Dear Sir or Madam;

Electronics For Imaging, Inc. (EFI) manufactures external Digital Front End (DFE) systems under the Fiery brand for use by digital color copier manufacturers to enable their copiers to function as digital printers. In order to remain competitive in the third party DFE market, EFI updates their DFE hardware product line approximately every eighteen months to ensure we provide our customers with the most energy efficient, highest performance, and cost effective solutions to meet their color printing needs. While we strive to be energy efficient, issues always seem to arise concerning DFE energy consumption and how it should be accounted for in the ENERGY STAR Imaging Equipment Specification. Given our experience/participation in past ENERGY STAR Imaging Equipment Specification DFE discussions and our knowledge of the external DFE market, we offer the following comments related to Section 5.3.2 "Treatment of DFEs" and Issue 18 of the "ENERGY STAR Imaging Equipment Version 2.0 Specification Revision Discussion Document".

- **Purpose Built Platform** – While a DFE on the surface may appear to be a Personal Computer, in reality our DFEs are purpose built to maximize performance at the lowest possible cost. For example, our systems contain components normally found in high-end servers (e.g., RAID disk controllers, dual four or eight core CPUs, and high speed PCI Express interconnects); but we also have non-server features such as a customized BIOS that enables our systems to enter all ACPI sleep modes and consumer grade peripherals to reduce cost and power consumption (e.g., using SATA instead of SAS hard disk drives). The primary goal of our hardware platform is to create a DFE that enables the copier to produce printed output at speed without introducing high power copier idle states, which occurs when the copier is ready to print a page; but the page has not been fully rendered by the DFE. This unique combination of hardware components including the custom PCI Express card required to connect the DFE to the copier's proprietary interface, and its controlling software have made it difficult (in fact impossible) to qualify a DFE as a high performance computer system under the ENERGY STAR Computer or Server specifications. In the original draft of the ENERGY STAR Imaging Equipment Specification Version 1.1, DFEs were suppose to be tested under the ENERGY STAR Computer specification; but it became clear that due to the DFEs unique construction and the direct relationship the DFE has with its associated imaging equipment, that it was best to keep everything under a single ENERGY STAR specification (the Imaging Equipment specification). Since the reasons for placing external DFEs under the Imaging Equipment specification have not changed, we believe that DFEs should not be regarded as general purpose computers which are qualified under the ENERGY STAR Computer specification.

- **Treating DFEs as an Integral Imaging Equipment Component** – Since EFI no longer manufacturers internal DFEs we will only comment on whether external DFEs should be considered an integral imaging equipment component or functional adder. In order to reduce costs we rely on three basic hardware platforms (with a custom copier interface card) to meet low, medium, and high performance printing requirements. If our DFEs were considered an integral component or functional adder it is our belief that each digital copier manufacturer that purchases our DFEs will ask us to modify our platform's energy consumption, in different ways, to enable their device to achieve ENERGY STAR certification. The margins and cost structure associated with a third party DFE manufacturer does not allow us to create a custom platform for each customer, therefore we believe that an external DFE should not be considered an integral component or functional adder to the imaging equipment.

- **Performance Matching** – As stated previously the primary purpose of our DFEs is to produce pages at a rate equal to or greater than the rate at which the digital copier can consume them. While it would be nice to say that the driver of this purpose is purely to save energy, the fact is that market forces control the DFE's performance and power consumption (i.e., higher performance DFEs which usually consume more power have a higher price). For example, no one will connect a DFE that can only produce 30 pages-per-minute (PPM) to a copier rated at over 100 PPM, conversely if you have a 50 PPM copier you are not going to purchase a DFE that is capable of producing output at 200 PPM (the cost of the DFE would be more than the copier). So in most cases market forces will ensure that the DFE is performance matched to the imaging equipment which in turn reduces the number of copier high power "ready state" idles and its associated power waste. This of course assumes that the energy consumed by the DFE to produce a page is less than the power that would be wasted during a "ready state" idle. Please note that in addition to the market forces that tend to performance match a DFE and its associated imaging equipment, other market forces such as cost/performance require us to adopt leading edge computer technologies, which tend to be more energy efficient, at an interval more frequent than most embedded/special purpose computing devices. For example a high performance EFI DFE manufactured less than six years ago could have consumed 650 Watts, while a system manufactured today that exceeds the page rate performance of the earlier system consumes less than 100 Watts. While it is probably worth discussing ways to measure the amount of energy a DFE consumes to render and transfer a given page to a digital copier and compare it to the amount of energy wasted if the copier enters a prolonged "ready state" idle, the end result may be the amount of power that could be saved during "active" mode is minimal compared to the savings that can be achieved by better management of how quickly the DFE enters and stays in "sleep" mode.

- **Preferred Mechanism to Reduce DFE Energy Consumption** – As documented by several LBNL presentations and papers, the greatest energy savings potential is obtained when a device transitions quickly from active to sleep mode and stays in sleep mode. It has also been well documented that it is difficult for DFEs to enter and remain in sleep mode due to network activity directed at the DFE (e.g., client PCs sending messages to ensure the DFE/printer is still present, and management software using SNMP to check the device's status and consumables). While a lot of work has been accomplished, most notably the Ecma-393 ProxZzzy Standard, to enable network connected devices to remain in sleep while maintaining network presence, devices incorporating this technology have yet to appear in the market. While a ProxZzzy device/component is the ideal solution to the problem of allowing DFEs to enter and remain in sleep until a print job is actually received, it is unclear whether these devices will be available during the timeframe of the new ENERGY STAR Imaging Equipment Specification. Therefore, we would like to recommend the following to enable DFEs to remain in sleep mode longer. First, we would like ENERGY STAR to engage with Apple and Microsoft to have these Operating Systems vendors design their printing interface stacks to not generate periodic requests to imaging equipment devices, simply to determine whether the device remains present on the network. We believe that this is the ideal time to engage Apple and Microsoft on this issue since both companies are preparing new OS releases. The second is that a DFE immediately enters sleep mode after completing the last job, when no user is logged into the DFE. Normally a PC is set to enter sleep within ten to fifteen minutes of no activity, reducing this sleep entry time on a PC often results in the user disabling the sleep feature, since the system tends to enter sleep when the user is actually doing something like reading or viewing an online/streamed presentation. While this long sleep entry time delay makes sense for a PC, a DFE is an

embedded device which usually operates without a user being logged on to the system, therefore entering sleep within a few seconds of completing the last job should be acceptable. Please note that this non-ProxZzzy sleep approach will only result in energy savings if the time interval between network traffic directed at the DFE is greater than several minutes. This number is based on informal experiments where we looked at the energy consumed when the device exits sleep (i.e., the system goes into a high energy state re-enabling all devices, then it drops to an idle power state). In other words if the DFE is awoken too frequently then it will consume more power entering and exiting sleep then remaining in idle. Additional more formalized testing would need to be conducted to determine whether a quick entry into sleep mode without a ProxZzzy device actually contributes to energy savings.

One final comment concerning the use of Energy-Efficient Ethernet (IEEE 802.3az). We are very much in favor of incorporating Energy-Efficient Ethernet into our DFE product lines especially since the technology will work on legacy networks. Our only issue with including Energy-Efficient Ethernet into the ENERGY STAR Imaging Equipment Specification is that at present the only chips we have been able to identify that incorporate IEEE 802.3az are designed for network switches and not the individual ports normally found on DFE and imaging equipment devices. If ENERGY STAR knows for certain that numerous chip vendors will be shipping IEEE 802.3az components for network end-point devices prior to when the new ENERGY STAR Imaging Equipment Specification Version 2.0 is finalized, then we would recommend that Energy-Efficient Ethernet be deferred until the next Imaging Equipment Specification release.

EFI views having our DFEs recognized by ENERGY STAR for their energy efficiency as being an important market enabler. We therefore look forward to participating in the imaging equipment specification revision process to ensure that we ship the most energy efficient products as possible. Should you or any member of the ENERGY STAR team have any questions concerning the material presented; please do not hesitate to contact me either by email or telephone and I will try and provide answers as quickly as possible.

Regards,

Brett

P.S. – Please note that the EFI email server automatically appends a generic confidentially statement to the end of every email sent. The information presented above is not considered confidential and can be publically shared with other ENERGY STAR Imaging Equipment stakeholders.

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