The "sunrise" industries policy has undoubtedly been a major political success for the new ALP federal government. Against a backdrop of continuing crisis in Australian industry, the "sunrise" industries appear as symbols of hope and regeneration, promising a bright new industrial dawn, and giving credence to the election propaganda of a "campaign of national reconstruction". Moreover, they are said to be the harbingers of the so-called "technological revolution".

"Sunrise" industries are the rising sun of a mighty new movement of new technology, changing the entire face of industry in roughly the same way as the advent of steam and mechanisation changed the face of Britain during the Industrial Revolution.

This statement, from the chairman of the Australian Scientific Industry Association, was quoted in an article on the front page of one of the leading Australian daily newspapers recently. The prominence and implicit credibility given such an extraordinary claim highlights the urgency of the task for the left in deciding where it stands in the midst of an apparent "revolution". Are the "sunrise" industries really going to be our industrial saviours and, equally importantly, are our existing industries really doomed to eventually disappear into the industrial "sunset"?

Before attempting to answer these questions, however, it is as well to recognise that the "sunrise" industries policy is not a peculiarly Australian product. It represents, in fact, another manifestation of the general social phenomenon, apparent in all the major advanced industrial countries today, of an increasing preoccupation with the economic, social and political consequences of technological change and scientific development.

In large part, this increasing preoccupation is a response to the profound social, political and moral implications of the new developments in areas such as genetic engineering and the like. But it is also, though less obviously, a consequence of the continuing international economic downturn. With traditional strategies for the stimulation and even mere maintenance of economic growth in capitalist countries having, for the most part, failed over the last decade or so, policy makers have increasingly turned their attention to the contributions of scientific and technological development. One of the most striking expressions of this new focus of attention was to be found in the communique of the June 1982 "summit" meeting of the heads of the seven major advanced capitalist nations:

The revitalisation and growth of the world economy will depend to a large extent upon co-operation between countries in the exploitation of scientific and technological development. Industrialised countries will have to exploit the immense opportunities presented by new technologies, particularly for creating new employment....

In this sense, then, the March 1983 federal election presented Australia with an opportunity merely to fall in step with the rest of the capitalist world by voting ... for a new ALP government which had, as a central plank of its economic, industry and science and technology platforms, a commitment to special government assistance for 16 new "high" technology-based industries; the so-called "sunrise" industries.

Much of the credit (or blame) for the policy undoubtedly lies with the indefatigable energies of the new Minister for Science and Technology, Mr. Barry Jones. He was also the

Stewart Carter
A large part of the Labor government's strategy for employment rests on the claims of so-called "sunrise industries" — the futuristic industries based on microprocessors, computer software, genetic engineering and so on. But what are the implications of this policy for employment and for Australia's beleaguered manufacturing industry where most jobs are now located? Are the sunrise industries a promise or a threat? ....
person who first introduced the industrial metaphors of "sunrise" and "sunset" into the everyday lexicon of Australian political economy. It's probable, too, that Jones borrowed both these metaphors, and much of the intellectual baggage that goes with them, from America, where they seemed to enter the language about the same time as the emergence of the "Atari" Democrats grouping in the U.S. Congress, i.e. about mid to late 1981. But they were almost unknown in Australia in the middle of 1982 at the ALP's biennial national conference when the new policy was first unveiled.

Strictly speaking, they were not actually a part of the science and technology platform adopted at the ALP's national conference, but only included in a paper prepared by Barry Jones to accompany the new policy. In fact, they were only initially slipped into the text in brackets, as can be seen from the following extract.

... can a nation with only 15,000,000 people, a mere 4 percent of the English-speaking world, and whose high-technology industries are overwhelmingly under foreign control, make a transition towards newly developing types of high-technology ("sunrise") industries as wealth generators, and which will compensate for the long-term decline in employment in traditional manufacturing ("sunset") industries?'

Leaving aside the etymology of sunrise and sunset for the moment, the question Jones asked clearly begs an answer. The answer he gave was, of course, yes, and the list of "sunrise" industries to be established was given as —

- biotechnology
- computer software
- bio-chips
- scientific instruments
- solar energy
- hydrogen generation and storage
- shape memory alloys.

By the time of the election, some seven months later, the "sunrise" industries metaphor had become part of the official policy and the list of new industries to be established had grown to 16. The policy had also, by the time of the elections, become incorporated in the manufacturing industry policy as well, and was, in fact, jointly released during the campaign by Barry Jones and John Dawkins, then shadow minister for industry and commerce. The following extract is from the manufacturing industry policy document released in February 1983:

... It is a matter of urgency that Australia takes steps towards newly developing "Sunrise" industries as wealth generators, and to compensate

for the long term decline in employment in our traditional industries ... A priority for a Labor government will be the identification of the "Sunrise" industries for the 1980s and '90s, and the channelling of investment to them. The best prospect for Australia at the moment is Biotechnology ... Other industries will be identified and assisted according to their potential. The list that follows is intended as indicative and not exhaustive. Some areas not listed may emerge unexpectedly, as has often happened with technology in the past. Personal computers, custom-made computer chips, scientific instrumentation, medical technologies, lasers, communications technology, industrial ceramics, solar technology, shape memory alloy, fusion energy research, intermediate technology projects, hydrogen generation and storage, biomass.

Press reports of the policy launching indicated that $30 million was to be spent establishing these industries, with the money to come from a renamed Australian Industries Development Corporation, and a new Australian Industrial Research and Development Incentives Board "investment fund".

Clouds Roll In: The "Big 16"

The policy is well worth examining in detail, and not only to see how far it has been departed from when actually in government. For instance, the first thing to note about the policy is that one of the industries was missing — robots was mistakenly left off. (Good old human error!) More seriously, though, the policy established an entirely new principle in Australian industry and industry assistance policy: namely, the selection of a list of industries for special government assistance. In economists' vernacular, the ALP's new policy has put the government in the business of "picking winners" in the industrial market place.

To most conservative economists, with their child-like faith in the superiority of the free market, and a deep-rooted aversion to almost any form of government intervention, the sunrise industries policy is therefore an abomination. If "picking winners" is about picking future profit makers, they would argue, then this is best done by corporations and entrepreneurs, for making profits is their special skill; governments, they would argue, have a proven track record for picking losers — the Concorde being an oft-cited example.

For my purposes here, this is largely irrelevant. More important, now that the ALP is actually in government, is deciding whether the industries that have been "picked" are, or are not, ever going to be "winners". Of course, this is impossible to predict in advance of their actual establishment and operation. But it is possible to get some sort of idea as to the probability of the chosen industries turning out winners by looking at the criteria used in choosing them.

Unfortunately, the criteria are nowhere clearly spelt out in the policy documents, and it is only possible to piece them together from various comments by Bob Hawke and Barry Jones. Hawke, for instance, in his campaign opening speech said that, "We will select new intermediate and high technology industries in which Australia has special skills and opportunities and support their establishment." But this is so general as to be useless. A more detailed exposition on the selection criteria was given by Jones to an industry conference earlier this year where he said that the list actually chose itself, and that the sunrise industries chosen fell into two different categories:

(I) areas where Australia would itself be able to compete internationally, and

(II) areas where Australia would itself provide a major market.

However, later on in the same speech he also claimed in respect of the selection procedure that

... we put emphasis on high potential sectors where we have a comparative and competitive technological
Leaving aside the question of what a "high potential sector" might be, it is fairly clear that the selection criteria change somewhat each time they are described. Looking at the list again, it is also apparent that "biochips" was considered eligible for inclusion in a list of only seven in July 1982, but not eligible for a somewhat larger list in February 1983. One is tempted to inquire as to whether our "comparative and competitive technological advantage" in "biochips" manufacture somehow evaporated in the space of only eight months. Variation between the two lists might be said not to matter very greatly, in so far as the lists are only meant to be "indicative" and not "exhaustive", but many have since taken the list to be very much fixed and, indirectly,"sunrise industries". The report referred to it as "the big 16". To add to the confusion, the report also described the list as 16 "categories" of sunrise industry. For good measure, the "big 16" were said to have been chosen because they are fields in which Australian technologists have made good progress despite poor financial resources.

The question thus arises as to the basis on which any such list of "key" industries should be chosen for, quite clearly, only the fuzziest of notions underlay the choice of the so-called "big 16". Orthodox economics, of course, respond "comparative advantage". Certainly, this was cited as one of the rationales used in the ALP's (or Barry Jones') selection process but, looking again at the list, it is difficult to see that any of them are areas in which Australia has a clear comparative advantage. Indeed, one commentator recently claimed that "Australia has no obvious comparative advantage in high technology". He went on to demonstrate his point in somewhat humorous terms by listing the various advantages that have been claimed by the different Australian states in their attempts to attract high-technology industries:

... clean water for Canberra, pure air for Tasmania, tertiary education for Perth and Adelaide, the existing Australian electronics industry for Newcastle and Wollongong, "bright people" and "established reputation" for Queensland.

The concept of comparative advantage is obviously subject to interpretation in itself. Economic history textbooks, for instance, to the best of my knowledge, still claim that the utter destruction of Japan's and West Germany's industrial bases in World War II gave those countries a subsequent comparative advantage in industrial development, due to their industry having to start from scratch with the latest and most sophisticated technology and capital equipment. Accordingly, I am almost prepared to accept Barry Jones' dictum that ".... in the area of high technology industry, comparative advantage is not bestowed, but rather created" and, for the moment, forget about worrying as to how we are ever going to create in this country a comparative advantage in "fusion research", for instance.

Sunrise Industries or Sunrise Technology

The second problematic aspect of the list is related to the concerns arising from the poorly defined selection procedure. In short, the second problem is whether the "sunrise industries" are really "industries" or, in fact, whether they could be more appropriately called "sunrise technologies". Returning to the list again, it is fairly clear to see that some of the "industries" listed are quite product-specific, as it were, such as custom-made computer chips, while others, such as communications technology, are really very broad, covering, in fact, a generic field of products. Communications technologies nowadays include such a diverse range of technologies and products as television, radio, telephony, satellite communications, etc. etc. Other elements of the list are only indirectly, or even not at all, related to products and would probably best be described as possibly very promising areas in pure science and technology research.

The list is, then, in itself, somewhat confused, and contains a heterogeneous range of products, generic fields in technology, and promising areas of scientific and technological research. Not surprisingly therefore, it has been the source of a good deal of confusion and has, as we shall see, caused a great deal of difficulty in implementation.

The Policy Rationale: Post-Industrialism & Employment

The third problematic aspect of the sunrise industries policy derives not so much from the list itself, but from the accompanying rationale for the policy and, in particular, the claim that the urgency of the need to identify "key" sunrise industries deserving of government support rests, in large part, on the need to develop industries as wealth generators and ".... to compensate for the long-term decline in employment in our traditional manufacturing industries".

Unfortunately for the Atari Democrats, Atari Inc. ran into financial difficulties very shortly after they started using its name. To add to their embarrassment, Atari began laying off some hundreds of its workers and eventually closed up some of its American plants and relocated them in South East Asia.

Clearly, there is little point in the government granting a great deal of assistance to an industry which is never going to produce a great deal of wealth or employment. Of course, at the same time, it is very difficult to predict with any accuracy what an "infant" industry's eventual employment and wealth-generating capability might turn out to be. The Department of Science and Technology, in its submissions to these hearings, was pressed to make some predictions, but was sufficiently cautious not to do so beyond pointing out that high-technology industries overseas had experienced high growth rates. The minister was, however, not so cautious in an interview published in the department's new glossy magazine "Ascent" (to the summit?) He clearly believes that not only will the sunrise industries themselves grow quickly, but also that they will be major contributors to our aggregate economic growth.

I think it is fair to say that we have set out two major priorities, first, getting the sunrise industries going because of their economic impact on the community as a whole. It is a major growth factor. If we are going to get a 5% growth rate over a three year period as the Prime Minister has indicated,
Factor NO. 1
Access To Government
The federal government has the largest procurement capability of any organization in Canada, especially products of a high technological nature. For exporting firms, proximity to decision-makers in the Export Development Corporation, CIDA and the Department of Industry, Trade and Commerce and Regional Economic Expansion is a real benefit. Ottawa-Carleton firms have benefited significantly from key government programs such as STEP and the Office Communications Program.

Factor NO. 3
Innovative Environment
The Ottawa-Carleton high technology community is one of the most exciting work environments in North America today. The camaraderie existing among firms such as Digital, Mitel, Bell Northern Research, Gandalf and Computing Devices coupled with access to the new Ontario Microelectronics Technology Centre and the federal research establishment places the region at the forefront of new developments. A supportive infrastructure has emerged to help new ideas progress to commercial successes and many new startup firms exist because of this environment.

Factor NO. 5
Lifestyle
A wide choice of available housing, restaurants of all types, professional football, theatre, national symphony, ballet, endless jogging and cross country trails, nearby skiing, etc... all create an environment to which employees are readily attracted and retained.

Factor NO. 6
Labour
Ottawa-Carleton has developed a fine labour pool to support high technology. The area graduates 10% of Canada's electrical engineers. Algonquin College has 2300 full-time students in science-related programs. Local industry reports waiting lists of highly motivated assemblers. Salaries in the private sector in Ottawa-Carleton are competitive with other major centres in Canada and not influenced by federal government wages. Employee turnover is low.

Educational Facilities
University of Ottawa and Carleton University, with combined full-time enrollment of nearly 20,000 students, have initiated co-op programs with industry and a close cooperation with local industry ensures that programs are related to needs. Continuing business management programs are available through Algonquin College and the two universities.

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you can't do that on RED scheme revisited, and on tree planting. You have got to have some high yield elements in it.

The obvious fallacy in this argument is, as the IAC has put it:

The extent to which the development of nominated "sunset" industries could contribute to the employment and growth prospects of Australian industry depends as much on their absolute size as it does on their prospective rates of growth.

Looking once again at the list, it is obvious, not only that none are more than tiny industries currently, by traditional manufacturing industry standards (i.e. where they are, in fact, industries at all), but also that none are ever likely to be very large employers.

The reality of the employment potential of the sunrise industries is, indeed, one of the most peculiar features of the whole sunrise industries policy. Any number of public statements by Barry Jones could be cited to show that he does not believe the sunrise industries will ever be large employers. Certainly, that is the general thrust of his book Sleepers Awake, and what he has told the federal parliament on at least one occasion. Moreover, he has even been fairly reliably reported as believing that Australia needs to foster strong high technology industries to create wealth, rather than employment, to allow a smaller proportion of the population to participate in the conventional workforce and keep a larger proportion in reasonable conditions outside it.

Thus, in so far as the policy was sold to the Australian people at the last election (and perhaps earlier to the ALP itself) as designed to "... compensate for the decline in employment in our traditional manufacturing industries", one could well say that the Australian people had been sold the proverbial "pup".

Sunrise versus Sunset: The Future of Manufacturing

The last problematic area in the policy that I would like to address is the nature of the "sunset" industries. As has become clearly apparent since the election, some industries have not taken too kindly to being so called. The term "sunset" industry in fact never actually appears in either of the relevant ALP election policy platforms, but has just as assuredly percolated into our everyday parlance as the "sunset" metaphor. Just as with the meaning of that latter metaphor, however, it is difficult to identify which industries it actually applies to. Barry Jones, for instance, in his enthusiasm to welcome the advent of the post-

industrial society (or, as it is sometimes called, the "post-postman" society), often blithely consigns the whole of manufacturing industry to the "sunset" category, as the following extract from one of his more recent speeches indicates:

Since the mid-1970s there has been a growing recognition that Australia's economic base has been undergoing a fundamental change — a decline in employment in manufacturing and a growth in employment in services .... Australia has been passing through a Post-industrial Revolution which began here about 1965-66. Our decline in manufacturing employment is not a temporary anomaly to be rectified by tariffs, wage freezes, bounties, quotas and other fiscal measures.

The reality of manufacturing industry's situation is, however, somewhat different from the picture painted by Barry Jones. Manufacturing industry employment grew very strongly from 1966, the date at which

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he supposed post-industrial revolution began in Australia, through to 1973. The increase over the period was some 150,000 jobs. And although manufacturing employment has fallen quite dramatically since 1973, with a loss of nearly 250,000 jobs over the decade from August '73 to August '83, the fall has not been one of continuous downward slide. Most of the jobs, some 200,000 of them, were lost over the five years to 1983. The current recession has also had a major impact with some 59,000 jobs disappearing in manufacturing during the last year (to August '83), but over the four years from August '78 to August '82, manufacturing employment fairly constant, even showing a slight increase. Similarly, over the three years to 1980-81, eight out of the twelve ASIC manufacturing industry subdivisions showed either a constant or a growing demand for labour.

Clearly, then, the future of manufacturing employment is a contingent matter. Given the right macro-economic conditions, and appropriate government policies, there is every reason to believe, from the evidence that manufacturing employment would begin to grow again. Indeed, the director of the Metal Trades Industry Association said much the same thing when he recently claimed that —

If the potential for the development of metal-based industries can be realised and we achieve employment growth in the order of that recorded after the 1974-76 recession, a minimum of 150,000 jobs could be created in the industry over the next seven years.

In summary, then, it needs to be pointed out that the decline in the absolute level of manufacturing industry employment which has characterised most of the last ten years or so, may not be as permanent as many would have us believe. Certainly, manufacturing continues to produce real wealth and, over the decade to 1980-81, showed real increases in the value of its gross product for all but two years (1974-75 and 75-76) out of the last ten. Thus, if the sunrise industries are only to produce more wealth, and not more employment, in coming years, and require high levels of industry assistance at the same time, one wonders what really distinguishes manufacturing as a whole from the sunrise industries in terms of what they are both expected to contribute to our economic future.

An Evaluation: Prospects and Promises

The great expectations that have been built up around the "sunset" industries policy are likely to be largely unfulfilled. It is, perhaps, just as well, then, for the ALP, that the emerging international recovery has reduced the necessity for the sunrise industries to be among the major contributors to the national economic recovery. One, at least an impressionistic measure of this reduced importance was recently to be found at the national technology "summit" where, over the course of the three days of the conference, the list of sunrise industries failed to come up for discussion at all.

Nonetheless, the budget and subsequent announcements have shown that the sunrise industries policy is still one of the main planks of the government's industry policy. The recommendations of the Academy of Technological Sciences Committee on High Technology Financing have been
almost entirely accepted, and some $200 million in tax deductions is to be made available to investors in companies financing other high technology companies over the next five years. It remains to be seen whether this scheme will actually finance a new venture capital market as envisaged, or whether it will merely attract "vulture capital", seeking a new tax avoidance shelter. But, either way, it is still a large amount of government revenue which is being foregone — revenue which may well have to be made up in some other area of taxation.

Similarly, the government has announced a program of capital injection of $12.5 million every year, for the next five years, into the government-owned but autonomous Australian Industry Development Corporation (AIDC). More importantly, the AIDC's borrowing limits have been almost doubled, from something in the order of $800 million to around $1500 million. And the reason given — to enable commercialisation of new CSIRO discoveries.

There can be little doubt, then, that there has suddenly been a comparatively large amount of government money made available for investment in new technologies.

To say that such a development, with little or no safeguards on the social impact of these new technologies, was a probability under a Labor government, would have been unthinkable only a few short years ago. Nevertheless, that is what is happening and, seemingly, with the approval of much of the population and the labor movement. ACTU policy is still that technological impact statements should be enforced on employers introducing new technologies, but even less is heard of this part of the policy than the other part, similarly ignored by governments and employers alike, demanding that prior consultations with employees and unions about technological changes should be compulsory.

What, then, does one make of the sunrise industries policy as a whole. Has it been, in fact, a very successful Trojan Horse, hiding a wholesale commitment by the state to a technological revolution, primarily in the interests of capital, under the guise of an illusory promise of new jobs in new industries for the unemployed. Or is it, instead, a necessary step in the maintenance of the future economic viability of Australia as an independent, advanced industrial trading nation?

There are no easy answers to these questions, however important they may be, and I shall not pretend that I can answer them.

There is, though, one very definite conclusion which can be drawn form all this: that is, that in contrast with the situation in the late 1970s, a type of technological determinism has once again achieved a hegemonic status in Australian society. It is impossible to give a brief and satisfactory definition of what technological determinism is but, in general terms, it refers to those social theories which ascribe social developments as having been caused by autonomous movements in technology, and/or which promote the idea that, for whatever reason, we have no choice but to accept continuing technological development along the same lines as in the past.

The idea can be readily perceived in the terms sunrise and sunset themselves. As metaphors for industries they clearly imply the existence of a cycle in industry development where each industry has a sunrise and a sunset period; periods determined not by general social factors, but by reference to something inherent in the technology incorporated in that industry's products and/or processes. Thus, a sunrise industry is one built on new technology, while a sunset industry is one whose technology is old and "mature".

In fact, of course, the economic situation of an industry is determined by a host of other factors besides the relative age of the technology used. Moreover, if the technology that is being used is reasonably modern, then the age of the technology is likely to be one of the least important factors explaining an industry's relative health or sickness.

Thus, to the extent that the sunrise industries policy incorporates the technologically determinist thesis that certain industries are, because of something inherent in the technology they use, "sunset" industries, the sunrise industries policy is not only wrong, it is dangerous. Little wonder that Barry Jones was not invited to address the national economic summit. His absence, it seems, was symptomatic.

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• The University of Wollongong, situated in one of Australia's heavy industrial regions. From February 1984, the university's Centre for the Study of Technology and Social Change will provide a research consultancy service for state and federal governments.