# Typical meteorological year weather files for building energy modelling

## User Guide

Zhengen Ren, Zhi Tang, Melissa James
21 August 2024

Citation

Ren Z, Tang Z and James M (2021) Typical meteorological year weather files for building energy modelling - User Guide. CSIRO, Australia.

Copyright

Important disclaimer

# Contents

# Figures

# Tables

# Document History

| DATE | VERSION NO | DESCRIPTION |
|---|---|---|
| 2024-06-26 | 5 | Change in way time mapped from NatHERS to .epw format; Change in how radiation data obtained; Addition of this document history table |
| 2024-08-21 | 6 | New .epw dataset published to fix formatting issues in .epw dataset: year format 'yy' changed to 'yyyy'; 'DAYLIGHT SAVING' in header changed to 'DAYLIGHT SAVINGS' |
|  |  |  |
|  |  |  |
|  |  |  |

# Acknowledgments

# 1    Introduction

This report describes the development of typical meteorological year (TMY) weather files suitable for use by building energy simulation software that require weather data in the EnergyPlus (.epw) format.

In 2016, the New Zealand National Institute of Water and Atmospheric Research (NIWA) developed typical meteorological year weather files suitable for use in residential building energy simulations which use Nationwide House Energy Rating Scheme (NatHERS) software. These weather files are known as Reference Meteorological Year (RMY) weather files. They are based on historical Bureau of Meteorology (BOM) weather data drawn from the period 1990 to 2015. To make these files suitable for use by software such as EnergyPlus, ESP-r and IESVE some parameters were added, and the file was converted to the format (.epw) required by the software. Figure 1 gives an overview of the process by which the typical meteorological year weather files were created.

Section 2 describes the typical meteorological year weather dataset. Section 1 describes the transformations necessary for converting the typical meteorological year weather files suitable for NatHERS software to the format and content required by software such as EnergyPlus, ESP-r and IESVE (in .epw format).
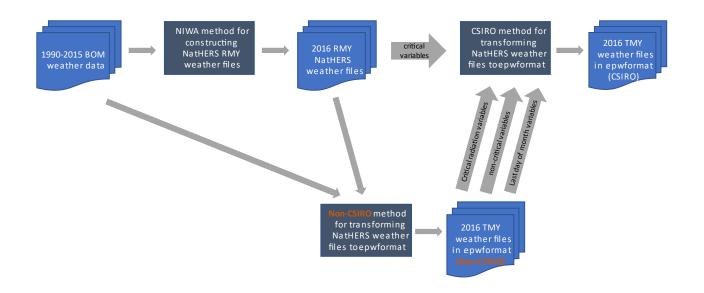


**Figure 1 Overview of creation of typical meteorological year weather files**

# 2 The dataset

The typical meteorological year weather dataset 'Typical meteorological year weather files in .epw format' consists of 83 text files in a single zip file. Each text file contains one year of weather data in hourly intervals for one of 83 Australian locations.

The typical meteorological year weather data is based on historical weather data drawn from the years 1990 to 2015.

The data is in the EnergyPlus (.epw) format and can be used by building simulation software such as EnergyPlus, ESP-r, and IESVE.

## 2.1 File naming

Each of the 83 files in the dataset has a unique name of the form:

> *nn*_CZ*mmmm_aa*_NH16_TMY.epw

For example:

> 60_CZ0607_TU_NH16_TMY.epw

Where:

> *nn* = NatHERS climate zone
>
> *mmmm* = Australian Climate Data Bank (ACDB) climate zone
>
> *aa* = Location name code

## 2.2 Locations

Typical meteorological year weather files exist for 83 locations around Australia (Table 1).

**Table 1 Locations**

| NATHERS CLIMATE ZONE | ACDB CLIMATE ZONE | LOCATION CODE | LOCATION NAME | POSTCODE | STATE | LONGITUDE | LATITUDE |
|---|---|---|---|---|---|---|---|
| **1** | CZ0101 | DA | Darwin | 800 | NT | 130.9 | -12.4 |
| **2** | CZ0110 | HE | Pt Hedland | 6721 | WA | 118.6 | -20.4 |
| **3** | CZ0304 | LO | Longreach | 4730 | QLD | 144.3 | -23.4 |
| **4** | CZ0307 | CR | Carnarvon | 6701 | WA | 113.7 | -24.9 |
| **5** | CZ0109 | TO | Townsville | 4810 | QLD | 146.8 | -19.3 |
| **6** | CZ0306 | AL | Alice Springs | 870 | NT | 133.9 | -23.8 |
| **7** | CZ0202 | RO | Rockhampton | 4700 | QLD | 150.5 | -23.4 |
| **8** | CZ0404 | MO | Moree | 2400 | NSW | 149.9 | -29.5 |
| **9** | CZ0206 | AM | Amberley | 4306 | QLD | 152.7 | -27.6 |
| **10** | CZ0205 | BR | Brisbane | 4000 | QLD | 153.1 | -27.4 |

| NATHERS CLIMATE ZONE | ACDB CLIMATE ZONE | LOCATION CODE | LOCATION NAME | POSTCODE | STATE | LONGITUDE | LATITUDE |
|---|---|---|---|---|---|---|---|
| 11 | CZ0207 | CH | Coffs Harbour | 2450 | NSW | 153.1 | -30.3 |
| 12 | CZ0503 | GE | Geraldton | 6530 | WA | 114.7 | -28.8 |
| 13 | CZ0505 | PE | Perth | 6000 | WA | 115.9 | -31.9 |
| 14 | CZ0701 | AA | Armidale (old Tamworth) | 2350 | NSW | 151.7 | -30.5 |
| 15 | CZ0509 | WE | Williamtown | 2300 | NSW | 151.8 | -32.8 |
| 16 | CZ0514 | AD | Adelaide | 5000 | SA | 138.6 | -34.9 |
| 17 | CZ0512 | SY | Sydney RO (Observatory Hill) | 2000 | NSW | 151.2 | -33.9 |
| 18 | CZ0604 | NO | Nowra | 2541 | NSW | 150.5 | -35 |
| 19 | CZ0310 | CV | Charleville | 4470 | QLD | 146.3 | -26.4 |
| 20 | CZ0414 | WA | Wagga | 2650 | NSW | 147.5 | -35.2 |
| 21 | CZ0609 | ME | Melbourne RO | 3000 | VIC | 145 | -37.8 |
| 22 | CZ0612 | SE | East Sale | 3852 | VIC | 147.1 | -38.1 |
| 23 | CZ0707 | LT | Launceston (Ti Tree Bend) | 7250 | TAS | 147.1 | -41.4 |
| 24 | CZ0703 | CA | Canberra | 2600 | ACT | 149.2 | -35.3 |
| 25 | CZ0801 | CM | Cabramurra (old Alpine) | 2629 | NSW | 148.4 | -35.9 |
| 26 | CZ0709 | HO | Hobart | 7000 | TAS | 147.5 | -42.8 |
| 27 | CZ0413 | MI | Mildura | 3500 | VIC | 142.1 | -34.2 |
| 28 | CZ0602 | RI | Richmond | 2753 | NSW | 150.8 | -33.6 |
| 29 | CZ0102 | WP | Weipa | 4874 | QLD | 141.9 | -12.7 |
| 30 | CZ0104 | WY | Wyndham | 6740 | WA | 128.1 | -15.5 |
| 31 | CZ0105 | WS | Willis Island | 4871 | QLD | 150 | -16.3 |
| 32 | CZ0106 | CN | Cairns | 4870 | QLD | 145.8 | -16.9 |
| 33 | CZ0108 | BM | Broome | 6725 | WA | 122.2 | -18 |
| 34 | CZ0111 | LM | Learmonth | 6707 | WA | 114.1 | -22.2 |
| 35 | CZ0201 | MK | Mackay | 4740 | QLD | 149.2 | -21.1 |
| 36 | CZ0203 | GL | Gladstone | 4680 | QLD | 151.3 | -23.9 |
| 37 | CZ0301 | HA | Halls Creek | 6770 | WA | 127.7 | -18.2 |
| 38 | CZ0302 | TE | Tennant Creek | 860 | NT | 134.1 | -19.6 |
| 39 | CZ0303 | IS | Mt Isa | 4825 | QLD | 149.2 | -21.1 |
| 40 | CZ0305 | NE | Newman | 6753 | WA | 119.7 | -23.4 |
| 41 | CZ0401 | GI | Giles | 6438 | WA | 128.3 | -25 |
| 42 | CZ0402 | MT | Meekatharra | 6642 | WA | 118.5 | -26.6 |
| 43 | CZ0403 | OO | Oodnadatta | 5734 | SA | 135.5 | -27.6 |
| 44 | CZ0406 | KA | Kalgoorlie | 6430 | WA | 121.5 | -30.8 |
| 45 | CZ0408 | WO | Woomera | 5720 | SA | 136.8 | -31.2 |
| 46 | CZ0409 | CO | Cobar | 2835 | NSW | 145.8 | -31.5 |
| 47 | CZ0410 | BI | Bickley | 6076 | WA | 116.1 | -32 |

| NATHERS CLIMATE ZONE | ACDB CLIMATE ZONE | LOCATION CODE | LOCATION NAME | POSTCODE | STATE | LONGITUDE | LATITUDE |
|---|---|---|---|---|---|---|---|
| 48 | CZ0411 | DU | Dubbo | 2830 | NSW | 148.6 | -32.2 |
| 49 | CZ0412 | KT | Katanning | 6317 | WA | 117.6 | -33.7 |
| 50 | CZ0501 | OA | Oakey | 4401 | QLD | 151.7 | -27.4 |
| 51 | CZ0504 | FO | Forrest | 6434 | WA | 128.1 | -30.8 |
| 52 | CZ0506 | SW | Swanbourne | 6010 | WA | 115.8 | -32 |
| 53 | CZ0507 | CE | Ceduna | 5690 | SA | 133.7 | -32.1 |
| 54 | CZ0508 | MD | Mandurah | 6210 | WA | 115.7 | -32.5 |
| 55 | CZ0510 | EP | Esperance | 6450 | WA | 121.9 | -33.8 |
| 56 | CZ0513 | MA | Mascot (Sydney Airport) | 2020 | NSW | 151.2 | -33.9 |
| 57 | CZ0603 | MJ | Manjimup | 6258 | WA | 116.1 | -34.2 |
| 58 | CZ0605 | AB | Albany | 6330 | WA | 117.8 | -35 |
| 59 | CZ0606 | ML | Mt Lofty | 5240 | SA | 138.7 | -35 |
| 60 | CZ0607 | TU | Tullamarine (Melbourne Airport) | 3020 | VIC | 144.9 | -37.7 |
| 61 | CZ0610 | MG | Mt Gambier | 5290 | SA | 140.8 | -37.8 |
| 62 | CZ0611 | MR | Moorabbin | 3189 | VIC | 145.1 | -38 |
| 63 | CZ0613 | WR | Warrnambool | 3280 | VIC | 142.4 | -38.3 |
| 64 | CZ0614 | OT | Cape Otway | 3220 | VIC | 143.5 | -38.9 |
| 65 | CZ0702 | OR | Orange | 2800 | NSW | 149.1 | -33.4 |
| 66 | CZ0705 | BA | Ballarat | 3350 | VIC | 143.8 | -37.5 |
| 67 | CZ0706 | LD | Low Head | 7253 | TAS | 146.8 | -41.1 |
| 68 | CZ0708 | LU | Launceston Airport | 7120 | TAS | 147.2 | -41.5 |
| 69 | CZ0802 | TH | Thredbo (Village) | 2625 | NSW | 148.3 | -36.5 |
| 70 | CZ0502 | TW | Toowoomba | 4350 | QLD | 151.9 | -27.6 |
| 71 | CZ0107 | AT | Atherton | 4880 | QLD | 145.5 | -17.3 |
| 72 | CZ0405 | RX | Roxby Downs | 5725 | SA | 136.9 | -30.5 |
| 73 | CZ0204 | MN | Maleny | 4552 | QLD | 152.9 | -26.8 |
| 74 | CZ0103 | KN | Katherine | 853 | NT | 132.3 | -14.4 |
| 75 | CZ0515 | AC | Adelaide Coastal (AMO) | 5950 | SA | 138.5 | -35 |
| 76 | CZ0407 | TA | Tamworth | 2340 | NSW | 150.8 | -31.1 |
| 77 | CZ0511 | PA | Parramatta | 2200 | NSW | 151 | -33.8 |
| 78 | CZ0704 | SU | Sub-Alpine (Cooma Airport) | 2630 | NSW | 149 | -36.3 |
| 79 | CZ0601 | BL | Blue Mountains | 2785 | NSW | 149 | -21.5 |
| 80 | CZ0608 | CS | Coldstream | 3770 | VIC | 145.4 | -37.7 |
| 81 | CZ0516 | BU | Busselton | 6280 | WA | 115.4 | -33.7 |
| 82 | CZ0208 | GM | Glasshouse mountains | 4519 | QLD | 153 | -27 |
| 83 | CZ0112 | XI | Christmas Island | 6798 | WA | 96.8 | -12.2 |

## 2.3    EnergyPlus weather file (.epw) format

The EnergyPlus weather file format (.epw) is a text format with variable values separated by commas. The file structure is shown in Table 2. A sample of the data is shown in Figure 2.

The format is based on TMY2 which is a strict, position-specific format, with missing data filled with nines.  SI units were used for all the data. Each weather file has basic (header) information followed by time step data.

The first eight lines provide basic information, including longitude, latitude, time zone, elevation, annual design conditions, monthly average ground temperatures, typical and extreme periods, holidays/daylight savings periods, and data periods.

The remaining lines provide time step data, including Dry Bulb Temperature, Dew Point Temperature, Relative Humidity, Atmospheric Station Pressure, Radiation (Extraterrestrial Horizontal, Extraterrestrial Direct Normal, Horizontal Infrared Radiation from Sky, Global Horizontal, Direct Normal, Diffuse Horizontal), Illuminance (Global Horizontal, Direct Normal, Diffuse Horizontal, Zenith), Wind (Direction, Speed), Sky Cover (Total, Opaque, Visibility, Ceiling Height), Present Weather (Observation, Codes), Precipitable Water, Aerosol Optical Depth, and Snow (Depth, Days Since Last Snowfall).

**Table 2 EnergyPlus (.epw) weather file format (adapted from Crawley, Lawrie and Hand, 1999)**

LOCATION, A1 [City], A2 [State Province Region], A3 [Country], A4 [Data Source], N1 [WMO Number], N2 [Latitude {+N –S: -90.0 to +90.0: degrees minutes in decimal}], N3 [Longitude {-W +E: -180.0 to +180.0:degrees minutes in decimal}], N4 [Time Zone {-12.00 to +12.00: GMT-12 to GMT+12: partial hours in decimal}], N5 [Elevation {m: -1000.0 to +9999.9}],

DESIGN CONDITIONS, N1 [Annual Extreme Daily Mean Maximum Dry Bulb Temp {C}], N2 [Annual Extreme Daily Mean Minimum Dry Bulb Temp {C}], N3 [Annual Extreme Daily Standard Deviation Maximum Dry Bulb Temp {C}], N4 [Annual Extreme Daily Standard Deviation Minimum Dry Bulb Temp {C}], N5 [99.6% Heating Dry Bulb Temp {C}], N6 [99% Heating Dry Bulb Temp {C}],N7 [98% Heating Dry Bulb Temp {C}],N8 [0.4% Cooling Dry Bulb Temp {C}], N9 [0.4% Mean Coincident Wet Bulb Temp{C}], N10 [1.0% Cooling Dry Bulb Temp {C}], N11 [1.0% Mean Coincident Wet Bulb Temp {C}], N12 [2.0% Cooling Dry Bulb Temp {C}], N13 [2.0% Mean Coincident Wet Bulb Temp {C}], N14 [0.4% Cooling Dew Point Temp {C}], N15 [0.4% Mean Coincident Dry Bulb Temp {C}], N16 [0.4% Humidity Ratio {g/kg}], N17 [0.4% Relative Humidity], N18 [1.0% Cooling Dew Point Temp {C}], N19 [1.0% Mean Coincident Dry Bulb Temp {C}], N20 [1.0% Humidity Ratio {g/kg}], N21 [1.0% Relative Humidity], N22 [2.0% Cooling Dew Point Temp {C}], N23 [2.0% Mean Coincident Dry Bulb Temp {C}], N24 [2.0% Humidity Ratio {g/kg}], N25 [2.0% Relative Humidity], N26 [Daily Range of Dry Bulb Temp {C}], N27 [Heating Degree Days Base Temp {C}], N28 [Heating Degree Days], N29 [Cooling Degree Days Base Temp {C}], N30 [Cooling Degree Days]

TYPICAL/EXTREME PERIODS, N1 [Number of Typical/Extreme Periods], A1[Typical/Extreme Period 1], A2 [Period 1 Start Day], A3 [Period 1 End Day], A4 [Typical/Extreme Period 2], A5 [Period 2 Start Day], A6 [Period 2 End Day], A7 [Typical/Extreme Period 3], A8 [Period 3 Start Day], A9 [Period 3 End Day], A10 [Typical/Extreme Period 4], A11 [Period 4 Start Day], A12 [Period 4 End Day], A13 [Typical/Extreme Period 5], A14 [Period 5 Start Day], A15 [Period 5 End Day], A16 [Typical/Extreme Period 6], A17 [Period 6 Start Day], A18 [Period 6 End Day], A19 [Typical/Extreme Period 7], A20 [Period 7 Start Day], A21 [Period 7 End Day], A22 [Typical/Extreme Period 8], A23 [Period 8 Start Day], A24 [Period 8 End Day]

GROUND TEMPERATURES, N1 [Number of Ground Temp Depths], N2 [Ground Temp Depth 1 {m}], N3 [Depth 1 Soil Conductivity {W/(mK)}], N4 [Depth 1 Soil Density {kg/m3}], N5 [Depth 1 Soil Specific Heat {kJ/(kgK)}], N6 [Depth 1 January Average Ground Temp {C}], N7 [Depth 1 February Average Ground Temp {C}], N8 [Depth 1 March Average Ground Temp {C}], N9 [Depth 1 April Average Ground Temp {C}], N10 [Depth 1 May Average Ground Temp {C}], N11 [Depth 1 June Average Ground Temp {C}], N12 [Depth 1 July Average Ground Temp {C}], N13 [Depth 1 August Average Ground Temp {C}], N14 [Depth 1 September Average Ground Temp {C}], N15 [Depth 1 October Average Ground Temp {C}], N16 [Depth 1 November Average Ground Temp {C}], N17 [Depth 1 December Average Ground Temp {C}], N18 [Ground Temp Depth 2{m}], N19 [Depth 2 Soil Conductivity {W/(mK)}], N20 [Depth 2 Soil Density {kg/m3}], N21 [Depth 2 Soil Specific Heat {kJ/(kgK)}], N22 [Depth 2 January Average Ground Temp {C}], N23 [Depth 2 February Average Ground Temp {C}], N24 [Depth 2 March Average Ground Temp {C}], N25 [Depth 2 April Average Ground Temp {C}], N26 [Depth 2 May Average Ground Temp {C}], N27 [Depth 2 June Average Ground Temp {C}], N28 [Depth 2 July Average Ground Temp {C}], N29 [Depth 2 August Average Ground Temp {C}], N30 [Depth 2 September Average Ground Temp {C}], N31 [Depth 2 October Average Ground Temp {C}], N32 [Depth 2 November Average Ground Temp {C}], N33 [Depth 2 December Average Ground Temp {C}], N34 [Ground Temp Depth 3 {m}], N35 [Depth 3 Soil Conductivity {W/(mK)}], N36 [Depth 3 Soil Density {kg/m3}], N37 [Depth 3 Soil Specific Heat {kJ/(kgK)}], N38 [Depth 3 January Average Ground Temp {C}], N39 [Depth 3 February Average Ground Temp {C}], N40 [Depth 3 March Average Ground Temp {C}], N41 [Depth 3 April Average Ground Temp {C}], N42 [Depth 3 May Average Ground Temp {C}], N43 [Depth 3 June Average Ground Temp {C}], N44 [Depth 3 July Average Ground Temp {C}], N45 [Depth 3 August Average Ground Temp {C}], N46 [Depth 3 September Average Ground Temp {C}], N47 [Depth 3 October Average Ground Temp {C}], N48 [Depth 3 November Average Ground Temp {C}], N49 [Depth 3 December Average Ground Temp {C}]

HOLIDAYS/DAYLIGHT SAVINGS, A1 [Day of Week], A2 [Daylight Savings Start Day], A3 [Daylight Savings End Day], N1 [Number of Holidays, A4 [Holiday 1 Name], A5 [Holiday 1 Day], … , Ax [Holiday N Name], Ay [Holiday N Day]

COMMENTS 1, A1 [Comments 1]

COMMENTS 2, A1 [Comments 2]

DATA PERIODS, N1 [Number of Data Periods], A1 [Data Period 1 Name/Description], A2 [Data Period 1 Start Day], A3 [Data Period 1 End Day], A4 [Data Period 2 Name/Description], A5 [Data Period 2 Start Day], A6 [Data Period 2 End Day], A7 [Data Period 3 Name/Description], A8 [Data Period 3 Start Day], A9 [Data Period 3 End Day], A10 [Data Period 4 Name/Description], A11 [Data Period 4 Start Day], A12 [Data Period 4 End Day], A13 [Data Period 5 Name/Description], A14 [Data Period 5 Start Day], A15 [Data Period 5 End Day], A16 [Data Period 6 Name/Description], A17 [Data Period 6 Start Day], A18 [Data Period 6 End Day], A19 [Data Period 7 Name/Description], A20 [Data Period 7 Start Day], A21 [Data Period 7 End Day], A22 [Data Period 8 Name/Description], A23 [Data Period 8 Start Day], A24 [Data Period 8 End Day], A25 [Data Period 9 Name/Description], A26 [Data Period 9 Start Day], A27 [Data Period 9 End Day], A28 [Data Period 10 Name/Description], A29 [Data Period 10 Start Day], A30 [Data Period 10 End Day], A31 [Data Period 11 Name/Description], A32 [Data Period 11 Start Day], A33 [Data Period 11 End Day], A34 [Data Period 12 Name/Description], A35 [Data Period 12 Start Day], A36 [Data Period 12 End Day]

N1 [Year], N2 [Month {1-12}], N3 [Day {1-31}], N4 [Hour {0-23}], N5 [Minute {0-59}], A1 [Data Source and Uncertainty Flags], N6 [Dry Bulb Temp {C}],N7 [Dew Point Temp {C}], N8 [Relative Humidity {0.0 to 1.0}], N9 [Atmospheric Station Pressure {mb}], N10 [Extraterrestrial Horizontal Radiation {Wh/m2}], N11 [Extraterrestrial Direct Normal Radiation {Wh/m2}], N12 [Horizontal Infrared Radiation from Sky {Wh/m2}], N13 [Global Horizontal Radiation {Wh/m2}], N14 [Direct Normal Radiation {Wh/m2}], N15 [Diffuse Horizontal Radiation {Wh/m2}], N16 [Global Horizontal Illuminance {lux}], N17 [Direct NormalIlluminance {lux}],N18 [Diffuse Horizontal Illuminance {lux}], N19 [Zenith Luminance {Cd/m2}], N20 [Wind Direction {degrees}], N21 [Wind Speed {m/s}],N22 [Total Sky Cover], N23 [Opaque Sky Cover], N24 [Visibility {km}], N25 [Ceiling Height {m}], N26 [Present Weather Observation], A2 [Present Weather Codes], N27 [Precipitable Water {mm}], N28 [Aerosol Optical Depth {thousandths}],N29 [Snow Depth {cm}], N30 [Days Since Last Snowfall]

```
LOCATION,Mascot (Sydney AP),NSW,Australia,NatHERS-TMY2 BoM 66037 CZ0513,947670,-33.94,151.17,10.0,5
DESIGN CONDITIONS,0
TYPICAL/EXTREME PERIODS,0
GROUND TEMPERATURES,0
HOLIDAYS/DAYLIGHT SAVING,No,0,0,0
COMMENTS 1,TMY2 months selected from 1990-  2016 out of 26 years of data; after Marion & Urban (1995), US National Renewable Energy Lab, NREL/SP-463-7668. Data reliability GOOD.
COMMENTS 2,Weights: T_dry 0.20, T_dew 0.20, Wind 0.10, R_glob 0.25, R_dir 0.25. Details in NIWA Client report 2019175WN, Ben Liley <Ben.Liley@niwa.co.nz>, Apr 2020.
DATA PERIODS,1,1,TMY2 Year,Sunday,1/1,12/31
2070,01,01,01,60,E8E8E8E8?0?3?3?3I4I4I6I5B8B8E8E8?0?0E8?0?0?0,20.7,12.5,59,101800,0,1407,9999,0,0,0,0,0,0,0,315,2.4,1,99,9999.,99999,9,999999999,23,0.999,99,99
2070,01,01,02,60,A7A7A7A7?0?3?3?3I4I4I6I5A7A7E8E8?0?0A7?0?0?0,20.8,12.4,58,101600,0,1407,9999,0,0,0,0,0,0,0,337,2.5,1,99,9999.,99999,9,999999999,23,0.999,99,99
2070,01,01,03,60,A7A7A7A7?0?3?3?3I4I4I6I5A7A7E8E8?0?0A7?0?0?0,20.9,12.4,58,101600,0,1407,9999,0,0,0,0,0,0,0,337,2.9,1,99,9999.,99999,9,999999999,23,0.999,99,99
2070,01,01,04,60,A7A7A7A7?0?3?3?3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,20.3,12.3,59,101600,0,1407,9999,0,0,0,0,0,0,0,337,2.9,1,99,9999.,99999,9,999999999,22,0.999,99,99
2070,01,01,05,60,A7A7A7A7?0?3?3?3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,19.0,12.2,64,101600,0,1407,9999,0,0,0,0,0,0,0,315,2.4,1,99,9999.,99999,9,999999999,23,0.999,99,99
2070,01,01,06,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,19.2,12.5,65,101600,16,1407,9999,5,4,5,8544,4612,3949,26,360,2.4,1,99,9999.,99999,9,999999999,23,0.999,99,99
2070,01,01,07,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,19.6,12.5,63,101700,293,1407,9999,176,637,42,32735,68628,6235,76,337,2.9,1,99,9999.,99999,9,999999999,23,0.999,99,99
2070,01,01,08,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,21.0,12.4,57,101700,572,1407,9999,416,933,37,58640,92780,7410,121,315,2.9,1,99,9999.,99999,9,999999999,21,0.999,99,99
2070,01,01,09,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,23.4,11.0,45,101700,832,1407,9999,655,1056,32,81360,99141,12138,190,360,5.5,0,99,9999.,99999,9,999999999,21,0.999,99,99
2070,01,01,10,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,25.1,11.0,40,101700,1056,1407,9999,862,1106,42,98685,101725,14038,279,360,3.4,0,99,9999.,99999,9,999999999,21,0.999,99,99
2070,01,01,11,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,26.5,10.9,37,101700,1230,1407,9999,1007,1098,49,110678,102917,14841,442,360,4.0,1,99,9999.,99999,9,999999999,21,0.999,99,99
2070,01,01,12,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,27.0,10.9,36,101600,1341,1407,9999,1104,1093,61,116454,103322,14882,715,45,4.0,0,99,9999.,99999,9,999999999,20,0.999,99,99
2070,01,01,13,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,27.9,10.6,33,101600,1381,1407,9999,1135,1081,72,116253,103320,14759,964,45,5.8,0,99,9999.,99999,9,999999999,20,0.999,99,99
2070,01,01,14,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,28.4,10.5,32,101500,1348,1407,9999,1107,1094,59,109506,103117,13644,696,45,7.9,0,99,9999.,99999,9,999999999,21,0.999,99,99
2070,01,01,15,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,29.0,10.9,32,101500,1245,1407,9999,1011,1097,49,96695,102103,11794,391,45,8.2,0,99,9999.,99999,9,999999999,20,0.999,99,99
2070,01,01,16,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,28.4,10.2,31,101400,1077,1407,9999,862,1092,42,79218,100550,9414,226,45,7.9,0,99,9999.,99999,9,999999999,22,0.999,99,99
2070,01,01,17,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,28.3,11.5,35,101400,857,1407,9999,664,1056,33,55871,92101,8104,158,45,8.2,1,99,9999.,99999,9,999999999,22,0.999,99,99
2070,01,01,18,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,27.9,11.5,36,101400,600,1407,9999,426,927,31,30087,71823,7243,122,45,7.9,3,99,9999.,99999,9,999999999,23,0.999,99,99
2070,01,01,19,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,26.6,12.4,41,101500,322,1407,9999,172,535,49,3153,57,3156,111,45,7.4,8,99,9999.,99999,9,999999999,25,0.999,99,99
2070,01,01,20,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,25.6,13.5,46,101600,44,1407,9999,0,0,0,0,0,0,0,45,6.4,1,99,9999.,99999,9,999999999,26,0.999,99,99
2070,01,01,21,60,A7A7A7A7?0?3?3?3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,24.9,14.1,50,101600,0,1407,9999,0,0,0,0,0,0,0,22,6.9,1,99,9999.,99999,9,999999999,27,0.999,99,99
2070,01,01,22,60,A7A7A7A7?0?3?3?3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,24.3,14.5,54,101700,0,1407,9999,0,0,0,0,0,0,0,45,4.5,2,99,9999.,99999,9,999999999,28,0.999,99,99
2070,01,01,23,60,A7A7A7A7?0?3?3?3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,24.2,15.0,56,101700,0,1407,9999,0,0,0,0,0,0,0,45,4.5,2,99,9999.,99999,9,999999999,28,0.999,99,99
2070,01,01,24,60,A7A7A7A7?0?3?3?3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,23.3,15.5,61,101700,0,1407,9999,0,0,0,0,0,0,0,45,4.5,2,99,9999.,99999,9,999999999,29,0.999,99,99
2070,01,02,01,60,A7A7A7A7?0?3?3?3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,23.1,15.6,62,101700,0,1407,9999,0,0,0,0,0,0,0,45,2.4,1,99,9999.,99999,9,999999999,29,0.999,99,99
2070,01,02,02,60,A7A7A7E8?0?3?3?3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,23.0,15.8,63,101600,0,1407,9999,0,0,0,0,0,0,0,22,2.4,1,99,9999.,99999,9,999999999,29,0.999,99,99
2070,01,02,03,60,A7A7A7A7?0?3?3?3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,21.9,15.6,67,101600,0,1407,9999,0,0,0,0,0,0,0,337,1.8,1,99,9999.,99999,9,999999999,28,0.999,99,99
2070,01,02,04,60,A7A7A7A7?0?3?3?3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,21.9,15.3,65,101600,0,1407,9999,0,0,0,0,0,0,0,360,1.3,1,99,9999.,99999,9,999999999,28,0.999,99,99
2070,01,02,05,60,A7A7A7A7?0?3?3?3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,20.9,15.3,70,101600,0,1407,9999,0,0,0,0,0,0,0,315,2.1,1,99,9999.,99999,9,999999999,28,0.999,99,99
2070,01,02,06,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,20.9,15.3,70,101700,13,1407,9999,4,1,4,7750,2154,4258,23,315,2.4,1,99,9999.,99999,9,999999999,28,0.999,99,99
2070,01,02,07,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,21.7,15.0,65,101700,290,1407,9999,162,531,52,28988,56931,8647,88,337,2.1,1,99,9999.,99999,9,999999999,28,0.999,99,99
2070,01,02,08,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,23.8,15.0,57,101800,569,1407,9999,396,849,52,56934,90188,7128,119,337,2.4,1,99,9999.,99999,9,999999999,26,0.999,99,99
2070,01,02,09,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,25.4,14.2,49,101800,829,1407,9999,632,994,45,79744,99804,8701,162,360,4.8,1,99,9999.,99999,9,999999999,24,0.999,99,99
2070,01,02,10,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,26.5,12.6,41,101800,1054,1407,9999,834,1045,50,97193,102142,11042,243,22,5.5,1,99,9999.,99999,9,999999999,22,0.999,99,99
2070,01,02,11,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,27.9,11.8,36,101800,1228,1407,9999,985,1052,65,108747,102994,11958,376,45,7.9,2,99,9999.,99999,9,999999999,20,0.999,99,99
2070,01,02,12,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,28.3,10.5,32,101800,1340,1407,9999,1077,1041,85,114034,102750,12317,605,22,8.2,1,99,9999.,99999,9,999999999,20,0.999,99,99
2070,01,02,13,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,29.3,10.3,30,101700,1381,1407,9999,1104,1020,102,114414,103691,11487,763,22,7.9,0,99,9999.,99999,9,999999999,22,0.999,99,99
2070,01,02,14,60,A7A7A7A7?0A3A3D3I4I4I6I5A7A7A7A7?0?0A7?0?0?0,29.9,11.3,31,101700,1348,1407,9999,1081,1043,80,108524,103569,11195,585,45,8.8,1,99,9999.,99999,9,999999999,23,0.999,99,99
```

**Figure 2 Sample of .epw format data**

# 3 CSIRO methodology for converting weather files in NatHERS format to .epw format

In 2016, the New Zealand National Institute of Water and Atmospheric Research (NIWA) developed typical meteorological year weather files suitable for use in Australian residential building energy simulations which use Nationwide House Energy Rating Scheme (NatHERS) software (NIWA 2017). These weather files are known as Reference Meteorological Year (RMY) weather files. They are based on 26 years of historical weather data from the period 1990-2015. The NatHERS RMY weather file has a position-specific text format. The file structure is shown in Figure 3. A sample of the data is shown in Figure 4. Weather data includes dry bulb temperature, absolute humidity, atmospheric pressure, wind (speed, direction), solar radiation (global, direct, diffuse), cloud cover, solar altitude, and solar azimuth.

To make these files suitable for use by software such as EnergyPlus, ESP-r, and IESVE, some parameters were added, and the file was converted to the format (.epw) required by the software. The EnergyPlus (.epw) format requires some variables that are not contained in the NatHERS RMY format, such as relative humidity and dew point temperature. The critical variables were derived from variables contained within the NatHERS RMY files. Other values were filled with values from a version of the 2016 TMY weather files that was created by a third party (referred to as '2016 Non-CSIRO TMY weather files').

Relative Humidity and Dew Point Temperature were calculated using the NatHERS variables Dry Bulb Temperature, Absolute Humidity, and Atmospheric Pressure as described in Equations 6-10 (Snyder 2005, Buck 1981).

$$RH = \frac{P_v}{P_s} \times 100 \tag{6}$$

$$P_v = \frac{AH \times (T + 273.16)}{2165} \tag{7}$$

$$P_s = (1.0007 + 3.46 \times P \times 10^{-6}) \times 6.1121 \times e^{17.502T/(240.97+T)} \tag{8}$$

$$T_d = \frac{237.3 \times b}{1 - b} \tag{9}$$

$$b = \frac{LN\left(\frac{RH}{100}\right)}{17.27} + \frac{T}{237.3 + T} \tag{10}$$

Where:

- *RH* is the relative humidity (%)
- $P_v$ is the vapour pressure of the air (mbar)
- $P_s$ is the saturation vapour pressure of the air (mbar)
- *AH* is the absolute humidity (g/m³)
- *T* is the dry-bulb temperature of the air (°C)
- *P* is the absolute pressure of the air (mbar)
- $T_d$ is the dew point temperature (°C)

Some variables have different units and conversion was necessary to account for this (e.g. conversion from kPa to mb for Atmospheric Pressure). Table 3 summarises the origin of each variable value in the EnergyPlus (.epw) format.

```
Characters          Item

  1 - 2  location identification (e.g.ME represents Melbourne)
  3 - 4  year (e.g. 67)
  5 - 6  month (i.e. 1 - 12)
  7 - 8  day (i.e. 1 - 31)
  9 - 10 hour standard (i.e. 0-23, 0 = midnight)
 11 - 14 dry bulb temperature (10-1 °C)
 15 - 17 absolute moisture content (10-1 g/kg)
 18 - 21 atmospheric pressure (10-1 kPa)
 22 - 24 wind speed (10-1 m/s)
 25 - 26 wind direction (0-16; 0 = CALM.  1 = NNE ,...,16 = N)
 27      total cloud cover  (oktas, 0 - 8)
 28      flag relating to dry bulb temperature
 29      flag relating to absolute moisture content
 30      flag relating to atmospheric pressure
 31      flag relating to wind speed and direction
 32      flag relating to total cloud cover
 33      blank
 34 - 37 global solar irradiance on a horizontal plane (W/m2)
 38 - 40 diffuse solar irradiance on a horizontal plane (W/m2)
 41 - 44 direct solar irradiance on a plane normal to the beam (W/m2)
 45 - 46 solar altitude (degrees, 0-90)
 47 - 49 solar azimuth (degrees, 0-360)
 50      flag relating to global and diffuse solar irradiance
 51      flag                                }
 52 - 56 Australian Met Station Number       } Some locations only
 57 - 61 wet bulb temperature (10-1 °C)       }
 62 - 81 Station name (first line only)       }

Values for flags relating to standard surface meteorological data (columns 28 - 32)

0  means that the value is measured value
1  means that the value is estimated to replace a missing measurement
2  means that the value is an interpolating between three-hourly measurements
3  missing value

  Values for flag relating to solar radiation data (column 50)

0  means that both global and diffuse irradiance values are based on measurements
1  means that both global and diffuse irradiance values are estimated to
   replace a missing measurement
2  means that the global irradiance value is based on measurement but the
   diffuse irradiance value is estimated to replace a missing measurement
3  missing value or estimated value from cloud cover data
4  interpolated value from three hourly data
```

Figure 3 NatHERS weather file structure

```
MA120101 0 207 951018 24141000010   0   0   0 018131320
MA120101 1 208 951016 25151111210   0   0   0 016531320
MA120101 2 209 951016 29151000010   0   0   0 015031320
MA120101 3 203 941016 29151000010   0   0   0 013731320
MA120101 4 190 931016 24141000000   0   0   0 012731320
MA120101 5 192 951016 24161000000   5   5   4 111800020
MA120101 6 196 951017 29151000000 176 42 6371211000020
MA120101 7 210 951017 29141000000 416 37 9332410300020
MA120101 8 234 871017 55161000000 655 32105636 9500020
MA120101 9 251 871017 34160000000 862 42110649 8700020
MA12010110 265 871017 401600000001007 49109861 7600020
MA12010111 270 871016 40 210000001104 61109372 5600020
MA12010112 279 861016 58 200000001135 72108179  400020
MA12010113 284 861015 79 200000001107 5910947330700020
MA12010114 290 881015 82 200000001011 4910976228500020
MA12010115 284 841014 79 20000000 862 4210925027400020
MA12010116 283 921014 82 20000000 664 3310563826600020
MA12010117 279 921014 79 21000000 426 31 9272525800020
MA12010118 266 971015 74 23000000 172 49 5351325100020
MA12010119 2561041016 64 27000000   0   0   0 224300020
MA12010120 2491071016 69 11000000   0   0   0 023400020
MA12010121 2431101017 45 21000000   0   0   0 022431320
MA12010122 2421131017 45 22000000   0   0   0 021231320
MA12010123 2331161017 45 22000000   0   0   0 019731320
MA120102 0 2311171017 24 22000000   0   0   0 018131320
MA120102 1 2301191016 24 11000000   0   0   0 016531320
MA120102 2 2191171016 18151001000   0   0   0 015031320
MA120102 3 2191151016 13161000000   0   0   0 013731320
MA120102 4 2091151016 21141000000   0   0   0 012731320
MA120102 5 2091141017 24141000000   4   4   1 111800020
MA120102 6 2171131017 21151000000 162 52 5311211000020
MA120102 7 2381131018 24151000000 396 52 8492410300020
MA120102 8 2541081018 48161000000 632 45 99436 9500020
MA120102 9 265 981018 55 11000000 834 50104549 8700020
MA12010210 279 931018 79 21000000 985 65105261 7600020
MA12010211 283 851018 82 120000001077 85104172 5600020
MA12010212 293 851017 79 100000001104102102079  400020
MA12010213 299 911017 88 200000001081 8010437330800020
MA12010214 296 961016 98 21000000 994 5510596228600020
MA12010215 2931001016 98 20000000 845 4110495027400020
MA12010216 2841031015 93 20000000 641 36 9913826600020
MA12010217 2781111015 98 21000000 401 50 8212525800020
MA12010218 2771171015 98 24000000 157 62 4171325100020
MA12010219 2651161016109 27000000   0   0   0 224300020
MA12010220 2591181016 88 11000000   0   0   0 023500020
MA12010221 2541171017 82 11000000   0   0   0 022431320
MA12010222 2521171017 79 11000010   0   0   0 021231320
```

**Figure 4 Sample of NatHERS weather file data**

**Table 3 Origin of weather variables in .epw files**

| ENERGYPLUS (.EPW) VARIABLE | ORIGIN |
|---|---|
| Dry Bulb Temp | NatHERS Dry bulb temperature with change of unit |
| Dew Point Temp | Calculated using NatHERS Dry Bulb Temperature, Absolute Moisture Content, and Atmospheric Pressure (Eq 6-10) |
| Relative Humidity | Calculated using NatHERS Dry Bulb Temperature, Absolute Moisture Content, and Atmospheric Pressure (Eq 6-8) |
| Atmospheric Station Pressure | NatHERS Atmospheric pressure with change of unit |
| Extraterrestrial Horizontal Radiation | As per 2016 Non-CSIRO TMY |
| Extraterrestrial Direct Normal Radiation | As per 2016 Non-CSIRO TMY |
| Horizontal Infrared Radiation from Sky | As per 2016 Non-CSIRO TMY |
| Global Horizontal Radiation | As per 2016 Non-CSIRO TMY |
| Direct Normal Radiation | As per 2016 Non-CSIRO TMY |
| Diffuse Horizontal Radiation | As per 2016 Non-CSIRO TMY |
| Global Horizontal Illuminance | As per 2016 Non-CSIRO TMY |
| Direct Normal Illuminance | As per 2016 Non-CSIRO TMY |
| Diffuse Horizontal Illuminance | As per 2016 Non-CSIRO TMY |
| Zenith Luminance | As per 2016 Non-CSIRO TMY |
| Wind Direction | 2016 RMY NatHERS Wind direction with change of unit |
| Wind Speed | NatHERS Wind speed with change of unit |
| Total Sky Cover | As per 2016 Non-CSIRO TMY |
| Opaque Sky Cover | As per 2016 Non-CSIRO TMY |
| Visibility | As per 2016 Non-CSIRO TMY |
| Ceiling Height | As per 2016 Non-CSIRO TMY |
| Present Weather Observation | As per 2016 Non-CSIRO TMY |
| Present Weather Codes | As per 2016 Non-CSIRO TMY |
| Precipitable Water | As per 2016 Non-CSIRO TMY |
| Aerosol Optical Depth | As per 2016 Non-CSIRO TMY |
| Snow Depth | As per 2016 Non-CSIRO TMY |
| Days Since Last Snowfall | As per 2016 Non-CSIRO TMY |

### 3.1.1 Time period

The NatHERS format uses hours 0, 1, 2, 3, …, 23, whereas the EnergyPlus (.epw) format uses hours 1, 2, 3, …, 24.

In the previous versions of the Typical meteorological year weather files in .epw format, when NatHERS data was converted to .epw format, NatHERS hour values were mapped to .epw hour values as follows: 0->1, 1->2, 2->3, …, 23->24.

In the current version of the dataset, when NatHERS data is converted to .epw format, NatHERS hour values are mapped to .epw hour values as follows: 0 not used, 1->1, 2->2, …, 23->23.

For the last hour of each month (.epw hour 24), instead of using a value from the NatHERS RMY dataset (e.g. from hour 0 of the following month), critical variable values have been taken from the third party (non-CSIRO) 2016 TMY dataset. This avoids any potential problems in cases where consecutive months in the RMY/TMY datasets contain data which have been selected from the BOM weather data from different years.

These changes result in a better alignment of variable values with the .epw time period.

### 3.1.2 Radiation

In the previous version of this dataset, values for the three radiation variables Global Horizontal Radiation, Direct Normal Radiation, and Diffuse Horizontal Radiation were taken from the NatHERS RMY dataset. The current version of the dataset takes these values from the third party (non-CSIRO) 2016 TMY dataset.

The reason for this change is that for the NatHERS RMY dataset, the radiation values are calculated centred around the hour. For example, radiation at hour 9 relates to radiation for the period 8:30AM to 9:30AM. Whereas the .epw format defines radiation values as relating to the hour preceding the stated hour. For example, radiation at hour 9 relates to radiation for the period 8:00AM to 9:00AM.

The radiation values in the third party (non-CSIRO) 2016 TMY dataset are consistent with the .epw understanding of radiation values.

# 4    QA and feedback process

## 4.1    QA process

The 2016 RMY weather files were developed and converted to .epw format by the New Zealand National Institute of Water and Atmospheric Research (NIWA) under contract from the Australian Commonwealth Department of Industry, Science, Energy and Resources (the department). The department provided these files to the CSIRO who reviewed the files and ran EnergyPlus with a sample of the .epw files.

CSIRO found that the files could be used in EnergyPlus and identified some errors in the data periods, which they rectified.

All of the files were then provided to an independent consultant with access to IES-VE who reviewed them. The consultant found that the files were usable in IES-VE and identified some errors in the relative humidity data (with some values greater than 100%).

The CSIRO addressed these errors by:

1.  Replacing the three points of absolute humidity with negative values with the data derived from the two hours before and after these three points using a linear approach

2.  Replacing estimated relative humidity greater than 100% with 100%

3.  Replacing estimated relative humidity less than 1% with 1% for .epw files

4.  Leaving dew point temperature found to be less than -30°C as it was, since there was no reliable data on which to base modification

The independent consultant re-checked a sample of five representative files and found that the errors in the sample had been corrected and the files were usable in IES-VE.

## 4.2    Feedback process

Please provide feedback on the usability and functionality of this weather data to the CSIRO via the contact details on the Data Shop website. If you are happy to be approached for your advice on how the weather files could be improved, please provide your contact details.

The TMY files have undergone checking and testing and were found to be generally suitable for use on EnergyPlus and IES-VE for modelling commercial buildings in Australia. However the CSIRO and the Department of Industry, Science, Energy and Resources (the department) welcome feedback on the usability and functionality of this weather data for the purposes of designing and testing commercial building performance for:

- Compliance to Section J of the National Construction Code
- NABERS commitment agreements
- Green Star
- HVAC sizing

- Building fabric design

- Thermal comfort assessment

In 2022 the department will set up a technical working group to review the success of this project.

The group will be asked to provide feedback on the ease of access to the weather data, its suitability for use by commercial building modellers and the level of awareness of how to access and use the weather data. The group will also be asked to provide suggestions for improvement.

The department will collate the feedback and liaise with the CSIRO to implement improvements which are agreed by the department.

# 5    Data version control

The dataset is likely to be updated from time to time. This could be due to fixing errors discovered in the data, incorporating new weather data, or other reasons. Older versions of the dataset will still be available if required. The superseded versions will be available in the Data Shop on the same page as the current version, but clearly marked as archived versions.

Table 4 lists all versions of the dataset 'Typical Meteorological Year weather files in .epw format' that have been available in the Data Shop, the date they were added, and the changes made.

**Table 4 Data version control – Typical Meteorological Year weather files in .epw format**

| DATASET ZIP FILE NAME | DATE ADDED TO DATA SHOP | CHANGES |
|---|---|---|
| **TMYWeatherFilesEpw_20210712.zip** | 2021-08-13 | First version of dataset publicly available |
| **TMYWeatherFilesEpw_20240528.zip** | 2024-07-10 | Change in way time mapped from NatHERS to .epw format; Change in how radiation data obtained |
| **TMYWeatherFilesEpw_20240821.zip** | 2024-08-05 | Formatting issues fixed: year format 'yy' changed to 'yyyy'; 'DAYLIGHT SAVING' in header changed to 'DAYLIGHT SAVINGS' |

# References

Buck W (2005). New equations for computing vapor pressure and enhancement factor. Journal of Applied Meteorology and Climatology 20(1981):1527-1532 <https://journals.ametsoc.org/view/journals/apme/20/12/1520-0450_1981_020_1527_nefcvp_2_0_co_2.xml>

Crawley D, Hand J, and Lawrie L (1999). Improving the weather information available to simulation programs, Proceeding of Building Simulation 1999, September 13-15, 1999, Kyoto, Japan <https://www.researchgate.net/publication/267720701_Improving_the_Weather_Information_Available_to_Simulation_Programs>

NIWA (2017). Creation of NatHERS 2016 Reference Meteorological Years Including Maleny and Christmas Island <https://www.nathers.gov.au/sites/default/files/2016%2520Climate%2520File%2520NIWA%2520Report.pdf>

Snyder R (1981). Humidity conversion <http://biomet.ucdavis.edu/conversions/HumCon.pdf>

**As Australia's national science agency and innovation catalyst, CSIRO is solving the greatest challenges through innovative science and technology.**

CSIRO. Unlocking a better future for everyone.

**Contact us**

1300 363 400
+61 3 9545 2176
csiroenquiries@csiro.au
csiro.au

**For further information**

Energy
Zhengen Ren
+61 3 9545 2430
Zhengen.Ren@csiro.au
csiro.au/energy