Electrical Workers’ Decision Making Regarding Electrical Safety Practices

Behavioural Research Summary Report
Agenda

• Research Background
• Considerations
• Summary of Electrician Research Findings
• Summary of Inspector Research Findings
• Discussion of Research and Considerations
Research Background
The following Opportunity Statement was developed and validated during the Expert Model Workshop with ESA and key stakeholders:

The opportunity of the ESA Team is to reduce the number of critical occupational injuries and fatalities by 20% over the next 5 years, while proactively working to prevent future harm among electricians. We will do this by first understanding influences on their judgment, decision making and behaviour, then using that insight with others, to design, implement and evaluate actionable policies, initiatives, communications and other interventions that produce the desired breakthrough in behavioural outcomes.

The first step is to gain in-depth actionable insight by conducting state-of-the-science, behavioural (mental models) research with electricians, inspectors and key stakeholders. This research, undertaken in collaboration with Decision Partners, will be initiated mid-July, 2015 and be completed by the end of March 2016.
Applying Science to Achieve Behavioural Outcomes

Nothing changes until behaviour changes

- We bring latest advances in behavioural communications and decision sciences to strategic management
  - Applied psychology, cognitive science, risk communication
- Tremendous advances have led to powerful tools
- To influence judgment, decision making and behaviour, must work from insight into people’s mental models
- Prominence of Mental Modeling:
  - Science-informed, evidence-based approach
  - Proven over 25 years of application
  - MMT™ preferred when success depends on behavioural outcomes -- strategic management approach
Mental Modeling Core Technique

1. “Should” System and Outcome Models
   - Base Model
   - “Should” Know, Understand, Value
   - “Should” Behaviours

2. “Do” Discovery and Analysis
   - Mental models- Do Know, Understand, Value
   - Behaviours - What’s happening? Why?

   - Focused strategies, policies, interventions and communications
   - Measurable behavioural outcomes
   - Evaluation for continuous improvement
Overview of Research Steps

• July 21, 2015: Developed Research Opportunity Statement

• July – August 2015: Developed a Stakeholder Map and two Expert Models (Base and Detailed Expert Models) of:
  » Influences on Electrical Workers’ Judgments and Decision Making Regarding Electrical Safety Practices

• September – December 2015: Conducted Mental Models Research with 60 Electricians
  » Electrician Interviews ranged from 27 to 81 minutes and averaged 45 minutes in length.
  » Total: 60 interviews → 45 hours 9 minutes.

• December 2015 – January 2016: Conducted Mental Models Research with 11 ESA Inspectors
  » Inspector Interviews ranged from 44 to 70 minutes and averaged 57 minutes in length.
  » Total: 11 interviews → 10 hours 29 minutes.
## Sampling Frame

### Primary Sampling Frame

<table>
<thead>
<tr>
<th></th>
<th>5 Electricians or less in Organization</th>
<th>More than 5 Electricians in Organization</th>
<th>Totals (# in Sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apprentices</td>
<td>4 (138)</td>
<td>3 (164)</td>
<td>7 (302)</td>
</tr>
<tr>
<td>Journeymen w/ &lt;10 years since Apprenticeship</td>
<td>7 (220)</td>
<td>9 (256)</td>
<td>16 (476)</td>
</tr>
<tr>
<td>Journeymen w/ 10+ years since Apprenticeship</td>
<td>21 (390)</td>
<td>16 (408)</td>
<td>37 (798)</td>
</tr>
<tr>
<td>Total Interviewed (# in Sample)</td>
<td>32 (748)</td>
<td>28 (828)</td>
<td>60 (1576)</td>
</tr>
</tbody>
</table>

### Sampling Observation:

» Electricians responded quickly and in great numbers to the announcement of the screening survey, with many indicating their high level of interest in the topic of safety when interviewed. This also demonstrates their comfort in using the web and a computer interface.
Interview Protocol Topics

• The interview protocols offered Electricians an agenda of topics to discuss in a way that allowed for free expression.

• Topic areas included:

  » Personal Influences on Electrical Safety Behaviours
     ▪ work experiences, how the decisions they make may affect the level of safety on the job site, and about working in energized and de-energized states

  » Project and Worksite Influences on EW Safety
     ▪ specific external factors, things that may be outside of their control that affect the likelihood that someone could be seriously injured or killed on the job

  » Electrical Safety Training, Guidelines and Communications
     ▪ safety training, guidelines or practices, regulations that apply to electrical worker safety, and how they receive/want to receive information about electrical safety

• Electricians were encouraged to raise additional topics spontaneously and to elaborate on their perspectives.
How to Read the Report

• Specific findings are ordered based on their frequency of mention, using the following qualitative terms:
  » “Nearly all” indicates a response by 80 to 100% of Interviewees;
  » “Most” indicates a response by 60 to 80% of Interviewees;
  » “Many” indicates a response by 40 to 60% of Interviewees;
  » “Some” indicates a response by 20 to 40% of Interviewees; and
  » “A few” indicates a response mentioned by less than 20% of Interviewees.

• Frequency of mention for specific findings is rounded to the nearest 5% to highlight the qualitative nature of the results.

• In addition, we have reviewed the variances in frequency of mention among the cohorts shown in the primary sampling frame (size of Electrician’s organization and years of experience) and reported on these variances when the reported frequency of mention varied by 20% or greater.

• Specific findings are supported with example quotes from Electricians to illustrate the finding being presented.
Bottom Line Up Front

Electricians
The Bottom Line – Electricians

• **Working live is a fact.**
  » Nearly all Electricians (90%) reported having worked live, by choice or inadvertently

• **Working live is more complicated than a single decision with a single right choice.**

• Electricians are motivated to work safely and “get home safe” every night. Self-motivation drives behaviour more than regulation and enforcement from without.

• Electricians are motivated to coach and support peer electricians, sharing best practices and key learnings from personal experience.

• **The work environment is complex and dynamic.**
  » Yet only 50% of Electricians reported doing formal hazard assessments.

• **Current formal training and apprenticeship doesn’t adequately prepare electricians for making decisions and taking appropriate actions in complex work environments.**
Conclusions

Working Live is a Fact

• Nearly all Electricians (90%) reported having worked live, by choice or inadvertently.

• “Don’t work live” – negative, absolute language, presumes that working live is willful, negligent behaviour.

• Electricians sometimes work live because:
  » They have to, due to the nature of the task
  » They mistakenly believe they have to, because of a lack of knowledge or misunderstanding
  » They choose to, knowing that it isn’t necessary, because of personal preferences or external pressures
  » Others take actions that cause them to unknowingly work live

• Nearly all Electricians said they were confident they could refuse a request to work in an energized state and felt comfortable doing so.
Conclusions

Electricians are motivated to work safely

• Virtually all Electricians said that that are motivated to “get home safe” every night.

• Safety consciousness appears to increase with age, experience and responsibility.

• More regulation and enforcement is only part of the solution.
  » Top down strategies do not align with the needs, interests, priorities and preferences of electricians
  » Self-motivation has a greater influence on Electricians’ behaviour
Conclusions

Electricians are motivated to coach and support peers

• Electricians are committed to working safely, which includes helping others to be safe.

• Electricians who supervise others expressed strong commitment to ensuring the safety of their staff and crews.

• Electricians are used to the “buddy system” – they are motivated to coach and support peers and subordinates, sharing best practices and key learnings from their experiences.

• Electricians all have stories of “near misses” – valuable experience to share to prevent injury and death.

• Electricians are motivated and appear ready to be engaged in creating a professional culture of safety – a Community of Practice.
Conclusions

The Work Environment is Complex and Dynamic

• Every job is different and conditions change rapidly – the jobsite is a cognitively complex environment.

• Unexpected energy, legacy wiring, communications and interactions with peers and other trades are major risk factors.

• The primary challenges are cognitive and behavioural.

• More regulations, more inspectors, more fines are not the only solution, only part of it.

• More focus on processes and procedures will miss the mark unless simple tools to support hazard assessment and mental rehearsal on the job are put in place.
  » Only 50% of Electricians reported doing formal hazard assessments.
Conclusions

Current Training Doesn’t Adequately Prepare Electricians

• Formal training and apprenticeship doesn’t adequately prepare Electricians for:
  » Making daily, well-informed safety decisions in complex environments.
  » Taking appropriate actions -- for example, working live either by choice or by circumstance.
  » The social complexity on a job site and the ability to communicate effectively.

• Post certification learning is primarily through “the school of hard knocks” – personal experience.

• Establishing continuous learning across the profession could save lives.
The Strategic Opportunity for ESA

Nothing changes until behaviour changes

• Be a **catalyst** in the establishment of a *culture of safety* across the electrician profession that will produce sustainable, measurable behavioural outcomes year over year:

1. Support the establishment of an electrician-focused Community of Practice

2. Foster development of appropriate training and decision support tools to support electricians’ on-the-job decision making, primarily: 1) hazard assessment; 2) mental rehearsal; and 3) effective communication

3. Engage inspectors as safety advocates and provide them with the tools they need to be successful coaches, enforcers and monitors
Creating a New Culture

- Planning & Development
  - Introduce
  - Awareness & relevance
  - Understanding & priority
  - Option examination
  - Choice, opt in/out
  - Attitudinal change
  - Institutionalize behavior
  - Commitment
  - Resolution
  - New culture

- Time

Copyright © 2016 Thorne Butte: Decision Partners Inc.
All rights reserved. Business Proprietary and Confidential.
Key Components of Sustainable Behavioural Change

- Formal Training
- On the Job Training & Experience
- Enforcement & Monitoring
- Decision Support Tools
- Peer-to-Peer Coaching & Mentoring
Summary of Key Research Findings

Electricians
Electricians were asked to describe the goals that they had for those projects or jobs and almost all of them focused on wanting to “get home safe at the end of the day” as well as a number of other safety-related and non-safety goals:

- Getting Home Safe at the End of the Day
- A Job Well Done / Job Satisfaction
- Making Money / Keeping Within Budget
- Protecting the Public / Other Trades
- Training Apprentices in Safe Practices
- Keeping to the Timeline on a Job
- Satisfying Their Customers
- Protecting Reputation / Gaining Knowledge
- Using the Proper PPE / Never Working Live
- Right Equipment / Right Number of People
Personal Influences on Safety

Project Goals

• Nearly all (85%) of the Electricians stressed the importance of safety often describing the goal as “getting home safe at the end of the day”:

  » “The number one goal, honestly, is for me to come home every night. I care more about safety than I do about pretty much anything else because I know with the type of job I’m in, you make one mistake, you could potentially not be coming home.”

• One Electrician summed up the multiple goals very concisely:

  » “Obviously I want everyone to stay safe and for the project to be done on time and hopefully make a little bit of money at the end as well. Quality of work is also a big point as well. Learning and teaching other apprentices as well as we go along.”
Personal Influences on Safety

Most Hazardous Tasks

• When Electricians were asked to think about the most hazardous work they typically did or supervised on a project, they mentioned electrical hazards as well as other workplace hazards they encounter:
Electrician described a relatively holistic view of the safety concerns in the workplace, listing both hazards that are specifically electrical in nature as well as more general hazards:

- Many (50%) said that tasks done in an energized state, whether as part of a planned procedure, or by accident were the most hazardous work that they typically did or supervised on a project.
- Some (30%) also spoke specifically about the hazards related to working at heights as being the most hazardous while another (25%) identified it as a secondary hazard. Working at heights referred to the physical nature of the job site and/or the tools and machinery they had to work with – ladders, lifts, and scaffolding.
- Electricians mentioned several other difficult worksite conditions posing additional hazards including high temperatures, working around construction equipment, the presence of chemicals, sharp edges causing cuts, and slip and fall hazards.
- A few (15%) mentioned working with high voltage as being a particular hazard.

One Electrician summed up his discussion of the level of hazard by pointing out that the basic nature of the job is hazardous:

- “We are working with something that you can’t see, can’t touch and you rely on the people ahead of us to have done the job right. So, even walking into a situation, it’s hazardous.”
Personal Influences on Safety

Working in an Energized State

• When asked if they worked in an energized state, nearly all (90%) of Electricians with more than 10 years’ experience and most (60%) of those with less than 10 years’ experience said that they did, primarily for tasks that they feel “have” to be worked on live:
  » Troubleshooting
  » Mission Critical Environments (e.g., Hospitals, Roadways, Computer Data)

• Some (20%) Electricians either never work energized as part of their company policy or they were not allowed to work energized:
  » “I don’t work live, absolutely not. This is the rule for apprentices never to touch anything live.”

• One Master Electricians said that while company policy made working energized “forbidden”, when an unavoidable situation arose, he felt comfortable working energized wearing his full PPE.
When asked, “Who decides whether to work in an energized state?” many (55%) of Electricians with less than 10 years’ experience said that others made the decision, while many (50%) of Electricians with more than 10 years’ experience believed it was their own decision to make:
When asked how they decide whether to work energized, Electricians described assessing: the particular situation; the availability of PPE; the risk; and the safety of others around them.

Many (55%) Electricians said they conducted a formal hazard assessment before working in an energized state, although their perceptions of “formal” varied from five minute talks at the start of the day to written assessments and checklists mandated by their companies.

Some (25%) said they did not do any kind of hazard assessment, formal or informal.
Personal Influences on Safety

Pressure to Work Energized

- Many (55%) of the Electricians said that they did not feel pressured to work in an energized state.

- Some (25%) said that they did sometimes feel pressured to work energized, primarily because of time and budget concerns expressed by customers, employers, contractors or supervisors.

- No significant variance was found based on years of experience.

- Some (20%) of Electricians with more than 10 years of experience described how they had felt the pressure in the past, but not any longer.
  » This may reflect both a general shift in attitude in the profession towards working energized and potentially a personal shift in attitude coming from experience.
Refusing Energized Work

- Nearly all of the Electricians who were asked said that they felt confident that they could refuse a request to work in an energized state and that they felt comfortable doing so:
  - “I know enough to know when to say no. You can justifiably say no because they cannot fire you for saying no to hazardous work.”

- Only one Electrician didn’t believe he could refuse and wasn’t comfortable saying:
  - “I don’t think you have the power to pull the switch as an electrician.”

- Some (20%) mentioned that they had refused to work energized in the past:
  - “There was one time when it wasn’t safe at all. It was kind of a dangerous tie-in and they wanted it done quick and I said, ‘Well, we are going to have to shut it off.’ Then it turned into a job that we had to do at night so I had to come back after.”

- Some (20%) had never had to refuse working energized, with a few expanding on why:
  - “Yeah, we allow our workers to refuse, but usually we ultimately have to find someone to do it unless we get there and there’s a good reason that we can come to the engineer or the owner with and tell them this is why we can’t [work energized].”
Personal Influences on Safety

Working De-energized

• When specifically discussing working de-energized:
  
  » Some (25%) Electricians proceeded with the work as if it were energized.

  » Some (25%) Electricians believed it to be much less hazardous leading to a more relaxed frame of mind and work habits often employing less PPE.

• When asked if they had ever believed that they were working de-energized but discovered that they were actually working live, many (45%) of Electricians had had that experience, often early in their career and often influencing their safety behaviours from that point forward:

  » “Yeah, that’s why I almost punched my first boss. Well, it was a plug in and he said, ‘Yeah, it’s dead.’ I went to grab it and it’s 220 volts. So my muscle tensed up. I was very lucky and let go of it. I think I was 18 or 19, and from that day on I don’t trust anybody. I always go check myself.”
When Electricians were asked about the safety steps they take they described a range of steps with PPE use being mentioned most frequently. This finding should be compared to the hierarchy of risk control which identifies use of PPE as the least effective option compared to steps that eliminate risk (such as de-energizing the system).
Electricians were asked to discuss how the type, quality, or condition of electrical components can affect the likelihood that someone will be seriously injured or killed. They mentioned:

- Electricians with larger companies were more likely to discuss level of maintenance: 45% (6+) compared to 20% (<6)
- Electricians with more years of experience were more likely talk about issues relating to the quality of equipment and materials: 55% (10+) compared to 30% (<10)

N=60

Type, Quality and Condition of Components

- Age of Equipment & Materials
- Quality of Equipment & Materials
- Voltage of Equipment
- Level of Maintenance
- Quality of Workmanship
- Source of Equipment & Materials
- User Friendly Equipment
Project and Worksite Influences

Electrical Components Impact on Safety

• Most (60%) discussed the impact the equipment’s age has on safety, mentioning that materials that deteriorate over time lead to potential safety hazards while working on electrical equipment:
  » “The age of equipment comes into play in insulating value. The rubber insulating materials they use in wiring does degrade over time.”

• However, some (35%) stated that regular maintenance is critical and can alleviate problems associated with the age of equipment:
  » “If it’s old and not maintained, there’s definitely a possibility of injury. We try to perform preventative maintenance on all of our equipment.”

• Many (45%) said that the initial quality of parts, materials and equipment at the job site can affect safety, arguing that higher quality parts are more durable and less likely to cause accidents:
  » “If it’s not CSA-approved, it’s not meeting the safety standards and there’s probably going to be hazards whether it’s immediate or further down the road.”
  » “We get every single thing from overseas now because it’s cheaper and it’s quicker but it’s not better. I’ve bent pipe where it splits on itself at the joints and rips because they got it from China.”

• Mostly when prompted, many (40%) discussed how voltage impacts safety, mentioning the potential for mismatches between the ratings of equipment and the voltage it is being used for and the greater potential for injury from exposure to higher voltage.
Electricians were asked to discuss how location or the job site environment affects the likelihood that someone will be seriously injured or killed. They mentioned:

- **Job Site Characteristics**
- **Housekeeping**
- **Access to Equipment**
- **Weather**

![Bar chart showing the impact of different factors on safety at job sites.](chart.png)

The chart shows the following percentages:
- Job Site Characteristics: 60%
- Housekeeping: 55%
- Access to Equipment: 45%
- Weather: 25%

N=60
Location / Job Site Impact on Safety

- Most (60%) mentioned particular characteristics of the job site environment, such as the presence of machinery, construction sites, or hazardous materials that make for a less safe working environment because of the impact that they have on people’s focus and pace of their work:
  » “In our plant we have nitrogen, ammonia and a little spark can cause a lot of havoc. You have to know your surroundings always.”

- Many (55%) discussed the importance of good housekeeping and clean work spaces, mentioning how wet or dusty surfaces, tripping hazards or cluttered job sites impact safety conditions:
  » “Your workplace has to be clean and organized so that you are not tripping over anything. Know where your goals are and make sure you have good lighting.”

- Many (45%) talked about the need for safe and easy access to the equipment that is being worked on and noted that working in tight, confined spaces or on hard to reach equipment increases the risk of accidents:
  » “I like to see 10 square feet per person for the job site. The minute you start to encroach on that space you drastically increase the chance of injury because you’re working on top of each other.”
Electricians were asked how other people working on the job site at the same time affect safety – either positively, in terms of encouraging or checking safe work behaviour – or negatively, in terms of interfering with safe work practices:

- Electricians with smaller companies were more likely to stress the importance of communication at the job site: 95% (<6) compared to 75% (6+).
Nearly all (85%) said it was important to have good communications among all of the workers on a job site to point out hazards and reinforce safe work practices and to coordinate work activities to minimize interactions that may have an impact on safety:

> “If you see something that’s unsafe, you bring it up, you talk about it. Then we do something about it because you don’t just leave things unsafe especially when you’re working around it.”

Most (65%) stressed the importance of proper work habits among fellow workers, and in particular, following safe practice guidelines or protocols and job site cleanliness:

> “Negative impact would be poor work habits. Job site cleanliness, care and use of the equipment, proper storage of equipment and materials on the job site.”

Many (50%) recounted problems associated with having multiple trades working side by side, either because they don’t follow – or understand the importance of – the same safety standards as electricians, or because they are competing for space under time pressure or don’t have the same standards for a clean work site:

> “We are a multi-trade company. Working with other trades, 99% of the time increases the chance of injury.”
Electricians were asked how supervisors can encourage electricians to work more safely and supervisors were asked how they ensure those they supervise are working safely. Topics mentioned included:

- Supervisors Responsible for Safety
- Supervisor Spot-Checks
- Electricians Have Personal Responsibility for Safety together with Supervisors
- Supervisor Coordinates Work Flow
- Supervisor Provides Safety Equipment & Training
- Supervisor Provides Safety Incentives

Electricians from smaller companies were more likely to mention their personal responsibility for safety – valuing one’s own health and safety – together with supervisors: 40% (<6) compared to 20% (6+)
Many (45%) Electricians said they don’t interact with the end customer. Those who did discuss how end customers affect safety – positively or negatively – mentioned the following:
• When asked to describe the electrical safety training they had received, Electricians said they learned about electrical safety during their formal education, on-the-job or during their apprenticeships, by taking courses provided by or funded by their employer or union, from ESA, or from one or more of these sources.
Training, Guidelines, and Communications

Electrical Safety Training Received

• Many Electricians (60%) said they had received some electrical safety training during their formal education: in “tech school”, “trade school” or through the Ontario College of Trades. Some (20%) said they had received little or no electrical safety training in school, commenting that the focus of their formal education was “electrical theory”, math and practical training rather than electrical safety.

• Many (45%) said they had received electrical safety training from their employers as part of company safety initiatives or from courses provided by or funded by their company:
  » No significant variances by size of organization were found for frequency of reported company provided training.

• Some (30%) said that most of their electrical safety training was learned “on-the-job”, during their apprenticeships, from “their boss” or from “the school of hard knocks”:
  » No significant variances by size of organization were found for frequency of reporting, only experiential or informal guidance from superiors.

• A few (15%) said they received electrical safety training from the many courses offered by or paid for by the union.

• A few (10%) said they received electrical safety training from ESA either in safety courses or as part of the Master Electrician certification.
Training, Guidelines, and Communications

Formal Safety Guidelines / Practices

• When asked whether they follow (or require those they supervise to follow) any formal safety guidelines or practices, most Electricians (75%) said they follow formal safety guidelines relating to the Code, PPE, not working live, ladder safety, occupational health and safety, etc.

• Some Electricians (20%) said they do not follow formal safety guidelines and practices, but rather rely on their experience, “work habits” and “common sense”.

• A few (5%) commented that although they do follow formal safety guidelines and practices, there are situations, albeit rare, when they ask for “special permission” or fill out safety forms in order to work live.
Effectiveness of Formal Safety Guidelines

When asked how effective whatever formal safety guidelines they follow are, most Electricians (50%) said they were very effective. Some of these Electricians (30%), however, added the caveat of “if they are followed”. The importance of formal safety guidelines and processes was emphasized by participants in the expert model workshop.

Effectiveness of Formal Safety Guidelines

- Very Effective
- Somewhat Effective
- Not Very Effective
- Not Asked/Answered

N = 60
Training, Guidelines, and Communications

Effectiveness of Formal Safety Guidelines

- Most Electricians (50%) said the guidelines are very effective, commenting that they are clear and comprehensive and are designed to ensure the safety of Electricians. Some (30%) emphasized, however, that their effectiveness depends on whether they are followed.

- Some Electricians (25%) said the guidelines are only somewhat effective, commenting that the guidelines are too extensive, are designed to protect individuals who aren’t qualified to be electricians in the first place or are only effective if enforced.

- One said the guidelines are not effective due to the lack of enforcement:
  » “There are not enough people hired that are coming in and not just giving a little slap on the wrist. These people need to get in trouble. They need to get fined to set statements saying ‘we’re not messing around here’. It’s not an easy job to do either but at least you guys are trying to do something about it and there are guys out there that hate ESA. They think it’s a big money grab monopoly and all they care about is the money and there’s no competition. It is what it is but they forget that ESA was formed to protect people, to protect the electricians to make sure that everything is done safely, legally. Maybe another company needs to be brought in to keep things on the same playing field everywhere across the board.”

- One said the guidelines are not effective commenting that safety is “taken for granted” but “it shouldn’t be”.
When asked how they typically hear or read about topics related to electrical safety, Electricians mentioned a range of ways and means, including the ESA website or bulletins; company safety initiatives; industry publications and magazines; online websites; or from their unions.

Sources of Information about Electrical Safety

- ESA
- Company Safety Initiatives
- Online / Websites
- Industry Publications / Magazines
- Union
- Ontario College of Trades
- Media
- Other Electricians
- Ministry of Labour Emails
When asked how they would like to get information or training, Electricians mentioned a range of information sources. Some participants in the expert model workshop highlighted the importance of communications through unions and employers.

**Preferred Modes of Communications**

- Courses / Classes
- Emails from ESA
- Email (No source specified)
- Online Courses, Videos, YouTube, Websites
- Hands on Experience
- Through the Union
- Ontario College of Trades
- Company Safety Initiatives

N=60

Preferred Modes of Communications for Information or Training

Copyright © 2016 Thorne Butte: Decision Partners Inc. All rights reserved. Business Proprietary and Confidential.
• When asked to rate the level of safety of overall practice of electrical work as compared to 10 years ago, nearly all Electricians (80%) said electrical work is safer, citing improved procedures and guidelines, reducing the need to work live, and safer equipment.
When describing how the overall practice of electrical work had changed over the past 10 years, some Electricians (30%) mentioned improved procedures and guidelines, stricter regulations on safety, and reducing the need to work live.

» “Within the last 10 years certainly more focus has been put on reducing the need to work in an energized environment.”

Some (20%) mentioned increased awareness and understanding due to improved communications, including ESA’s “Don’t Work Live” campaign and videos, communications coming from Health and Safety Committees, and more training “allowing electricians to be safer”.

A few (15%) said working with better equipment and safety equipment, including PPE, has made the overall practice safer:

» “Equipment gets safer; habits are safer generally. People are being more safe and the equipment and materials supplied make things safer in the trade.”

A few (10%) cited increased enforcement:

» “Obviously, you see results of fines being implemented for people who are working unsafe. Monetary is always … it sucks to have to go that route but people actually respond to that (laugh) because it hits the pocketbook, so yeah, the whole culture seems to have changed in the last 10 years.”
When time permitted, Electricians were prompted to comment on the need for safety improvements in the following areas, including: the apprenticeship program; educational requirements prior to certification; recertification; additional tools or other resources; and certification requirements that could improve safety. Electricians cited the need for improvements in:

- Safety Improvements
- Prompted Training, Guidelines, and Communications
- Improvements to Apprenticeship Program
- Education Requirements
- Recertification
- Other Tools / Resources
- Certification Requirements

N=60
Summary of Key Research Findings

Inspectors
The Bottom Line – Inspectors

- Inspectors’ top priority is Code compliance and there is some evidence that they believe Code compliance = safety.
- They believe greatest hazard is working live.
- They know electricians are working live.
- Their prevailing mental model is that electricians’ decisions to work live are primarily driven by convenience, sloppiness, disrespect for the law and/or economic pressures.
- This drives their belief that electricians need more training – some would say on Z-462 – and more enforcement:
  » As one noted, “in the last 10 years, nobody had been taught how to work live.”
- Inspectors think differently than Electricians! They are not a proxy for electricians.
- Inspectors emphasized the need for more enforcement – along with the power and resources to adequately enforce and monitor.
- Inspectors also mentioned the need for better processes and tools, for electricians, and for themselves.
- Inspectors would benefit from their own Community of Practice.
Inspectors and Electricians viewed work site hazards differently. Inspectors almost exclusively mentioned electrical hazards like working energized or high voltage tasks, while Electricians also focused on other workplace hazards such as working at heights.

**Most Hazardous Tasks**

- Inspectors (N=11)
- All Electricians (N=60)
Many (55%) Inspectors when asked what tasks needed to be worked on in an energized state believed troubleshooting or testing needed to be done energized, as compared with most (60%) of Electricians with more than 10 years’ experience and some (30%) of those with less than 10 years’ experience.

Many (55%) Inspectors and some (25%) of the Electricians spoke about mission critical environments where computer data or public safety, like in hospitals or on roadways, would be compromised.

One of the Inspectors said that working in a panel needed to be done energized as compared with (15%) of Electricians.

Only one Inspector said that no tasks, without reservation or exception, should be done energized:

» “Is there any? No. There’s nothing that important that they can’t turn it off.”
Inspectors and Electricians viewed the decision to work live differently. Inspectors, by a wide margin, characterized the decision to work live as being made by the electrician, while Electricians saw the decision as nearly equally theirs, their supervisors’ and as dictated by the task.

**Decision to Work Energized**

- Inspectors (N=11)
- Electricians (N=60)
Changing Electrician Culture and Behaviour

- A few Inspectors spoke of the challenges of changing behaviours and the culture around working energized:

  - “There are a few reasons why people work on things live, and the culture is a big one. It’s still out there that you’re brave and you’re a hero if you work on something live and that’s got to be dispelled.”

  - “It just boils down to common sense to protect yourself, and the right, to know that you don’t have to do. If it is not safe, don’t do it. But yet again, the contractors will say, ‘But I am not going to get the next contract then. I have got to work. I have got to do this.’ That is what it boils down to; it is all about money.”

- A few Inspectors talked about trying to persuade Electricians to adopt safer work behaviours:

  - “We chastise them. We give them a bit of grief by more verbal like, ‘don’t be so stupid as to do that’, but most of the time that’s where it goes and it usually stops there.”

  - “I want to talk to the individual who did the work in an energized form. I want to understand why they did it in an energized form. Was there a specific reason? Why couldn’t that have been de-energized? …”

  - “What I do is I usually try to get the attention of the person doing the work and explain to him that, ‘You know you shouldn’t be doing it, working live or whatever.’ But I think that a lot of the time it just falls on deaf ears …”
Changing Electrician Culture and Behaviour

• Another Inspector commented on enforcement and emphasized that Inspectors need to have better means of influencing compliance:
  » “We are at a loss as to what we can do as electrical inspectors because all we can do is preach to them. I find that our hands are sort of tied as to what we can do. I can only come up to the guy and tell him that you shouldn’t be working live and explain to him why but we really have no enforcement of that aspect.”

• One spoke of the need to focus on management specifically getting the buy in and support of management:
  » “It is not just the front line worker that we have to focus on, it is management. I don’t even know how many safety courses I teach in a year… probably thirty or forty safety courses annually and I am lucky if I have a manager in the room for those courses. They send all their front line guys and many times they say, ‘Where is the manager? You mean that is supposed to be in our policy? Like hell… they are not going to buy that.’ Ultimately, it does come from the top down. You can train the front line guys all you want. If they don’t feel like they have the support to do what you are telling them they need to do to be safe, they are not going to do it.”
Complexity of Work Tasks

- Inspectors generally talked about the same themes as Electricians regarding the impact of quality and condition of electrical components being worked on and their effect on safety:
Inspectors tended to focus more on general job site characteristics than Electricians did, often comparing different types of job sites they inspect, and less on the importance of good housekeeping at the job site:

![Job Site Influences on Safety Diagram](image-url)
Complexity of Social Environment

- Inspectors, more so than Electricians, discussed issues related to having multiple trades at a job site as an impact on safety while fewer mentioned the importance of good communication:

Co-Workers' Impact on Safety

- Communication at Job Site
- Work Habits
- Multiple Trades
- Mindfulness of Surroundings

inspectors (N=11) electricians (N=60)
Effectiveness of Regulations

- Most Inspectors and Electricians (75%) said that regulations were “Very” or “Somewhat” effective. More Inspectors and Electricians, however, rated the regulations as “Somewhat” effective.

![Effectiveness of Regulations Chart]

- Inspectors (N=11)
- Electricians (N=60)
Effectiveness of Regulations

• Some Inspectors (25%) who rated the effectiveness of regulations as “Somewhat” or “Not” effective, cited the lack of enforcement:
  » “Our regulations for working live are zero percent effective. Everybody knows in the industry that if I was to go out there and catch somebody working live, the contractor would phone my boss or higher and ESA would eventually cave in and give up. They will say don’t do it again and we will send you a strongly worded letter.”

• One Inspector spoke of the lack of monitoring or follow up following an inspection:
  » “We have a system in place where we can document and track anything we have and give them warnings and proceed to the next level but unfortunately that’s how it goes. It’s a tracking tool. It’s nothing to stop them from doing things like that. You give them the verbal ‘you shouldn’t do that’ and we send them paperwork to educate their employees, but we never follow up and see whether they’re smarter afterwards than they were before. We do have a tool on the ESA internet to track it and send out paperwork, but that’s as far as it goes. We don’t follow the tracking and we don’t know whether it’s successful or not.”
Challenges Faced By Inspectors

• Inspectors face many challenges in doing their jobs to ensure Code Compliance.

• Some are frustrated and feel they don’t have adequate tools, power and in some cases, support, to change electricians’ safety behaviour:
  » They don’t have the power or resources to adequately enforce and monitor.
  » They lack adequate tools to track electricians’ performance, provide coaching and training.
  » Some feel they don’t have adequate support from ESA or the management of organizations the electricians are working for.

• But at the end of the day, all Inspectors believed electrical work is safer today than 10 years ago due to improved procedures and guidelines, increased awareness, an improved culture of safety and increased education and training.
Considerations – Inspectors

• Inspectors play an important role in the safety system

• Producing the desired results – sustainable behavioural change resulting in better safety performance across the industry requires active engagement by inspectors

• Enforcement is only one tool – “a stick”
  » There are many other factors influencing the achievement of a sustainable safety culture

• Inspectors as safety advocates could:
  » Identify training opportunities, including the use of hazard assessment tools, and training on how to determine when it is critical to work live, then how work live safely when required
  » Identification of mentoring opportunities

• Inspectors need tools to support:
  » Safety advocate role
  » Monitoring and follow up with individuals and organizations
  » Communications and lessons learned among the Inspector Community of Practice
Discussion of Research and Considerations
The Strategic Opportunity for ESA

Nothing changes until behaviour changes

• Be a **catalyst** in the establishment of a *culture of safety* across the electrician profession that will produce sustainable, measureable behavioural outcomes year over year:

1. Support the establishment of an electrician-focused Community of Practice

2. Foster development of appropriate training and decision support tools to support electricians’ on-the-job decision making, primarily: 1) hazard assessment; 2) mental rehearsal; and 3) effective communication

3. Engage inspectors as safety advocates and provide them with the tools they need to be successful coaches, enforcers and monitors
Creating a New Culture

- **Commitment**
  - New culture
  - Institutionalize behavior

- **Resolution**
  - Attitudinal change
  - Choice, opt in/out
  - Option examination

- **Consciousness raising**
  - Understanding & priority
  - Awareness & relevance
  - Introduce

- **Planning & Development**
  - Time

- **Awareness & relevance**
  - Understanding & priority

- **Commitment**
  - New culture
  - Institutionalize behavior

- **Resolution**
  - Attitudinal change
  - Choice, opt in/out
  - Option examination

- **Consciousness raising**
  - Understanding & priority
  - Awareness & relevance
  - Introduce

- **Planning & Development**
  - Time
Key Components of Sustainable Behavioural Change

- Enforcement & Monitoring
- Formal Training
- On the Job Training & Experience
- Peer-to-Peer Coaching & Mentoring
- Decision Support Tools

An international team of scientists and management professionals, Decision Partners is a global expert centre for applied research in judgment, decision making and behaviour, and behavioural communication science.

Decision Partners is the creator of Mental Modeling Technology™, a unique, science-informed management process for developing programs – policies, strategies and communications – for belief and behaviour change. And we are the hub of a large, global and rapidly growing community of clients and users of Mental Modeling Technology™ applying proven, scientifically sound methods to help better understand and shape their environment.

For more information about Decision Partners, contact: Gordon Butte and Sarah Thorne, 1-877-588-9106 gbutte@decisionpartners.com; sthorne@decisionpartners.com