Exhibit No.: 402
Issues: Negative Impacts to Farming
And Land on Property Value
Witness: Kurt C. Kielisch
Sponsoring Party: Show-Me Concerned Land Owners
Type of Exhibit: Rebuttal Testimony
Case No.: EA-2014-0207
Date Testimony Prepared: September 15, 2014

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the Application of Grain Belt Express Clean Line LLC for a Certificate of Convenience and Necessity Authorizing it to Construct, Own, Operate, Control, Manage, and Maintain a High Voltage, Direct Current Transmission Line and an Associated Converter Station Providing an interconnection on the Maywood-Montgomery 345 kV Transmission Line	)	Case No. EA-2014-0207

REBUTTAL TESTIMONY OF
KURT C. KIELISCH
ON BEHALF OF THE
SHOW ME CONCERNED LANDOWNERS

SEPTEMBER 15, 2014

Exhibit No. 402
Date 11-10-2014 Reporter Stewart
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I. Qualifications and Purpose of Testimony

Q1. What is your name, profession, and business address?

A. My name is Kurt C. Kielisch, I am a real estate appraiser and I work for the Forensic Appraisal Group, Ltd, 116 E. Bell Street, Neenah, Wisconsin.

Q2. What is your position with the Forensic Appraisal Group?

A. I am the president and senior appraiser.

Q3. How many employees work for Forensic Appraisal Group?

A. We have seven employees.

Q4. What geographical area do you and your company provide appraisal services?

A. I am currently licensed and provide real estate appraisal services in five states, Kansas, Michigan, Minnesota, Virginia and Wisconsin. In the past I have completed appraisal services for properties located in Alaska and Colorado, Illinois, Indiana, Iowa, Mississippi, Missouri, North Dakota, Ohio and Wyoming.

Q5. What is a "forensic appraiser"?

A. Forensic simply means "giving testimony to a unique body of knowledge". A forensic appraiser is an appraiser who specializes in a certain field of appraisal and is utilized as an expert witness testifying to that unique body of knowledge.

Q6. What areas do you and your company specialize in?

A. Our appraisal services are focused in: eminent domain, utility easements, avigation easements, rails-to-trails, valuation disputes, estates, stigmatized properties and impact studies.

Q7. What is your educational background?

A. I have three college degrees, a bachelor's degree in Business Administration with a minor in economics, a bachelor's degree in Biology with a minor in natural sciences (chemistry and physics), and a master's degree in education focusing on the adult learner.

Q8. What is your professional educational background?

A. Aside from my business and economics courses completed in the degree programs, I have completed 28 appraisal courses and 40 appraisal continued education seminars.

Q9. Do you have any advanced designations awarded to you through appraisal organizations or associations?

A. Yes. I have four advanced designations. They are: ASA (urban) designation from the American Society of Appraisers, IFAS (senior) designation from the National Association of Independent Fee Appraisers, SR/WA (senior) designation from the International Right-of-Way Association (IRWA) and the R/W-AC (appraisal certified) designation from the IRWA.

Q10. In what states have you given expert testimony?

A. I've given testimony in state courts and commissioner hearings in Kansas, North Dakota, Minnesota, Ohio, and Wisconsin.

Q11. Have you ever given testimony in a federal court?

A. Yes. I've given testimony in federal court cases in Ohio and Wisconsin.

Q12. Have you testified before a regulatory commission before?

A. Yes. I have testified before the Wisconsin Senate Committee on the impact of wind farms to property value, before the Wisconsin Public Service Commission on both the impacts of wind farms and high voltage transmission lines on property value, before the Illinois Wind Siting Counsel, and before the Wyoming Industrial Siting Counsel.

Q13. Has any of your testimony been involved in State Supreme Court decisions?

A. Yes. My testimony was directly cited in two Wisconsin Supreme Court decisions: Waller v. American Transmission Corporation, and Spielberg v. Wisconsin Department of Transportation.

Q14. Have you ever given presentations relating to eminent domain to attorneys?

A. Yes. I was a faculty member in the annual ALI-CLE eminent domain conference in 2013 and 2014, and a faculty member in the Eminent Domain Institute CLE in Cleveland in 2013.

Q15. Do you have a curriculum vitae?

A. Yes. It is attached as Schedule KCK-1.

Q16. What is the purpose of your testimony on this docket?

A. I am to give testimony on the impact that high voltage transmission lines (HVTL) have on agricultural property value.

II. Testimony to the Negative Impacts that HVTLs Have on Property Value

Q17. What is market value?

A. Market Value is defined, in layman's terms, as the value a property would sell for at a given date considering an open market. An open market assumes that the property is available for purchase by the public, being properly marketed for maximum exposure, and that the buyer and seller are well informed, fully knowledgeable and acting in their best interest. Included in this definition is that the buyer has full knowledge of the pros and cons of the property, and then acts with that knowledge in a way that will benefit them. Essentially, the value of a property is based on the perception of the

buyer. Understanding that perception drives value is the foundation in analyzing the effect that electric transmission lines have on property value.

Q18. Is this perception based on facts?

A. This perception does not have to be based on a scientific or engineering fact, it based on what a buyer believes. An example of perception driving value based solely on belief is the haunted house. A home cannot be proven scientifically to be haunted. Yet, there are several homes throughout the nation thought to be "haunted" which stigmatizes the property resulting in a diminished selling price. The same holds true with environmental factors.

The market has shown that a previously contaminated property that has satisfactorily removed the contamination receiving a clean bill of health from the scientists and engineers still suffers a loss of value. Why? Because there is a perception in the market that once a property is contaminated the issue may reappear and the fear of this reality will stay with it for an unknown period of time. Therefore, the buyer demands a discounted price to protect them of this event.

Q19. On what do the buyers base this perception?

A. Buyer's perception is based on what they hear, see and read. We are a nation that has multiple forms of communication, however the dominate forms are: what we see on television, cable or the internet, what we hear on the radio and from others, and what we read, mainly in newspapers, magazines and on the internet.

Q20. Have you researched what buyers see, hear and read in regards to HVTLs?

A. Yes. In 2013 we completed a literature study investigating the number of articles that were printed regarding HVTLs safety, health issues, EMFs and rural living. (Schedule

KCK-2, attached.) This study showed that an overwhelming number of printed articles were negative toward HVTLs with regards to health, view shed, EMF concerns and their impact on agricultural land uses.

The internet plays a large part shaping our perception on issues. You can search a vast array of topics quickly finding information in printed form, videos, news casts and the like. A very popular search engine is Google. When I typed in the search "do high voltage power lines pose a risk to health?" the first page had ten entries of which nine suggested they do, or might, and one said they do not. (See Schedule KCK-3, attached.) Of particular interest was the Zillow entry which was following a chat of various individuals on Zillow about this topic. Nearly all participants indicated they had a concern that high voltage power lines do cause health risks. Many cited old studies (and some new) that suggested there was a direct link between health risk (mainly rare cancers or childhood cancers) and proximity to HVTLs. A similar question on YouTube had a similar result. Such searches are common place in today's modern world of communication. I did a test search on Sunday, September 14, 2014, inserting the search "do high voltage power lines cause health risks?" The first page had twenty entries of which one was images of power lines, two were safety videos from the State of Virginia's Department of Labor & Industry, one from American Transmission Corporation leaving the balance of sixteen videos stating, or suggesting, that HVTLs do cause health risks. (See Schedule KCK-4, attached.) These are just a sampling of what a person would find using these resources. And, all play into the notion that seeing, hearing and reading that HVTLs do cause (or may cause) negative

health issues and other harm influence the perception that a typical buyer would have regarding HVTLs on a property.

Q21. Your focus in this testimony is on agricultural properties. Is a buyer of agricultural property different from any other type of buyer?

A. In appraising a property the appraiser attempts to reflect the potential buyer of the subject property and estimate their action as to the subject property with all its advantages and disadvantages (knowledgeable buyer). To accurately reflect this buyer, the appraiser must determine the typical profile of such a buyer of the property in question.

For properties that are utilized for agricultural purposes, the most likely buyer would be one who: (1) prefers the rural lifestyle over the urban lifestyle; (2) typically generates their income from working in the agricultural field; (3) would be sensitive to environmental issues that affect the uses of the land and the view shed of the land; and (4) would be sensitive to health and safety issues relating to the land and its use. It is most likely that such a person, when confronted with an electric transmission line traversing the property, would be concerned with the aesthetics, health issues, disruption to rural lifestyle and how it would impact the use of the land for agricultural purposes.

Q22. What common concern does an agricultural property buyer have regarding HVTLs?

A. Agricultural properties are a mix of land uses. They include crop land, pasture land, animal husbandry, recreation and single family homes. Each land use has its unique set of concerns regarding HVTLs. However, a common concern is the negative impact to the aesthetics or view shed caused by HVTLs. It is a false notion that the

farmer only cares about production, not what the land looks like. A farmer in North Dakota summed it up when he and I were in his field, looking at hundreds of acres of flat land, few trees and row after row of half-grown corn. He asked me: "Do you have an office? Yes," I replied. "Does that office have windows? Yes. Do you pay a higher rent for windows and a view? Yes I do." Gesturing towards his wide open expanse he said, "This is my office."

Q23. Is the presence of electric and magnetic forces, commonly referred as EMFs a concern?

A. Definitely. Though the electric utility companies present engineering studies showing there is little to no health risks posed by EMFs radiating from HVTLs, it appears the buying public do not buy it as indicated by the USA Today public survey, 1996, which listed EMFs as the "number one environmental concern." The literature study we completed in 2013 (Schedule KCK-2, attached) stressed the concern that people have about being in close proximity to HVTLs and their corresponding EMFs. This concern is real, though it may not be supportable by scientific laboratory studies. The fear is mainly in the areas of leukemia, rare cancers, and other such diseases believed to be associated with the presence of HVTLs. Working near, or under HVTLs, is considered not to be a healthy choice by the general public.

To heighten the health concerns, are warnings by heart doctors and pacemaker equipment manufacturers. A publication by CIGNA, entitled *Heart Problems Living with a Pacemaker* (November 2012), warned that pacemakers are affected negatively by strong electrical fields and put high voltage transmission lines on the "stay away"

list, recommending to keep at least 25ft away (it did not clarify the easement or actual line).

The Mayo Clinic Family Health Book (3d edition (2013) speaks about pacemakers and has this warning with regards to HVTLs: "avoid electromagnetic fields such as those found near high voltage transmission lines or substations." (Chp 26, pg 769)

American Transmission Corporation (ATC) ,a large electrical transmission company in the Midwest, contacted Metronic USA Inc, CRM Technical Services, to complete a risk analysis of a property owner who had a heart pace maker (Kappa DR 902) and his property was being subject to the installation of a 345kV HVTL. Metronic's technical advisor Gregg Duetsch advised ATC that the property owner would need to stay at least 50ft distant from the centerline of the power line to remain reasonably safe. Previously, the property owner's heart physician recommended 600ft.

The BPA power line safety brochure addresses this issue with the following comments: "Under some circumstances, voltages and currents from power lines and electrical devices can interfere with the operation of some implanted cardiac pacemakers. However, we know of no case where a BPA line has harmed a pacemaker patient."

"As a precaution, people who may have reason to be very near high-voltage facilities should consult with a physician to determine whether their particular implant may be susceptible to power line interference."

Q24. Are irrigation systems impacted by HVTLs?

A. Yes, they can be. The placement of poles can interfere with the radius of the boom swing of a center pivot irrigation system. This interference would require either reprograming of the pivot operations or replacement of the system to one more compatible with

maneuvering around the obstacle. In some cases the pivot system is rendered useless, requiring the land to revert to non-irrigated status. Such a loss will reduce property value. Our analysis using USDA records of property value between irrigated and non-irrigated showed an average of 21% difference.

In addition to pole interference the irrigation system would need to make certain it did not spray water as a continuous stream on the electric lines. The HVTL electric lines are not insulated. Therefore, a stream of water could provide conduction to the irrigation system causing harm to the electrical components of the system, operator, and potential harm to the electric line (which is a violation of the easement condition).

The government-run Bonneville Power Administration (BPA) has a brochure on high voltage transmission line safety entitled *Living and Working Safely around High Voltage Power Lines* (October 2007). In this brochure the following guidelines are given for the safe handling of center pivot irrigation systems:

"In addition, central pivot circular irrigation systems installed near or under power lines can develop hazardous shock potentials during operation and maintenance. To eliminate these hazards:

- Provide a good electrical ground for the pivot point.
- Do not touch the sprinkler pipe or its supporting structures when the system is operating under, or parallel to, and near a power line.
- Perform repairs/maintenance of the system with the sprinkler pipe perpendicular to the power line."

The cost to reprogram or install a new device would need to be under the impact of value loss to be curable within the scope of eminent domain.

Q25. Many agricultural crops are utilizing aerial spraying to combat pests and disease that can ruin a crop. Do HVTLs impact the use of aerial spraying?

A. Yes they do. High voltage transmission towers and a 345kV power line running across a property present obstacles for aerial spraying pilots. Typically these pilots like to get as low as they can to the ground before releasing their chemical spray on the plants. This ensures accuracy, reduces waste, and prevents float of the spray. Often these pilots will get near the tassel tops of corn, a height of 8-10ft or so from the surface. Many pesticides require a minimum distance of ten feet above the plants to achieve the maximum application. The plane itself can be 10-12ft tall from landing gear to tip of the tail (e.g. M-18 Dromader (12'1"), Grumman Ag Cat (12'1"), and Thrush 510P (9'4")). A power line typically has a minimum distance of 20-24ft above ground at the low sag point. Flying under a power line at a speed of 120-145mph is a high risk and potentially deadly business. Therefore, it is not a practice endorsed by professional spray operators, nor their insurance companies. In addition, many spray planes operate with a differential GPS guidance system, which we discussed earlier may be affected by the presence of HVTLs.

Even with these difficulties many fields near HVTLs can benefit from aerial spraying. However, the drawbacks are that the spray will not get near the HVTLs due to safety and if the HVTLs are bisecting, diagonal cutting, or crisscrossing the field there may be substantial areas of the field that cannot be serviced from the air.

The farmer is left with only one option if a field cannot be serviced with aerial spraying, that is, mechanical spraying. This is a more costly method of herbicide application that often causes crop loss due to the vehicle trampling the plants resulting in a reduction of the

profitability of the parcel. In some cases the plants are too tall for a mechanical sprayer and the crops go unprotected.

Q26. Do HVTLs affect the use of GPS systems on the farm?

A. There has been much conversation about HVTLs interfering with GPS signals. This is a concern for all agricultural land owners since nearly all farm equipment works in conjunction with a GPS signal of some kind. The loss of this signal or inaccurate readings would impact crop production and labor.

We contacted manufacturers of GPS units, which are used in agriculture, about this issue. GPS signals are bounced off satellites orbiting in space. By the time the signal is received on Earth it is relatively weak and any major obstacle can distort it. Product Test and Support Specialist Max Forest of Hemisphere GPS (Calgary, Alberta, Canada) had this response to the question if HVTLs impact GPS signals: "Since GPS signals come from outer space, by the time they reach us on Earth the signal is quite weak. When using your HVTLs in close proximity with GPS receivers you will see that you will lose position and heading. My recommendation would be to set the GPS antenna as well as the receiver as far away as possible from any HVTL."

Chad Ostring of Ag Express Electronics (Des Moines, Iowa) had this to say about the impact of HVTLs on GPS units used in farm machinery and on board computers: "HVTLs can interfere with the GPS guided systems up to 300 yards away and HVTLs have an impact of computer-driven machinery, especially in close proximity. Our shop is close to an HVTL and we have had issues with our electronics due to them." (Not exact quotes, but summarized statements from a phone conversation.)

Independent studies about these phenomena are rare. One such study was completed by Peter Gibbings, Lecturer, Faculty of Engineering and Surveying at the University of Southern Queensland, Australia. In his study, *Assessing the Accuracy and Integrity of RTK GPS Beneath High Voltage Power Lines,* Mr. Gibbings attempted to discover the reason for the anomalies of data accuracy in survey instruments under or in close proximity of a HVTL. His conclusions were more qualitative than quantitative and found that electronic interference did occur within 30 meters from the center of a 275kV transmission line. Translated into the English system, that would be approximately 98ft.

Farms utilize the RTK systems on their farms for row planting guidance, pesticide and fertilizer applications and harvest information so they may manage their farms to the maximum productivity. It has been stated by electric utility engineers that it is a near impossibility for HVTLs themselves, in reference to the wires and corona, can cause signal distortions. Often the argument is the only potential interference that HVTLs could cause in signal loss would be the blocking of the signal by a pole. However, this statement is made with the words "unlikely" which is not a certainty that the marketplace desires. Similar to the EMF argument, uncertainty breeds doubt which the market reacts equal uncertainty heightening the perception that there may be more to the story.

Anecdotal evidence suggests that farmers have experienced malfunctions of GPS systems in close proximity to the HVTLs. Indeed, conversations with farmers in many states have revealed to me that this is a common concern and there is a perception that HVTLs do, or could, impact the accuracy of GPS systems which farmers, and potential buyers are uncomfortable with.

Q27. Does working around and in close proximity of HVTLs require the farmer to use extra caution due to potential shock hazards?

A. The potential of shocks and electrical arcing near high voltage power lines is real. A training video presented to electrical engineering students at the School of Engineering, University of Wisconsin (Madison) instructed the students that an electrical arc can reach across as much as 45ft from the power line to an object. Testimony from an engineer for American Transmission Corporation (Wisconsin) indicated that it is recommended to attach grounding chains on all vehicles that are working under or in close vicinity to a HVTL and that storing equipment and vehicles or refueling under or in close proximity of a HVTL is not recommended.

BPA's brochure on high voltage transmission line safety states the following in relation to electric shocks and arcing:

"The most significant risk of injury from a power line is the danger of electrical contact. Electrical contact between an object on the ground and an energized wire can occur even though the two do not actually touch. In the case of high-voltage lines, electricity can arc across an air gap. The gap distance varies with the voltage at which the line is operated. Unlike the wiring in a home, the wires of overhead power lines are not enclosed by electrical insulating material.

BPA does not recommend that anyone attempt to calculate how close they can come to a power line. As a general precaution, when under a line, never put yourself or any object any higher than 14 feet above the ground.

Under some high-voltage lines, vehicles can collect an induced voltage. This is particularly true if the vehicle is parked on a nonconductive surface such as asphalt or dry rock. You

can drain the voltage from your vehicle to the ground by attaching a chain that reaches the ground or by leaning a metal bar against your vehicle. The only way to be sure you won't get shocked is to park your car away from the high-voltage power line.

These types of shocks are caused by a voltage induced from the power line into the nearby metallic objects. Typically the shocks can be avoided when the nearby metallic objects are grounded or connected to earth. The severity of these shocks depends on the operating voltage of the power line, the distance from the conductor, the size or length of the object, its orientation to the line and how well the object is grounded. Normally, shocks do not occur when BPA's guidance is followed (see the following sections).

However, under certain conditions, non-hazardous nuisance shocks can still occur and possibly cause discomfort. The severity of nuisance shocks can vary in sensation from something similar to a shock you might receive when you cross a carpet and then touch a door knob to touching the spark-plug ignition wires on your lawnmower or car. The nuisance shock, however, would be continuous as long as you are touching the metallic object. Such objects include vehicles, fences, metal buildings or roofs and irrigation systems that are near the line or parallel the line for some distance."

Q28. Is soil compaction as a result of the construction and maintenance of a HVTL a concern for farmers?

A. Yes it its. Soil that is compressed under heavy pressure will compact. As a result, compacted soil will not drain properly nor absorb moisture, readily creating an area of dry soil. Plants attempting to grow on such a compacted soil will have shallow roots and be susceptible to drought-like symptoms when there is adequate ground moisture. Such plants typically have a stunted growth and often do not mature or produce the same as the non-

compacted soil areas. The only way to cure this condition is by having a soil specialist test the compactness of the soil and the depth of the substance. Typically, a deep plow technique is recommended that will turn the soil and loosen the soil substrates. However, even after the cure it often takes a few crop cycles to return to the field to its original state. Use of heavy vehicles such as dump trucks, concrete mixers, cranes, bulldozers, and the repeated traffic of pickup trucks along the same route can create soil compaction.

Q29. Some farms have dairy cows and other animal product units as their main source of income. Are there concerns relating to raising animals in near proximity to HVTLs?

A. Yes there is and it is typically focused on stray voltage. Stray voltage has gotten a lot of press within the agricultural industry. Stray voltage occurs when an electrical current leaks onto metal objects and a current is carried by that object. When an animal or person has contact with that object they get a shock. This shock can be small, felt as a tickle, or more severe including severe discomfort. An animal that experiences this shock will no longer make contact with the object. This is of particular concern among dairy farmers. When their cows are subjected to stray voltage they tend to stop drinking, which negatively changes the content and quality of their milk, reducing the cell counts that are needed to continue with Grade A labels. The farmer is not only at risk of losing this grading of his milk product, which would reduce his income, but he is at risk of losing the cows affected by the stray voltage.

Stray voltage can be caused by a number of factors including poor wiring, errant distribution lines, and such. However, the general belief in the dairy industry is that stray voltage can be caused by HVTLs in close proximity.

Q30. Does it matter where the HVTL is located on a property?

A. Yes it does. We have found different impacts on property value due to location of the HVTL on the property and have developed a hierarchy of sorts as a result.

The diagonal cut is the most severe of all the locations. Such a division creates triangular-shaped remainder lands. An angular cut impacts the largest expanse of area causing the most disruption of planting, field maintenance, harvesting, GPS units, and machinery that travel under the lines, irrigation, and aerial spraying. Typically, a diagonal location has poles located in the fields, reducing tillable acreage and requiring the operators to work around the obstacles, thus creating more work time, overlap, and safety concerns. Aesthetically, it is the most dominant of all locations impacting the view shed. This location would pose the greatest health concern considering its expanse and the necessity of having to work near and under it. Residential impact is great since the HVTL is a dominant feature in the view shed and would most likely be in close proximity to the residence.

The bisection would be the next tier under a diagonal cut. Cutting a parcel in two east-to-west, or north-to-south, leaves two rectangular shaped remainders is bisection. The rectangular shape is easier to work around than a triangular shape. However, this cut has the same issues as a diagonal cut since the easement is located in the field disrupting the maximization of the parcel. Typically there are poles located in the field. Aesthetically, the dominance of the HVTL in the view shed ranks slightly behind the diagonal cut. The health concerns would be the same as with the diagonal location. Residential impact is similar to the diagonal.

Located at the front of the parcel is the next tier under the bisection. This location runs parallel along the property line that abuts the access road and sometimes encumbers a

portion of the road's right-of-way. Though less disruptive than a bisection it does cause issues with the operation of agricultural machinery, GPS signals, sometimes aerial spraying if the pilot cannot run parallel to the line, irrigation pivot units, which must exercise caution not to hit the poles with the boom, or bare electric lines with the water spray. Aesthetically this location has a dominant position similar to the bisection due to it being along the road at the entry point of the parcel and must always be gone under to enter into the property. The health concerns would be slightly less than the bisection due to less exposure. Residential land use is negatively impacted similar to a bisection and diagonal cut.

The fence line location is the most common location for HVTLs and ranks slightly under the front of the parcel location. This location would be along the rear or side fence line (or quarter section line), often sharing the easement with an abutting property owner. Typically, the poles are not in the field to disrupt field work. However, this location has the same disruptive concerns as that of the front of parcel easement location. Aesthetically this location has less of an impact due to running along the rear or side of a property, the side position being more noticeable. Health concerns would be a result of living and working in close proximity to an HVTL. Residential property use is found on such properties and the impact depends on the view shed and proximity to the structures.

The corner nip is last location and has the tendency to have the least impact. This location is best described as a brief intrusion into the property by nipping a corner. The nip is usually in a diagonal fashion, but not dividing the property, per se. Most nipping locations are at the rear of the property, which is the least intrusive in position and view shed. Often poles are not located on the property, and if they are, they are typically in the corner potentially

creating issues with equipment turns, row planting, or irrigation equipment. Health concerns and residential land use are the lowest at this location.

Q31. What is the best way to measure the impact of HVTLs on property value?

A. The best method to measure the impact HVTLs have on property value is to use comparable sales. Comparable sales are sales of properties that are in most respects equally substitutable to the subject property. To extract an impact of the HVTL on property value, an appraiser would find comparable sales of that property which do not have an HVTL, make adjustments for those things that are different, and then compare the indicated value of the subject property derived from the comparable sales. The difference in value is attributed to the one factor that this analysis has isolated, that is the presence of the HVTL.

Q32. Is this type of analysis easy to accomplish?

A. Typically a new HVTL is the only such line in the county, which is problematic for the appraiser for test of "comparable" sale is not met. When this happens the appraiser will resort to the use of "similar" (but not truly comparable) sales such as lower voltage HVTL impacted property or studies on this topic as a guideline to predict the impact of the proposed HVTL on the subject property. When sales of a lower size HVTL are used the appraiser is establishing a base line of impact which would logically increase with the magnitude of the HVTL. For example, if an appraiser can only find sales involving a 138kV AC line in the market area, but the proposed line is 600kV DC line (such as in this matter), and has found a diminution of value of, say 10% due to the presence of a 138kV line bisection a parcel, then the appraiser can logically make two observations that would be applicable to subject property's situation: (1) HVTLs do have a negative impact on property value (which answers the first "yes, no" question), and (2) the impact is at least -

10%. In this example the base line of -10% impact has been set, however logic would dictate that a larger, more encumbering HVTL would have a greater impact than the base. If such similar (but, not truly comparable) sales are not available, then the appraiser can use studies as a guideline to the impact that the subject property may experience. These studies can be done by the appraiser themselves in another market area that would have similar highest and best use as the subject property (though may not have similar per acre land values) or utilize studies completed by other individuals, or do both.

Q33. Have you completed studies on the impact of HVTLs on agricultural property value?

A. Yes, I and my company have.

Q34. What methodology did you utilize in your studies?

A. Two of the most common study methods utilized in real estate appraisal are the matched pair analysis and the regression analysis. Each have their strengths and weaknesses, but designed correctly they can give good parameters to the appraiser on the impact of an isolated variable. We utilized both methods.

Our paired sales analysis typically are expanded to look more like a sales comparison analysis you would find in an appraisal report, whereas the subject property is placed on the left column and a number of comparable sales are found in the columns to the right making adjustments for the variables that are different ending with an indicated value of the subject property if it did not have the variable you are testing for. Then the sales price of the subject property is compared to the indicated values of the sales comparables and any difference in value is attributed to the variable you are trying to extract – in this case the impact of a HVTL.

The second method we utilized is a simple linear regression analysis. In this analysis we typically complete an independent market trend analysis for the difference in time between the comparable sale date of transaction and the date of valuation (which typically is at a different date). This trend analysis compensates for the change in the market over this period of time to predict what the comparable sale would sell for as of the date of valuation. Once this is completed and all the sales are adjusted for the market trend then their $/acre values are plotted on a graph and a trend line is plotted to achieve the best fit of predictive value. This is done for both the HVTL encumbered sales and then for non-encumbered sales. On conclusion the trend lines are compared to see if there is a difference in predicted value. The difference between the trend lines is the measured impact of the variable, in this case HVTLs. In this method you are isolating one variable after the variable of time has been applied.

Q35. Do you use multiple regression analysis in your studies?

A. No.

Q36. Why not?

A. Multiple regression analysis is a statistical analysis that attempts to use observations (i.e. sales in this case) that have a number of variables which are different from each other, isolating the impact on value of each variable (except the variable being studied), then applying those adjustments to each sale arriving at a mean sale price. (This is similar to the above mentioned technique of paired sales analysis.) Statisticians desire at least 60 observations (sales) to make such a model work, or 15 observations per variable. Unfortunately, the real estate market tends not to have such a magnitude of sales all within a narrow period of time (years) and in the same competitive market (e.g. township). Hence,

such models compensate for this problem by either expanding the time period (which becomes problematic in the accuracy of the trend adjustment as you add more years to the equation) or the geographic market area (which also becomes problematic unless an accurate adjustment can be supported for a difference in locations.)

A simpler method utilizing the power of statistical analysis is the single regression technique. This method does not need the same volume of sales if the sales have high conformity (similarity) to each other. For instance, the Appraisal Institute's Quantitative Analysis Course and in their Real Estate Finance, Statistics and Valuation Modeling course, it is noted that an analysis with 30 observations can be sufficient and sometimes down to 15 observations can still result in a viable statistical study. Of course, the less "other" variables that in the mix the lower the number of observations are needed. This is more real world to the appraisal industry. Often you can find 15 or more sales of comparable properties within a narrow time period (to reduce trend analysis error) and within the competitive geographic market. Another factor is cost. To collect, confirm, and analyze large amounts of sales is expensive and typically beyond the budgets of a self-financed study or an individual property owner.

Q37. How many HVTL impact studies have you completed and in what states?

A. We (when I say "we" I mean my company under my direct supervision) have completed five studies, two in Wisconsin, one in Indiana and two in Kansas.

Q38. In brief, what were the studies and their conclusions?

A. A brief description of each study is found below.

Sales Analysis on the Impact of a 345kV HVTL line on Agricultural Property in Kansas (Kurt C. Kielisch, Forensic Appraisal Group, Ltd, 2014). The first study was in Sedgwick

County. This analysis compared thirteen agricultural land sales that were collected in five related townships from 2010 to 2013. These sales were compared to three HVTL encumbered property sales. Adjustments were made for market conditions, major soil differences, development potential, and dissimilarities between the sales. On conclusion the adjusted sales prices of the unencumbered land sales were compared to the adjusted values of the HVTL encumbered sales to extract a difference in value attributed to the presence of the HVTLs. The final analysis indicated a loss of value of approximately 23%. It should be noted that the HVTL sales all had a 345kV wood H-poles improvement within the easement. These same properties were later subjected to another 345kV line easement known as the Prairie Wind project. However, at the time of the sales the second easement was not in place. It was assumed that the buyers had knowledge of the coming easement had assumed just compensation would be given for the additional easement. The table below summarizes the findings:

SEDGWICH COUNTY ANALYSIS						
average acreage	99.1	acres for non-HVTL	108.7			
average	$ 4,110	per acre for non-HVTL	$ 3,104	per acre for HVTL	difference=	-24%
median	$ 4,095	per acre for non-HVTL	$ 3,117	per acre for HVTL	difference=	-24%

The second study was in Butler County. This analysis compared seven HVTL encumbered sales to twenty-two agricultural land sales. This analysis used a sales comparison method that selected comparable sales for seven of the HVTL sales and then adjusted for market conditions, major soils differences, development potential, and other differences to arrive at an adjusted land value. Then the adjusted land values were compared and a difference in value was extracted and stated as a percentage. The seven comparisons had a range of

loss from a low of 9% to a high of 44%. A preliminary summary of the study is found in the following table:

Butler County Land Sales Analysis		
Diagonal	-19%	
Bisection	-17%	
Fenceline	-34%	
monopole	-22%	on a diagonal
lattice	-34%	both on fenceline
H-poles	-20%	mixed locations
total ave	-24%	
total med	-25%	

Study of the Impact of a 345kV Electric Transmission Line in Clark County, Town of Hendren (Kurt C. Kielisch, Appraisal Group One, 2006, revised 2009). This study was limited to Hendren Township, Clark County, and covered a five-year time period from January 1st, 2002 to June 1st, 2006. This study included 22 land sales of agricultural and recreation land, of which 4 were encumbered with a 345kV electric transmission line having wood H-pole design, 60ft height and 150ft wide easement. The other 18 land sales were considered comparable to the power line encumbered sales. The conclusion of this study was that: (a) the land sales with an electric transmission line sold for 23% less than comparable land sales without a transmission line; and, (b) the more severe the location of the power line the greater was the loss of value.

An Impact Study of a 345kV Electric Transmission Line on Rural Property Value in Marathon County - Wisconsin (Kurt C. Kielisch, Appraisal Group One, 2006). This study focused on the impact a 345kV line, known as the Arrowhead-Weston line, had on property value. This power line was a 345kV electric transmission line, having steel single poles ranging in height from 110ft to 150ft, single and double circuit lines, having a 120ft wide

easement. The study compared sales within a 2 year time period (January 1st, 2004 to December 31st, 2005) in Marathon County, Wisconsin, focusing the area to the Townships of Cassel and Mosinee. This study used 14 land sales, of which 5 were encumbered with the power line and 9 were not. A simple regression technique and matched pair analysis was used to extract the value impact. The study concluded with a finding that when the power line traversed the property along the edge, such as a back fence line, the loss was as low as -15%, and when it bisected a large parcel the loss was as high as -34%. The properties were all raw land sales with either agricultural or residential land use.

An Impact Study of the Effect of High Voltage Power Lines on Rural Property Value in Southwestern Indiana (Kurt C. Kielisch, Appraisal Group One, 2010). This study was based in southwest Indiana in Gibson County. It was focused on large agricultural land and the impact of a high voltage transmission lines (HVTL) varying in size from monopole to large steel lattice towers. The study included 32 land sales of which 10 were HVTL sales. The time period was January 1st, 2006 to December 31st, 2009. Adjustments were made for time, location and other utility easements (if any) and the results were graphed to compare the non-HVTL land sales to the HVTL land sales. The study concluded that the power lines negatively impacted the property with an impact range from -5% to -36% with the average impact being -20%.

Q39. Have you completed any other type of analysis with regards to the impact of a HVTL on agricultural property value?

A. Yes, we have completed a number of appraisals in Minnesota regarding the 345kV CapX line which is running from Fargo, ND to St. Cloud, MN. In these analysis we were able to utilize the comparable sales technique to isolate the impact of the proposed 345kV line on

agricultural properties. In Sterns County we found land sales that were encumbered with a 400kV DC line, and in Clay County we found on 250kV DC line as comparable sales. After completing a sales comparison analysis we found the similar impacts that our studies in other states indicated, i.e. -10% to -20% loss of value.

In Michigan we came across a sale of 78.05 acres of agricultural land located on Fairgrove Road, Gilford Township, Tuscola County, Michigan, took place on April 17, 2013 for $490,000. The grantor was Alex Bondarenko Irrevocable Trust, and the grantee was Randall and Judy Humpert. The document was Trustee's Deed #1277/919. This parcel was level, had a crop CPI of 133 and had two barns used for storage. The property also had an ITC 345kV HVTL easement running diagonally through the property, running from the northeast corner to the southwest corner. The easement was 200ft wide. A sales analysis on this property indicated that the impact of the HVTL ranged from -16% to -18%. Mr. Humpert (buyer) confirmed the sale and stated that the presence of the HVTL negatively impacted the property value and its use. He also stated that he has had negative experiences with HVTLs. These findings were consistent with our other studies.

Q40. Are any of these studies published?

A. No they are not. They were not done with a purpose of publication. They were completed to assist our firm in the valuation of agricultural properties that will have a HVTL placed upon them through eminent domain proceedings.

Q41. Are you aware of any published studies that investigated the impact of HVTLs on agriculture land values?

A. Yes I am. The three most cited studies are: 138kV Transmission Lines and the Value of Recreational Land (Glenn J. Rigdon), Right-of-Way Magazine (December, 1991); High

Voltage Transmission Lines and Rural, Western Real Estate Values (James A. Chalmers, Ph.D.), Appraisal Journal (Winter, 2012); and Electric Transmission Lines: is there an impact on rural land values (Thomas Jackson, Ph.D.), Right-of-Way Magazine (November-December 2010).

The Rigdon study is not applicable to agricultural land since it was for recreational forested land and dealt with a 138kV.

The Chalmers study is not applicable since it deals with low grade pasture lands in Montana, used a mix of questionnaires and some sales data for the agricultural properties analysis and had most his "agricultural" properties dominated by recreation land use. Mr. Chalmers found no conclusive evidence that HVTLs had a measurable negative impact on these lands, but interestingly found sizable losses (up to 50%, typical range 20%-30%) when he examined the impact on rural residential land.

The Jackson study would appear on its face to be the only study applicable for agricultural property. However, an examination of this study has revealed many flaws including, but not limited to, a mix of highest and best use (including residential, rural residential, commercial, development land, forest land, recreational land and agricultural land), a mix of a wide array of geographical areas throughout the State of Wisconsin which are not comparable in either land structure, soils nor economics and the comparable sales were hand selected by an appraisal firm under contract with the American Transmission Corporation in a large litigation matter. Further investigation by this firm has found omission of viable comparable sales, omission of HVTL land sales and errors in adjustment of the variables. (Example: Jackson's study indicates there is no $/acre difference between lake front, river front, and trout stream properties, which the market indicates is an absurd

conclusion.) This appraiser has an intimate knowledge of this study having investigated the sales, adjustments, viewed a selection of the comparable sales and have testified to these findings in court proceedings when the study was relied upon by other appraisers or Mr. Jackson had given testimony. Consequently, I do not feel the Jackson study is legitimately represents the actions of a buyer of agricultural lands when encumbered with a HVTL.

Q42. The proposed Grain Belt line is a 600kV DC transmission line. Did any of your studies include a line similar to this?

A. No. The proposed line is unique in this market and we found no studies nor did our studies include a line of this size and magnitude. The closest we got to that was the 400kV DC line in Stearns County, Minnesota.

Q43. Nearly all the studies you mentioned, except for Stearns County, Minnesota, involved an AC transmission line. Do you think a DC line will have a different impact on property value than the AC transmission lines?

A. I do not believe the buying public perceives a difference (or knows the difference) between an AC and DC power line. I base this on my experience in Minnesota whereas the property owners did not express any knowledge that they knew the HVTL on their property was a DC line (400kV DC line in Stearns County and 250/230kV DC line in Clay County). My experience investigating and confirming sales of properties encumbered by HVTLs is that the property owner rarely knows the power rating (kV) of the line or whether it is AC or DC. However, they do observe if the line is big, tall, and has a large easement width, which I believe plays into the overall impact.

Q44. Does this conclude your testimony?

A. Yes it does.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the Application of Grain Belt Express Clean Line LLC for a Certificate of Convenience and Necessity Authorizing it to Construct, Own, Operate, Control, Manage, and Maintain a High Voltage, Direct Current Transmission Line and an Associated Converter Station Providing an interconnection on the Maywood-Montgomery 345 kV Transmission Line	)	Case No. EA-2014-0207

AFFIDAVIT OF KURT C. KIELISCH

STATE OF Wisconsin)

) ss

COUNTY OF Winnebago)

Kurt C. Kielisch, being first duly sworn on his oath, states:

1. My name is Kurt C. Kielisch. I am a forensic appraiser and the President of Forensic Appraisal Group. My address is 116 E. Bell Street, Neenah, Wisconsin 54956.

2. Attached hereto and made a part hereof for all purposes is my Rebuttal Testimony on behalf of Show Me Concerned Landowners, consisting of 27 pages, all of which have been prepared in written form for introduction into evidence in the above-referenced docket.

3. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and accurate to the best of my knowledge, information and belief.

Kurt C. Kielisch

Subscribed and sworn to before me this 15th day of September, 2014.

Notary Public

ANNITA J HOCK
NOTARY
PUBLIC
STATE OF WISCONSIN

My commission expires: June 10, 2018

KURT C. KIELISCH

Work Experience

As a practitioner, I entered the appraisal industry in 1984 employed by ValuPruf Valuation Service, Milwaukee, Wisconsin. Appraisal assignments through the years have included the following: single-family residential, multi-family residential, farms and ranches, commercial properties, special use properties, tax assessment, ocean-front properties, litigation support work, stigmatized properties, eminent domain, utility easements, valuation consulting, and impact studies. I have provided appraisal services for properties in Alaska & Colorado (desk appraisals), Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Mississippi, Missouri, Ohio, Pennsylvania, Virginia, Wisconsin, and Wyoming.

As a communicator, I have authored the book: *The Listing Appraisal Program* (ATI press, 1996) and three magazine articles: *Dead Body Appraisers* (The Appraisal Buzz, October 3, 2002), *Expert Testimony and Reports: Is Change Good?* (Working R.E. Magazine, February 2002), and *Rails to Trails Property Rights* (Right of Way Magazine, Nov/Dec 2012). I have been engaged in valuation related research projects including: *EMFs and Their Effect on Real Estate Values in the De Pere, Wisconsin, and Surrounding Areas* (1998); *An Impact Study of a 345kV Electric Transmission Line on Rural Property Value in Marathon County - Wisconsin* (2006); *Study of the Impact of a 345kV Electric Transmission Line in Clark County - Wisconsin* (2006); *Update Study of the Impact of a 345kV Electric Transmission Line in Clark County - Town of Hendren* (2006/2009); *Impact Study on the Effect of High Voltage Power Lines on Agricultural Property Value in Southwestern Indiana* (2010); *Wind Turbine Impact Study 2009* (2009, Wisconsin), *Pioneer Wind Park I & II Project – Property Value Impact Report* (2011, Wyoming), *Hermosa Wind Project – Fish Creek Impact Study* (2011, Wyoming); eighteen studies on the impact of natural gas transmission pipelines on property values; and smaller studies related to the impacts of property value due to highway proximity.

Related to the impact on property value of utility projects and wind farms, I have given testimony before the Wisconsin Senate Committee, Wisconsin Public Service Commission, Wisconsin Wind Farm Siting Council, Illinois Wind Farm Siting Council, and the Wyoming Industrial Committee.

As an expert witness, I have been an approved expert in Wisconsin Circuit Courts and the Federal Courts in Wisconsin and Ohio, and commissioner hearings in Minnesota. In the Wisconsin Supreme Court case of Spiegelberg vs. State of Wisconsin DOT (2004AP3384), I was the appraiser for Ms. Spiegelberg. This hearing resulted in a landmark decision relating to the proper valuation methodology when appraising property involved in eminent domain to obtain just compensation. In the Wisconsin Supreme Court decision of Waller vs. American Transmission Corporation, LLC (2012AP805 & 2012AP840) the high court made a landmark decision involving relocation rights and an uneconomic remnant. I was the expert witness for the Wallers.

As an educator, I taught appraisal pre-licensing and continuing education courses throughout a multi-state area from 1994 to 2000. During this time, I authored course curriculum for seven pre-licensing courses and twelve continuing education courses as well as the creation of a two-year professional appraiser training program. Since 2000, I have given several presentations for professional continuing education (IRWA - Badger Chapter, The American Law Institute CLE Annual Eminent Domain Conferences (2013, 2014), IRWA Annual Conference (2013) and for general information at public meetings.

Academics

M.A. Education. Regent University, Virginia Beach, Virginia. This degree concentrated on the adult learner and state-of-the-art communication technology to enhance learning. The focus was on the adult learner.

B.A. Business Administration (Economics Minor). Lakeland College, Sheboygan, Wisconsin.

B.A. Biology (Natural Sciences Minor). Silver Lake College, Manitowoc, Wisconsin.

Certifications/Designations/Organizations

Certified General Real Property Appraiser State of Kansas. License #G-2941 (Expires 6/30/2015).
Certified General Appraiser State of Michigan. License #1201073299 (Expires 7/31/2016).
Certified General Appraiser State of Minnesota. License #40285817 (Expires 8/31/2015).
Certified General Appraiser State of Virginia. License #016559 (Expires 3/31/2015).
Certified General Appraiser State of Wisconsin. License #1097-010 (Expires 12/31/2015).
Temporary Certified General Licenses. Illinois, Indiana, Iowa, Kansas, Mississippi, Missouri and Ohio.
Past Certified General Appraisal Licenses. North Dakota and Wyoming.
ASA-Urban Designated Member. American Society of Appraisers (ASA).
IFAS (Senior Member) Designated Member. National Association of Independent Fee Appraisers (NAIFA).
SR/WA (Senior Member) Designated Member. International Right-of-Way Association.
R/W-AC (Appraisal Certified Member) Designated Member. International Right-of-Way Association.
Review Appraiser. Department of Regulation and Licensing, State of Wisconsin (contract position).
Associate Member. Appraisal Institute (AI).
Member. Real Estate Educator's Association (REEA).
Approved Contract Appraiser. Wisconsin Department of Natural Resources (DNR).
REALTOR member. Realtors Association of Northeast Wisconsin and National Association of Realtors.
Approved R.E. Appraisal Instructor (past). Virginia, Maryland, Indiana, Illinois, Minnesota, and Wisconsin.
Assistant Editor. ASA-Real Property quarterly newsletter (2012-2014).
Chapter Treasurer. ASA Wisconsin Chapter.
Faculty. Eminent Domain and Land Valuation Litigation, The American Law Institute – CLE: Miami Beach, FL (January 2013) and New Orleans, LA (January 2014). Eminent Domain Impact of Political & Economic Forces, Eminent Domain Institute CLE International (September 2013), Cleveland, Ohio.
Seminar Instructor. International Right-of-Way Annual Conference (2013), Charleston, West Virginia (topic Valuation of Rails to Trails Corridors); International Right-of-Way Appraisal Day Seminar (May 13, 2014) Ohio IRWA Chapter 13 (topic Valuation of Utility Corridors).

Appraisal/Real Estate Courses (28 courses, 556hrs)

Fundamentals of Real Property Appraisal (40hrs). IAAO, University of Virginia, Charlottesville, VA.
Income Approach to Valuation (40hrs). IAAO. University of Virginia, Charlottesville, VA.
Real Estate Appraisal (45hrs). Alpha College of Real Estate [Instructor].
Uniform Standards of Professional Appraisal Practice (15hrs). Alpha College of Real Estate [Instructor].
Appraising the Small Income Residential Property (15hrs). Alpha College of Real Estate [Instructor].
Advanced Income Appraisal I (30hrs). Alpha College of Real Estate [Instructor].
Advanced Income Appraisal II (30hrs). Alpha College of Real Estate [Instructor].
Residential Construction, Design & Systems (20hrs). Appraisal Training Institute [Instructor].
Residential Cost Approach & Depreciation Methods (20hrs). Appraisal Training Institute [Instructor].
Residential Market Approach & Extraction Methods (20hrs). Appraisal Training Institute [Instructor].
Computer Applications in Appraisal Report Writing (15hrs). Appraisal Training Institute [Instructor].
Completing the URAR in Compliance with FNMA Guidelines (15hrs). Appraisal Training Institute [Instructor].
The Residential Appraisal Process (20hrs). Appraisal Training Institute [Instructor].
Residential Appraisal Practicum (40hrs). Appraisal Training Institute [Instructor].
Pipeline ROW Agent's Development Program: Course 215 (16hrs). International Right-of-Way Association.

Eminent Domain Law Basics for Right-of-Way Professionals: Course 803 (16hrs). International Right-of-Way.
Financial Analysis of Income Properties (16hrs). National Association of Independent Fee Appraisers (NAIFA).
Appraisal of Partial Acquisition: Course 401 (40hrs). International Right-of-Way Association.
National Uniform Standards of Professional Appraisal Practice (USPAP): Course 2005 (15hrs). NAIFA.
Easement Valuation: Course 403 (8hrs). International Right-of-Way Association.
Principles of Real Estate Negotiation: Course 200 (16hrs). International Right-of-Way Association.
Bargaining Negotiations: Course 205 (16hrs). International Right-of-Way Association.
Principles of Real Estate Appraisal: Course 400 (exam). International Right-of-Way Association.
Principles of Real Estate Law: Course 800 (exam). International Right-of-Way Association.
Principles of Real Estate Engineering: Course 900 (exam). International Right-of-Way Association.
SR/WA Comprehensive Exam: International Right-of-Way Association.
Course 420: Business Practices & Ethics (8hrs). Appraisal Institute.
United States Land Titles (16hrs). International Right-of-Way Association.
Quantitative Analysis (40hrs). Appraisal Institute.

Appraisal/Real Estate Seminars (40 courses, 214.9hrs)

Real Estate Taxation (7hrs). University of Wisconsin: Continuing Education Division.
Review Appraising as the Supervising Appraiser (3hrs). Appraisal Training Institute [Instructor].
Legal Ramifications of Environmental Laws (3hrs). International Association of Assessing Officers (IAAO).
Virginia State Mandatory Continuing Education (4hrs). Appraisal Training Institute [Instructor].
Appraising the Small Income Property (8hrs). Appraisal Training Institute [Instructor].
Listing Appraisals (7hrs). Appraisal Training Institute [Instructor].
Marshall & Swift Residential Cost Approach: Sq. Ft. Method, (7hrs). Western Illinois University [Instructor].
Marshall & Swift Residential Cost Approach: Segregated Method, (7hrs). Western Illinois University [instars].
Residential Construction, Design and Systems (7hrs). Appraisal Training Institute [Instructor].
EMF and its Impact on Real Estate (4hrs). Appraisal Training Institute [Instructor].
Easements and Their Effect on Real Estate Value (7hrs). Appraisal Training Institute [Instructor].
Exploratory Data Analysis: A Practical Guide for Appraisers (3hrs). Appraisal Institute.
Residential Statistical Modeling (3hrs). Appraisal Institute.
Valuation Modeling: A Case Study (3hrs). Appraisal Institute.
Real Estate Valuation Cycles (3hrs). Appraisal Institute.
Subdivision Analysis (3hrs). Appraisal Institute.
Appraisal of Nursing Facilities (7hrs). Appraisal Institute.
National Standards of Professional Appraisal Practice: Course 400 (7hrs). Appraisal Institute.
Land Valuation Adjustment Procedures (7hrs). Appraisal Institute.
Valuation of Detrimental Conditions in Real Estate (7hrs). Appraisal Institute.
Appraising Conservation Easements (7hrs). Gathering Waters Conservancy.
ROW Acquisition in an Environment of Power Demand Growth & Legislative Mandates (12hrs). IRWA - Minnesota.
Analyzing Distressed Real Estate (4hrs). Appraisal Institute.
7 Hour National USPAP Course for 2008-2009 (7hrs). International Right-of-Way Association.
6th Annual Condemnation Appraisal Symposium (6hrs). Appraisal Institute.
Contemporary Issues in Condemnation Appraisal (4hrs). Appraisal Institute.
7-Hour National USPAP course for 2010 (7hrs). International Right-of-Way Association.
Real Estate Finance Statistics and Valuation Modeling (14hrs). Appraisal Institute.
Michigan Law Update (2hrs): McKissock.
Local Public Agency Real Estate Seminar 2010 (6hrs). Wisconsin Department of Transportation.
8th Annual Condemnation Appraisal Symposium (6hrs). Appraisal Institute.
Golf & Hotel Valuation (3.4hrs). International Right-of-Way Association.
7-Hour National USPAP course for 2012 (7hrs). International Right-of-Way Association.
Statistics, Modeling, and Finance (14hrs). McKissock.

Eminent Domain Issues in the Pipeline Industry: IRWA 2013 Conference (1.5hrs).
Pipelines: Abandoned vs. Idle/Consequences of Not Maintaining Your Easements or ROW. IRWA 2013 Conference (1.5hrs).
The Right of Reversion, "Who's on First." IRWA 2013 Conference (1.5hrs).
Ad Valorem Tax Consultation (2hrs). McKissock.
Appraisal Applications of Regression Analysis (7hrs). McKissock.
Valuation of Avigation Easements (3hrs). ASA Wisconsin Chapter (Instructor)
11th Annual Condemnation Symposium. Appraisal Institute – Wisconsin Chapter. (6hrs)

EXPLANATION OF DESIGNATIONS

ASA-Urban Real Property: The ASA designation is the senior designation granted by the American Society of Appraisers, which is the only multi-discipline international appraisal association in America. The ASA-Urban designation requires the passing of five advanced level commercial appraisal courses, the passing of a comprehensive exam, a passing grade on a demonstration narrative report, 5 years full-time appraisal experience, a Certified General appraisal license and the recommendation of the local and national membership committee. All ASA designated members must adhere to the Code of Ethics of the Association and keep up-to-date with continuing education (Source- www.appraisers.org).

IFAS: For this senior level designation from the International Fee Appraisal Association the appraiser must meet the requirements for the Member [IFA], successfully pass the Senior Member Examination, score a passing grade on a narrative demonstration report on an income-producing property conforming to prescribed guidelines and meet educational and experience requirements as outlined by the Association. In addition, the designation requires a minimum of 4 years appraisal experience in commercial type properties, a State Certified General Appraisal license, successful completion of over 200-hours of appraisal course work, completion of the current USPAP course, a college degree and the recommendation of the appraiser's peers and local chapter (Source: www.naifa.com). All IFAS members must adhere to the Code of Ethics of the Association and keep up-to-date with continuing education.

Senior Right of Way (SR/WA): This is the most prestigious professional designation granted by the International Right-of-Way Association to members who have achieved professional status through experience, education, and examination. The SR/WA designation requires training and examination in seven major right-of-way disciplines. The SR/WA designation says, "I have more than five years of right-of-way experience, plus I have had formal training in a wide variety of right-of-way areas." The SR/WA professional may be a specialist in one area such as appraisal, engineering, or law, but also must be familiar with the other seven disciplines associated with the right-of-way profession. Additional requirements for the SR/WA designation include: a bachelor degree, 5 years right-of-way experience, successful completion of four core courses and four elective courses, passing the all-day comprehensive exam and recommendation from the designee's peers and local chapter. The SR/WA designation is the only designation reflecting evidence of professional attainment in the right-of-way field (Source-www.irwaonline.org). All SR/WA members must adhere to the Code of Ethics of the Association and keep up-to-date with continuing education.

Right of Way Appraisal Certified (R/W-AC): The Right of Way (R/W) Certification is an esteemed professional designation granted to members who have achieved professional status through experience, education, and examination in a specific discipline. Earning this certification demonstrates an unparalleled achievement in a single discipline and reinforces a standard of excellence in services provided to the public (Source: www.irwaonline.org). All R/W-AC members must adhere to the Code of Ethics of the Association and keep up-to-date with continuing education.

Literature Study to the Impact of HVTLs on Property Value

Before a discussion can be entered about the perception of electric transmission lines and their effect on property value, it is important to understand what a transmission line is and how it differs from a distribution line.

An electric *transmission* line is an electric line that transports electrical power from one substation to another. These lines are typically 100kV (kilovolts) or larger, exceeding one mile in length, have large wood or steel support towers over 65ft in height, and often have more than one set of wires (3 wires per circuit plus the static wire). The graphic below shows the different types of transmission line support structures and their typical kilovolts.

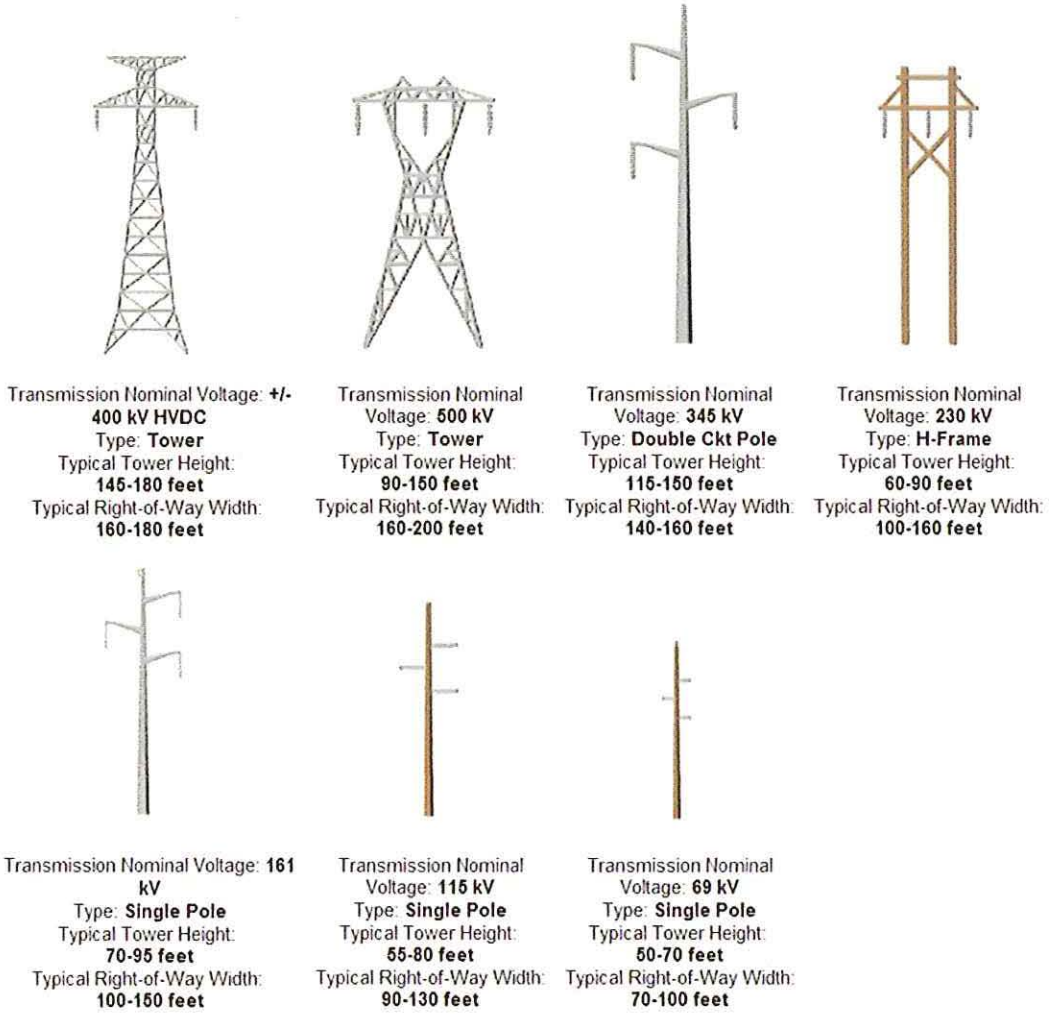

Figure 1: from Minnesota Electric Transmission Planning. www.Minnelectrans.com.

Electric transmission lines do not directly serve electric utility customers: their power is moved from power source to a substation. Transmission line wires are not insulated and are "bare." Typically, they are constructed to have at least 20ft of clearance between the ground elevation and wire at low sag.

The following graphic demonstrates the relationship between transmission and distribution lines.

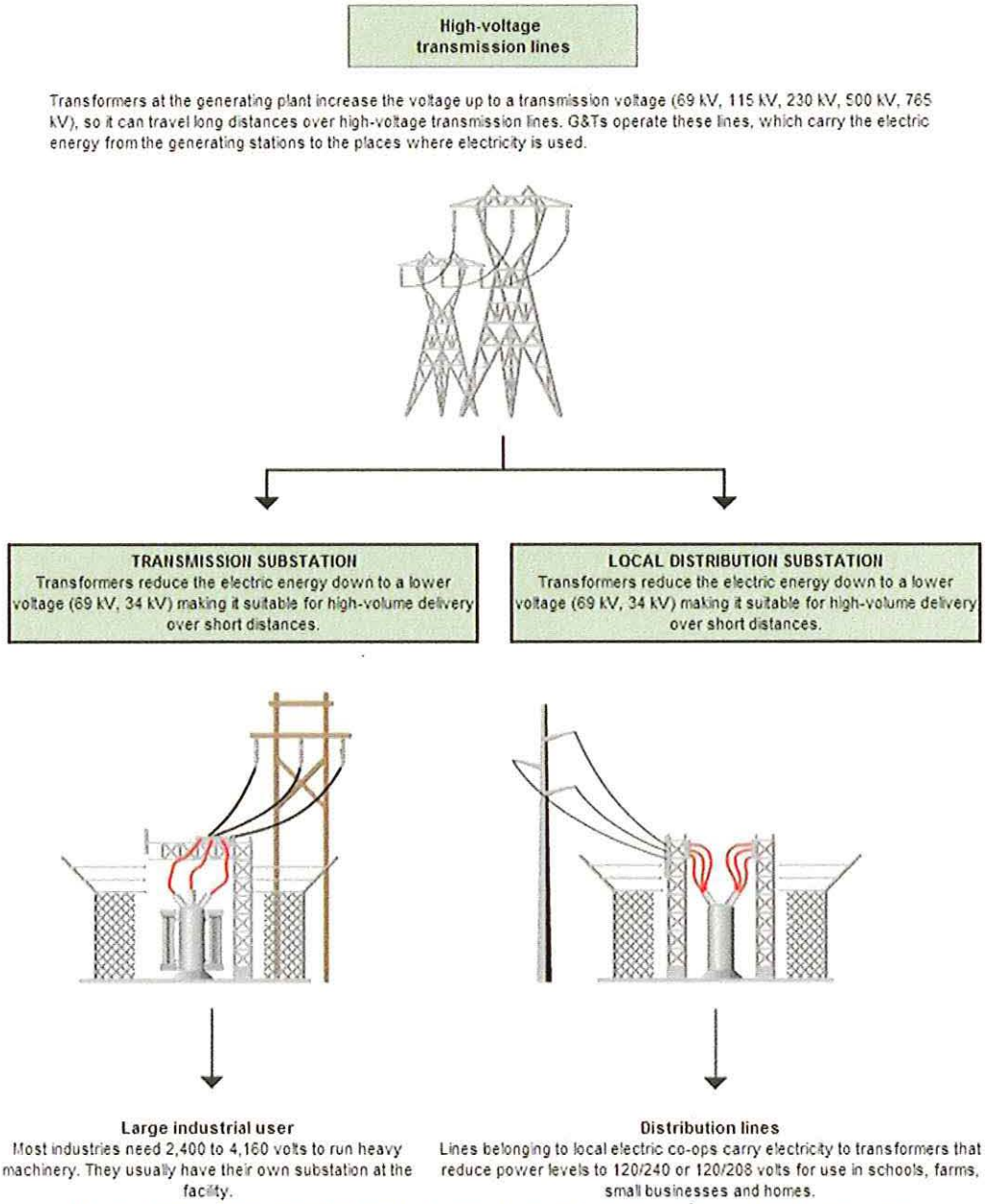

Figure 2: from Minnesota Electric Transmission Planning. www.Minnelectrans.com.

An electric *distribution* line is an electric line that transports electricity from the substation to the electric utility customers. These lines are of less voltage, typically under 65kV, carried on wood poles of 45ft in height or less, and hold one pair of wires. The voltages of these lines are downgraded before the electricity is brought to the customer's residence or commercial building.

The focus of this study is on transmission lines, not distribution lines.

Perception = Value

The valuation of properties that have an electric transmission line requires an understanding of the basic principles of Market Value. Market Value is defined, in layman's terms, as the value a property would sell for at a given date considering an open market. (A complete definition of this term is included in the body of the appraisal report.) An open market assumes that the property is available for purchase by the public, being properly marketed for maximum exposure, and that the buyer is well informed, fully knowledgeable and acting in their best interest. Included in this definition is that the buyer has full knowledge of the pros and cons of the property, and then acts with that knowledge in a way that will benefit them. In other words, the value of the property is based on the perception of the buyer. Understanding that perception drives value is the foundation in analyzing the effect that electric transmission lines have on property value.

The key point of the Market Value definition, which gives guidance to answer the impact question, is the willing buyer part of the equation. In appraising a property, the appraiser attempts to reflect the potential buyer of the subject property and estimate their action as to the subject property with all its advantages and disadvantages (knowledgeable buyer). To accurately reflect this buyer, the appraiser must determine the typical profile of such a buyer of the property in question. An example of this would be a one-bedroom condominium on the lake; it may indicate a typical buyer to be a retired couple who is looking for a recreational retreat for themselves and their guests. Another example would be a parcel with the best use being a dairy farm; the typical buyer would be a person either currently engaged in dairy farming looking to expand or relocate, or one who desires to enter into this field – in either case a dairy farmer. Such an analysis should be obvious, yet it is often overlooked when appraising properties.

For rural properties that are utilized for agricultural purposes, the most likely buyer would be one who: (1) prefers the rural lifestyle over the urban lifestyle; (2) typically generates their income from working in the agricultural field; (3) would be sensitive to environmental issues that affect the uses of the land and the view shed of the land; and (4) would be sensitive to health and safety issues relating to the land and its use.

It is most likely that such a person, when confronted with an electric transmission line traversing the property, would view such an improvement as aesthetically ugly, potentially hazardous to their health, disruptive to rural lifestyle and potentially harmful to the use of the land for agricultural purposes.

Research Format

Our literature study into the impact of electric transmission lines involved investigating, collecting, indexing and reading many of the published articles, news stories and published transcripts relating to the topics of EMFs and stray voltage. Stray voltage was included in this research due to the concern dairy farmers have relating to its presence from high voltage power lines. This research yielded over a thousand pages of information that was collected and analyzed. The purpose of this study was to discover "what is the public's perception of high voltage transmission lines." This study broke down the issues into major headings as will follow.

HVTL Impacts on Rural and Agricultural Properties

Throughout the nation's rural communities, literature research suggests that the presence of an HVTL easement can have a noticeable impact on both the use and appeal of rural properties and farms. Common concerns include stray voltage, health risks to livestock and cattle, diminished livelihoods and heritage, limited land use, and lessened aesthetic appeal. As the following literature survey will show, many different issues play a role in shaping one's perception of the impact of HVTLs on rural property values.

Stray Voltage

To understand the potential impact of HVTLs on rural land, it's important to discuss a key component in many farmers' apprehension about HVTLs: stray voltage.

Stray voltage is the rural equivalent of the high-profile residential Electromagnetic Field (EMF) factor, but instead of fearing leukemia or brain cancer, farmers fear their animals will become unproductive, ill, and even die.

Whenever energy is transferred, some is lost along the way. If metal buildings are near leaking energy, they can act as a conduit for voltage to find its way to feeding systems, milking systems and stalls.

In their 1995 presentation, "Stray Voltage: The Wisconsin Experience," a team of researchers led by Mark Cook and Daniel Dascho stated that farmers most worry that stray voltage will increase somatic cell count in their animals, make cows nervous, reduce milk production, and increase clinical mastitis.[1]

"Few issues are more upsetting to dairymen than fighting case after case of clinical mastitis with more and more cows in the sick pen," writes Dr. Winston Ingalls. "It represents extra time to properly handle such cows, lost production, vet calls, treatment products, concern about contaminated milk and an occasional dead or culled cow."[2]

In Cook & Dascho's presentation, they discuss their findings from a non-random sampling study of farms with stray voltage complaints stemming from a nearby substation. Their research team found no significant relationship between cow contact current and distance from the substation or contact currents. However, they also noted that cow contact current depends on many physical factors from on-farm and off-farm electrical power systems. They say, "There are many confounding factors that may outweigh the impacts of stray voltage which makes it difficult to draw conclusions from field studies about its effects on production and animal health."[3]

In a 2003 study prepared for the NRAES Stray Voltage and Dairy Farms Conference, a research team conducted by the University of Wisconsin-Madison, and led by Dr. Douglas J Reinemann, studied the

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1 Stray Voltage: The Wisconsin Experience. Written for presentation at the 1995 International Meeting by Mark A Cook, Daniel M Dascho, Richard Reines and Dr. Douglas J Reinemann.
2 Clinical Mastitis. Winston Ingalls, Ph.D. GoatConnection.com. August 2, 2003. http://goatconnection.com/articles/publish/article_173.shtml
3 Stray Voltage: The Wisconsin Experience. Written for presentation at the 1995 International Meeting by Mark A Cook, Daniel M Dascho, Richard Reines and Dr. Douglas J Reinemann.

effects of stray voltage on cows at four dairy farms over a two-week time period. He and his team found that after the first few days of exposure, cows quickly acclimated to the presence of stray voltage. They also found that stray voltage of 1mA had little effect on the immune system of a cow.[4]

Concerning EMF levels, they noted that "even though man-made signals were larger than the naturally occurring currents, levels are significantly lower than what is considered sufficient earth current strength to develop step potential anywhere near the Public Service Commission 'level of concern.'"[5]

Stray voltage is usually undetectable by humans, and some researchers believe it occurs when electricity escapes a power line or wiring system and emits a secondary current. The problem intensifies with older barns that add automated electrical equipment, "raising ambient levels of current. Soon the cumulative effect of these secondary currents becomes harmful to cows." Though stray voltage can be measured, experts don't know how and why it happens or what conclusive effect (if any) it has on animals.[6]

Despite little concrete evidence, courts have compensated farmers for their losses due to stray voltage when all other factors are eliminated. In 1999, a jury awarded Peterson Bros. Dairy $700,000 after deciding that stray voltage from an automated feeding system from Maddalena's Dairy Equipment of Petaluma, California slashed the herd's milk output and increased the cow's death rate.[7]

The company's defense attorney called stray voltage "junk science," the Petersons' claim of stray voltage in the milk barn a "harebrained theory" unsupported by electrical engineers, and blamed the herd's health problems on the Petersons' own mismanagement.[8]

In a similar case in Wisconsin in 2004, a dairy operation owned by George and Kathy Muth successfully sued Wisconsin Electric Power Co. (now We Energies) for negligence in the maintenance and operation of a distribution system on their farm. They claimed that the system led to stray voltage that injured and killed several of their dairy cows and damaged their milk production. The utility said that the levels of stray voltage were "extremely low" and were levels you could find anywhere.[9]

The farmers said that shortly after moving to their new location, they faced low milk production, excessive illnesses, and deaths of cows.[10] The cows didn't walk right or act normal. They didn't want to go into the barn, inside, or into the stalls. The Muths examined everything from the animals' food to

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4 Dairy Cow Response to the Electrical Environment: A Summary of Research conducted at the University of Wisconsin-Madison. Paper presented at the NRAES Stray Voltage and Dairy Farms Conference. Dr. Douglas J. Reinemann. April 2003.

5 Results of the University of Wisconsin Stray Voltage Earth-Current Measurement Experiment. A revised version of a report submitted to the State of Wisconsin Legislature on June 25, 2003. Written by David L Alumbaugh and Dr. Louise Pellerin.

6 Jury gives $700,000 to dairy farmers for losses blamed on "stray voltage." Author Unknown. The Associated Press. April 21, 1999.

7 Ibid.

8 Ibid.

9 Power company negligent in dairy suit; Jury awards $850,000 to couple over effect of stray voltage on cows. Lauria Lynch-German. Milwaukee Journal Sentinel. February 27, 2004.

10 Jury must decide in voltage complaint; Farm family says stray power harmed dairy herd. Lauria Lynch-German. Milwaukee Journal Sentinel. February 5, 2004.

their bedding until consultants told them it could be stray voltage. In one year, they lost 15-18 cows and calves. Autopsies were inconclusive.[11]

After reviewing herd management and nutrition, they hired a consultant who detected stray voltage. Later that year the utility found no stray voltage problems. The farmers further consulted with veterinarians and tested and ruled out all the other factors except for stray voltage.[12]

The farmers hired an electrician to upgrade the farm's wiring, but it didn't decrease the stray voltage. After being asked, the utility made some other changes, but this also had no effect. Further consultants still found stray voltage from a conductor on the utility's distribution lines. A couple years later the utility removed a piece of underground electrical equipment and the herd immediately recovered...though the level of stray voltage remained the same.[13]

The utility's attorney stated that being able to measure something doesn't make it harmful. He cited several federal and state studies that say the current must be 2 milliamps or higher to adversely affect cattle and said no reading on their farm reached that level.[14]

The jury awarded the dairy farm $850,000 in damages.[15]

Stray voltage fears aren't limited to dairy or cattle operations. Max Hempt, a horse farm owner in Pennsylvania, tried to oppose a proposed 9-mile 138kV HVTL because he feared that the line's EMFs caused by stray voltage could cause sterility and death among his horses.[16]

Though it's difficult to prove a significant presence of stray voltage, and even more difficult to prove a direct correlation between stray voltage and poor health, courts have awarded farmers sizable judgments to compensate them for damaging stray voltage from nearby power lines.

In 2002, one such case in Iowa made it to the state supreme court where the court upheld a $700,000 judgment to a dairy farmer who argued that stray voltage from nearby power lines injured his herd. A substation sits less than a quarter mile from his farm. He said he often got electric shocks from the metal buildings on the farm. Also, he said his herd acted oddly, appearing frightened and refusing to enter barns. Milk production also suffered.[17]

The defendant, Interstate Power Co., said that "there's an inherent risk to transmitting electricity" and it shouldn't be vulnerable to such lawsuits unless they were negligent. The court ruled in favor of the dairy farmer, citing the lack of a statute exempting electric utilities from nuisance claims.[18]

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11 Dairy farm owner testifies that stray voltage killed cows in his herd. Lauria Lynch-German. Milwaukee Journal Sentinel. February 10, 2004.
12 Jury must decide in voltage complaint; Farm family says stray power harmed dairy herd. Lauria Lynch-German. Milwaukee Journal Sentinel. February 5, 2004.
13 Ibid.
14 Ibid.
15 Power company negligent in dairy suit; Jury awards $850,000 to couple over effect of stray voltage on cows. Lauria Lynch-German. Milwaukee Journal Sentinel. February 27, 2004.
16 Farmer Fears Stray Voltage From PP&L 138 kV Line Could Harm His Horses. Author Unknown. Northeast Power Report. June 24, 1994.
17 Court upholds stray voltage judgment. Mike Glover. The Associated Press. October 10, 2002.
18 Ibid.

One year later, the Wisconsin Supreme Court similarly found "that a utility can be held responsible for harming the health of a dairy herd with stray voltage even though state-recommended voltage tests did not find potentially damaging levels where the animals congregated."[19]

As the preceding case studies show, courts have acknowledged stray voltage and its possible effects. However, to fully understand the apprehension surrounding power lines, one must examine the EMF debate and its fear factor.

EMFs and Fear

In 1990, the EMF debate was so prevalent that members of Congress passed a bill that would limit the public's exposure to EMFs.[20] A couple years later, in response to public concern about EMFs, Congress established the EMF-RAPID program in 1992 to be managed by the National Institute of Environmental Health Sciences (NIEHS). RAPID is an acronym for Research and Public Information Dissemination. Its purpose was to coordinate and execute a limited research program to fill information gaps concerning the potential health effects of exposure to EMFs, to achieve credibility with the public that previous research has not earned, and to coordinate and unify federal agencies' public messages about possible EMF effects.[21] The program originally was to receive $65 million in funding,[22] but the final budget was $45 million.[23]

Several years later in 1999, the National NIEHS studied the health effects of EMF exposure and found conflicting results. Though they concluded that the evidence is weak linking EMFs to health risks, they also found that the most common health risk was leukemia (mostly appearing in children). They also found a fairly consistent pattern of a small, increased risk of childhood leukemia with increasing exposure. The majority of the panel's voting members voted to acknowledge EMFs as a possible human carcinogen. They concluded that ELF-EMF exposure cannot be recognized as entirely safe because of weak scientific evidence.[24]

In 2005, UK scientists conducted a case-control study on childhood cancer in relation to distance from high voltage power lines in England and Wales. They found an association between childhood leukemia and proximity of home address at birth to HVTLs. "The apparent risk extends to a greater distance than would have been expected from previous studies," although they have yet to discover an "accepted biological mechanism" to explain their results.[25]

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19 Utility liable for stray voltage, high court says. Don Behm. Milwaukee Journal-Sentinel. June 26, 2003.
20 Electric Powerlines: Health and Public Policy Implications – Oversight Hearing before the Subcommittee on General Oversight and Investigations of the Committee on Interior and Insular Affairs House of Representatives, 101st Congress, second session on electric powerlines: health and public policy implications. March 8, 1990.
21 Electric and Magnetic Fields Research Program by Mr. Mukowski from the Committee on Energy and Natural Resources. 105th Congress, first session. June 12, 1997.
22 Ibid.
23 The Federal EMF RAPID Program. http://www.sdge.com/safety/california-federal-international-research-programs/federal-emf-rapid-program.
24 NIEHS Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields. Released by the National Institute of Environmental Health Sciences on May 4, 1999.
25 Childhood cancer in relation to distance from high voltage power lines in England and Wales: a case-control study. Gerald Draper, Tim Vincent, Mary E Kroll, John Swanson. British Medical Journal (bmj.com). June 3, 2005.

Though an accepted biological mechanism remains elusive, an early nineties case made it possible to link loss of property value to a fear of EMFs. In the 1993 case, *Criscuola v. Power Authority of the State of New York*, the court found that, "there should be no requirement that the claimant must establish the reasonableness of a fear or perception of danger or of health risks from exposure to high voltage power lines" and "Whether the danger is a scientifically genuine or verifiable fact should be irrelevant to the central issue of its market value impact."[26]

Utilities say that landowners should not be able to recover damages or injunctive relief "based on myth, superstition or fear about an alleged health risk that is not supported by substantial scientific or medical evidence."[27]

With the EMF debate unresolved, and evidence for both sides of the argument, some communities are reluctant to approve new HVTLs...and may even legally oppose them.

In an effort to preempt public opposition, Public Service Enterprise Group offered hundreds of thousands of dollars to New Jersey towns opposing its proposed HVTL project if the towns dropped all opposition and didn't comment on the payments. Opponents called them "bribes." The utility called them "settlements" to help minimize impacts of the project on towns and residents.[28]

Some towns accepted payment, but the majority did not. Either they said they didn't have enough time to respond to the offer, or they rejected them as payoffs. One of the opposing mayors, Mayor James Sandham of Montville, said it's not about the money; "It's about safety and property values."[29]

HVTLs and Property Values

Fear can impact the public's buying habits. Residential homeowners' resistance to abutting HVTLs is well documented. Though homeowners may fear negative effects on their community and environment,[30] their first point of opposition is usually safety, especially if there are many children in the neighborhood. Though the 1979 Wertheimer study linking EMFs to childhood leukemia has long been contested, supported, and contested again, the very existence of a debate about the safety of EMFs sows enough doubt in residents' minds to justify the fear.[31] And that fear can influence the values of nearby homes.[32] [33] [34] [35]

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26 'Criscuola' – The Sparks Are Still Flying. Michael Rikon. New York Law Journal. April 24, 1996.
27 High Court Hears Arguments Today on EMF Claims. Todd Woody. The Recorder. June 6, 1996.
28 Opponents of $750M N.J. power line project argue towns were paid to drop opposition. Lawrence Ragonese. The Star-Ledger. January 31, 2010.
29 Ibid.
30 NY Power Line Opponents Win Court Fight. Associated Press. New York Post. February 20, 2009.
31 Lines in Sand and Sky. B.Z. Khasru. Fairfield County Business Journal. September 3, 2001. Vol. 40 Issue 36, p3, 2p.
32 Power line plan concerns metro residents. Melissa Maynarich. News 9 (Oklahoma). July 22, 2008.
33 Power Line Worries Landowners. Ben Fischer. The Wisconsin State Journal. June 3, 2006.
34 Lines in Sand and Sky. B.Z. Khasru. Fairfield County Business Journal. September 3, 2001. Vol. 40 Issue 36, p3, 2p.
35 Commissioners voice opposition to transmission lines. David Rupkalvis. The Graham Leader. February 9, 2010.

When given the choice to purchase two identical homes, one with such health concerns and the other without, most buyers will choose the home without the concern,[36] forcing the homeowner to lower their price. Aesthetic impact can also influence a property's value. Many residents don't want to look at HVTLs,[37] something they consider to be an "eyesore."[38]

One of the hardest properties to sell can be one encumbered by an HVTL. Unlike roadway proximity, its effect isn't readily noticeable or measurable. Though homes near HVTLs typically have larger lots (and that can be a benefit), the biggest disadvantage is the fear factor surrounding EMFs.[39]

In the early nineties, when EMFs were just entering the public consciousness, it was difficult to find a measurable price difference between homes close to an HVTL and those that were not.[40] However, two researchers (Hsiang-te Kung & Charles F Seagle) conducted a case study on the impact of power transmission lines on property values and found that such negligible results depended almost entirely on the public's ignorance of EMFs and their related issues. They also found that the amount of potential property loss increased dramatically the more homeowners were aware of the potential health impacts of EMFs.[41]

The effect of HVTLs on property values has long been a matter of contention with many studies either proving a diminutive effect or none at all. Methodologies differ and different areas of the country register different results. Some markets (ex. high-end homes) are very sensitive to HVTLs whereas others (ex. low-end homes) hardly notice them. The size of the line and the pylons are also a factor. A 69kV power line will have less effect than will a 1,200kV power line. Distance from the easement also matters. Some studies combine homes thousands of feet from HVTLs with those directly encumbered. Research sponsors also may play a factor with many being funded by the utilities themselves.

For example, in a 2007 study funded by a utility, researchers Jennifer Pitts and Thomas Jackson conducted market interviews, literature research and empirical research and reported little (if any) impact of power lines on property values. However, they did note that there is an increasing recent opinion that proximity to power lines has a slight negative effect on property values.[42]

Two California appraisers, David Harding and Arthur Gimmy, published a rebuttal to the Pitts-Jackson study that disagreed with their methodology, took issue with their sponsor, addressed omitted information and failure to conduct before-and-after cost comparisons.[43]

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36 Real Estate Agents on Property Value Declines. 4 Realtor opinion letters submitted to residents in the Sunfish, MN area whose properties are being affected by an HVTL.
37 Ibid.
38 Power line plan concerns metro residents. Melissa Maynarich. News 9 (Oklahoma). July 22, 2008.
39 High Voltage Transmission Lines, Electric and Magnetic Fields (EMF's) And How They Affect Real Estate Prices. David Blockhus. January 3rd, 2008. http://siliconvalleyrealestateinfo.com/electric-and-magnetic-fields-emfs-and-how-they-effect-real-estate-prices.html
40 Impact of power transmission lines on property values: A case study. Hsiang-te Kung & Charles F Seagle. Appraisal Journal. Vol. 60, Issue 3, p.413, 6p. July 1992.
41 Ibid.
42 Power lines and property values revisited. Jennifer M. Pitts & Thomas O. Jackson. Appraisal Journal. Fall, 2007.
43 Comments on "Property Lines and Property Values Revisited." (Letter to the editor) David M. Harding & Arthur E. Gimmy & Thomas O. Jackson & Jennifer M. Pitts. Appraisal Journal. Winter, 2008. http://www.entrepreneur.com/tradejournals/article/176131510.html

Pitts and Jackson responded to the rebuttal and defended their methodology, saying they purposely limited their literature research to only include empirical, peer-reviewed articles from The Appraisal Journal and the American Real Estate Society journals. They acknowledged they conducted the research for "a litigation matter" but did not elaborate on their sponsor.[44]

In a similar case, researchers James A Chalmers and Frank A Voorvaart published a large study spanning nearly 10 years and over 1,200 properties in which they found that an encumbering HVTL had only a small negative effect on the sale price of a residential home. In half of their samples they found consistent negative property values mostly limited to less than 10%, with most between 3%-6%.[45]

They summarized their findings as showing "no evidence of systematic effects of either proximity or visibility of 345kV (kilovolt) transmission lines on residential real estate values."[46]

They did, however, say that, "An opinion supporting HVTLs effects would have to be based on market data particular to the situation in question and could not be presumed or based on casual, anecdotal observation. It is fair to presume that the direction of the effect would in most circumstances be negative, but the existence of a measureable effect and the magnitude of such an effect can only be determined by empirical analysis of actual market transactions."[47]

Appraiser Kerry M. Jorgensen disagreed with the authors' views that paired data analysis and retroactive appraisal were "too unrefined and too subjective to be of much value," and that only through objective statistics could the effect of HVTLs on property value be truly understood. He argued that relying too much on statistics can be dangerous as there could be problems with how the data is compiled and interpreted. For example, he points out that out of their set of 1,286 qualifying sales, only 78 (6%) are directly encumbered by a power line easement, and only 33 (2.6%) more are within 246 feet of a power line easement.[48]

The Chalmers-Voorvaart study also attracted the interest of Washington Post Real Estate writer Elizabeth Razzi who wrote that the study was paid for by Northeast Utilities and completed before they proposed a high-voltage transmission grid in New England. She also wrote that both Chalmers and Voorvaart are appraisers and expert witnesses for the power industry.[49]

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44 Ibid.

45 High-Voltage Transmission Lines: Proximity, Visibility, and Encumbrance Effects. James A Chalmers and Frank A Voorvaart. The Appraisal Journal via the Appraisal Institute website. Volume 77, Issue 3; Summer, 2009; pages 227-246. Reposted by CostBenefit of the Environmental Valuation and Cost-Benefit News blog - http://www.envirovaluation.org/index.php/2009/11/09/high-voltage-transmission-lines-proximity-visibility-and-encumbrance-effects

46 Power Lines Don't Affect Property Values. The Appraisal Journal. July 30, 2009. http://www.appraisalinstitute.org/about/news/2009/073009_TAJ.aspx

47 High-Voltage Transmission Lines: Proximity, Visibility, and Encumbrance Effects. James A. Chalmers, PhD and Frank A. Voorvaart, PhD. The Appraisal Journal. Summer 2009. Pgs. 227-245.

48 Letters to the Editor. Kerry M. Jorgensen. Appraisal Journal. January 1, 2010. http://www.thefreelibrary.com/Comments+on+"high-voltage+transmission+lines:+proximity,+visibility,...-a0220765052

49 Do High-Voltage Lines Zap Property Values? Elizabeth Rassi. Local Address. August 4, 2009. http://voices.washingtonpost.com/local-address/2009/08/do_high-voltage_lines_zap_prop.html

Several studies have found that, over time, property value damages from nearby HVTLs diminish though properties near the pylons stay permanently damaged no matter the elapsed time.[50] In the first case, though the property owner may grow accustomed to HVTLs and thus think less of them, new potential buyers aren't as sensitized and the diminutive impact is fresh to them.

Realtors usually oppose HVTLs. Nearly all surveyed realtors and appraisers in the Roanoke and New River valleys of Virginia said that close proximity to HVTLs would diminish property values by as much as $25,000, but mostly for high-end homes. Lower-end homes see little impact.[51]

Diminished property values can also impact communities. In one case, Delaware residents were worried that a proposed 1,200 megawatt HVTL would depress local property values, thus weakening the local tax base and leading to higher taxes to offset the losses. Kent Sick, author of a 1999 paper on power lines and property values, projects losses from a few percentage points to 53%.[52]

In Atlanta, a local realty group named Bankston Realty ranked power lines as the number one item that damages resale value, followed closely by busy roads and inferior lot topography. They advise buyers to pay 15% less of the asking price if power lines are present, and they advise sellers to accept it as a logical perception of value.[53]

Evidence suggests that HVTLs affect the health of residents in close proximity to lines 345kV and higher. Evidence also suggests that the power lines have little to no impact on property values because encumbered lots are often larger and more private than unencumbered lots, resulting in no diminution of purchase price. However, most studies did observe longer time on the market for encumbered properties.[54]

Rural Impact

Now that the reader is aware of stray voltage, EMFs, and property values, the reader will have a deeper understanding of the potential effects of HVTLs on rural land throughout the United States.

In Goodhue County, Minnesota, an area locally known for protecting agriculture, CapX2020 (a utility consortium) is proposing to build a 345kV HVTL through the county that may be doubled to 690kV. Local landowner Linda Grovender voiced her concern in a 2010 letter to the editor of the Cannon Falls Beacon. She worries that the line, proposed to traverse residential and agricultural lands instead of following existing utility right-of-way, will have an adverse effect on her family's health (due to EMFs),

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50 The Effect of Public Perception on Residential Property Values in Close Proximity to Electricity Distribution Equipment. Sally Sims, B.Sc. Paper presented to the Ph.D. Forum at the Pacific Rim Real Estate Society Conference. January 2002. This is the first part to the study.

51 A Question of Power: Part III – Realtors: High voltage lines lower property values. Leslie Brown. Roanoke Times. 1998. http://www.vapropertyrights.org/articles/98lineslowervalues.html

52 Expert: Power lines hurt property value, market research shows sellers lose up to 53 percent. Elizabeth Cooper. Gannett News Service. May 20th, 2006.

53 Atlanta Homes and Resale Value... Power lines are a definite NO. The Bankston Group. July 17, 2008. http://atlantaintheknow.com/2008/07/17/atlanta-homes-and-resale-value-power-lines-are-a-definite-no/

54 High Voltage Power Lines Impact On Nearby Property Values. Ben Beasley. Right of Way Magazine. February 1991.

jeopardize agricultural interests, result in lost agricultural productivity, and damage property values.[55] She wrote that if the proposed 345kV HVTL is doubled to 690kV (as it legally could be) it could have an adverse effect on her family's health, jeopardize agricultural interests, result in lost agricultural productivity, and damage property values.[56]

The CapX2020 line was approved in April of 2012,[57] but many landowners still oppose the project. Farmers and homeowners "in record numbers" are trying to invoke Minnesota's "buy the farm" law, "hoping it will force utilities to buy them out so they can move away from the looming towers." However, the 79 landowners are being frustrated by restrictions in how it's applied.[58]

Elsewhere n Minnesota, Dairyland Power Cooperative (one of the chief members of CapX2020) surveyed rural landowners for their opinion regarding the proposed HVTL in their area. Whether they were crop or dairy farmers, each had several reasons why the proposed line would impact their business. The unnamed respondents shared Grovender's views and said they prefer to use highway corridors and woodlands to avoid impacts to productive agricultural land; protect livestock; avoid interference with large farm equipment, GPS, and navigation systems used in farm machinery; preserve open channels for crop-dusting; protect farm buildings; protect pasture land, tree farms, and timber production.[59]

The Dairyland survey also found that livestock operations are concerned that the HVTL will generate stray voltage, impacting livestock and feedlots. Cattle, horses, and other livestock will not go near transmission lines due to stray voltage. And stray voltage can impact the health of beef cattle and hogs. Farmers also fear potential impacts on dairy operations, poultry, livestock mortality, horse boarding facilities, and herd reproduction.[60]

HVTLs also pose potential technological obstacles. For example, The GPS equipment used in the farm equipment may not be able to steer around transmission poles, potentially making farming around the towers extremely difficult.[61]

One major concern was routing the HVTLs through the middle of properties or fields. The surveyed farmers quoted many repercussions for bisecting a property. They include: Interrupted irrigation and tile drainage equipment and practices; decreased food production; fragmented existing cropland and dairy operations; diminished lease value: the addition of transmission lines would make it difficult to lease farm land for the top rental price; compacted soil from construction of the HVTLs and access roads: it would take 3–5 years to restore.[62]

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55 No CAPX2020. Letter to the Editor by Linda Grovender. The Cannon Falls Beacon. March 23, 2010.
56 Ibid.
57 Regulators Approve Last Segment of CapX2020 Transmission Line. NAW Staff. North American Wind Power website. April 16, 2012.
http://www.nawindpower.com/naw/e107_plugins/content/content.php?content.9697#.USMFJKV1-So
58 'Buy the Farm' law not working, Minnesota landowners say. David Shaffer. Star Tribune. February 12, 2013.
59 SE Twin Cities-Rochester-La Crosse Transmission System Improvement Project Macro-Corridor Study, Appendix A: Summary of Public Comments regarding a proposed HVTL. Dairyland Farm Cooperative. September 2007.
60 SE Twin Cities-Rochester-La Crosse Transmission System Improvement Project Macro-Corridor Study, Appendix A: Summary of Public Comments regarding a proposed HVTL. Dairyland Farm Cooperative. September 2007.
61 Ibid.
62 Ibid.

Across the border in Wisconsin, the state's Department of Agriculture validated many of the Minnesota respondents' concerns when it found that HVTL construction could compact soil, making it difficult to plow and plant those areas, naturally resulting in reduced crop yields. The HVTLs force farmers to change planting patterns to avoid support structures. Since farmland is only as valuable as its ability to yield good crops, rural property values suffer from the limitations and effects of HVTLs on their land.[63]

Potential compaction, forced building changes, and lower property values equally threaten dairy operations as much as they threaten agricultural farmers. Susan and Robert Herckendorf, dairy farmers in the path of the proposed A-W HVTL, are worried that the line could put local dairies out of business.[64]

In researching the possible negative factors of the then-proposed Arrowhead-Weston HVTL in Wisconsin in 2000, the state's Public Service Commission found that rural property values may decrease from "concern or fear of possible health effects from electric or magnetic fields; The potential noise and visual unattractiveness of the transmission line; Potential interference with farming operations or foreclosure of present or future land uses."[65] They also found that the value of agricultural property will likely decrease if the pylons inhibit farm operations."[66] However, they also found that adverse effects appear to diminish over time.[67]

The impact report further states that, on farmland, HVTL installation can remove land from production, interfere with operation of equipment, create safety hazards, and deprive landowners the opportunity to consolidate farmlands or develop the land for another use. The greatest impact on farm property values is likely to occur on intensively managed agricultural lands.[68]

Nearly a decade later in 2009, the Wisconsin Public Service Commission conducted another study on the environmental impacts of transmission lines and found that "in agricultural areas, the number of poles crossing a field may be the most significant measure of impact," and "agricultural values are likely to decrease if the transmission line poles are in a location that inhibits farm operations."[69] Beyond the impact of pole placement, the PSC found that "the overall aesthetic effect of a transmission line is likely to be negative to most people, especially where proposed lines would cross natural landscapes. The tall steel or wide 'H-frame' structures may seem out of proportion and not compatible with agricultural landscapes or wetlands."[70] They further explained, "Transmission lines can affect farm operations and increase costs for the farm operator. Potential impacts depend on the transmission line design and the type of farming. Transmission lines can affect field operations, irrigation, aerial spraying, wind breaks, and future land development."[71]

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63 Line could affect farms, property values. Author Unknown. Oshkosh Northwestern. June 26, 2000.
64 Ibid.
65 Property Values (pages 212-215) from Final Environmental Impact Statement, Arrowhead-Weston Electric Transmission Line Project, Volume 1. Public Service Commission of Wisconsin. Docket 05-CE-113. Date issued, October 2000.
66 Ibid..
67 Ibid.
68 Property Values (pages 212-215) from Final Environmental Impact Statement, Arrowhead-Weston Electric Transmission Line Project, Volume 1. Public Service Commission of Wisconsin. Docket 05-CE-113. Date issued, October 2000.
69 Environmental Impacts of Transmission Lines. Public Service Commission of Wisconsin. March 2009.
70 Ibid.
71 Ibid.

The study further examines how rural HVTL pole placements can affect agricultural land values: They can create problems for turning field machinery and maintaining efficient fieldwork patterns; expose properties to weed encroachment; compact soils and damage drain tiles; result in safety hazards due to pole and guy wire placement; hinder or prevent aerial activities by planes or helicopters; interfere with moving irrigation equipment; hinder future consolidation of farm fields or subdividing land for residential development.[72]

To oppose these potentially diminutive effects on their land, landowners sometimes organize against them. In Ohio, a group of concerned citizens formed the group, Citizens Advocating Responsible Energy (CARE), to oppose FirstEnergy's proposed Geauga County power line. On their website they state the reasons for their opposition. They fear the HVTL will devalue the properties it crosses, force affected property owners to continue paying taxes on damaged property, damage natural beauty and local ecology, lessen agricultural productivity of impacted land (thus reducing farm income and local purchasing power), and create a thorough-fare for snowmobiles and off-road vehicles.[73]

Other times, concerned landowners are united in voice, but not in form. In 2010, Idaho property owners in Bonneville County are nervously following the progress of Idaho Falls Power's proposed 161kV HVTL (North Loop Project) that would pass close to their homes.[74] Later, in 2011, they formed the group, The Alliance for Property Rights and Fiscal Responsibility to "give the citizens of Idaho Falls and Bonneville County a voice as it relates to the North Loop Project." [75]

On March 8, 2012, attorneys for the Alliance challenged Idaho Falls Power and the City of Idaho Falls effort to "take control of land outside of their jurisdiction and condemn a right of way for the construction of a 161kv transmission line." As a result, a district court judge ordered the City of Idaho Falls to "show cause why it has authority to proceed with a condemnation of county property, and if any such authority exists." [76]

Lynn Pack, a Bonneville County dairy farmer, has educated himself on HVTLs and said he's most concerned with stray voltage. "It causes so many problems with cow's production. They won't feed, they won't drink water, they dry up and when they dry up they just don't give any milk."[77] Another property owner, Sharon Nixon, fears the HVTL could harm her husband's health after his recent victory over bone cancer. She also fears the value of her home will fall. "It is not something we want in our backyard. We worked all our lives. This is our dream home." [78]

Idaho Falls Power General Manager Jackie Flowers said the HVTL is a necessary step to meet new federal energy reliability standards and that the utility is open to the public's input.[79]

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72 Ibid.
73 We oppose FirstEnergy's proposed Geauga County power line. Website posting by Citizens Advocating Responsible Energy (CARE). Date unknown but website copyright suggests sometime from 2008-2009.
74 Transmission Lines Worry Property Owners. Brett Crandall. Local News 8. March 5, 2010.
75 Protect Property Rights. http://allianceforpropertyrights.blogspot.com.
76 Protect Property Rights Press Release. March 12, 2012.
http://allianceforpropertyrights.blogspot.com/2012/03/press-release-march-12-2012-alliance.html.
77 Ibid.
78 Ibid.
79 Ibid.

A year earlier in Idaho, a coalition of Rockland County farmers tried to convince Idaho Power Company to avoid routing a new HVTL through their land, citing environmental and development concerns.[80] Doug Dokter, Idaho Power project leader, said the new lines are required because the existing lines are at their capacity.[81] Because of their concerns, utility representatives say they're looking at other options and hope for a compromise to avoid invoking eminent domain to take the land.[82]

Sometimes opposition to a proposed HVTL route can alter its course. In 1994, Public Service Company of New Mexico abandoned plans to take new right-of-way through the Jemez Mountains for a 50-mile long HVTL extension that Indian groups and environmentalists argued would cut through several miles of pristine vistas and Native American ruins.[83] The utility instead re-routed the extension to follow an existing utility corridor, bringing the decade-long dispute to a close.[84]

In 2008, California farmers and ranchers found themselves in a similar situation. San Diego Gas & Electric proposed a 150-mile long, 500kV HVTL (in conjunction with several 230kV HVTLs) across San Diego and surrounding counties to meet increasing energy needs and transport required renewable energy.[85]

Affected landowners are worried the line will have "huge" impacts on their properties. Katie Moretti, an affected cattle rancher, and other farmers worry that building construction access roads across untouched land will limit their land's future use. She also worries that the utility won't compensate her for the loss of use.[86]

Another rancher, Glen Drown, also worries about the impact the line will have on land-use and property values since the proposed route bisects several of his parcels subdivided for future development.[87]

Local dairy producer, Richard Van Leeuwen, is worried that stray voltage from the line would damage the health of his calves and milking cows. To protect his herd's health he said he would have to relocate the calf farm to another part of his property, costing millions.[88]

San Diego County Farm Bureau Executive Director Eric Larson acknowledges that the farming community won't be able to stop the project, but he's trying to make it compatible with the area's farming interests by recommending burying the line underground in some areas, going around some areas, and utilizing existing right-of-way.[89]

Elsewhere in the state, the City of Brentwood researched the potential impact of HVTLs on agricultural land values by interviewing several of their local and experienced Real Estate brokers. All the brokers

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80 Headway being made on proposed route for power transmission line. Author Unknown. The Power County Press and Aberdeen Times. April 8, 2009.
81 Ibid.
82 Ibid.
83 PNM Scraps Jemez Power Line Plan. Keith Easthouse. Sante Fe New Mexican. December 16, 1994.
84 Ibid.
85 Proposed power line would impact farms. Christine Souza. California Farm Bureau Federation. May 28, 2008.
86 Proposed power line would impact farms. Christine Souza. California Farm Bureau Federation. May 28, 2008.
87 Ibid.
88 Ibid.
89 Ibid.

said that "Agricultural land with power lines above ground is worth less than properties with below-ground utilities."[90]

However, in a 2007 report, the California Department of Conservation's Farmland Mapping and Monitoring Program reported that HVTLs installed on agricultural land for a wind farm will result in a temporary disturbance of 10 acres of farmland and permanently affect 1 acre. Since the affected areas are mainly grazing land, the report concluded that the HVTL would not significantly impair productivity. Though the impact to agricultural productivity during construction would be negative, they claimed it would be mostly insignificant.[91]

Across the country in Leesburg, Virginia, 26 landowners opposed Dominion Energy's proposed 230kV HVTL, saying it will damage their property values, thus decreasing their tax base and thus affect the county as a whole. They also fear its impact on Blue Ridge tourism.[92]

Bill Hatch, owner of a 400-acre farm was upset to learn the line would run through his farm. He said the proposed line would so affect his farm that he could only afford to keep it by direct marketing or agro-tourism, but he admitted that few people would want to visit a farm with power lines.[93]

Landowners want the utility to bury the lines, but the utility says it will cost 10 times more than traditional overhead lines. However, Harry Orton, an underground power line expert, testified that while the initial costs of burying the lines are higher, the lower cost of maintenance over the years evens the cost along the lines' lifecycle.[94]

A year later in 2006, Dominion proposed an additional 500kV HVTL to meet growing demand and routed it through northern Virginia because it was the most efficient route. However, the area is also one of the state's most pristine, and the proposal met with fierce resistance from landowners, environmentalists, Congressman Frank Wolf, and actor Robert Duvall.[95]

In the path of the HVTL are landowners of some of the most valuable land in Virginia, and they were bothered that the utility plans to erect the 40-mile, 15-story HVTL in their back yards.[96]

One landowner, Cameron Eaton, fears the line will bring financial ruin and "sink" her investment into her 100-acre Fauquier County property and horse business. "No one will buy that land if some ugly power line could run right over their house. I'm broken off at the knees."[97]

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90 City of Brentwood, California. Website page explaining their approaches to valuing agricultural land. Date and author unknown.
91 3.3 Agricultural Resources. Part of the public draft by The California Department of Conservation's Farmland Mapping and Monitoring Program. July 2007.
92 Committee Hears Debate Over Underground, Overhead Power Lines. Megan Kuhn. Leesburg Today. May 20, 2005.
93 Ibid.
94 Committee Hears Debate Over Underground, Overhead Power Lines. Megan Kuhn. Leesburg Today. May 20, 2005.
95 Landowners Fear Ruin from Power Line Route. Sandhya Somashekhar. Washington Post Staff Writer. December 11, 2006.
96 Ibid.
97 Ibid.

Real estate agents consider the area's picturesque countryside to be its most valuable quality. Matt Sheedy, a land developer and president of Virginians for Sensible Energy Policy, said that the very proposal that the line will soon dominate the countryside has already "sent land values plummeting." Brokers confirmed that the market froze. People backed out of real estate contracts, unwilling to live anywhere under the line. Sheedy's groups estimated that land immediately affected could lose as much as 75% of its value.[98]

"When you're out in the country and you're selling property, what you're selling is the open space and the bucolic views and the history," Sheedy said. "Running power lines through an area like this is just devastating." To landowners Gene and Deborah Bedell, who were trying to sell their 223-acre farm to pay for their retirement, it was a hard blow. Their agent told them no one would buy their property if they knew "that it could have a power line looming over it."[99]

Further north in New York, over 50 landowners and local officials spoke before the state's Public Service Commission in opposition to Upstate NY Power Corp's proposed construction of a 230kV HVTL in their community.[100]

Sharon B. Rossiter, co-owner of Doubledale Farms in Ellisburg, said the HVTL will damage their crop cycle, remove 100 acres from use, and make planting difficult by having to navigate around the poles. Also worried is Roberta F. French, owner of Farnham Farms in Sandy Creek. The proposed line will bisect her blueberry farm, eliminating two-thirds of it.[101]

Jay M. Matteson, Jefferson County agricultural coordinator, advocated routing the HVTL through public land to avoid damaging productive, private land. "The burden should be on New York state and the developer to prove to local landowners why their land is less valuable than public land," he said.[102]

The Town of Henderson opposed it because the town's foundation is tourism and agriculture, and the community is "very concerned about the visual impacts of this project."[103]

Robert E. Ashodian, chairman of the Henderson Harbor Area Chamber of Commerce's Economic Development Committee, agreed. "The scenic resources of the community and the natural resources are at the heart of the value of the community."[104]

In an effort to appease worried or angry landowners, agricultural property owners in Montana with HVTLs encumbering their land will be exempt from paying taxes on land within 600 feet on either side of the HVTL Right-of-Way.[105]

In the 2002 study, "The Impact of Transmission Lines on Property Values: Coming to Terms with Stigma," authors Peter Elliott and David Wadley cite a 1978 Canadian study that, according to one commentary,

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98 Ibid.
99 Ibid.
100 Transmission line gets no support. Nancy Madsen. Watertown Daily Times. November 17, 2009.
101 Transmission line gets no support. Nancy Madsen. Watertown Daily Times. November 17, 2009.
102 Ibid.
103 Ibid.
104 Ibid.
105 Tax facts on proposed power line. The Montana Standard Staff. The Montana Standard. July 11, 2009.

found "the per acre values from more than 1,000 agricultural property sales in Eastern Canada were 16-29% lower for properties with easements for transmission lines than for similar properties without easements." The impact was greater on smaller properties. The 1978 study found little difference in impact from 230kV or 500kV HVTLs. The study also found that the impacts didn't seem influenced by time.[106]

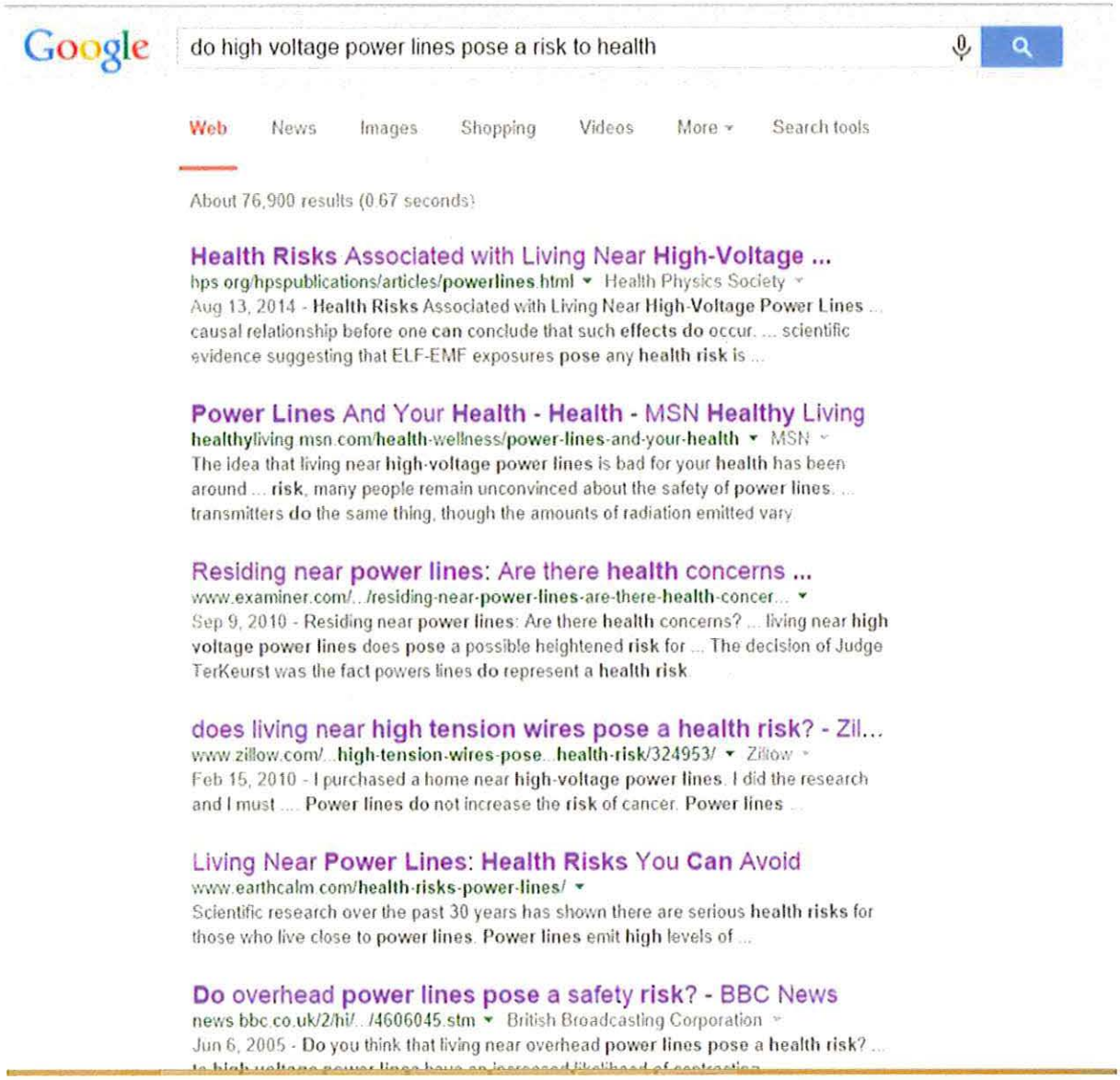
Three more Canadian studies on the impact of HVTLs on agricultural land values found different results.[107] Brown 1976 studied the effect of low-voltage power lines on agricultural land in Saskatchewan and found no measurable impact on property values. The Woods Gordon 1981 study focused on the effects of 230kV to 500kV HVTLs on Ontario farmland and found some areas had an average of a 16.9% negative impact, two areas had a positive effect, and others showed no statistically significant effect. The third study, a master's thesis referred to as Thompson 1982, found sales prices were lower for properties crossed by HVTLs but only where the land has potential for irrigation (pgs. 56-57).[108]

Summary

Overall, the majority of the articles indicated a fear of these power lines, citing health concerns and safety as the primary factors. Other concerns included stray voltage issues (mainly with rural publications) and interference with agricultural activity and aesthetics. It was clear that most of the information the public receives about these matters was negative.

106 The Impact of Transmission Lines on Property Values: Coming to Terms with Stigma. Peter Elliott & David Wadley. Property Management, pgs.137-152. 2002.
107 The Effects of Overhead Transmission Lines On Property Values: A Review And Analysis Of The Literature. Edison Electric Institute Siting & Environmental Planning Task Force. 1992.
108 Ibid.

Google Search by Kurt Kielisch, September 14, 2014:



Do overhead power lines pose a safety risk? - BBC News

news.bbc.co.uk/2/hi/.../4606045.stm ▾ British Broadcasting Corporation ▾

Jun 6, 2005 - Do you think that living near overhead power lines pose a health risk? ... to high voltage power lines have an increased likelihood of contracting ...

[PDF] High-voltage power lines pose health risks - RETA

https://retasite.files.wordpress.com/.../reta-independent-art-sept-22-2012.... ▾

Sep 22, 2012 - High-voltage power lines pose health risks. WHO has prescribed ... the Power Grid Company of Bangladesh, said: "We do not have any ...

Power Lines and Cancer: Nothing to Fear - Quackwatch

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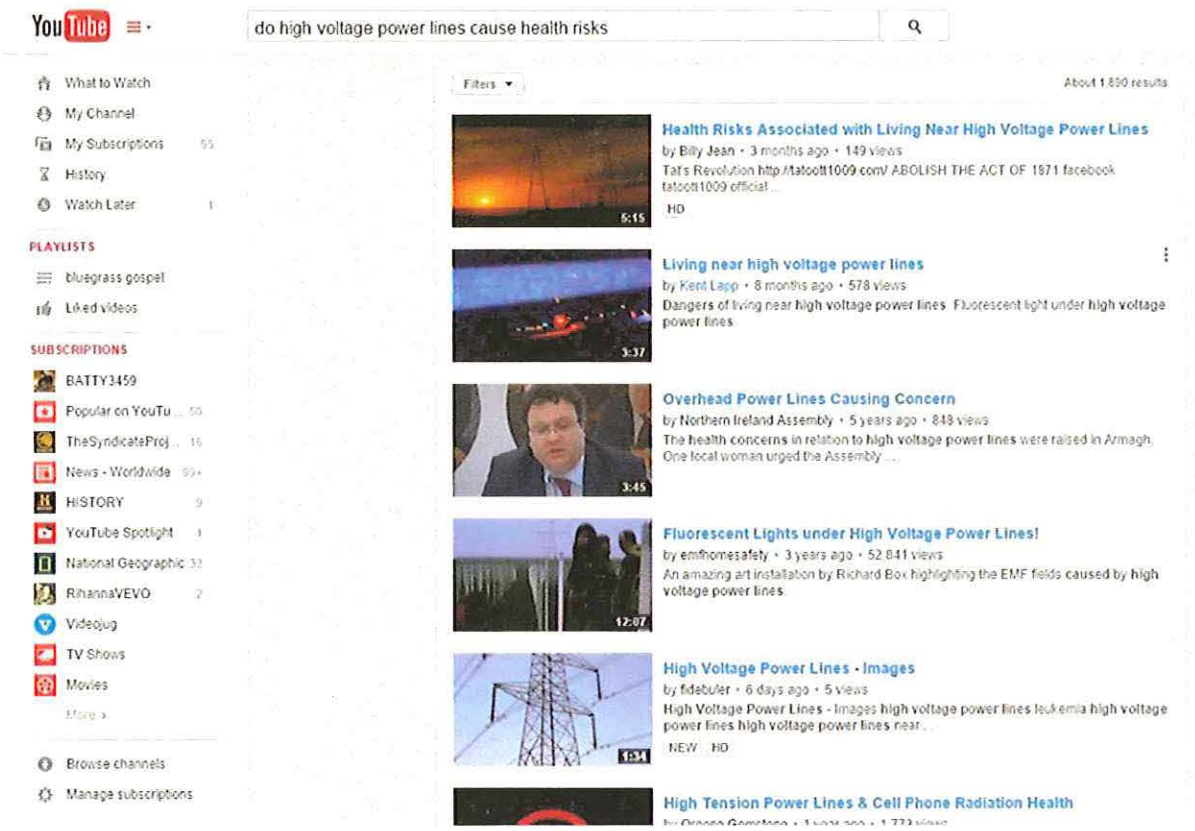

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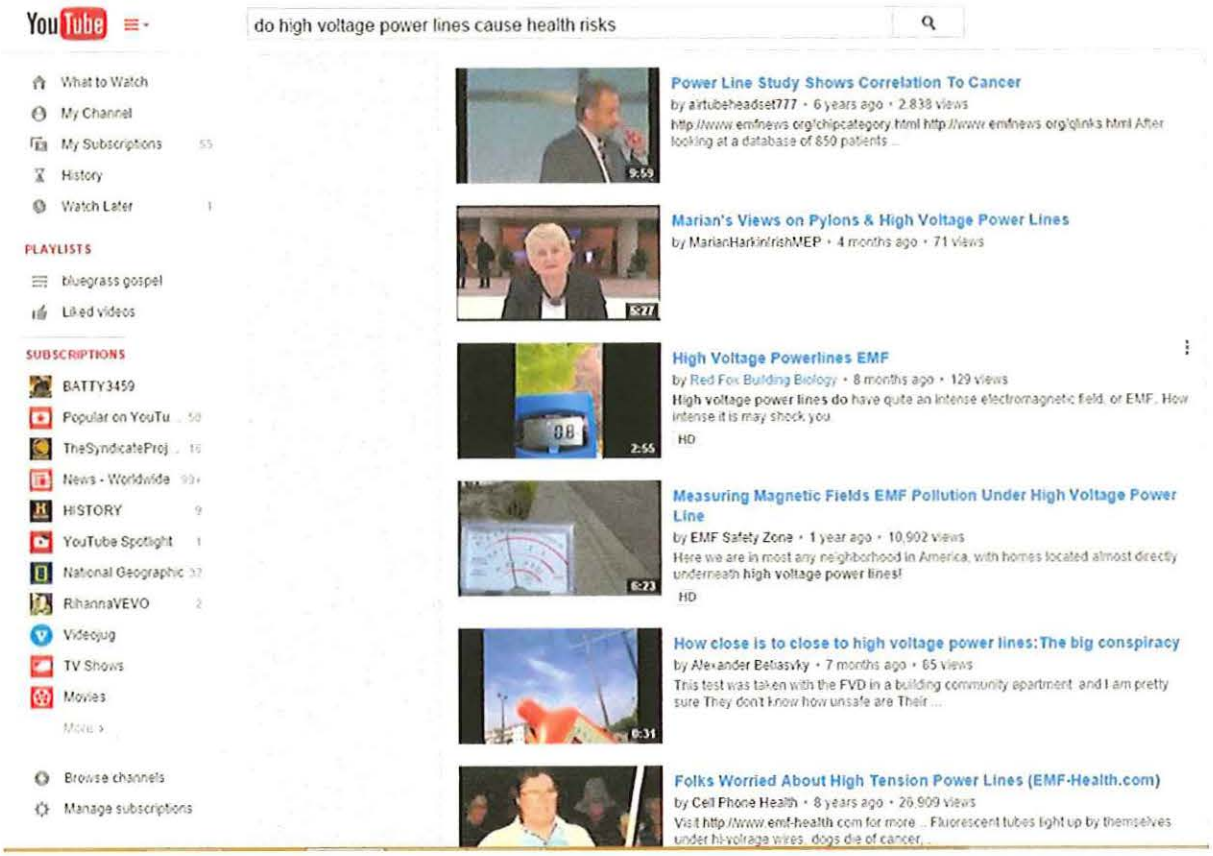

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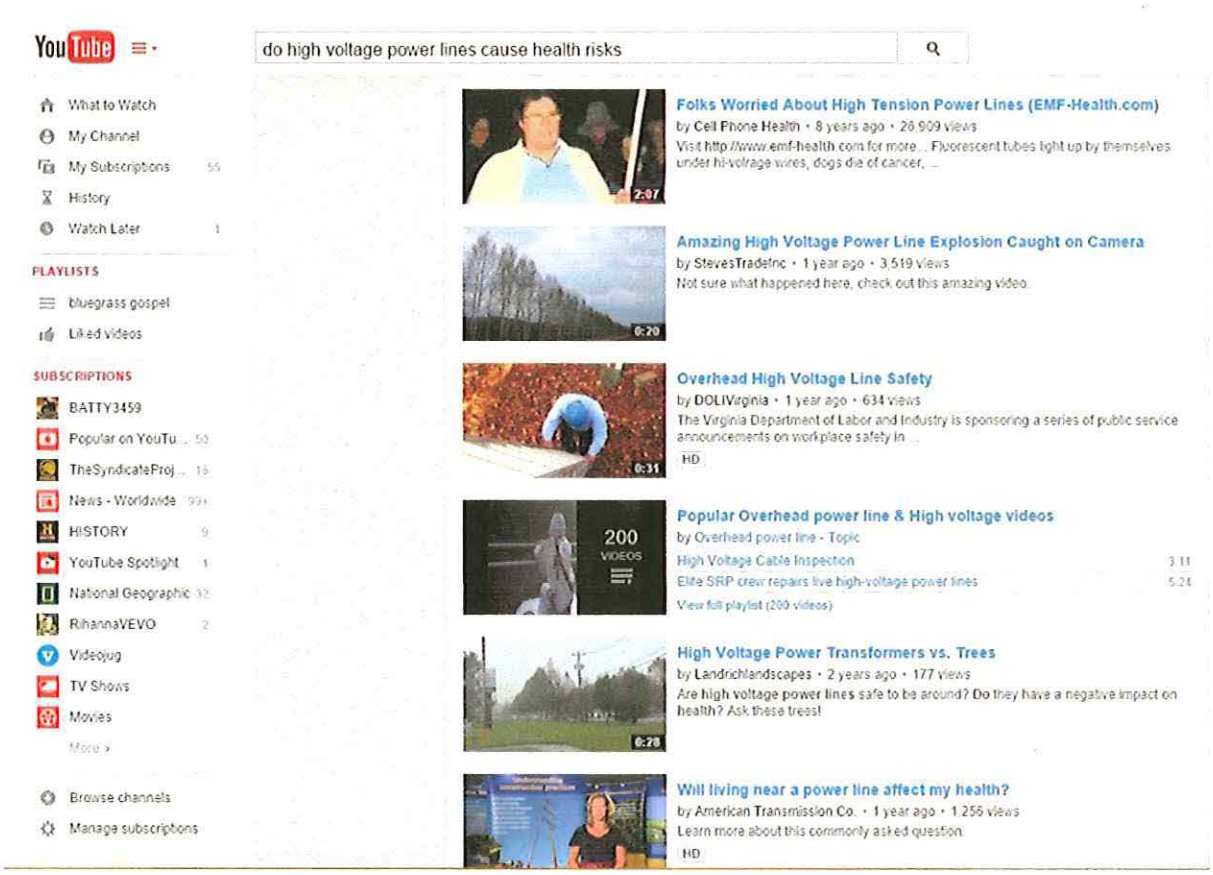

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