Views

From LED to laser fusion: Green Photonics in a US perspective

Photonics technologies have a large impact on energy savings. That is well known, even to politicians. But how is this enforced in the markets? Andreas Thoss spoke with OIDA analyst Tom Hausken about his perspective on current developments in the USA.

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Dr. Tom Hausken, with over 30 years in optoelectronics, focuses on industry activities at OSA – the Optical Society. This includes OIDA (the Optoelectronics Industry Development Association, the trade association operated by OSA) where he held a position earlier in his career. For 13 years until 2012, Dr. Hausken led market research and strategy consulting for lasers, image sensors, and a range of other photonic products at Strategies Unlimited. He was also a telecom policy analyst at the US Congressional Office of Technology Assessment and held R&D and production positions at Alcatel and Texas Instruments in photonics and electronics. He has a Ph.D. from the University of California at Santa Barbara, in Optoelectronics.

AOT: A few years ago, Green Photonics has been popular in many discussions. Nowadays, I think, subfields such as photonics in carbon-free energy generation or energy efficient photonic devices are much more discussed. How do you see this point?

Tom Hausken: Indeed, the perspective has changed. In the 2000s, there was a lot of talk about green energy and the like. People wanted to attach that to photonics as well. We focus more on individual technologies. All of the photonics technologies have been around for a long time. Solar, or let's say PV, LEDs, sensors for things like wind turbines and many more – they were here before, and they remain important, bigger than ever. They're important for all the same reasons they were important before the introduction of green labels.

AOT: Thinking of energy efficiency, for example, is a wider societal issue. But what are the drivers in these fields of photonics?

Tom Hausken: It's often coming from the government, and the LED industry responds to that. There's research money to reach certain goals. And there are certain policy decisions that will accelerate the migration from incandescent bulbs to LEDs. The LED and the photonics community can support that, they can cooperate, help, all those good things. But the driving force isn't coming from within the photonics industry, it can't. The driving force is coming from either the market or, in this case, really it's government policies.

AOT: If we look back 5 or 10 years ago, those political issues were quite prominent, and there were a lot of programs installed to, for instance, improve the energy efficiency in lighting. Would you say that the expectations that were connected to those programs have been met?

Tom Hausken: That's a very good point. In general, I would say they're being met.

Let's take LEDs as an example again. In the US you can buy an LED light bulb for $10. And they're getting cheaper all the time. It takes time because you have to get the volumes up for the prices to go down, but the volumes don't go up until the prices come down. It's a circular thing. It's happening, though, and that's all good. The problem is that in the short-term, you do have these cycles. PV is another good example, where in the short-term you can get too much capacity, companies lose money, then there is a period of recovery, and then you start the cycle all over again.

AOT: Incandescent light bulbs have been banned in several regions of the world now. Do you see that this is already influencing the sales numbers in the field of solid-state lighting? Can you see that in the numbers?

Tom Hausken: Yes. This is one of those situations where the market by itself would not go so fast. When you have a government mandate, then the migration to LED light bulbs will go much faster. There's nothing like a government mandate to speed the adoption of a new technology. Another example is airbags in cars: They were proven to be effective. They were conceived and first installed several decades ago as high-end features, but the car companies wouldn't install them on all cars; they add cost, and so on.

When the US government said you must have airbags in cars, then suddenly, the adoption went very fast. In fact it's a little bit more complicated for LED because there is also a compact fluorescent lamp (CFL).

The old technology is incandescent, and then, compact fluorescent is the next generation, and then, the generation after that is LEDs. Compact fluorescent has the misfortune to be really getting market traction about the time that LEDs also are coming out. LEDs will eventually win, but for now there is competition in the market.

AOT: So market restrictions worked better than funding incentives?

Tom Hausken: Probably, it did. For the market by itself you need to get volume to get the price down. That happens slowly by itself. What the government is doing, basically it's forcing volume up which then drives prices down further and on and on.

AOT: Nevertheless, the US Government is spending on LED and on PV research (see Figure 1). Can you comment on these numbers?

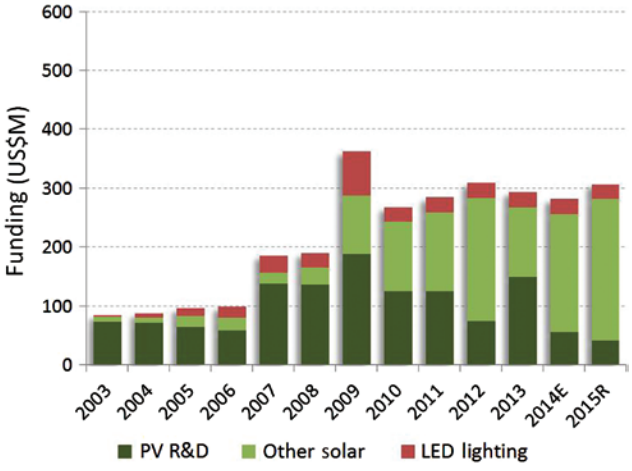

Figure 1 US governmental funding for photovoltaics (PV), other solar technologies, and LED lighting from 2003 to 2015 (forecast).

Tom Hausken: The chart from the U.S government is interesting for a couple of reasons. One, the government is going to move some money out of PV R&D because of the success of price reductions in PV. You don't see that in the chart. Also, what's interesting about the charts is that a lot of people, even here, or maybe particularly here, don't appreciate how much money the US government is spending on PV and LED; more so on PV.

It's a type of spending the US government is not known for, which is to enable the market. For example; in Germany, I think it's well known and understood that the German government supports its auto industry, its laser industry, things like that. In Asia, or China in particular, there is a huge amount of that support, too. They've no problem at all directly supporting the industries that they choose.

In the US, it's more complicated. Of course the military gets funding, but outside of that, photovoltaic is an area where they've been spending a lot of money to enable the market, not necessarily directly helping companies, but doing things like figuring out new business models and incentives and all these things to enable it. Again, you don't usually see the US government doing that thing.

AOT: What is the US government's interest? Why are they interested?

Tom Hausken: On the one hand, there is an interest in the companies that are making the solar cells because there are jobs involved there. It wants to have that industry for the long-term. There's no reason why anybody wouldn't want to have this manufacturing, but it also wants cheap photovoltaic power along with other renewable energies for the consumer.

If that has to come from China, maybe that's okay. The US government has some conflicting interest in what they do. In a perfect world, they'd like to have the solar cells manufactured in the US, making PV modules affordably and then used in the US and exporting them as well. That hasn't necessarily worked out that way. There are still some US suppliers, but there are also very affordable Chinese suppliers. US government in that situation has to think what's more important: to have the affordable panels to go on people's roofs or to support the US manufacturers foremost.

AOT: Okay.

Tom Hausken: I think that's one thing that the photonics industry has difficulty understanding: the supply chain is

long, and you have to understand that your own government – and society – have multiple interests.

AOT: I think, here, in Germany, many people are at the moment very much thinking about particularly those issues within the supply chain. And particularly regarding PV, they focus more on measurement technology than on mass production because they are better in tools and solutions than in mass production. Let's move a little bit closer to technology. If we look at the current photovoltaics market, there are several technologies competing. What do you think? Will there be a single technology dominating, and if so, which one?

Tom Hausken: I can say that the crystalline silicon solar cells have dominated up to now and continue to dominate. They do not seem to be losing any ground. You might think that if the thin film solar cells had such an advantage that by now that might appear in larger market share. By the way, the thin film production is increasing. The market share is not. It appears that the crystalline silicon solar cells are still the market choice by far.

Tom Hausken: Keep in mind that I'm not saying that it's the best technology, I'm saying the market has chosen it. We could go through the reasons why crystalline silicon is better and why thin film alternatives are better. It doesn't matter, it's what the market sees, what the market chooses for whatever reason. Crystalline continues to dominate in market share, and it looks like that it's not going to change for the indefinite future.

AOT: If we look further into the field of energy generation, then laser-producing energy seems a bit exotic, but America is certainly leading this field. What realistic impact do you see that a laser-driven fusion with inertial confinement can have?

Tom Hausken: Laser-enabled Inertial Confinement Fusion. Whether you think that's legitimate or not, it's conceivably on the table. These technologies date back to the 70s for the most part. It's still a very speculative technology. The work that's being done now is controversial from the technical point of view. There are alternatives that don't use lasers. It's not proceeding as fast as anyone will like. I don't want to say that it's going to solve our energy problem or that it's moving forward very quickly. That would be completely incorrect.

What I think is interesting, is if you really want to solve the energy problem, imagine what fusion could do. Maybe it takes 30 more years, maybe 40, I don't know. Imagine the potential there. Solar is good, wind, it's all good, and of course, we may strongly improve energy efficiency, too. But we still have to replace a lot of conventional energy sources with something else. We may or may not get fusion to work for energy generation, but imagine the potential there.

By the way, the laser is only a part of that. Of all the money that the US Department of Energy spends, much goes into research on other aspects of fusion. Nonetheless, it is enabled by the biggest laser in the world. So I think it's important to acknowledge that that work is going on, even if you think that it's too speculative to take seriously.

AOT: Thank you for the interview.

Tom Hausken was interviewed by Andreas Thoss, th@thoss-media.com.