technology, there's no excuse not to do this. I think they agreed.

Note that Pinet becomes noticeably more noisy at the onset of "excess heat," with some strange "negative excursions" they could not explain. Before the onset of EH, the power seems to reflect only the "superwave" excitation (btw, these "superwaves" are just old-fashioned amplitude/frequency/phase modulation signals). One can "eyeball" some correlation between Pinet and Pout. It would have been useful to have obtained the power spectral density of both Pinet and Pout and their cross-correlation, and this should a future experimental requirement . The next figure is a "blowup" of a single superwave taken from Fig. 14.

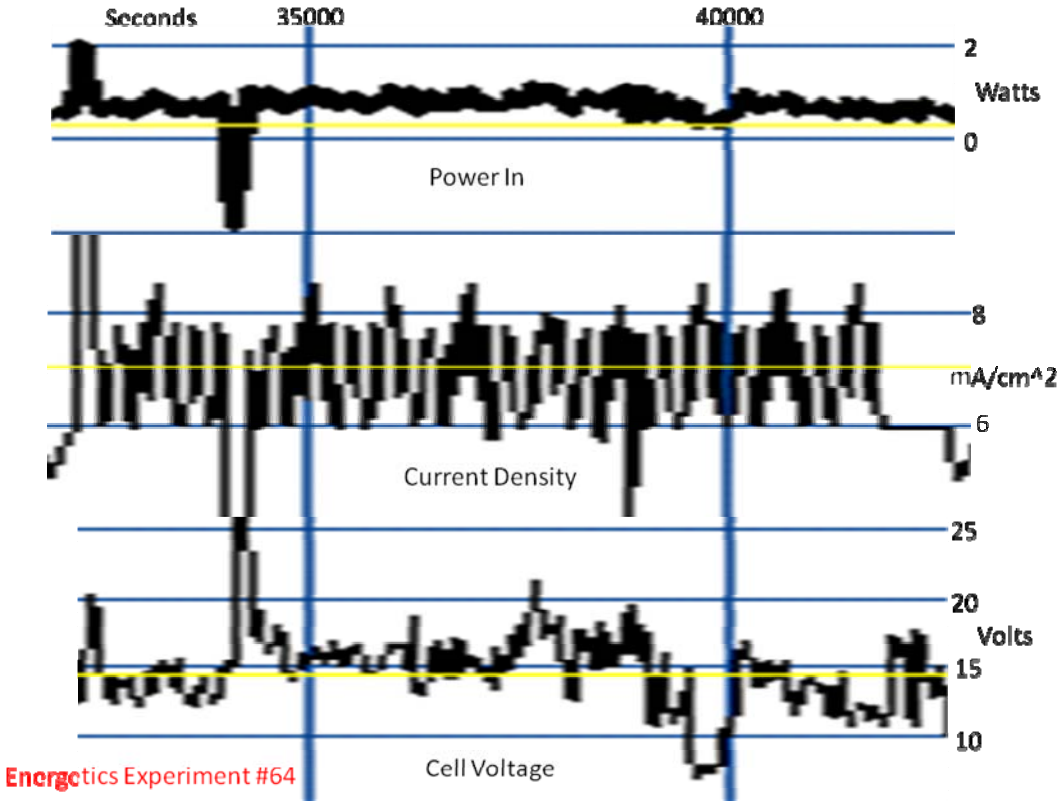


The "fundamental" period appears to be 1000 seconds (17 minutes) or 0.001 Hz. A rough guess at the highest frequency would be around 0.1 Hz. This is practically dc. The bandwidth of their instruments can easily accommodate this range.

The aforementioned "strange noisiness of Pinet" is further revealed in the I, V vs time curve, Fig. 13 from the Energetics report.



Note that the cell voltage is especially erratic. The next figure compares I, V and Pinet between 35,000 – 40,000 seconds, during one of the peak EH episodes.



The apparent sample rate from the plots seems to be roughly 50 seconds, >> 2 seconds, and is probably pixilation from magnifying the Word images. An "eyeball product" of the I and V curves roughly correlates with Pinet, but the overall behavior of all three curves is "strange," to say the least (the cathode resistance also fluctuates markedly during EH episodes). Note the "negative power" spike near 34,000 seconds. With onset of EH, the average cell voltage jumps from around 2 volts to around 15 with roughly a +/- 3 volt deviation over the course of the episode. Assuming 10 of these volts are dropped across some sort of Pd surface barrier, say 1 micron, a local electric field of 10 MV/m would exist, reasonably large, a little more than air breakdown, but anecdotal evidence, along with the noise, that large Pd structural movements may be underway at the atomic level (or bubble spark-over ?!).

The power/energy input to a PF cell is assumed to be totally electric in nature, and the CF advocates would hold that the observed EH is due to some sort of nuclear reaction. However, that it could result from the metallurgical release of previously stored mechanical energy during the process of inducing extremely high levels of D/Pd loads (I believe this was considered by Hubler and dismissed as a possible cause) and/or during the metallurgical processing of the Pd foils themselves at the "factory." Could such a process account for the variability in the observation of EH, its noisiness and that the effect eventually exhausts itself.

It is for issues such as this that the in-situ program proposed by NRL for Phase II should be carried out if the "anomalous effects in deuterated palladium" controversy is to be successfully resolved. The Energetics group agreed this to be the case as well.

I think the Energetics folks were comfortable with me and did not hold anything back. There was some "exercised discussion" among them when I asked if they ever tried to change something during an EH episode, like components of the superwave. The answer, as far as I could tell was, "not on purpose." However, when I mentioned the possibility I might visit Omer, Greenspan muttered something to the effect, "that would have to be negotiated." Clearly, they saw I was not the type to sit by and just watch a demonstration, and would want to see a lot of different measurements made, especially with respect to the power conditioning equipment. I'll give them the benefit of the doubt on calorimetry.

I was also up front that I did not believe, in the absence of at least a partial completion of the DARPA Phase II proposed program, that a 60 Minutes segment was appropriate at this time. This was greeted with silence. Earlier, in fact at the beginning of our meeting, I asked if anyone of them knew who originally contacted 60 Minutes, and they collectively answered, "It wasn't any one of us." Interesting. The following morning while I was checking out, Ehud took me aside and, in effect, said he agreed with me that we should support additional funding for NRL Phase II, but also insisted exposure for Energetics on 60 Minutes was key to the success of the company. Clearly, he meant more capital investment than Kimmel has provided…at least that's the way I read it.

<u>Other Interesting Presentations at ICCF-14</u>

<u>Violante, et al., Abstract 12</u>

This was one of the better papers at ICCF-14, co-authored with NRL staff. Key points:

- Looks like Phase I results
- Any excess power observed is always less than 20% (1.2x)
- Frequency of observation of excess power correlates with particular Pd crystallographic faces loaded (this is just the kind of metallurgical detail needing further study in Phase II)
- They are starting molecular dynamics (MD) simulations on D loading wrt to crystallographic orientation and possible contaminants (excellent)
- I met with one of the NRL co-authors, Kneis, who struck me as serious and competent, not one of the true believers.

Kidwell, Abstract 26

Dave Kidwell is one of NRL's and the country's top trace analysis chemists. In my opinion, this talk laid to rest all past claims of "fusion reactions," including He-4, and transmutations. Essentially, Nature contains a multitude of trace radiochemical elements all around us, and it is almost impossible to separate reports of very small amounts of isotopes from background and contamination. Moreover…and I had forgotten this…in a mass spectroscopy measurement, light atoms/ions will cluster together and the resultant heavier mass will mimic that of radioisotopes. Kidwell's talk was greeted with stark silence. One gentleman (Indian or Middle East) protested he had seen transmutation and Kidwell said, "better check again…it's probably clusters." The overwhelming product of true D-D fusion are 14 MeV neutrons…never seen…and was the primary reason CF was rejected in 1989.