

BE YOUR OWN POWER COMPANY

Selling and Generating Electricity
from Home and Small-Scale Systems

PHOTOVOLTAICS • WIND POWER
HYDROPOWER • COGENERATION

by David Morris
Illustrations by Frank Rohrbach



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CONTENTS

Acknowledgments	v
Introduction	vi
Chapter 1 The Electric Revolution	1
Edison and the Rise of the Modern Utility	3
The New Deal Electrifies the Nation	14
The Pendulum Swings Back: Decentralized Power	23
Chapter 2 How the Electric System Works	35
The Modern Steam Plant	41
Case Study: Boston Edison	54
System Reliability	61
Utility Planning	63
Chapter 3 PURPA	70
Qualifying for PURPA	76
Utility Avoided Cost Data	79
Purchase Prices and Avoided Costs: A Brief History	84
Avoided Capacity Costs	96
As Available Capacity Credits	102
Excess Capacity	115
When Utility Purchases Are Not Required	119
All-Requirements Utilities and Wheeling	121
Wheeling	125
Chapter 4 Interconnecting with the Grid	128
Protecting the Worker, the Customer and the Network	131
Generators, Inverters, Self-Excitation and Power Factors	141
Chapter 5 Getting the Best Deal	153
The Regulatory Process	154
The Negotiation Process	157
Force Majeure and Interruption of Power	173
Interconnection Requirements	178
Paying Interconnection Costs	183

Chapter 6	Electric Generation Technologies	185
	Wind Power	188
	Hydropower	204
	Photovoltaics	218
	Cogeneration	226
Chapter 7	Economics	235
	A Simplified Guide to Energy Economics	237
	Opportunity Costs	239
	Case Study: Wind Power	243
	Hydropower	253
	Cogenerators	254
	Photovoltaics	256
Appendix 1	PURPA Sections 201 and 210	259
Appendix 2	Federal Energy Regulatory Commission Regulations Implementing PURPA Sections 201 and 210	265
Appendix 3	Electricity Generated by Oil	284
Appendix 4	Twenty-Five Most Expensive and Twenty-Five Least Expensive Service Territories	286
Appendix 5	Cost-of-Service Data for Selected Utilities	288
Appendix 6	Source List: Equipment and Publications	291
	Cogeneration Equipment	291
	Hydro Equipment	291
	Photovoltaic Modules and Arrays	292
	Utility Interface Hardware	293
	Wind-Driven Generators	294
	Publications	297
Appendix 7	States' Cogeneration Rate-Setting under PURPA	298
Notes		306
Bibliography		311
Index		320

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Of course, any errors or murkiness in this book are my sole responsibility. I hope the reader finds it a useful introduction to the new era.

INTRODUCTION

Electricity is no longer a luxury. It is essential to our well-being. A residence cut off from electricity in 1900 suffered the minor inconvenience of living by candlelight. Today cutting off one's electricity can be tantamount to murder. Witness the deaths of Dallas residents from lack of air conditioning during a recent heat wave or the deaths of Buffalo residents from lack of heat during a recent cold spell. We design for electricity and therefore are dependent on it even when it doesn't represent the primary supply source. For example, gas and oil furnaces are spurred into action by tiny amounts of electricity.

We are an electric society. Our news and entertainment come via electric-powered conduits. Our products are increasingly produced by electricity. Electricity is the foundation of our future computer and robotic society. Today almost one-third of all our primary energy (fossil fuels and uranium) is used to generate electricity.

Unfortunately we have almost no direct control over our electric system. Can you imagine depending solely on one company for your food supply, with no chance to grow your own or buy it from anyone else? Unthinkable. Yet until recently our access to electricity was limited in just this way.

In the early part of this century, utilities received the exclusive privilege of producing and selling electric power. Since then they have jealously guarded that prerogative, often disregarding certain responsibilities inherent in that privilege. While failing to meet the energy needs of rural America, the utilities vigorously opposed efforts to do so by such entities as the Tennessee Valley Authority (TVA) and Rural Electric Cooperatives (REC). It is a matter of record that an act of Congress, not private enterprise, finally brought low-cost and reliable electric power to American farms.

In this same period, when urban dwellers tried collectively to own their own electric systems, the utility response was equally negative. A national campaign that was unwittingly funded by utility customers smeared the municipal utility movement as communist-inspired. Bills

were introduced in state legislatures to make municipal ownership illegal.

When cities were successful in their efforts, they soon found that while ownership of the distribution lines increased their leverage, it wasn't enough. The larger utilities still controlled the power plants and manipulated prices at will. If a city-owned utility tried to get a better price from another producer, the investor-owned utility invariably refused permission to transmit the cheaper electricity over its lines. And woe be it to any individual or enterprise that wanted to produce power independently. Utilities cut them off or charged them exorbitant prices for back-up power.

The vigor with which utilities protect their monopoly hasn't waned, but the environment within which they try to wield that power has indeed changed — dramatically. Technological developments and changes in the cost of conventional electric generation in the 1970s laid the foundation for a profound transformation of the electric generation system. The winds of change are blowing through the utility structure.

Today conservation is cheaper than production. Every time the utility raises its prices, its customers reduce their demand. Almost half a trillion dollars in projected power plants have been canceled in the last ten years. With aggressive conservation investments, utilities may well never need to build another large central power plant.

We can never conserve to the point where we use no electricity. New power plants will be necessary to replace old ones. But we would be better off building thousands, even millions, of small power plants. The rising costs of conventional power plants and an increasing maturity of renewable-based power plants and small cogeneration systems make this approach economically feasible. Evidence exists that many small plants rather than a single mammoth facility can increase the whole system's overall reliability. We are in a time of much change, when we cannot accurately predict future events. Having a great variety of small power plants that can be quickly brought on-line gives us a greater degree of flexibility and responsiveness to external changes such as in energy demand and pricing.

The economic attractiveness of decentralization is becoming ever more apparent. Yet to emphasize only the economic value of decentralization would be a mistake. The political and psychological value of a widely distributed capacity to produce a commodity as essential as electricity is equally important. Self-reliance was a major objective of the nation's founders. Benjamin Franklin once remarked, "The man who trades independence for security usually deserves to end up with

neither." In the beginning of this century we voluntarily relinquished control over electric production in return for a lower cost and more reliable supply from utilities. Today that decision has brought us not only dependence, but insecurity as well.

In 1978 in an act of unprecedented political foresight, the U.S. Congress gave the American people the opportunity to reconstruct our electrical system with an emphasis on local self-reliance. The Public Utility Regulatory Policies Act (PURPA) abolished the monopoly utilities have over electric generation. It forced utilities to purchase electricity from independent power producers at a fair price.

That act presented the opportunity to decentralize control over electric generation. It did not make such decentralization inevitable. Congress did not enact PURPA out of a desire to promote small power plants. PURPA was designed to minimize the use of oil in electric generation by encouraging high-efficiency power production and the use of renewable fuels. Congress encouraged the growth of independent power producers only because it had become convinced that utilities would not promote the new technologies rapidly enough. However, small-scale systems and self-reliance were not objectives recognized by Congress.

PURPA makes possible a self-reliant future but does not ensure one. For instance, one of the incentives PURPA offers the independent producer is exemption from state and federal utility regulations. That incentive presents a danger as well as an opportunity for those desiring more control over the electric system. Currently the vast majority of investment in PURPA-sponsored power plants is for relatively large facilities owned by major corporations. Conceivably by 1995 we could be just as dependent on outside institutions for our electricity but the producers will not be regulated at all.

PURPA abolishes the monopoly utilities have over electric power production, although their monopoly over the distribution systems continues. PURPA doesn't allow independent producers to send electricity along the utility lines to another buyer. When that next step is taken and utilities are required to transmit electricity from one producer to another buyer, the grid system will become a gigantic marketplace. The price will be established through the actions of hundreds of thousands of buyers and sellers of electricity.

To transform the grid system into a marketplace and to add the ethical considerations of small-scale systems and self-reliance to PURPA requires a strong political movement. Such a movement is quite possible. Each household power plant produces very little electricity. But each household contains two voters. A hundred thousand such plants may generate less electricity than one central power plant.

But they represent an extremely powerful political constituency if organized, a constituency to demand the best price from the utility and to become actively involved in restructuring the electric system around the small power producer.

Many of those attracted by the prospect of owning their own power plants have a disdain for politics, preferring to work alone rather than in groups. Others view negotiations as a scientific process. The utility presents its data. The small power producers present their data. And truth emerges.

But the fact is that without collective effort, the small power movement can make little overall impact because it cannot change the rules of the game. The negotiation process is not an objective pursuit of ultimate truth but a bargaining process between two parties with very different objectives and visions of the future.

I remember finishing the chapter of this book titled "Interconnecting with the Grid" while sitting in the magnificent dining room of the Blue Mountain Center, a writer's colony in the heart of the Adirondacks. A typical August downpour was raging outside, the rolling thunder punctuated by jagged bolts of lightning. I was reading a contract between the local utility and the owner of a small wind turbine. Worried that the "dirty" electricity coming from the wind machine would contaminate the grid system, the utility demanded guarantees of purity. Three pages of the contract described the standards for the small producer. One paragraph caught my attention. The wind machine owner had to provide an oscillographic print of the waveform coming from the machine.

That the utility wanted to protect its customers from low-quality electricity was laudable. But the situation in which I found myself reading these lines indicated the utility clearly didn't apply those rules to itself. For three hours lights had flickered and my word processor had gone crazy. An hour before, the system had collapsed. I was reading the contractual provisions on waveform purity by the light of hurricane lamps.

Stories of the double standard are legion. Representatives of one large utility appeared before the California Public Utility Commission in two unrelated cases. In one they were arguing in their capacity as sole seller of electricity for a rate increase. To justify the increase the representatives presented data that showed that the next hydroelectric plant the utility was to build would cost more than 15¢ per kilowatt-hour produced. In the other case, the same utility was arguing (in its capacity as the sole buyer of electricity from small power plants) that they should be paying an independently owned hydroelectric facility owner only 4¢ per kilowatt-hour.

This book is intended as a technical aid to those desiring to enter the power production business through the doors opened by PURPA. It translates jargon, examines the economics of the utility business, discusses legal issues and describes the state of the art for small-scale electric plants. Knowledge is a necessary precondition to entering this business. But—I say again—without a collective effort by all those desiring to regain some control of the electric system, this technical knowledge will prove insufficient.

We are in the throes of a revolution in the way we generate and transmit electricity. The only certain prophecy is change. The electric utility in the year 2000 will be organized differently and play a different role. But as Bertrand Russell once remarked, "Change is one thing. Progress is another. Change is scientific; progress is ethical. Change is indubitable, whereas progress is a matter of controversy." Will we have change or progress? The answer rests in the strength of the grass-roots movement to harness new energy technologies to bring under popular control a resource that is basic to our well-being.