September 24, 2013

Air Quality Permit Coordinator
George Davis, Permit Writer
DEQ Northwest Region
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Portland, OR 97201

Dear Air Quality Permit Coordinator and Mr. Davis,

The following are my comments re DEQ's proposed Title V air quality permit for Intel's semiconductor manufacturing and research plants in Hillsboro and Aloha (Permit number: 34-2681-TV-01). The comments represent a much expanded version and documentation of my oral comments at the public hearing on September 16th at the City of Hillsboro Civic Center. Please treat this set as my formal comments. Thanks.

DEQ's proposed Title V air quality permit for Intel raises many doubts, questions, issues.

1. It's very non-reassuring, for instance, that Hydrogen Fluoride was somehow removed from the Hazardous Air Pollutants (HAPS) table of DEQ's August 16 public notice and replaced with Hafnium [1]. Hydrogen Fluoride was listed in the HAPS table on the two preceding public notices [2,3]. When the omission and substitution was called to DEQ's attention on the morning of the September 16 public hearing, DEQ acknowledged the error, and also acknowledged the error at the hearing. But why does the error still appear as of today in the online public announcement?

Issues about Hydrogen Fluoride emissions have been raised in both a U.S. EPA Compliance Investigation Report and an Agency for Toxic Substances and Disease Registry Public Health Consultation Review at Intel's Rio Rancho, New Mexico plant [4,5]. Issues about Hydrogen Fluoride emissions were also raised at the Hynix Semiconductor Manufacturing America plant in Eugene, Oregon [6-8]. Given the many questions surrounding such emissions, DEQ's error and failure to correct the online notice means that any member of the public viewing the printed or online August 16 public notice who was not present at the September 16 hearing will be viewing and making decisions about whether to comment on partially incorrect information.

2. It's also very non-reassuring that fluoride emissions were omitted from prior Intel air quality permits because DEQ thought they were "deminimis," and because Intel failed to report them. This citizen found the reasons offered for the omissions in sections 39 through 42 of DEQ's proposed Title V Model Review Report for the Intel permit [1], and in two recent articles in The Oregonian [9,10] unconvincing.

On a related note, the absence of any indication in the permit about the exact fluorides that are encompassed within the generic Fluorides listed in the Criteria Pollutants table impairs public confidence, and provides no basis for understanding and comment.

3. Given the emphasis on precision, reliability, verification and state of the art technology in the semiconductor industry, one would think, or at least hope, that the same emphases would be applied to the air pollution control technologies used to protect the environment and health.

According to federal regulations, semiconductor manufacturing plants, including research & development plants, that emit 25 tons or more per year of combined Hazardous Air Pollutants, or 10 tons or more per year of any one HAP, are subject to Maximum Achievable Control Technology (MACT) standards for limiting emissions. [11]

In the proposed air permit, however, Intel would not be subject to Maximum Achievable Control Technology standards, because DEQ estimates Intel's combined HAPS potential emissions to be 19.7 tons per year, and its highest single HAP potential emissions to be 8.7 tons per year.

4. Estimates, however, are only as good as the factors that go into them, and such estimated emissions ultimately need to be validated against actual measured stack emissions. The air quality permit DEQ is proposing for Intel requires no such validation.

4A. Stack Testing - In an email inquiry on 9/13 to DEQ I asked: "Could you direct me to the page on the proposed permit that indicates the proposed frequency of exhaust stack monitoring/testing for hydrogen fluoride." The reply I received: "The permit does not require testing for fluoride emissions. Intel has tested fluoride emissions at other Intel facilities that perform the same production processes to develop their emissions estimates."

At the Q & A session prior to the formal public hearing on 9/16 I asked: "Is stack testing for any of the HAPs listed in the permit required?" The answer: "No."

4A. The importance of validating estimated emissions against actual measured stack emissions is illustrated by the permit developed between Hynix Semiconductor Manufacturing America in Eugene, the Lane Regional Air Protection Agency, and the community. Below find an excerpt from a September, 2007 article in the Eugene Register-Guard that describe the stipulations in the permit for stack testing at the Hynix plant [8, see also 6,7]. The excerpt is revealing in other ways as well (developed below in 4B).

After almost a year of gathering facts and deliberating, local air regulators have approved Hynix's request to more than double the limits on how much hydrogen fluoride it can release into the air each year.

Hynix is a computer-chip manufacturer in west Eugene with 1,215 workers.

The Lane Regional Air Protection Agency on Thursday renewed Hynix's Air Contaminant Discharge Permit, raising the hydrogen fluoride cap to 5 tons a year, up from 1.8 tons.

The new permit, which requires more frequent monitoring than the previous one, will be in force through Dec. 31, 2011.

Hynix had notified the air agency in July 2006 that it was nearing the maximum emissions allowed for the year because it had increased production and because the method to calculate emissions had changed.

Hynix's request to boost its hydrogen fluoride emissions generated a flood of 275 public comments, raising concerns about potential effects on the environment and public health.

The EPA classifies hydrogen fluoride as a hazardous air pollutant. In large doses, it can irritate skin, eyes and the respiratory tract and affect the health of plants and animals.

"One of the concerns we heard often was that the community was uncomfortable with a testing requirement of once every five years (as the proposed permit required)," the agency's director Merlyn Hough said in prepared remarks. "The final version of the permit requires testing semi-annually, which should give the community more confidence."

Hynix spokesman Bobby Lee said the company suggested that it test the air coming out of its exhaust stacks twice a year, after discussions with air regulators and community members.

"Stack testing allows all parties to get on the same page," he said. "We were all using hypothetical data, and I think everyone came to realize that without good data it was difficult to make good decisions." [...] [8]

Why is it that the Lane Regional Air Protection Agency (LRAPA) permit for Hynix in 2007 requires semi-annual, twice yearly stack testing, but the proposed 2013 permit for Intel requires stack testing only once every five years? While I don't know the exact relationship between LRAPA and DEQ, LRAPA seems to serve a function similar to other DEQ regional offices [12]. While Hynix closed in 2008 [13], everything in this section and the next section [4B) are relevant to the Intel permit that has been proposed.

4B. Comparisons of Estimated Potential Emissions - It's instructive to compare DEQ's estimated yearly emissions of combined and single HAPs in its proposed 2013 Intel permit for Intel's Hillsboro and Aloha plants, and its 2007 Air Contaminant Discharge Permit (ACDP) for both plants.

In DEQ's proposed 2013 Intel permit, the combined HAPS are estimated to be 19.7 tons per year, and the highest single HAP -- Hydrogen Chloride -- is estimated to be 8.7 tons per year. Hydrogen Fluoride potential emissions are estimated to be 1.8 tons per year. By comparison, in the public notice for the 2007 ACDP, DEQ shows a combined HAPS for both facilities of 3 tons per year, and no breakdown of individual HAPS is included [14]. Going from a combined HAPS of 3 tons per year in 2007, to 19.7 tons per year in 2013 is quite an increase!

Another comparison. DEQ estimates Hydrogen Fluoride potential emissions in its proposed 2013 Intel permit to be 1.8 tons per year. But as indicated above in 4A, in its 2007 permit, the Lane Regional Air Protection Agency raised the cap on Hydrogen Fluoride potential emissions at the Hynix plant in Eugene from 1.8 tons per year, to 5 tons per year. Is DEQ's estimate of 1.8 tons per year of Hydrogen Fluoride potential emissions at Intel a serious underestimate?

It's also instructive to note that part of the context in which LRAPA raised the cap on Hydrogen Fluoride potential emissions at the Hynix plant to 5 tons/year, included the assertion by Doug Erwin, air permit writer at LRAPA, that "air scrubbers remove 87 percent of the pollutant from the air before it's released, according to tests conducted in 1999" [6]. As will be developed below in 5B, Intel's stated scrubber removal efficiency [is] 70% for hydrogen fluoride," and the U.S. EPA Compliance Investigation Report raised questions about that [4]. The point here, however, is that if LRAPA issued a permit for Hynix in 2007 for 5 tons of potential emissions of Hydrogen Fluoride per year with the understanding that the Hynix scrubbers had an efficiency of 87%, how is it possible that DEQ is proposing potential emissions of Hydrogen Fluoride of 1.8 tons/year, given that Intel states its scrubbers operate at 70% efficiency?

5. Since DEQ's proposed air permit apparently intends to rely, in part, upon emissions estimates developed "at other Intel facilities that perform the same production processes," it's instructive to look at what two major federal reports suggest are the inadequacies and uncertainties associated with the emissions estimates for Intel's Rio Rancho, New Mexico, semiconductor plant.

5A. Emissions Factors - The estimated emissions in a permit are based, in part, upon "emissions factors" that are used to calculate and project the emissions of various criteria and HAPS air pollutants. If these emissions factors are in error, the actual emissions will be either higher or lower than projected levels.

5A1. In June, 2010, for instance, the U.S. EPA issued a Clean Air Act Compliance Investigation Report [4] based upon a surprise onsite investigation from Dec. 7 through 11, 2009, of Intel's Rio Rancho, New Mexico, semiconductor manufacturing plant. In its Summary of Findings (pages 26 and 27), and re "emissions factors" and calculations, the report notes the following Area of Noncompliance:

"Intel did not properly calculate the emissions for ethyl lactate. The emission factors Intel developed underestimated the emissions of ethyl lactate by 36 percent. Intel also failed to account for the downtimes of the regenerative thermal oxidizers in its HAPS emission calculations for methanol and xylene. This underestimates the emissions for both of these chemicals. Intel also overestimated the emissions of methanol by 8 percent." [4]

5A2. In addition to the U.S. EPA Compliance Investigation Report at the Intel Rio Rancho plant, the Agency for Toxic Substances and Disease Registry (ATSDR) conducted a Public Health Consultation Review [5] to address the concerns of the Rio Rancho and Corrales communities about the plant. Re the the changing production processes and the frequent changes in emission factors that accompanied these changes, the ATSDR report, published in Feb. of 2009, had this to say:

[...] Like other semiconductor manufacturers, Intel-New Mexico's production processes have changed considerably over the years. Some changes were made to accommodate changing production demands, some were to comply with environmental regulations, and still others were to keep up with scientific and technological advances in the field of microelectronics. The evolving nature of this facility is an important fact or to consider when evaluating the facility's air emissions. With frequent alterations in, among other things, production rates, chemical usage, and pollution control equipment, air emissions observed at any point in time might differ from those observed over the long term. [...] pp. 5-6

[...] Some of the more recent permit revisions ... were either administrative in nature or added emissions limits and other requirements to keep Intel-New Mexico within federal environmental "synthetic minor" policies and guidance. "Synthetic minor" refers to facilities that accept permit conditions limiting emissions below thresholds that would, if exceeded, designate the facility as a "major source." [...] p. 7

To see the frequent updates of emission factors at Intel Rio Rancho, see Table 1, "Intel-New Mexico's Air Permit History" on p. 8 of the ATSDR report [5].

The ATSDR report also reinforces the point made above in # 4 that emissions estimated with emissions factors and models must be verified by real-world emission measurements. The following is an excerpt from the report's overall Recommendations [5]:

[...] ATSDR recognizes environmental sampling and monitoring is resource intensive and any additional sampling/monitoring efforts would depend on the availability of resources. However, because of the uncertainty associated with previous modeling studies, FTIR data and because of ongoing community concern about air emissions from the Intel-New Mexico Plant, ATSDR recommends that public health and environmental agencies explore the possibility of conducting additional sampling or monitoring to characterize residential exposures, specifically in the community and particularly immediately southeast of Intel-New Mexico. Some possible analytes may include • acidic gases (hydrogen fluoride), • aldehydes, • ammonia, and • VOCs [...] p.42

5A3. The U.S. EPA's Compliance Investigation Report and ATSDR's Public Health Consultation Review occurred because of the persistence and resilience of the members and professionals that comprise Corrales Citizens for Clean Air and Water (CRCAW) [15], and because of the excellent reporting of Jeff Radford in the Corrales Comment [16]. Below find an excerpt from the April, 2004 edition of the Corrales Comment, quoting a former New Mexico Air Quality Bureau permit supervisor that the agency had no verification of the accuracy of the "emissions factors" used by Intel at its Rio Rancho plant! [17] The excerpt reveals much more as well:

[...] The controversial Intel permit does not require actual continuous emissions monitoring to determine how much of each regulated toxin is being emitted. Instead, Intel is allowed to calculate what its annual emissions will be, based on a pre-determined multiplier, or factor, related to how much chemical is theoretically sucked off into exhaust ducts from a particular manufacturing step and how much of it will be removed by pollution control equipment before being released to the air.

But former Air Quality Bureau permit supervisor Jim Shively and other regulators have argued for years that the bureau has no independent verification of the accuracy of those "emissions factors." Without such verification, Shively, Marsh and others have insisted, there is no way to tell how much of each toxin is actually being released, especially over short durations.

Marsh pressed that point at the February 26 meeting with Curry. Addressing Intel permit writer Goodyear, Marsh said. "I asked you about the 32 emission factors, and asked you what proof you had to verify these emissions factors. I asked you if you had evidence for those, and you said, 'No.'

"Is there in the department files any record going back to when the minor source permit was considered, a record of department personnel doing a proper investigation to validate that these emissions factors were correct? Can you produce some documentation to back it up?"

According to minutes of the meeting, Goodyear responded: "No. There is nothing in a permitting action like that."

Shively, the recently retired bureau permit writing supervisor who calls the version finally approved a "sham," said the process was subverted to give Intel the pollution permit it demanded.

"There are plenty of department memos to the file that question the factors and permit conditions. Why then, are there not department memos that ultimately accepted the factors and permit conditions?

"If the department can't verify the factors, how does it know that Intel is below the 10 tons per year limit for a single Hazardous Air Pollutant (HAP) or the 25 ton per year limit for combined HAPs?" [...]

5A4. It's clear that it's imperative that all variables (e.g., emissions factors, scrubber efficiencies, etc.) that are included in the calculations to estimate emissions have to be verified against real-life stack emissions. Below find an excerpt from the August 2, 2013 edition of the Corrales Comment, describing how Corrales Residents for Clean Air and Water (CRCAW) are currently working with Intel's "Community Environmental Working Group (CEWG) to explore possible around-the-clock analysis and recording of stack emissions" [18]:

[...] Just as Intel begins cooperating with an air pollution specialist's study of emissions spikes of hydrogen fluoride, a highly toxic acid gas used in the chip manufacturing process, discussions have begun within its Community Environmental Working Group (CEWG) to explore possible around-the-clock analysis and recording of stack emissions.

When villagers demanded that continuous emissions monitoring (CEM) be required by state air pollution regulators in the mid-1990s, Intel countered, saying it was not technically feasible. When the topic came up at the June 19 CEWG meeting, Intel environmental manager Sarah Chavez recalled that the technology was not available back then, "and at that point it was much more expensive."

John Barlit, acting chairman of Intel's CEWG and co-founder of New Mexicans for Clean Air and Water, introduced the topic and clarified that no state or federal regulations require Intel to install such equipment.

On the other hand, both the U.S. Environmental Protection Agency (EPA) and the U.S. Agency for Toxic Substances and Disease Registry (ATSDR) have expressed concern in recent years that routine stack testing of industrial chemical missions into the air may not be adequate.

(See Corrales Comment series on the EPA report, starting with Vol.XXIX, No.17, October 23, 2010 "EPA Inspection Report Slams Intel Air Pollution Permit")

The CEWG's previous study of silica dust pouring from Intel's solvent-burning incinerator stacks had been requested by the ATSDR.

Highlighting the importance of CEM to residents downwind of Intel, a spokesman for Corrales Residents for Clean Air and Water (CRCAW), retired Los Alamos Laboratories chemist Fred Marsh, pointed out, "The inadequacy of the existing monitoring program was demonstrated when Intel admitted that one of its pollution control systems was shut down for a period of 3.5 months, during which they claim to have been unaware of the malfunction.

"The incident, reported in the June 1, 2000 Albuquerque Journal, reveals that one of the world's wealthiest corporation, whose business is on the leading edge of high technology, required 3.5 months to detect a serious malfunction. And when Intel finally released the information more than five months late —instead of the 10-day notification period required by the air quality permit— they took credit for being open and forthright with the public," March recalled.

"If Intel's exhaust stacks had been continuously monitored as we have requested and as required by the withdrawn 1998 air quality permit version, Intel would have known immediately that there was a problem. But instead, for three and a half months, Intel continued to dump untreated pollutants into the air that we, their neighbors, must breathe." [...]

The continuous emissions monitoring (CEM) being explored in Rio Rancho should also be incorporated into the permit for Intel's Hillsboro and Aloha plants.

5B. Scrubber Removal Efficiencies - The estimated emissions that are listed in the permit and in the emissions reports that Intel submits are also based, in part, upon assumptions about "scrubber removal efficiencies" for various Hazardous Air Pollutants. The June, 2010, U.S. EPA Compliance Investigation Report [2] raises questions about "Intel's stated scrubber removal efficiency of 70% for hydrogen fluoride." In its Summary of Findings (pages 26 and 27), the report outlines eight Ares of Concern (A through H). The thrust of A-H is that because of major uncertainties related to scrubber efficiencies, monitoring, stack testing, and reporting, Intel's actual emissions cannot be known. Section H captures the gravity of the situation at Rio Rancho well:

"Intel's permit does not contain short-term (hourly, daily, monthly) emissions limits for VOCs and HAPS. Without short-term limits, Intel can have spikes in its emission profile that can lead to acute exposures of these chemicals. Further, since the permit does not require monitoring and recordkeeping of emissions during upsets, NEIC [National Enforcement Investigations Center] could not accurately confirm Intel's minor source status." [2]

5C. Excess Emissions and Upsets - Section 45 (Excess Emissions Reporting) of the proposed permit details how excess emissions during "planned startup, planned shutdown, scheduled maintenance, or as a result of a breakdown, malfunction, or emergency" should be dealt with, quantified in magnitude and duration, and logged. [1, p.28]

Section 45e notes, however, that "the permittee is not required to submit the detailed log with the semi-annual and annual monitoring reports. The permittee is only required to submit a brief summary listing the date, time, and the affected emissions units for each excess emission that occurred during the reporting period." [1, p. 28]

The above requirements result in the ludicrous situation where excess emissions during six categories of events -- planned startup, planned shutdown, scheduled maintenance, a breakdown, malfunction, or emergency -- are logged and quantified, but are then systematically excluded from the estimated emissions that are used to determine whether a plant is below or above the threshold triggering the adoption of Maximum Achievable Control Technology (MACT) standards for limiting emissions.

The emissions during the above six categories of events can be huge. Above in section 5A I noted that the U.S. EPA in its Compliance Investigation Report of the Intel Rio Rancho plant, found that "Intel also failed to account for the downtimes of the regenerative thermal oxidizers in its HAPS emission calculations for methanol and xylene. This underestimates the emissions for both of these chemicals." [2, p. 26] To further put the preceding in perspective, in 2001 EPA noted that "as reported by the SIA [Semiconductor Industry Association], five chemicals comprised 95 percent of the total HAP usage: hydrochloric acid (HCl), hydrofluoric acid (HF), glycol ethers, methanol, and xylene." [11, p. 2-23]

As noted above, if the estimated excess emissions were included rather than excluded (or, stated differently, if reality was acknowledged), it's likely that Intel would es a major source of HAPS, and that Maximum Achievable Control Technology standards would be required.

The possibility of the above is acknowledged in sections 5A and 5B above, in the ATSDR Public Health Consultation Review, and the U.S. EPA Compliance Investigation Report, respectively. The relevant sections are below:

From 5A, and the ATSDR Public Health Consultation Review [10, p. 7]

[...] Some of the more recent permit revisions ... were either administrative in nature or added emissions limits and other requirements to keep Intel-New Mexico within federal environmental “synthetic minor” policies and guidance. “Synthetic minor” refers to facilities that accept permit conditions limiting emissions below thresholds that would, if exceeded, designate the facility as a “major source.” [...]

From 5B, and the U.S. EPA Compliance Investigation Report [2, p. 27]

"Intel's permit does not contain short-term (hourly, daily, monthly) emissions limits for VOCs and HAPS. Without short-term limits, Intel can have spikes in its emission profile that can lead to acute exposures of these chemicals. Further, since the permit does not require monitoring and recordkeeping of emissions during upsets, NEIC [National Enforcement Investigations Center] could not accurately confirm Intel's minor source status."

In closing, I and others appreciate the jobs created by Intel, and the contributions of its products. But such jobs and products must be created in ways that minimize harm to the environment, and harm to the health of humans, animals and ecosystems.

Based upon the evidence presented above, I believe there is every reason to conclude that the combined Hazardous Air Pollutant emissions from the Intel facilities will be 25 tons or more per year, and/or 10 tons or more per year of any one Hazardous Air Pollutant. Thus, I believe it is imperative that DEQ revise the permit to require Maximum Achievable Control Technology standards for HAPS at Intel.

At a minimum, the proposed Intel air permit must be modified to require:

-- that emissions estimated with emissions factors and models must be verified by frequent stack measurements

-- that the efficiency and operational integrity of scrubber and other pollution control systems be verified by continuous stack measurements (i.e., continuous emissions monitoring)

-- that short-term (hourly, daily, monthly) emissions limits for VOCs and HAPS be included within the permit

-- that the excess emissions during the six categories of events listed in 5C above be added to the estimated emissions that are routinely used to determine whether a plant is designated as a minor or major source of Hazardous Air Pollutants.

Sincerely,

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Member, Environmental Health Working Group, Oregon Physicians for Social Responsibility
Former Member, Board of Directors, Oregon Physicians for Social Responsibility
Member (representing Oregon PSR), Oregon DEQ Conversion Technology Rulemaking Advisory Committee

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