

4-C Foods CHP Plant NYSERDA Demonstration Project

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Project Summary:

- **Modular 380 Kw CHP plant**
- **Heat recovery to space heating, cheese process and absorption cooling.**
- **Total project cost \$1,120,000.**
- **Net-net savings of \$ 200,000 per year.**
- **NYSERDA grant of \$558,000.**
- **Status: plant built within budget and now operating, some commissioning still under way.**

4-C Foods, Brooklyn, NY

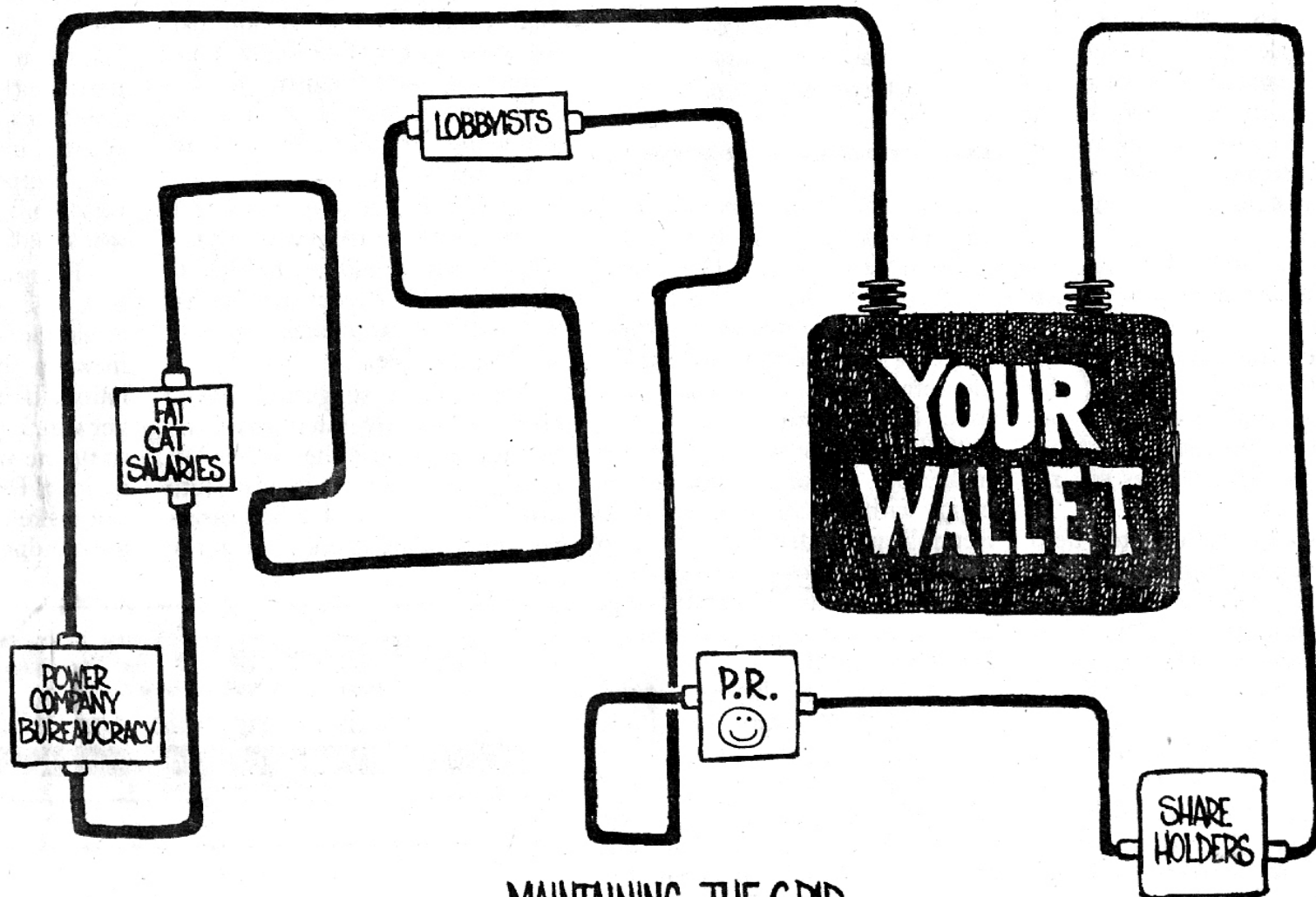


4-C Foods Project Team

- Owner – 4-C foods, Wayne Celauro
- Owner engineer – Joe Oriero
- Designers – Energy Concepts
- Cogen units – Coast Intelligen
- Electrical – All Services/Interphase
- Mechanical – Richtech Inc
- Controls –Integrated Controls (Automated Logic)
- Electric Utility – Coned
- Gas Utility - Keyspan
- NYSERDA rep – Dana Levy

JOHN DE ROSIER'S VIEW

DE ROSIER
TIMES UPON



MAINTAINING THE GRID

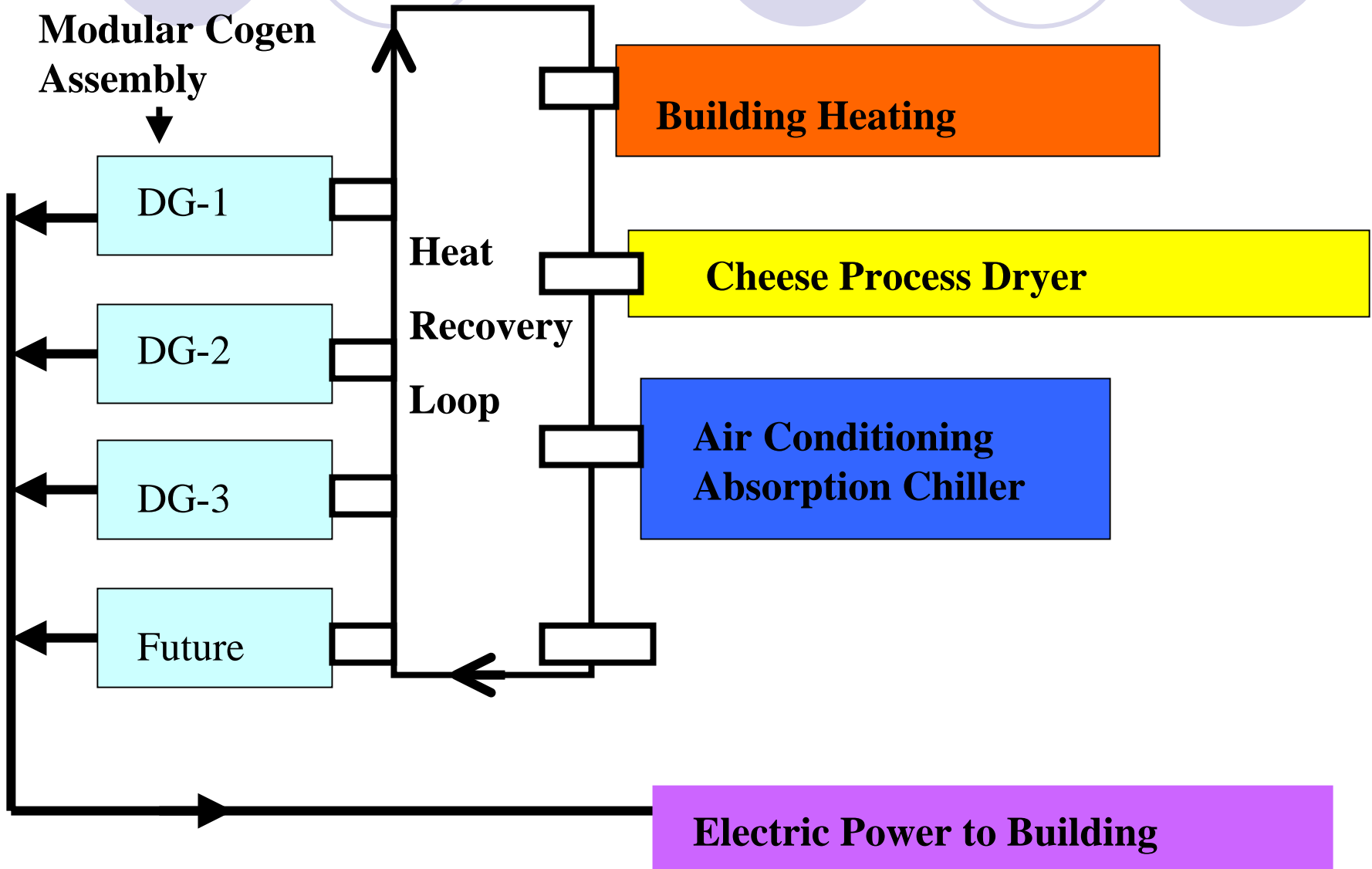
What Was 4-C Interest ?, Needs ?

- **Product process is energy intensive and 4-C needed to reduce costs.**
- **Needed to upgrade HVAC systems for better plant conditions.**
- **Some aging chiller equipment needed replacement/service.**
- **Required an orderly project process.**
- **Remain competitive in future.**

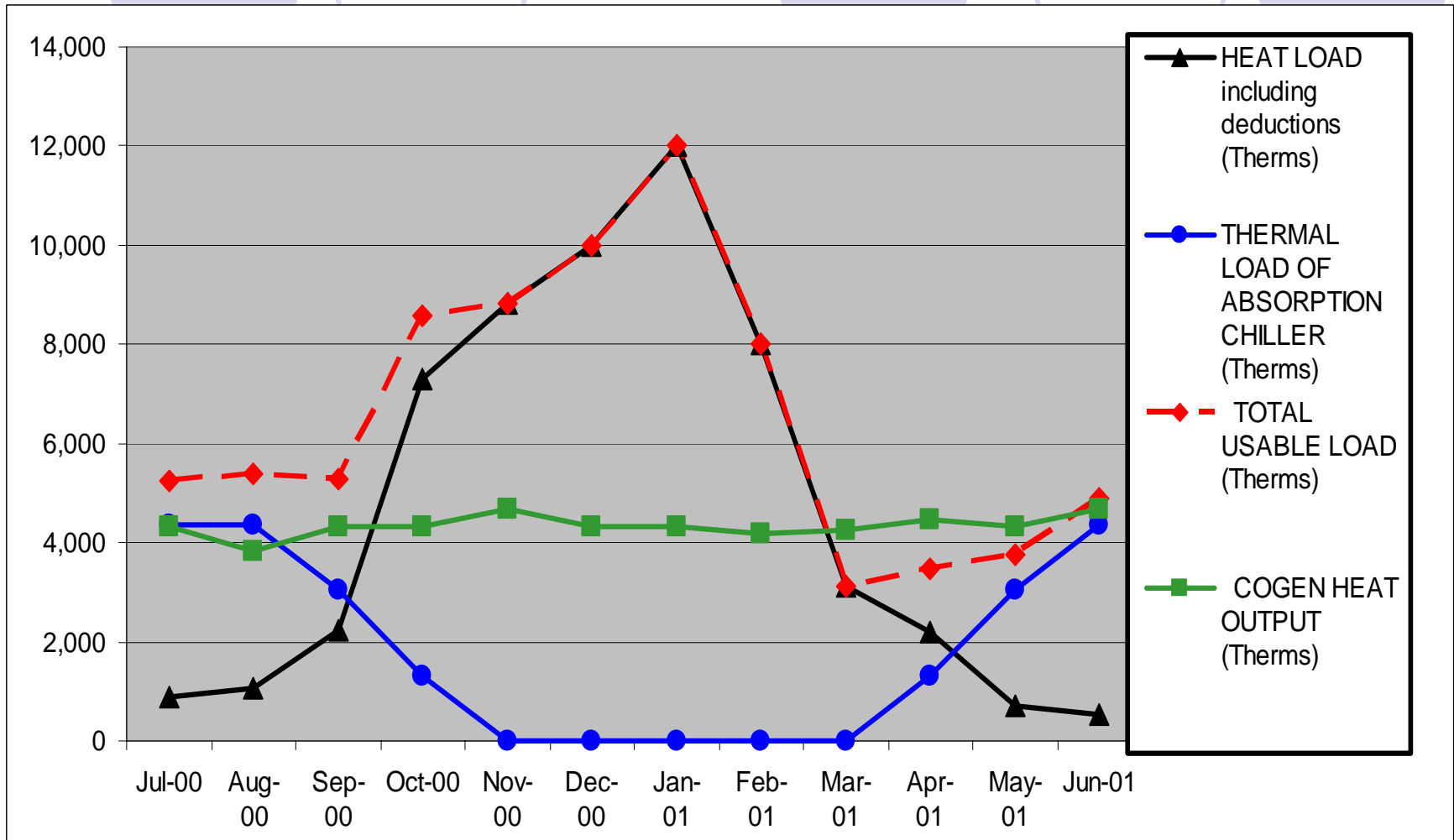
First Step – Engineering Analysis

- **Preliminary engineering study to determine electric and thermal loads, model sizes of CHP Plants.**
- **Figure out best uses for heat recovery specific to 4-C foods.**
- **Based on economic size do preliminary layout and project estimate.**
- **Provide owner with options.**
- **Apply for NYSERDA funding.**

4-C Foods Heat Recovery Plant Layout



Thermal Effect With Absorber

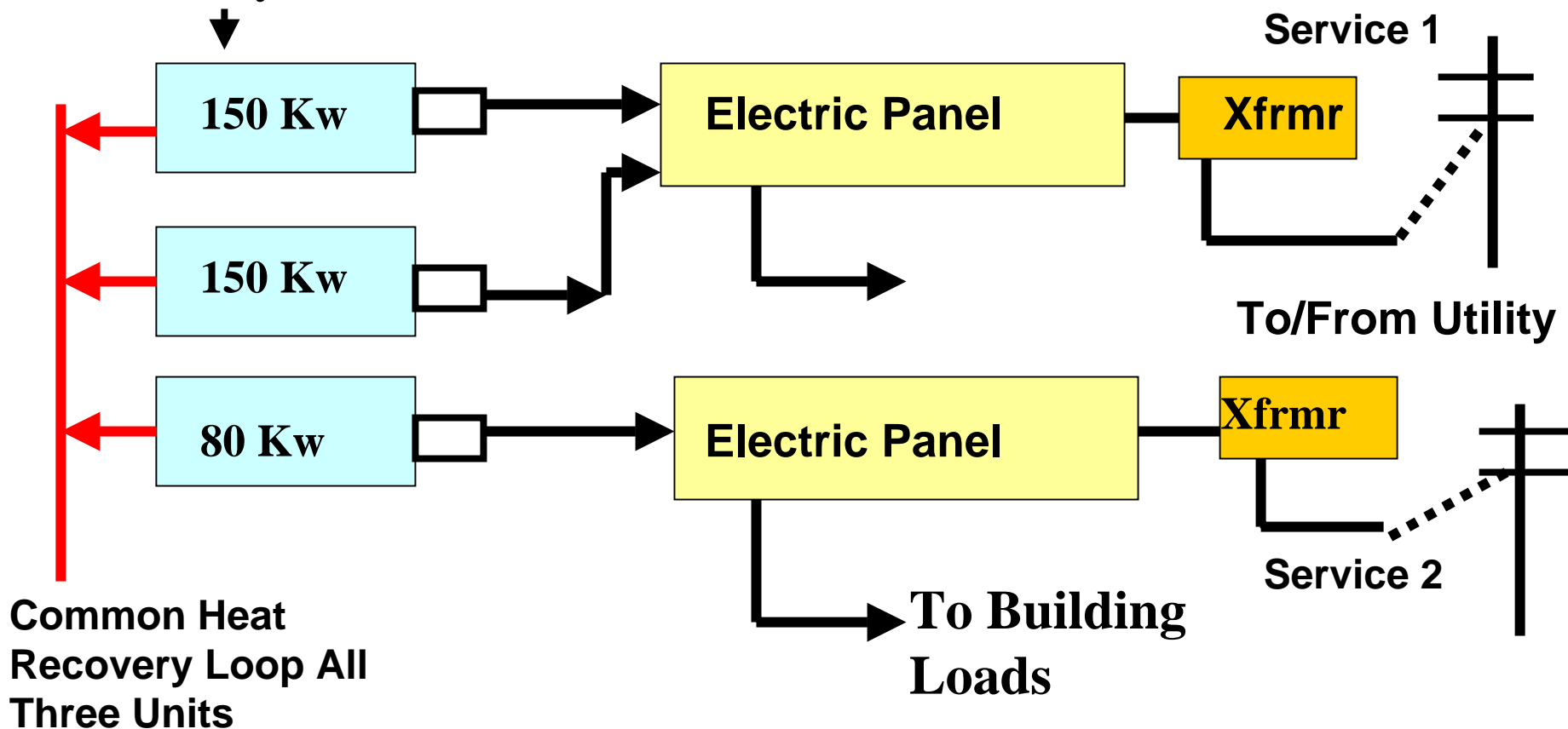


Added thermal load of absorber achieves year long thermal balance.

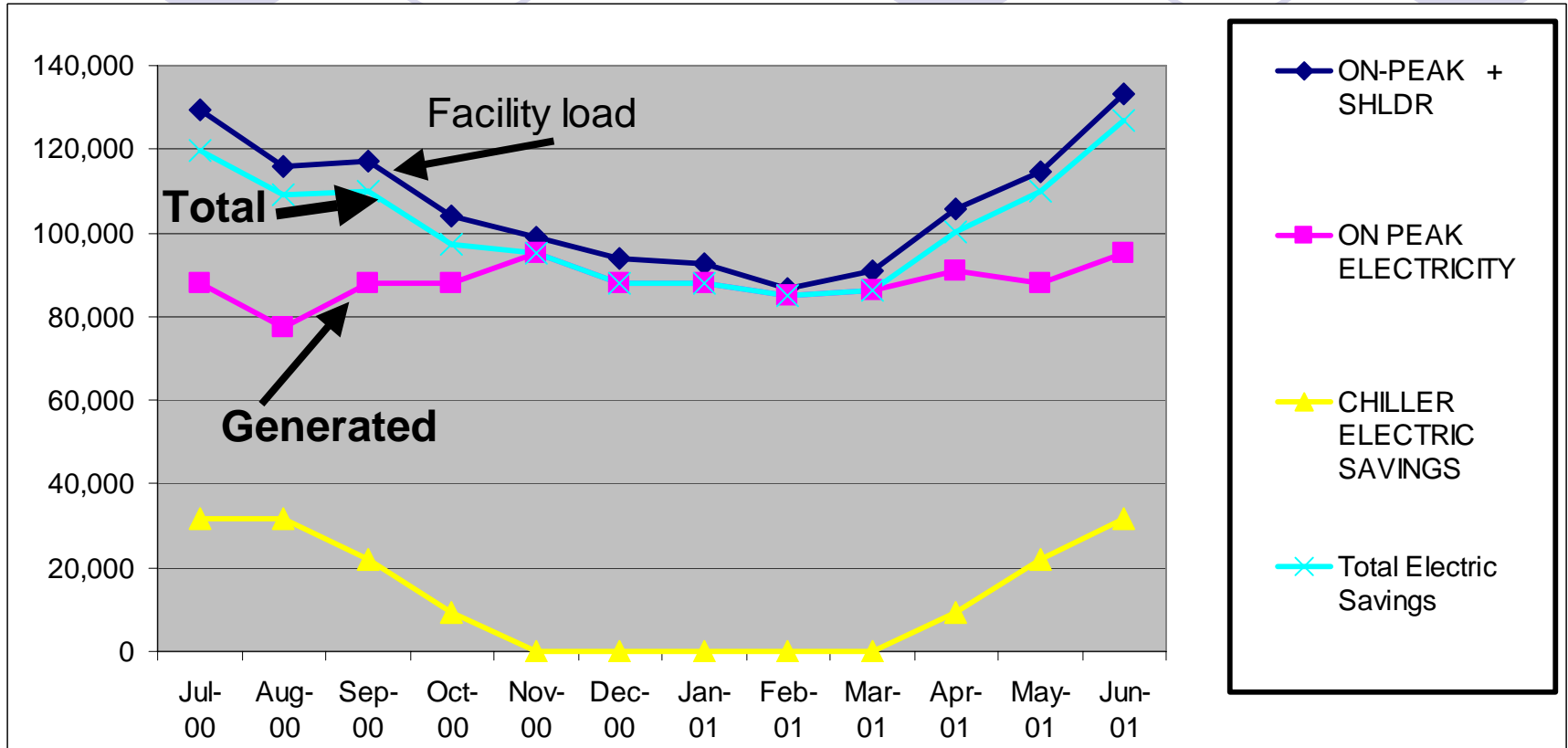
Electric Utility Arrangement, 4-C Foods

Simultaneous Power From Utility
and CHP Plant, Split Service.

Modular Cogen
Assembly



4-C Foods, Electric Savings

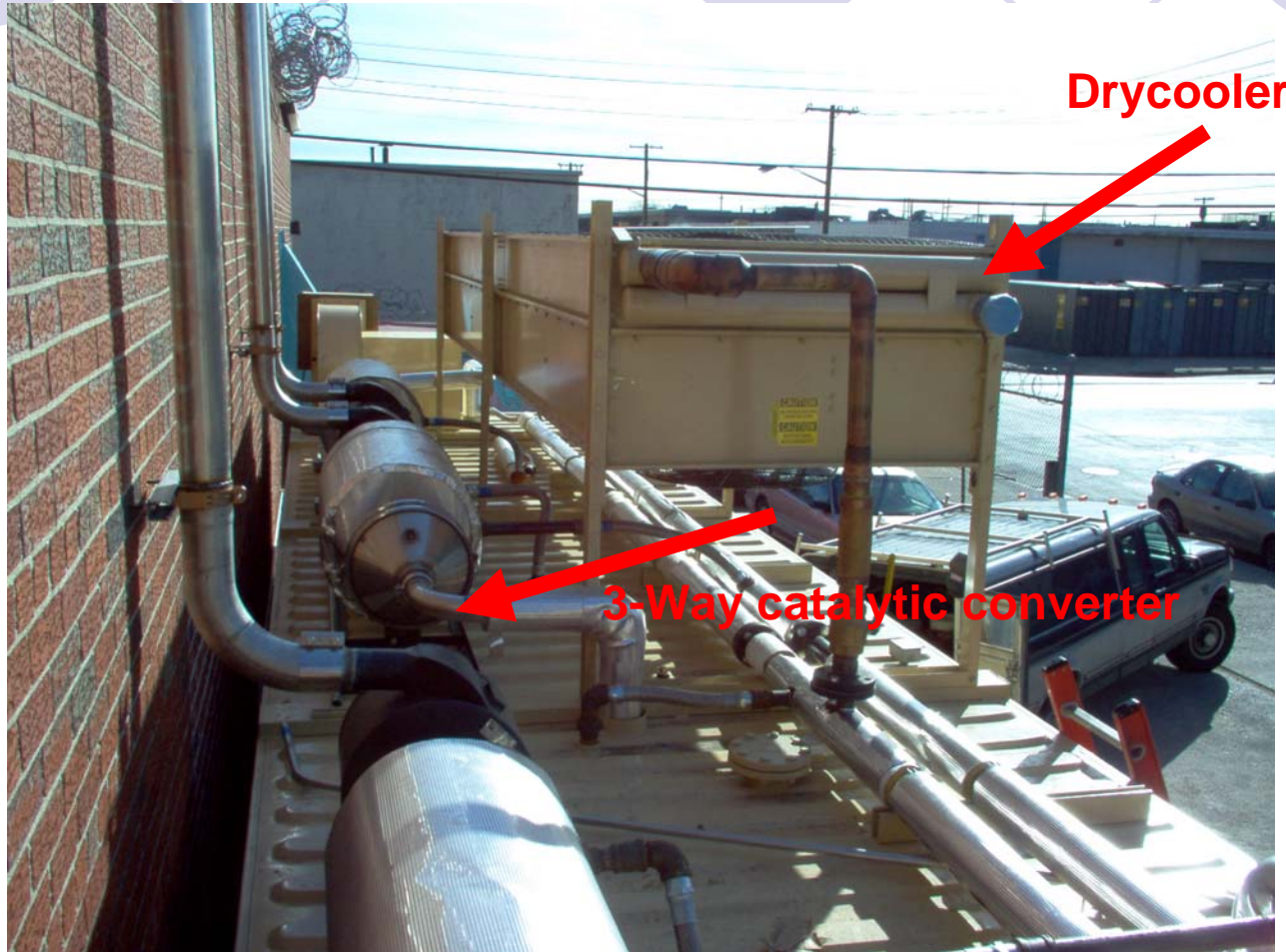


Load following parallel plant. Summer chiller electric savings is added to power generated savings.

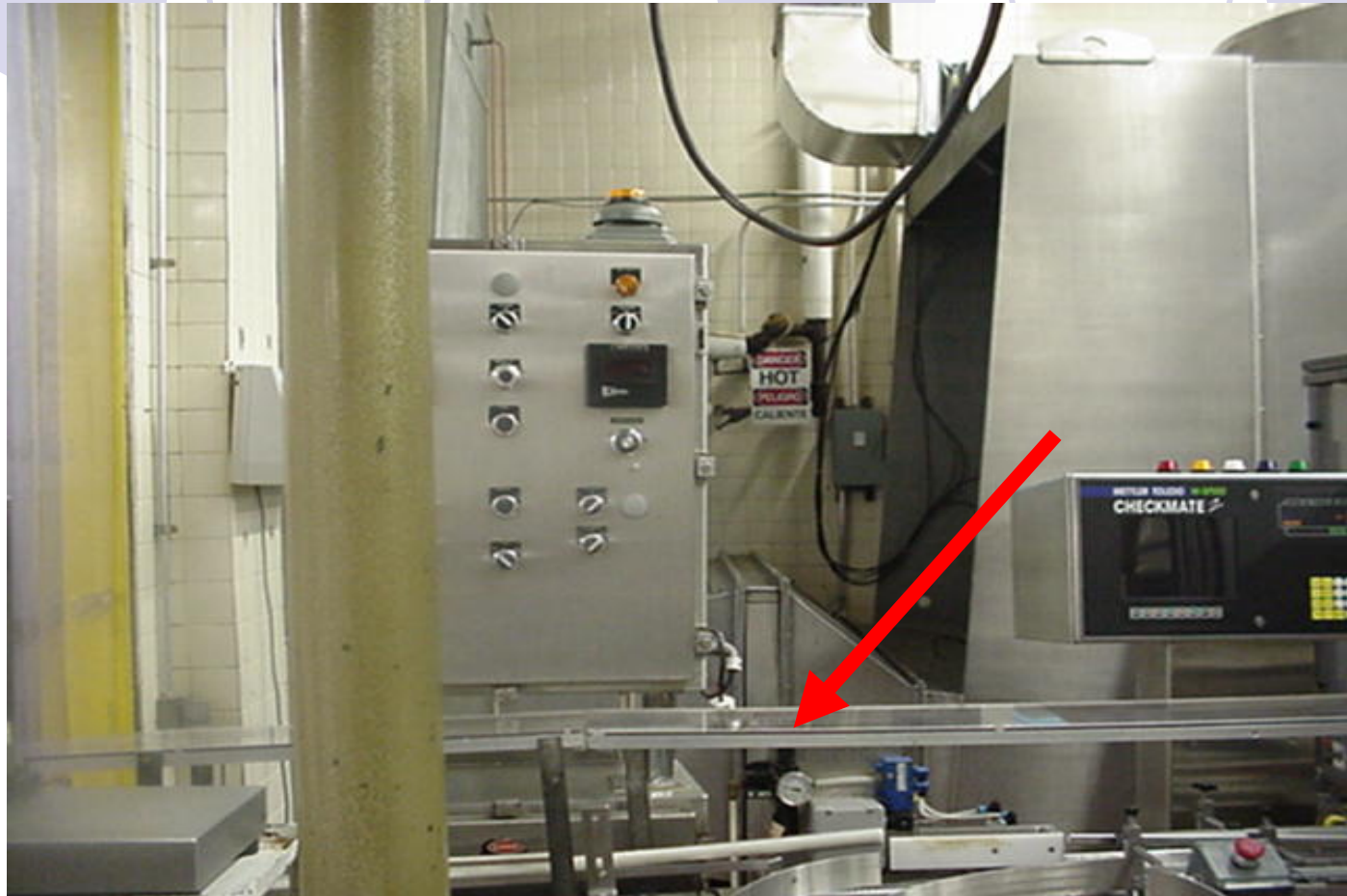
Main System in C-Tainer Package



Top of C-Tainer, Catalytic Converters



Heat Recovery to Cheese Dryer

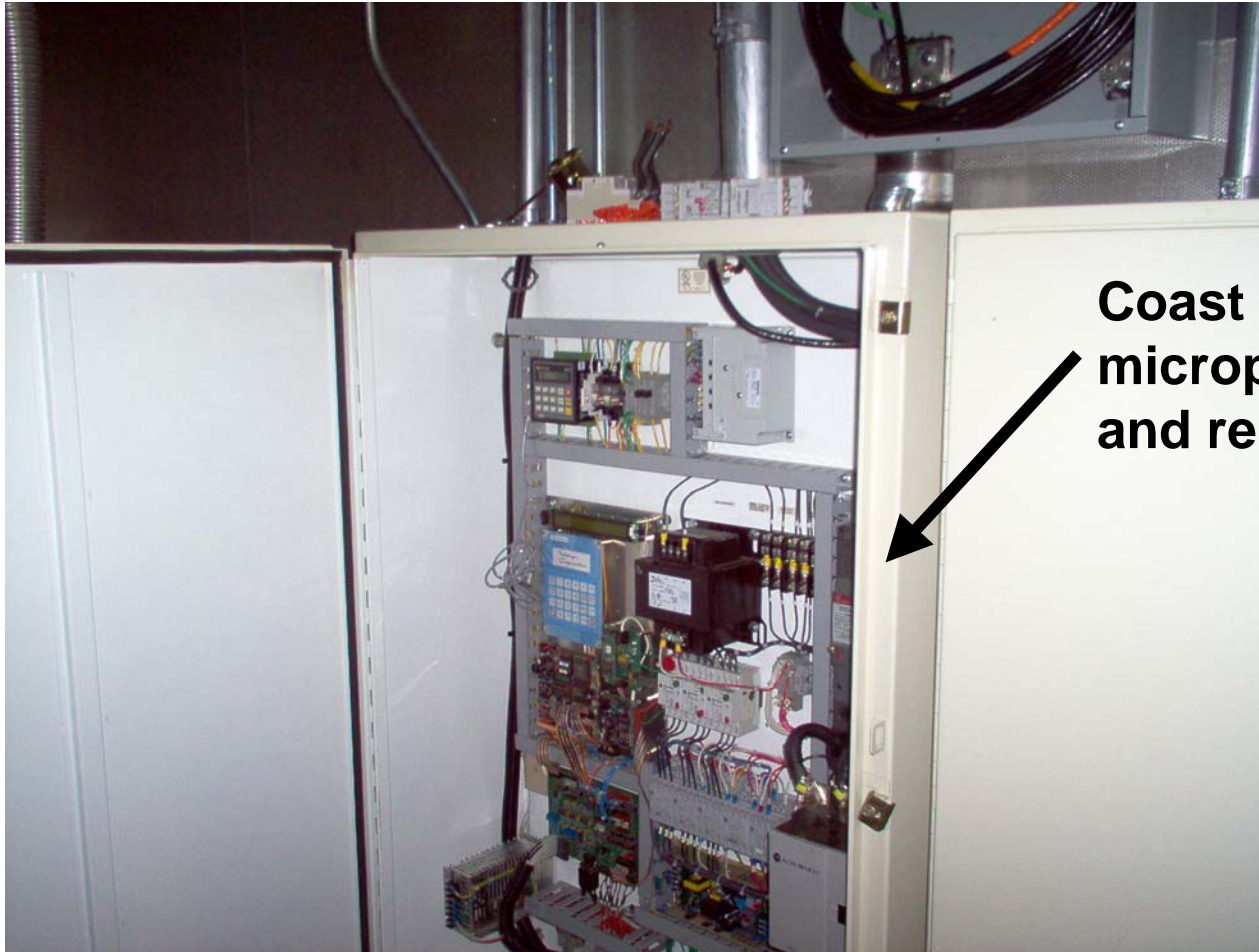


Hot water coil added to air stream ahead of existing coil

Ceiling Units for Heating/Cooling

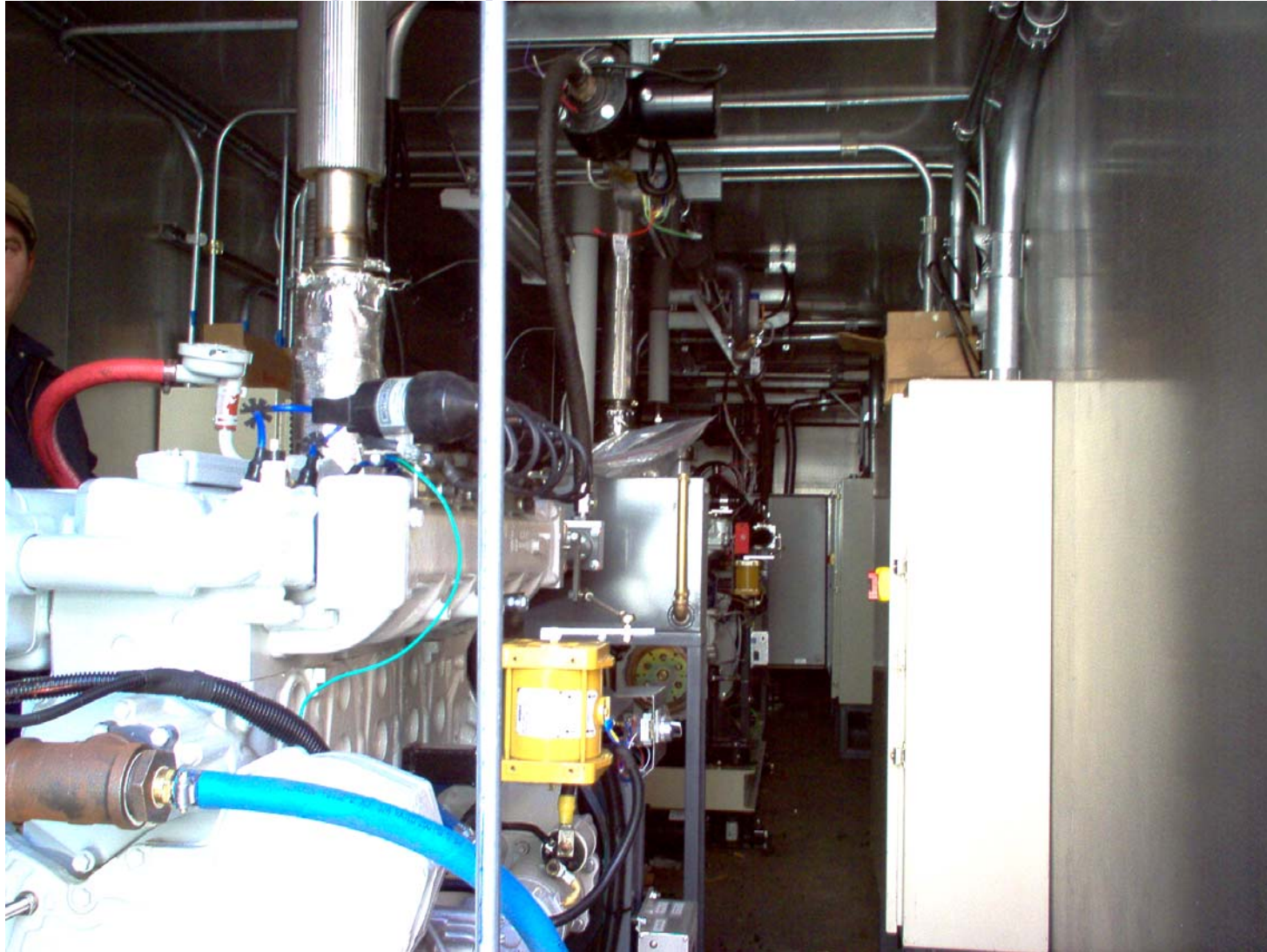


4-C Foods, Cogen Unit Controller



**Coast Intelligen
microprocessor controller
and relays.**

C-Tainer Cogen Packaging

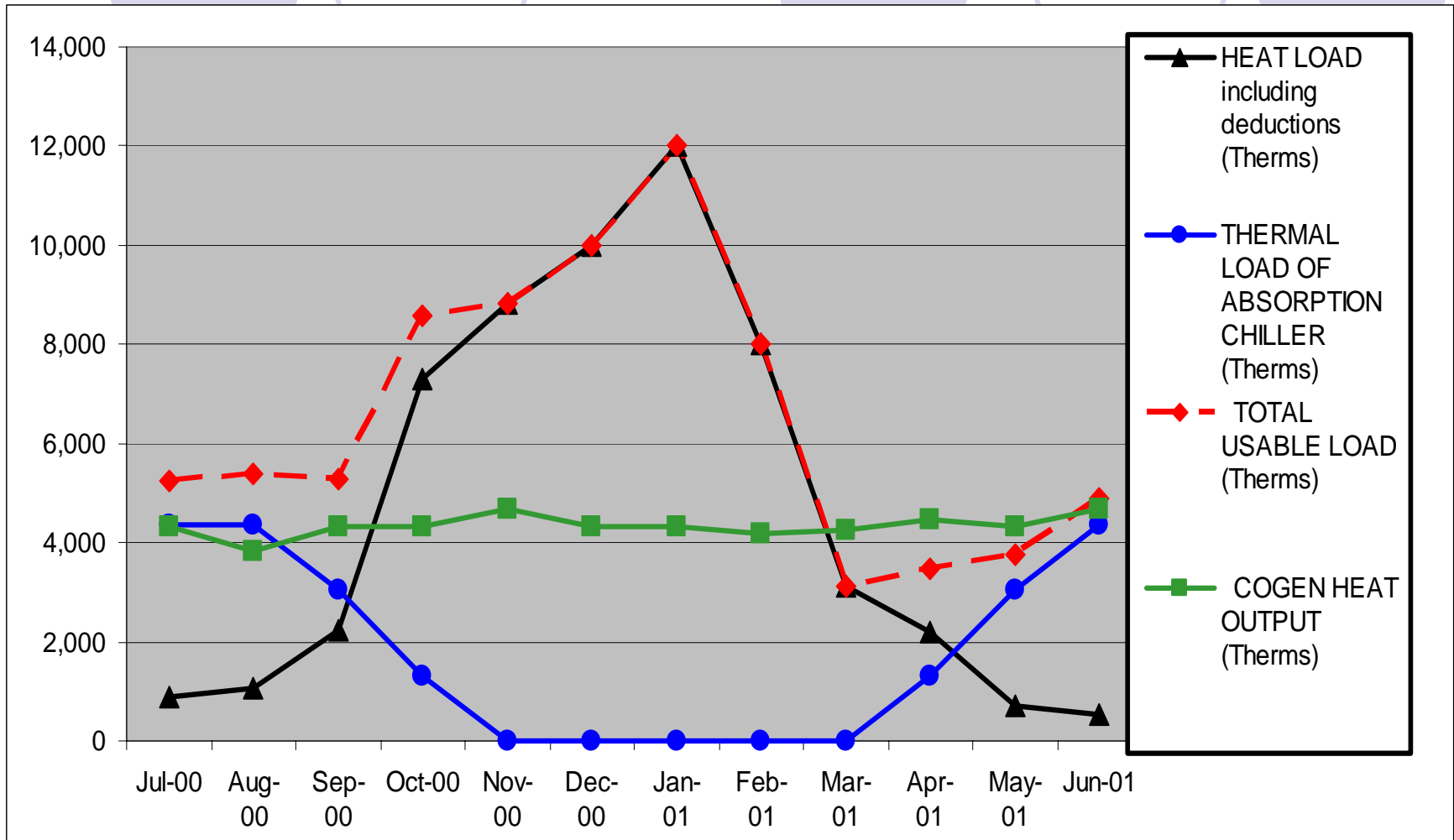


4-C , Yazaki Absorber Chillers



- Waste heat from DG plant used to drive **Absorption air conditioning**. Does not use electricity and eliminates use of ozone depleting refrigerants and hazards.

Thermal Effect With Absorber



Added thermal load of absorber achieves year long thermal balance.

Absorber Air Conditioning

- Small to Large Chiller Plants
- Flexible Location, Just Get Hot Water
- Uses Waste Heat From Plant
- Little Electric Use
- Cleanest Available Refrigerant
- Complete Elimination of Ozone Depleting
- Good for Low Temp Chilled H₂O

Max Use of Waste Heat



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Regulatory and Tariff Issues

- **Owner can choose CONED SC-09 or CONED SC-14 standby tariff.**
- **Economics similar for either tariff.**
- **Major NY PSC “Under 1,000 kw rule”**
 - **On-site power less than 1,000 kw**
 - **Clean emissions (Lean or CAT Conv.)**
 - **Min total energy efficiency of > 60 %.**
 - **Exempt from standby tariffs – or owner choice of best tariff.**

Value Engineering/Lessons Learned

- **Consolidating electric services should be weighed economically with split-service arrangement.**
- **Simplify heat recovery without compromising effectiveness.**
- **Take advantage of pre-packaging in high labor markets.**
- **Use digital control and automation to lower equipment cost and increase efficiency.**

Lessons Learned - Issues

- Coordination of equipment vendors and technicians continues to be an important issue.
- Project scheduling more complex with CHP, team members may underestimate effects of decisions.

4-C Foods: Project Recap

- **\$ 1,120,000 Project completed within budget.**
- **Some schedule slippage due to certain coordination items.**
- **Electric and thermal recovery systems operating as expected.**
- **Some commissioning and controls work still underway.**
- **Increase in client loads will increase cost savings/avoidance.**