

Smashing Atoms for Science & Profit:

A Brief History of the Van de Graaff Generator & High Voltage Engineering Corporation

26 March 2015 – Wright Nuclear Structure Laboratory, Yale University

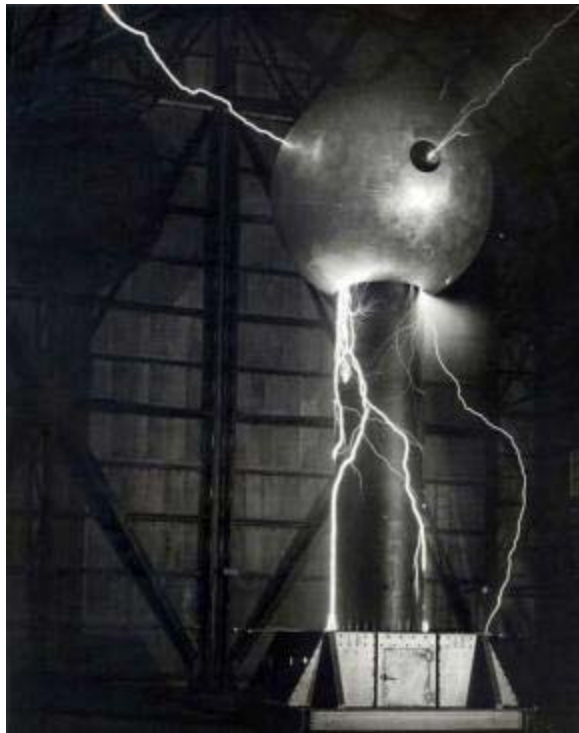


- What most people know about Van de Graaff generators
 - Static electricity
 - High Voltages, low currents
 - Learn about science, electricity
 - Fun!

Van de Graaff Generators

- What most do not know:
 - First electrostatic generator/accelerator to reach 1 MeV
 - First X-ray devices to treat cancer patients
 - Used in WWII in Manhattan Project to discover isotopes and by U.S. Navy to X-ray ordnance, welding, etc.
 - Still used today to sterilize food, implant ions in semiconductors, harden paint, and perform basic physics research and teaching

Van de Graaff Generators



- Round Hill Lab, Dartmouth, Mass. Funding and hangar given by eccentric millionaire Edward Green.
- First electrostatic generator to reach 1,000,000 volts.
- First lessons in publicity and marketing.

Van de Graaff Generators



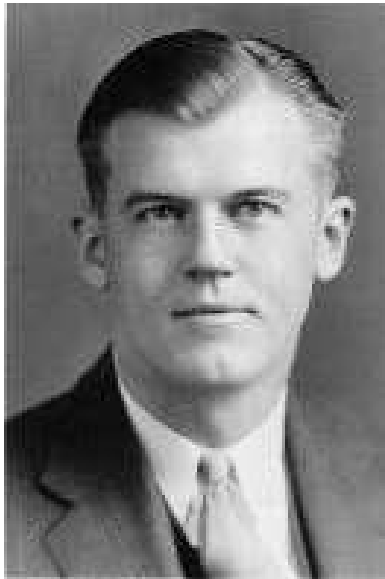
- First cool hangout for media and guests to see LOUD high voltage experiments since Tesla in Colorado and NYC.
- While this was going on, MIT, Trump, Van de Graaff, Compton, and the government (at the TVA) were hashing out terms.

The Tennessee Deal



- Tennessee Valley Authority
- New kind of relationship between govt, industry, and academe.
- Wanted to use VDG electrical generation & distribution system

The Brain Trust



- Robert J. Van de Graaff, scientist, engineer, physicist, inventor, reluctant entrepreneur
- John G. Trump, same but he was the apps guy.

The Brain Trust



- Bill Buechner, the wrench-turner, glass blower, and all-around wizard.
- Denis Robinson, the British connection, Rad Lab guy, and first head of HVEC.

The Money Men



- Karl T. Compton, president of MIT. Brought Van de Graaff, his tech, and the commercialization rights with him from Princeton.
- Vannevar Bush, dean, head of NDRC, OSRD, etc.

The Money Men



- Gen. Georges Doriot, head of ARD (ARDC). Harvard prof and director of the U.S. Army's Quartermaster General during WWII.
- Col. Edward Green, radio pioneer, eccentric, party animal, inspiration for Great Gatsby?

World War II



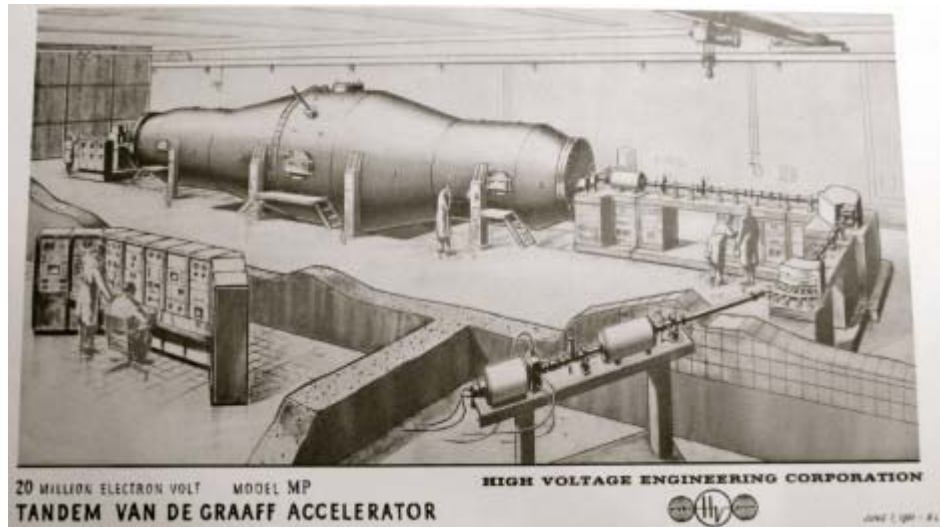
- *LIFE* magazine issue revealing the A-bomb with article and photos of Van de Graaff accelerator.
- This was Van de Graaff's own copy – among the 9,000 documents I've examined in his sons' holdings.

World War II



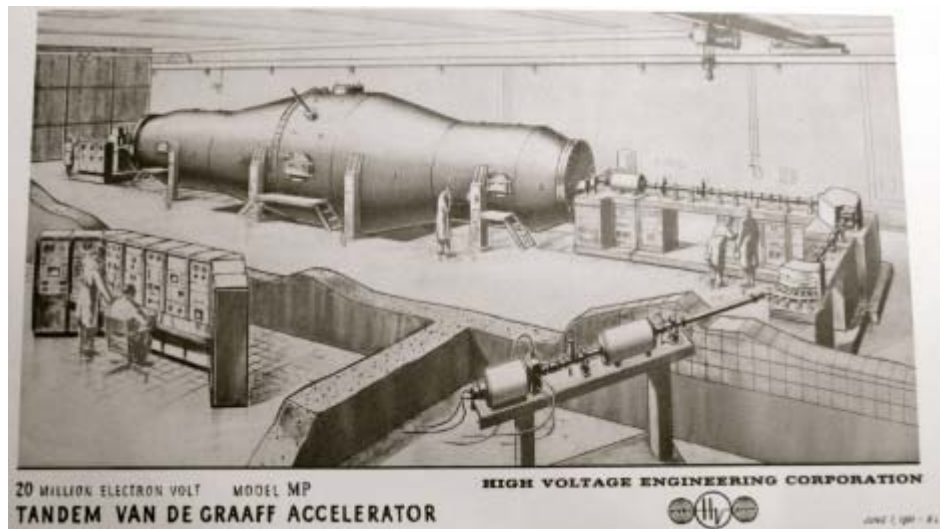
- Ray Herb, Trump, Buechner, and Robinson at Rad Lab.
- Herb's VDG at Los Alamos
- U.S. Navy orders VDGs from MIT.

High Voltage Engineering Corp.



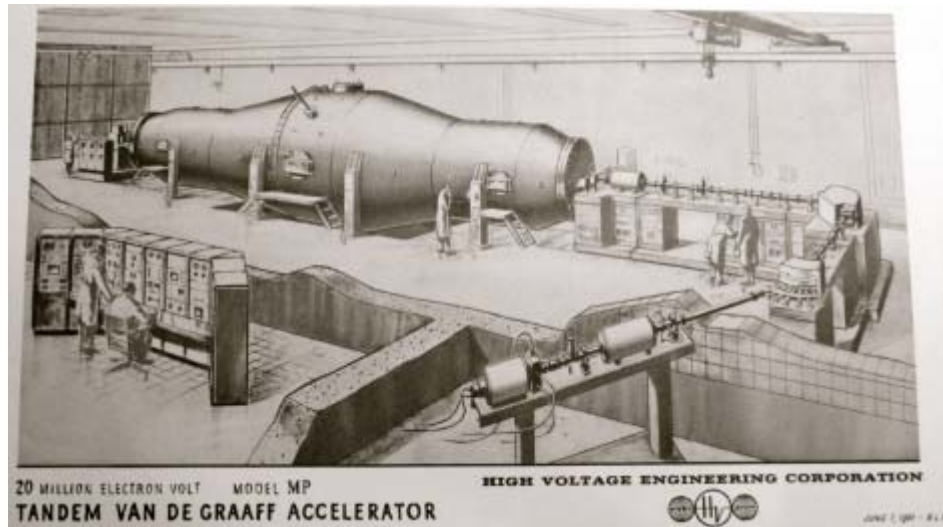
- VDG & Trump est. 1946. Profits by 1954.
- First high-tech firm floated by publicly-funded venture capital.
- Made 500+ particle accelerators over 40 years

High Voltage Engineering Corp.



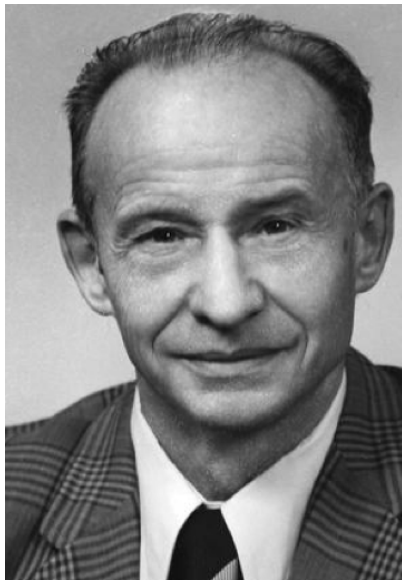
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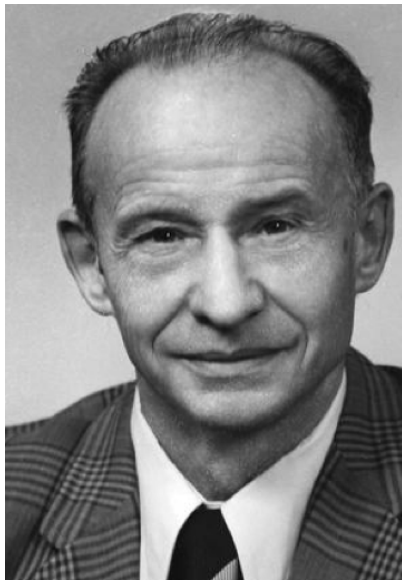
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The Problem



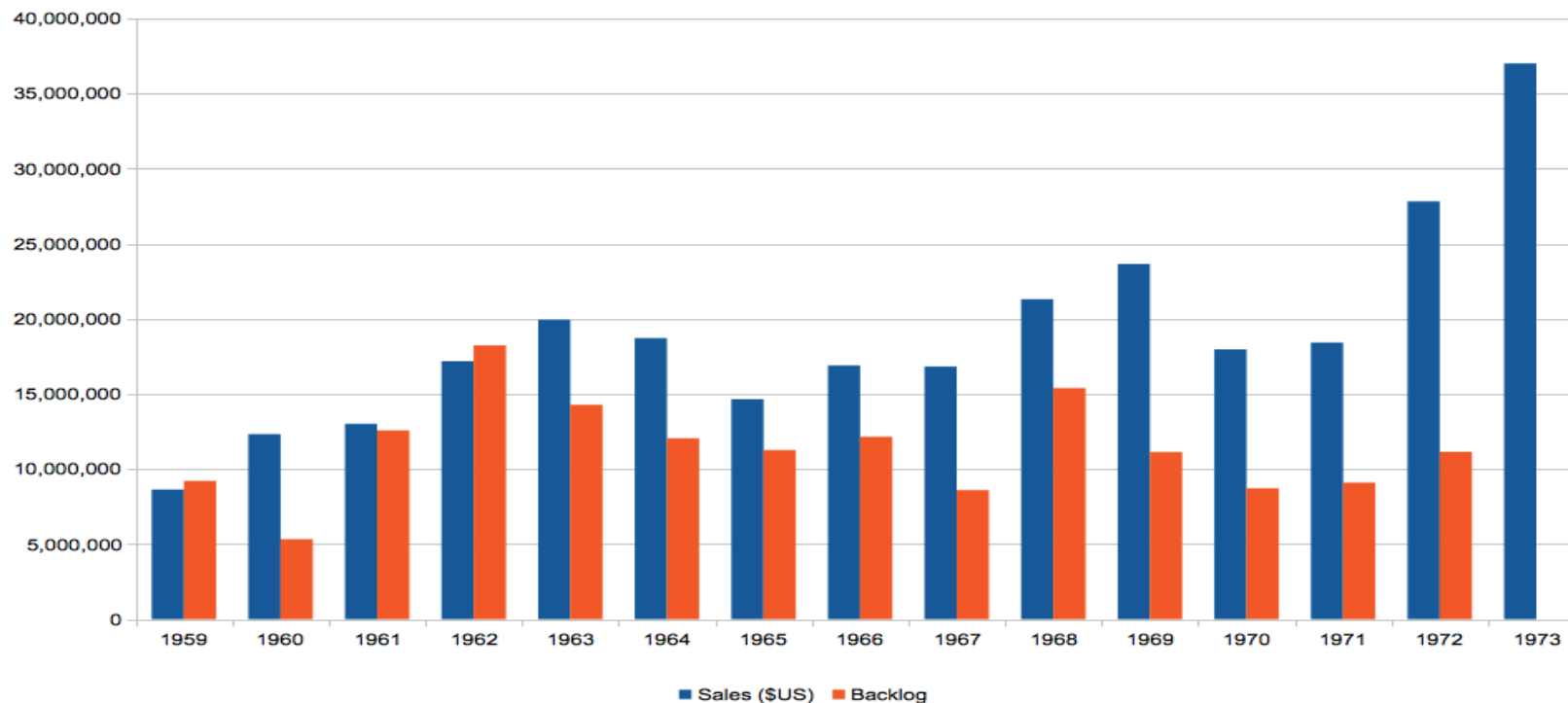
- U Wisconsin physics prof joins HVEC as consultant.
- Leaves under dodgy circumstances, starts competing company NEC (National Electrostatics Corporation) in 1965.

The Problem



- Buechner says Herb ripped them off.
- Put VDG into a pressurized tube and developed Pelletron charging system.

High Voltage Engineering Corp.



High Voltage Engineering Corp.



- VDG leaves MIT in 1960 (not 1959) for HVEC.
- Uranium experiment at last.
- Dies in 1967. Twinned craters on the moon named for him.
- Company folds in the 1980s. Dutch subsidiary survives.

High Voltage Engineering Corp.



- Original Van de Graaffs are still in use today at Brookhaven, Tennessee, Research Triangle, and more – especially the FN series.
- Very durable.
- Customizable.
- Upgradable.

Where is it now?



- Original device from Round Hill still working at the Museum of Science in Boston.
- 80+ years old.
- Textolite is deteriorating.

Questions?



- Thank you!
- efenner@yorku.ca
- Blog: The Smashing Mr. Van de Graaff
- Funding by the Scientific Instrument Society (UK), the Friends of the American Inst. of Physics, an anon. patron, and from