



**WSC ESH TF / SEMI EHS Division
May 19, 2005**

Joint White Paper on energy efficiency of tools and supporting equipment

The World Semiconductor Council (WSC) and SEMI® recognize that reducing energy consumption reduces the need for energy production, resulting in corresponding environmental benefits, and is strategically valuable to the semiconductor industry. Overall, the semiconductor industry is not a large contributor to emissions of global warming gases. However, along with PFC emissions, energy consumption is our primary contribution to global warming. There are additional environmental impacts as a result of energy production and consumption, including emissions of SO_x, NO_x, and generation of waste—both hazardous and non-hazardous. As responsible citizens we need to reduce these effects as much as possible. The WSC and SEMI are committed to developing proactive solutions to environmental concerns. In addition to the environmental benefits of energy reduction, the semiconductor industry is keenly aware that efficient utilization of energy resources is an important ingredient to the realization of continued, cost-effective manufacturing. Hence it is necessary to involve all stakeholders (equipment suppliers, purchasing, facilities, manufacturing and design) in designing for energy efficiency.

The semiconductor industry has already begun benchmarking tools and facilities systems on a global level. The WSC has established an Energy Savings WG that will coordinate information exchange and cooperation between each association in the field of energy efficiency improvement to reduce energy consumption of our operations.

With this intent, we are partnering with our strategic suppliers to achieve our mutual energy savings goals, requesting that they evaluate cost-effective improvements to current tool-sets and establish active and meaningful energy optimization goals as part of new equipment design.

We support and encourage the development of standard protocols which are currently being reviewed and updated through the SEMI Standards process. It is imperative that equipment manufacturers have a single, consistent and reliable set of objective protocols to measure the environmental impact of the industry. We also support the reporting of consistent, key environmental metrics such as, PFCs, VOCs and HAPs emissions, hazardous waste generation, equipment energy consumption, water consumption and process chemicals consumption. It is important to remain focused on measuring those metrics that are meaningful in terms of providing useful information that will result in reducing the environmental impact of the semiconductor industry.

The purpose of the World Semiconductor Council (WSC) is to promote cooperative semiconductor industry activities, to expand international cooperation in the semiconductor sector in order to facilitate the healthy growth of the industry from a long-term, global perspective.

WSC activities shall be undertaken on a voluntary basis and guided by principles of fairness, respect for market principles, and consistency with WTO rules and with laws of the respective countries or regions of each Member. The WSC recognizes that it is important to ensure that markets will be open without discrimination. The competitiveness of companies and their products should be the principal determinant of industrial success and international trade.

SEMI is a worldwide industry association serving companies that develop and provide manufacturing technology and materials to the global semiconductor, flat panel display, MEMS and related microelectronics industries. SEMI maintains offices in Austin, Beijing, Brussels, Hsinchu, Moscow, San Jose (California), Seoul, Shanghai, Singapore, Tokyo and Washington, D.C. For more information, visit www.semi.org.

The semiconductor industry will help suppliers develop and support the voluntary publication of energy efficiency metrics for their tools in a manner that would allow for valid comparison by potential buyers.

For technical details, refer to SEMI S23 – 0305, Guide for Conservation of Energy, Utilities and Materials used by Semiconductor Manufacturing Equipment. (If amended, refer to the most recent version of the guide.)

A tool supplier should submit information on electric power, exhaust and cooling water as part of the quotation provided to the customer interested in ordering the equipment.

An example of this information is listed below:

1. Electric power

- Standard process condition.
- Component condition and system.
- Measurement protocol
- Consumption in kWh per suitable time unit (hours, day, week or month) or per cycle, whichever is most appropriate.
- Standby power consumption (in kW) at idle.
- Average consumption in kWh per batch of wafers or per wafer.

Note: the equipment specification should clarify:

Batch process (number of wafers per batch) or other

Multi chamber system (number of chambers);

Wafer size/ Wafer transfer mechanism/ Throughput.

2. Exhaust

- Volume (m³/hr)
- Temperature difference between in and out

3. Cooling water

- Volume (m³/hr)
- Temperature difference between in and out

.