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**Trip Report:
Power Electronic Building Block (PEDD) Workshop**

Gary W. Johnson

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TO: Distribution
FROM: Gary W. Johnson
SUBJECT: Trip Report: Power Electronic Building Block (PEBB) Workshop

I attended the Power Electronic Building Block (PEBB) workshop at DOE HQ on June 21, 1995. Accompanying me was Doug Hopkins, who is contracting with the Lab through Mark Newton on power electronics. The PEBB concept, and the workshop in particular, are sponsored by the Office of Naval Research (ONR) and DOE. The general concept behind PEBB is a "second electronics revolution" facilitated by a single-package, smart, multi-function power control block. The PEBB will potentially replace all conventional power electronic elements at scales from watts to megawatts, thus shifting power engineering from circuit design to system design. ONR is interested because power distribution aboard ships is expensive, complex, and bulky, and getting worse. The same applies to aircraft and many other military systems. DOE's interest is in electric vehicles, utility power systems, and various end-use applications such as adjustable speed drives. There was obvious enthusiasm from industry, academia, and Government at this workshop.

The PEBB concept is in its infancy. Exactly what a PEBB will encompass is still up for discussion. What is certain is that *everything* is up to industry: standards, innovations, marketing strategies, etc. ONR and DOE are only acting as facilitators and coordinators, and perhaps offering a little seed money. The program will be long-term but fast-paced, relying on concurrent engineering in a serious way. Great strides are required in semiconductors, packaging, controls, and system design. ONR want to put a big knee in the historic power density and dollar-per-watt curves, starting right now.

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The current ONR call for PEBB whitepapers is open for one year, ending May 1997, but they would prefer most submissions arrive by September. At any time, the PEBB reviewers may ask a submitter to write a real proposal. Top-rank proposals will be funded by ONR. They currently have about \$20M from several ONR programs funding various PEBB activities. ONR hopes to have PEBB become a budget line item in FY97. DOE does not yet have a budget for PEBB, but may in FY97. Regarding whitepaper content, they said that it is important to address Navy, other military, and DOE/EV applications. Also, partnerships and cost sharing should be indicated.

The biggest (only?) ONR-funded player right now is Harris Semiconductor in Latham, NY. They are totally committed to bringing PEBB components and systems to market. I talked with their people (Venkatesh "VP" Pai, Jim Poe, and Eric Yang), and they want to sign mutual NDAs and start talking about how NMCs would fit in with their power semiconductors. Harris would like to evaluate capacitors—they have great expertise in this area, and very clear requirements. They are definitely *not* interested in manufacturing capacitors, however.

I contacted some Westinghouse people (L.E. Lesster and Dan Zeitlin) from their Electronic Systems group in Baltimore. They had vaguely heard of NMCs before. Mr. Lesster is Tom Matty's boss... he should have known more, considering how many times we had talked to Tom. He did mention that Westinghouse has something going with Pinnacle.

The most unexpected new business came from John Driscoll, a friend of Doug Hopkins, who is a power semiconductor expert now running a startup in Raleigh, NC called PTS Co. They are under Navy SBIR funding, among other things, working on device engineering. His tip was that we should look into applying multilayer materials to electrostatic chucks, which hold semiconductor wafers in a vacuum chamber while they undergo plasma etching and possibly other processes. It's a materials problem: a dielectric is required that has high thermal conductivity, and the whole assembly must be thermally rugged. John indicated that this is a new, high-value market. I've passed this information to Troy Barbee—he's sure we can do this. John will be visiting the Lab in the near future. We will have to discuss possible business arrangements.

Our DOE contact is David Hamilton at 202-586-2314. He has our FY95 report that we sent to Pat Davis regarding NMC results. He's a big champion of our work and had already brought it to the attention of the ONR group before this workshop.

ONR handed out a laundry list of problems to be solved, listing everything from high band-gap semiconductors to packaging to controls. There is room for players with all kinds of expertise and there is sufficient time to assemble a response. I am sending a copy of all the handouts to Lyn Ahboltin in the DSED office, and I'll ask her to put a note about the workshop in the next DSED news.

Distribution:

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