Tom Bender: Achieving 'Steady State'

Interview by John Darling of Pilot Rock Magazine, Ashland, Oregon, June 1974.

> *Tom Bender is one of a new generation of energy-generalists who has reeducated himself to working in terms of the Steady State society. An architect, professor at University of Minnesota and now on the staff of Gov. Tom McCall's Office of Energy Planning and Research in Salem, Bender showed up barefoot, wearing levis and dashiki to speak to Bend-in-the-River's environmental group in Medford.*

Darling*: How did we get into the present bind?*

Bender: For the last 100 years or so, we've been able to tap into a great reservoir of freely available energy, fossil fuels, coal, oil, gas. We've been tapping these at an every-increasing rate and evermore easily, gas being the easiest because it is pure energy. This is like finding a wallet It's an exhaustible resource. Use it up and it's gone, but as you come to the end of it, you keep wishing for ways to make the wallet last forever. But you discover you don't have an Aladdin's lamp.

For the next 20 or 30 years, it looks like there will be a steady worsening of the supply of energy. Two reasons: We've taken the easy energies first. Now we have to go offshore to spend $12 million on a well that cost $12,000 in Texas. We have to dig deeper, use lower grade energy; we have to process it more. All this is costing more, which is causing inflation. We have to use more energy to extract energy, so we have less net energy left. This factor has been completely ignored in all estimates of our reserves.

Our reserves are looked at in terms of how much oil is in the ground. Yet oil pools in Texas give only a third of what is there before you have to put more energy back in the ground (steam) to push the rest of the oil up. This tells us that what we have is much less net energy left and also we've been miscalculating how fast we've been using it.

Darling: *Is it true fossil fuels will run out in 30 years (2004)?*

Bender: Fossil fuels will not 'run out.' They will price themselves out of the market. If you can't afford to buy gas for your car, you stop driving. There is also an increasing demand worldwide for fossil fuels. More and more people want to use that form of energy. In fact, we've just passed the point where, for the first time, demand has exceeded supply. So it's a sellers market...It's easier for emerging nations to use fossil fuels because it's there.

Darling*: Don't emerging nations understand their investment will be lost?*

Bender: We are only beginning to understand the relationship between net energy and inflation. Only the oil-producing countries seem to understand the tie-in. Like the Shah of Iran, who said he's only going to produce oil for chemical use...because it's limited and when it runs out, that's it.

Darling: *So, what energy will we run on then?*

Bender: Since the Energy Crisis began, most of our attention has been on what is disappearing and little on what energy supplies are continuous and inexhaustible. This is

partially because our money, which we seem to measure everything in, is only tied to transactions which take place in human society. By this, I mean an awful lot of work is performed by natural systems which don't get accounted for in our dollar currency, yet they do work which we now are paying dollars to have done.

Our agriculture is a net loser of energy by a ration of 20-to-one, because we use up more energy in oil to run farm machinery than we get from food grown on the land. We use oil because it's the cheapest way. There's nothing wrong with that because it has been freely available. In any system, if the energy is there, you have to use it.

Darling: *What energy will replace fossil fuels?*

Bender: It doesn't look like anything will. Almost everything we've been looking to for replacements, whether oil shale, nuclear or whatever, not only has a lower and lower net energy, which means it will bring a great deal of inflation and cost much more, but the time which would be necessary to bring any of these into production on the scale to replace gas and oil means it just can't be done.

Darling: *What does that mean?*

Bender: It means we're going to have to cut back considerably in our use of energy over the next 20 or 30 years. The long-term picture may be different. If we find a way to store nuclear wastes for 250,000 years, if we can develop fusion power, if we come across a cheap, inexhaustible energy source, it doesn't change the picture at all. It just postpones for 50 years the day we have to cut back.

Darling: *In other words, we can't make the transition in time?*

Bender: No, I'm saying that even if we have an endless energy source, we're still going to have to level off in our use of energy and go into a Steady State. We're going to have to stop growing. Our society uses energy at the rate of 10 percent of net photosynthesis on the planet right now. So, if we continue growing for 30 to 50 more years, the extreme result could be that we boil away the surface of the planet. We are coming up against the bio-physical constraints of the planet to absorb the heat produced by our use of energy. A number of things, air, water, space, are coming to exhaustion at the same time. It's basically this - we live in a finite, material system and you can't grow forever in that kind of system.

Darling: *What immediate consequences can we expect to see in the next, say, 20 years?*

Bender: The more successful we are at maintaining our energy supply, the more rapidly we will cause our economic and social imbalances. The decreasing net energy (that is, the increasing cost of obtaining energy) is the principal cause of the present inflation. More and more of the dollar you use to buy bread with is going to pay the energy industry to produce the energy - and less is left to buy the bread with. Goods are getting less energy and energy is getting more. There are political price tags on our feeling that we have to have oil. Our recent agreement to give Egypt and Israel nuclear power technology I think can only be interpreted as giving them nuclear weaponry.

Egypt has a surplus of electricity from the Aswan Dam and there is lots of oil on the Sinai Peninsula and in the hands of Arab allies. With the present American nuclear technology, I

don't know why anyone would want one of our reactors, other than the potential for weapons-grade Plutonium. We're also given them missile-delivery systems. This spells only one thing: we agreed to give them nuclear armaments in trade for restoring the flow of oil. The President's (Nixon) Project Independence, I think almost everyone is admitting is the completely backward approach to our energy picture. If we do as he proposes and develop our domestic energy sources and become energy-independent of other countries, we will exhaust our reserves much more rapidly. We will be energy-independent by 1980 and be 100 percent dependent -- energy, militarily, economically -- on whomever continues to have energy reserves in 1980.

Darling: *Why?*

Bender: We will use up everything we have in the ground.

Darling*: Doesn't this mean catastrophe?*

Bender: Basically, in the past we have found the most successful strategy is using up energy to outcompete other countries, to make available great amounts of material goods for our population and do all sorts of things. We know this isn't going to continue to be possible. We have to go to Steady State.

Darling: *Through crisis or planning?*

Bender: If things are allowed to take the natural course, we will cut back our use of energy. We see this happening now the way it will happen in the future, through the increase of prices. The problem is, left to happen naturally, this doesn't give us time we need to do several things, 1) learn to operate on low energy budgets, 2) develop and get operating solar energy, mass transit, 3) circumvent inherent changes of this magnitude. If this is left to happen naturally, it will hit people on low and fixed income hardest and this will happen at exactly the time when revenue of states and federal government will be decreasing and they will be unable to support welfare during transition.

What appears to be the best way of handling this is a tax on all energy and raw materials at the point of extraction. This gives us a way, through our normal economic mechanisms, of raising the price, thereby reducing consumption of energy. Revenue gained would go to support those on low and fixed incomes.

Darling*: If we were able to make a switch soon to some form of natural energy, would not this cause growth of the sort that would push us up against our limits?*

Bender: Not at all. In fact the probability is that these natural systems would support only a fraction of the present world population.

Darling: *Then do you think we will be on natural systems in, say, 50 years?*

Bender: This depends on whether something like fusion comes in. If we do find some resources which can increase our energy budget, we will be able to support more people. Since this is unlikely, available energy (solar) is best maximized through plant materials, which have evolved over millions of years to do just that -- convert solar energy into biological structures and their mechanical energy. Agriculture, in other words.

So you could almost say that the population a planet can support under non-oil fed agriculture is its carrying capacity as a natural system. And Howard Odum (Environmental Engineering professor, University of Florida) estimates this at about 1 percent of the present world population.

Darling: *One percent of us is all that can be supported through natural, non-nuclear energy?*

Bender: Right. There's a possibility of this being raised to 10,20, 30 percent. We don't know because we don't know what sort of redistribution we can make in resources, canals to bring water, etc.

Darling: *Is fusion the only alternative to this?*

Bender: I don't see any alternative to moving from a growth state to a Steady State system. Fusion would let us take off and grow again. We are already up against the planet's constraints in terms of materials, space, ability to radiate heat, etc.

Darling*: Just how close are we to the absolute limit?*

Bender: That's hard to say. The ore supplies of phosphorus, which is mined to make phosphate inorganic fertilizer, are said to be near exhaustion and that on a Steady State carrying capacity, I think they said we could support 2 billion. We have almost 4 now...Of course we have incredible amounts of human, animal and vegetable wastes, which can be returned to the soil.

Darling*: Are the leaders of our government and society coming to understand the necessity of a cooperative Steady State?*

Bender: They are only beginning to understand the problem, just as all of us. We just realized the relationship between inflation and energy in the first part of this year. It's only now beginning to get out to people, but it's traveling like wildfire. Maybe it's not so dramatic as I tell it because it's only recently that our energy growth has become so extraordinary. If we cut back our energy use by one-third, it takes us back to four years ago.

Japan today uses one-third of the energy per capita that we do, yet their quality of life is about equal to ours. As a blanket figure, we could reduce our energy use in almost every sector of our life by about 40 percent and not have to make any major changes in systems. There's that much inefficiency.

Darling*: I assume such steps will soon become law?*

Bender: Well, the problem with dealing with things piecemeal, saying 'thou shalt not drive a car' is that it builds incredible rigidity into the system. We found the energy tax idea would probably get around all that.

Darling: *Where are these inefficiencies?*

Bender: Transportation is 25 percent of our energy budget. The car is very inefficient, the plane much worse. The simple cost of a fare will cut it back. Here again, the energy

extraction tax will work to price inefficient energy sources out of the market. It also encourages you to use the lowest quality energy available. We can maintain our present farm production with half the energy now used, with only a very small increase in the amount of human labor put into it. You use manure instead of phosphates or even more efficient is green manure - that's growing clover or legumes between rows in August and plowing them under next spring. Hand application of pesticides takes 1 or 2 percent of the energy needed to spray by plane or tractor.

An awful lot of our industrial production goes for things we have absolutely no need for: luxuries, gadgets, toys, things which are poorly made and fall apart. You can go to what I consider a higher quality of life while using less energy, for example, Chinese cooking is a full step more efficient than ours. Western food is built on meat, which requires 10 to 20 times as much agricultural production per unit of protein as does vegetable protein. The Chinese use much less meat and in far richer combinations of sauces and dishes. It's also chopped up smaller so it cooks quickly and efficiently.

Darling: *What changes in the individual's lifestyle do you see?*

Bender: All society's activities will be on a much smaller scale. The ability to organize things on a large scale, whether industry, government, tourism, is only possible when you have a great deal of energy.

Darling: *This means reversion to the community as the basic unit of society?*

Bender: Yes. Community controlled and much less formalized - welfare, care for the aged in the home of the family, cooperative agriculture, locally grown and distributed food, rather than Safeway supplying the whole country. We can look for people to live at or near their work, like the live-over store. Commuting has meant duplication of heating, buildings, police and fire protection, freeways, all of which is possible only if you are very energy-rich.

Darling: *How will all this be made to work?*

Bender: People may do a lot of their work at home, going to the office one or two days a week. More small shops. More hand crafts. More creative, more individualistic, more durable goods.

Darling*: Is the cobbler more energy-efficient than the shoe factory?*

Bender: Large-scale industry *looks* efficient because it internalizes all the efficiencies for the sake of finding the market and maximizing prices. But it also *externalizes* the *in*efficiencies, passing on to someone else the pollution costs, commuting costs of employees. It will become much more competitive to do things locally.

Darling*: You have given many catastrophic statistics, yet you don't speak of catastrophe. Why?*

Bender: Actually, we are very excited. There are a great many fine and attractive cultures all over the world which have had no access to fossil fuels. It's not necessary to a quality life. There is growing evidence that fossil fuels even make a quality life harder to attain. Ironically, it looks like the whole environmental movement will become unnecessary

in the near future because we physically won't have the energy to screw up the environment.

Darling*: So, we won't be allowed to be that bad? Nature did give us a self-correcting planet?*

Bender: Yeah. A field of weeds is a Growth System. The organism which gets there first, grows the quickest and out-competes the rest, wins. The rest die. This is what happened to the American Indian and everyone else we outcompeted. But intrinsically, a Steady State system, like the redwood forest, I think feels better. We've all grown up in a Growth System and have no idea what a Steady State feels like. Most of our evolution, however, has been in a Steady State and our organism is set up for it; this growth spirit has been a real stress on us. Living in a Steady State is dramatically different. Cooperation is the word. Mutual support, like the bee fertilizing the plant in exchange for pollen. *Inter*dependence.

Darling*: Am I wrong or does this mean the arrival of peace on earth, where war takes too much energy to wage?*

Bender: That's a good possibility. Our capacity to make war is cut drastically. In World War II, we controlled two-thirds of the world's energy. In the Korean War, we had 50 percent. As this balance shifts, it becomes less possible to maintain an army a long distance away, for any country. ~

Now, almost four decades later, Tom Bender is an architect, author and economist in Nehalem, Oregon and has been a formative leader in the nation's shift to "green" and sustainable architecture. It's remarkable how much we knew back in 1974 and how true most of it has become -- even down to the "live over" store, working at home, local production and the impact of red meat. Although Bender mentions the heat generated by human activity, global warming as such was not yet on the screen. Humanity has largely resisted the need to shift to lower energy use, but the decline of cheap fossil fuel supplies has led to vastly higher prices. The announcement of "peak oil" did indeed come about 30 years out, as Bender predicted.

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