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
  - P opulation, 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 MW avg. = 4.5 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

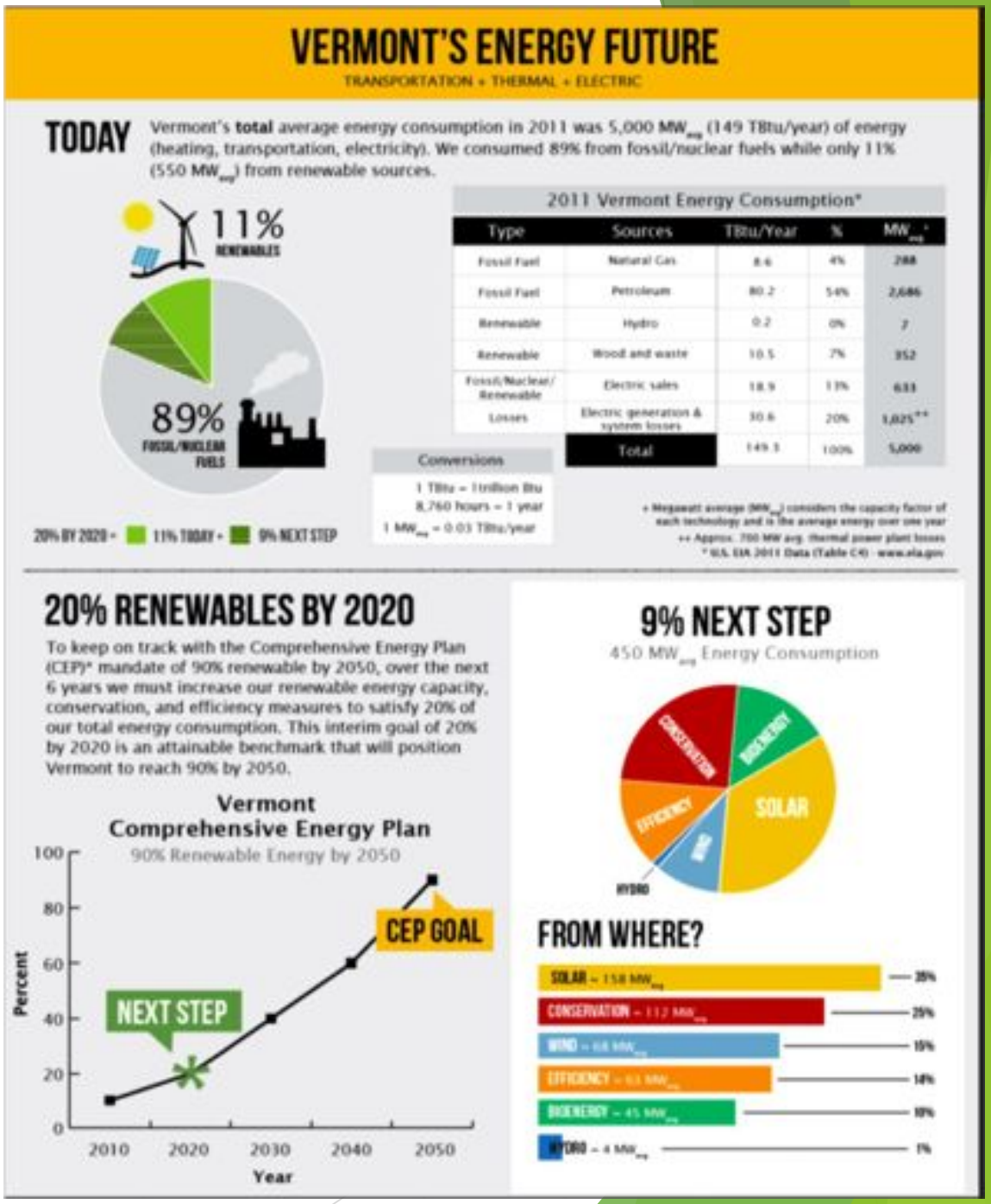
A Framework and Ala Cart policy and action Menu *by Renewable Energy Vermont (2013).*

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 Clearn Energy Goals!

Pick from a menu of options. Advance with intent and commitment:

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

½ Efficiency & Conserv

½ 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**
Conservation	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)
Energy Efficiency	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
Land Use |Transportation Efficiency	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
Renewable Energy	.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)
Waste to Energy	.7 - 1	1	1.0	1%	
Digesters and biofuels					Biogas, biodiesel from organics, anaerobic digestion, smaller farm applications
Combined Heat & Power	.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
TOTAL Supply/Demand		**304**	**115**	**100%**	

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

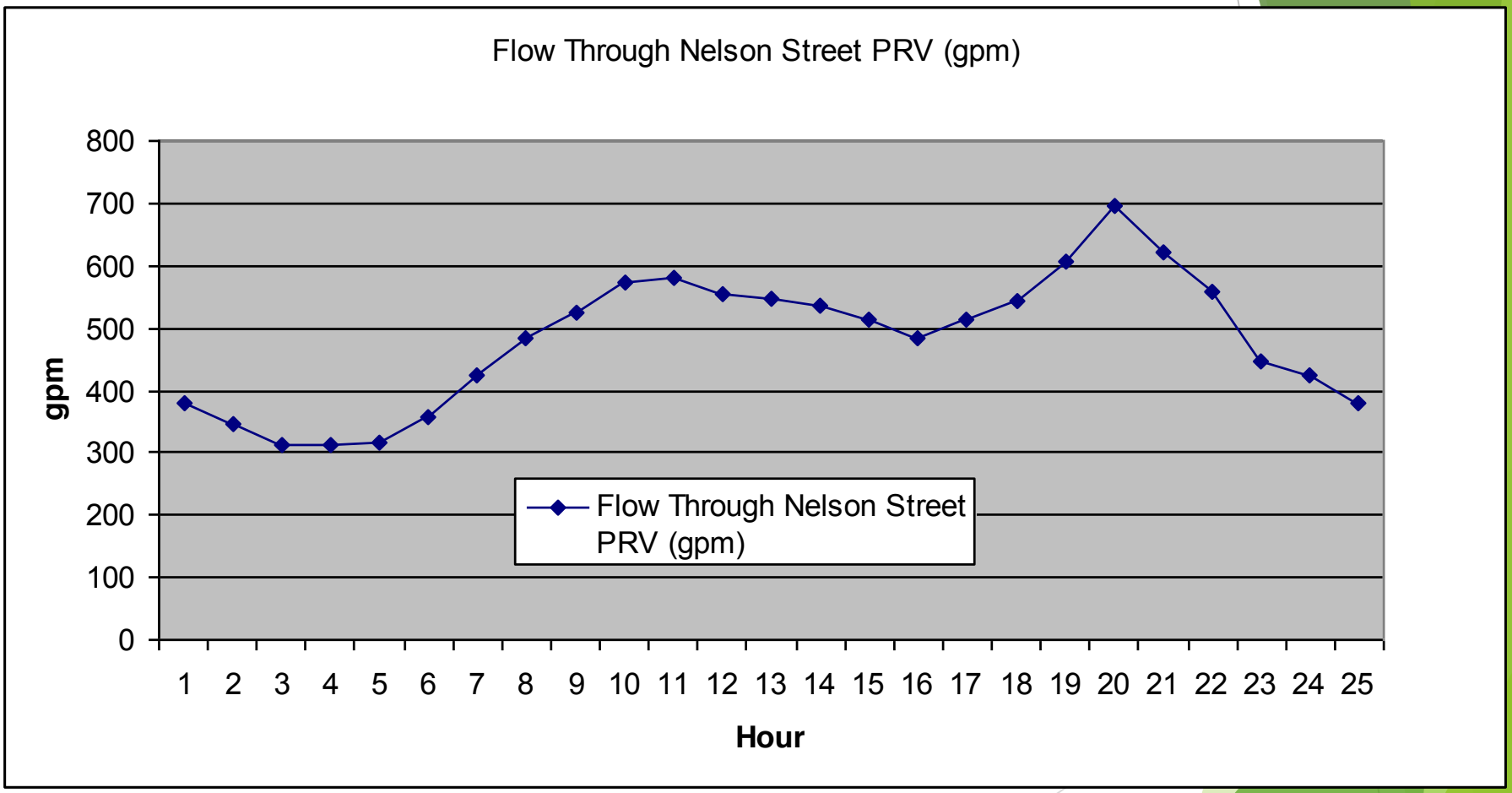
Purpose

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

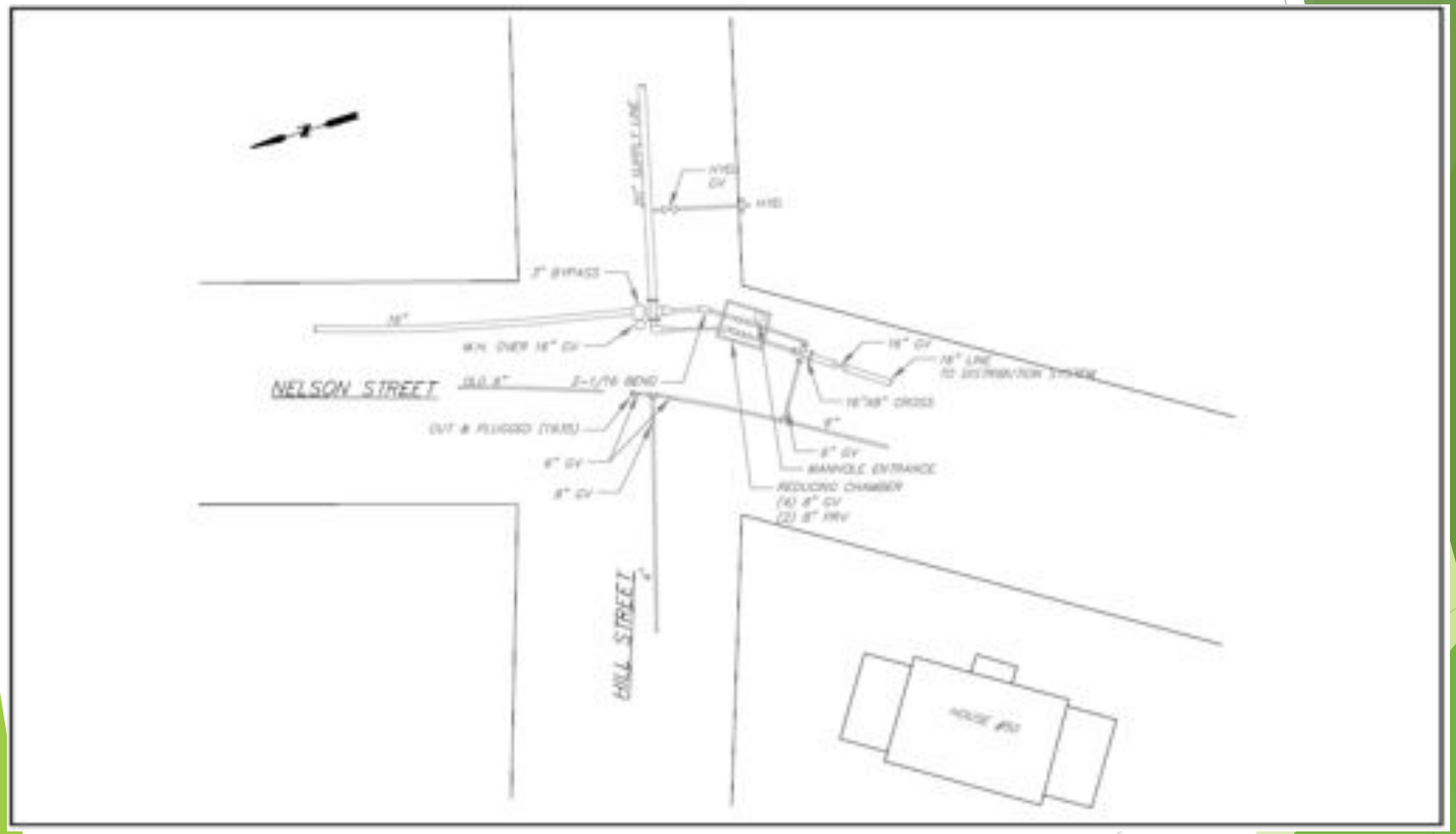
Nelson Hill Streets (existing)

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

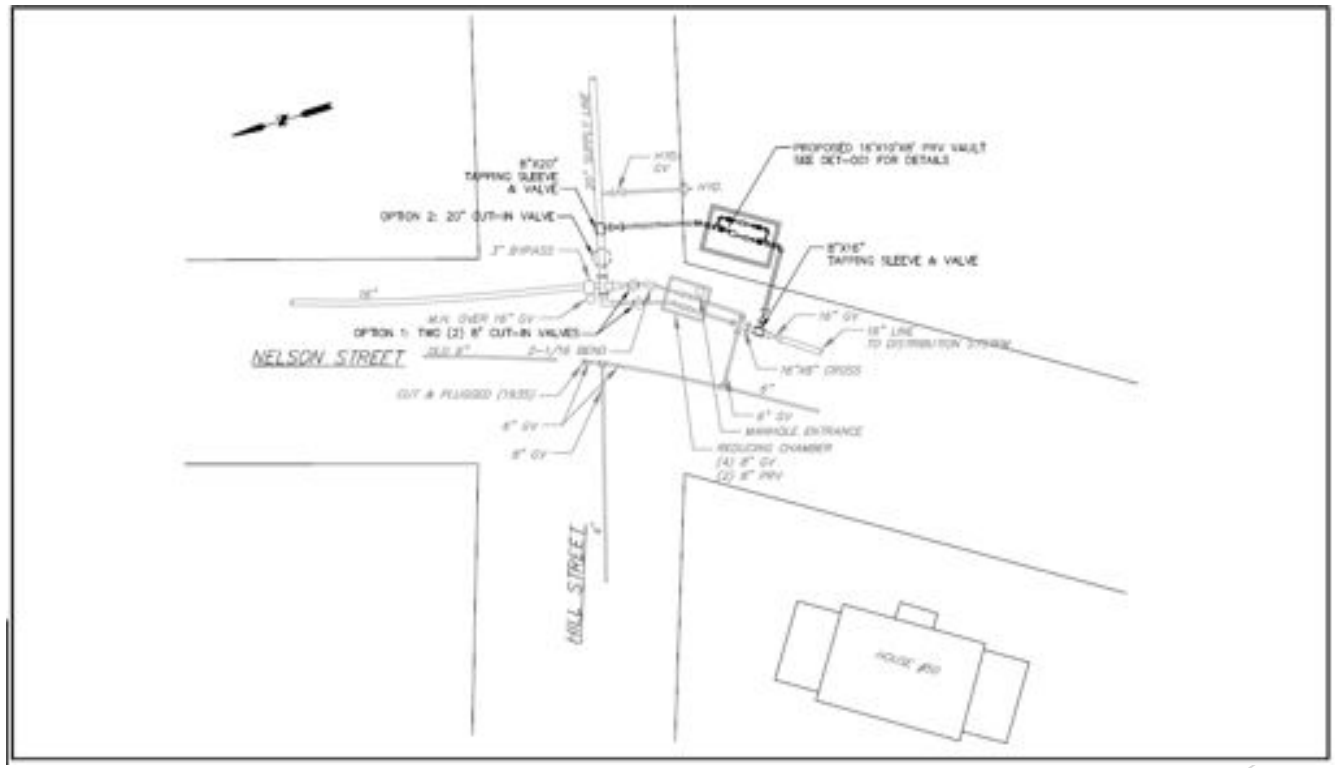
Need Estimate of Average Daily Flows to Determine Generation



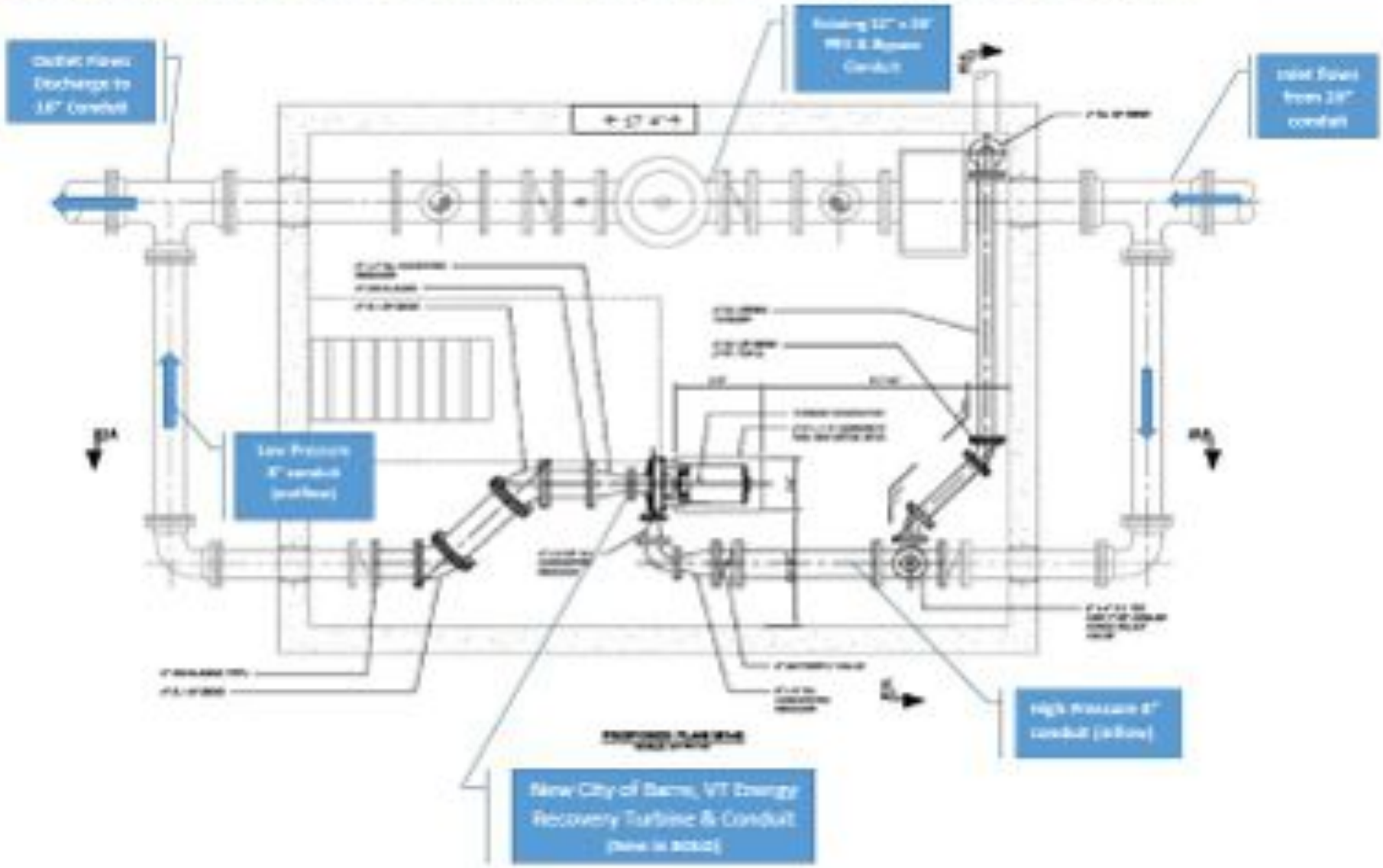
Site Conditions



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)**
Capital Cost Summary			
Base Project Cost	$ 190,000		$169,588
Vender Proposals			16,412
Extra Features			47,000
Turbine Installation			
Total Construction Cost	**$ 190,000**	**$ 186,000**	**$ 233,000**
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
Total Project Costs	**$ 260,000**	**$ 260,000**	**$ 324,000**
Grant Funding	$ 0	$ 100,000	$ 100,000
Net Project Cost	**260,000**	**160,000***	**224,000***
Revenue Summary		15 kW	25 kW
Turbine Power		18 hrs/d	24 hrs/d
Operating Time		$ 12,500/yr	$ 28,500/yr
Group Net Metering Projected Initial Revenue (at 13 cents/kwh)			
Simple Payback		**~ 13 Years**	**~8 Years****

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

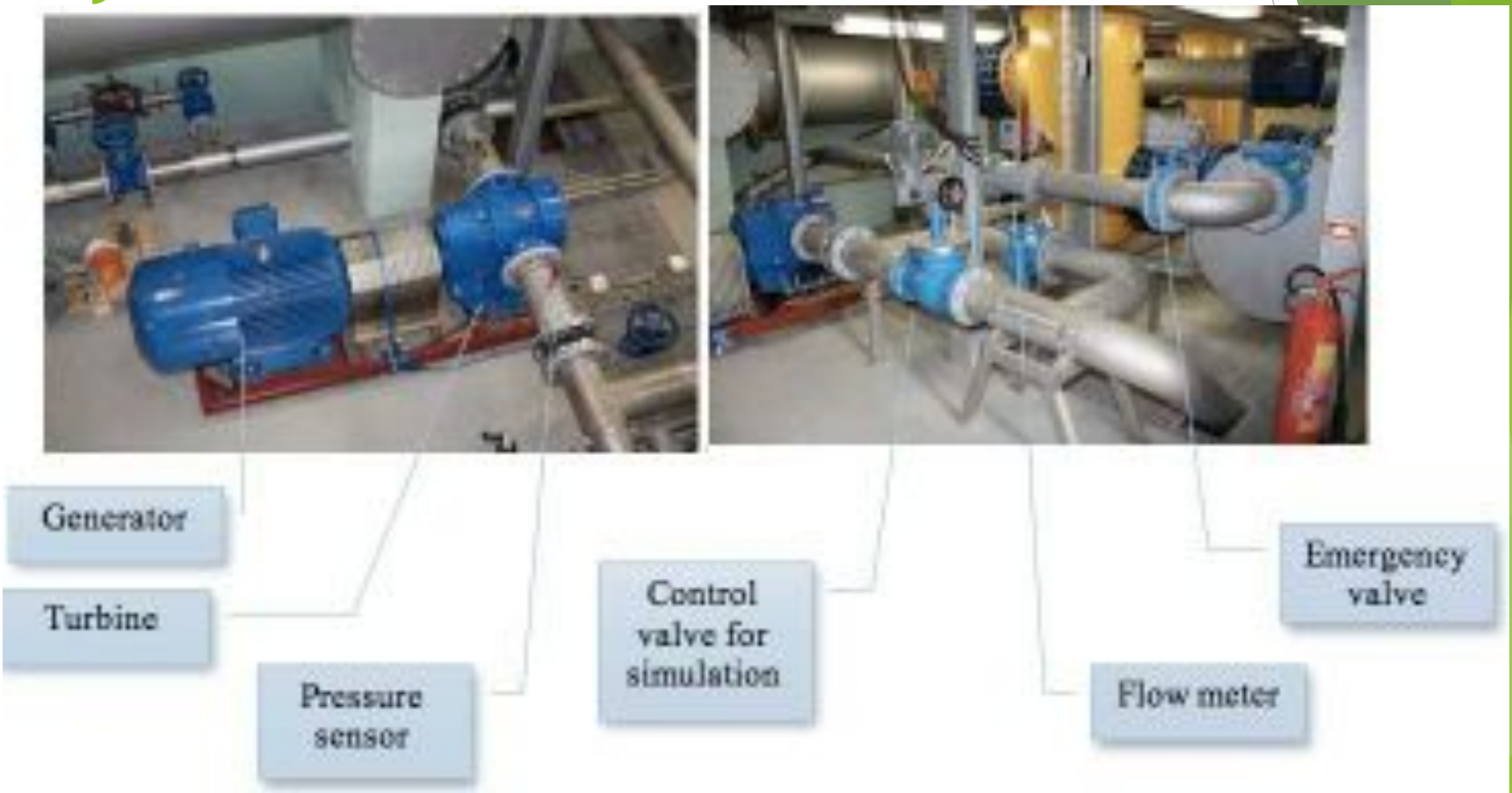
Conducted Site Visit to Bennington—gravity flow 15 kW system

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