

The Infrastructure Road to Recovery— Let's Build Our Way Out of the Depression!

Building a Nation: The Snowy Scheme

In 1967, before it was even finished, the American Society of Engineers rated the Snowy Mountains Scheme as "one of the seven engineering wonders" of the modern world.

The Snowy Scheme is the largest single infrastructure project in Australian history, and an appreciation of its magnitude, and the way in which it transformed postwar Australia, provides a model of how, once again, to think in terms of building our nation.

The scheme took one generation to build, from 1949 through 1974. It was finished on time, and under budget, for \$820 million for a national asset which will last for hundreds of years. Over 100,000 people worked on the Snowy Scheme, two-thirds of them "new Australians", who were given hope and an opportunity to make a new life, and to contribute to building a young nation, Australia, after the death and destruction of World War II, particularly in Europe, where most of the new Australians came from.

The Scheme covers an area of 7,780 km², with sixteen dams, seven power stations (two of which are underground), 145 km of tunnels, and 80 km of aqueducts. It diverts the headwaters of the Snowy, Eucumbene and Murrumbidgee Rivers westward through the mountain range, releasing extra water without charge into the irrigation areas of the Murray and Murrumbidgee. The heart of the scheme is Lake Eucumbene, the Scheme's biggest reservoir, with a volume nine times that of Sydney Harbour. From there, huge underground tunnels carry water to and from the two major parts of the Scheme, the Tumut (and on to the Murrumbidgee) and the Murray.

The generators of the Scheme are large enough to produce up to 17% of southeastern Australia's energy requirements, but produce only 5% because of the limited amount of water available. However, the Scheme's large capacity enables it to produce a lot of power for short periods, which, among other things, means it can provide emergency support to the electricity systems of southeastern Australia in the case of a major blackout, and it could start up a whole electricity system if a total blackout occurred. In emergency situations, hydropower can provide energy within two minutes, compared to the hours or days it takes to crank up a coal or oil burning plant.

The Scheme transformed Australia in many ways. For the construction industry, for instance, according to Martin Albrecht, Managing Director of Thiess Contractors Pty. Ltd., one of the Australian firms which played a key role in building the Snowy,

"The experience gained by individual engineers participating in the Snowy Scheme had a profound influence on the culture of the construction industry beyond the life of the scheme. The early 1960s saw rapid growth of Australian heavy construction, including roads, railways, ports, coal-fired power-stations, power transmission, mineral processing, materials handling, mining, oil refining and industrial plant. The blossoming Australian contracting industry bolstered by the pool of talent available from the Snowy Scheme greatly facilitated this growth."¹

Many of the engineers who had worked on the Snowy took up leading positions with engineering firms in Australia and internation-

ally, while others took up senior positions in other governmental construction Authorities, like the Hydro-Electric Commission of Tasmania, the Electricity Commission of NSW, and the Sydney Water Board. The Snowy also had a profound impact on safety practices (it was the first project to mandate the wearing of seat belts, for instance), in technological processes, and in quality control.

But, perhaps more important, the Snowy transformed Australia's sense of what the nation itself was capable of.

Australia had never tackled anything so vast. Initially, most of the contracts and design work were let out to foreign firms. However, very quickly, Snowy Commissioner Sir William Hudson, the legendary figure with sole responsibility for driving the project forward for its first two decades, sent young Australian engineers off to America to study, to learn the techniques employed in the great Tennessee Valley Authority (TVA) project which covered seven states, and which the U.S. Bureau of Reclamation had used in building the great American dams, such as the gigantic Hoover and Grand Coulee dams in the American West. As Martin Albrecht recalled,

"William Hudson adopted the practice of talking to most of his engineers individually on their return home. His persistent questioning generally led to the observation by the returning engineer-trainee that 'we are individually just as competent and as well educated as the American engineers. If we work together and use management systems as they do, we can become world-class here, too.' To this William Hudson would sum up 'that is the main lesson I sent you to



Source: Snowy Mountains Hydro-electric Authority

The Snowy Scheme covers an area of 7,780 km², with 16 dams and seven power stations.

the USA to learn. We must get rid of our Australian technical and cultural inferiority complex."

But perhaps the best way to appreciate the Scheme, is from two accounts of individuals deeply involved in it. The first is from one

of the first group of twelve young engineers whom William Hudson sent to America to be trained, Prof. Lance Endersbee, and the second is about William Hudson himself, the driving spirit behind the mighty project.

The Snowy Vision

by Emeritus Prof. Lance Endersbee AO, FTSE²

The concept of the Snowy Mountains Scheme captured the imagination of all those involved.

From the beginning, the challenges of the project attracted young and capable people. They were supported by wise leadership, and encouraged to accept tasks to the full limit of their capacity. They had access to the best world experience.

As the work proceeded, new challenges arose. Problems were being solved as they arose in practice, and innovations were being adopted without any delays to the overall progress. There was excellent co-operation within the Snowy team of engineers involved in investigation, design, and contract administration, geologists and laboratory scientists, and with the contractors. There was a united focus on achievement.

The scheme evolved in overall concept and was improved in detail. The project was finally completed not only on time and within the original estimate, but with much greater installed capacity and electricity output, and with much greater water storage. That ensured secure water releases for irrigation in long term drought.

Plan for the Nation

It is now 50 years since the *Snowy Mountains Hydro-electric Power Act of 1949* was passed by the Commonwealth Government. The time was right.

The nation had almost been invaded during the war. Darwin had been bombed. Ships had been sunk along the east coast. Enemy submarines had entered Sydney Harbour. During the war, almost all civil works had been deferred. The nation now had to rebuild. There

was a need for greater electricity supplies for new industries, and there were blackouts as supplies failed to meet the demand. The international situation had become tense again. There was an Iron Curtain across Europe. It was the time of the Berlin Air Lift.

The Snowy Scheme was a plan for the nation, for national development. The prospect of diverting the Snowy waters inland had been considered for over 60 years, very seriously in times of drought, but always leading to argument between the colonies, and later the states, about the rights to the waters.

In 1941, Mr. L.R. East, Chairman of the State Rivers and Water Supply Commission of Victoria proposed that the Commonwealth and the two states of NSW and Victoria create a separate authority to undertake the work, on the lines of the River Murray Commission. However, the allocation of the diverted waters to the states of NSW, Victoria, and now also to SA, remained contentious.

In 1943 the conflicting proposals for the development of the Snowy waters led Mr. Arthur Calwell, MP, to ask in Parliament that "plans be formulated for the best use of the waters in the interests of the people of Australia as a whole."

In 1946, the Commonwealth and State Ministers from NSW and Victoria finally discussed the national aspect of the project. The engineering investigations for the project became the overall responsibility of the Commonwealth Department of Works and Housing, The Director General was Mr. L.F. Loder (later Sir Louis). The Director of Engineering was Ronald B. Lewis. The detailed work of inves-



Nelson Lemmon employed the *Defense Act* to ensure the great Snowy Scheme was built. Photo: Snowy Mountains Hydro-Electric Authority

tigations and evaluation of alternative proposals was the task of E. F. Rowntree, Engineer for Major Investigations.

Rowntree had been a courageous aerial observer in World War I, and had won the Distinguished Flying Cross for several missions at low altitude in the face of heavy machine gun fire. He was a member of a Quaker family in Hobart, but the pacifist Quakers disapproved of his war effort. After World War I he worked with the Hydro-Electric Department in Tasmania, where he designed entire hydro-electric projects virtually single-handedly. His professional background was ideal for the task of developing a plan for the Snowy Scheme.

He assessed many possible alternative layouts. Every variation involved site inspections, estimation of river flows, and calculation of reservoir capacity and regulation of storages, outline designs and costs of dams, tunnels and power stations. This task was the



Drilling at the Tooma-Tumut Tunnel, 1959. These great Australians built "one of the seven engineering wonders" of the modern world. Photo: Snowy Mountains Hydro-Electric Authority

sole occupation of Ted Rowntree over about four years. He alone carried out the development of ideas, and studies of economic feasibility. It was a remarkable achievement by one man. Rowntree developed the concept of the diversion of Snowy water to the

Tumut River for power and irrigation in the Murrumbidgee Irrigation Area, thereby gaining NSW support for the project.

Another remarkable contribution was by O.T. Olsen, an officer of the State Electricity Commission of Victoria, who had carried