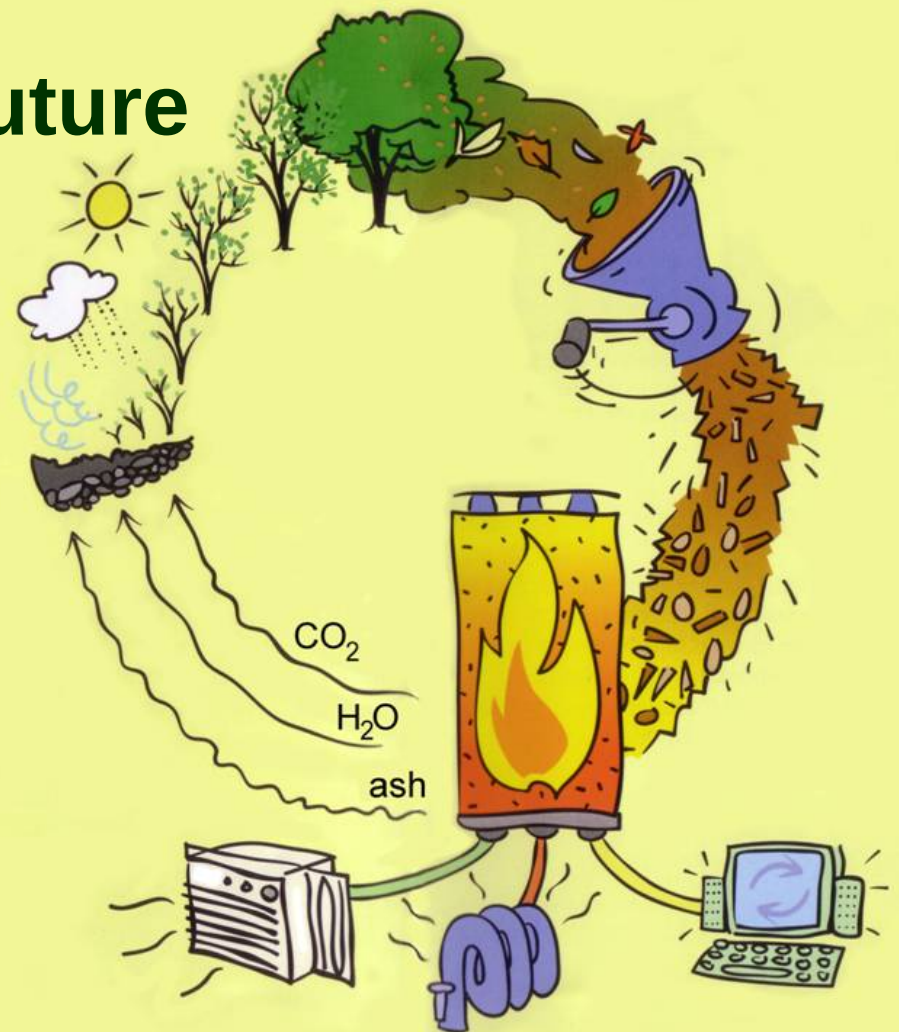


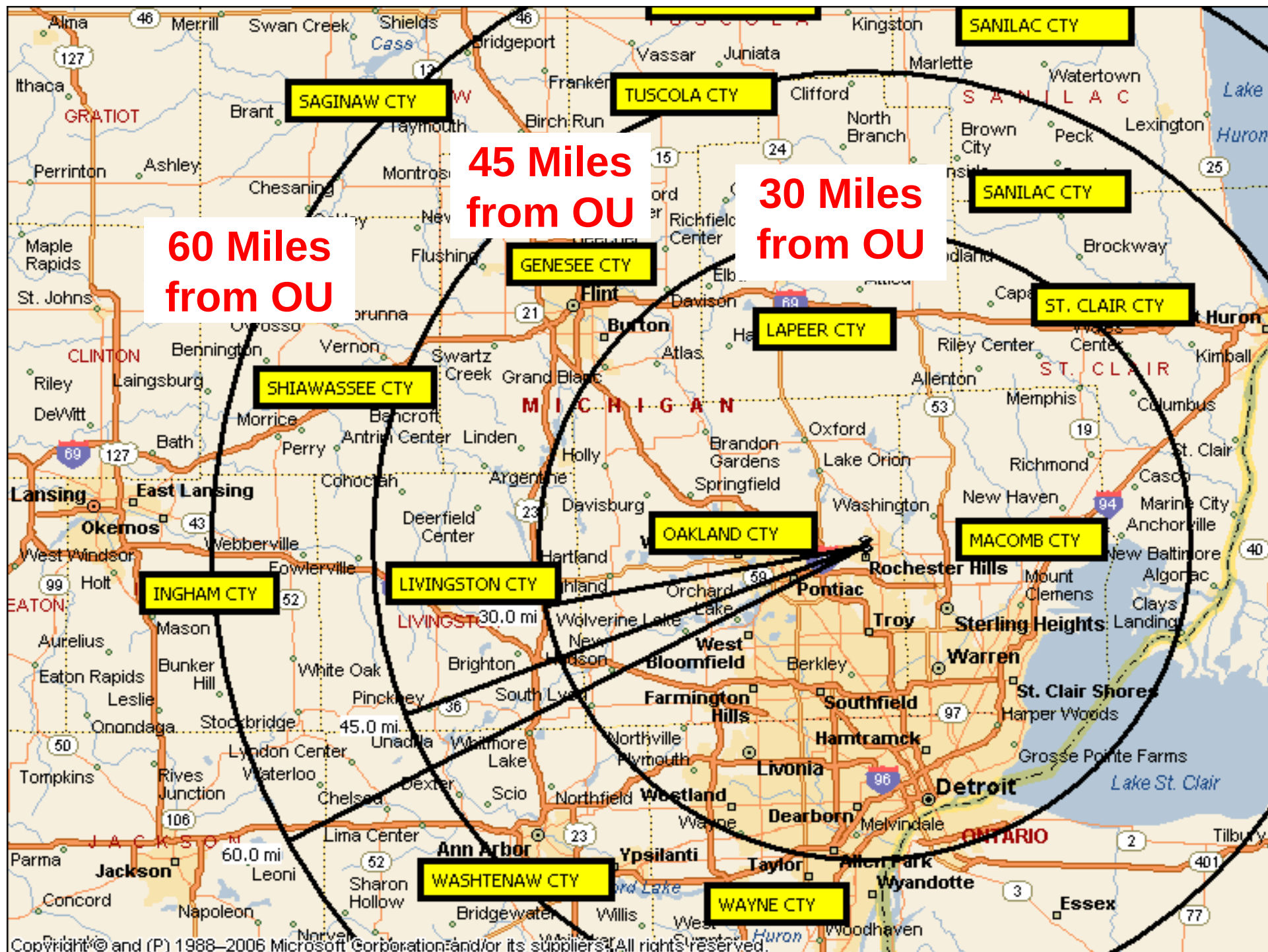
Biomass Power

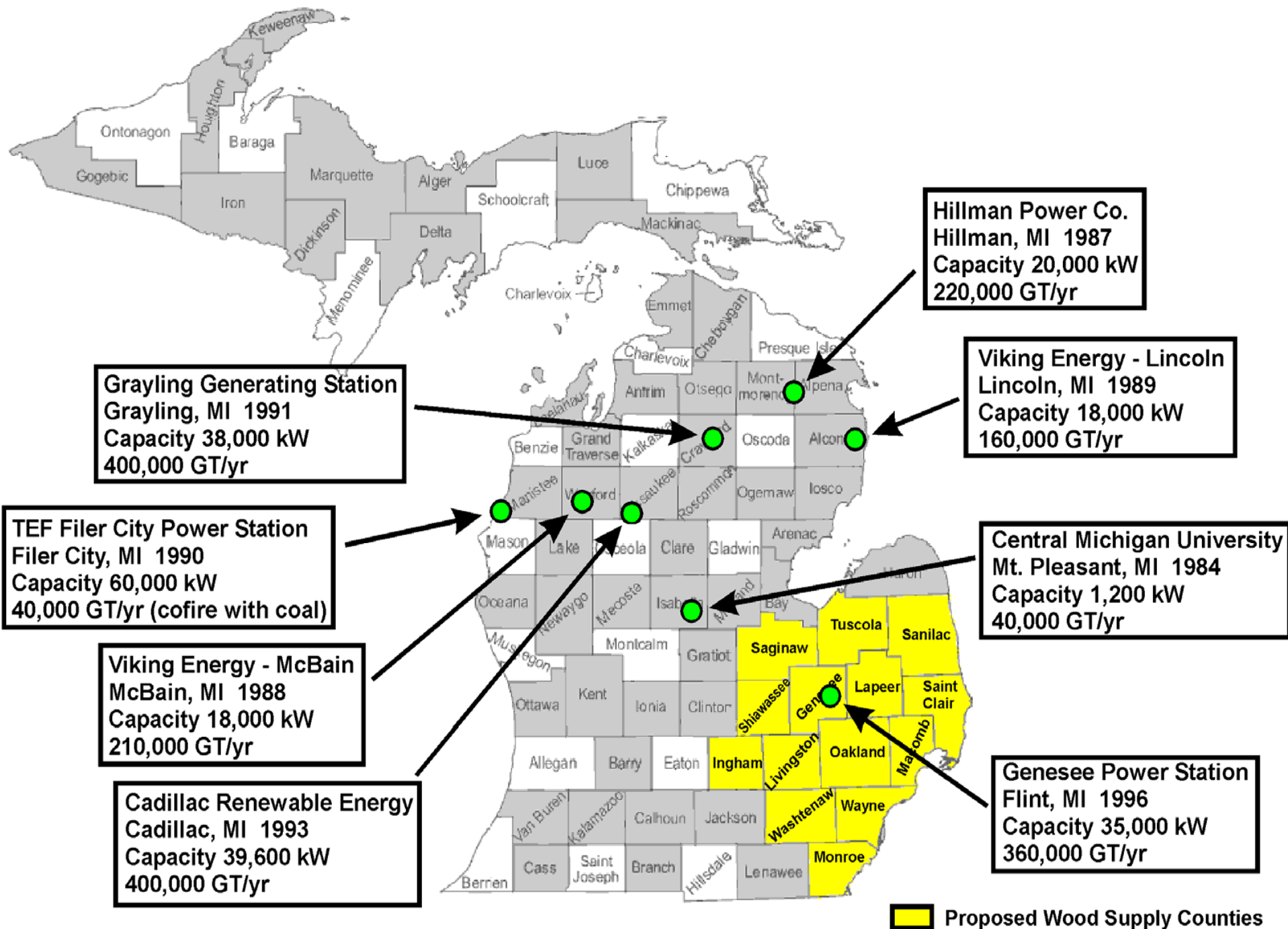


Jim Leidel
Oakland University
April 2008

- Wood supply
- Campus growth & future needs
- Wood boilers
- Proposed sites
- Costs & savings
- Funding
- Recommendations









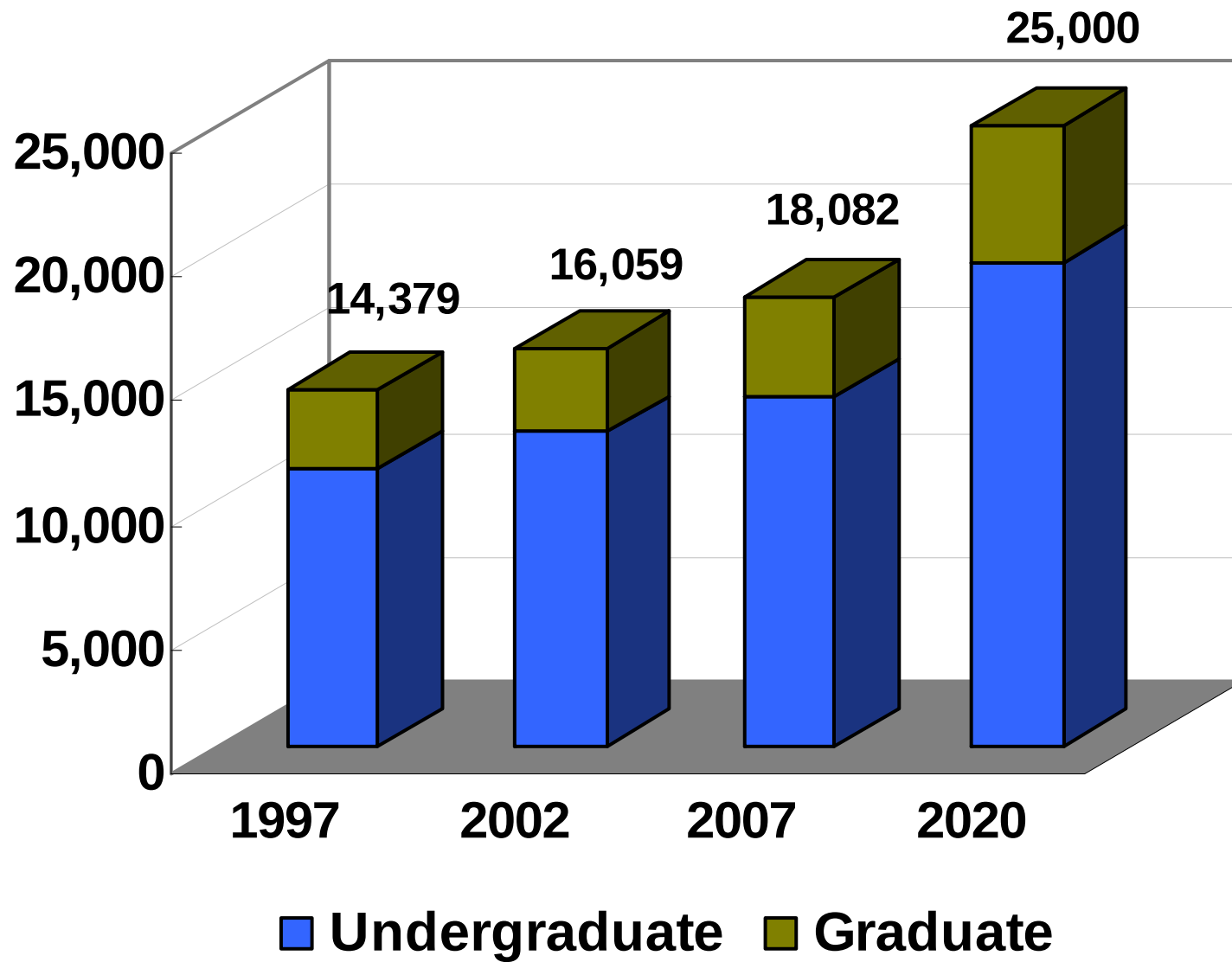
CMU Wood Boiler Plant

**(note: only water vapor
is coming from stack)**

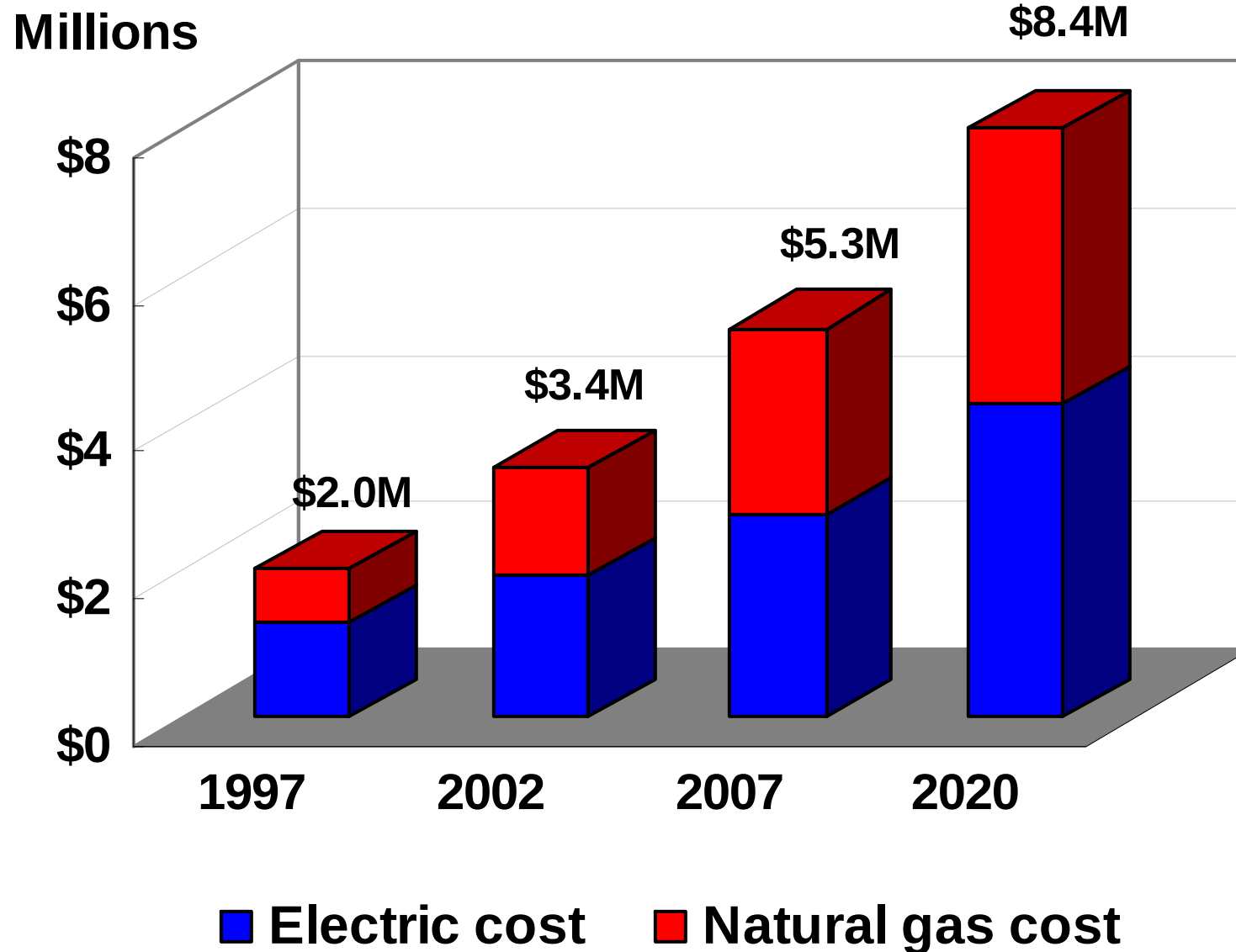
photo - Jim Leidel 2005

Existing Central Heating Plant

Unit	Capacity (MMBTU/hr)	Year Installed	Age in years / Condition
B-1	100	1969	39 / good
B-2	100	1969	39 / good
B-3	34	1959	49 / fair
B-4	32	1957	51 / marginal
Total	265		

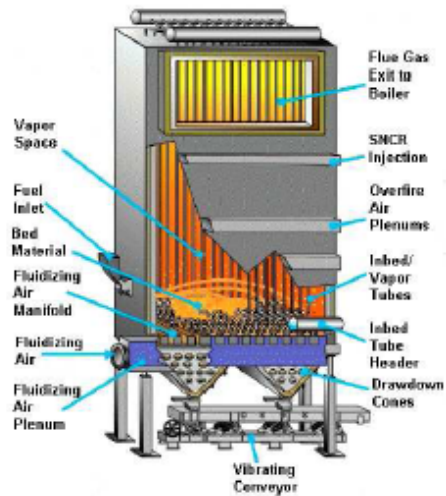


Oakland University Ten Year Fall Enrollment Growth with 2020 Vision

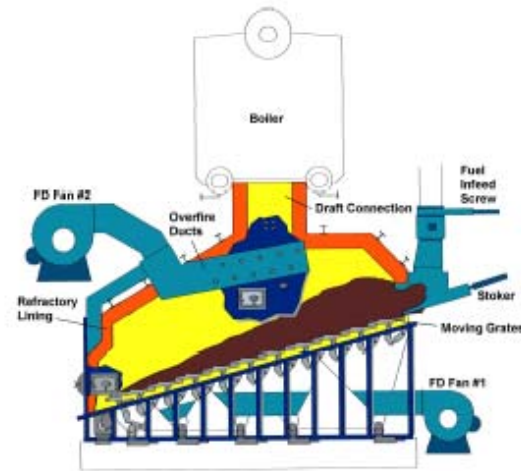


Oakland University Ten Year Energy Growth with 2020 Vision

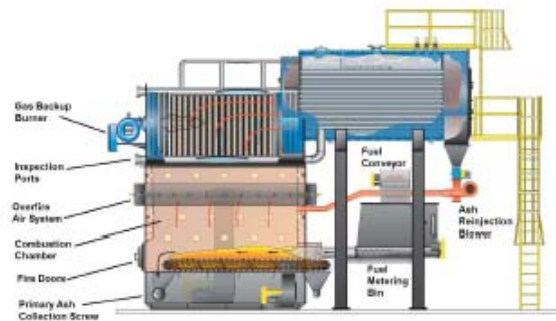
2020 Projection based on \$0.085/kWhr electricity and \$11/MMBTU gas



EPI Fluid Bed
(Steam & HW)



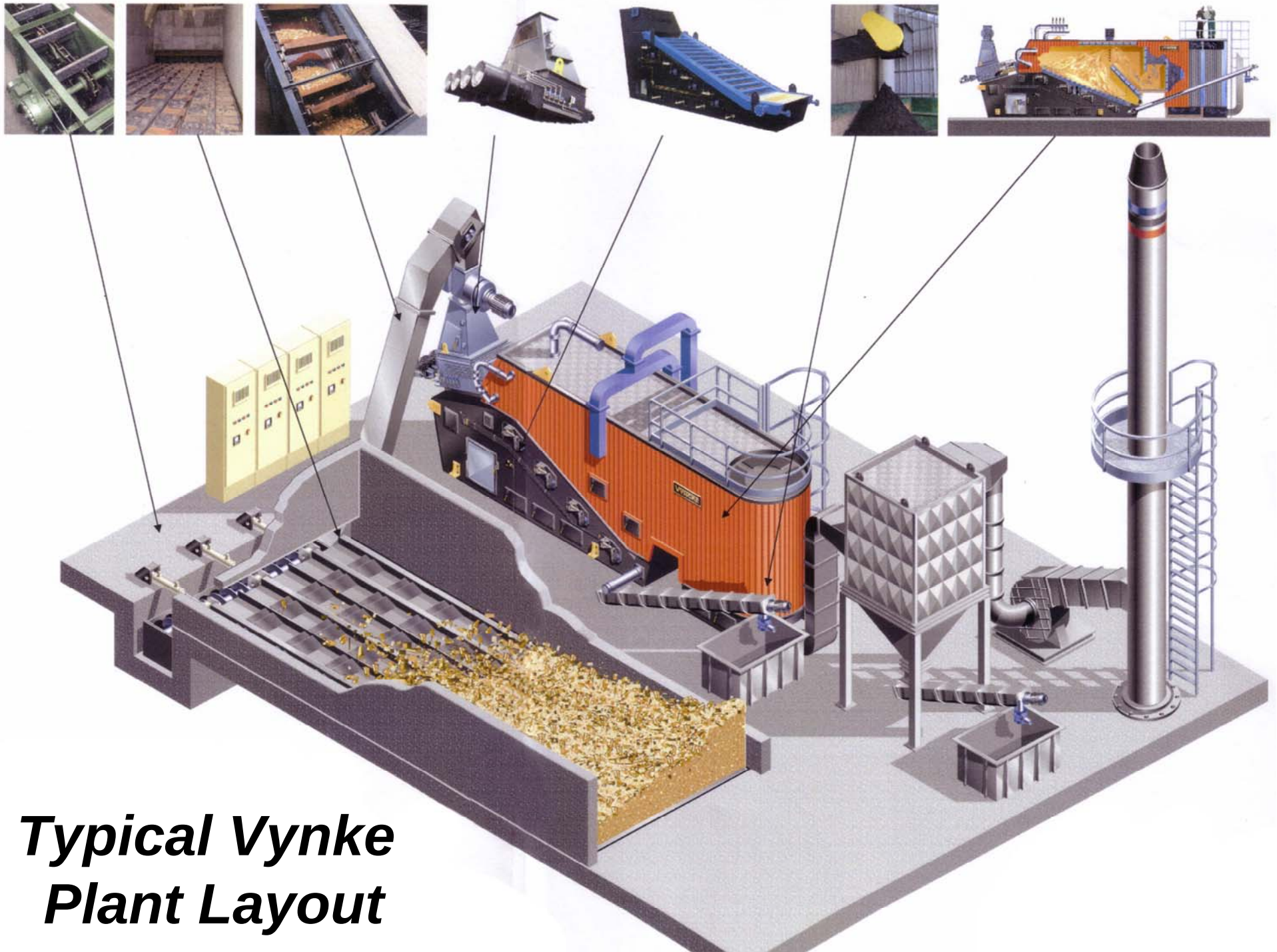
English Stoker
(Steam & HW)



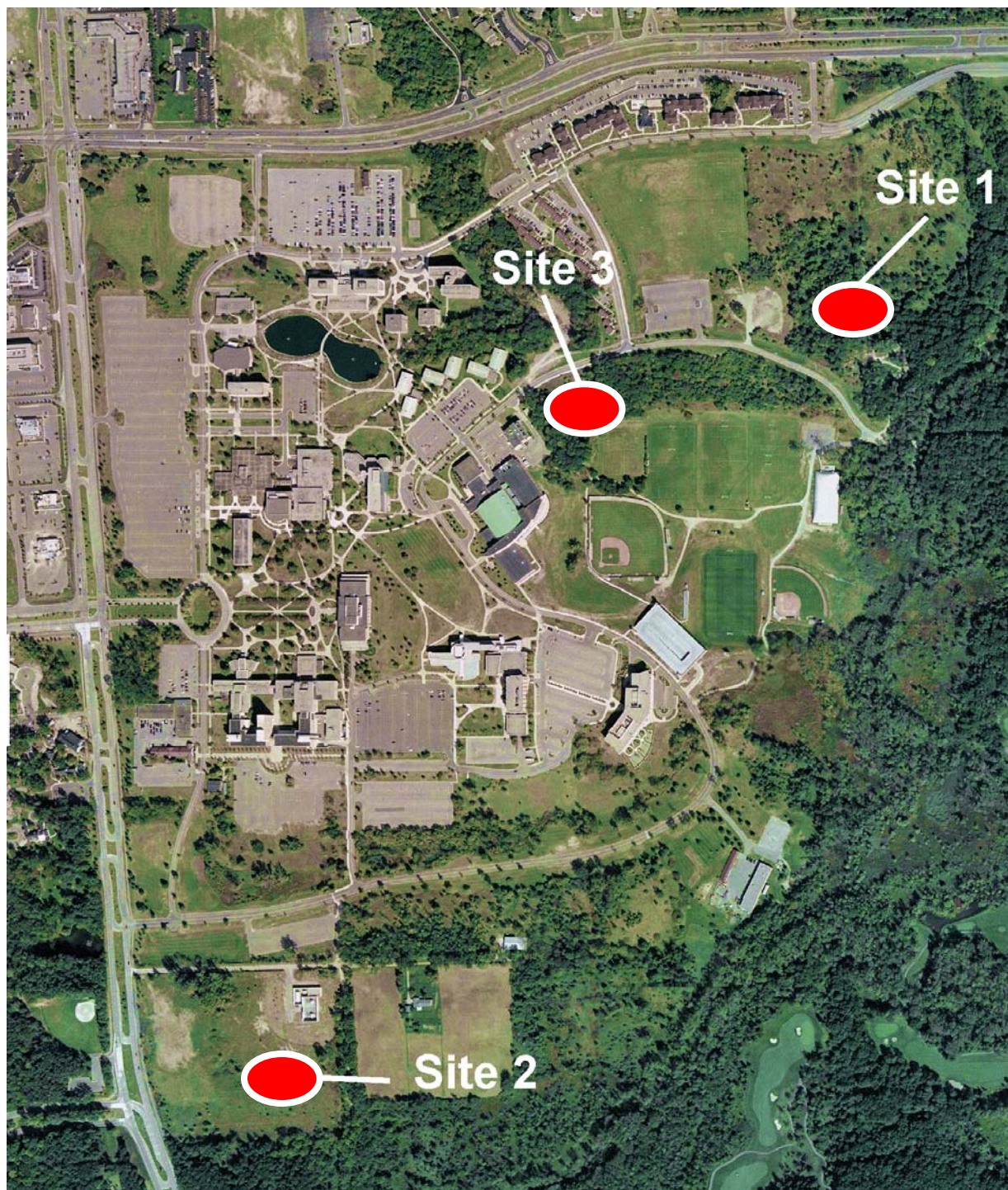
Hurst Stoker
(HW Only)



Vynke Stoker
(Steam & HW)



***Typical Vynke
Plant Layout***



Three Proposed Site Locations









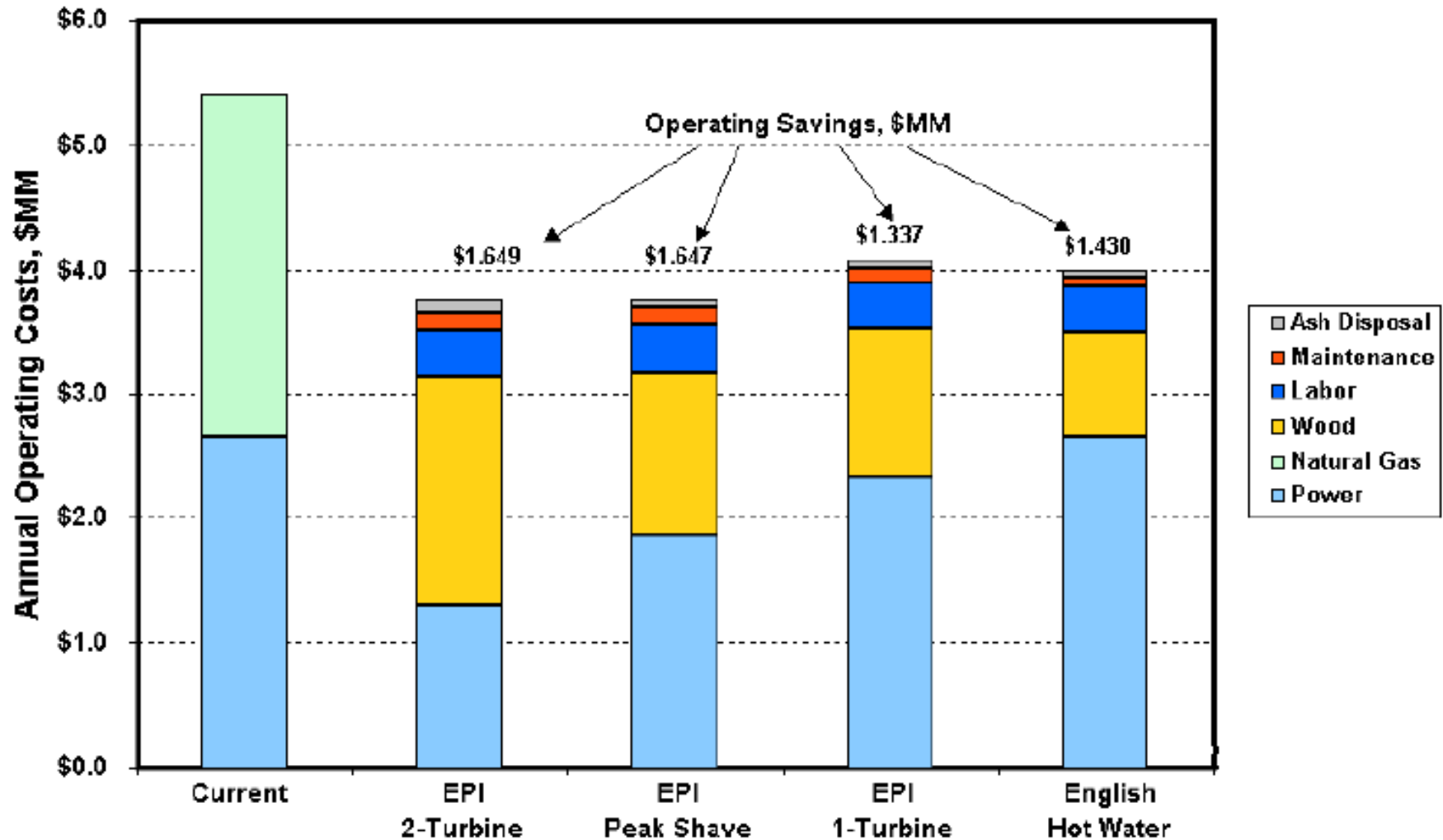
Estimated Project Budget for Site Two



Site #2 at Spencer Substation

CONSTRUCTION COSTS:	Feet	Cost/ft	Cost	Notes
HTHW connection	1,200	\$2,750	\$ 3,300,000	
13.2kV electric connection	300	\$250	\$ 75,000	
Sitework: development, parking, etc...			\$ 1,000,000	allowance
Roadways	1,300		\$ 2,250,000	estimate based on comparison to site #1 estimate
Storm water relocation			\$ -	
Boiler Plant			\$ 25,540,000	EPI fluidized bed with steam cogeneration option
Subtotal			\$ 32,165,000	
Permits & agency reviews			\$ 50,000	allowance
Construction contingency			\$ 3,216,500	10%
Contractor fees, general conditions, insurance			n/a	all construction cost included in boiler plant cost
Construction Subtotal			\$ 35,431,500	
OWNER COSTS:				
Architectural & engineering fees			\$ 2,125,890	6%
Furniture, fixtures, and equipment			\$ 55,000	allowance
Sound & video security			\$ 50,000	allowance
Telecommunications & data			\$ 80,000	allowance
Signage			\$ 30,000	allowance
Testing, survey, borings			\$ 75,000	allowance
Owner contingency			\$ 5,314,725	15%
Debt placement			\$ 708,630	2%
Total Project Cost			\$ 43,870,745	

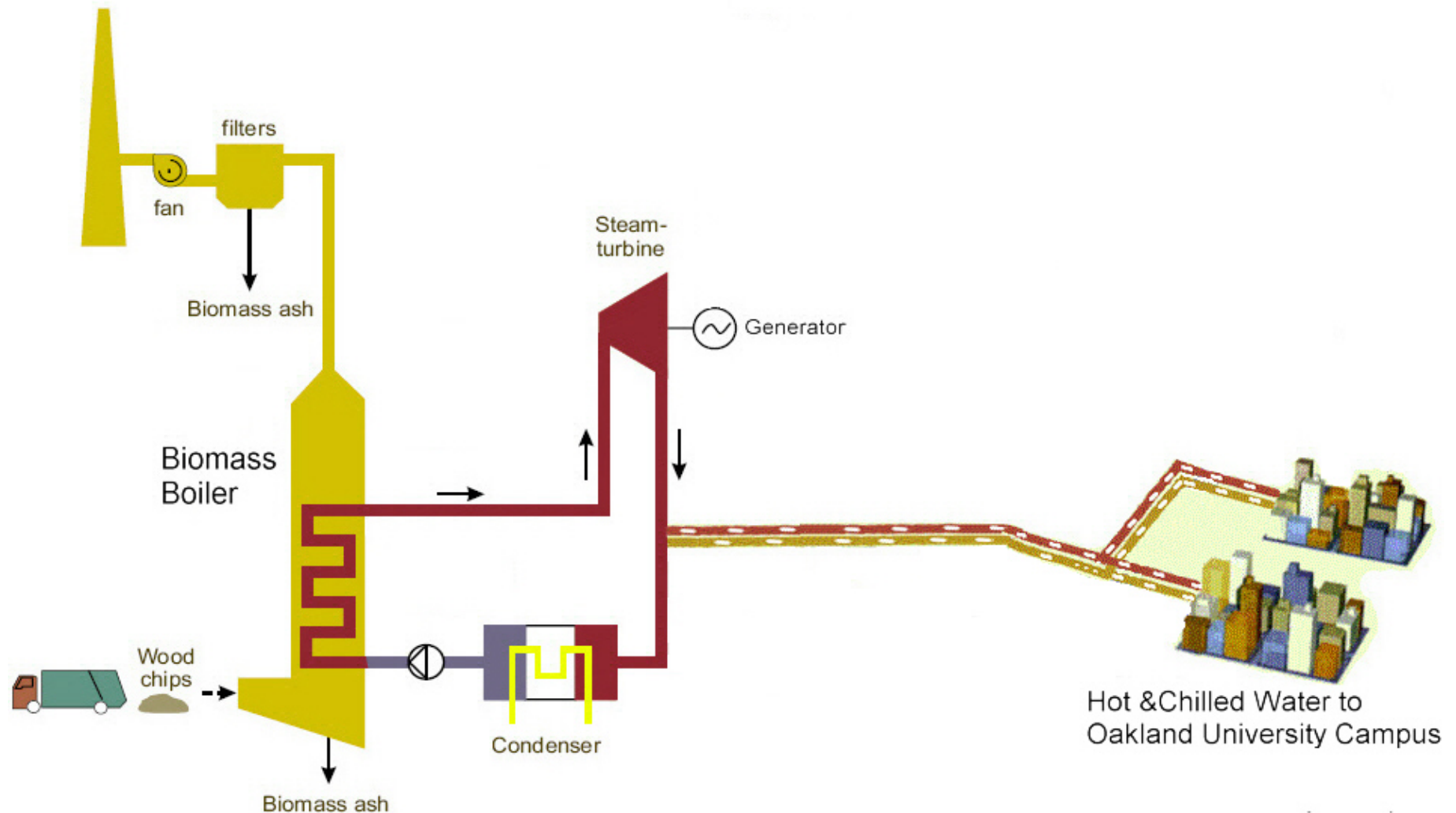
Operating Cost Estimates



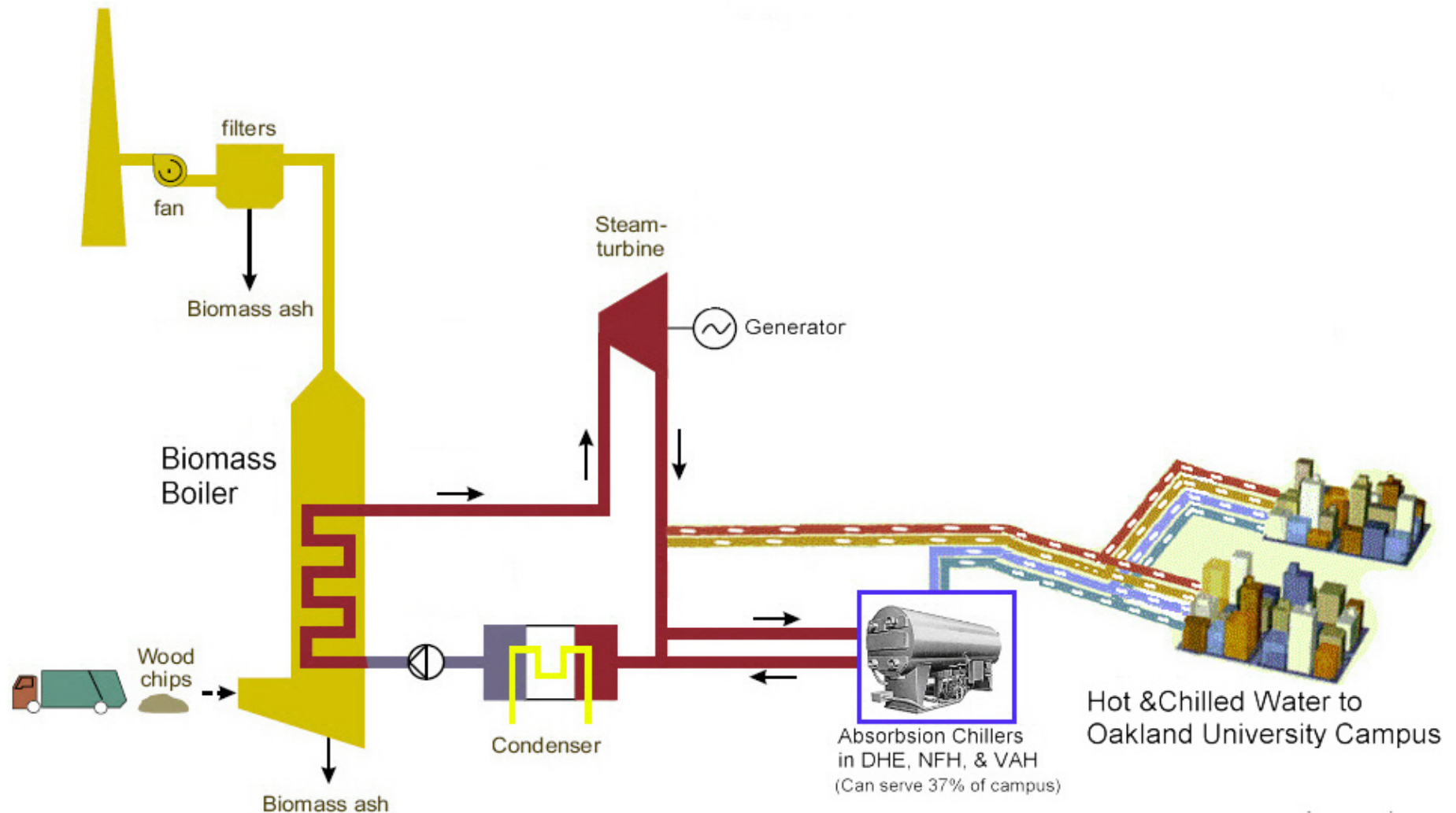
Estimated Payback

Biomass boiler plant	\$43.9M
Avoided cost for existing B-4	(\$ 3.0M)
Avoided cost for oil system	(\$ 1.3M)
Net biomass boiler plant cost	\$40.3M
Net annual operating costs	\$ 1.7M
Simple Payback	23-24 yrs

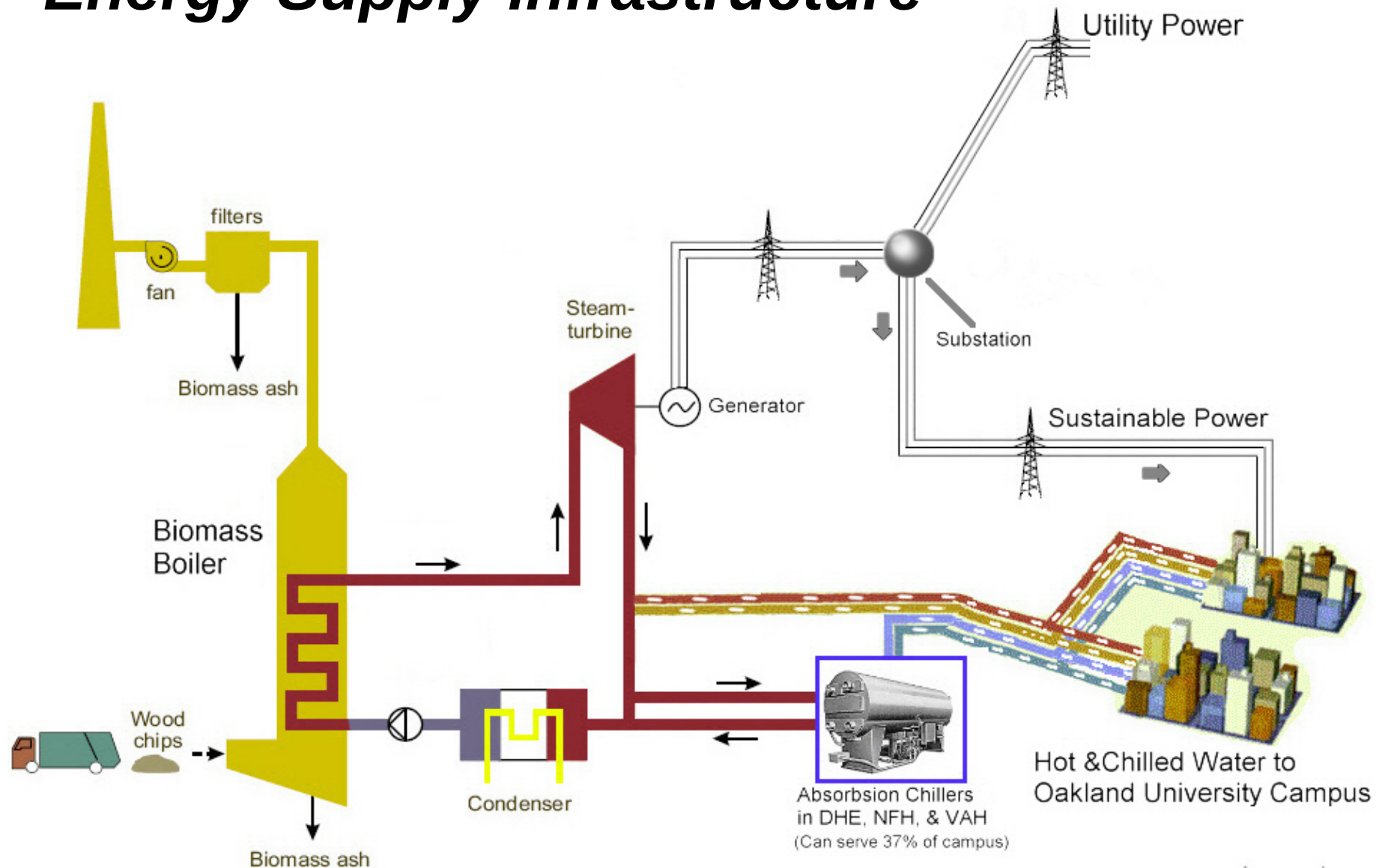
Overview of an Integrated, Renewable Energy Supply Infrastructure



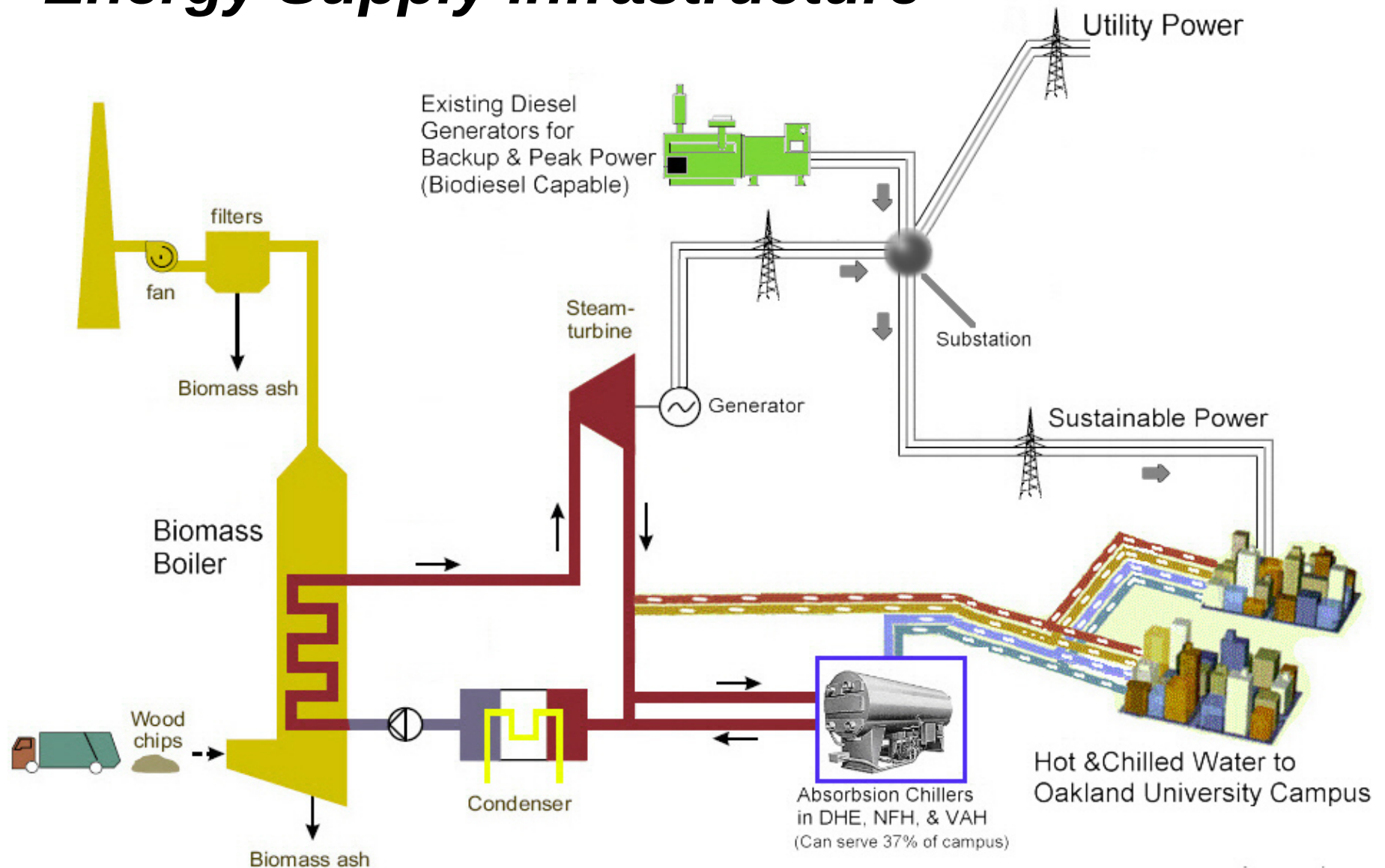
Overview of an Integrated, Renewable Energy Supply Infrastructure



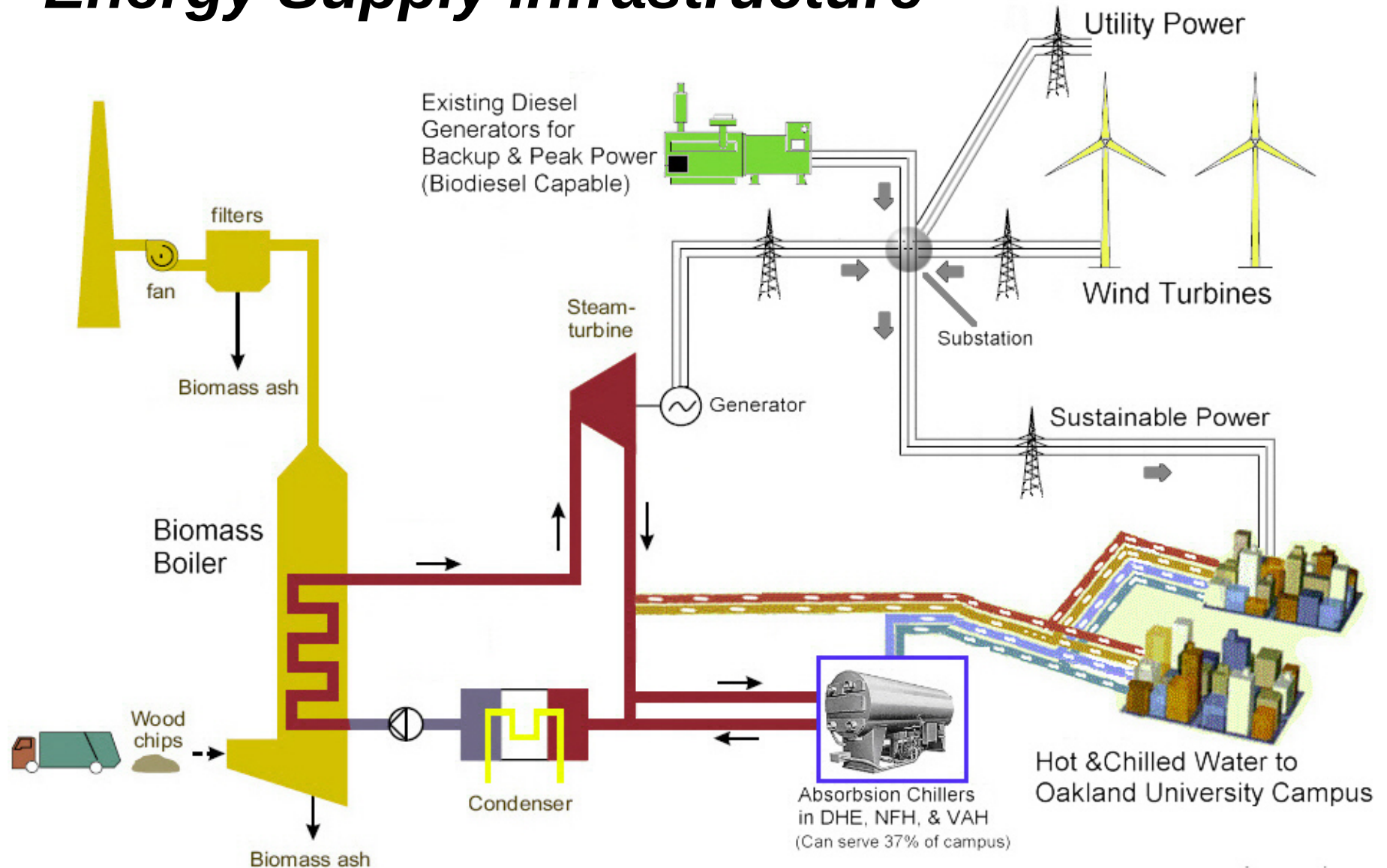
Overview of an Integrated, Renewable Energy Supply Infrastructure



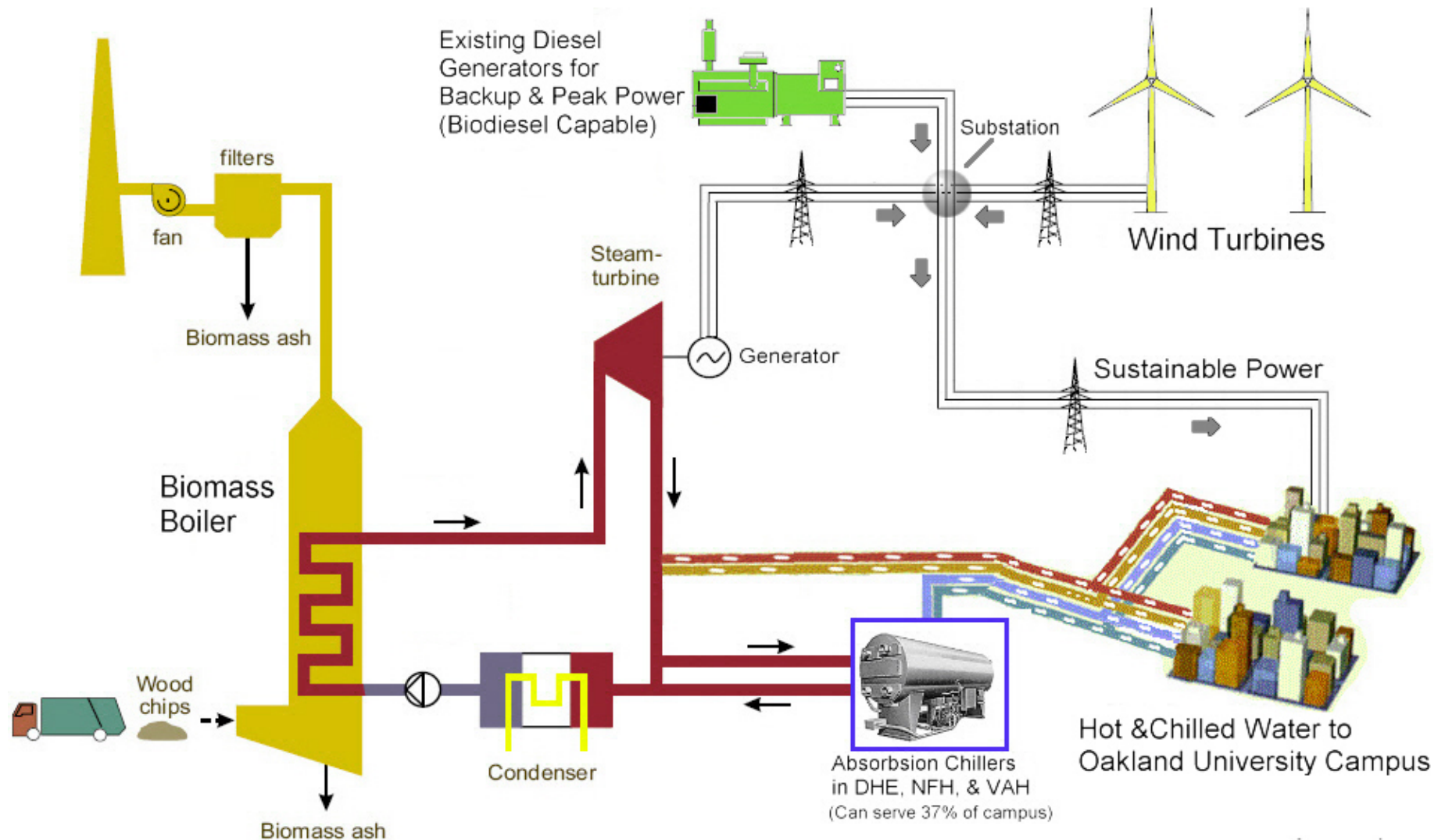
Overview of an Integrated, Renewable Energy Supply Infrastructure



Overview of an Integrated, Renewable Energy Supply Infrastructure



Overview of an Integrated, Renewable Energy Supply Infrastructure



Overview of an Integrated Renewable Energy Supply Infrastructure



	Existing Fossil Fuel Mix		Proposed Renewable Energy	
	Thermal (Heating)	Electrical	Thermal (Heating)	Electrical
Central Heating Plant (natural gas)	100%		20%	
Detroit Edison		95%		20%
Diesel Generators		5%		10%
Biomass Boiler Plant			80%	50%
Wind Power				20%
Totals	100%	100%	100%	100%

Proposed Funding Sources

- 1. Issue 15 to 20 year bonds**
- 2. Seek partners willing to enter into a third party “owned & operated” arrangement. Several potential parties have been identified that could provide this option.**

Recommendations

- **Select project site**
- **Select financing method**
- **Solicit bids for design/build contractor**
- **Begin the detailed engineering**
for the boiler plant, building, roadways, and
utility interconnections to the selected site
- **Begin permitting process**
- **Establish a utility interconnection
agreement**

Biomass Power

A Sustainable
Energy Option
for the Future
of Oakland
University

