SUBMISSION TO "INDEPENDENT PRICING AND REGULATORY TRIBUNAL" NSW

AQUIP SYSTEMS PTY LTD

Submission regarding Draft Document on Embedded Networks in NSW

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Table of Contents

Aquip Systems Pty Ltd

Aquip Systems is an Australian owned company established in 1991. We specialise in instrumentation.

We are leaders in supply of metering solutions for thermal energy and have worked on many projects around Australia and New Zealand.

Scope and purpose of submission

The scope of this submission is to look at reasons that embedded networks with centralised non VRV/VRF plant may be a preferred option for HVAC solutions in residential or similar applications.

The submission aims to give a general overview as well as look at some specific aspects of metering these installations that will provide the accountability and transparency that will bring about lower prices for consumers and better outcomes for all stakeholders.

There are many options and considerations, and this submission does not endeavour to cover any topic in full detail.

This submission generally refers to cooling as it is more prevalent in our climatic condition. It would also be typical that if a centralised cooling system was used in a building then a centralised heating system would be typical (region dependant).

Other government departments referred to are:

NSW Climate and Energy Action: www.energy.nsw.gov.au

National Australian Built Environment Rating System – (NABERS) www.nabers.gov.au

NABERS is a national initiative managed by the NSW Government on behalf of the Federal, State and Territory governments of Australia.

There are likely many other government and independent bodies that are stakeholders including but far from limited too:

Energy Efficiency Council

Green Building Council of Australia

Australian Institute of Refrigeration Airconditioning and HVAC (AIRAH)

Chartered Institute of Building Services Engineers (CIBSE)

Differentiation between hot water for consumption and hot water for heating

It is common to have a centralised plant for production of hot water for consumption (showers, hand basins etc), these are open circuit with water going to sewerage after use. There are several meters available in the market to measure this water that conform

to National Measurements Institute (NMI), Watermark and the appropriate Australian Standards.

This submission only makes comment on closed loop systems where chilled or heated water is used for HVAC. In a closed loop system, the water is cooled or heated and circulated through specific pipework in the building, chills or heats the building, and then flows back to be rechilled or reheated – this is a continuous process.

We believe that water for consumption should be treated separately from water for HVAC applications.

Differentiation between commercial/industrial and residential

In most larger scale commercial, and some industrial applications, it is the norm to have a centralised chiller and boiler set up and this water distributed through the building to provide chilled and heated air via air passing through a Fan Coil Unit (FCU) to occupants.

It is unlikely that these almost exclusively Business to Business transactions would or should change, as they are the accepted method of providing HVAC to the commercial building and industrial sectors. This is due in large part to their long-term lower costs and better efficiency.

Types of Centralised HVAC Plant

There are two main types of Centralised plant.

Variable Refrigerant Flow/Variable Refrigerant Volume VRF/VRV in which essential the refrigerant flow through the building and to each desired area.

Chilled water systems in which Chilled water (or heated) is circulated through the building and the water chills or heats the desired area via a fan coil unit chilled water systems can be either water cooled, or air cooled.

Note that there are countless variations to types available.

Benefits of centralised chilled water HVAC plant

It is well known that in medium to large buildings that a centralised chilled water system is more efficient and cost effective than a VRV/VRF system over the longer term.

We put forward that in a proposed single building or proposed group of buildings with a cooling requirement of 1055 kW or greater (300 Refrigeration Tons) that a centralised Non VRF/VRVchiller be the default cooling method unless the developer can provide a

performance solution that is more efficient, as well as with a lower total cost over the expected life of the building.

Many developers will by default go to a VRV/VRF system as the capital outlay required is typically lower and this leads to lower sell prices of the real-estate and more profits for the developer but likely a worse long-term result for consumers and other stakeholders.

Benefits of an Embedded Network

To keep prices as low as possible for the owners/tenants then nearly always the better outcome is centralised plant, and this must give a lower energy cost to consumers.

With proper metering and knowledge of energy consumption it is highly probable that consumers of energy will adjust their behaviour to reduce energy consumption. This will reduce costs to consumers.

NSW State Government Net Zero targets

The NSW has a target of Net Zero emissions and the way that IPART can assist in reaching this is to mandate Centralised Chilled and heated water HVAC plant wherever it is the most efficient.

More details at

https://www.energy.nsw.gov.au/nsw-plans-and-progress/government-strategies-and-frameworks/reaching-net-zero-emissions/net-zero

Metering

It is noted that in other parties submitted documentation forming parts of this review that thermal metering can be difficult, and this is simply not the case.

Installing a thermal meter is only slightly more work than installing a consumption water meter.

A thermal meter consists of a flow sensor to measure water flow as well as two temperature sensors to measure the temperature of the water going to the billing area and the temperature coming back from the billing area. These are easily installed by any competent and qualified person. There must able be a calculator to calculate energy consumption.

Modern thermal meters are accurate, flexible and a very valuable tool for not only measuring thermal energy but also for increasing efficiency right at the point of metering and allow greater control by the consumer and greater information for the building management to better run central plant.

Typical Installation

Picture from https://www.kamstrup.com/en-en/customer-references/submetering/croonwolter-and-dros

Advantages of Metering

Whilst it may be somewhat convenient to bill thermal energy as part of the cost of rent or on a per square meters basis. This provides no accountability for the owner of the embedded network and no transparency for the consumer.

Some of the capabilities of meters are:

Efficiency Control

Chillers typically work best with a differential of supply and return temperatures of 10 – 15 Degrees Celsius and It is possible to have the meter (with an additional valve) control these values via adjusting flow rate so that each apartment is maximising efficiency of the central plant. This will lead to an increase in energy efficiency of the chiller and lower costs to consumers. These should be considered for all installations.

Pay for use

Consumers pay only for the thermal energy they use.

Tariffs

Time of day tariffs can be set in a meter to reward a consumer for using energy when it is lower price.

Communications

Meters can have up to four communication modules for availability of the usage data in Building Management Systems as well as Energy Management Systems or Billing systems.

Data can be updated to the reading system every few seconds and this would instantly alert building managers of any errors or tampering with the meter.

It is possible to also have data available via an App so that the consumer is fully aware of their energy consumption live.

Information codes

Information codes (error codes) are available from the meter. These would near instantly alert the building manager of any problems in or with the meter and in some cases problems with the served area such as a water leak somewhere in the network.

Logging data

There are several ways to do this, and we recommend that at a minimum the following parameters are logged on a minimum of once every 15 minutes.

- Inlet temperature
- Outlet temperature
- Live flow rate
- Live Power
- Accumulated energy use
- Infocode present

It would be typical for the data to be stored in a centralised logging system but the data will always be stored on the meter should communications be lost or there are more detailed information required.

Many meters will store15 years or more of usage data.

Other comments on meters

Accuracy

Class two meters are the most commonly available and have a Maximum Permissible Error (MPE) of 2% at the designated permanent flow of the meter and at the temperature difference specified in the technical specification. Calibration certificates will often show that the accuracy of any given meter is much better than 2%

Locations of meters

We would recommend that a meter is paced at each billing area and also one for each floor or group of meters. It is far easier to carry out a water or energy balance if there are production meters on the chiller or boiler, floor meters and tenant meters.

Validation

We strongly recommend that meters are validated by a competent person upon installation and some types of meters can be partially re validated using a test device and we recommend that this is carried out after 10 years or after any information (error) codes.

Longevity

We recommend that meters are replaced at an interval no greater than 15 years from installation.

Meter costs

Meters start at around $300 AUD each and this is a very small cost to the overall cost of any project.

Meter types

Thermal meters are available in

- Cooling only
- Heating only
- Combined Heating / cooling meters

Meters should be selected as to be best for the application. This will provide increased level of error codes should the meter be operating out of the design parameters.

Power supply

Meters can be mains powered - including low voltage options. Alternatively, they can be battery powered with batteries lasting 15 years or more in many instances.

Retro Fitting existing Embedded Networks

As these meters are quite easy to install, with little to do disruption to consumers, it is quite feasible to retro fit meters, increasing accountability and transparency of existing systems.

Australian Thermal Metering Standards

For measuring energy for metering of closed circuit hot and cold water for heating and chilling there are no Australian Standard and to our knowledge the only rules around thermal metering in Australia are written by NABERS.

NABERS state that meters used for thermal metering exclusions should comply to EN 1434 Class 2

NABERS interim rules at https://www.nabers.gov.au/sites/default/files/2022-11/Thermal%20Energy%20Systems%20Rules.pdf

NABERS can be used to rate many types of buildings including Office buildings, apartment buildings, retirement living and many others. It would be advantageous if anything that IPART mandated or recommended was not in conflict NABERS.

We recommend that the meters specified for use are certified to the most current version of EN1434 Class 2 (currently 2022) and individual calibration certificates for each meter must be provided and retained. Calibration certificates must show exact calibration results for the specific Flow sensor, Temperature sensors and Calculator.

Europe and Rest of world practice

Throughout Europe and for many decades it has been the case that primarily heated water has been reticulated to consumers from a central energy plant and then metered

to consumers of the water for heating. This is an efficient method of heating occupiers of buildings and provides benefits for all. There is little cooling required in many parts of Europe.

In vast parts Asia apartment living is prevalent. Almost without fail cooling is provided from a central energy plant for that building or group of buildings.

We believe that there are significant advantages for centralise plant in many situations and with correct metering, all stake holders will benefit.

Energy pricing for Embedded Thermal Networks

We make no statement on how this should be calculated but believe that there should be no long-term disadvantage to consumers of thermal energy in an embedded network.

By providing accountability and transparency as well as the most energy and cost-efficient method for cooling and heating, we believe that the price to consumers and results to stakeholders will be the best available.

Questions

Should you have any questions please contact the author at:

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