SUBMISSION: Electricity Price Review

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(Andrew Curtis, CEO Irrigation NZ)

IrrigationNZ (INZ) would appreciate the opportunity to engage with the Advisory Panel around our submission.

Summary

1. Irrigation is a significant user of electricity. On a national basis it is estimated to be up to 3% of New Zealand's annual electricity use but, given its seasonal and regionally concentrated nature, irrigation can account for a high proportion (more than 70%) of distribution companies' network infrastructure and seasonal load.

2. Electricity use in the irrigation sector will continue to increase in the near term driven by modernisation of existing systems and some expansion in irrigated area. Good irrigation practice involves the use of pressurised water through modern spray systems to maximise water use efficiency and minimise adverse environmental impacts.

3. Electricity is a significant cost to irrigating farms so the future price of electricity is extremely important to irrigators. Connection charges typically form a significant proportion of overall electricity supply costs to irrigators and this is exacerbated by the seasonal nature of irrigation. Pricing stability is important so connection pricing mechanisms need to ensure that annual connection costs remain stable.

4. Irrigation use typically occurs over the September – April period, with most demand in the November-March period. As a significant power user which doesn't use power over the peak demand winter period, irrigation provides revenue to electricity providers which helps keep power costs affordable for residential and business users and also provides income to allow investment in power infrastructure to cope with growing winter demand.

5. However, irrigation electricity use is inherently variable – both across seasons and within seasons and this presents challenges throughout the supply system.

6. Irrigation electricity use has some inherent time-of-use flexibility so pricing mechanisms and signals that enable irrigators to manage their electricity use are beneficial both to the irrigators and throughout the electricity supply chain (generation-transmission-distribution).

7. Many irrigation schemes provide natural opportunities for embedded hydro generation. Confidence in the commercial framework for embedded generation is important to ensuring that these renewable energy opportunities are realised in support of New Zealand's ambitious renewable energy targets. Some proposed changes in the transmission pricing methodology appear to be counter-productive to this. This area needs to be reviewed to ensure that opportunities for additional hydro generation through irrigation infrastructure are maximised.

Electricity Use in the Irrigation Industry

Overview

8. Modern irrigation systems are a large user of electricity and further growth in demand is anticipated as irrigated land area grows and existing systems are upgraded. The irrigation industry now represents a major electricity consumer sector in many New Zealand regions and has significantly influenced the development and operation of many rural network companies.

9. At a national level, irrigation energy use is estimated to be 2.5% - 3.0% of New Zealand's total energy use. However, since irrigation is a seasonal activity (typically September - April) and large-scale irrigation tends to be concentrated in specific regional areas, irrigation electricity use is much more 'intense' than average or annual figures might suggest. As an example, in one Canterbury distribution network, irrigation accounts for 79% of the maximum demand (their cost driver) and, on average, 36% of their annual energy delivered – so in excess of 70% of their summer seasonal energy.

10. Within the irrigation sector there is a very broad range of consumers – from individual farmers that may be considered essentially large residential, through more typical commercial operations, up to very large industrial scale users with some schemes directly grid connected with loads over 15 MW and annual demand exceeding 60 GWh.

11. The nature of electricity demand and use in the irrigation sector presents both opportunities and challenges for the electricity supply industry. The main challenge is the high degree of variability of demand – both between seasons and also within a season. The opportunities lie in the seasonality itself – the warmer irrigation season is traditionally a lower energy demand period in New Zealand – and also in the time-of-use flexibility that is inherent in some irrigation systems.

12. For irrigating farmers, electricity cost represents a major operating expense and therefore there is significant interest in the factors that may influence changes to the price of electricity.

Electricity Use for Irrigation

13. The predominant use of electricity in irrigation is for pumping (pressurising) water. Somewhat akin to the electricity supply model itself, there is often a supply and then a 'distribution' aspect to electricity use.

14. The supply component is essentially about getting water to the farm property and electricity use depends on the nature of the water source. At one end of the scale, a gravity source such as an adjacent natural or artificial watercourse requires no electricity or pumping, or an on-site well may require shallow or deep groundwater pumping to get water to the surface. At the other end of the scale are large irrigation schemes with centralised and/ or distributed pumping facilities that deliver pressurised water via a piped network directly to the farm.

15. On farm electricity use is for pressurising the water to operate through spray irrigation systems. Older style border dyke or 'flood' irrigation still exist on farms but most of these are scheduled to convert to more modern spray systems in the interests of improved water efficiency and environmental performance. This conversion programme is one of the significant factors in the overall increase in electricity use in the irrigation sector. There are a variety of spray systems that are used on farms. These include mobile spray guns and travelling rotary irrigators but the fixed central pivot irrigators have become the most common with the majority of New Zealand's irrigated area now under pivot irrigation. The pivot irrigators use electricity to drive the traversing boom as well as pressurising the spray water.

16. The electrical load required to irrigate any farm varies significantly depending on water source and farm topography but installed capacities typically range from 0.6 – 1.9 kW/ha (mid-point ~1

kW/ha) and energy use can range from 15 – 40 kWh/ha/day (mid-point ~ 25kWh/ha/day).

The Nature of Irrigation Electricity Use

17. There are two key features of electricity use for irrigation – variability and flexibility. The variability in demand and electricity use is by far the most significant issue for the electricity supply chain.

Variability

18. Irrigation demand, and consequently electricity demand and use, is driven almost exclusively by the prevailing climatic conditions on both a seasonal and a short-term basis. In most modern irrigation management systems, soil moisture is the key determinant of irrigation demand. Rainfall, temperature and wind conditions all influence soil moisture conditions as does the type of crop or land use, and the stage of the crop cycle.

19. Modern irrigation good practice results in irrigation only being used when required to maintain target soil moisture conditions.

20. As a result, the difference in electricity use between a 'dry season' and a 'wet season' can be as much as 300% for any individual irrigator or irrigation scheme.

21. Despite this huge variation between seasons, it is highly likely within any season, 'wet' or 'dry', that the irrigation will be operating at 100% for some period. This period might only be a handful of days over a five-month season or could be six weeks in one stretch.

22. Within a season, there is also generally large variations in electricity demand from one period (day, week, month) to another. Demand depends on the weather and it is not unusual for irrigation and electricity demand to go from 100% to virtually zero in a period of a few days, if there is a sudden change in the weather.

23. The impacts of this high variability on the electricity supply chain include:
    - Full electricity supply <u>capacity</u> is typically required for a relatively low proportion of time (i.e. only in summer season and then dependent on seasonal climatic conditions) but is nearly always required at some time each season.
    - Energy requirements can vary greatly – up 300% between seasons and, within a season, demand can vary from 100% to near zero with changing weather conditions.

Flexibility

24. Some irrigation systems can provide reasonable time-of-use flexibility and, where possible, this is often a strong driver in the design and operation of irrigation schemes and on-farm systems. The amount of flexibility typically reduces as irrigation demand increases during any season.

25. Irrigation schemes that incorporate some sizeable water storage capacity (buffer storage) within the scheme will normally have some flexibility as to what time of day they operate the primary pumping supply system. For much of the season, with moderate irrigation demand, some schemes are able to schedule their primary pumping to off peak electricity periods. At full irrigation demand however, capital cost constraints on buffer storage size and primary pumping capacity typically mean that the amount of flexibility at full irrigation demand can be as low as 2 - 4 hours before water is restricted to farms.

26. On farm, there is a similar sliding scale of flexibility depending on irrigation demand. In low to moderate conditions, individual farmers can have some ability to schedule irrigation to avoid typical peak electricity demand/price periods although this flexibility diminishes as irrigation demand increases with most on-farm systems designed to operate near full time when conditions are very dry.

27. Some work has been done to look at the cost of non-supply of electricity for irrigation and while there is a relatively low cost for short duration interruptions (especially if there is reasonable notice) the cost of extended outages (eg beyond four hours) can rise sharply. Weather conditions at the time are again very relevant. The 'cost-of-non supply' for irrigators is estimated to range between $2,000/MWh and $5,000/MWh. Reliability of electricity supply is important for irrigators.

28. The incentive for any irrigator, scheme or individual farmer, to operate their system with any level of 'flexibility' is dependent on there being price signals and supply contracts that reflect such variable time-of-use.

29. The impacts of this inherent flexibility on the electricity supply chain mean that irrigation load could be used to manage network or grid peaks if relevant signals (operational or pricing) were available.

Other Relevant Factors

Electricity Generation Opportunities

30. There are many examples where irrigation schemes have or offer the opportunity for hydro generation.

31. In-scheme hydro generation facilities can be associated with large storage facilities (such as Opuha, Falls Dam and the proposed Waimea Community Dam) and they can also be embedded within the irrigation distribution network – typically installed in-line in open channel or piped sections where there is significant gravity head (pressure) available.

32. Some irrigation schemes are able to generate all year round, some are able to generate only when irrigating and a few are only able to generate in the off season (winter).

33. The incorporation of hydro generation within an irrigation scheme provides some valuable 'synergies', especially at a local electricity network level.

34. In the irrigation season, the water available for generation is driven by irrigation demand so at times of high irrigation (and therefore high on-farm electricity demand) the hydro generation tends to naturally reduce peak grid import demand for the local network.

35. In the off season, the embedded hydro generation is able to offset network peak demands.

36. In the face of New Zealand's forecast increase in demand for renewable energy, irrigation schemes can offer ideal opportunities for the development of additional hydro generation capacity. It is important, however, that there are appropriate commercial enabling mechanisms

within the electricity industry pricing structures to support the investment in hydro generation facilities.

37. Historically, embedded generation facilities have benefited from the Avoided Cost of Transmission (ACOT) mechanisms within the transmission pricing framework. This mechanism provided surety and confidence for investment in small hydro facilities and currently, for existing schemes, often represents a significant component of revenue/value to the owners. The review of the TPM over recent years has threatened to disestablish this ACOT mechanism – to the detriment of existing and aspirant small hydro owners and developers.

38. To meet the national targets for renewable energy, of which hydro should still be recognised for its inherent 'quality' above solar and wind, there needs to continue to be appropriate enabling commercial mechanisms within the electricity framework.

Power price rises for commercial users could impact all electricity users

39. We note that the review commented that residential power users in New Zealand have felt the impact of power price rises in recent years. When analysing the range of potential solutions to this issue, it is worthwhile examining the situation in Australia where power prices have risen sharply for commercial users. As a result many have shifted to off-grid electricity solutions. This has worsened the situation for all consumers who remain on electricity network, as the cost of maintaining the network is spread across a smaller number of consumers, resulting in higher power prices and making it more difficult to fund infrastructure improvements. While larger commercial power users have options to find alternative power sources, households have less options and the situation in Australia is an example for New Zealand that increasing power prices to commercial users could potentially negatively affect all power users.

About IrrigationNZ

40. INZ represents over 3,500 irrigator members nationally, including most large irrigation schemes as well as individual irrigators. Our members include a wide range of farmers/ growers – dairy and cropping farmers, horticulturalists, winegrowers, and sheep and beef farmers. We also represent over 140 irrigation service industries – manufacturers, distributors, irrigation design and install companies, and irrigation decision support services.

41. As an organisation we actively promote best practice irrigation and carry out a range of training and education activities, including in efficient water and energy use. Over the last 5 years we have trained over 3,000 irrigators on different aspects of irrigation best practice to improve water use efficiency.

42. INZ members share the same goals as other New Zealanders:
    a. to see improvements to their waterways
    b. to make a contribution to their communities
    c. to make a living for themselves and their families.