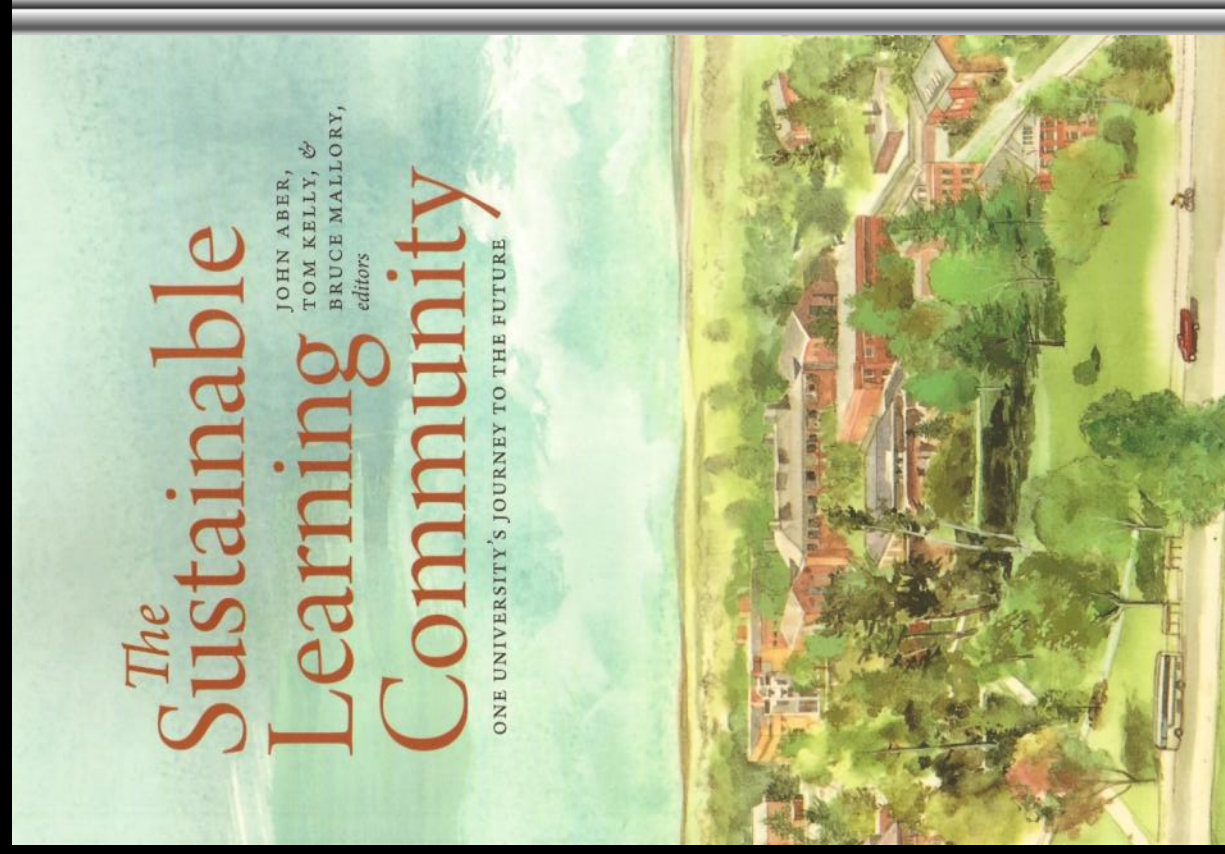




UNIVERSITY *of* NEW HAMPSHIRE

Transforming our Campus Energy Systems

Association of University
Architects
June 2009

The Sustainable Learning Community

describes the ten-year transformation of a university through

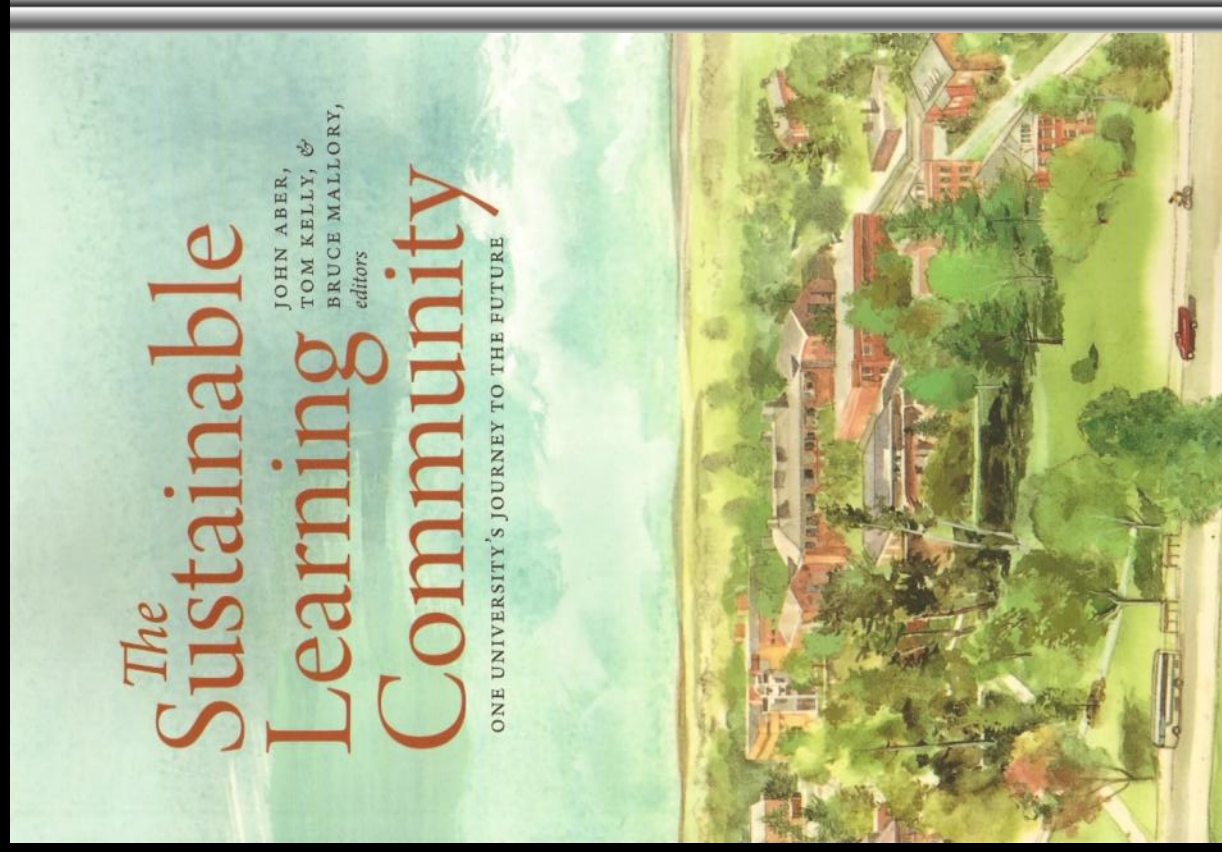
- Curriculum
- Operations
- Research
- Engagement

University Press of New England

published 2009

288 pp. 12 illus. 6 x 9"

\$29.95 Paperback



Transforming our
Campus Energy Systems

Began with financial decisions that
became good sustainability
decisions

Which then became one of our
most marketable traits

UNH on Princeton Review's "Green
Honor Roll" of Top 11 Sustainable

Colleges

*Oldest endowed sustainability program in the US
established in 1997*

Winner in 2008 Business
NH's "Leanest And
Greenest" Award



*Top Grade on 2008 & 2009
Sustainable Endowments
Institute College Sustainability*

*Report Cards
Nationally recognized energy
program*

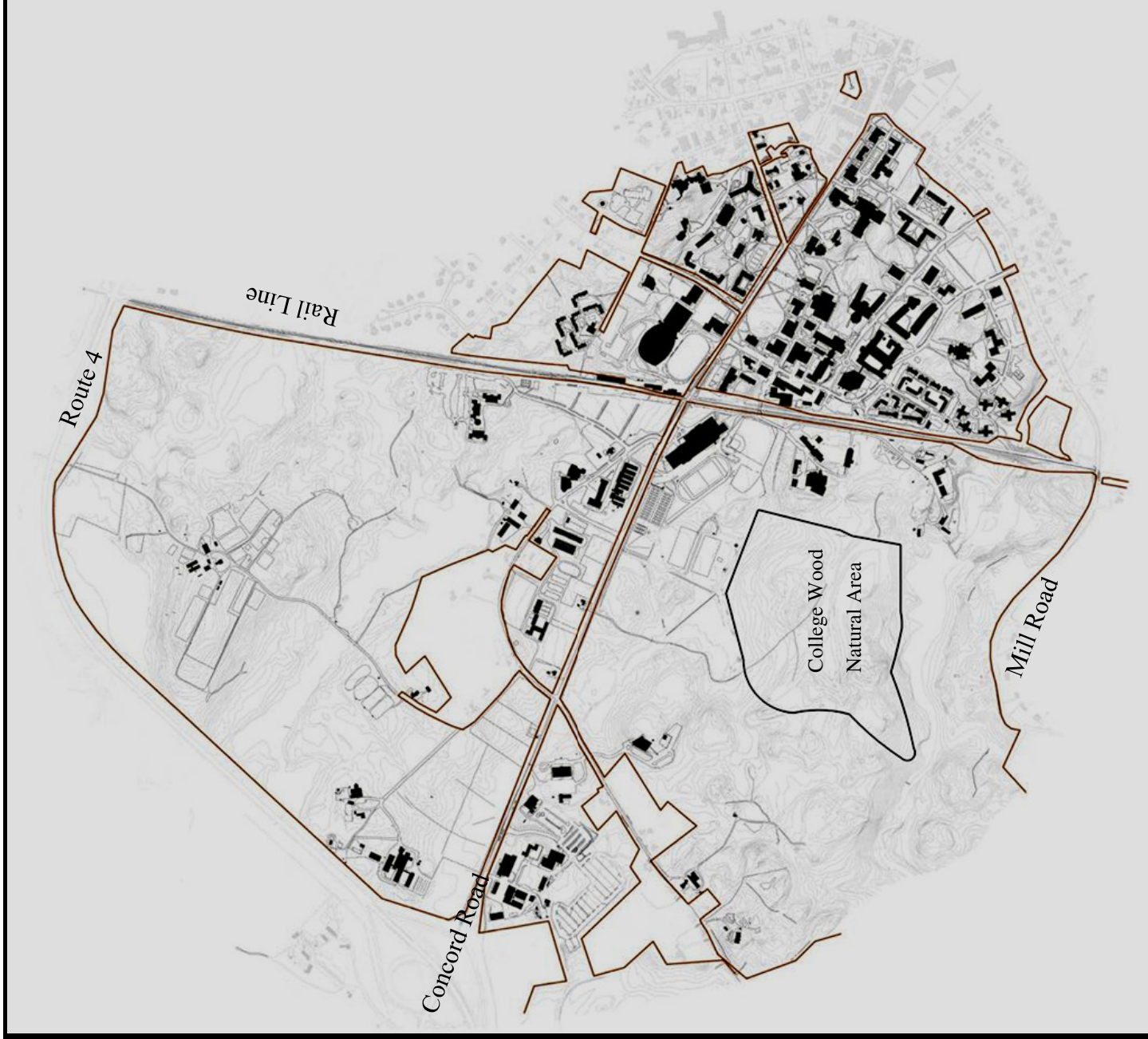


What's the real story?

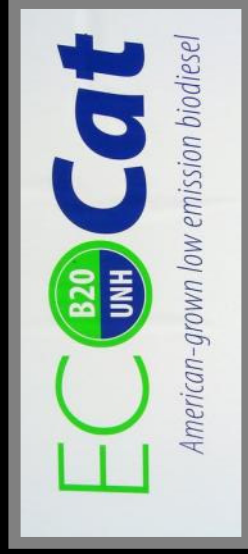
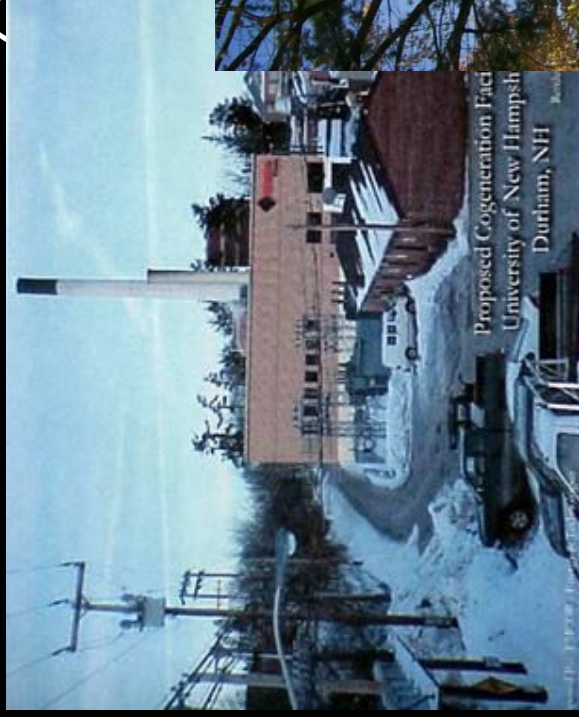


Current Campus Facts

- 1100 acres
- 300 acres is the campus proper
- 180 buildings
- 5,600,000 sf
- 11,800 undergrads
- 2,500 graduate students
- 6,600 parking



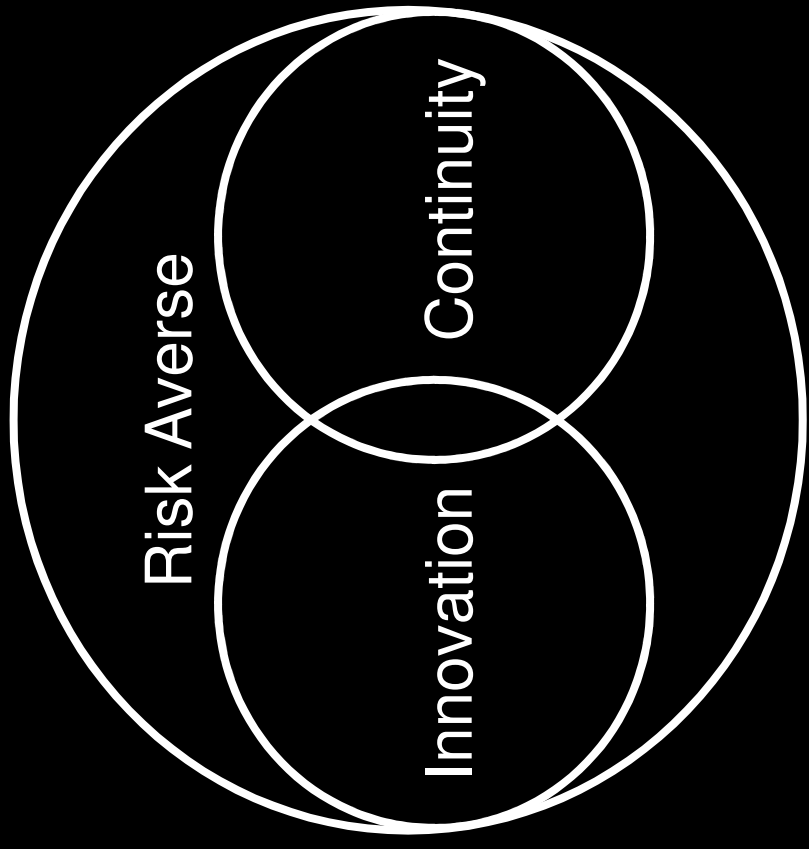
Sustainable Evolution of Campus Operations



UNIVERSITY of NEW HAMPSHIRE



Sustainability



Long Term Best Value using
the Limited Resources we have



UNIVERSITY of NEW HAMPSHIRE

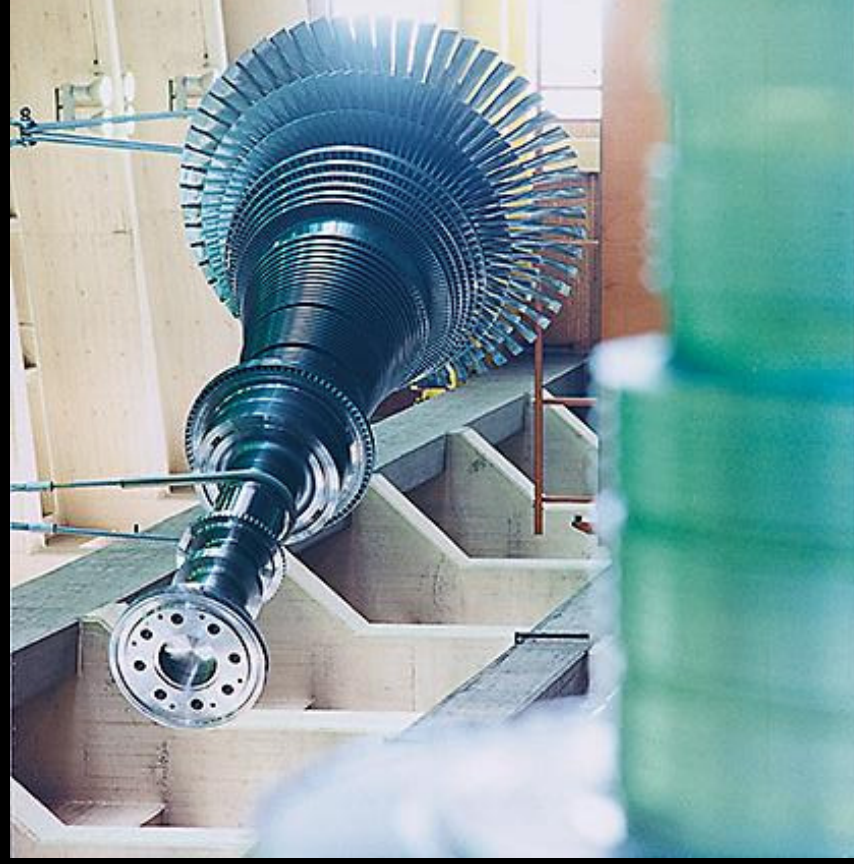
Campus Energy Initiatives

- Energy retrofits for over 20 years
- Centralized energy management
- Annual residence halls energy challenge
- Energy Star purchasing policy in place
- Central Heat and Power Plant (CoGen)
- *EcoLine* landfill methane gas for fuel



\$28.5m completed in 2006

Co Generation



Gas fired steam turbine generator

The University transformed our traditional heating plant into a combined heat and power plant

Generates 80% of the campus electricity and uses the waste heat for heating the central campus buildings

Up to 90% efficient, so it's almost getting 2

Much more
complicated to
operate than a
traditional
plant

*We hired an
outside operator
to run
our plant and to
manage our
campus power
grid*

THE BALANCE for CO GENERATION



It needs a steam load to make it financially effective, this is fine in the winter, but what about the summer?

We need to invest in steam absorption chillers for our major science, and academic buildings that need summer chilling, we hope to use the same campus

THE BALANCE for CO GENERATION



Transforming our Campus Energy Systems

Chapter 2



Landfill Gas

The dilemma

University Energy

Needs

The University is facing more and more uncertainty about its energy costs

Limited financial resources are placing additional pressure to find ways to reduce energy costs

Landfill Methane Gas

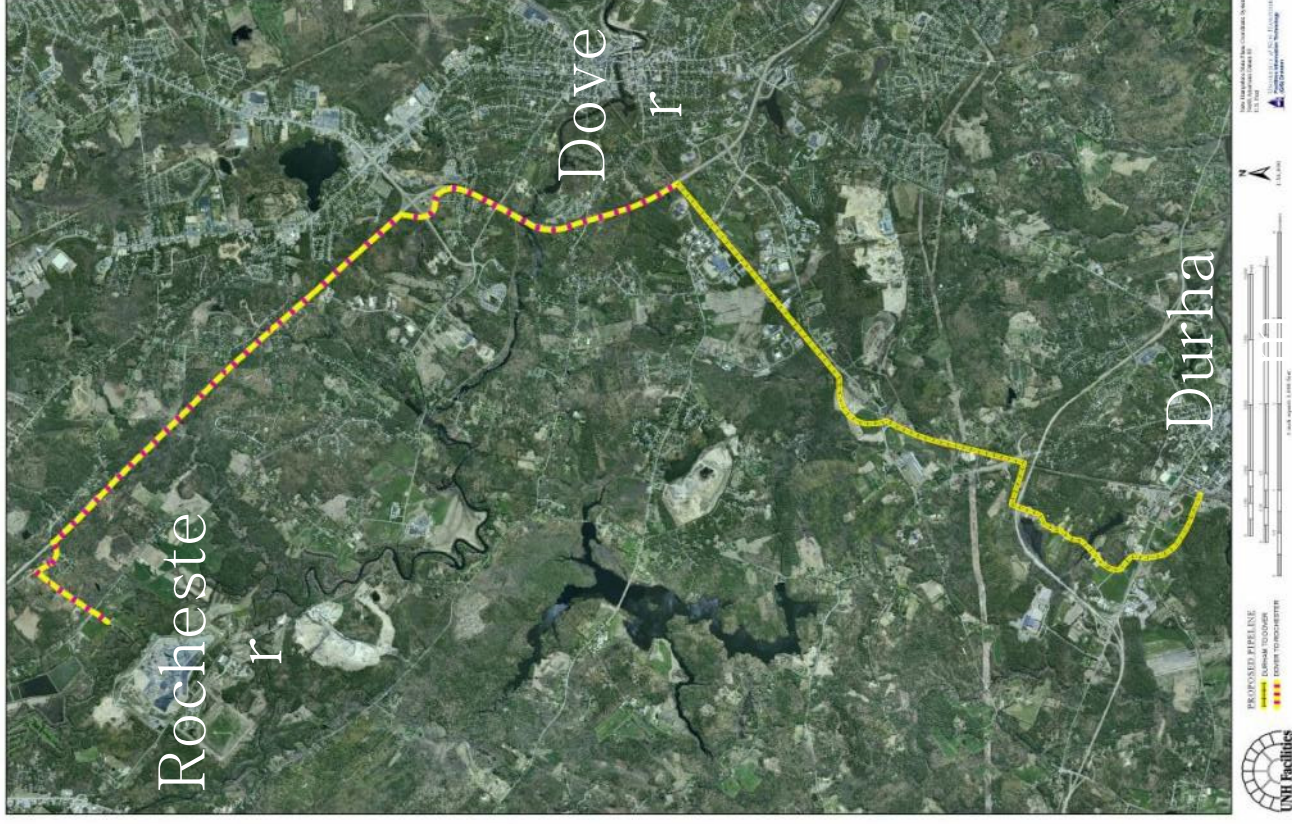
Issues

Waste Management's large regional landfill is producing more methane gas than they can utilize in the power plant

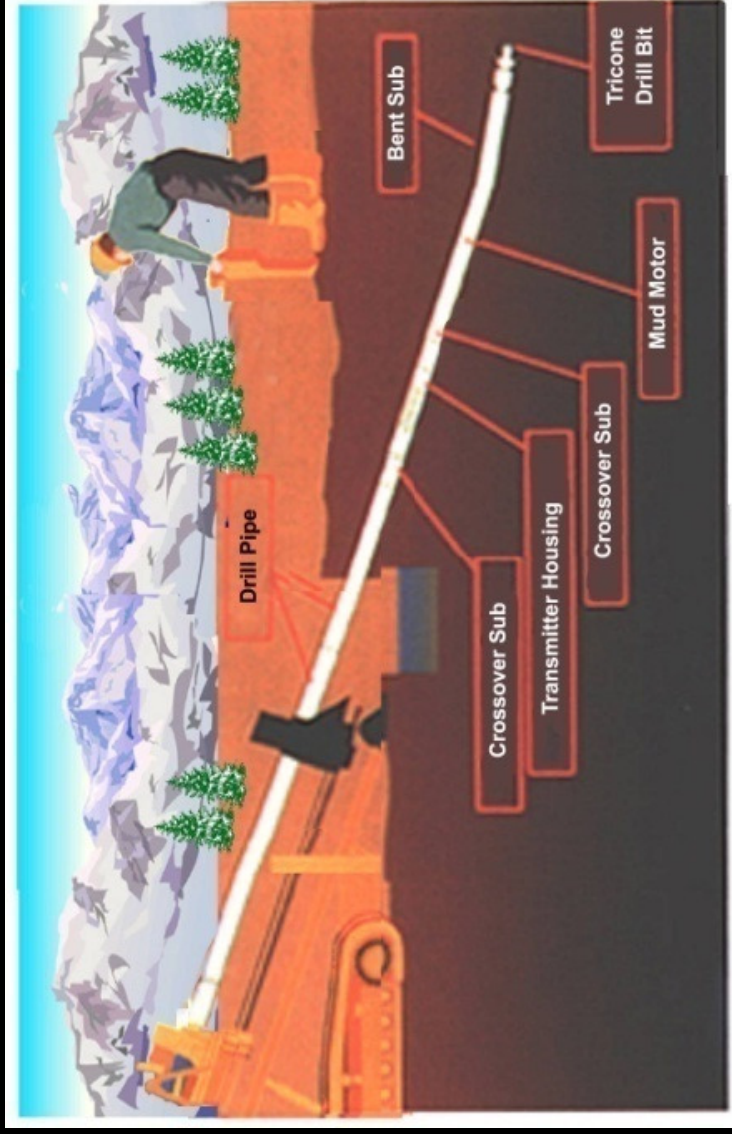
And the State of NH has limited their ability to expand their power plant and threatened to fine them.

The Benefits of using the *EcoLine* landfill gas for the campus

- 80% - 85% of campus energy can be from renewable energy
- Reduce exposure to energy market fluctuation and improve cost stability and predictability
- Carbon Emission Reduction



Directional Drilling



Campus Energy provided by the EcoLine



Raw Landfill Gas



Processing Plant
(Remove Contaminates)



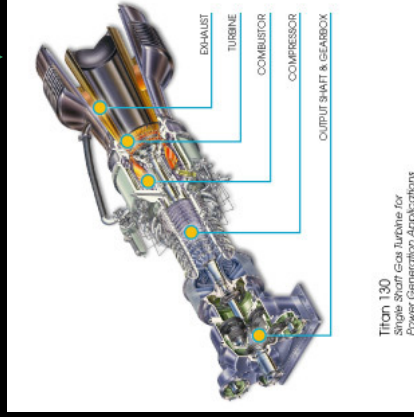
Flare Unused Gas

Dirty, low-
energy gas

Clean, medium energy gas
piped to campus

Productively Use Excess

Campus needs

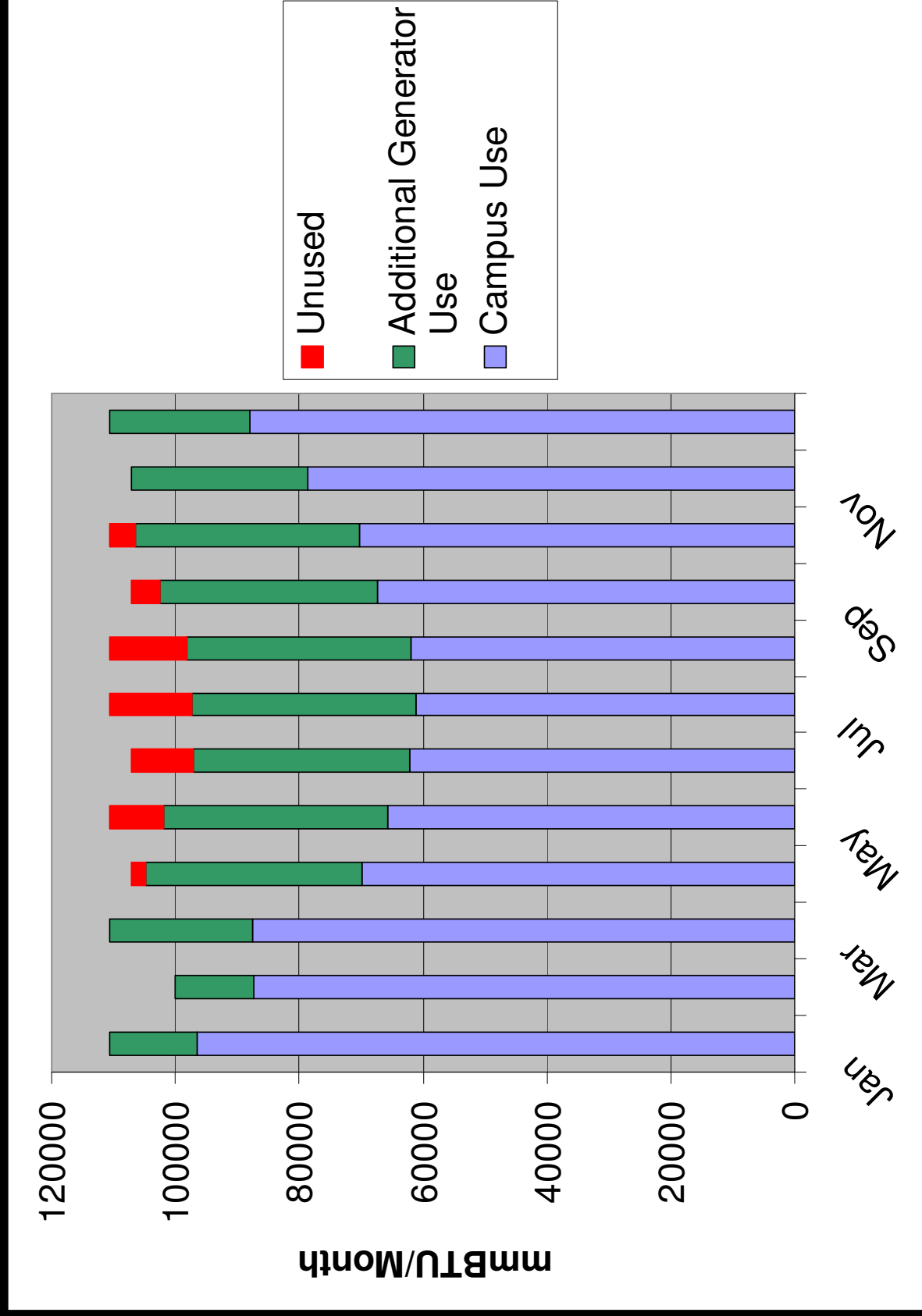


Electric
Generator



UNH Co-Gen Plant

Maximum Use of the Gas



Initially Estimated at \$40m in 2006

Completed 2009 - Final Cost \$49m

paid back over 10 years

Potentially Huge Benefits

- Financial – Possible 17% return
- Environmental PR

Seven Areas of Risk

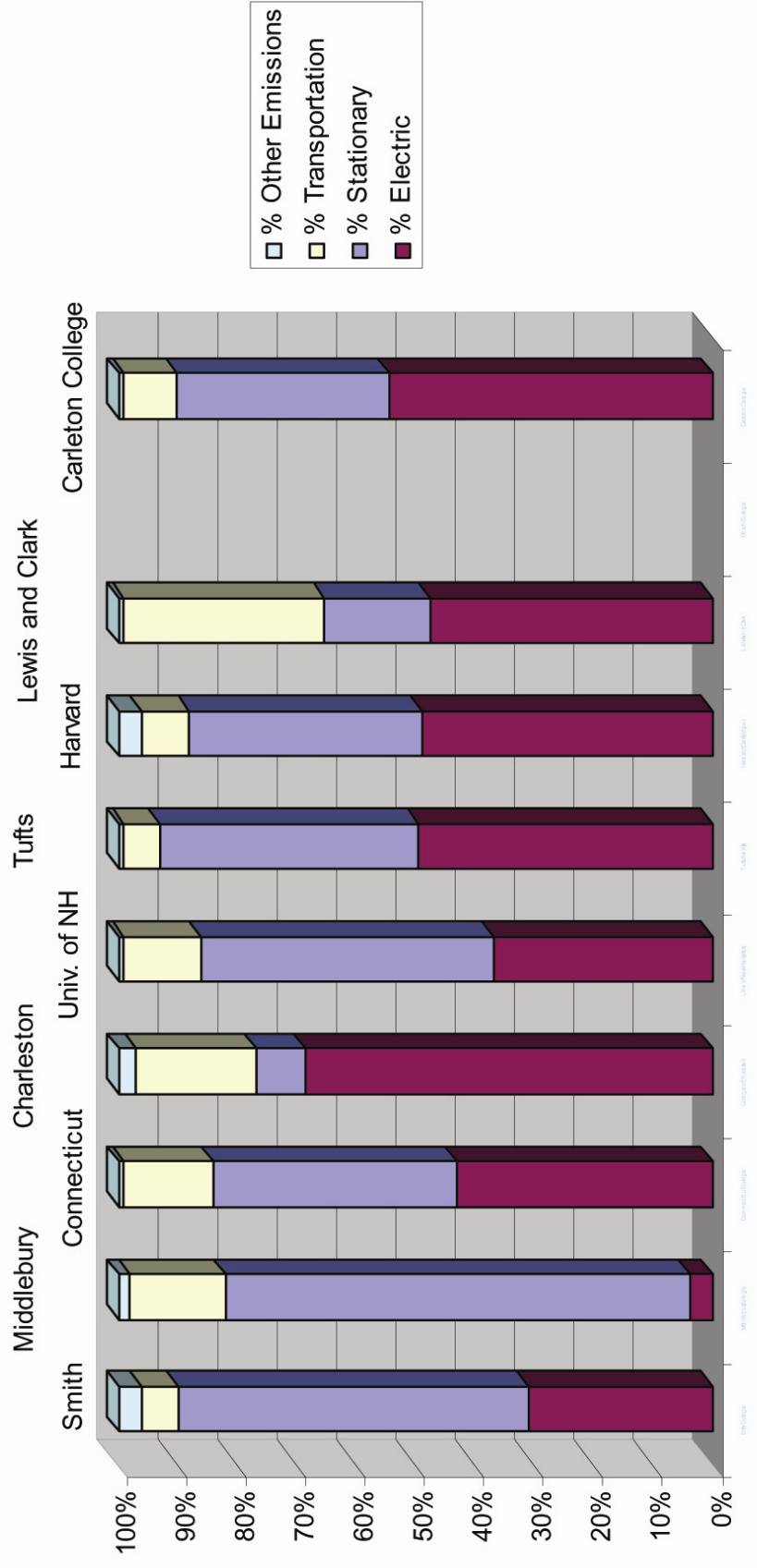
- Capital Cost Escalation due to unknowns
- Air and Wetland Permits
- Natural Gas Market Price Fluctuations
- Actual Operating Costs
- Need a Fixed Price Charged to Campus
- Quality and Quantity of Landfill

Sustainability Greenhouse Gas Emissions The Climate Commitment

70-90% of Emissions are Building Related

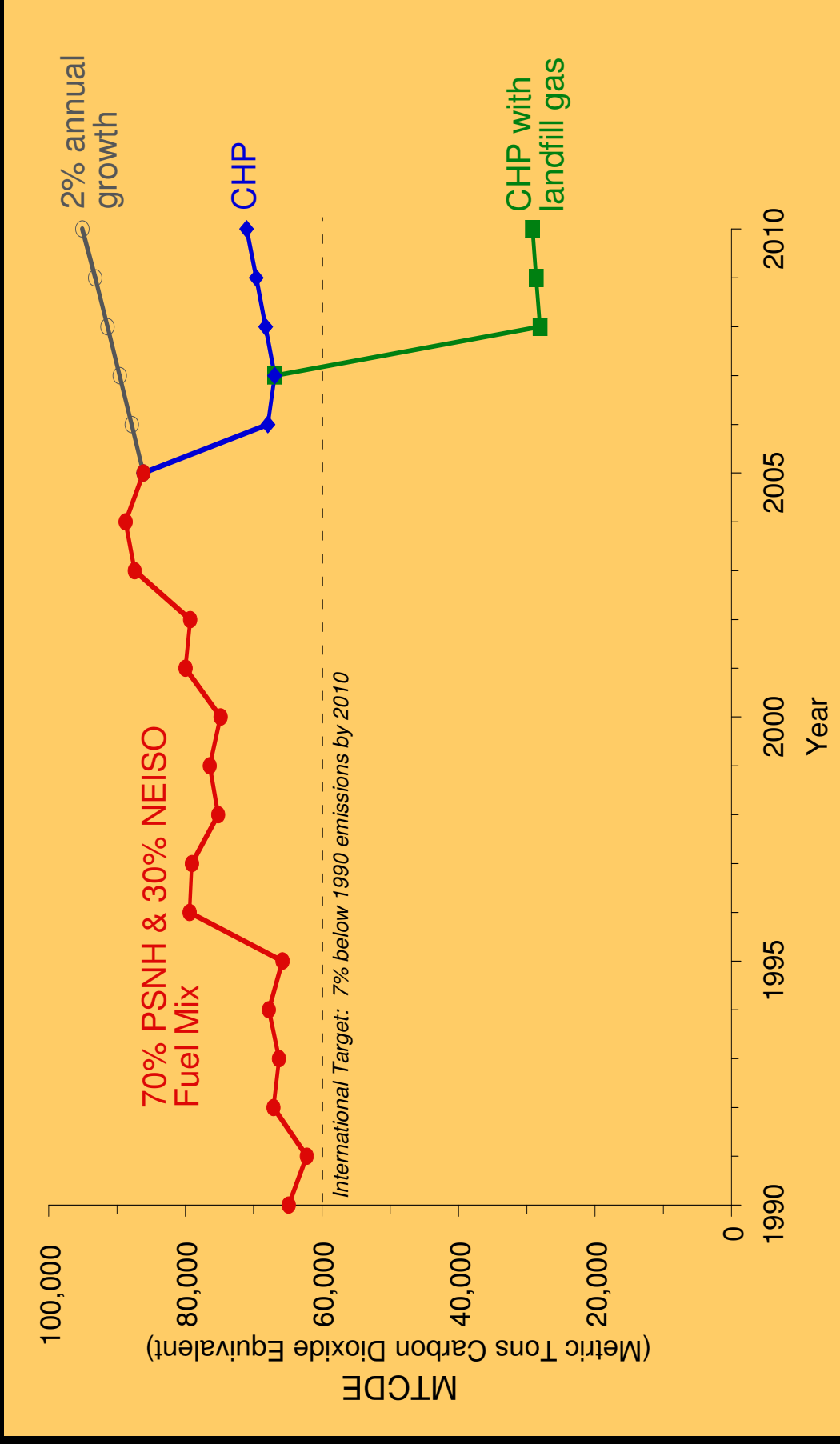
Graph 8:

% of Each Type of GHG Emissions in Most Recent Inventory



Campus Energy - Sustainability

reducing carbon emissions





American College & University Presidents Climate Commitment (ACUPCC)

UNH commitment
is an 80%
reduction in
greenhouse gas
emissions by 2080
and 50% by 2020
because of this

Sustainability Trade Offs

- Claim Carbon Credits and Meet the ACUPCC Renewable Energy Goal

OR to make it more financially viable

- Sell Renewable Energy Credits (RECs)
- Sell allowances through the

Lots of Regional and
National Hype, Recognition
and Press

<http://www.youtube.com/watch?v=6Gg4JG3X6dY>

Only Time will tell how well
it actually pays off