



Research Summary

Lessons learned from major infrastructure upgrades

May 2020 Future Fuels CRC project RP2.1-0.1

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To prepare for future transitions to net zero emission future fuels it is valuable to understand and learn the lessons from previous infrastructure upgrades and fuel transitions in Australia. Although each of these three case studies is defined by different events, technologies and incentive schemes, there are similarities and overlaps in the lessons that they contain. First and foremost, the three case studies illustrate the importance of gaining and maintaining the public's trust in a new industry or fuel:

1960s Town Gas to Natural Gas

In the late 1960s, many gas consumers in Australia were presented with a new fuel, natural gas that was not only cheaper but also cleaner and more reliable than the coal gas that it replaced. Nonetheless, gas companies had to invest considerable effort to ensure that customers accepted the so-called "lazy blue flame". Thanks in part to those efforts, the conversion to natural gas was widely considered successful.

1990s Ethanol and LPG as motor fuels

When petrol stations in New South Wales started blending ethanol into petrol in the 1990s to produce a cheaper fuel, motorists were initially happy to use it. Ethanol was only ever competitive with petrol because it was not taxed as heavily. But by the early 2000s, concerns about engine damage and poor governance caused a consumer backlash which no amount of government subsidies, consumption mandates and awareness campaigns was able to fix. The LPG industry managed to recover from a safety scare in the late 1970s and had a boom in the years around 2005 on the back of generous government subsidies; but the popularity of LPG reduced when subsidies were removed and with the emergence of new diesel and hybrid technologies.

2000s Coal Seam Gas

The third case is the rapid expansion of the coal seam gas (CSG) industry across a broad geographic area. The CSG industry initially began to develop in the 1990s without issue but became increasingly controversial from the mid-2000s. Communities were not prepared for the impacts that occurred when a vast network of infrastructure expanded onto high-value agricultural and rural residential areas. The initial failure of the industry to build productive relationships with landholders and communities contributed to the ongoing trust problems and widespread public opposition that ultimately ensued.

Drawing on published information, these three case studies provide accounts of the issues that arose during the upgrade or transition and the approaches that industry and government used to manage these issues. The report distils applicable lessons and frameworks from academic literature about stakeholder analysis, megaprojects, and the social acceptance of industries and technologies. It also identifies tools that can be used to develop consistent communication around the future transition to hydrogen and other future fuels.

Lessons Learned

Public Trust

The case studies illustrate that earning public trust is not a simple matter of selling a reliable product while minimising social, financial, and environmental impacts. Trust has many drivers, and chief among them are perceptions of fairness, integrity and good governance. Australians' trust in government was much higher in 1969 than it is today, a factor that may have contributed to the successful transition from town gas to natural gas. In contrast, a lack of confidence in both the capability and integrity of government has subsequently contributed to the public's reluctance to accept ethanol and coal seam gas. Compounding these problems, there have been perceptions that the benefits of these industries have flowed disproportionately to a small number of interests.

The academic literature on social acceptance and participation theory reinforces many of the themes identified in the case studies. The centrality of trust to social acceptance, highlighting the roles of procedural fairness and good governance in earning trust, have been demonstrated in numerous studies. So too has the observation that social acceptance and successful engagement are contingent on contextual and dynamic factors. More generally, there is a wide body of literature demonstrating the benefits of meaningful community participation throughout project lifecycles. At the same time, however, the literature shows that care must be taken to select appropriate engagement methods for different situations and types of stakeholders.

Local Context

Public reactions to new fuels and infrastructure are highly context-dependent. For example, the experiences with gas conversion were markedly different in Sydney compared to Melbourne. Consumers' responses to ethanol have been different in Queensland compared with New South Wales, as have the reactions of rural and urban communities and governments to coal seam gas in Queensland, Victoria, and New South Wales.

Limitations of Mandates

The ethanol case study illustrates the limitations of mandates as a policy mechanism to increase the production or consumption of a fuel. It also shows that while lower prices can make an alternative fuel more popular, some consumers will pay more to avoid a fuel that they do not trust. In contrast, the experience with LPG shows that subsidies and rebates can be hugely successful in driving demand if consumers already trust a fuel. Equally, however, the outcomes of LPG demonstrates what can happen when there are no prospects for a fuel to become competitive without ongoing subsidisation.

Find out more

The case studies summaries are attached and the full report is available at www.futurefuelscrc.com. A toolkit to implement these lessons within your organisation or project is also available to the participant organisations of the Future Fuels CRC.

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Case study

The transition from town gas to natural gas

How and when was the fuel introduced?

In the 1960s and 1970s, many Australian towns and cities transitioned from using 'town gas', which was manufactured from coal, to natural gas, which is obtained from underground reservoirs. Consisting mostly of methane, natural gas was cleaner, cheaper and more reliable than town gas, which consisted of hydrogen, methane, carbon monoxide, and other components. The introduction of natural gas began with the construction of gas transmission pipelines from the gas fields to major cities. These pipelines were built mostly by state governments. Gas companies then visited every customer's household to modify their appliances so that they would work with natural gas. Gas companies also visited houses before and after the conversions to survey appliances, to fix conversion faults, and to help customers adjust to the new fuel.

What were the challenges and how were they addressed?

Converting appliances was a huge logistical and technical undertaking. In Melbourne, for instance, the Gas and Fuel Corporation deployed a team of 800 workers to visit 435,000 households and convert 1.25 million appliances. The process took 18 months and cost around \$350 million in today's terms. Despite extensive preparatory work, things still went wrong. In the early days, the corporation's targets were too ambitious, resulting in hundreds of call-backs to fix faulty conversions. Some converted appliances did not behave as expected, and few mechanics had much experience with conversions. One poorly converted room heater left two people in a coma (one of whom eventually died) due to carbon monoxide poisoning.

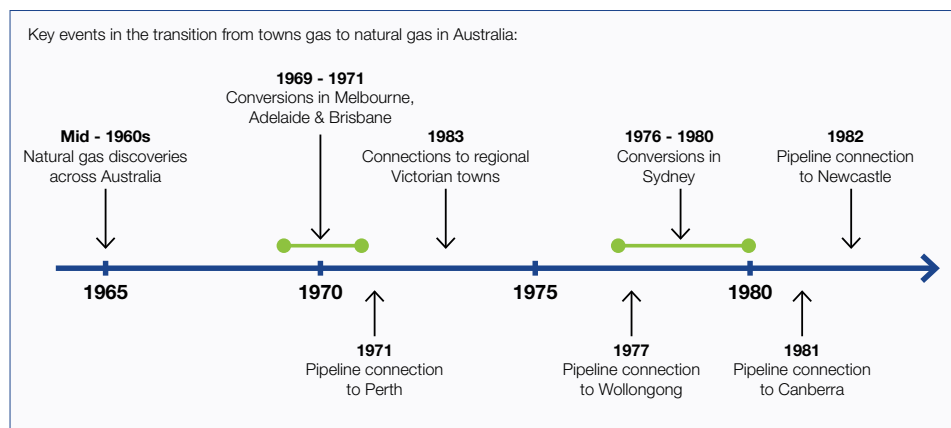
Gas companies also had to contend with apprehension or disinterest from their customers. In Adelaide, for example, the South Australian Gas Company surveyed 300 housewives before the conversion process and discovered that natural gas had a serious image problem. In response, the company invested more than \$100,000 (\$1.2 million in today's terms) in a publicity campaign to inform customers about what to expect from the conversion. In Sydney, delays in pipeline construction meant that natural gas did not arrive until 1976, much later than anticipated. Faced with ambivalence and even cynicism from its customers, AGL reinvented itself through a massive and highly successful marketing campaign dedicated to 'the living flame'.

What are the lessons for future fuels?

Expect the unexpected. No amount of laboratory testing or planning can prevent unexpected problems from emerging when a new fuel is deployed at scale.

Conversion requires communication. Proactively engaging customers before, during and after a major conversion process will help to ensure that issues are identified and addressed quickly and effectively.

Times have changed. Managing a large-scale conversion program is likely to be more difficult today than 50 years ago. Trust in government is at an all-time low, and gas companies are not highly trusted either. Gaining access to households will also be more difficult now that fewer people stay home on a full-time basis. And finally, safety incidents and installation problems could be broadcast via social media, potentially becoming a series of public relations crises.



Case study

Ethanol and LPG as motor fuels

How and when were the fuels introduced?

Petrol has long been the dominant motor fuel in Australia, but alternatives have occasionally been promoted by governments and fuel suppliers. Notable examples are ethanol—a biofuel often made from grains or sugarcane—and liquid petroleum (or propane) gas, otherwise known as LPG. Proponents of these fuels argue that they produce fewer greenhouse emissions and other pollutants, while governments have supported them to boost fuel security and local industry.

For a brief period in Queensland in the 1930s, Shell sold a petrol-ethanol blend under the name of Shellkol. Ethanol blends (typically 10 per cent ethanol, or E10) resurfaced at independent petrol stations in northern Queensland the late 1980s and in New South Wales in the early 1990s. Assistance from state and federal governments at this time helped the industry to grow, while favourable tax treatment kept the price of ethanol below that of petrol. LPG became widely available in the late 1970s, also helped by government support and tax exemptions.

What issues and challenges emerged?

As petrol prices rose in 1999 and 2000, some independent 'cowboy' retailers took advantage of loose regulations by pushing their ethanol blends to as high as 20 per cent. Concerns about engine damage caused a backlash among consumers. The federal government, however, was slow to tighten regulations and to seek clarity from vehicle manufacturers about

engine compatibility. Making matters worse, perceptions arose that the federal government was pandering to the country's main ethanol producer, who also happened to be a major political donor.

Consumer demand for ethanol rebounded the mid-2000s on the back of surging petrol prices. Eager to promote their local sugar and grain industries, the Queensland and New South Wales governments introduced mandates to enforce the sale of E10 at service stations. By and large, these mandates failed. Ethanol production has been constrained by feedstock availability, while consumer demand has remained low due to ongoing distrust and marginal price differences. When regular unleaded 91 octane petrol (ULP 91) was removed from petrol stations in New South Wales, many motorists switched to expensive premium fuels to avoid using ethanol blends.

LPG survived a safety scare in 1979 to become a trusted fuel, especially among taxi drivers and fleet operators who could quickly recover the upfront costs of engine conversion. Generous rebate schemes in the mid-2000s made LPG popular even among regular drivers. However, demand for LPG collapsed when the rebate and tax exemptions were phased out. Also contributing to LPG's demise was the emergence of new diesel and hybrid electric technologies, as well as a shift towards smaller cars.

What are the lessons for future fuels?

Trust requires good governance as well as good behaviour. The ethanol industry was undeniably burned in the years around 2000 by the actions of a few 'cowboy'

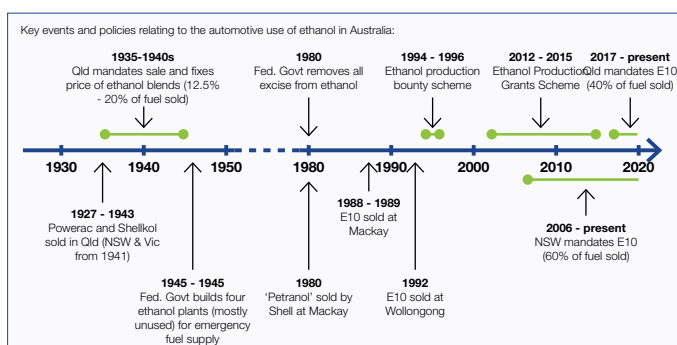
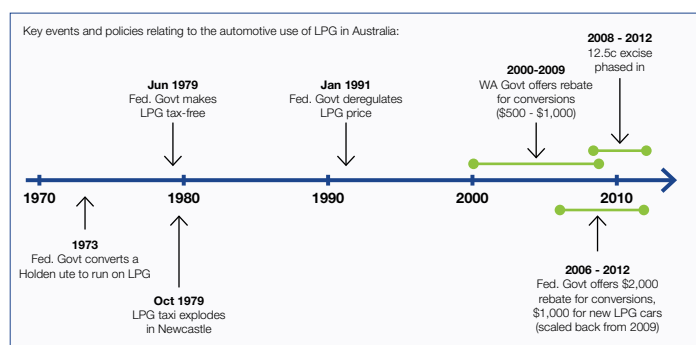
operators. Equally damaging, however, was the failure by governments to reign in the industry and reassure motorists that their interests (rather than those of ethanol producers) were being protected. The relative ease with which LPG shook off early safety concerns provides an interesting contrast.

Price is powerful, but trust can trump it. When ethanol and LPG were cheap (at least relative to petrol), they were popular. However, the willingness of motorists in New South Wales to switch to premium fuels rather than use E10 shows that distrust in a fuel can override its economic advantage.

Mandates are not magic. Mandating the sale of a fuel may increase its consumption but will not overcome natural limits imposed by supply and demand. Mandating amid a lack of supply will make the mandate unenforceable, while mandating amid a lack of demand could make the product even less popular.

Local Context

Public reactions to new fuels and infrastructure are highly context-dependent. For example, the experiences with gas conversion were markedly different in Sydney compared to Melbourne. Consumers' responses to ethanol have been different in Queensland compared with New South Wales, as have the reactions of rural and urban communities and governments to coal seam gas in Queensland, Victoria, and New South Wales. Experience with Coal Seam Gas expansion highlight that there is no one-size-fit-all-communities approach to social, economic, and environmental engagement. Tailored approaches are much more successful.



Case study

Coal seam gas development

How and when was the fuel introduced?

Coal seam gas (CSG), also known as coalbed methane or coal seam methane, occurs underground in coal seams. It is chemically similar to natural gas and can be used in the same ways. The Australian CSG industry developed in central Queensland in the 1990s to supply domestic gas networks and electricity generation. Starting in the mid-2000s, CSG development expanded rapidly to support exports of liquefied natural gas (LNG) from Gladstone. Commercial production of CSG in New South Wales began near Sydney in 2000, but subsequent state government policies and community reactions have limited further expansion.

What issues and challenges emerged?

The CSG industry developed almost without issue during the 1990s and early 2000s. However, it became controversial when expansion encroached onto prime agricultural and rural residential areas in southern Queensland. Land access conflicts arose as gas companies used their legal and financial advantage to drill gas wells on land managed by farmers. In addition, farmers and the wider public became concerned about the impacts that CSG development could have on water resources and the environment more broadly. Communities in southern Queensland and in various parts of New South Wales soon mobilised to oppose further development, claiming that the industry lacked a social licence to operate. Finally, due to the breath-taking speed of the construction phase of three parallel projects, costs exceeded estimates, efficiencies of scale were casualties of competition, and Australian firms along the supply chain lost opportunities to foreign firms.

In New South Wales, this community opposition prompted the state government to impose a moratorium on new petroleum licences, virtually bringing the CSG industry to a standstill. In Queensland, the industry was allowed to continue under an

expanded regulatory framework to manage environmental risks. To facilitate better coexistence with agricultural communities, the Queensland Government established a dedicated body (the Gas Fields Commission) representing communities, landholders and the CSG industry.

The reorientation of east-coast gas producers towards exports has, ironically, led to fears of domestic gas shortages, and pushed up the price of natural gas for east-coast consumers.

What are the lessons for future fuels?

Social licence can affect legal licence. The fate of the CSG industry in New South Wales shows that under the right political conditions, community opposition can lead directly to regulatory action, including the literal loss of a legal licence to operate.

Pursue long-term relationships as well as short-term opportunities. Had CSG companies acted in the early days with more restraint, and with more of an eye to building long-term relationships with landholders and communities, it is likely that the industry would have faced less of a battle in gaining social acceptance.

Trust in industry is tied to trust in government. The experiences of the CSG industry demonstrates how public trust in an industry can be bound inextricably to public trust in the regulator and regulatory regimes. The perceived competence and integrity of government oversight will be a critical component in building and retaining public trust in future fuels.

Be cautious of international investment. Although the capital funding available from foreign governments and Joint Venture (JV) partners is attractive to rapid expansion of mega-projects, there are unanticipated costs to Australian firms along the value chain. These costs could be better mitigated by a more moderate pace of development and thorough consideration of the Australian context.

