Wed., Feb. 27, 1:45 Discussion notes:

It could be useful to mix UVA and UVB and test the effects of both at the same time, but the mixing must be done carefully, as “zebra stripes” can occur. In general, it is difficult to control uniformity; fluorescent lamps may help to improve temperature uniformity. The use of mini modules can help to reduce the cost of the tests and allow better control over uniformity.

Together, UV, thermal variation, and water stress the polymeric materials in a way that is more similar to what is experienced in the field. Paint, plastics, and other testing for automobiles uses a dark cycle and a water spray intermixed with light. Most chambers (with light) have this capability. Would PV material testing benefit from this approach?

We could also learn from the electrical industry. IEC has standards for testing outdoor jacketing of wires. PV should be using those.

We limit the UV intensity to 5X; if we could increase the acceleration factor, we would reduce the time and the cost of the UV testing. Mitsui reported that intensities over 3 suns resulted in a change in the mechanism (for encapsulant testing)

The reason for not going to higher acceleration is that there is divergence from what happens in the real world if with intensity > 10X.

Why doesn't the automotive industry go to 100X? *Because it does not work.*

Realistically, it is a matter of risk. We must trade off the risk of failure with the time for the test. Boeing did not wait, they saved a lot of money by going straight to the final product, but now their planes are grounded.

A lengthy discussion of what is the maximum acceptable test time mostly pointed toward 3 months. However, the discussion differentiated four types of testing: materials, brand new product, tweak of a product, and quality control. The testing of component materials may proceed while the product is being developed and testing, implying that material testing can realistically take longer than 3 months. A new product is unlikely to be tested in 3 months (a completely new product may require > 1 y), as the failure modes are not well known. But, everyone would like to be able to test a small tweak of a known product in 3 months. Therefore, it is useful to view testing as an iterative process: The early testing done at the material level should be leveraged to help reduce the test time for the final product.

The requirement for the shortest test time may be the testing needed to ensure quality during manufacturing. If a drift away from quality takes > 3 months to detect, it will be a huge loss for the company.