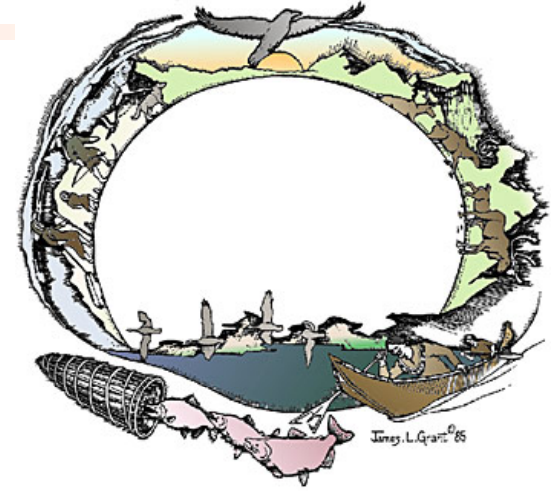

Heat Recovery for Rural Greenhouses



Ross Coen

**Alaska Center for Energy and Power
Tanana Chiefs Conference**



ACEP

Alaska Center for Energy and Power



Galena Greenhouse Project

- Funded by Environmental Protection Agency
- Construction to begin summer 2010; Full operation spring 2011
- Community garden
- Fresh, nutritious, affordable produce
- Local employment
- Educational tool for students
- Reduce amount of imported food, carbon emissions, and solid waste in landfill





Why a greenhouse in Galena?

- Average monthly cost of food for family of four is 49% higher in rural Alaska than urban areas.
- Tomatoes: \$7.36/lb
- Lettuce: \$7.60 per head
- Onion: \$2.50 each
- Spinach: \$7.97/lb





Why a greenhouse in Galena?

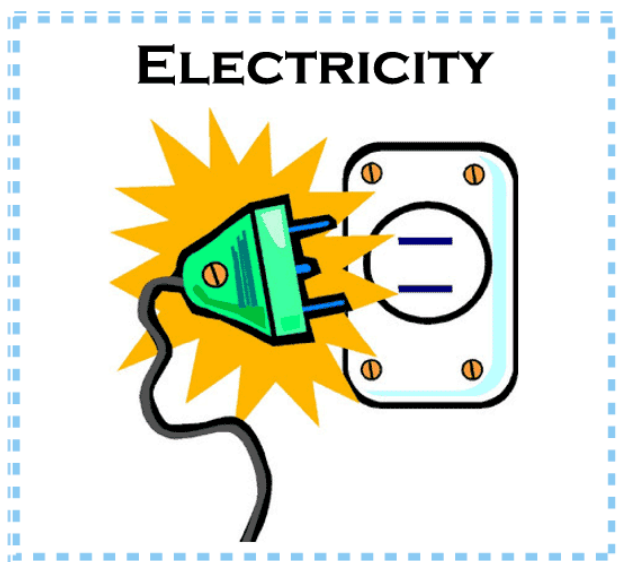
Galena Interior Learning Academy:

- ~170 students
- 3,500 meals/week in dining hall
- Local food production has potential to reduce imported food, reduce fuel consumption, reduce solid waste from landfill.



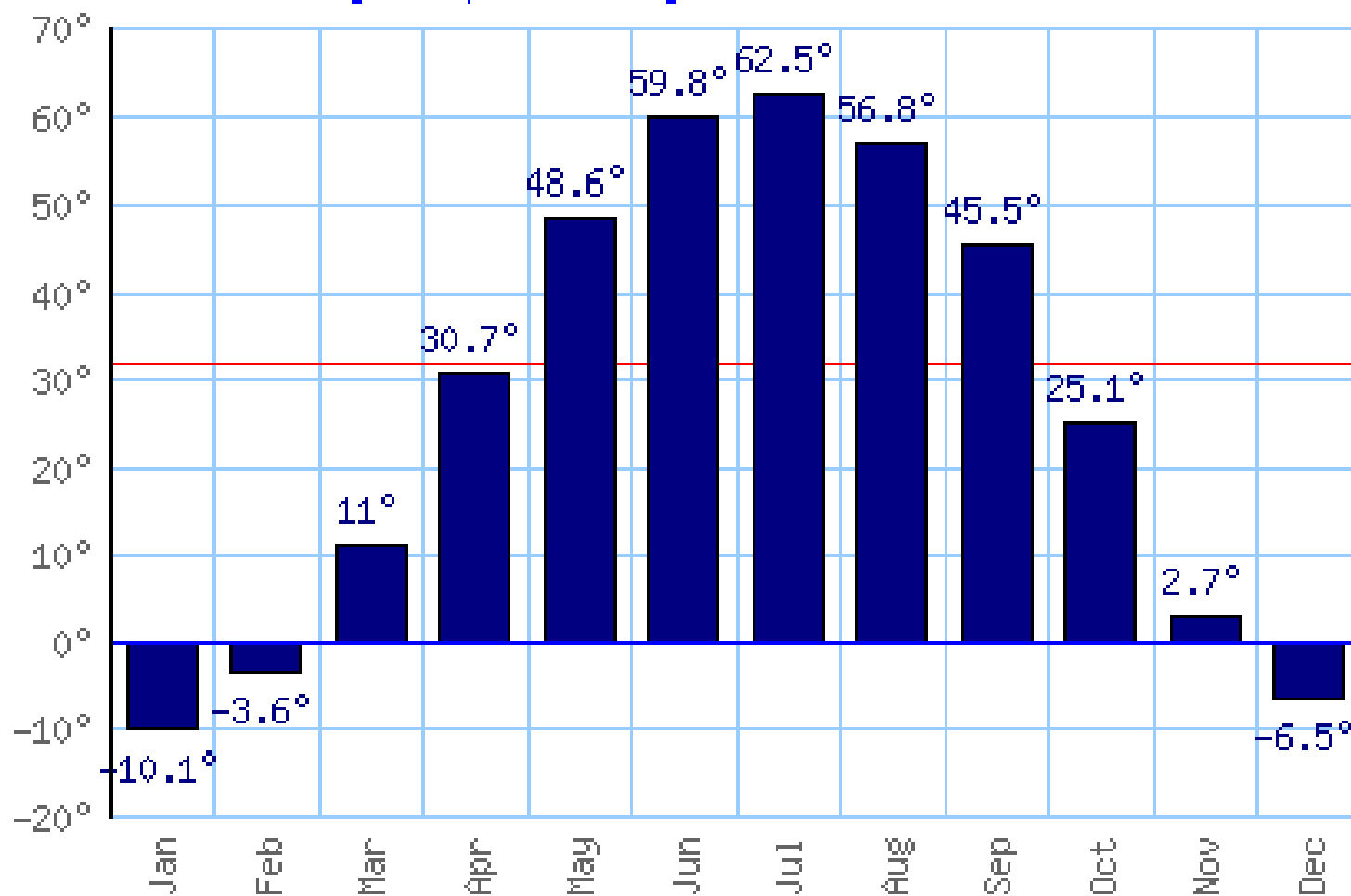


Limiting factors in rural Alaska?





Average Temperature by Month, in Fairbanks Alaska





Heat recovery in Galena

- Average power load = 500kW
- Heat loop connects power plant, city building, clinic, shower building, swimming pool, and school.
- Water enters loop ~185 degrees F
- Water returns ~150 degrees F
- Potential resource for greenhouse





Heat recovery in rural Alaska

- “Waste heat” – *Use it or lose it!*
- Recovered heat has the potential to extend growing season by several months.
- Maximize greenhouse production at minimum cost.
- Not just vegetables! Seed starts, ornamental flowers, herbs.

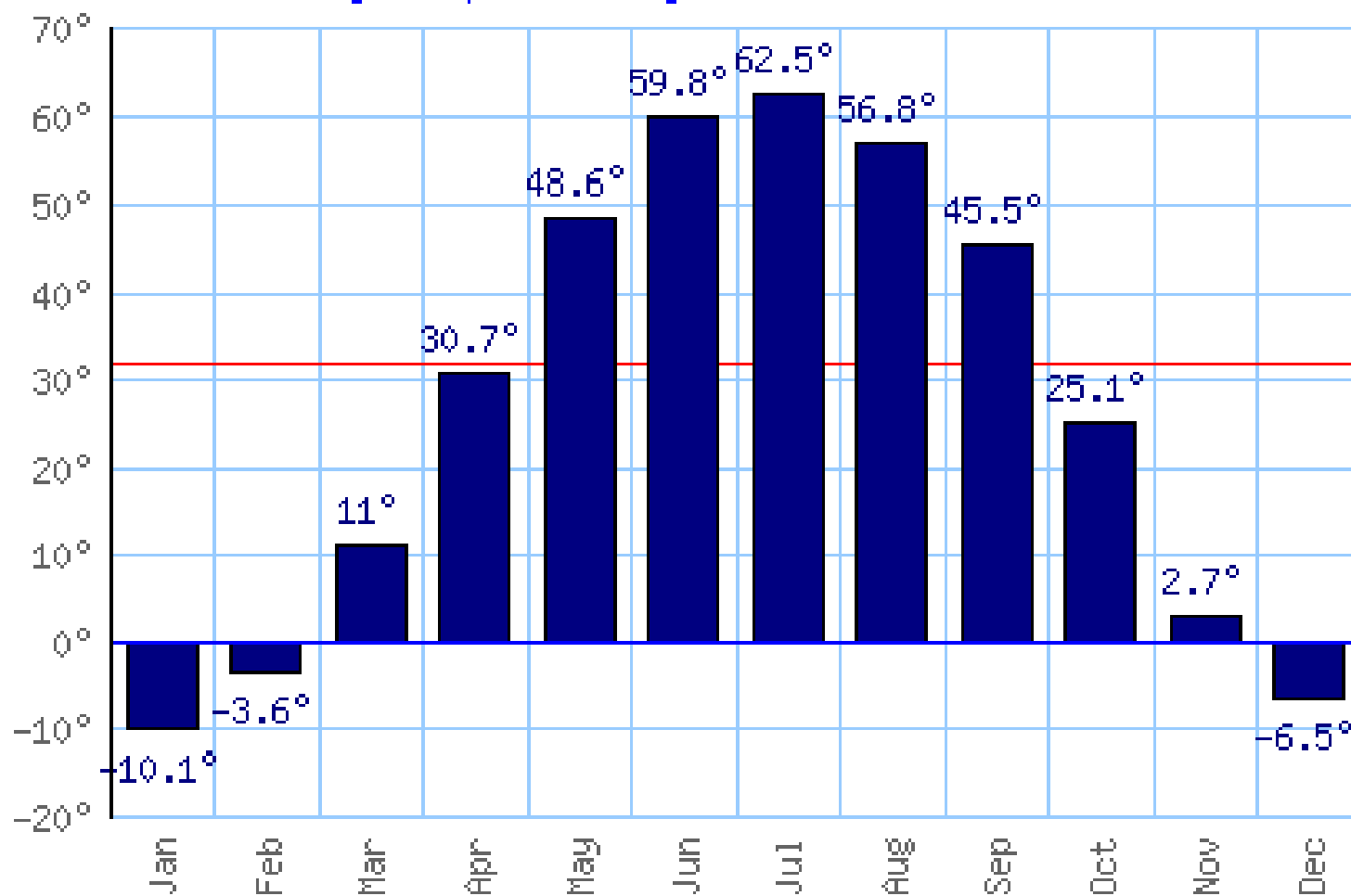


Greenhouse Heating Systems

- Forced air
- Central heating
- Radiant heating
- Under-bench heating
- Simpler is usually better!



Average Temperature by Month, in Fairbanks Alaska





When might heat recovery for greenhouses NOT be appropriate?

- Space heating for community buildings.
- Shoulder seasons only (no tomatoes in January).
- Recovered heat needed to maintain warm loop.
- Secondary heat source (i.e., wood-fired boiler) might be necessary.



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