Geothermal Community Comments to NH PUC
Regarding PUC 2500 DRAFT Rules dated 12.20.12

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FONT LEGEND
Calibri indicates text from PUC Draft.
Red indicates suggested edit
Highlighted Times New Roman indicates comments

Puc 2504.03 Commission-Issued Certificates.
(f) The owner of the customer-sited source shall make available to the monitor and the commission a copy of the certificate from the meter manufacturer attesting that the meter *operates to the manufacturer's standards*.

Are they asking for a certificate that the meter meets the requirements of PUC 2506.04? The monitor is supposed to verify proper installation of the meter [PUC 2506.02 (f), 2506.04 (q), 2506.07 (h) (2)]. This seems restrictive especially for smaller residential systems, and appears redundant. It is recommended to remove this, or instead refer to PUC 2506.02 (f), 2506.04 (q), 2506.07 (h) (2).

By definition, customer-sited source only applies to electricity generation. See Puc 2502.13. The definition of customer-sited source could be modified to include thermal energy.

Puc 2505.02 Application Requirements.
(b) The application shall include:
(12) If a geothermal system producing useful thermal energy, proof that the facility complies with the requirements of this section and Puc 2505.10;

Clarification on the proof that is being requested.

(17) If an electric generation facility, A statement as to whether the facility's output had been verified by ISO-New England;

(17) A description of how the facility's output is reported to the GIS if not verified by ISO-New England;

There are two (17)s. The first appears to apply to facilities generating electricity and the other for thermal. Please clarify.

Puc 2505.10 Certification of Geothermal Systems.

(a) A source producing useful thermal energy which seeks certification as a class I geothermal facility pursuant to Puc 2502.06 shall file the following information in addition to the application required pursuant to Puc 2505.02:

(3) The nominal ARI/ISO 13256 certified coefficient of performance and energy efficiency ratio of the heat pumps; and

Are you referring to what is being metered or the rated nominal capacity. If nameplate, we recommend the edits shown above. The measured COP and EER is dynamic and different from the published values. Language for geothermal should be equivalent to language for solar thermal. See 2505.11(a)(2) and (3) which refers to 'rated thermal capacity' and 'rating of system as determined by the SRCC'

PART Puc 2506 MONITORING, VERIFICATION, AND REPORTING

Puc 2506.01 Monitoring of All Renewable Energy Sources

(a) Except as provided in Puc 2506.02, electrical generation in megawatt-hours and useful thermal energy in megawatt-hours shall be measured and verified in accordance with ISO-NE and NEPOOL GIS Operating Rules and this Part, as applicable.

Do ISO-NE and NEPOOL GIS Operating Rules include methods for measuring and verifying useful thermal energy production? 'as applicable' added since useful thermal energy typically would not need to follow the ISO-NE rules.

Puc 2506.02 Monitoring of Customer-Sited Sources.

(e) If an electric production facility, A customer-sited source shall use a revenue quality meter to measure the electricity generated.

Is this applicable to geothermal? By current definition, customer-sited source only applies to electricity generation. See Puc 2502.13.

(f) The owner of the renewable energy source shall certify to the independent monitor and the commission that the meter operates to the manufacturer's standards.

Appears to be the same as 2504.03 (f), please clarify.

(g) The customer shall maintain the meter according to the manufacturer's recommendations.

Puc 2506.04 Monitoring of Renewable Energy Sources Producing Useful Thermal Energy

Same heading at 2506.03. change title of one of these

(b) Owners of renewable energy sources producing useful thermal energy shall meter the useful thermal energy with devices to measure and record both energy provided to (heating) and from (cooling) the end-user of useful energy.

Clarification: 'energy provided …. from the end-user' is confusing. Would it be correct to say: 'energy delivered to (heating) and removed from (cooling) the end-user of useful energy'?

(c) Water or steam measurements shall meet the requirements of American Society of Mechanical Engineers (ASME) standards for flow, pressure, and temperature measurements. The properties of water shall be determined using the latest version of ASME steam tables.

It would be helpful to identify the specific ASME standards here and in (e). We have reviewed ASME PTC 19.3 pertaining to the measurement of temperature and it suggests that thermal wells are necessary for measuring fluid temperature in pipes. However, thermal wells are not readily available for 1" pipe and complying with this requirement may significantly impact the cost of a residential heat pump system. ASME PTC 19.3 was written in 1977 and does not recognize the use of low-cost (but high accuracy) integrated circuit temperature sensors. Clarification of the specific standards cited would be helpful.

(e) Measurement for other fluids shall meet the requirements of ASME standards for flow, pressure, and temperature. Physical properties for other fluids shall be determined using NIST properties for fluids.

There is a NIST 'netbook' data product at http://webbook.nist.gov/chemistry/fluid/ that provides thermophysical properties of many fluids. However, the antifreeze compounds commonly used in geothermal systems are not included.

(f) Electrical measurements shall use revenue quality metering that meets Institute of Electrical and Electronic Engineers (IEEE) standards.

The question here is clarify specifically what electrical equipment needs to be measured.

This will add significant cost (equipment + installation ~$750). For geothermal systems **with the UTE being measured on the source side,** the only electrical energy used in the process is that of the loop pump. While not necessarily negligible, it is equivalent to about $1/10^{th}$ of the useful thermal energy produced. We recommend using industry standard methods AHRI 325 and ASHRAE 13256 for computing the pump penalty using the flowrate and measured runtimes.

The heat pump's compressor and fan also use electricity to extract the heat. None of it should matter. If the owner is using inefficient equipment to operate the system, that burden is on him, because he is spending more money to operate the system than he would with good equipment. This is making things too complicated.

(h) The owners or operators of a geothermal system shall measure the net useful thermal energy by installing temperature and flow meters with an accuracy of at least ±3%.

These requirements are ambiguous. Recommend 3% of temperature reading (Fahrenheit) and 3% of full scale for flow.

(i)The owners of a geothermal system shall measure the operating minutes per day of the heat extraction device.

For geothermal heat pump systems, the operating time should be measured down to minute intervals to accurately capture UTE.

(l) The owners of renewable energy sources producing useful thermal energy shall calibrate the meters at least annually and in accordance with the manufacturer's recommendations. The devices used for calibration shall be traceable to NIST.

Annual calibration is not practical for residential and light-commercial installations. Perhaps there could be production threshold (100MWh thermal) that would trigger this requirement.

Calibration is extremely burdensome and it's cost will likely wipe out any income from the credits.

(m) The owners or of renewable energy sources producing useful thermal energy shall convert the useful thermal energy calculated in Btu to MWh by dividing the number of Btu by 3,412,000.

This is redundant with (n)

(n) The owners of renewable energy sources producing useful thermal energy shall calculate the net useful thermal energy to qualify for the production of renewable enrgy certificates as follows:

NUTE = (mHot * hHot – mCold*hCold)*delta_t/3,412,000 Btu/MWh – EEl

Where:

NUTE = Net Useful Thermal Energy (MWh)
mHot = Mass flow to thermal load (lb/h)
mCold = Mass flow from thermal load (lb/h)
hHot = Enthalpy of fluid to thermal load (Btu/lb)
hCold = Enthalpy of fluid from thermal load (Btu/lb)
delta_t = time between measurements (hr)
EEl = Net electrical energy into process (MWh)
3,412,000= Conversion from Btu to MWh

(mHot*hHot-mCold*hCold) is a rate and needs to be integrated to get Btus.

(o) Owners of eligible useful thermal sources shall take data readings for the measurement of useful thermal energy on a frequency of at least every hour. The net useful thermal energy shall be totaled for each 24 hour period and each monthly period.

The measurement frequency of one hour (delta_t) in equation above is very coarse for geothermal systems that can cycle on and off several times in an hour. The accuracies gained in requirements (a)- (l) are lost if sampling interval is too coarse. Recommend 1-5 minutes.

Total runtime per day is going to be very important – not just an instantaneous reading once per hour.

(p) Owners of the system shall install meters at the closest practical point to the delivery of the useful thermal energy.
(q) Owners shall retain the services of a registered independent monitor to verify the useful thermal energy production from the source.
(r) The owner of the source shall report to NEPOOL GIS the amount of MWh of net useful thermal energy produced for the reporting period as verified by the independent monitor.

Puc 2506.07 Independent Monitors.

(a) An independent monitor shall verify the production of electricity of a customer-sited source and the production of useful thermal energy from a renewable energy source acquiring certificates pursuant to this part. Such a customer-sited source shall either retain the services of an independent monitor directly or, if participating in aggregation pursuant to Puc 2507, through an aggregator.

It appears that Puc 2506 was a typo.
Also, could the independent monitor (i.e. a Professional Engineer) verify the energy production through verification of written reports by on-site personnel and therefore not need to necessarily visit the site themselves?

(c) Except as provided in subsection (b), an independent monitor shall be:

(6) For verifying useful thermal energy, a plumber licensed by the state of New Hampshire and in good standing; or

Recommend inclusion of IGSHPA Accredited Installer. Plumbers don't have the needed experience. Could also include HVAC and/or refrigeration technicians, but IGSHPA Accredited Installer or Designer is really the key here.

(f) No source shall use an independent monitor who is a member of the immediate family of the owner of the source or who sold or installed the equipment used by the source.

Does 'equipment' refer to energy producing equipment only? Can the monitor be associated with the sale or installation of the metering equipment?

(h) The duties of the independent monitor shall be:

(1) To perform an initial inspection of source's meter for accuracy and capability to measure the electricity produced, unless the meter is owned by a distribution company that has already inspected it pursuant to Puc 305;
(2) To perform an initial inspection of source's meter for accuracy and capability to measure the useful thermal energy produced;

(3) To measure annually the source's electricity production or useful thermal energy production used to qualify for certificates pursuant to Puc 2505.08, Puc 2505.10, Puc 2505.11, Puc, 2505.12, or Puc 2505.13;
(3) To report the production of electricity to the customer and the commission annually, no later than January 31 for the preceding calendar year;
(4) To report the production of useful thermal energy and a summary of supporting data to the customer and the commission annually, no later than January 31 for the preceding calendar year; and
(4) The inspection of projects pursuant to Puc 2507.04(h).

It is unclear if a monitor is being asked to perform all or some of these tasks. Perhaps the requirement should be "may include:" rather than "shall be:"

There are 2 items labeled (3) and 2 labeled (4).

It appears that item (1) is related to electrical generation, and is similar in intent to (2) for useful thermal energy. If so, they should be labeled as such so that the monitor won't be required to perform both methods on the meter for one type of system. Same comment applies for the second (3) and the first (4).

The inspection of projects pursuant to Puc 2507.04(h) is significant and would seem to require qualifications beyond those listed in (c)(6). Request that smaller residential projects of under 250 MWh are exempt from this requirement ..

PART Puc 2507 RENEWABLE ENERGY FUND

2507.04 (h)(2) does not seem applicable to sources producing Useful Thermal Energy on residential scale.

General Questions:

What are the ISO NE and NEPOOL operating rules. Do they allow for thermal RECs?

Are there aggregators that exist that can handle RECs associated with Useful Thermal Energy? Would NEGPA qualify as an aggregator?

Can the work of the monitor be conducted remotely using documents submitted by owner and data received from metering equipment?

Might it be helpful to split Useful Thermal Energy producers into two classes (e.g. below and above 100MWh)? There are a number of measurement, commissioning, and calibration requirements that would be very costly for smaller systems (with little benefit) though are probably justified for large producers.