WHITE PAPER

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# THE POWER FORWARD INITIATIVE

## CHARTING THE INDUSTRY'S COURSE TO ACHIEVING ENHANCED POWER MANAGEMENT SOLUTIONS FOR ADVANCED PROCESS GEOMETRIES

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## OVERVIEW

As the electronics industry continues its move toward advanced process geometries, significant challenges have emerged that cannot be met by the existing design infrastructure. One of these challenges is power management. Across the design and manufacturing chain, there is a clear need for a power-aware infrastructure that will benefit design teams; ASIC, library, IP, and tool vendors; equipment providers; and manufacturing facilities alike.

Limitations in the existing design infrastructure prevent power-related aspects of design intent from being specified across the design chain. These limitations prevent companies from initiating profitable low power projects due to high levels of risk and uncontrollable design costs. The industry lacks automated power-control techniques capable of achieving both functional and structural verification of designs prior to incurring extensive manufacturing costs. Threatened by potentially high costs coupled with missed time-to-market opportunities, companies will remain reluctant to adopt advanced process geometries and effective low power methodologies at 90nm, 65nm, and below.

The reluctance to adopt new process geometries has a negative impact across all business sectors in the electronics industry. Innovation by design teams is constrained due to the risk of low yields and costly re-spins. Library and IP vendors are unable to leverage the differentiated value of modeling the new processes, and tool providers are unable to sell new capabilities based on evolving process requirements. Finally, sales of new equipment to manufacturers are limited because foundries are unable to drive sufficient volume through new facilities to recoup their huge investments. As a result, consumers are offered products that suffer from shorter battery life, higher heat dissipation, and other shortcomings that lead directly to lower sales—negatively affecting the profitability of businesses across the industry.

Electronics companies are facing similar challenges in other areas as well, and are meeting them with broad alliances tasked with creating new solutions. Developing and adopting new standards for video compression, DVD formatting, and high-definition broadcast signals are just a few of the technological hurdles currently being resolved by the communications and entertainment industries. New standards-based solutions create a catalyst for innovation, giving birth to exciting new product categories that translate into increased profitability across the industry.

In the recent past, isolated efforts to lower power consumption have been made. However, to effectively address the larger challenges posed by power consumption at advanced process nodes, an urgent need for a broad new industry alliance has emerged: the Power Forward Initiative.

## THE POWER FORWARD INITIATIVE

Organizations will be welcomed from across the broader electronics industry to participate in the promotion, refinement, and open standardization of demonstrated results emerging from the Power Forward Initiative. By devising an industry-wide solution to power issues affecting systems, design, verification, implementation, and manufacturability, a holistic approach can be created to benefit all Power Forward Initiative members and the industry as a whole. Based on the insights provided collectively by its members, the organization will also be tasked with projecting future industry infrastructure needs.

## CURRENT PRIORITIES

The Power Forward Initiative's primary goal is to remove the barriers to automation of advanced low power design, and to provide a pathway to the development of a standards-based solution. Only by reducing the risks and costs associated with the design, verification, and implementation of designs using multiple/variable supply voltages and power shut-off design techniques, particularly at 90nm and below, will the door to a new era of innovation and profitability be opened.

Building a solution that fills the current void in the industry's infrastructure will require a departure from current approaches that have failed to create a holistic solution. In an effort to create a reset, the Power Forward Initiative will address the entire scope of the industry—from the initial specification of design intent through to manufacturing and test. Only by taking this broad approach can the innovation logjam be broken.

However, this reset must not be disruptive to the portions of the existing infrastructure that are clearly still working. What is required is a solution that serves as an overlay instead of a radical departure—one that does not require re-engineering of libraries, IP blocks, verification suites, or designs that can be reused. By definition there will be additive elements to the design environment and design process, but these new elements must not create a snowballing change throughout the ecosystem.

The Power Forward Initiative will initially focus on the issues related to the use of complex power domains including multiple/variable supply voltages and power shut-off (PSO) techniques.

To achieve these goals, ongoing work on the Common Power Format is being considered within the larger industry frame of reference. Looking to satisfy the needs of the broad constituency of chip design teams and providers of tools, equipment, IP, silicon, manufacturing, test and services, the Common Power Format has been created to deliver a comprehensive solution to the challenges posed by today's advanced power requirements. The Common Power Format is being architected for future support of new design techniques and materials breakthroughs, including architecture, hardware and software system modeling, as well as analog and mixed-signal design.

Benefits of the Common Power Format-based solution include:

- Functional verification of PSO using the same design description used for implementation
- Reduced turnaround time for physical implementation
- Enhanced optimization through simplified design exploration
- More accurate power utilization estimates
- Equivalence checking between functional description and implementation

Due to the fact that the new Power Forward approach is additive to the existing environment infrastructure and design flows, no changes to existing/legacy designs will be required. The Common Power Format shows strong indications of viability for delivering productivity gains and improved QoS across the design chain. Automation is a key aspect to solving the industry's power management design challenges, and support for the Common Power Format's extendable infrastructure will foster the adoption of automated low-power design and verification solutions.

## ENHANCING PROFITABILITY THROUGH INDUSTRY COLLABORATION

Created to assist the electronics industry in resolving the significant issues centered on power utilization at advanced process geometries, the Power Forward Initiative will only accomplish its mission by drawing from the collective expertise of its members. By devising a new approach that increases design team efficiency and delivers higher yields, the initiative will reduce the risk of costly re-spins and facilitate faster time to market. Participation from companies across the design and manufacturing chain is the key to the Power Forward Initiative's success, and collaboration will ensure the industry's continued growth and enhanced profitability.

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