Center For ENERGY Workforce Development

TOOLKIT

Hosting a Teachers' Career Day at Your Energy Company

February 2017

Teachers Career Day
Project Manager To-do List

# of Months before Career Day	Task	Responsible Party	Completed
Four			
	Present career day concept to upper-management for buy-in		
	Select date (a Saturday)		
	Assign a project manager		
	Develop a budget (use template provided in toolkit)		
	Make assignments for various pieces of the agenda (e.g. opening, *Day in the Life* employees, etc.)		
Three			
	Select partner high schools in your area		
	Set meetings with school principals		
	Meeting: bring program agenda, "Why a Teachers Career Day?," one-pager, flyers and registration forms; discuss stipend		
	Work on logistics for rooms and computers that will be used for the career day		
One			
	Provide prep questions for employees who will do "A Day in the life of…" and recommended hands-on activities		
	Order or collect giveaways for teachers		
	Meet with all players to discuss the flow of the day		

Month of			
	2-weeks in advance: order food/beverages through a caterer for the lunch and afternoon snack		
	1-week in advance: reminder phone calls and/or e-mail to those who plan on attending		
	1-week in advance: copy agenda, lesson plans, evaluation form and any other handouts you will be using		
	2-days before: meet with key players to review agenda and flow of the day		
	1-day before: make sure rooms are set up and ready to go		

Why a Teachers Career Day?

What is the *Get Into Energy* Teachers Career Day?

The *Get Into Energy* Teachers Career Day is a one-day program designed for high school teachers to build their awareness of the operation of energy companies and the wide array of exciting careers available in these organizations. The energy industry faces a projected critical shortage of skilled technical and craft workers in the next five to ten years. These entry-level skilled jobs are highly desirable, high-skill, high-wage jobs that will not be out-sourced to foreign countries. Energy companies report that these positions are best filled with home grown talent - workers who currently live in the vicinity of the job locations.

What are the advantages for the teachers?

At the *Get Into Energy* Teachers Career Day, math, science, technology, and career and technical education teachers will learn more about our specific organization and the workforce needs of the energy industry. They will also receive examples of hands-on lessons applying math, science and technology to real world situations at energy companies to take back and use with their students.

What are the advantages to students?

Energy careers typically are not on students' radars, yet are some of the most exciting and stable careers available. Once teachers know more about these careers, they can get the students interested in energy and the prospect of choosing a career path to be a part of this vital industry.

How is it structured?

The Career Day is a one-day program from 9am-5pm. Teachers will participate in several hands-on science lessons, tour the facility, talk to employees and network. Lunch and snacks will be provided to teachers.

What is the cost of the school and/or the teacher?

This program is free of charge to high school math, science, technology, and career and technical education teachers. For their time, teachers will receive a stipend of $ upon completion of the program.

Teachers Career Day Budget Spreadsheet

(actual numbers will vary by company)

Line item	Estimated cost	Actual cost
Catering needs • Coffee in morning • Lunch • Sodas/cookies for afternoon break	About $30 per teacher, depending on area	
Stipend for teachers	Typically between $50-$150 per teacher	
Giveaways	Depends on what you choose (available on ShopCEWD): USB Charger or Tape Measure $2.70 each	
Get Into Energy Posters	$2.50-$10 each, depending on the quantity printed (available on ShopCEWD)	
Get Into Energy Booklets	$1.70-$3.50 depending on quantity ordered (available on ShopCEWD)	
Staff time (if applicable)		

Teachers Career Day
Sample Letter to Teachers

Dear Math, Science, Technology, or Career and Technical Education Teacher:

I want to invite you to a very important event: our energy company's *Get Into Energy* Teachers Career Day. The *Get Into Energy* Teachers Career Day is a one-day program designed for high school teachers to build their awareness of the operations of energy companies and the wide array of exciting careers available in these organizations. The energy industry faces a projected critical shortage of skilled technical and craft workers in the next five to ten years. These entry-level skilled jobs are highly desirable, high-skill, high-wage jobs that will not be out-sourced to foreign countries. Energy companies report that these positions are best filled with home grown talent - workers who currently live in the vicinity of the job locations.

At the *Get Into Energy* Teachers Career Day, as a math, science, technology, and career and technical education teacher, you will learn more about our specific organization and our workforce needs over the next few years. You will also receive examples of hands-on lessons to help students understand why they need to know math, science, and technology. Lunch and snacks will be provided. In addition, if you participate in the full day of activities and agree to use one of the activities with your students, you will receive a stipend of $<amount>.

The *Get Into Energy* Teachers Career Day will be held on < date > from 9am-5pm at <your company> at <address>. Directions are enclosed. This program is limited to <number> of teachers. Teachers will be admitted on a first-come, first-served basis, so fill out your registration form today. We look forward to meeting you soon!

Sincerely,

<name>

<job title>

Career Day for Teachers
Program Agenda

9:00 – 9:15 a.m.	Kick-off ❖ Why a Teachers Career Day? ❖ Learning objectives ❖ Schedule/logistics
9:15 – 10:00 a.m.	Energy Industry Workforce Needs ❖ Brief overview of generation, transmission and distribution process ❖ What are the opportunities for technical and skilled workers? ❖ What are the knowledge and skill sets needed? ❖ Why do teachers need to get the word out?
10:00 – 11:00 a.m.	Facility Tour
11:00 a.m.– 12:15 p.m.	Math hands-on activity/lesson plan
12:15 – 1:00 p.m.	Lunch
1:00 – 2:30 p.m.	A Day in the life of……
2:30 – 2:45 p.m.	Cookie/Soda Break
2:45 – 3:15 p.m.	Power Play lesson demo (physics)
3:15 – 4:30 p.m.	CEWD PowerPoint/lesson plan
4:30 – 5:00 p.m.	Closing ❖ Stipend requirement ❖ Evaluation

- Giveaways

Teachers Career Day
A Day in the Life…

Questions/Format (based on a 45-minute program)

1. Briefly describe your job responsibilities. Teachers have received a competency document outlining typical knowledge and skill sets required for your position.

2. What do you like best about your job?

3. What are the most challenging aspects of your daily work?

4. Take the teachers through your typical day. Walk them through the places you work. When possible, show them how you use your equipment, and if there are any opportunities for them to try something out, please incorporate.

5. Why do you think high school students should consider working in the energy industry? If you tell these students one great thing about energy careers, what would it be?

6. Take questions from the teachers.

HAVE FUN!

Teachers Career Day Registration Form

Career Day Date: STIPEND: $

Career Day Location:

Time:

Teacher Name _____

Subject(s) Taught _____ Grade(s) _____

School _____

Address _____

City _____ State _____ Zip_____

Phone _____ E-mail _____

RETURN FORM TO:

BY:

Power Play Web-based Activity

Power Play

http://www.sciencenetlinks.com/interactives/powerplay.html

Description

Power Play is an interactive activity that helps users learn about harnessing energy from different power sources. Users click on the start icon to begin the activity. The four different screens in this interactive are divided into an upper and lower section. In the upper section, there is a picture of a power source on the left and a picture of a job that needs to be accomplished on the right. In between these two pictures is a blank space that users should fill up with the parts to build a machine that would capture the energy from the power source to get the given job accomplished.

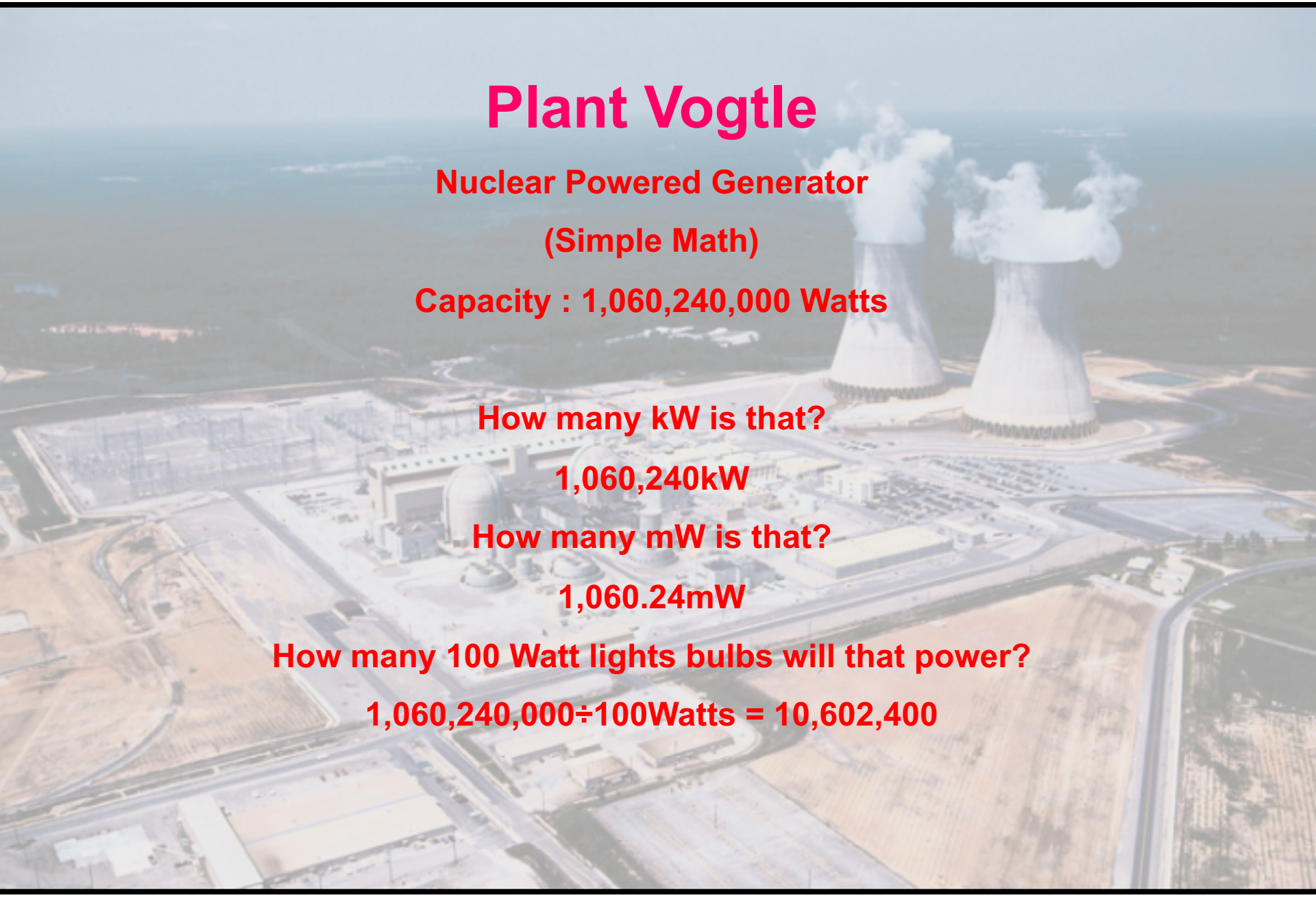
Users are given machine pieces (plus others) in the lower section in order to build the appropriate machine in the upper section. To build the machine, users should click on one of the parts in the bottom screen and then drag it into the upper screen. Each machine requires three pieces. Once the machine works, users can click "Next" to go on to the next challenge. To make it more fun, users can try to do this as fast as possible!

In the lower section, on the far right, there are three icons that users can click on to get more information. The "!" takes users to a screen that contains information about energy; the "?" takes them to a screen that gives directions about how to play the activity, and the "Done" button allows them to quit the interactive.

Using the Resource

This interactive is a great resource to utilize when teaching students about physics. In particular, this is a great opportunity to challenge students to do some critical thinking about energy and power! Have students do their own project where they use a power source (e.g., wind, fire, etc.) and develop their own machine to harness energy to accomplish a particular job! Or students can do the same project using a machine that we already use in daily life. In this case, they would need to define the power source and describe how the machine works by using the harnessed energy to accomplish the intended goal. Students can use diagrams to explain their project, along with photos, pictures from magazines, or their own drawings! Also, have students define energy and power in their own words. In addition, have them select one machine they use on a regular basis that they feel has benefited society and have them write a short paper about the benefits of this machine and what life would be like without it!

Vogtle Nuclear Plant



Plant Vogtle

Nuclear Powered Generator

(Simple Math)

Capacity : 1,060,240,000 Watts

How many kW is that?

1,060,240kW

How many mW is that?

1,060.24mW

How many 100 Watt lights bulbs will that power?

1,060,240,000÷100Watts = 10,602,400

Bowen Steam Plant

Plant Bowen

Simple Math

Plant Bowen burns 1400 tons of coal per hour.

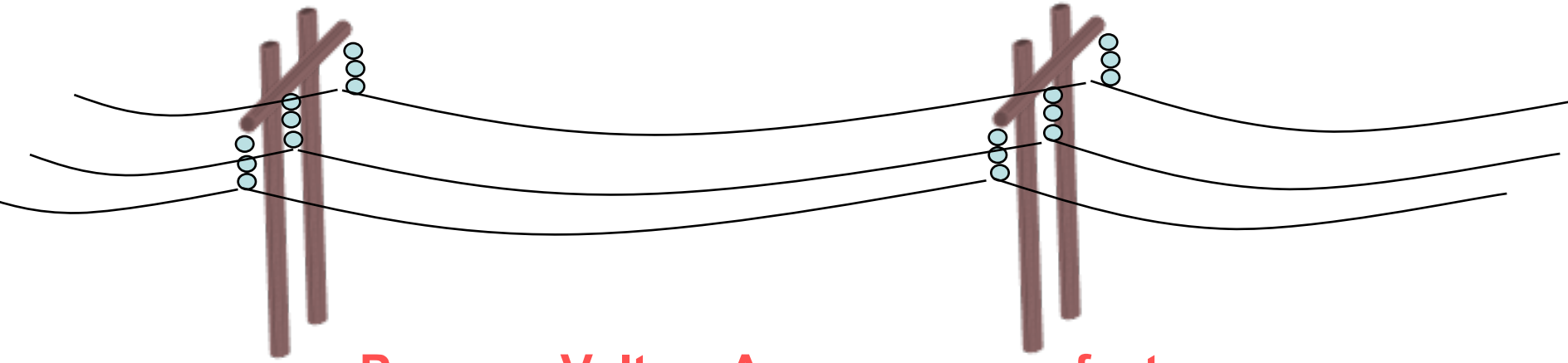
If a tandem axle dump truck carries 20 tons, how many such trucks must unload each hour to keep Plant Bowen in operation?

1400 tons/hour÷20 tons/truck = 70 trucks / hour

At 3600 secs/hour, that is one truck every 51.4 secs!

Transmission Exercises

Concepts of Electrical Energy Transfer



Power = Volts x Amps x power factor

If a transmission line at 115kV and 100% power factor delivers 200 MW of power, how many amps is that?

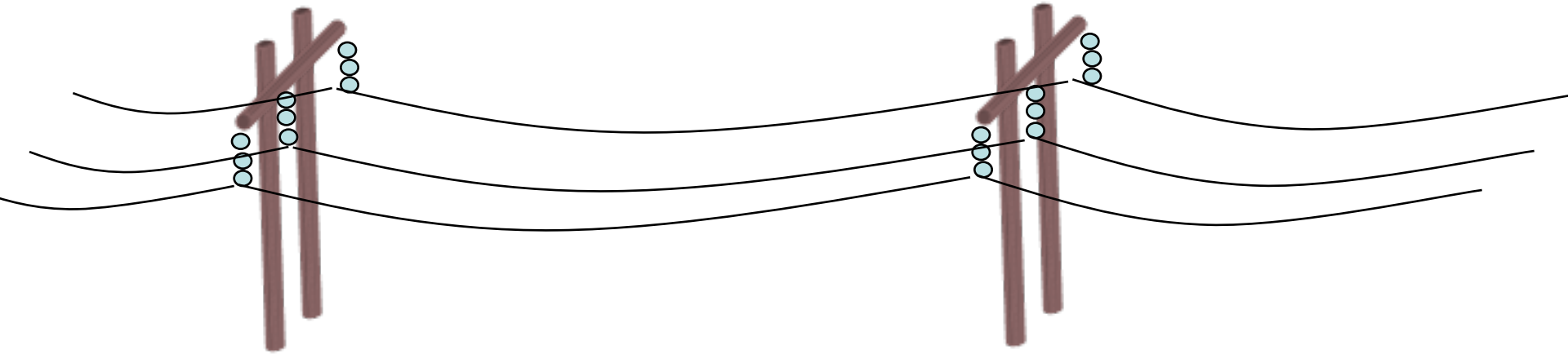
Answer: (115kV)($\sqrt{3}$)(x amps)(1.0 pf) = 200mW

Then x = 1004 amps

This Means HUGE wire!

Transmission Exercises

Concepts of Electrical Energy Transfer



Suppose we increased the Transmission voltage level to 500 kV. How many amps is that?

Answer: (500kV)($\sqrt{3}$)(x amps)(1.0 pf) = 200 mW

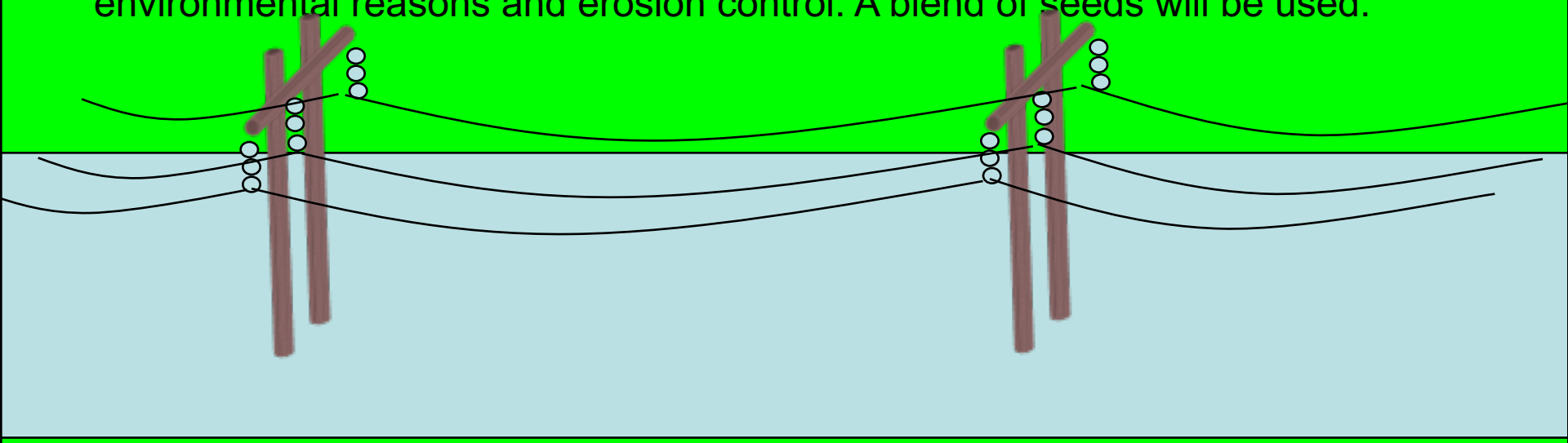
x = 231 amps

(Much smaller wire!)

RESEEDING A RIGHT OF WAY

(uses straight algebra)

Ga Power has just perfected a new right of way and needs to re-seed it for environmental reasons and erosion control. A blend of seeds will be used.



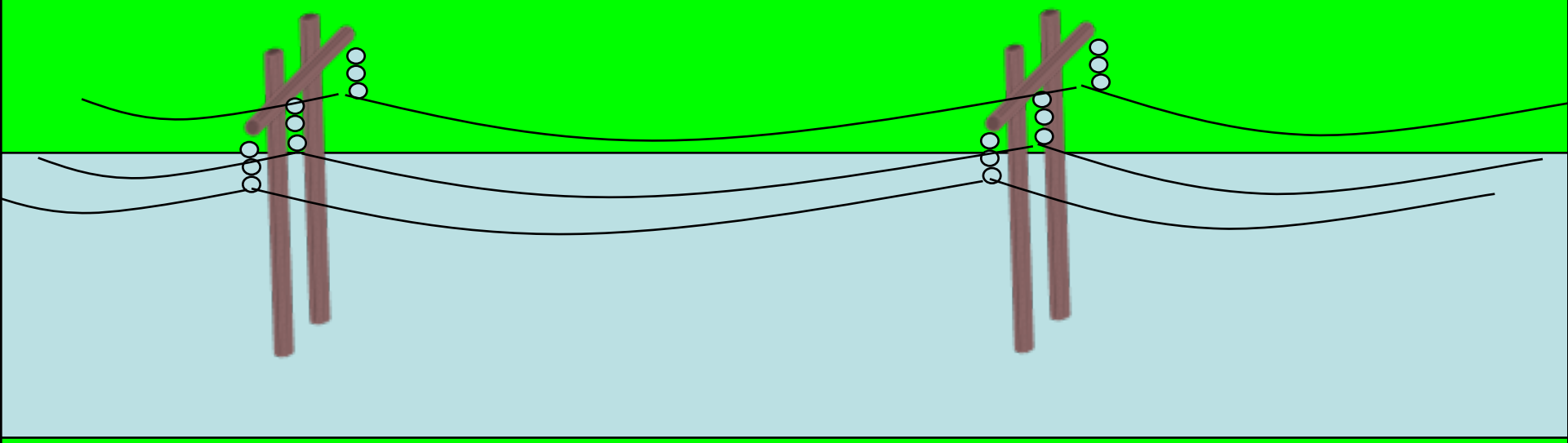
Lespedeza sells for $4/lb; Rye sells for $3/lb, and fescue sells for $1/ lb. How much fescue should be added to 10 lbs of lespedeza and 8lbs of rye to create a mixture of all 3 that sells for $2.50/lb?

Answer: First we must state the problem in mathematical terms.

Let “x” be the **total** number of lbs needed, y = lbs of fescue needed

Then x = (10lbs L) + (8lbs R) + (ylbs F) => **x = 18 + y**

RESEEDING A RIGHT OF WAY



x = 18 +y total lbs.

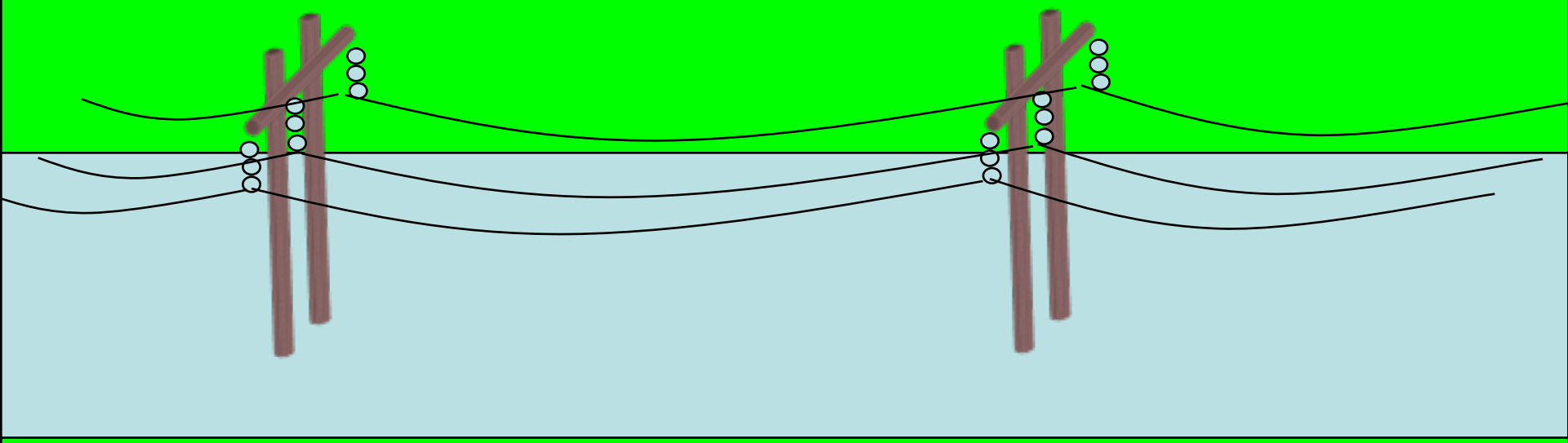
Also, $2.50(x) = ($4/lb)(10lbs) + ($3/lb)(8lbs) + ($1/lb)(ylbs)

Substituting, we have 2.5 x = 40 + 24 + (x-18)

or 1.5 x = 64 -18 = 46. **Thus total lbs x = 30.666 lbs.** and y =

30.666 – 18 = **12.666lbs of fescue**

RESEEDING A RIGHT OF WAY



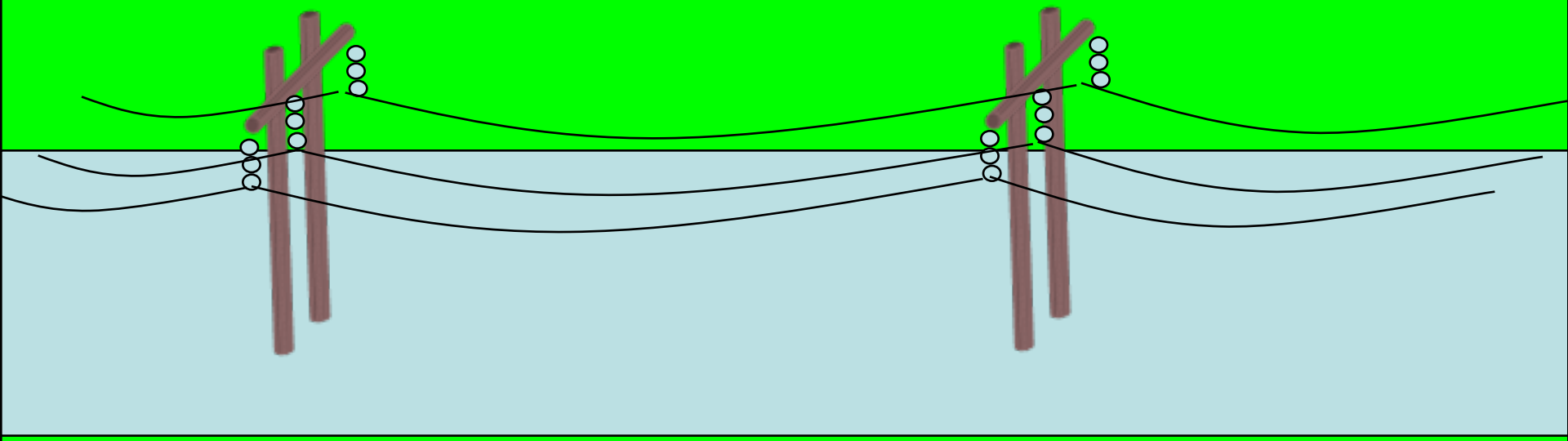
If the area to be re-seeded is 2 miles long and 100 feet wide, and good coverage requires 100 lbs of this mixture per acre, how many pounds of the mixture will be needed?

How much will the seed cost?

Square footage = (2miles)x(5280 ft/mi)x(100') = 1,056,000 sq ft

1 acre = 43560 sq ft; so total acres here = 1,056,000/43560 = 24.24 acres

RESEEDING A RIGHT OF WAY



24.24 acres will require 24.24acres x 100lbs/acre of seeds = 2424.24 lbs and at $2.50/lb, the seed will cost ($2.50/lb)(2424.24lbs) = $6060.60

The Island

This problem employs:

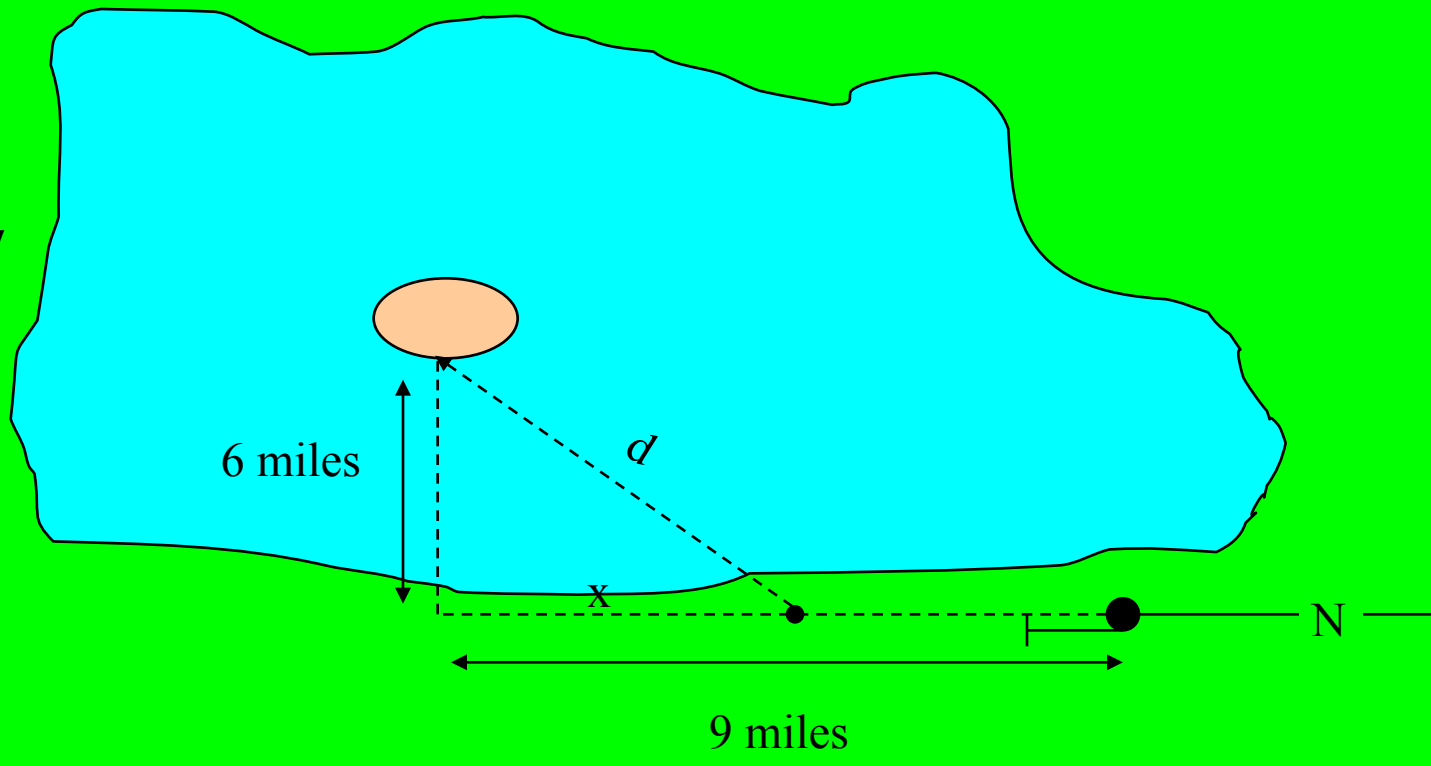
-engineering economy

-geometry

-trigonometry

-differential calculus

-graphical analysis



Ga Power needs to serve an island complex as shown. If the island is 6 miles from shore, the nearest pole is 9 miles along the shore, and underground costs $400/mile while underwater costs $500/mile, what is the optimum point “x” to cross the lake in order to minimize the costs?

Answer: First we must state the problem in the form of an equation.

d= $\sqrt{(x^2 + 6^2}$ ➔Then minimum cost c = ($500/mile x d) + ($400/mile x (9-x))

So c = (500/m x $\sqrt{(x^2 + 36)}$ + (400/m x (9-x))

3 ways to proceed are suggested:

1- numerical iteration; i.e., solve the equation multiple times and look for the lowest total cost “c”.

2-take the first derivative of the function with respect to x and set it equal to zero.

3-graph a range of possible answers and look for the zero slope of the graph

Method 1: Iteration

Solve for c

x	$500($\sqrt{x^2+36}$)	$400(9-x)	Total C	
1	$3041.38	$3200	$6241.38	
2	3162.28	2800	5962.28	
4	3605.55	2000	5605.55	
6	4242.64	1200	5442.64	
7.5	4802.34	600	5402.34	
8.5	5202.16	200	5402.16	
9	5408.33	0	5408.33	

Method 2: Set the first derivative equal to zero

Formula: c = (500/m x $\sqrt{x^2 + 36}$) + (400/m x (9-x))

So $\partial c / \partial x = \partial / \partial x(500(\sqrt{x^2 + 36}) + 3600 - 400x)$

$=500 (x / \sqrt{x^2 + 36}) + 0 - 400 = 0$

Now solve for X:

$$\frac{500x}{\sqrt{(x^2 + 36}} = 400$$

$$\frac{x}{\sqrt{x^2 + 36}} = \frac{400}{500} = 0.8$$

Square both sides:

$$\frac{x^2}{x^2 + 36} = 0.64$$

$$x^2 = .64x^2 + (.64)(36)$$

$$.36x^2 = 23.04$$

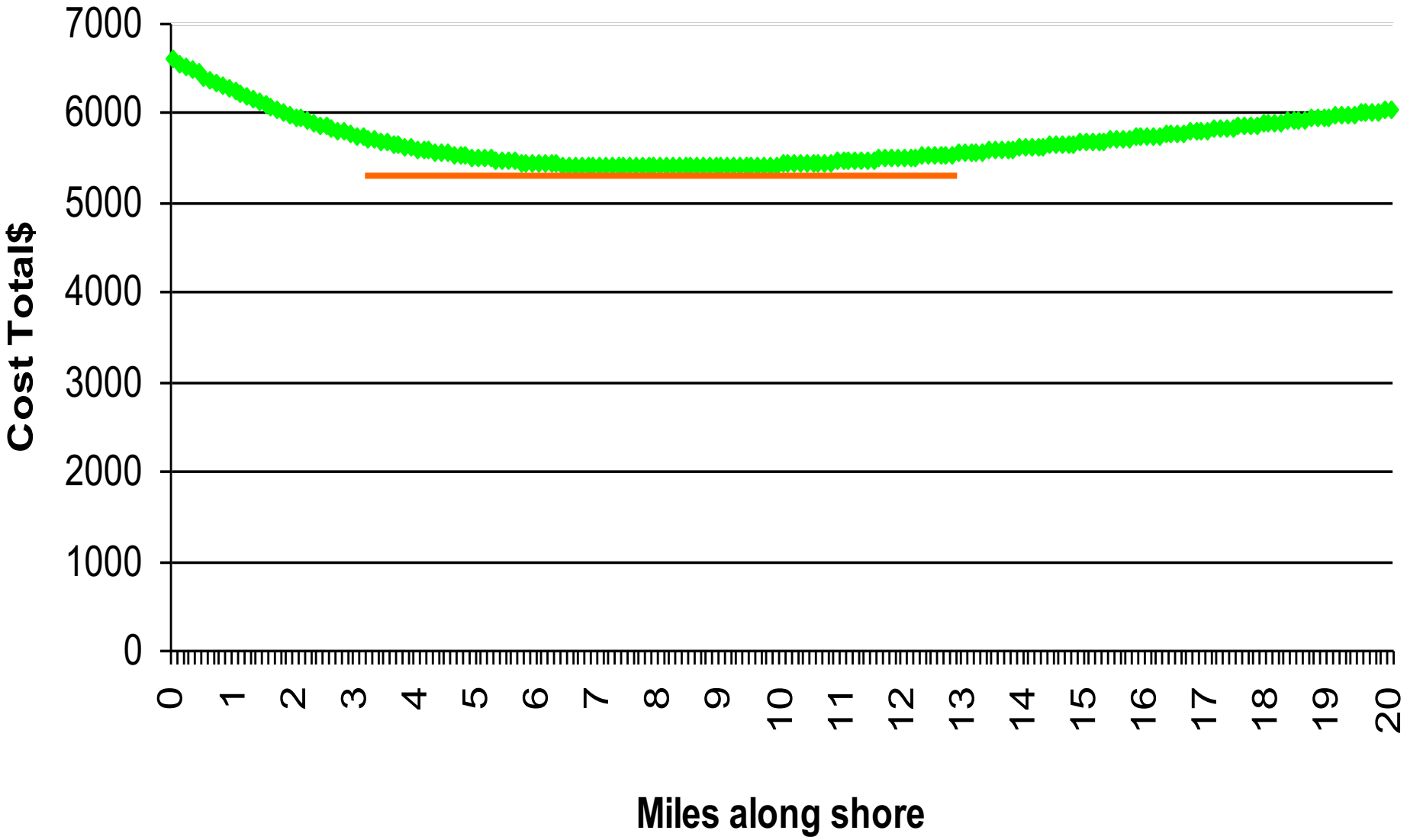
$$x^2 = 64$$

$$x = 8 miles$$

So at x=8 miles, we find the first derivative equals zero which indicates a slope of zero which is a local minimum.

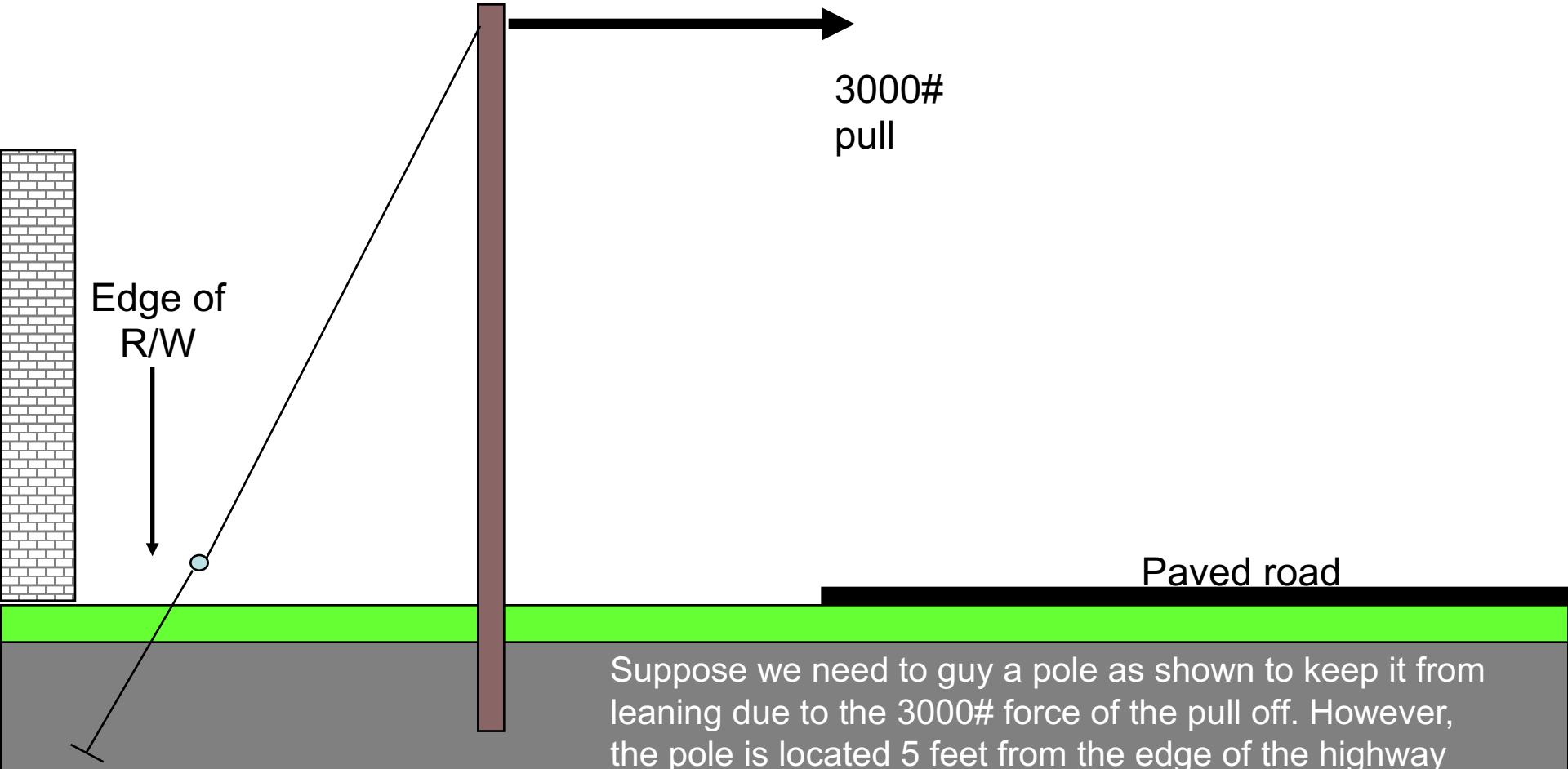
Minimum Cost of Installing Cable

(Graphical Solution)



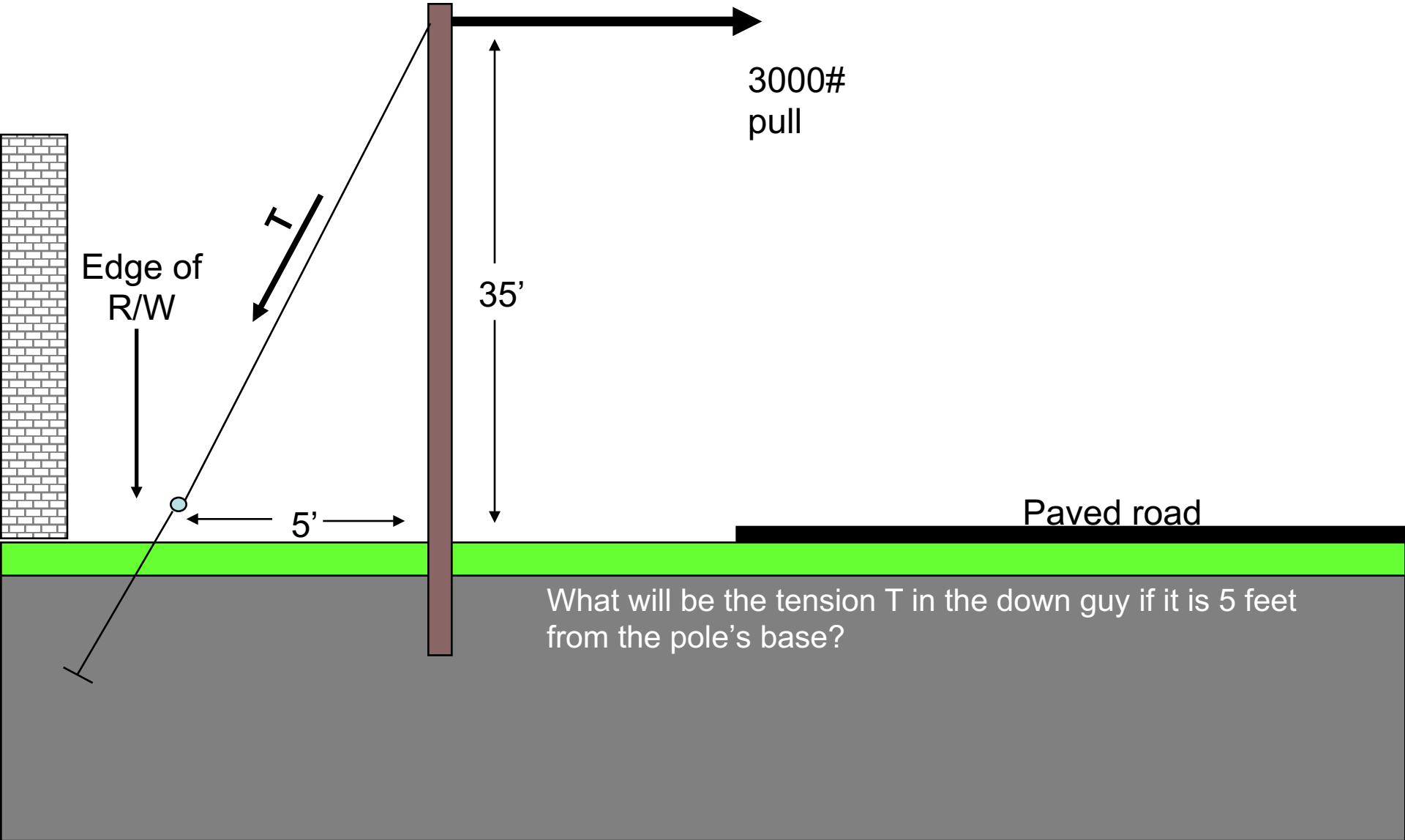
Guying Poles

This problem uses trigonometry, engineering science & mechanics, physics, and knowledge of easements and legal interactions.



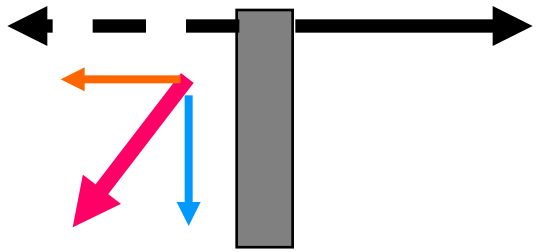
Suppose we need to guy a pole as shown to keep it from leaning due to the 3000# force of the pull off. However, the pole is located 5 feet from the edge of the highway right of way and no easement was obtained to allow guying on the private property behind the pole.

Guying Poles



What will be the tension T in the down guy if it is 5 feet from the pole’s base?

Guying Poles



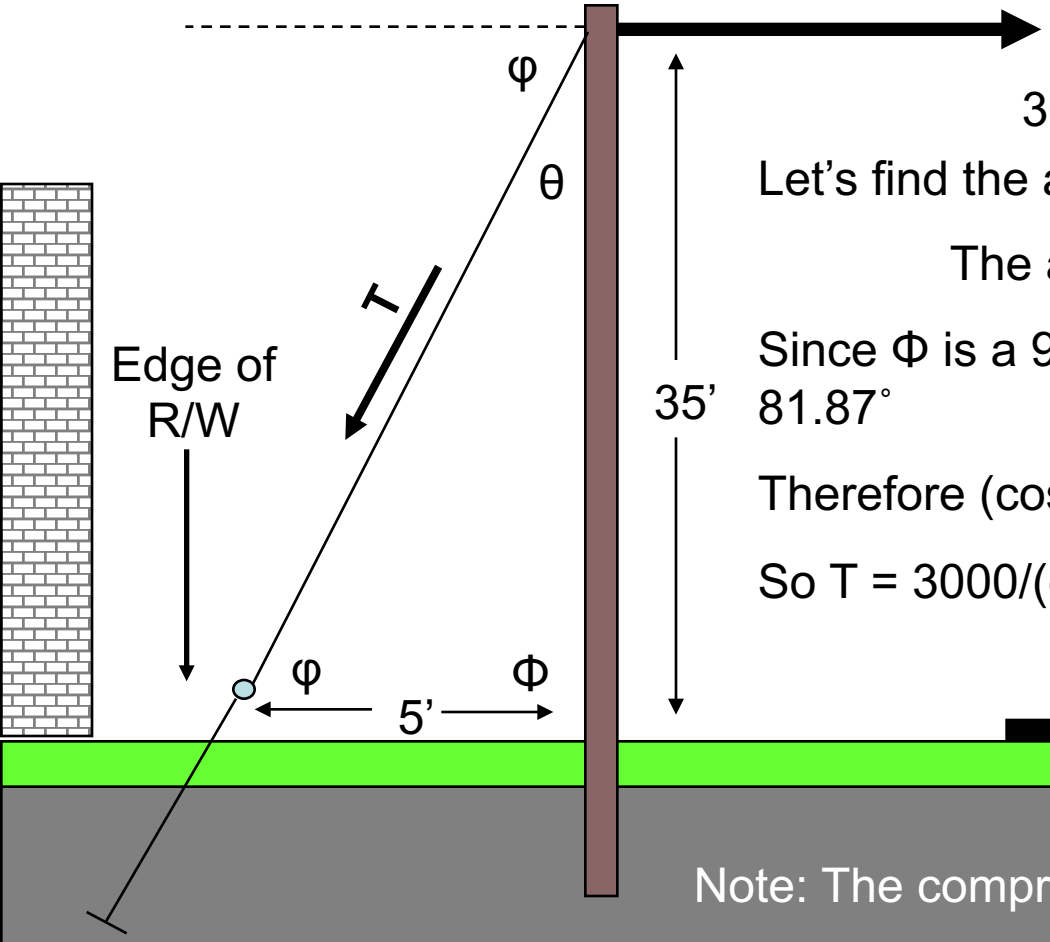
Consider a “free body” diagram of the pole. If the pole is not accelerating in the direction of the pull, then there must be an equal and oppositely directed force balancing the pull on the pole. We will create that force using a down guy and anchor!

However, we can’t pull straight away from the existing force—we have to anchor to the earth, so our force must be created by pulling downward at some angle.

That angle is determined by the distance from the base of the pole that we can set our anchor, in this case, 5 feet. Therefore, part of the tension will offset the existing pull and part of the tension will “compress” the pole!

Our tension **T** must be comprised of both of these pulls—a horizontal pull and a vertical pull. And we know the horizontal pull must equal the existing 3000# pull…

Guying Poles



3000# pull

Let’s find the angles:

The arctan (5/35) = 8.13˚=θ

Since Φ is a 90˚ angle, then φ must be (90-8.13) = 81.87˚

Therefore (cos φ)(T) = 3000

So T = 3000/(cos 81.87˚) = 21,213#

Paved road

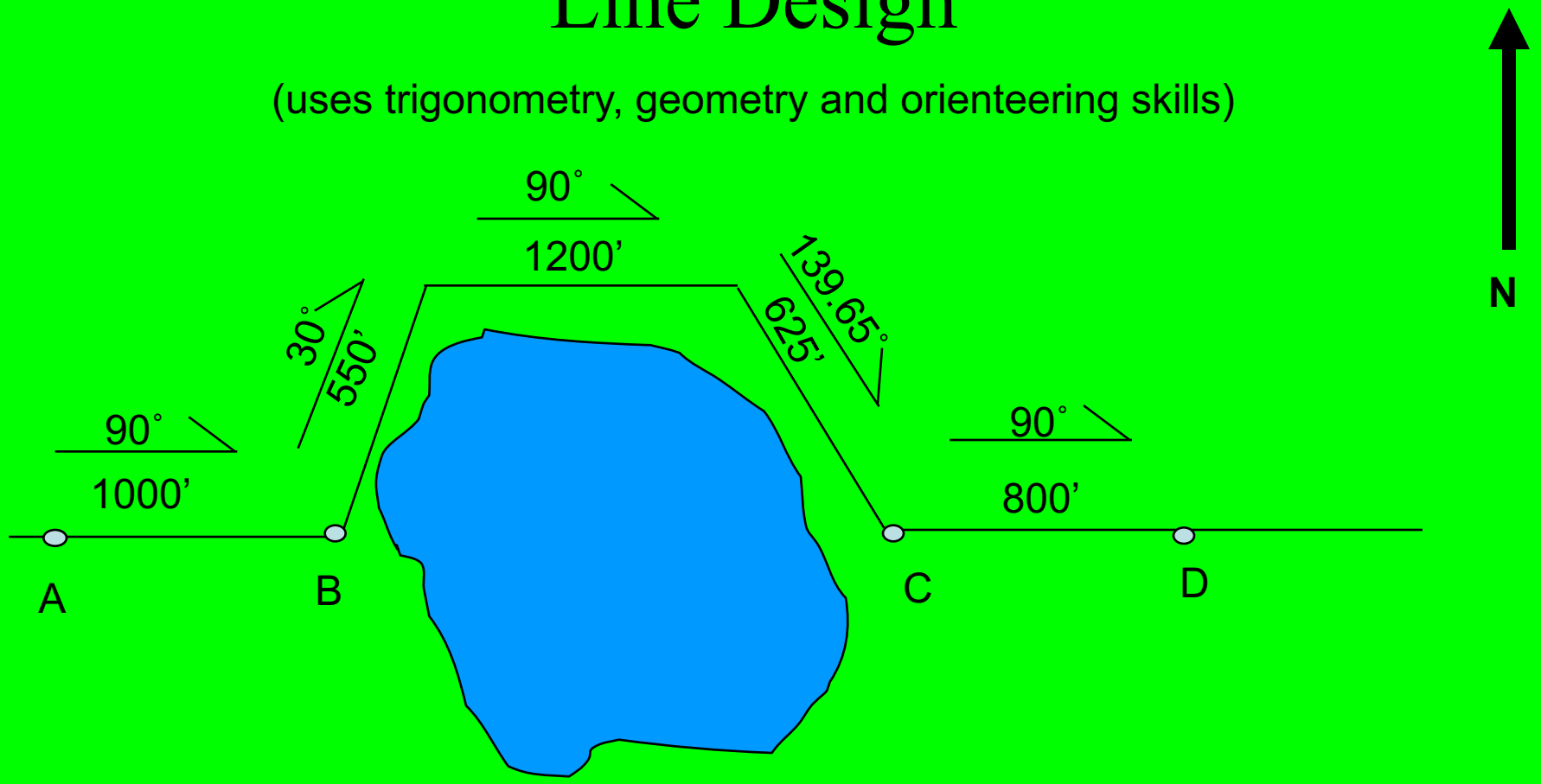
Note: The compression on the pole is ~21,000#

With a 10 foot guy lead, what would T be?

10,920#

Line Design

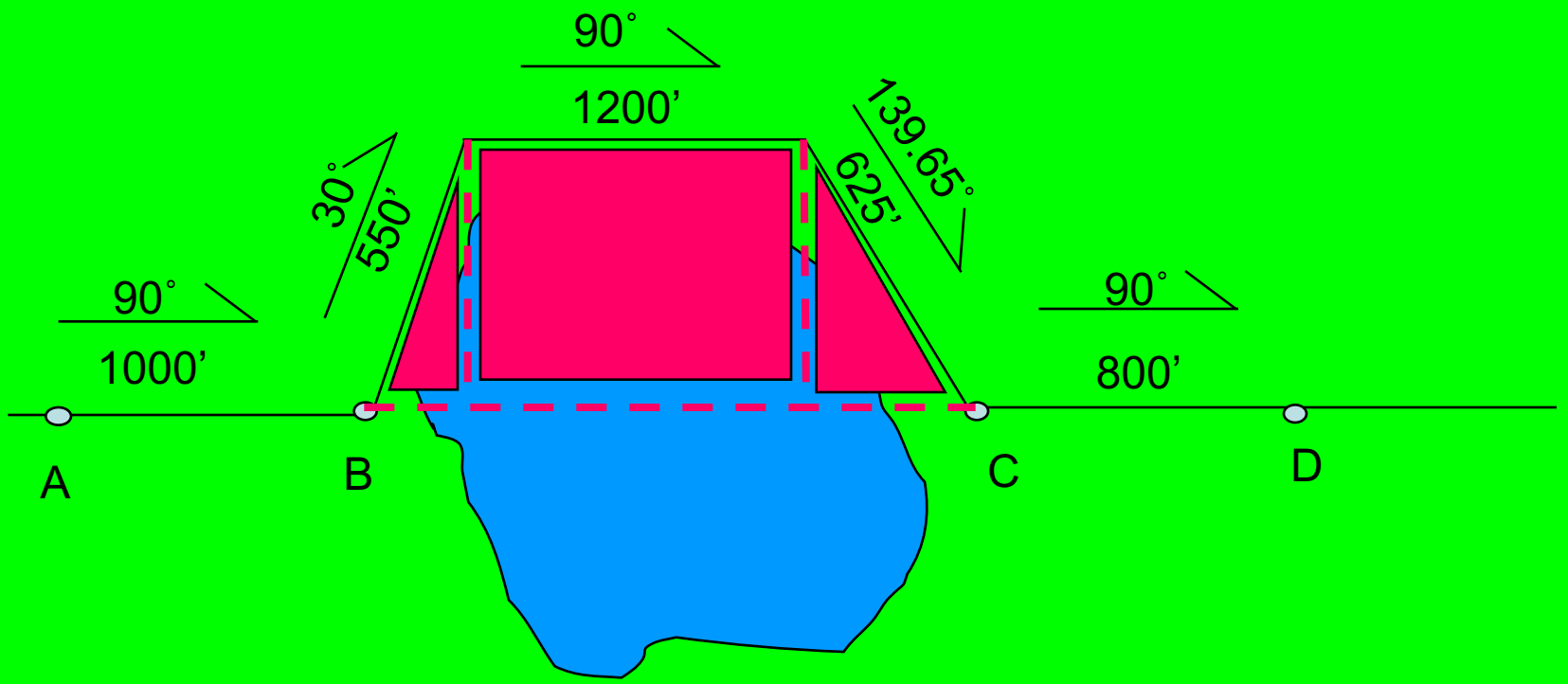
(uses trigonometry, geometry and orienteering skills)



In Laying out a new line, a lake is encountered. Find the straight line distance from point A to Point D. (Note that given angles are compass headings referenced to magnetic north.)

Line Design

(uses trigonometry, geometry and orienteering skills)



We need the base lengths of the two triangles plus the length of the rectangle.

Total length is given by: 1000’ + cos 60˚(550’) + 1200’ + sin 40.35˚(625’) + 800’ = 3679.65’

Teachers Career Day
Program Evaluation

1. What did you like best about the Teachers Career Day?

2. What did you like least?

3. Would you recommend energy careers to your students? Why or why not?

4. Would you recommend the Career Day to a colleague?

5. Any other comments?

THANK YOU FOR JOINING US TODAY!

Formed in March 2006, the Center for Energy Workforce Development (CEWD) is a non-profit consortium of electric natural gas and nuclear utilities and their associations —Edison Electric Institute, American Gas Association, Nuclear Energy Institute, and National Rural Electric Cooperative Association. CEWD was formed to help utilities work together to develop solutions to the coming workforce shortage in the utility industry. It is the first partnership between utilities, their associations, contractors and unions to focus on the need to build a skilled workforce pipeline that will meet future industry needs.

Center For
ENERGY
Workforce Development

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