

# **ENERGY AND THE TAX BASE; IMPLICATIONS FOR SOLAR POWER**

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## **Abstract**

The aim of this paper is to demonstrate that in implementing a changeover within society to the wider use of solar power, the tax system must also be addressed. In fact until the tax system is addressed, a change to renewable energy sources is unlikely within the next fifty years.

To demonstrate this, I shall first outline some examples to show that taxes do substantially affect behaviour, though in often unseen ways. Then I shall examine the business cycle, in particular long term cycles, showing the relevance the long term cycle has to solar power over the next decade. A critical time in the cycle is coming for solar power.

## **PAPER**

### **Introduction and background information**

The SRD Group has been studying municipal taxation for about five years. Most local governments around the world derive their revenue from property taxation. In particular, councils can either tax buildings or rate land. The difference is important.

At the local government level, this difference is in fact what makes Melbourne a unique city to study. It is the only city in the world that uses two different rating structures, side by side, to finance local government. One system rates land,(site value), the other taxes buildings, (NAV/CIV). Also, there have been times when a council has changed from one method to the other, and from one year to the next. This has enabled extensive research to be undertaken, to determine the economic impact, if any, on the economy, and the change, if any, in ratepayer behaviour. Three examples are given to show the significance for solar power.

### **Examples to demonstrate how taxes affect behaviour.**

Example one, Buninyong, 1972.

Buninyong at the time was a rural shire, adjoining the City of Ballarat, 120 kms north west of Melbourne. Buninyong was famous in the past as a rich gold mining centre but its fortunes declined when the mines were worked out. By 1972 the dominant land use was agriculture and grazing. In 1972, after a poll of ratepayers was carried, the rating basis was changed from net annual value (taxing buildings), to site value (rating land). The result of the change was an immediate, continuing and most substantial upsurge in new dwelling

construction and other new building activity. In addition to this, it was noted also that after the change, houses of significantly greater value had been built. (Figures 1 and 2.)

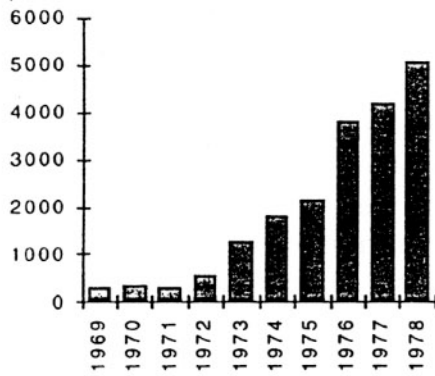


Fig. 1  
Buninyong shire building permits, by value \$000's.

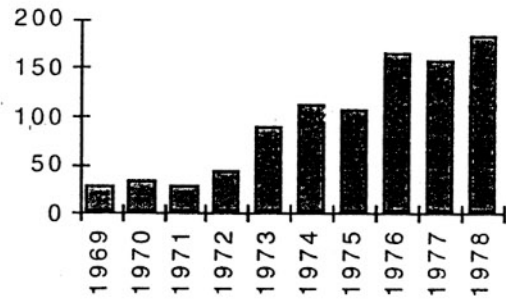


Fig. 2  
Buninyong shire number of dwelling approvals.

Example two, Buninyong and Ballarat district.

To discern whether the substantial upsurge in building activity, and the change in the rating system could be more closely linked, further examination was made. In the mid 1970's, it had been widely publicised that the increasing prices of land blocks was driving young home buyers to outer Melbourne, or more often, to country areas. It was to be expected then, that country shires, close to Melbourne would show the sort of increase in building activity seen above. In these areas land price had remained relatively low and newcomers were finding it economic to buy and build on sites in these previously predominantly agricultural regions. Ballarat was one such region. (The whole region was exhibiting growth at this time, Buninyong's being strongest.)

The Group compared therefore, building activity of the five adjoining areas of Ballarat, these being the shires of Ballarat, Bungaree, Grenville, Sebastopol and the city of Ballarat itself. Buninyong was the only shire of the six then not taxing buildings. In 1977, building activity, as measured by building approvals, turned down within the Ballarat region, as it did in most other regions within the state in accord with general business conditions of the industry at the time. Buninyong and Grenville shires only, sustained their building activity. (Figures 3 and 4.)

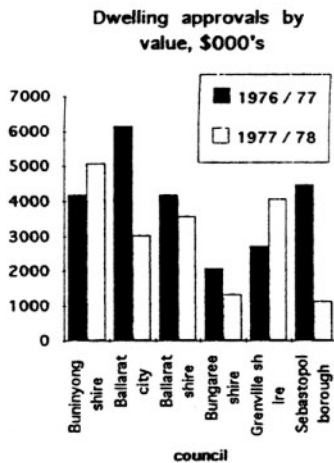


Fig. 3  
Ballarat region dwelling approvals, by value \$000's.

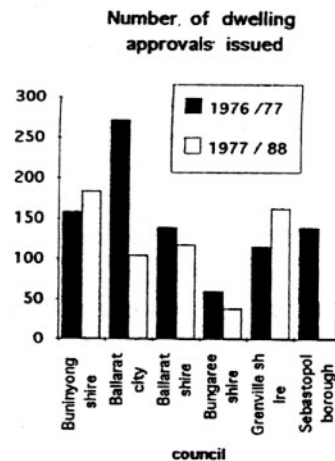


Fig. 4  
Ballarat region, number of dwelling approvals.

Whilst this study on its own is not conclusive in determining that municipal taxation has an economic impact, the Group has done enough other work to be totally confident in stating that the method of municipal rating, ie taxing buildings or rating land, does change the behaviour of property owners. A third example is included to back up this claim

Figure 5 is extracted from page 2 of the Australian Bureau of Statistics (ABS) publication number 8203.2, Manufacturing Establishments; small area statistics, Victoria, released 15th October 1986.

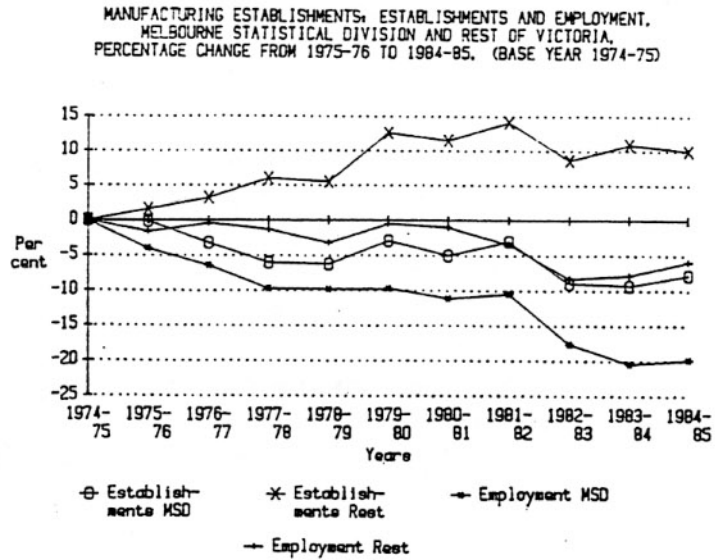


Fig. 5 ABS chart, as shown

The ABS chart, figure 5, reveals that manufacturing in Melbourne declined steadily over the ten years 1974 to 1984, averaging 9%. The SRD Group, to show the effect of different rating systems, if any, broke down further this chart, by plotting separately, for the Melbourne Statistical Division, the same ABS data for site rated, as against CIV taxed municipalities. The Melbourne Statistical Division accounts for over 80% (ABS figure) of total Victorian industrial activity, so the group did not continue further in breaking down the whole Victorian figures. (Figure 6.)

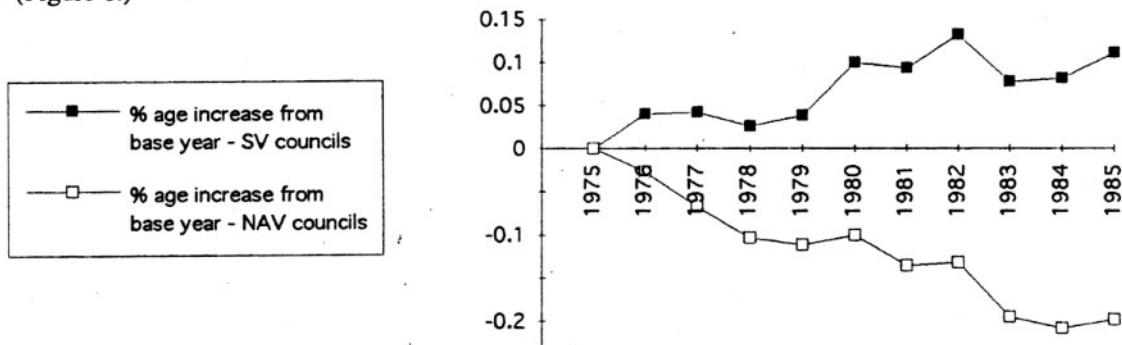


Fig. 6 Melbourne manufacturing growth, by rating system.

It was found that the decline in manufacturing was markedly different depending upon the rating system used by council. Indeed, in council areas rating site value, the number of manufacturing establishments actually increased by 10%. In council areas taxing buildings, manufacturing establishments declined by 20%. This study confirms that economic development in Melbourne has followed the site rate. (The Group is currently liaising with the ABS to update the study past 1984, as in this year the ABS changed the format of the information required for our study.)

The significance for solar power advocates is as follows;

Taxes can be used to influence economic outcomes. We highlight the studies here because they are studies of

property taxation. Very few similar studies have been done. In terms of solar power, renewable energy systems of course, compete with other energy sources, such as coal, oil, natural gas etc. At the current state of technology, resources such as solar power do not appear to be cost competitive with fossil fuels. The non-renewable energy industries however, all receive various indirect subsidies, and the techniques for utilising coal and oil have been refined for over a hundred years. Renewable energy may never actually become cost competitive because whilst people (and corporations) can own potential energy resources themselves, in the ground, it is not possible to own the sun. Profits from oil and coal come from land and capital, whereas profits from various forms of solar energy come almost exclusively from capital. It is important to understand this point.

Rating land collects some of that profit in the ground, through higher rates charges on the value of that land. At the same time the burden on labour and capital is eased via lower taxes on buildings. Even at the municipal level, our Group has demonstrated the clear economic impact of shifting the tax base. If such a principle were to be extended somewhat, solar power would become far more competitive with today's entrenched — but environmentally destructive — fossil fuels. I am quite confident in stating that the widespread application of solar power will not come about until this fact is more widely understood.

Municipal taxation also substantially effects urban renewal. The process of urban renewal is vital to any properly functioning city, not only in terms of living conditions and poverty levels, but also because better, and often more appropriate buildings are constructed, taking advantage of the most modern design and energy codes. Better planned, and higher levels of urban renewal, (particularly in the United States), are vital to assist in the application of solar power technologies.

Municipal rates, in promoting urban renewal, can therefore be used to change the behaviour of ratepayers to one that is more environmentally sustainable. Also it is quite clear that for country areas in particular, rating land gives councils access to their own funding base, particularly since it can be shown that rating land actually promotes economic development. Country areas, particularly remote locations, are important for solar development applications.

## **SOLAR ENERGY AND THE LONG TERM BUSINESS CYCLE**

At this point, I'd like to turn now to an examination of longer business cycles, the Kondratieff wave in particular. The relevance of such a cycle to solar power will then also be explained.

Nikolai Kondratieff, in the 1920's, undertook empirical exercises to test for price and output long waves in capitalist economies. He was at the time a Professor of agricultural economics in the newly communist city of Moscow. Kondratieff, (1926), fitted ordinary least squares trends to per capita data and then used a nine year moving average of the deviation to eliminate well known short (Juglar) business cycles. It should be noted that Kondratieff's work stands out as incomplete and was a somewhat preliminary exercise. He identified cyclical behaviour up to 1925, and then successfully predicted the 1930's depression and subsequent capitalist revival. In reporting this to Comrade Stalin, Kondratieff was sent directly to the salt mines, where, sadly, he is reported to have gone mad. (Stalin was apparently visibly upset that his young economist could predict a capitalist regrowth.) The phenomenon Kondratieff supposedly identified is today though, a heavily researched area of economics.

Why study this cycle? Two answers emerge. First, if such a cycle proves to be regular, it may be possible to offer some future potential scenarios, and second, the world needs clean energy for the 21st century. Anything

we can do to hurry the application of solar power is essential. The Kondratieff research shown here is not original, and has been drawn from existing research. This style of presentation I have not seen before however. The research can be easily followed up at any major library, from a large number of sources. (The regularity of economic and political events over the past three hundred years I personally found to be startling.)

Experts have generally agreed - rare in economics - on the dates of the K waves, and the following long waves in economic development can be described.

1st long wave	upswing	1790 - 1810/17
	downswing	1810/17 - 1844/51

Key driving technologies;

Material, cotton. Energy, water / steam. Communication, overland. Dominant force, textile industry. Economies most effected, France and Britain.

2nd long wave	upswing	1844/51 - 1870/75
	downswing	1870/75 - 1890/96

Key driving technologies;

Material, iron. Energy, wood. Communication, telegraph. Dominant force, railroads. Economies most effected, Britain.

3rd long wave	upswing	1890/96 - 1920
	downswing	1920 - 1940 (WW II)

Key driving technologies;

Material, steel. Energy, coal. Communication, telephone. Dominant force, motor vehicle. Economies most effected, Germany

4th long wave	upswing	1945 - 1974
	downswing	1975 - ?

Key driving technologies;

Material, plastics. Energy, oil. Communication, electronics. Dominant force, electricity. Economies most effected, United States

For better presentation I have illustrated this diagrammatically. (Figure 7.) Note the cyclical pattern of economic and of political events. By examining the past, we may be able to get a glimpse of the future. Here we need to examine the concept of innovation. A German economist, Mensch (1975), looked at innovation over the last several centuries. He discovered that key technological innovations were "clustered" in four periods in or around the "crises" years of 1770, 1825, 1885, and 1935. Mensch stressed that inventions go on all the time, it is their application, (or innovation and appearance) in the market place, that is cyclical. Mensch did not claim a direct connection with Kondratieff cycles, concluding only that peaks in basic innovations in the industrialised world follow an approximate fifty year cycle. It would seem then that we are approaching another "cluster" time period in the cycle now, hence the importance for solar energy.

It is clear that severe world wide depressions have been followed by long term recovery of business, in which major new, or key technologies have been commercialised. I believe that for the fifth wave, most such technologies have already been identified. The situation regarding energy use is not quite as certain. 5th wave key driving technologies can be identified as follows;

Material, silicon. Communication, through space. Dominant force, biotechnology and information.

Economies most effected, United States, giving way to the pacific rim and China. (I'd like to add here that the geographical base for the fifth wave may become irrelevant. Several key transglobal corporations may in fact

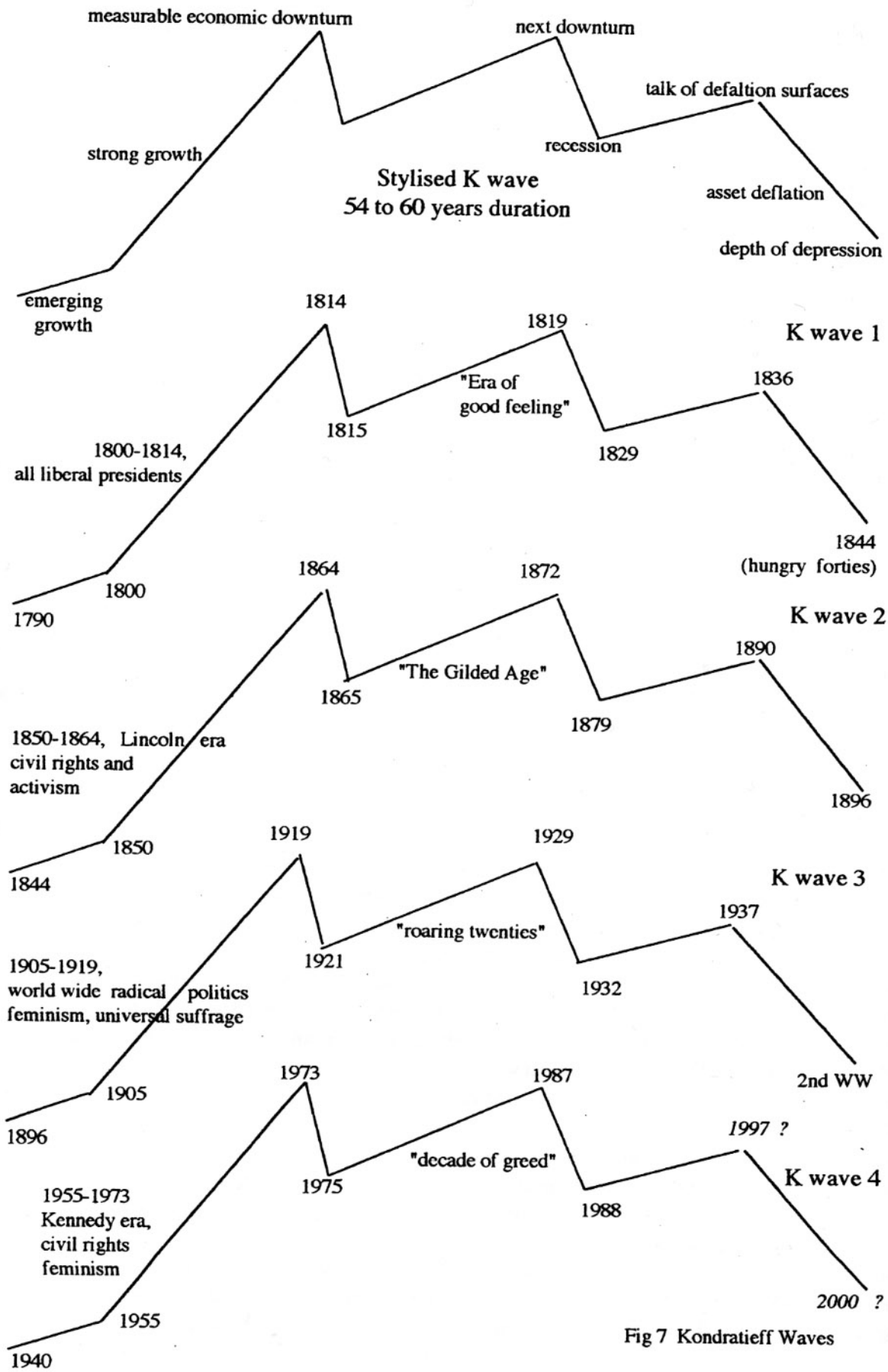


Fig 7 Kondratieff Waves

this time show the irrelevance of national borders and specific geographic locations.) In extrapolating the 5th long wave energy base, it is timely to review past historical factors.

Recovery from past depressions has been possible, or at least is assisted by the application of radical new technologies. Such innovations and technologies have, it seems, shaped the growth of the upturn. This does not seem to have been predetermined in any way. The economics and tax base of the time may well have been the cause of the dominant emerging energy type. In each of the past identified upturns, the very basic innovations have been energy related. Ray, (1983), noted;

“The pattern arising.....those major innovations that appear to have sparked off the upturn in the long cycles were either directly originating in, or closely connected with, the production of energy, or aimed at producing a new form of energy. Their purpose was to utilise primary energy in some novel form, they contributed significantly to the raised demand for energy, and the fundamental condition of their dissemination had always been the abundant supply and almost unlimited availability of fuel.”

So which energy source will it be this time ? I believe nuclear energy can be discounted. The NIMBY syndrome, not in my backyard, is unlikely to permit further substantial growth in nuclear power stations until something dramatic occurs to solve the long term waste problems and radiation concerns,. Coal will have a place in the short term future, but concerns about green house emissions may limit this resource further. Notably, there is no shortage of coal. I believe too that a limit on oil supply may be realistic enough to also place future limitations on this resource. One could suggest that maybe the innovations to come might simply be refinements in conservation of such non renewable energy sources, and further conservation measures. I suggest also this to be unlikely; large profits are not involved. Such measures are also generally politically driven, through legislation. Politicians are not innovators.

An interesting modelling approach has been taken to this problem by Cesare Marchetti, (1985), at the International Institute for Applied Systems Analysis in Austria. (Figure 8.) Elliott, (1986), noted that Marchetti “makes use of a predator prey model of competition between species drawn from biological science (which describes cycles in the densities of rival populations) and applies this to the competition between existing and emerging technologies. Marchetti links this competition to the basic innovations found by Mensch.” Marchetti found that “each wave of innovation seems to coincide with that of a new primary energy source, and that waves occurred in a regular 55 year cycle.”

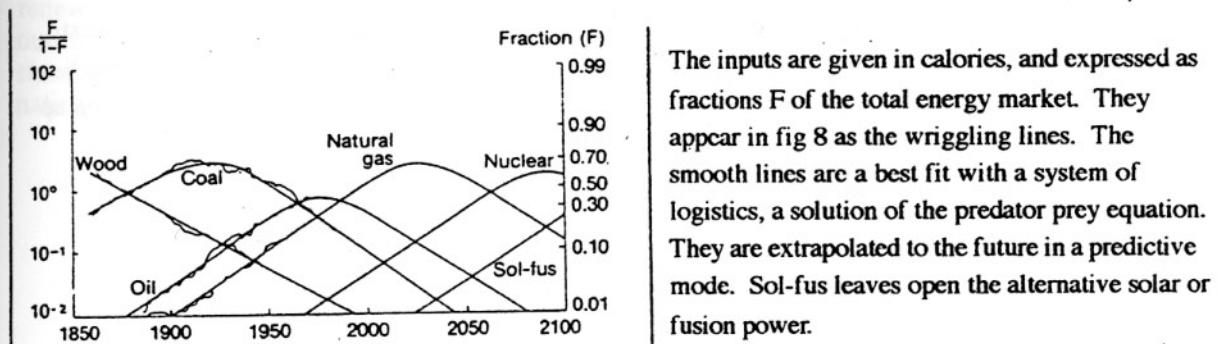


Fig. 8 The evolution of primary energy units, at world level, for the past 100 years

Marchetti believes the next fifty years will be dominated by natural gas. I concur with this view, though probably for different reasons. Natural gas can be viewed as clean and green. This will be useful to the owners of the gas resource, in moulding public opinion; a public remember, probably more empowered and united than

at any other time in history, or at least certainly at this time of the cycle. (Note the dominance of true "liberal" politics and "peoples issues" in growth stages of the cycle.) Natural gas will also prove versatile; it can be used in cars and other existing transport modes. One should note also the current plans to distribute, via pipeline, Australia's vast gas supplies to South East Asia, generally considered to be the worlds next growth region. It will need abundant energy. They will likely turn to natural gas.

But apart from all else, solar power simply will not be cost competitive; not because solar power is actually more expensive to produce, (I don't believe that it is actually, especially if externalities such as pollution were to be factored in), and though I am not an expert in this field, you see we are not comparing apples with apples. The profits from natural gas will accrue to the resource owners from just that, ownership of the resource, in the ground. Fundamental economic laws will drive the energy innovations (ie their application) determined by where profit can be maximised. Human (economic) thinking just simply isn't ready yet for solar power.

To change this scenario, at least two things could (should) be done.

1. Push for a shift in the tax base. A rationalist, or right wing economist; of which I am not, might call this "levelling the playing field". It is long overdue in my view. Solar power will never be cost competitive until an economic distinction is drawn between the profits from capital, and the profits of resource ownership.
2. Call for more government support of solar power at this the most critical time in the innovation cycle. As I am sure the reader would agree, existing energy sources obtain at times unprecedented government support, none more so than the nuclear industry. A left style economist might call this "picking winners". Even if only as a counter cyclical measure, more government support for solar energy is also long overdue.

## Conclusion

This paper has shown that land use charges affect taxpayer behaviour. Taxes affect profits which affect business economic decisions. Both suggestions above are calling for political changes, something I find to be most unlikely. It is difficult to see the present economic status quo being overturned. The adoption of solar power however, will happen if it is what the people want, or we can be given good reasons for accepting it. After all, something has to fuel economic and world development. And whilst the utmost care must be taken in economic analysis, a study of historical cycles reveals quite clearly that a critical time in energy issues is approaching.

The governing tax and economic laws will determine the energy decisions taken; and developments in the next seven years will lay the foundation for the next long term cycle. Such specific industry developments though, will most likely be in ways that nobody could ever possibly imagine, let alone predict. It is now very much up to all of us to demonstrate the great benefits of solar power.

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