



VIA Solar Computing

Powering PCs with the Sun

With an Overview of the
Solar-Powered VIA pc-1 Information Community Center
Ulutogia, Samoa



VIA Technologies, Inc.

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Index

Introduction	3
The Benefits of Solar Power	4
New Markets	4
New Environments	4
New Usage Models	4
VIA Solar Computing	5
Solar and Computing	5
Addressing the Issues.....	6
VIA Solar Computing Partner: Motech	7
Samoa as a Showcase for Emerging Markets	8
The VIA pc-1 Information Community Centre Configuration.....	9
Energy Efficient Computing Technologies	10
VIA pc-1 Power-Saving PC Reference Design.....	10
VIA pc-1 Processor Platforms	10
VIA pc-1 Platforms: The Power Advantage.....	11
Conclusion	12



Introduction

VIA Solar Computing is a bold and exciting step forward for bridging the digital divide and helping to provide more responsible and cleaner sources of energy to power ICT. As part of the VIA Clean Computing Initiative, it is a focused effort to effectively research and develop complete solutions comprising highly efficient VIA computing devices and ways of powering such devices that are less polluting, more affordable, more flexible, and more reliable than traditional electricity supplies.

Such solar-powered solutions need to be deployable both in developed urban areas and in rural or remote locations where electricity supplies are unreliable or non-existent. The possibilities are immense, and so is the focus of our research and development into forms of power that can be made available to all, even those in the most remote and harshest of environments.

As a clean energy source that can be harnessed to provide environment-conscious power, solar power is a complementary technology to VIA's power efficient silicon and platform technologies, making a natural addition to the VIA Clean Computing Initiative to drive environment-conscious computing.

In August 2006, VIA opened the first solar-powered information community center on the island of Samoa as a showcase for VIA Solar Computing, demonstrating the viability of solar powered computing and communications solutions and creating a blueprint for installations virtually anywhere in the world.



Gisa Fuatai Purcell, ICT Secretariat Director, speaks at the PaciNet Conference, Samoa

"VIA has the capacity and committed staff to provide solar powered computers, a big step towards reducing poverty."

– August 2006

The Benefits of Solar Power

Solar power, in the form of photovoltaic (PV) modules, offers enormous promise as a clean, renewable energy source with a wide spectrum of applicability, and has already been proven in numerous deployments around the world. Its potential spans new markets, new environments and new usage models:

New Markets

Solar power provides people and communities in rural and remote locations with a realistic option of local electricity generation by harnessing the power of the sun. The photovoltaic effect of semiconductors within solar panel cells generates electricity from sunlight, which can then be stored into batteries or used directly, enabling them to be used almost anywhere with sunlight. Combined with portability and low maintenance factors, solar power makes a viable option for both urban and rural communities.

New Environments

Solar power has the ability to be set up in conditions that would not permit, or be far too costly for, electricity supplies generated by traditional sources such as oil, gas, coal, hydro or nuclear. In addition, solar power is durable, reliable and low maintenance, it can operate as an independent power source in environments with extreme weather and climatic conditions.



New Usage Models

Solar power can also be cost effective in many developing nations, where traditional mains electricity is tremendously more expensive than in developed nations; for example, normal electricity supplies in Samoa are six times the price of those in New Zealand. Given the lack of moving parts, increasing reliability and reducing maintenance costs, solar systems can pay for themselves in less than five years.

Moreover, in remote locations with limited or non-existent and/or expensive electricity, many currently turn to generators with their lower purchase cost for power, yet solar power provides a freedom and independence not available to such traditional supplies

- Solar power is a clean, non-polluting energy
- Solar panels are silent in operation; ideal for classroom, kiosk, shops, or evening operations where a noisy generator would be disturbing
- Solar power is virtually free energy once the capital cost has been covered
- Solar panels do not require refueling; they are self-sufficient
- Solar panels are highly reliable and virtually maintenance free, requiring only to be kept free of debris and with some requiring annual changes of water in the deep-cycle batteries; they usually come with an average warranty of 20 years due to the absence of moving parts.
- Solar power provides reliable electricity to power anything that normal electricity supplies are used for, from computers and lighting to air conditioners and refrigerators – indeed, almost anything that requires power to operate.

VIA Solar Computing

VIA Solar Computing is a cutting edge approach to efficient computing devices and clean energy technologies, and constitutes a key element of the VIA Clean Computing Initiative charged with driving environment conscious computing. VIA has pioneered energy efficiency at the silicon, platform and system level; now, through VIA Solar Computing, it is leading the way in developing complete solar powered applications for those ICTs and peripherals.

As a clean, quiet, cost-effective energy source, solar power is among the most appropriate energy sources for the future; practical for a wide range of markets, environments and usage scenarios and naturally complementary to VIA's power efficient computing technologies. The objective is to collaborate with VIA Solar Computing partner Motech to develop complete solar powered systems to enable practical solar computing solutions that can be easily deployed, and thus to address the major requirements for immediate and sustainable power in rural, off-grid communities and urban centers.

As the knowledge of solar photovoltaic technology and its uses is only now gaining worldwide recognition, VIA aims not just to be the first to utilize its true potential to extend access to computing and communications technologies far beyond traditional markets, but to foster the effective growth and development of solar and other viable power options for the future.



Solar and Computing

VIA selected photovoltaic solar power for a variety of reasons. First, it is proven, sustainable, low maintenance, cost effective, reliable and flexible power. It is a source of power that is rapidly gaining both respect and popularity worldwide due to its numerous versatile applications.

The economics of solar power are increasingly attractive, especially for emerging market applications; worldwide production of solar cells has increased rapidly over the last few years, with 2004 noting growth of 60% and production still on the increase. The resulting economies of scale, combined with the development of more efficient photovoltaic technologies, has reduced the average retail cost of a solar panel from US\$27 to US\$4 per watt between 1982 and 2005. And as R&D, production and popularity continue to expand, costs will continue to decline.

At the same time, local and national governments are starting to recognize the national and international benefits of solar power; with many jurisdictions now offering tax and rebate incentives to promote solar power in their communities, regions and nations. Traditional sources of power, such as oil, gas, coal, hydro and nuclear, are not sustainable, are environmentally damaging and are not always available, especially in rural communities or areas with harsh geographical and weather conditions. They can also be costly options for communities with such access. As a result, many traditional energy companies now have solar R&D and manufacturing facilities, while research into new, fast-emerging clean energy technologies is spreading quickly, such as wind, biomass, hydrogen fuel cell and geothermal energy as well as solar.



At a time in history where technology and societies change with tremendous speed, VIA Solar Computing is looking forward, realizing that there is a multitude of more promising, cleaner and more responsible energy sources to be utilized. This acknowledgement is a cornerstone of the VIA Solar Computing initiative.

Addressing the Issues

By playing a pioneering role in the realm of solar powered computing, VIA is taking a significant stride forward in addressing the major issues of the global digital divide:

- Appropriate Technology
- Power
- Connectivity
- Sustainability
- Collective efforts between sectors



Appropriate Technology

VIA has developed some of the world's most energy efficient computing devices available. The VIA pc-1 range of computers are powerful but highly efficient, flexible, rugged, remarkably affordable systems that make individual and community access a reality for those previously not able to access such technology.

Power

Photovoltaic solar, wind, biomass, hydrogen fuel cell and geothermal are all options being explored by VIA as viable, reliable, cost effective, accessible and responsible power options.

Connectivity

With respect to connectivity, VIA makes highly efficient and affordable devices to foster last mile solutions such as wireless mesh networks that are more suited for emerging markets and avoid the expense of laying extensive cable to remote areas.

Sustainability

On-the-ground training is incorporated into the projects, which not only provides practical training of the computing and Internet access devices, but also takes into consideration the need to promote small and medium sized business opportunities for the recipients of such devices; thereby enabling an infrastructure to develop an element of independence.

Collective Efforts between Sectors

To help all efforts move forward as effectively as possible, attention is being paid to improving working partnerships and information sharing with other sectors. For example, each sector, whether public, private, civil society, academic or international organization, has a collection of attributes that are beneficial to the bridging of the digital divide. By working closer together, we can formulate the tools to maximize the individual strengths of each sector.



VIA Solar Computing Partner: Motech

For over 25 years, Motech Industries, Inc. (Motech) has been creating high quality products, from testing and measuring instruments to solar cells. Motech has now become one of the top 10 producers of solar cells and maintains a well known and respected reputation for creating some of the most user friendly and durable instruments.



The combination of VIA's ultra efficient computers with Motech's expertise and extensive experience in innovative solar devices has proven to be a solid and productive collaboration, out of which a synergy has developed built on mutually shared perspectives on and approach to bringing clean and sustainable technologies to both developed and developing nations.

The Motech range of solar devices includes rugged, portable, self-contained photovoltaic suitcases from 12 watt to 75 watt capacities, which includes all the elements needed for use with ICTs in the most remote locations; there is also a wide array of small to full-sized solar panels, controllers, inverters, cables, framing and specialized batteries to provide power to anything ranging from a single PC to a personal workshop or office space, and all the way up to monolithic high-rise urban structures.

With the necessity and popularity of efficient ICTs and quality alternative power options growing daily we will be working together to foster new technologies, approaches and concepts towards improving the overall use, reliability, and sustainability of such technologies. Within this research initiative we have a mutually dedicated team of engineers and specialists known as the Modern Communications and Power Think Tank (MCP). This group was specially selected to nurture such research and developments based upon their specific skill sets and experience.

Samoa as a Showcase for Emerging Markets

Emerging markets make natural candidates for solar power, as an efficient, cost effective way of bringing ICT access to rural and remote communities, which is also one of the principal objectives of the VIA pc-1 Initiative aimed at enabling the next one billion users; hence the first solar deployment was designated a VIA pc-1 IT center for the South Pacific. Largely overlooked by global ICT deployment initiatives, the South Pacific is only now starting to build the infrastructure necessary to raise the region's e-readiness.

The remote Samoan village of Ulutogia, Aleipata District was selected for the first solar powered information community center due to its breadth of community, ranging from young to old, the lack of formalized education, health and governance facilities, and many eager and helpful citizens who wished to fully participate from the onset of the project. And, like most of the South Pacific, it has an abundance of sunshine, making solar the logical source of power.



Amongst a sea of smiling faces, young and old, VIA opened the first solar powered Information Community Centre in the South Pacific in late August. The project was developed and carried out in tandem with the Samoan ICT Secretariat, and the community centre is accessible to all in the locality.



Helping to address issues of e-Education, e-Health and e-Governance, as well as provide the infrastructure for localized business opportunities for the recipient and surrounding communities; the initiative will be working with major international organizations and governments in the future to build an infrastructure network to help people all over the world achieve such goals, and ultimately truly bridge the digital divide.

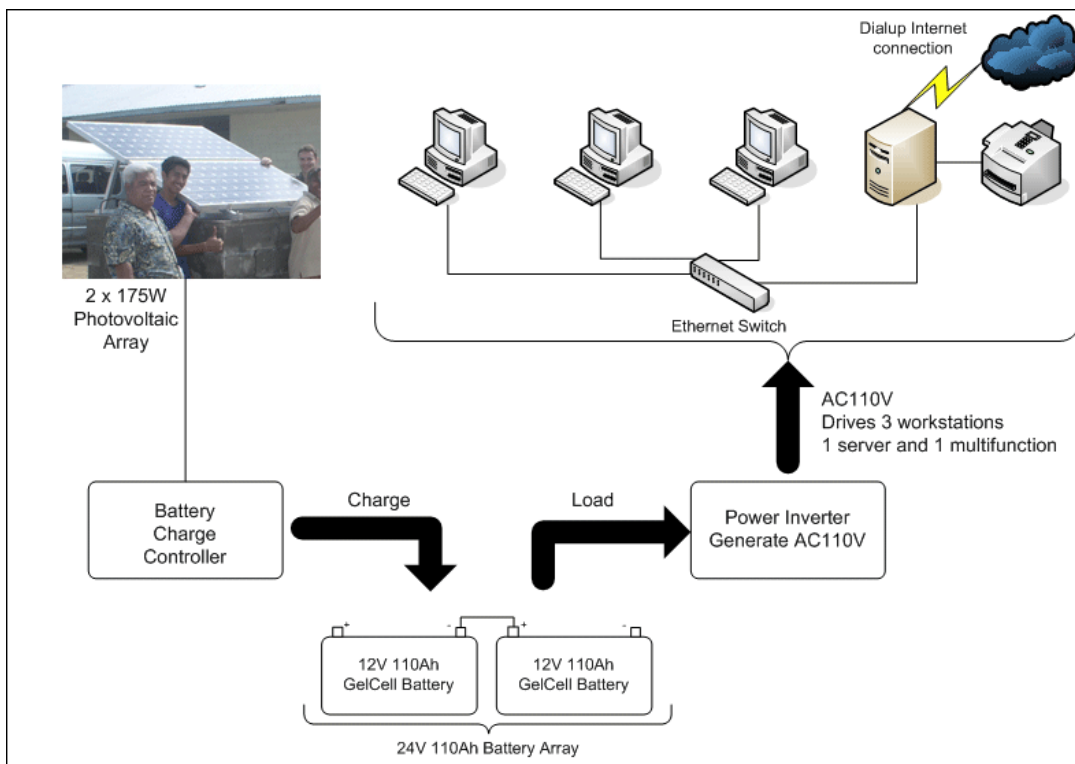
The solar powered VIA pc-1 Information Community Center was fully deployed on time and within budget, and was well received both by the local community and by delegates at the international PaciNet conference taking place in Samoa at that time. The success of the project, and the proof of concept it represents in acting as a blueprint for similar simple, cost effective installations in remote and rural regions around the world, were extensively discussed at the conference, which sought to identify the key technologies that will extend global ICT access in the 21st century.



The VIA pc-1 Information Community Center Configuration

The VIA pc-1 Information Community Center involved the installation of VIA pc-1 systems along with a complete solar panel system from Motech. The solar system consists of two 175 watt photovoltaic panels, an aluminum frame, wiring, charge controller, an inverter and two deep-cycle batteries. Deep-cycle batteries are preferred, since they allow for frequent partial charges and draws over an extended period of time compared to shallow-cycle batteries such as starter or car batteries.

The complete solar system provides the power for three VIA Power-Saving PCs featuring the VIA pc1500 platform, complete with 40 GB HDDs, DVD ROMs, 15 inch LCD monitors, keyboards, mice and modems, plus a VIA pc-1 server powered by the VIA pc2500 platform with a 120GB HDD and peripherals, as well as an external fax/scanner/copier/printer.



The above diagram shows the configuration of the solar-powered VIA pc-1 Information Community Center in Samoa; for more details on the solar technologies employed, please refer to the white paper supplied by Bear Systems International Ltd, available for free download from the VIA pc-1 website.

Energy Efficient Computing Technologies

VIA's leading power efficient and cost effective computing technologies lend themselves to effective solar power utilization, enabling an affordable information and computer facility that is fully self-sufficient and not reliant on the traditional power grid. Based on the ultra power efficient VIA pc-1 processor platforms, the flexible VIA pc-1 system platform architecture comprises a blend of stand-alone desktop PCs, PC clients, server appliances and mainboard platforms that can be configured to meet the requirements of a variety of emerging market applications.

VIA pc-1 Power-Saving PC Reference Design

The VIA Power-Saving PC Reference Design is a robust, energy-efficient, full-featured multimedia PC that can provide emerging market households, corporations, schools, and other organizations, as well as Internet cafés and village kiosks, with a highly reliable complete system at prices below \$250.



Combining an energy efficient VIA processor with a fully integrated video processing feature set that includes a 2D/3D graphics engine and ultra efficient VIA DDR memory controller, the VIA Power Saving PC is designed for high quality digital video streaming and digital video playback. The system also facilitates seamless connectivity with the innovative VIA 8X V-Link technology and 10/100 Ethernet to improve bandwidth efficiency and 6-channel surround sound to give a rich audio experience.

The VIA pc-1 Information Community Centre in Samoa features three VIA pc-1 PCs powered by the VIA pc1500™ platform, with 1GHz+ performance, and one VIA pc-1 PC server based on the VIA pc2500™ platform boasting the new 1.5GHz VIA C7®-D processor, the world's first carbon neutral processor. Both types of device were equipped with all the necessary peripherals, including hard disk drive, optical disk drive and monitor, and a full set of connectivity and multimedia features to meet the needs of business, education and leisure users in Samoa.

VIA pc-1 Processor Platforms

At the heart of the VIA pc-1 System Platform Architecture are the VIA pc-1 processor platforms, featuring VIA's power efficient processors and digital media IGP chipsets for smooth performance yet with low heat production and effective heat dissipation. These technologies have been optimized to meet the specific needs of emerging markets:

- **Energy Efficient:** Industry-leading low power consumption and effective heat dissipation.
- **Rich Digital Media Performance:** Advanced 2D/3D graphics, hardware video processing and multi-channel audio enable a rich entertainment experience.
- **Software Compatibility:** The native x86 instruction set ensures full compatibility with Microsoft Windows and Linux operating systems and applications, as well as local language software.



- **Seamless Connectivity:** Advanced features for fixed and wireless broadband Ethernet networking (with a Wi-Fi card as required) and enhanced connectivity for peripherals such as digital cameras. Optional TV-Out support allows output to a TV set.
- **Durable and Scalable:** Proven reliability and inherent flexibility provides scope for much broader deployment.

VIA pc-1 Platforms: The Power Advantage

The distinct power advantage of VIA pc-1 processors can be seen in this power performance comparison between a VIA pc-1 platform: the VIA pc2500™ platform mainboard featuring the 1.5GHz VIA C7®-D processor, and a mainboard featuring the 2.8GHz Intel® Celeron® processor, which is targeted at the same segment.



The table shows the power consumption of both platforms during Microsoft® Windows® desktop ready tests; the considerable power savings of the VIA pc2500 platform is clear, with corresponding real dollar savings in operating costs.

Measurement Part	Watts	
	VIA pc2500 mainboard	Intel Celeron 2.8GHz based mainboard
Mainboard	13.58W	35.58W
Hard drive & Optical drive	6.58W	6.43W
Total Power Consumption	20.16W	42.01W

With this power advantage, not only does it significantly save running costs when powered by the standard mains electricity, it makes the use of clean energy sources like solar power all the more effective, with VIA pc-1 systems able to run for longer (or run more of them) on alternative energy supplies than competing systems. For the VIA pc-1 Initiative, as well as for VIA Solar Computing, this is a critical factor.

Conclusion

The importance of effectively and genuinely addressing the needs of sustainable development exist in people working together to share ideas and foster ways that truly consider the value of the world in which we are all apart. All sectors, whether public, private, civil, international or academic have truly definable qualities and characteristics that can best be tapped by working in partnership with others, ultimately maximizing one another's skill set.

VIA Solar Computing, as part of the VIA Clean Computing Initiative, is aimed at leading the way as a matter of necessity, realizing that through such efforts we all benefit. By providing new, ultra efficient, non-polluting computing technologies and clean, flexible sources of power we can build a global network of Community Information Centers that can be accessed by all and effectively replicated virtually anywhere in the world.

VIA understands that successfully bridging the digital divide requires a broad range of issues to be effectively addressed. The issues are known; their importance appreciated. Now it is time to put the wheels in motion. Providing appropriate, responsible, accessible technologies and power; enabling universal, affordable, unrestricted connectivity; integrating sustainability through shared knowledge, maintenance and income; and building partnerships where they traditionally did not exist, are all fundamental parts of the equation in making an empowered future for all a right and not a privilege.

VIA and Motech are not just developing the appropriate technology, but integrating into practice and sharing their knowledge and hard work with others. Solar power has proven its quality, applicability and remarkable potential over the years. The global community is just now starting to realize the breadth of its applications. VIA recognizes this value and is now working to nurture clean, sustainable ways to bring information and communication technologies and power sources that equally value and respect this vision and provide us all with a brighter tomorrow.



Prime Minister Tuilaepa Soliai
Saiile Malielegaoi with Scott
Phipps, VIA pc-1 International
Relations Manager

*"For our next 10 telecenters, I want
VIA solar powered computers,
monitors, and so on. I want anything*

For more information please visit www.viipc-1.com, with links to an article, the technical white paper referred to on page 9 of this paper, blog entries, photos and more on the Solar Powered VIA pc-1 Information Community Centre in Samoa.