



Above: Risa Buck's home is solared-powered and off of the grid in downtown Ashland, Oregon.

Just Say No!

Risa Buck

© 1995 Risa Buck

I am blessed by being able to live on a small parcel of land that can accommodate an accessory structure addition and the good fortune to have secured a loan to make my dream come true.

Changing Values

Developing the way I wanted to live took a more sustainable direction during my six years in Davis, California, where I lived in a 5-person vegetarian cooperative. Our front and back yards utilized many permaculture concepts: composting, the use of drought-tolerant native plants, diversity in vegetables, flowers, and seed collecting from our organic garden.

But it was my relationships with the people I lived with and those in my community that exposed me to a link I was unaware was missing. I lacked knowledge of the connection of me, the human, to my impact upon my surroundings.

Once upon a time, I believed organic farming was a marketing ploy. It had never occurred to me that the "conventional agricultural industry" was poisoning much more than the food I ate. I had never been exposed to information that enabled me, nor was I on my own able, to connect the dots.

My awakening began with the pleasures and necessity of eating. It then traveled full circle to affect every aspect of living. What I consume, where it comes from, how it was created, what the *costs* are (human, environmental, economical, political, and spiritual), are factors that matter to me. It is not always practical to honor these ideals. Money and time are unfortunately important considerations. No one ever said that the road to conscientious consuming would be easy.

So, all kinds of new, incredible information and understanding has come to me and been integrated over the years. Talking to people, attending the Ecological Farming Conference for some years, volunteering for the Committee for Sustainable Agriculture and the California Action Network, and a little bit of reading helped shape my idea of what a dream home might look like if one took an ecological approach to building a home.

I built my house the way I did because it expresses (in part) the way I want to be in the world. The amount I impact my environment/community matters. Building my house the way I did took my convictions and materialized them into a 3 dimensional form that I can share with others. Taking to heart what I have learned in the last ten years made it impossible for me to build a house any other way.

Obstacles

There were numerous obstacles that were overcome: all the usual financial frustrations most home builders encounter and then there were more.... When I began this project, my greatest asset was enthusiasm. Perseverance saw me through my second tri-semester. And I think endorphins carried me to the finish line at the end of the ninth month when I got my C of O (Certificate of Occupancy).

Part of my point here is that I did not come into this project with an extensive background in carpentry, architecture or technical knowledge about alternative technology. I even lacked a basic understanding of how a conventional home is constructed and operates. Well, those days of blissful ignorance are gone. The more I learned, the more I wanted to do things efficiently and sustainably. Finding reliable resources (in written and human form) presented a major challenge. After some detours and poor choices, I found, with delight, that Southern Oregon has seasoned professionals (see Access at the end of this article).

I knew that there were many homes in Southern Oregon that had incorporated solar power in varying degrees, but the City of Ashland had never officially granted occupancy to a home that chose not to hook up at all to the electrical grid. When I submitted my plans to the City of Ashland, they included a passive solar designed home with photovoltaic modules for electricity, Copper Cricket (solar heat exchanger for hot water), north-facing cinder block wall bermed for mass (keep it cool in summer, retain heat in winter), and a masonry stove. There didn't appear to be any problems with the plans, and a number of people who work for the city were encouraging.

Below: Risa and her dog, Ahlyo, on the roof with the seven PV modules that provide their home with electricity.

A major obstacle loomed when the chief building inspector informed me that the Oregon Building Statutes dictated that I hook up to the city's electrical grid. At one point, I had resigned my ideal and figured I would just do both, hook up to the grid and equip my house with sufficient off-grid capacity. After some more thinking, I insisted that I be provided, in written form (a photocopy), with the building code that dictated mandatory electrical hook-up within city limits. I also asked for the chief building inspector's interpretation of that code. I said that having that information in writing would help me understand and accept his decision.

Time went on ... and I continued to repeat my request. Time was running out.

In the middle of all this, the inspector requested that I provide him a list of the PV equipment I had purchased plus a diagram of how the system would be installed. Much to my dismay, I learned AFTER purchasing all the PV equipment that it ALL must be UL listed (approved by Underwriters Laboratory or other sanctioned testing lab to UL specifications). The only acceptable purchase was my batteries. So, I began the process all over again. OUCH!

The second time around, I made certain I asked every possible question. In retrospect, I see I had made an incorrect assumption. I thought that my regular communication with the city would have revealed any small print that my inexperience would have been unaware of.

WHEW!

Well, I was just about down to the wire (no pun intended), and I got a call from the chief building inspector informing me that my perseverance had paid



off and I would indeed be able to be totally off the grid. A big sigh of relief and a major hooray resounded throughout the Rogue Valley.

The Best Picture

Perhaps living totally off the grid is not practical or feasible for the average household. The ultimate system, it seems, would be to hook up to the grid and have other renewable energy source(s), without batteries and install a two-way meter. When the sun is shining or the wind is blowing, the meter would run backwards and the home would be credited for the renewable energy it produces. When clean renewable energy is not available, the meter would run forward and the home would be billed by the utility as usual.

There are two reasons I did not choose the utility intertied scenario. Number 1: two-way metering is not yet available in my area. Number 2: I felt that getting the city to approve a totally off-the-grid house for the first time would do more for the movement toward clean renewable energy sources. Being off of the grid would stretch the City of Ashland's continuum of acceptance and general awareness in alternative housing and development.

Plans for the Future

A major personal and community hurdle was cleared when the City of Ashland approved my home for occupancy. The coming seasons will be a time to adjust to the technology in place. It is already apparent that my water heating system needs a supplemental source during sunless periods in the weather. This possibility was anticipated and propane is accessible to the water tank. The Myson "tankless hot water heater" will be the likely choice.

Once I get a computer, I may need a small wind generator to keep the batteries charged during low seasonal sun shining times. This site is conducive to generating electricity from the wind, particularly during the winter months. The wind tends to blow when the sun does not shine.

In the not-too-distant future, I hope to install a composting toilet and be able to hear, simultaneously, the applause from the City for my greywater system!

I planted seven fruit trees, plus kiwi, grape and berries, that will, in time, be part of a lush, tasty and sustainable landscape.

In the fall, Tom Ward and I will be organizing a workshop to build a 3,000 gallon ferro-cement tank to collect roof rainwater for irrigation. If you are interested in attending, please call (503) 482-6164 to reserve a spot. I anticipate an ongoing relationship with the City of Ashland to help promote sustainable development,

education on alternative energy, and to develop incentives for people wanting to retrofit existing homes as renters or homeowners and for eco-sensitive new development. I intend to create a slide show and booklet of some sort to equip individuals on "How to Build a Sustainable House in an Urban Setting." If you are aware of any grants or funding to support these projects, please contact me c/o HOME POWER or at my phone number listed above. In the near future, I hope to have an e-mail address.

I look forward to the day when my home blends into a landscape of rooftops functionally decorated with solar panels and wind generators, working together with local utility companies. This has been an incredible process that is possible, IF you can imagine, and then believe, that it could be so.

Risa Buck's RE System Costs

No.	Item Description	Item Cost	%
7	Siemens M55 PV modules	\$2,303	40%
1	Ananda Power Center	\$1,385	24%
1	Trace DR1512 inverter	\$849	15%
6	Used Interstate I-16 batteries	\$700	12%
1	Rack for PV modules	\$200	3%
1	TriMetric meter	\$169	3%
1	DuraPulse battery conditioner	\$169	3%
<i>total</i>		\$5,775	

Other Non-electrical Stuff

Masonry stove	\$6,100	48%
Copper Cricket solar DHW	\$2,600	20%
Battery/Inverter shed	\$2,600	20%
Danby propane frig/freezer	\$1,049	8%
Peerless propane cook stove	\$359	3%
<i>total</i>		\$12,708



Above: Risa's house viewed from the southeast.



Above: the back of the PV array showing the wiring and mounting rack.



Above: the power shed



Above: the inverter and safety stuff



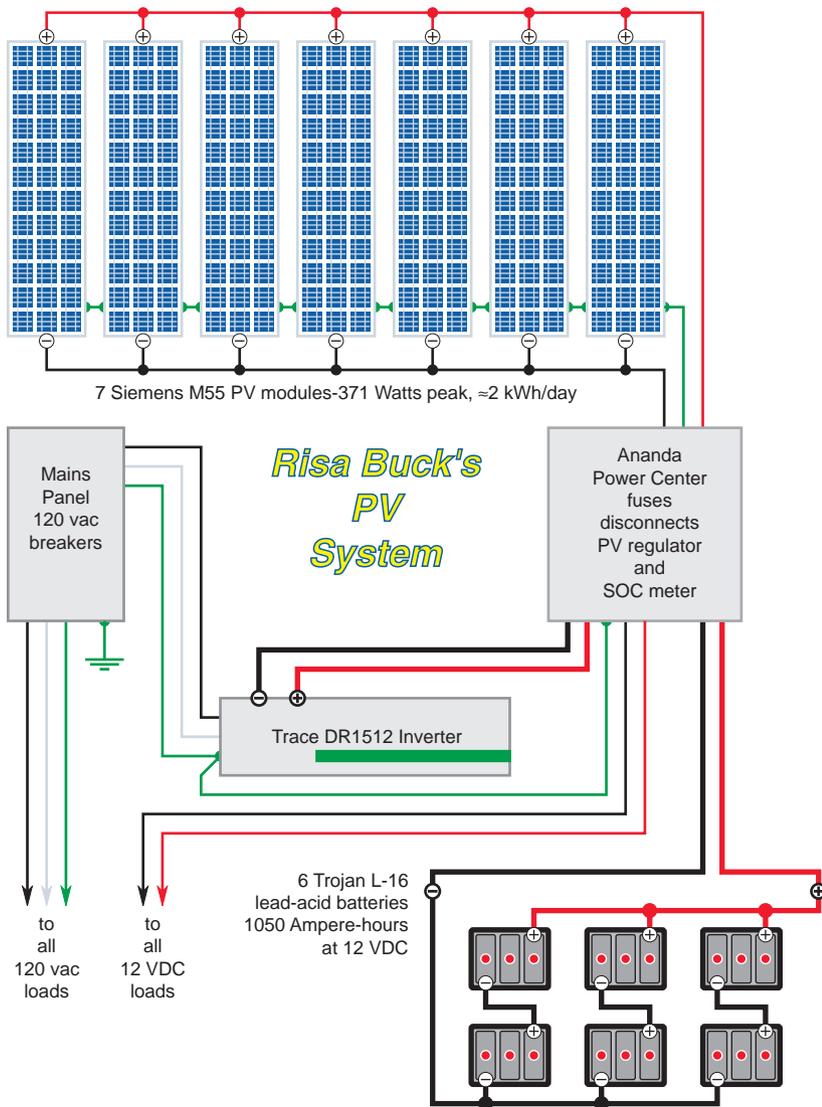
Above: the batteries in tubs



Above: the DuraPulse conditioner



Above: Jerome installed the system



Designing Risa Buck's PV System

Bob Maynard, Energy Outfitters

Risa and I began discussing her new home and power system long after construction had begun. She told me she had already purchased some used equipment, including a Trace 2012 inverter, six L-16 batteries, and an SCI controller and monitor. In addition, solar panels had been purchased via mail order. At this point in the project, no one had done a comprehensive load profile or system design to meet Code requirements. We sat down and went to work!

Risa's load profile showed that the components already acquired weren't too far off from meeting her needs, but due to Electrical Code requirements, UL Listing (or equivalent) was needed on the system components. The older inverter, controller and monitor did not meet this requirement, nor did the new PV modules.

I sized her stand-alone system based on my knowledge of a typical Ashland, Oregon winter. With no backup electrical source, this was a necessity. Risa's efficient lifestyle allowed me to do this without creating an unrealistic (and unaffordable!) system.

After choosing the components required to fulfill Risa's needs, as well as the inspector's, her used equipment was sold; her new PV panels were returned to the mail order source and they exchanged them (with extra cost) for Siemens M-55s.

Fortunately, appliances for the home had not been purchased yet. We chose a 24" pilot-less Peerless Premier LP range and a Danby LP refrigerator with carbon monoxide alarm. This being an airtight, new home, coupled with the fact that gas refrigerators are not vented to the outside, reflects the importance of CO protection. A 12 Volt DC ceiling fan was chosen for its low watt-hour consumption compared to conventional 120 vac fans.

My last concern was the six used batteries. Their history was unknown as to age and previous use (or abuse). We decided to use them, with the knowledge that we might have to re-evaluate them after the system was put into service. Mainline Electric's new pulse device is being used, and to date, the batteries are performing well.

My message to all new, potential users of a renewable energy system is this—before you start buying components, retain the services of a qualified system designer. Check their references, then provide them with quality information so a properly sized and designed system will result.

Installing Risa Buck's System

Jerome Cordeiro, Mainline Electric

The primary concern when wiring to satisfy local electrical inspectors is safety. As an electrical contractor, I find it most amazing that many equipment manufacturers in the solar industry have little concern for system integrity and safety. In the state of Oregon, all electrical equipment must be UL approved or approved by the State electrical inspectors office. There are some exceptions.

Whenever electrical inspectors see exposed wiring, rubber cord, romex, or electrical fittings used improperly or even plumbing fittings used in an electrical installation, they know they should try to be tactful in their explanation, or simply red tag the installation and walk away.

Exposed wiring below eight feet is usually not allowed. It should at least be protected by a wooden barrier, sheetrock, conduit, etc. Rubber cord is only allowed with portable equipment, or temporary installations. If you plan on packing your inverter from building to building or plan on leaving soon, your inspector may insist on permanent wiring. Permanent wiring means conduit or flex over conductors for all exposed wiring. To make conduit wiring possible, inverter manufacturers should always include a termination box as standard equipment. Charge controllers should have a wiring area large enough to connect conduit and be UL approved. Solar panel junction boxes should be large enough to allow at least two 7/8" knock outs for standard 1/2" flex fittings. It is difficult to find a single strand wire able to withstand UV rays and be durable for years. I use #10 XHHW wire, but I would prefer to run the solar panel wiring in inexpensive liquid tight flexible nonmetallic conduit, generically speaking, plastic flex.

For the inspector, I installed plastic flex over the solar panel wires and cut a small hole at the bottom of the flex loops to drain any moisture since I could not install connectors in the junction box. I could not buy a wiring junction box for the Trace inverter, so I had one fabricated. In most installations, I find it best to use a 4" x 4" or 6" x 6" wireway for interconnect wiring. It makes the installation neat and most of all, accessible for future changes. It is also very simple, saving installation time. All conduit runs are short conduit nipples from the equipment straight into the wireway. Large battery cables run easily from the batteries straight to the disconnect, then passes easily to the inverter junction box.

Since the batteries in this installation were used, the voltages varied after being charged. Specific gravity was between 1.200 to 1.245. I installed the DuraPulse unit, and after three weeks all cell voltages were within .1 Volt and the specific gravity returned to 1.270 in all cells.

When installing a system be sure you label all breakers and disconnects. Protect your wire with the proper fuses or circuit breakers. Grounding is important for lightning protection and safety. A good practice is to oversize rather than undersize low voltage wiring and use the proper termination methods because we do not want to loose that expensive PV power.

All the inspectors that I know are pretty decent people. They will remind you that their job is not to teach you how to wire, but they will usually give you good hints if you smile and are nice to them.



Above & below: Risa's kitchen



Above: the earthbermed north wall



Above: the masonry heater.



Above: Risa's living room.



Above: While Ahlyo lives in a solar-powered home, what he really appreciates is chilling out in his very own wading pool.



Above: Risa's bedroom



Above: the hot water tank with solar loop.

The City of Ashland's Point of View

Kelly Madding

City of Ashland Associate Planner

The City of Ashland, Oregon, issues many certificates of occupancy (a statement that all inspections have been completed and the home can be occupied) a year. Yet the certificate of occupancy issued to Risa Buck on March 17, 1995 was cause for celebration. She had accomplished a feat never before performed in Ashland, she had built a house that derived its electricity from the sun, instead of the grid. Her unique house and the sometimes rigorous building permit process was finished.

When she walked through the door with her project we here at the City jumped on a steep learning elevator. The three main points of the learning curve come to mind:

1) We realized that, and this may be a gross generalization considering only one person has accomplished this within the City limits, the people interested in building this way are "hands-on" kind of people. Risa wanted to be there through every step of the process. And as it turned out her tenacity was necessary; necessary when her first electrician did not promote her wishes and she had to step into the process herself and necessary to keep asking the right questions until she got answers. And finally she heard the answer she'd been waiting for "Yes, you can build your house off of the grid." This answer came only after she provided the necessary information to our building department, an interpretation from the State of Oregon Chief Electrical Inspector, and that interpretation was affirmed by the City's Building Official.

It must be noted that building departments are typically very busy and ours is no different. The building department has to balance individual needs with the needs of the many. Permits still need to be reviewed and inspections need to be performed daily. The building department is best suited to approve plans created by licensed professionals. Because it is unlikely that the building departments' load will get lighter, the building official has this advice, "find the licensed professional you are most comfortable with and work closely with them."

2) The City learned that we don't have any information, in a handout format, that we can give to people who are interested in pursuing this path.

3) We learned that this project has had the effect of a small stone being tossed into a pool of water, it has had a rippling effect. The ripples have gone out to the

City's Administration, Conservation, Planning, and Electric Departments. All those connected with the project, except the building department, felt the waves.

And all of those not directly connected to the building department learned some things as well. We learned that our building codes are derived from local, state, and federal law. They require energy equipment to be listed and labeled from an approved testing agency. One of the most common listing agencies for electrical equipment is Underwriter's Laboratory (UL). However there are other approved testing companies and checking with your local building official will let you know who and where they are. Also if the structure you are building is of a residential nature (a house) your equipment needs to be listed and labeled for residential use—commercial use is not acceptable. We learned that the Building Official can interpret codes. For example the codes are written with the assumption that houses connect to the grid yet the code does not specifically say that a home is required to be connected. The Building Official was able to make the determination that the house needed to be electrically designed as if it were going to be connected to the grid. So Risa has electric outlets all over her house prepared to emit electricity from the grid but emitting it from the sun instead.

Again I would like to emphasize that this has been a learning experience for the City. Our goal now is to make sure the next person who walks through the door with the desire to build or retrofit a home using alternative energy will be greeted with a warm handshake and informational handouts. In addition the City is sponsoring a solar workshop on July 29, 1995 from 9:00 am to 12:00 pm in the City Council Chambers. For more information contact Dick Wanderscheid at 503-488-5306. The Conservation Manager has also initiated discussions with the Electric Department to determine the feasibility of allowing reverse metering. The Electric Department is listening which is fabulous considering that the City of Ashland sells electricity to its residents.

Finally, I would like to thank Risa for her tenacity and humor through the City's process. As anyone who has paved the way knows, the road can be initially rocky. Hopefully the next person that walks down this path will have an easier journey. We at the City of Ashland hope to make the road as smooth as possible as we all continue on the alternative energy learning path.

Editorial Comments on Risa Buck's System

Richard Perez

Our coverage of Risa Buck's system is different from any system saga we have ever published in Home Power. Usually system articles are written by a single person—the same person that designed, installed, and uses the RE system. Here we have four different people writing their particular perspectives on Risa's system.

First, Risa herself describes why she decided to go off grid inside the City of Ashland, Oregon. Risa has a dream of how a house should be built and powered. Her home reflects her concern for our planet and everything living on it. She dreamed the dream and then carried it into reality.

Second, Bob Maynard of Energy Outfitters describes the design process involved with Risa's system. He knows the importance of UL listed components in "downtown" systems. If your dream system is going to be given electrical inspection, then be sure that all the components are acceptable to the local building codes before buying them.

Third, Jerome Cordeiro of Mainline Electric stresses installing the proper components in the proper fashion—downtown systems must pass NEC wiring standards. Jerome is an electrical contractor and regularly deals with inspectors. His comments are invaluable for anyone who needs to meet the NEC and have their RE system pass electrical inspection. Be advised different locations interpret the NEC differently. Check the codes in your area before beginning the system's design.

And finally, Kelley Madding describes the learning process involved for the City of Ashland. No one had ever wanted to go off grid in Ashland before. Her comments show that responsive local governments and utilities can peacefully coexist with user-owned, renewable energy systems.

During the last ten years, small scale RE systems have captured the off-of-the-grid market. Few consider using an engine generator as a prime power source anymore. Instead photovoltaics, wind generators, and microhydros provide cost effective electricity from renewable and natural sources. In the particular case of Risa Buck, she said, "No" to the local utility and went off grid. While the unincorporated areas around Ashland, Oregon abound with many off grid RE systems, no one had ever refused Ashland's municipal utility before.

Small scale RE systems are now being installed on grid—the next frontier is utility intertied systems. The hardware used is the same, the intent is the same, but the problems faced are different. Here the problems are legal, sociological, and political. Many small cities, such as Ashland, have municipal utilities. The majority of these small municipal utilities don't actually generate any electricity. Instead they buy power from larger utilities who make it using nonrenewable and polluting energy sources such as coal, natural gas, and nuclear. The same is true of most rural electric coops. These small utilities should welcome independent RE input to their grid. Questions such as NEC compliance, billing rates for the RE power placed on grid, and liability/insurance are paramount.

It's pioneers like Risa, Bob, Jerome, and Kelly who are putting renewable energy in places where it has never been before. Risa's system is a concert played by a quartet of electrical wizards. Four folks, each with their own specialty, working together to make Risa's dream come true.

Access

Risa Buck, c/o Home Power, PO Box 520, Ashland, OR 97520 • or via phone direct at 503-482-6164

I would like to thank the following professionals for their help on my solar home.

Jerome Cordeiro of Mainline Electric (503-770-0220) did the code-approved PV system installation.

Tim & Geoff Dawson of Solar Collection, Inc. (503-535-5364) installed the Copper Cricket solar hot water system.

Dennis De Bey of Ashland Forge (503-482-9568) built the custom PV rack.

Very special thanks to Les Langmeyer (503-482-3512) was my architect and building designer.

Bob & Golda Maynard of Energy Outfitters (1-800-GO-SOLAR) designed the photovoltaic system.

Jamie Paiken of Firestone Masonry (503-482-4379) installed the masonry heater, the foundation, and the cider wall.

Greg Sprague (503-482-8189) was my plumbing contractor.

Joe Tobiasson of Tobiasson Excavation (503-482-7554) did the earth moving for the home's berms and foundation.

Extra special thanks to Scott Vasak of Vasak Construction (503-858-3845 • Pager: 503-858-3845 • 503-865-4318) was my general contractor.

Dick Wandershceid, City of Ashland, • 503-488-5306

Tom Ward, Permaculture Designer & Wildcrafter • 503-488-3198

