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Testimony of

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My name is Tom Leschine, and I'm Director and Professor of the School of Marine Affairs at the University of Washington, in Seattle. I study marine environmental decision making, and oil spill prevention and response has long been a topical focus of great interest to me. I was the Principal Writer and Editor-in-Chief of the U.S. Coast Guard's *Federal On Scene Coordinator's Report* for the *Exxon Valdez* Oil Spill (issued in 1993). I'm currently a member of the Marine Board of the National Research Council where I focus on the uses of risk assessment in association with marine transportation of oil and other hazardous cargoes. My background training is in mathematics, but I long ago embraced environmental policy as my area of study. Past and present affiliations not withstanding, I'm here today representing only myself.

We're here because a nearly unparalleled environmental disaster is unfolding in the Gulf of Mexico. It wasn't anticipated and we—industry, government, and the nation as a whole—weren't prepared, even though in retrospect we had plenty of reason to understand better than we did that such an event *could* indeed occur. These are institutional as well as technological failures. Institutions and technologies are intertwined, meaning that effective "tool kit" development and deployment requires us to remedy as well underlying institutional failings—in this case, contributing to our failure to properly anticipate and to be adequately prepared.

Understanding underlying systemic problems is important to assuring that better prevention and response technologies—products of more fully realized R&D efforts than we've had in this arena to date—are both available and deployable with effectiveness as we call upon them in the future. Because human and technological systems are so interconnected, the quality of "soft" technologies needs to be considered as "hard" technologies are developed. Both need to be part of the tool kit.

1. Lack of anticipation

You'll never be prepared for future incidents of this kind if you don't have good ways of anticipating what to expect. *Risk assessment* is a soft technology that allows us to gauge what might go wrong, how likely it is to go wrong, and what consequences might result if it does. In a famous 1972 essay, Alvin Weinberg referred to risk assessment as *trans-science*—employing the methods of science, but inescapably relying in its conduct on the subjective judgments of experts and by implication, their broader systems of values.

The state of risk assessment practice that guides current decision making on offshore leasing is pretty dismal, in my view. Take a look at the risk assessments that supported MMS's 2001 EIS on extending oil production into the deep waters of the Gulf, where this blowout occurred (*Proposed Use of Floating Production, Storage and Offloading Systems on the Gulf of Mexico Outer Continental Shelf. Western and Central Planning Areas FEIS, Minerals Management Service Gulf of Mexico OCS Region*, OCS EIS/EA MMS 2000-090, on the MMS website at http://www.gomr.mms.gov/homepg/regulate/environ/deepenv.html).

Catastrophic failures of the type we're dealing with now are of course very rare, so if you rely on historical data to construct your assessment, as MMS's risk assessment contractor Det Norske Veritas (DNV) apparently did, you won't find many incidents in the record. So you might also miss seeing how such events are potentially significant sources of risk, as DNV apparently has. In the analysis that was done, a loss of well control in the deepwater environment is found to contribute *zero* risk (see Table 4-32 of the MMS EIS). All significant sources of the risk that are found to exist in the analysis are routine accidents not likely to spill much oil. This is thinking "well within the box", as it were, not the thinking we need.

I say DNV *apparently* relied on historical data on incidents, because the data they use, and the methods they use to analyze it, are proprietary. In their defense, they point out that their risk estimates are generic in nature and more detailed assessments should accompany permit applications. But of course we know now that those detailed assessments were not done. There's a fundamental lack of transparency in the assessment approach, and methods of risk assessment like those employed in the nuclear industry (i.e., relying on causal models) are more appropriate than what's being done as standard practice in the offshore industry today.

What happened in the Gulf is what sociologist Charles Perrow called a "normal accident" in his famous book of that title (C. Perrow, *Normal Accidents: Living with High Risk Technologies*, originally published 1984). As oil exploration moved into deeper and deeper waters, it took on qualitatively different characteristics and complexities—becoming inherently more risky. But these risks were not adequately recognized and prepared for. In shallower waters there is not the troublesome formation of hydrates with the release of oil, and robotic technologies do not have to be relied upon as extensively. Astounding Buck Rogers stuff on the TV and internet screens to be sure, but this is also our only immediate line of defense. The system as a whole changed gradually to the point where it took on a different configuration, and became literally, an accident waiting to

happen. A normal accident, in other words. How do we assure that the risks are adequately identified and analyzed and the toolbox stocked accordingly?

2. Lack of preparedness

I'm struck by the vivid contrast between the live internet imagery being transmitted by BP from the seafloor and what we see going on above the water. Astonishing high tech below, while the same old booms, skimmers, shovels, rakes and limited ability to track oil and understand the damage being done are the reality above. Engineering as a profession seems to learn well from disaster, and BP seems to be slowly learning how to control the oil flow, but it is painful to watch. We've known for some time that gas hydrates can form icy slush in the depths and pressures of deep water, but we still weren't ready to deal with the complications and consequences. Above the surface and on the shores, we're fighting a defensive war against a steadily advancing army, but our efforts are hampered by logistical and communications problems.

More than 35 years ago, when the environmental movement was just coming into being, a noted scholar of public administration named Anthony Downs wrote a now classic essay, "Up and Down with Ecology: The 'Issue Attention Cycle'" (1972). In it he posited that environmental concerns would be continually "discovered" by a public suddenly alarmed by real world events. Unfortunately, he predicted, such discoveries would often occur only *after* the underlying issues had been recognized as problems-in-the-making by the experts. Moreover, they would come well after the underlying problems and conditions had taken on a life of their own, making them much less amenable to public policy fixes than they might have otherwise been.

Considerable investment in time and resources would be necessary to make real progress, but even more unfortunately, public and governmental attention soon would wane, shifting to new problems and alarmed discoveries, and dissipating before much real progress could be made on the original problem. This was the issue attention cycle in action.

I mention this because one of Downs's inspirations for writing his essay was the 1969 Santa Barbara oil spill, a well blowout which in broad outlines was not dissimilar from what we are facing in the Gulf of Mexico today. That event is now the stuff of history and in basic outline perhaps not all that different from the event that brings us together today. A frantic crew aboard a drilling platform in the Santa Barbara Channel apparently managed to activate the well's blowout preventer after a sudden gas and oil eruption had occurred, but in the face of unforeseen technical glitches and environment conditions that precluded success. Soon the whole nation and world saw how disastrous the consequences can be when technology fails and well control is lost on a seabed oil well.

Public and policy-maker responses to oil spills since, including the 1989 *Exxon Valdez* spill, continue to be governed by the rhythms of the issue attention cycle. Prevention and response technologies, and associated scientific R&D, have suffered from on-again, off-

again attention, resulting in ad hoc and under-funded efforts that have left us under-prepared today.

I'd like to turn briefly to R&D efforts, because in my view they have definitely fallen victim to the issue attention cycle.

I used a warfare analogy above. Where advance in response R&D capability has occurred, it has often proved more suited to fighting the last war than the one we're trying to wage today. For example, NOAA's Emergency Response Program, part of NOAA's Seattle Office of Response and Restoration, is responsible for spill trajectory modeling. They model in two dimensions however, reflecting the reality that most spills occur on the surface of the ocean, not at great depth, and now there is a struggle to model this spill trajectory, with its apparently extensive subsurface plumes, in 3-D. NOAA and other experts have long understood that good predictive capability for a spill like this one requires the ability to synthesize a large amount of information into a fully realized 3-D model, but concerted efforts to create such a synthesis require considerable resources and have not been forthcoming.

Oil spill dispersants provide yet another example. Traditionally in the U.S. they have been politically controversial and used sparingly in sea surface applications. Research efforts to understand conditions of their effectiveness and impacts have been accordingly narrowly drawn. In the Gulf spill however they've been applied massively—many hundreds of thousands of gallons by now—and injected directly into the oil plume at depth. There's little understanding at present of the biological effects of this massive experiment, and where is the concerted long-term research effort that is needed going to come from? How will we know whether we want this particular tool in our toolbox or not, or what form the effective and safe to use tool will take? Is it a sledgehammer or a tack hammer?

The research needed to inform NOAA's oil spill scientific support efforts was funded for a while through the Oil Spill Liability Trust Fund, for a while, via Congressional earmarks. Federal funding has been on the order of a few million in some years, zero in many others. Even when the funding was there, the kind of sustained effort and "out of the box" thinking that is needed to get out of old ways of thinking has not been forthcoming. It is important to have in place a financing mechanism that is less prone to the erosive forces of the "issue attention cycle" than monies that have been dedicated to such efforts in the past. The underlying R&D efforts that the funds would support are again in the category of soft technology, and should not be overlooked.

Environmental disasters like that now unfolding in the Gulf, "focusing events" as it were, create opportunities for substantial policy change. Such change is often legal and regulatory in nature, as it was with the Outer Continental Shelf Lands Act (OCSLA) amendments of 1978, the product of a series of spills in the early and mid-1970s. Sometimes it takes the form of *technology forcing*, as it would with Congressman Markey's proposed "tool kit" bill. Shipping safety has benefited enormously from vessel traffic systems, e-navigation, redundancy in critical shipboard systems, double hulls or

bottoms for oil carrying vessels, repositioning of fuel tanks aboard merchant vessels and the like.

Such technological advances are certainly at least partially responsible for the great reduction in the incidence of vessel accidents leading to spills that has occurred over the past several decades. Spill rates that averaged 25.4 spills/year for major spills during the decade of the 1970s were down to just 3.3 major spills/year during 2000-2009, according to the International Tanker Owners Association. The technological advance has certainly contributed, but no one would say it's the only reason the seas are safer. Shipping continues to be a complex technological and institutional activity, and vigilance and oversight must be continuous to assure that conditions in the shipping sector aren't changing in ways that make us more prone to future "normal accidents". Experts who monitor safety see lots of clouds on the horizon, and how will OCS monitoring and oversight be provided for in the future? How robust will our institutional design be, in addition to our technology?

I'd like to speak very briefly to workforce issues. There's a workforce crisis in the Gulf today, finding and training enough workers to deal with the relentless onslaught of oil. But there's a deeper crisis, another consequence of the play of the issue attention cycle. Many of the NOAA scientists and other specialists I know cut their teeth on Exxon Valdez. That was 21 years ago and that means they're now beginning to retire. How do we train up the best people to take their place and keep current workers apprised of advances in technology and understanding? Workforce issues are pervasive throughout the government agencies that we rely upon to manage and protect our natural resources, and there are surely workforce issues within NOAA. Universities and programs like mine can help, through faculty exchanges and student training, the kinds of things we do best, but resources for such efforts have been lacking. Many vehicles exist, like Sea Grant and the NOAA Cooperative Institutes scattered around the Nation. What's missing is the money.

3. <u>We've been here before</u>

In 1990, shortly after the *Exxon Valdez* spill, the U.S. Office of Technology Assessment prepared at the request of the Congress a Background Paper, *Coping with An Oiled Sea: An Analysis of Oil Spill Response Technologies* (OTA-BP-O-63 U.S. Government Printing Office, March 1990). The report, strongly influenced by events then still unfolding in Prince William Sound, warned that future spills could easily overwhelm the technologies we had. It also cautioned that we can't prepare for every contingency. The risk will never be zero. It found that industry had focused its efforts on preparing for small, relatively easily controllable spills in harbors and sheltered areas, and that it had likely oversold its ability to respond to major spills. Major spills in open water had up to that point seen recovery rates of no more than 10% of oil spilled, 6-8% in the case of *Exxon Valdez*, despite billions spent on response. I believe that this picture has not changed much today.

The OTA report found that the relative rarity of major spills was a major impediment to a sustained effort that would yield a higher-impact technology development program. The good news, perhaps, it also found the problem to be less a matter of needing dramatic engineering breakthroughs and more one requiring simply good engineering and sustained attention. It highlighted the need for good design and maintenance, training in deployment and use, and pre-positioning of response equipment in adequate quantities and types to deal with the really big events, like now. The report focused on technology to be sure, but also on decisionmaking, logistics, and training. Soft technologies, in other words.

In my view, OTA's findings remain largely valid today, twenty years later. In many ways we are better prepared, but progress has been in fits and starts, issue attention cycle at work in my view. A robust approach to filling the tool kit, with the right hard and soft technologies, is needed.

Thank you.

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