

# Getting to 20% Renewable by 2020: *Three Project Stories*

- ▶ This goal is significant, by achievable.
- ▶ Technologically we know what to do.
- ▶ Where do we begin? Taking stock. Roll up your sleeves and develop your vision.
- ▶ Let's begin. What is your
  - ▶ Population, divide by state total, and divide by 450 MW avg.
  - ▶ Suppose a Town population of 6,300 residents

# Based on VT 2011 Energy Consumption....

## 3 Steps

1) Identify Your Town Population

= 6,300 [Ex. Swanton Town]

2) Calculate your proportion of VT statewide population

$[6,300/630,000] = 1\%$

3) Compute your share of [Cons., EE and RE] =

$1\% * 450 \text{ MW avg.} = 4.5 \text{ MW average}$

*Swanton's annual share of energy production and savings based on 2011 consumption is 4.5 MW average.*

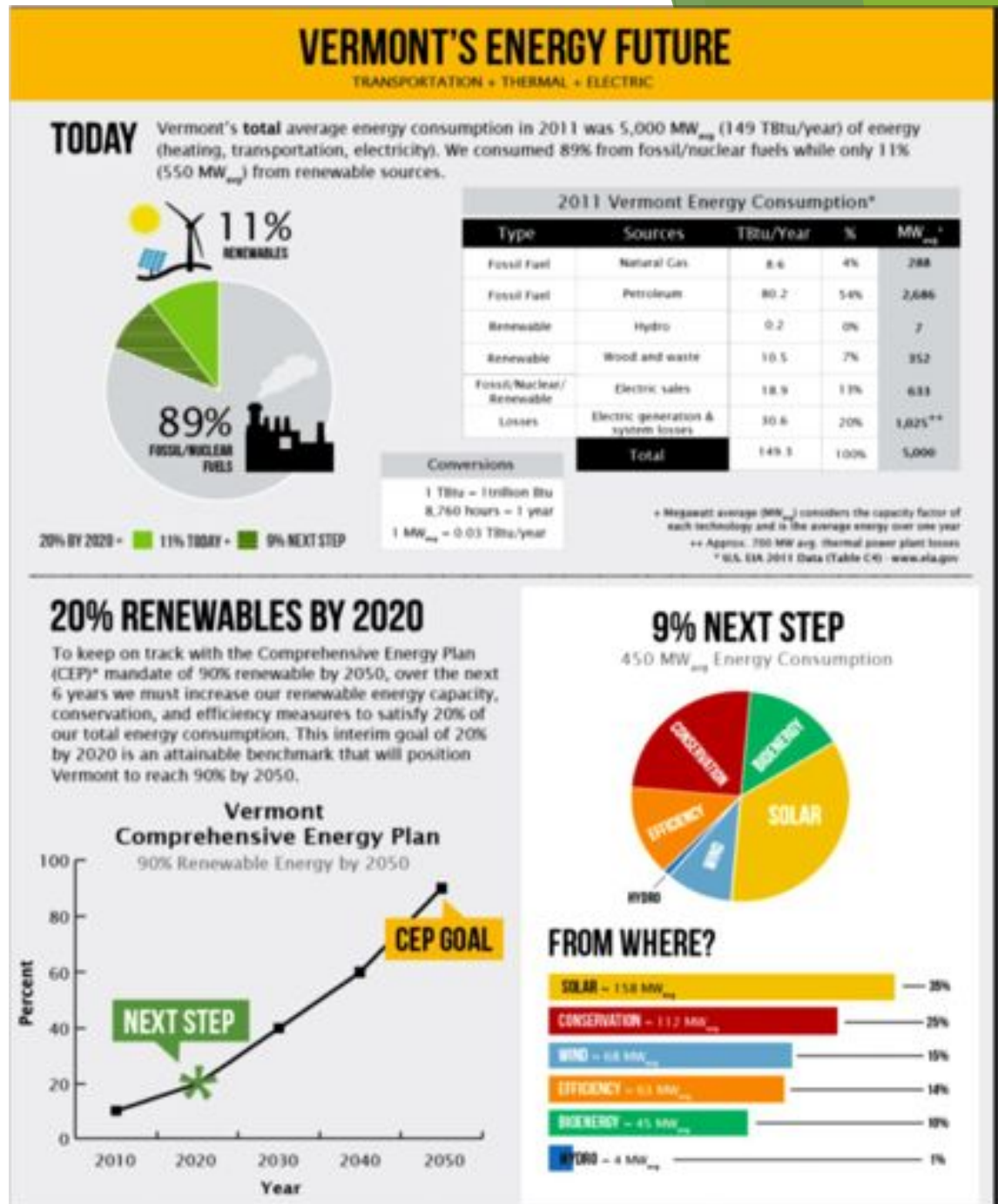
*About \$31M in energy expenses in 2012 (\$5,000/per capita)*

# VT 2011 Total Energy Consumption

A Framework and Ala Cart policy and action Menu by *Renewable Energy Vermont (2013)*.

Estimated 2011 Per Capita Annual Energy Consumption=

**Total Energy**  
**~69,000 kWh/year**  
 (~0.008 MWh/year)



# Ala-cart Options Policies and strategies a town, region, and state might advance.

Take Stock,  
Roll-up your  
sleeves and  
help your  
community  
achieve shared  
Clean Energy  
Goals!

## HOW CAN WE DO IT?

These initiatives will help us generate more while using less:



### Outreach & Education

Increase public outreach and education on energy matters.



### Electrify Our Energy System

Generate electricity with renewable resources, shifting away from liquid fossil fuels.



### Conservation

Improve carpooling, recycling, biking, walking programs.



### Weatherization

Weatherize 80,000 homes and retrofit heating with renewable sources.



### Electric Vehicles

Add tens of thousands of electric vehicles.



### Solar Thermal

Supply 50% of building hot water load through solar thermal installations.



### PACE Vermont

Promote Property Assessed Clean Energy (PACE) to allow financing for home energy upgrades using monthly energy savings.



### Bioenergy

Continue to promote clean and highly efficient uses of biomass and biofuels.



### Standard Offer Program

Expand the VT Standard Offer Program to 5MW per project and greatly increase the annual capacity goals.



### Net-Metering Program

Remove or raise the electric utility net-metering cap and remove limits on size to increase customer-owned generation.



### Solar Electric

Build several hundred megawatts of solar capacity.



### Distributed & Community Generation

Site renewable capacity close to end users, reducing costly long distance transmission while upgrading local distribution systems.



### Wind Energy

Build additional new capacity and contract for additional regional capacity.



### Property Taxes

Value net metered solar equipment similar to other business equipment and home appliances. Don't include in local property tax assessment.



### Mass Transit

Triple our bus fleet, power with biofuels and add commuter rail between our cities and towns.



### Hydro

Support and maintain existing in-state hydro generation. Encourage development of small-scale hydro capacity.



### Streamlined permitting

Establish fixed timelines and electronic filing of permit applications to increase transparency and lower costs.



### On-bill financing for renewables

Reduce upfront costs of renewable and efficiency investment through payment on customer's utility bill.



### Carbon Tax and Dividend

Establish a carbon tax on fossil fuel sources and shift this dividend benefit to Vermonters.



### Renewable Portfolio Standard (RPS)

Implement RPS incorporating these initiatives and measureable renewable targets.

## THE IMPACT

Each step on the journey towards 90% renewables by 2050 is an opportunity to foster economic security and energy independence, safeguard our environmental legacy, drive in-state innovation and job creation and increase community involvement and investment while reducing greenhouse gas emissions.



Pick from a menu of options.

Advance with intent and commitment:

- ▶ Energy Efficiency ~20%
- ▶ Conservation ~ 25%
- ▶ Renewable Energy ~ 45%



1/2 Efficiency &  
Conserv

1/2 Renewables

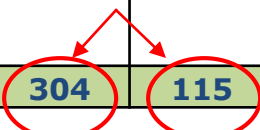
## NEED:

- ▶ Policies--Leadership by Design
- ▶ Advocacy & Voluntary Actions
- ▶ Move Fast

# Meetings Current & Future Needs

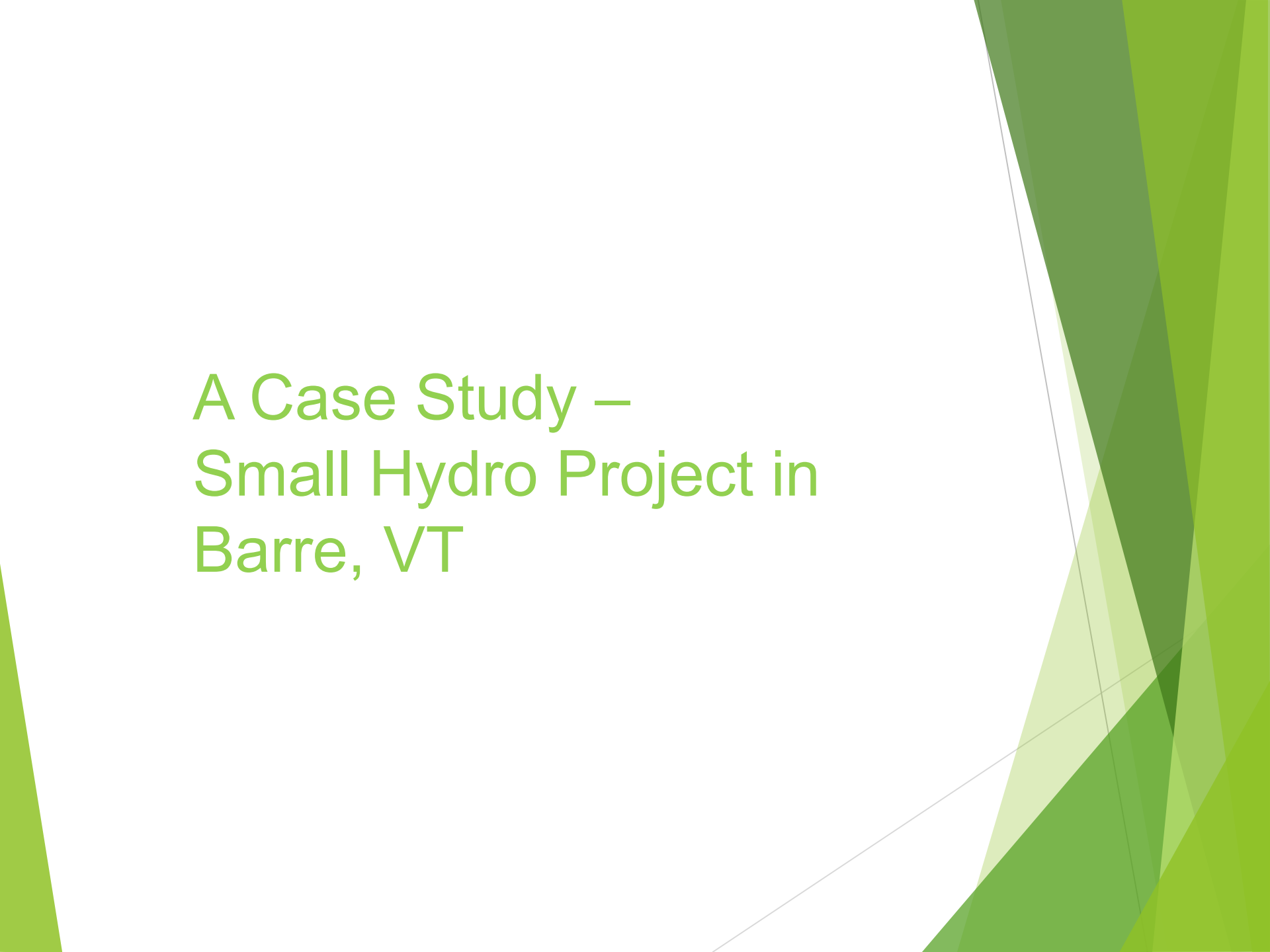
**Table 9. Summary of proposed energy demand and supply management options to displace 20 percent of XX County's fossil fuels by 2020.**

	Capacity Factor (range)	Needed Installed MW	Producing MWa	% of Total	Land Area, Roofs, Acreage, Sites, Actions, Energy Efficiency Products
<b>Conservation</b>	1	11	11	9%	
Voluntary steps/actions for huge conservation and efficiency in all sectors; public encouraged to save energy and reduce waste.					11 MWa Target: 35% of residents and businesses commit to take action (3-5 conserved actions at minimum, marketing education needed to inform choices)
<b>Energy Efficiency</b>	1 to 3	9	14	13%	
Residential; Commercial/Industrial and Technologies (Mini-split, air to air heat pumps Or cold climate heat pumps)					14 MWa Target: At min. 8,000 homes advance energy efficiency, add market focus on efficient electric drive heat pumps; pump water heaters, LED street lighting, VSB variable speed drive motors
<b>Land Use   Transportation Efficiency</b>	1	30	30	26%	
Transportation Demand Management (50%) Infrastructure (30%) Land Use and Enterprise Zones (20%)					30 MWa Target: Comprised of 50% TDM, 30% Infrastructure and 20% Land Use/Enterprise Zones; TDM CBSM Marketing; plus Transit Oriented Design, Complete Streets, E-Zones
<b>Renewable Energy</b>	.13 - .5	246	53	48%	
Solar, biomass, wind, hydropower and geothermal					53 MWa Target: 700 acres solar(85 MW); 4,200 roofs (30 MW); 15,000 acres biomass (20 MW); Wind (100 MW), Hydropower (10 MW); Geothermal (2.5 MW)
<b>Waste to Energy</b>	.7 - 1	1	1.0	1%	
Digesters and biofuels					Biogas, biodiesel from organics, anaerobic digestion, smaller farm applications
<b>Combined Heat &amp; Power</b>	.5 - .7	7	6.2	3%	
Anaerobic digesters, district energy systems, CHP fired by low carbon fuels					Focus areas: Institutions, Village Center, down- towns, wastewater/ water treatment plants
<b>TOTAL Supply/Demand</b>		<b>304</b>	<b>115</b>	<b>100%</b>	



# Know what questions to ask....

- ▶ What resources and opportunities exist in your communities to save energy, reduce waste and displace fossil fuel consumption with local generation?
- ▶ How much is it going to take to achieve shared goals?
- ▶ How do we double current levels in six years.



# A Case Study – Small Hydro Project in Barre, VT



# Barre In-conduit 17 kW Net-metered hydropower Project



EcoStrategies, LLC

South Burlington, VT

# Purpose

To upgrade the water system at Nelson and Hill Streets and to generate power from the downhill flows of main water pipe.



# Nelson Hill Streets (existing)

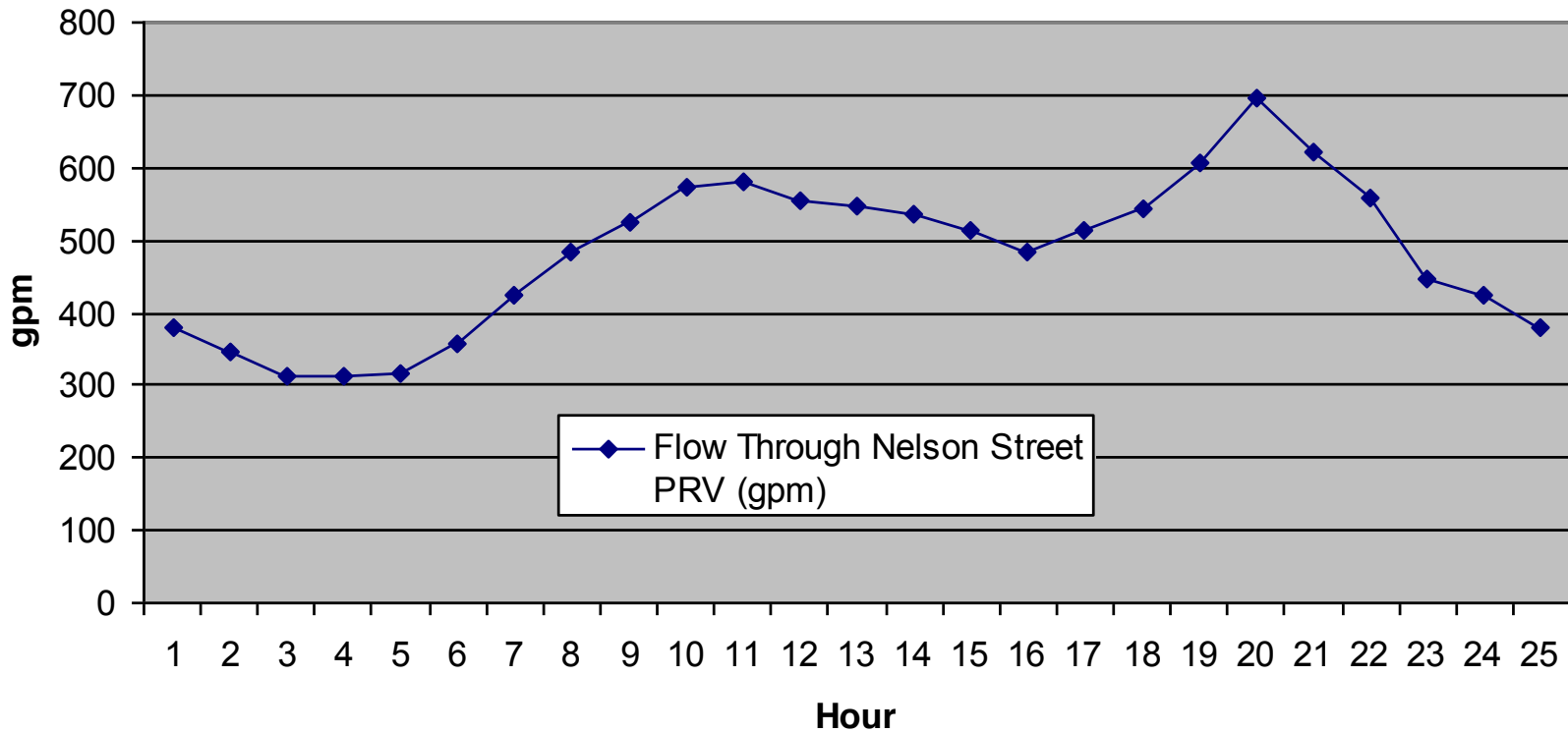




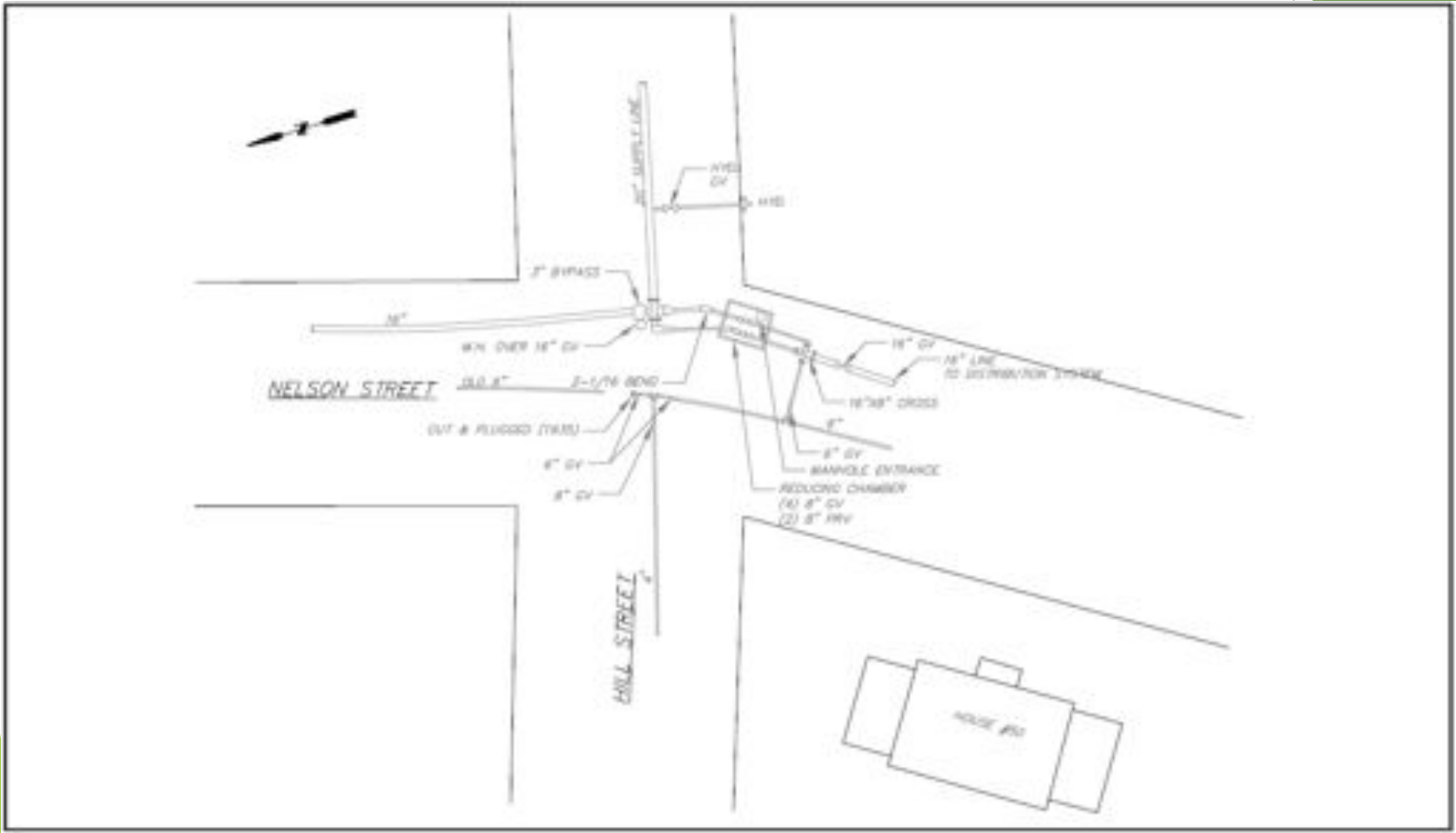
Need to replace aging existing Nelson Street Vault, March, 2011

# Need Estimate of Average Daily Flows to Determine Generation

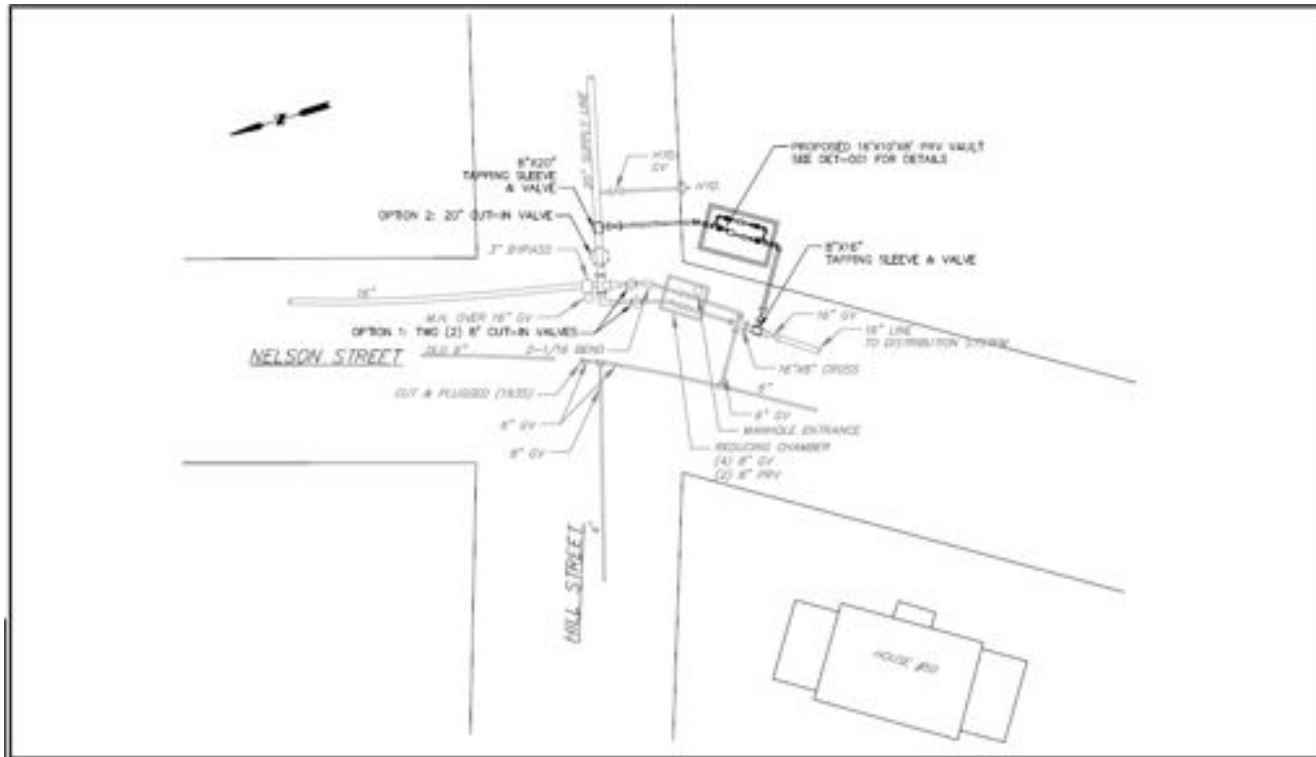
Flow Through Nelson Street PRV (gpm)



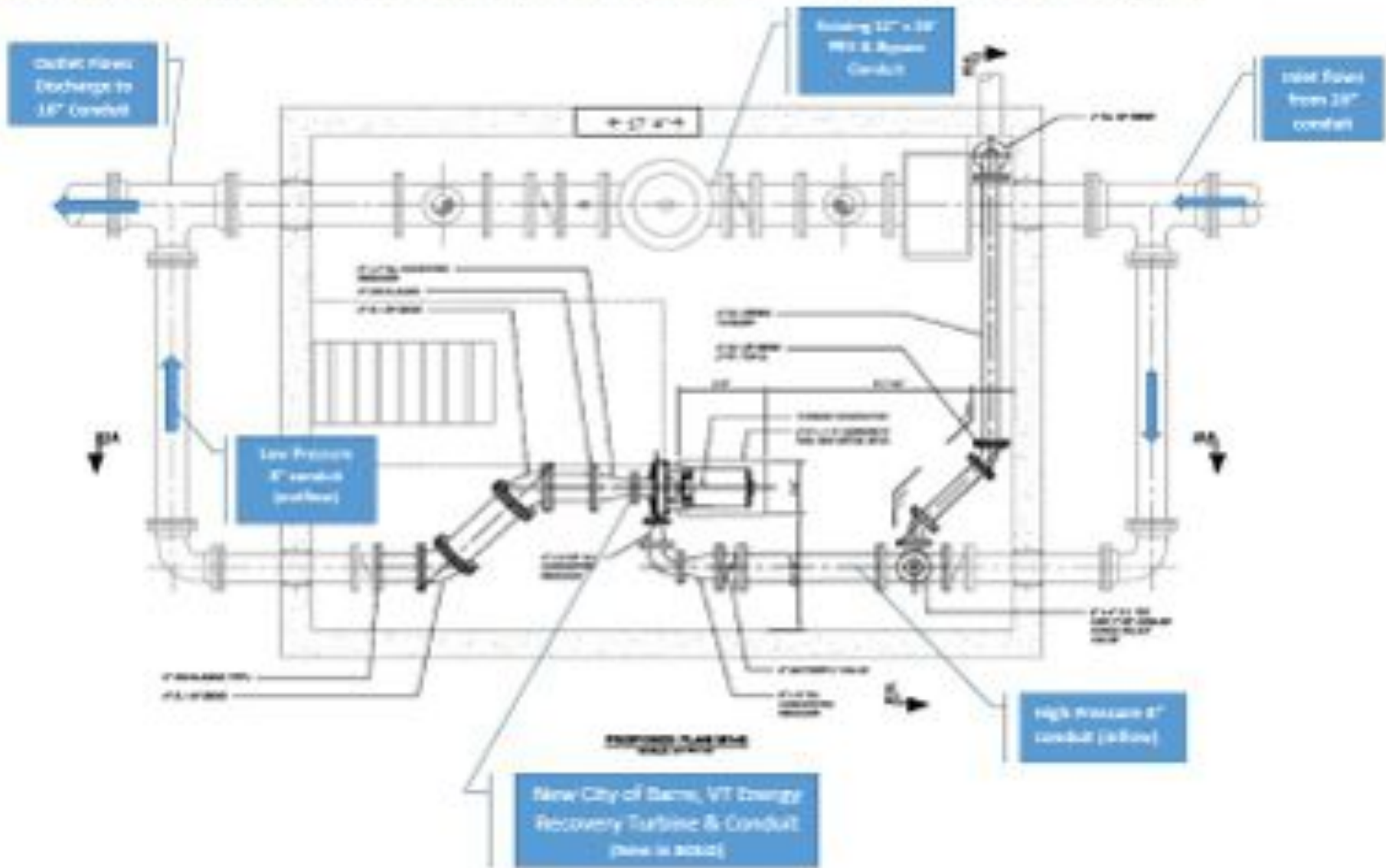
# Site Conditions



# Proposed Site Improvements



PLAN VIEW—Powerhouse PRV & New Turbine Generator – Barre, VT – 17 kW Hydropower Turbine System





# Estimated Development of In-Pipe Hydropower Probable Costs

	Water System Improvements	Energy Component Options	
Cost Item	Base Project New PRV Vault and Appurtenant Construction	Alternative A Vertical Turbine (Rentricity)	Alternative B Horizontal Turbine (Zeropex)
<b>Capital Cost Summary</b>			
Base Project Cost	\$ 190,000		\$169,588
Vender Proposals			16,412
Extra Features			47,000
Turbine Installation			
<b>Total Construction Cost</b>	<b>\$ 190,000</b>	<b>\$ 186,000</b>	<b>\$ 233,000</b>
Estimated Easement Cost	5,000	0	0
Preliminary Engineering	0	10,000	10,000
Development Costs (~20%)	37,000	36,000	46,000
Contingency (~15%)	28,000	28,000	35,000
<b>Total Project Costs</b>	<b>\$ 260,000</b>	<b>\$ 260,000</b>	<b>\$ 324,000</b>
<b>Grant Funding</b>	<u>\$ 0</u>	<u>\$ 100,000</u>	<u>\$ 100,000</u>
<b>Net Project Cost</b>	<b>260,000</b>	<b>160,000*</b>	<b>224,000*</b>
<b>Revenue Summary</b>			
Turbine Power		15 kW	25 kW
Operating Time		18 hrs/d	24 hrs/d
Group Net Metering Projected Initial Revenue (at 13 cents/kwh)		\$ 12,500/yr	\$ 28,500/yr
<b>Simple Payback</b>		<b>~ 13 Years</b>	<b>~8 Years**</b>

Construction begins on vault/home for grid connected 17 kW turbine generator.



# Conducted Site Visit to Bennington— gravity flow 15 kW system



# Horizontal Turbine



# Vertical Turbine Generator



A modified vertical turbine with fly wheel

# Sample Turbine Generator System



# Suggested Next Steps

- ▶ Conduct Initial Feasibility study to determine project viability
- ▶ Collect water system baseline and estimates for Simple Payback
- ▶ Outline pros and cons of energy project
- ▶ Explore and Determine financing options
- ▶ Explore technology options and total project costs and ROI
- ▶ Initiate Design and Construction Plans
- ▶ Advance permitting process and project schedule