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Subject: West Tisbury Police Station HVAC System Replacement Options

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1. Purpose:

The purpose of this report is to evaluate the existing HVAC system at the West Tisbury Police Station and to present replacement strategies that address current system deficiencies while improving long-term reliability, serviceability, and overall performance.

The intent of this report is to support a planned system replacement approach. The existing system is currently operational following recent repairs; however, its condition and history indicate that future failures are likely. This provides an opportunity to evaluate replacement options in a controlled manner rather than responding to system failure under emergency conditions.

2. Scope of Work and Existing System Review:

Energylogik performed a comprehensive review of the existing HVAC system to understand both its current condition and the feasibility of implementing replacement systems within the building.

This effort included discussions with building users to identify known operational issues, review of original design documentation, and a field assessment of accessible equipment, piping, and infrastructure. The intent was not only to assess the condition of the system, but also to understand how different system types could be integrated into the existing building.

Particular attention was given to evaluating existing electrical systems, control wiring, piping accessibility, and ceiling conditions. The majority of the building is constructed with drop ceilings, which provides accessible pathways for both piping and electrical routing. This is a significant advantage for retrofit work and allows flexibility in system selection without requiring major demolition.

Existing infrastructure was reviewed for reuse. Line voltage wiring appears adequate to support all replacement options. For systems based on VRF technology, low-voltage wiring between thermostats, indoor units, and central equipment can largely be reused. For a hydronic system, new low-voltage wiring would be required between each zone and the mechanical room, although the existing line voltage wiring can be maintained.

Potential equipment locations were also evaluated. Options A and B generally maintain the existing equipment footprint. Option C requires additional mechanical components and redistribution of equipment, which is feasible within the building but requires coordination. These layouts are shown in the Appendix.

3. Existing System Description and Current Condition:

The existing HVAC system is a Mitsubishi VRF heat pump system installed approximately in 2013. The system distributes refrigerant throughout the building to multiple indoor units serving individual zones.

This system type is commonly used in larger commercial buildings with dedicated facility management. In this application, it has not proven to be particularly well suited. The control interface and overall system logic are relatively complex and somewhat cumbersome for a building of this size. This has made operation and troubleshooting more difficult than expected.

The system has also been modified over time, including the removal of at least one indoor unit from the central system and replacement with a dedicated unit. This type of modification is typically indicative of increasing maintenance challenges and declining confidence in the original system.

4. Current System Status:

As of March 26, 2026, the system has been repaired and is currently back in operation. A full leak test was performed and no active refrigerant leaks were identified.

This condition will likely extend the usable life of the system and provides time for planning. However, given the system's history of leakage and degradation, this condition should be considered temporary rather than representative of long-term performance.

5. System Degradation and Maintenance Considerations:

The system has experienced repeated refrigerant leakage over time, accompanied by corrosion of piping and indoor equipment. The exact cause of the corrosion cannot be attributed to a single factor with certainty, and it is likely the result of a combination of environmental exposure, installation conditions, moisture, and long-term material degradation.

Refrigerant leaks in systems of this type are inherently difficult to locate. The system includes many connections distributed throughout the building, and failures may occur at multiple locations over time. Troubleshooting these leaks is often time-consuming and labor-intensive, and repairs can become increasingly costly as the system ages.

From a design perspective, the distribution of refrigerant throughout the building creates many potential failure points. This is a fundamental characteristic of the system and cannot be fully mitigated through repair alone.

6. Refrigerant Considerations and Code Evolution:

The existing system uses R410A refrigerant, which has a relatively high global warming potential and is currently being phased down under federal regulations. The industry is transitioning toward lower-GWP refrigerants, many of which introduce new safety classifications and design requirements.

Standards such as ASHRAE 15 place limits on refrigerant quantities within occupied spaces and define requirements for system design, installation, and safety. As refrigerants evolve, systems that distribute refrigerant throughout a building introduce a level of uncertainty that cannot be fully accounted for during design. Future changes in refrigerant requirements and code enforcement may impact system compliance.

The reuse of existing refrigerant piping further increases uncertainty. While reuse may be possible in some cases, factors such as piping size, contamination, and previous system performance can impact reliability. Manufacturer requirements may also limit reuse and affect warranty coverage.

For these reasons, replacement of refrigerant piping is generally considered the appropriate approach when installing new systems, even when reuse may appear feasible.

7. Ventilation and Load Considerations:

A review of the ventilation system indicates that the building may be significantly over-ventilated. A reduction in ventilation combined with a more efficient ERV system could reduce peak heating loads by approximately 20%.

The building is lightly occupied for much of the time, and ventilation does not appear to be aligned with actual usage. Demand-controlled ventilation using multiple CO_2 sensors would allow ventilation rates to be reduced during periods of low occupancy and increased only when required.

Additional control strategies, such as localized booster switches or occupancy sensors, would allow targeted increases in ventilation without maintaining high baseline airflow.

Reducing ventilation rates, replacing the ERV with a more efficient unit, and recommissioning the system would reduce both energy consumption and required HVAC capacity.

8. Load Analysis and System Sizing:

A preliminary load analysis was performed to compare building loads with installed equipment capacity and evaluate the impact of ventilation improvements. These results are included in Appendix A and Appendix B. These load calculations are preliminary and internal gains should be verified prior to final equipment selection.

VRF systems are typically sized using manufacturer software based on the total connected indoor unit capacity. This approach assumes that multiple zones may call simultaneously and does not fully account for load diversity. As a result, systems are often oversized relative to actual building demand.

Hydronic systems allow equipment to be sized more directly based on calculated building loads and expected diversity. This provides a closer match between system capacity and actual operating conditions, resulting in improved efficiency and comfort.

9. Replacement Options:

Below are three options for replacing the existing HVAC system at the West Tisbury Police Station. Each option varies in complexity, cost, and long-term benefit. Energylogik recommends the Town evaluate all three options in the context of budget, operational priorities, and long-term sustainability goals.

Option A – Like-for-Like VRF Replacement

Option A consists of replacing the existing system with a new VRF system of similar configuration, maintaining the same overall system architecture. This approach allows most of the existing system layout to remain unchanged. Indoor units can be replaced in place, and existing ceiling openings and mounting conditions can be reused. Low-voltage wiring between thermostats, indoor units, and the central system can largely be reused, along with existing line voltage infrastructure.

The existing fresh air system can also be reconnected with minimal modification. From a construction standpoint, this option represents the least disruptive approach and requires the least amount of redesign. It also represents the lowest upfront cost. However, this option maintains the same fundamental limitation of distributing refrigerant throughout the building. As demonstrated in similar systems, the presence of numerous refrigerant connections increases the likelihood of leakage over time and contributes to long-term maintenance complexity.

Future replacement of the system would likely require removal and replacement of refrigerant piping, which can be difficult and disruptive, particularly where piping is concealed.

Option B – Hybrid VRF System

Option B consists of replacing the system with a Hybrid VRF configuration. In this system, refrigerant is limited to the outdoor unit and mechanical room, and heating and cooling are distributed throughout the building using a water loop. This approach reduces the amount of refrigerant within occupied spaces and therefore reduces the risk associated with leakage. It represents an improvement over traditional VRF systems in terms of safety and serviceability.

The system still relies on VRF technology and proprietary components, including branch controllers and control systems. Existing wiring can largely be reused, although new hydronic piping must be installed and additional mechanical space is required.

While this option reduces refrigerant exposure, it introduces additional system complexity and remains dependent on manufacturer-specific components. Equipment costs are typically higher than a like-for-like replacement.

Option C – Air-to-Water Heat Pump System

Option C consists of replacing the existing system with a hydronic air-to-water heat pump system. In this configuration, refrigerant is contained entirely within the outdoor equipment, and heating and cooling are distributed through a water-based system. This eliminates refrigerant from the building and significantly reduces the number of potential failure points.

The system would likely consist of two smaller heat pump units operating together. These units are typically available in single-phase 208V configurations and would require electrical coordination and load analysis. Hydronic fan coil units, including four-way ceiling cassettes, can be used to maintain a similar architectural appearance. Hydronic systems provide more stable and consistent temperature control and are better able to handle load diversity across zones.

This system would require a simple centralized control strategy, allowing the building to operate in heating or cooling mode. Individual zones would operate independently using local thermostats. Hydronic systems are non-proprietary and provide long-term flexibility. Equipment and terminal units can be replaced independently, and the system can be adapted over time without requiring full system replacement.

In many cases, this approach is cost-competitive with Hybrid VRF systems due to lower equipment cost and reduced reliance on proprietary components.

10. Summary and Recommendation:

All three options will address the immediate need to replace the existing system. However, they differ significantly in how they address long-term reliability, flexibility, and maintenance.

We believe the best long-term solution for the West Tisbury Police Station is Option C, an air-to-water system. This system is better for maintenance, easier to modify and replace in the future, and if designed properly will be redundant to allow the system to maintain temperature control when one of the units is offline.

The primary limitation of the existing system is the distribution of refrigerant throughout the building. Options that maintain this approach retain inherent long-term risks. Option C eliminates this limitation and provides a more flexible and maintainable system while aligning with evolving industry trends and regulatory considerations.

11. Closing:

Energylogik is available to provide further analysis, cost estimates, and detailed design development.

12. Appendix:

See attached appendix for the following documents:
Appendix A – Load calculations with existing capacity and existing ventilation. Note that internal gains should be reviewed and this should not be used for equipment sizing
Appendix B - Load calculations with existing capacity and proposed ventilation. Note that internal gains should be reviewed and this should not be used for equipment sizing
Appendix C – Mitsubishi DSB file for existing unit capacity
Appendix D – Basement floor plan with proposed unit location for Option C design
Appendix E – First floor plan with Option C proposed outdoor unit location