

STATE OF ILLINOIS
ILLINOIS COMMERCE COMMISSION

COMMONWEALTH EDISON COMPANY)
)
Petition for Statutory Approval of a Smart Grid)
Advanced Metering Infrastructure Deployment Plan)
Pursuant to Section 16-108.6 of the)
Public Utilities Act)

Docket No. 12-0298

DIRECT TESTIMONY
OF

MEGAN SANDEL
MD, MPH

ON BEHALF OF

AARP and THE PEOPLE OF THE STATE OF ILLINOIS

AARP/AG Ex. 2.0

May 11, 2012

TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
I. INTRODUCTION.....	1
II. DESCRIPTION OF THE NATIONAL CENTER FOR MEDICAL LEGAL PARTNERSHIPS AND ITS WORK.....	5
III. HEALTH IMPACT ASSESSMENTS AND IMPACTS ON PUBLIC POLICY DECISION-MAKING PROCESS.....	10
IV. COMED AMI HIA SCREENING AND SCOPING.....	13
V. DESCRIPTION OF THE COMED AMI HIA ASSESSMENT’S SYSTEMATIC DATA REVIEW.....	19
VI. AMI’S IMPACT ON FUEL POVERTY AND THE RISK OF RAPID DISCONNECTIONS FOR NONPAYMENT.....	22
VII. AMI DEPLOYMENT AND THE THREAT TO HEALTH AND SAFETY OF VULNERABLE CUSTOMERS.....	27
VIII. COMED AMI HIA RECOMMENDATIONS.....	33

1 **I. INTRODUCTION**

2 **Q. PLEASE STATE YOUR NAME AND ADDRESS.**

3 **A.** My name is Megan Sandel, MD, MPH. My office is located at 88 E Newton St Vose Hall
4 304, Boston MA 02118 at Boston Medical Center and Boston University School of Medicine
5 where I am an Associate Professor in Pediatrics and Environmental Health. I am interim
6 executive director of the National Center for Medical Legal Partnership.

7
8 **Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?**

9 **A.** I have been asked to provide comments on behalf of the People of the State of Illinois, as
10 represented by the Illinois Attorney General’s Office and AARP to specifically comment on the
11 potential health impact of Commonwealth Edison’s Advanced Metering Initiative, particularly
12 on vulnerable customers such as children, the elderly, people with chronic disabling conditions,
13 the socially isolated and people for whom English is a second language. In this testimony, I will
14 reference a report called the Health Impact Assessment (“HIA”) of the Commonwealth Edison
15 (“ComEd”) Advanced Metering Infrastructure (AMI) Deployment (“ComEd AMI HIA”),
16 recently released by the National Center for Medical-Legal Partnership (“NCMLP”). I will
17 identify specific recommendations from the report as well as my own opinion as a physician and
18 public health expert that should be considered by the Illinois Commerce Commission (“ICC” or
19 “Commission”) respecting the ComEd’s AMI deployment proposal (“ComEd AMI Plan”)
20 currently before the ICC.

21

22 **Q. PLEASE SUMMARIZE YOUR QUALIFICATIONS AND BACKGROUND**

23 A. I am the Interim Executive Director of the National Center for Medical-Legal Partnership
24 and am an Associate Professor of Pediatrics at the Boston University School of Medicine, the
25 former Director of Pediatric Healthcare for the Homeless at Boston Medical Center, a research
26 scientist with Children's Health Watch and a nationally recognized expert on housing and child
27 health. I served as a general academic fellow at Boston Medical Center with a concentration in
28 environmental health in children, earning a Masters of Public Health with a dual concentration in
29 environmental health and epidemiology and biostatistics in 2002. In 1998, I published with other
30 doctors at Boston Medical Center, the DOC4Kids report, a national report on how housing
31 affected child health. In 1999, I followed as an author on "There's No Place Like Home," a
32 second report documenting how asthma, lead, injuries, homelessness, food insecurity, chronic
33 disease and educational attainment were all affected by housing. In 2000, I was a co-Principal
34 Investigator of the Boston Healthy Homes Partnership, a grant from Department of Housing and
35 Urban Development to the Boston Public Health Commission, to study if housing changes
36 improved the health of children with asthma. I am a founding member of the Asthma Regional
37 Council of New England. Over the course of my career, I have written numerous scientific
38 articles and papers. I serve on numerous committees and advisory boards, such as the National
39 Center for Healthy Homes, a national advocacy group, and both the American Academy of
40 Pediatrics Committee on Environmental Health and Massachusetts Chapter of the American
41 Academy of Pediatrics.

42

43 **Q. WHAT IS THE PURPOSE OF THIS TESTIMONY?**

44 A. My testimony summarizes the findings of the ComEd AMI HIA regarding the potential
45 positive and negative health impacts of ComEd deployment of AMI within its service territory

46 and makes recommendations designed to increase positive health impacts and mitigate negative
47 health impacts, particularly life threatening ones, associated with the AMI installation. My
48 testimony focuses on the chief findings and recommendations of the HIA which pertain to the
49 consumer protections related to residential electrical service, the need for monitoring of service
50 status and costs for certain groups of households, and consumer education, as well as my own
51 observations as a medical doctor and public health expert on the potential negative impacts of
52 increased disconnections and homelessness associated with ComEd's proposed remote
53 disconnection practices in its AMI Plan.

54

55 **Q. PLEASE DESCRIBE THE SCOPE AND STRUCTURE OF YOUR TESTIMONY.**

56 A. My testimony will summarize the health impact assessment that the NCMLP and its
57 project team conducted, with particular attention to the findings and recommendations that I
58 believe are pertinent to this proceeding. I first discuss the NCMLP and explain its expertise in
59 developing health evidence concerning regulated utility consumer protections and its successful
60 consumer advocacy to promote health and protect at-risk consumers in Massachusetts. My
61 testimony will then introduce the tool of health impact assessment, explain why the NCMLP
62 chose to conduct an HIA around ComEd's planned rollout of AMI in its service territory, the
63 steps involved in conducting the ComEd AMI HIA, the key domains and hypotheses tested, data
64 and analyses employed, key findings in the study, and the set of five recommendations that are
65 based on those findings, along with my own views about the threat of increased disconnections
66 associated with remote disconnection. Attached to my testimony as AG/AARP Exhibit 1.1 is a
67 summary table for the ComEd AMI HIA, entitled "Predicted Health Impacts of AMI in

68 Commonwealth Edison Service Territory.” AG/AARP Exhibit 1.2 is the executive summary of
69 that report. AG/AARP Exhibit 1.3 is the full HIA report.

70

71 **Q. PLEASE SUMMARIZE YOUR CONCLUSIONS.**

72 A Less access to adequate heating or cooling, whether due to a customer’s decision to use
73 less energy in the face of higher costs or because a household has been disconnected for
74 nonpayment, can threaten health through exposure of at-risk individuals to temperature extremes
75 that can result in illness, hospitalization, or premature death related to hyperthermia (heat
76 exposure), hypothermia (cold exposure), or the aggravation of existing health conditions that are
77 temperature-sensitive. Based on the ComEd AMI HIA literature reviews, there are documented
78 risks for fires, deaths, and severe morbidity such as unnecessary hospitalization related to loss of
79 electricity from remote disconnection for nonpayment. Regulators and policy makers should
80 carefully review and evaluate the costs and the benefits of AMI from the perspective of
81 vulnerable customers and include a consideration of health impacts for not only the average
82 customers, but those most vulnerable to higher prices for essential electricity service. I believe
83 that the ComEd AMI HIA contains important research and recommendations that should be
84 considered by the Commission as it reviews ComEd’s AMI filing. Furthermore, I offer my
85 personal opinion as a medical professional regarding the increased risk of unintentional injury
86 and premature death that would result from ComEd's proposed use of AMI technology for
87 remote disconnection for nonpayment. I further explain that these risks are not only amplified as
88 a result of an increased pace of disconnections for nonpayment due to the remote disconnect
89 capability, but also as a result of implementing an AMI plan that envisions the elimination of an
90 attempted in-person contact on residential premises immediately prior to disconnection.

91 **II. DESCRIPTION OF THE NATIONAL CENTER FOR MEDICAL LEGAL**
92 **PARTNERSHIPS AND ITS WORK**

93 **Q. PLEASE DESCRIBE THE NATIONAL CENTER FOR MEDICAL LEGAL**
94 **PARTNERSHIP.**

95 A. Medical-legal partnership (“MLP”) is a new patient care model that aims to improve the
96 health and well-being of vulnerable individuals, children and families by integrating legal
97 assistance into the medical setting. MLPs address social determinants of health and seek to
98 eliminate barriers to healthcare in order to help vulnerable populations meet their basic needs and
99 stay healthy. The National Center for Medical-Legal Partnership supports the expansion,
100 advancement, and integration of the MLP model by providing technical assistance to programs
101 across the U.S. and Canada, facilitating the national MLP Network, promoting leadership in law
102 and medicine, and coordinating national research and policy activities related to preventive law,
103 health disparities, and the social determinants of health. Physicians, nurses, social workers,
104 attorneys and paralegals are now partnered at more than 290 health institutions nationwide. The
105 MLP Network is a voluntary affiliation that signals participation in a variety of activities,
106 including annual conferences, MLP leadership and project-based initiatives, regional
107 collaborations and resource sharing. The National Center for Medical-Legal Partnership helps
108 MLPs work on three core components

- 109 • (1) Legal Assistance in Healthcare settings: Attorneys and paralegals become members
110 of the healthcare team to assist patients on-site at hospitals and health centers. MLP legal
111 teams provide broad legal assistance on a broad range of issues, commonly referred to by
112 the acronym **I-HELP**, which stands for: Income, Housing and utilities, Education and
113 employment, Legal status/immigration and Personal safety.

- 114 • (2) Transforming Health and Legal Institutions and Practices: MLPs re-orient health and
115 legal services to early detection and preventive care through the training of students,
116 residents and practicing physicians. Legal providers and MLP teams improve
117 institutional practices to more effectively address patients' non-medical needs, such as
118 establishing a hospital policy regarding utility protections for low-income patients.
- 119 • (3) Policy Change: Together, healthcare providers and attorneys can have a powerful
120 voice in the policy realm. MLP teams leverage health and legal expertise to improve
121 local, state and federal laws and regulations that impact the health of vulnerable
122 populations.

123 **Q: WHAT IS THE MEDICAL LEGAL PARTNERSHIP AT BOSTON MEDICAL**
124 **CENTER?**

125 A. The Medical Legal Partnership (“MLP”) at Boston Medical Center is the first medical
126 legal partnership, started in 1993, when it was founded with the name “Family Advocacy
127 Program” at Boston Medical Center. From 2000-2002 I served as the first medical director of
128 this medical-legal partnership. It was renamed as the Medical Legal Partnership for Children in
129 2004. The National Center for Medical Legal Partnership was founded in 2005 as a division of
130 the Medical Legal Partnership for Children. In 2009 the Medical Legal Partnership at Boston
131 Medical Center and the National Center for Medical Legal Partnership were established as two
132 separate organizations at Boston Medical Center.

133 I have continued to work with the Medical Legal Partnership at Boston Medical Center in
134 many capacities. First, I refer patients who I see clinically to be served by the MLP at Boston
135 Medical Center. Second, I educate pediatric residents, public health professionals and other
136 community members around legal needs in conjunction with the MLP at Boston Medical Center.

137 Third, I continue to do local policy work with the MLP at Boston Medical Center, such as
138 enforcement of housing codes or utility regulations.

139 **Q. PLEASE PROVIDE AN EXAMPLE OF HOW THE NATIONAL CENTER FOR**
140 **MEDICAL LEGAL PARTNERSHIPS AND THE MEDICAL LEGAL PARTNERSHIP**
141 **AT BOSTON MEDICAL CENTER HAS ADVOCATED SUCCESSFULLY AROUND**
142 **CONSUMER PROTECTIONS FOR HEALTH AND SAFETY RELATED TO ENERGY**
143 **ISSUES.**

144 As a point of background, the Low Income Home Energy Assistance Program (LIHEAP)
145 is a federal program that was established in 1981 with the mission to assist low income
146 households, particularly those with the lowest incomes that pay a high proportion of household
147 income for home energy, in meeting their immediate home energy needs through grants to help
148 cover utility bills and enable investments in energy efficiency. In 1994, LIHEAP was amended to
149 target the most vulnerable families, namely those with a child under the age of 5, an individual
150 with disabilities, or an adult over the age of 65.

151 Despite these grants, many families still fail to receive LIHEAP benefits, or receive less
152 than the maximum amount to which they are entitled. In light of these facts, the NCMLP and
153 various members of a working group at Boston Medical Center, where I have been employed
154 since 1999, completed a study in 2007 entitled the Children's Health Impact Assessment (CHIA)
155 that looked at how rising energy costs impact low-income families and the associated health risks
156 when families struggle to pay their utility bills. I was a member of the working group who co-
157 authored the CHIA. The CHIA examined how household budget trade-offs impact the health of
158 children. In the northeast, home heating makes up approximately 44% of a families' home

159 energy expenditures¹. The CHIA analyzed households in 2006, during which time 143,309
160 Massachusetts' families received LIHEAP assistance, though there were 189,600 families with
161 young children who were eligible. The study documented that there were more than 400,000
162 children in low-income families, 173,099 of whom lived below the poverty line and 56,715 of
163 whom were below the age of 5. The CHIA examined indoor air quality; nutrition impacted by
164 food insecurity, which is generally defined as lack of consistent access to sufficient healthful
165 food for all family members to live an active, healthy life; access to regular checkups, which are
166 essential for children younger than 5; and mental health issues that arise due to housing
167 instability.

168 The results of the CHIA demonstrate that many families reported making budget trade-
169 offs due to the burden of their energy bills. For example, 73% of families reported that they
170 reduced spending on household necessities because they did not have enough money to pay the
171 energy bills. Twenty percent of families went without food, 28% went without medical or dental
172 care, and 23% did not make full rent or mortgage payment at least once. The findings of the
173 CHIA show how the energy burden to low-income families, especially those with young
174 children, has huge implications for health outcomes. The trade-offs that families are forced to
175 make can impact child health, and these families may resort to alternative heating sources, which
176 can put their children in danger in the home.

177 The findings of the CHIA were presented to the state legislature in testimony before the
178 joint committee on housing by lead author Dr. Lauren Smith. Members of NCMLP and the

¹ **Smith LA**, Harrison E et al. *Unhealthy Consequences - Energy Costs and Child Health: A Child Health Impact Assessment of the Low Income Home Energy Assistance Program*, Child Health Impact Assessment Working Group, Boston, MA, November 2006.(Report access at <http://www.hiaguide.org/hia/child-health-impact-assessment-energy-costs-and-low-income-home-energy-assistance-program-liheap>)

179 CHIA working group successfully advocated for more appropriations for LIHEAP in
180 Massachusetts, in light of these findings.

181 The Medical-Legal Partnership in Boston at Boston Medical Center and the NCMLP
182 have also been instrumental in influencing policy changes at the state level to lessen the burden
183 of documentation of medical certifications that protect utility service for patients. In 2009, MLP
184 Boston was receiving many calls from physicians regarding patients' utility-related concerns.
185 Specifically, patients needed assistance from the medical staff relative to their fear of utility
186 disconnections (and the resulting inability to use medical devices such as nebulizers) due to
187 inability to pay. As a result, the MLP at Boston Medical Center established a weekly Energy
188 Clinic to consult with patient-clients about their specific questions pertaining to protecting utility
189 service, receiving appropriate financial assistance and entering payment plans to repay utility
190 arrearages. In addition, Energy Clinic staff assisted families in determining whether they were
191 eligible for other public benefit programs, such as Supplemental Nutrition Assistance Program
192 (SNAP) in order to avoid the need for families choosing between energy and food bills. Because
193 of the Energy Clinic at BMC, the physicians were better equipped to help patients obtain utility
194 shut-off protection.²

195 **Q WHAT ELSE INFORMS YOUR WORK AND VIEWS AS A PUBLIC HEALTH**
196 **EXPERT ON THE ESSENTIAL NATURE OF UTILITY SERVICE?**

197 A. Peer-reviewed publications by Boston Medical Center faculty affiliated with the National
198 Center for Medical Legal Partnerships document the harm of energy insecurity for infants and

² Pullen, B et al , Energy Clinic: A Toolbox for Helping Families Heat AND Eat, Boston Medical Center February 2008, accessed at <http://www.mlpboston.org/results/mlp-boston-publications>.

199 young children. A 2008 publication by Cook et. al³. analyzed the correlation between energy
200 security and child development in the pediatric setting. The researchers conducted a cross-
201 sectional study, using caregiver interviews to give each family an energy security score, the
202 factors of which included whether the family had their utility threatened to be shutoff or actually
203 shutoff, alternative of heating, and days without heating or cooling. Health outcomes measured
204 included child reported health status, hospitalizations, and Parents Evaluation of Developmental
205 Status. The findings of this study show that between 11% and 23% of children experience severe
206 energy insecurity. Children with severe energy insecurity had greater odds of caregivers
207 reporting significant developmental concerns and greater odds of caregivers reporting “fair/poor”
208 health for these children. Both moderate and severe energy insecurity correlated with an
209 increased likelihood of household food insecurity and child food insecurity.

210

211 **III. HEALTH IMPACT ASSESSMENTS AND IMPACTS ON DECISION-MAKING** 212 **PROCESS**

213

214 **Q. WHAT IS A HEALTH IMPACT ASSESSMENT?**

215 A. A Health Impact Assessment (HIA) is “a combination of procedures, methods and tools that
216 systematically judges the potential, and sometimes unintended, effects of a policy, plan, program
217 or project on the health of a population and the distribution of those effects within the

³ Quigley R, L de Broeder, P Furu, A. Bond, B. Cave, R. Bos. (2006). Health Impact Assessment International Best Practice Principles. Special Publication Series No. 5. Fargo, South Dakota, USA: International Association for Impact Assessment. (available at <http://www.iaia.org/publicdocuments/special-publications/SP5.pdf>)

218 population. HIAs identify appropriate actions to manage those effects”⁴, and is an approach to
219 policy analysis that makes visible the consequences related to *health and safety* aspects of a
220 policy decision. It is a systematic, data-driven methodology to evaluate the health outcomes
221 likely to be associated with a specific policy or program decision, with a focus on policy arenas
222 outside the traditional realm of public health and health policy. These realms include, for
223 example, energy, education, housing, immigration, criminal justice, and employment. HIA
224 impacts are identified, prioritized, and evaluated systematically in order to make
225 recommendations about how to minimize negative impacts and maximize positive impacts.
226 Conducting a HIA involves reviewing literature, court cases, or media coverage to develop
227 hypotheses that link the policy decision to health impacts. A core principle of HIA is health
228 equity, and HIA particularly focuses on the health impact of policies on vulnerable populations.
229 HIA is a flexible research process that typically involves six steps:

230 **1. Screening:** determines whether an HIA is warranted and would be useful in the decision-
231 making process;

232 **2. Scoping:** determines which health impacts to evaluate, the methods for analysis, and the
233 workplan for completing the assessment;

234 **3. Assessment:** includes gathering existing conditions data and predicting future health impacts
235 using qualitative and quantitative research methods;

236 **4. Recommendations:** engages partners by prioritizing evidence-based proposals to mitigate
237 negative and elevate positive health outcomes of the proposal;

238 **5. Reporting:** communicates findings; and

⁴ Quigley R, L de Broeder, P Furu, A. Bond, B. Cave, R. Bos. (2006). Health Impact Assessment International Best Practice Principles. Special Publication Series No. 5. Fargo, South Dakota, USA: International Association for Impact Assessment. (available at <http://www.iaia.org/publicdocuments/special-publications/SP5.pdf>)

239 **6. Monitoring:** evaluates the effects of the HIA on the relevant policy decision and its
 240 implementation as well as on health determinants and health status.

241

242 **Q. HOW ARE HEALTH IMPACT ASSESSMENTS USED TO IMPROVE DECISION-**
 243 **MAKING ON A POLICY OR PROGRAM?**

244 A. There are many different factors that influence health, from those that are beyond
 245 individual control (e.g., age, gender, genetics) to those that are linked to individual behavior
 246 (e.g., smoking, drinking, exercising, eating), to structural factors, which include:

- 247 • Access to public services and infrastructure (such as education and health care),
- 248 • Living and working conditions (such as housing quality and workplace hazards), and
- 249 • Social and economic factors (such as social cohesion and neighborhood poverty).

250 One recent peer-reviewed analysis⁵ estimated that genetics was responsible for 20% of
 251 health status, health care comprised another 10%, and the remaining 70% was attributable to
 252 social, environmental, economic and behavioral factors.

253 Conducting HIAs can also help decision makers assess policy proposals, avoid
 254 unintended consequences and costs, and advance smarter, cost-effective policies that promote
 255 health. HIAs are conducted with the following goals in mind:

- 256 • Save costs over the long-term by identifying ways to minimize adverse health
 257 outcomes that come with costs such as lost productivity, higher health services
 258 utilization, higher rates of disability and premature death.

⁵: J. Michael McGinnis, Pamela Williams-Russo, and James R. Knickman
 The Case For More Active Policy Attention To Health Promotion Health Aff March 2002 vol. 21 no. 2 78-93
 (accessed <http://content.healthaffairs.org/content/21/2/78.long>)

- 259 • Be a flexible process that can be tailored to the timeframe of decision-making,
 260 whether policies are made after a day-long deliberation to one that spans years.
 261 An HIA generally saves time by offering non-partisan, problem-solving forum
 262 that has potential to defuse conflict and resolve policy differences efficiently.
- 263 • Promote smart economic development by identifying and addressing potential
 264 concerns proactively.

265

266 **IV: COMED AMI HIA SCREENING AND SCOPING**

267 **Q. WHY DID NCMLP DECIDE TO CONDUCT AN HIA ABOUT DIGITAL METERING** 268 **IN ILLINOIS, WITH SPECIFIC FOCUS ON THE CHICAGO AREA?**

269 A. The purpose of the ComEd AMI HIA was to evaluate the potential health impacts of the
 270 deployment of AMI for residential customers in the ComEd service territory in Illinois. The
 271 purpose of this HIA was not to evaluate whether or not AMI meters should or should not be
 272 deployed, but rather to highlight the health and safety aspects of AMI for consideration by the
 273 ICC as it reviews proposed AMI deployment plans. The data-driven, systematic nature of HIA
 274 offers a unique opportunity to incorporate health explicitly into the terms set by the ICC so that
 275 AMI deployment maximizes its potential to promote health and minimizes the likelihood that
 276 consumers, especially those from households which struggle to pay utility bills, will be harmed.

277 The connection between access to affordable electric service and health has largely gone
 278 unacknowledged in debates about AMI deployment. To address this gap, the National Center for
 279 Medical-Legal Partnership, Citizens Utility Board, Consumer Affairs Consultant Barbara R.
 280 Alexander, and Energy Programs Consortium Consultant Lynne Snyder conducted this HIA
 281 between July 2010 and April 2012 to examine the potential health impacts of AMI deployment,

282 and the consumer protections associated with AMI, and to make recommendations to address the
283 potential adverse impacts on vulnerable populations.

284 At the time the ComEd AMI HIA was undertaken, it was expected that ComEd would
285 seek to file a proposal for full deployment of AMI and that such a proposal would outline the
286 costs and potential benefits of such an investment. I am advised by counsel that in the fall of
287 2011, the Illinois legislature created a new ratemaking system for electric utilities that would
288 include deployment of AMI throughout an electric utility's service territory in exchange for a
289 change in how these utilities rates are set. This proceeding is a result of that legislation. My
290 testimony is intended to provide additional information that the ICC should consider in any
291 proposal for full scale AMI deployment.

292 As the ComEd AMI HIA reports, deployment of AMI within ComEd's service territory
293 represents a transformation of the relationship between the utility and residential customers,
294 facilitating the collection and dissemination of more detailed information about energy usage,
295 new opportunities to communicate this information in order to influence customer behavior
296 around energy usage, and managing energy consumption from the standpoint of infrastructure
297 operations as well as rates governing the pricing of electrical service. It may also have
298 unintended consequences. For example, activation of AMI's remote disconnect capability is
299 likely to influence the health of the Illinois population given the connections between access to
300 electrical service, health and safety, especially for residents of low- and moderate-income
301 households. This HIA identifies and analyzes the elements of this transformation related to the
302 cost and terms of residential electrical service, with the goal of making visible the implications
303 for health of AMI deployment in order to inform decision-making.

304

305 **Q. WHAT HYPOTHESES LINKING AMI TO HEALTH OUTCOMES DID THE**
306 **HIA TEAM DEVELOP FOR TESTING IN THE COMED AMI HIA?**

307 A. In the scoping stage of the ComEd AMI HIA, the HIA team developed a set of
308 hypotheses about the relationship between AMI deployment and health, based on presentations
309 made at initial project meetings and input received from community stakeholders. These
310 hypotheses became the basis for the research questions at the core of the HIA.

311 In articulating these hypotheses, particular attention was paid to “vulnerable” or at-risk
312 populations as a subset of residential customers generally, since most utility proposals focus on
313 the “average” customer. Rarely do utility regulators or policymakers have information about
314 subsets of residential customers that might respond differently from or require specific needs
315 compared to “average” customers. For the purpose of the ComEd AMI HIA, “vulnerable
316 populations” refers to “five groups within the general population that are at greater risk for
317 adverse health outcomes”. They include: the very young (from birth to age 5), older individuals
318 (age 65 and older), individuals with a functional disability such as impaired mobility, persons
319 who are socially isolated, and, those who have limited English proficiency or literacy. It is
320 important to note that low and moderate income customers are also vulnerable, particularly for
321 issues related to electricity costs and potential trade-offs between food, rent and medicine. In the
322 ComEd AMI HIA we highlighted the above groups of the young, elderly, disabled, socially
323 isolated and limited English proficiency beyond low and moderate income populations as well.
324 The ComEd AMI HIA team prepared four pathway diagrams to depict the set of hypotheses⁶;

325

⁶ See Appendix 2 in the full report AG/AARP Exhibit 2.3.

- 326 • The first pathway identified the potential positive and negative health impacts of AMI
327 deployment generally, irrespective of the variable pricing programs, and with a focus on
328 at-risk, vulnerable groups. Hypothesized impacts include the potential for increased
329 electrical bills for cost recovery of AMI deployment; potential changes in non-ionizing
330 (EMF) radiation exposure; potential changes in reliability or remote connection; and
331 possibility for remote disconnections.
- 332
- 333 • The second, third and fourth pathways set out hypotheses related to dynamic pricing, in
334 particular critical peak pricing, peak time rebates, and time of use rates, again with
335 attention to the impact on vulnerable populations. These health impacts were scoped to
336 consider the potential for pricing plans to influence changes in usage (at the level of peak
337 load demand for energy or overall usage), the resulting potential impact on green house
338 gas emissions, and changes in prices of energy and impact on health. All scoping
339 pathways shared the same set of health determinants and hypothesized range of health
340 outcomes, irrespective of the type of rate plan for electrical service.

341

342 **Q. WHAT HEALTH AND SAFETY DOMAINS ARE STUDIED IN THE COMED AMI**

343 **HIA?**

- 344 A. The pathway diagrams in the study identified domains or determinants of health impacts
345 that are potentially influenced by AMI, including fuel poverty, housing adequacy and potential
346 exposure to non-ionizing (EMF) radiation, loss of electricity generally and from remote
347 disconnection for non-payment specifically, unintentional injuries and premature deaths,
348 vulnerability to heat or cold, and ambient air pollution. These domains are defined as follows:

349 **Fuel Poverty:** The inability to afford basic electrical service or other energy needs. The
350 term describes the condition of households that pay more than 10% of available income for
351 energy. In the general population that is not low income, households typically pay no more than
352 4% of total household income for energy. The financial pressures of trying to pay high home
353 energy bills, and related decisions not to use needed electricity in order to avoid high bills, leads
354 to trade-offs among household budget items that are often labeled “heat or eat.”

355 **Housing Adequacy:** The physical environment of a dwelling itself has myriad influences
356 on health, some related to the fiscal strains associated with fuel poverty and others related more
357 specifically to indoor air quality and exposures related to AMI, including anticipated exposure to
358 non-ionizing radiation from the digital meter’s radio transmitters. For example, access to central
359 air-conditioning is the single most significant factor predicting positive health outcomes in
360 summer, and disparities in access to central air-conditioning account for two-thirds of the
361 disparity in summer death rates for urban African Americans, compared with their white peers,
362 according to a study of four Midwestern American cities.

363 **Loss of Electrical Service:** Limited systematic evidence about outcomes related to loss
364 of service typically come from studies of blackouts, as well as anecdotal news reports, legal
365 cases, and collections of case studies investigated by the CDC and other public agencies. As the
366 ComEd AMI HIA Report notes, one study by a medical examiner’s office (Onandaga County,
367 Michigan)⁷ traced deaths over a decade connected with the loss of residential electrical service,
368 finding 7 deaths associated with the shutoff of service, 4 of which occurred following the
369 unintentional disconnection of service due to weather and 3 due to disconnection for

⁷ Stoppacher et al, Fatalities Associated with Termination of Electrical Services, 2008 American Journal of Forensic Medical Pathology, September 2008 - Volume 29 - Issue 3 - pp 231-234.

370 nonpayment. Shut-off of service for nonpayment increases the likelihood that consumers will use
371 risky, alternative means to heat or light their homes, degrading the quality of housing,
372 influencing the rate of unintentional injuries and deaths, and increasing homelessness and
373 instability of housing for elders and persons living with a disabling condition.

374 **Unintentional Injuries and Premature Deaths:** This domain is related not only to fuel
375 poverty and the adequacy of housing but also to how households respond to the loss of electrical
376 service, especially if a household member relies on an electrically-powered medical device, or to
377 a consumer's decision not to use electrical service because of concerns about cost. There are fire
378 and poisoning risks related to the use of gasoline-powered generators, kerosene space heaters,
379 gas stoves and ovens used for heat, and candles.

380 **Vulnerability to Heat or Cold:** Population response to ambient temperatures, both
381 indoors and out, reflect a number of factors, including the capacity of housing infrastructure to
382 concentrate or buffer weather conditions, and the degree to which residents adjust. Impacts can
383 be measured by changes in death (mortality) rates, emergency room visits, and hospitalizations,
384 among other indicators.

385 **Ambient Air Pollution:** Coal-fired electricity generating plants emit air pollutants that
386 harm health, including particulate, heavy metals, acidic gases, and carbon-based greenhouse
387 gases that contribute to climate change. The use of new pricing programs and customer
388 education enabled by AMI may reduce peak energy usage or overall energy usage, lowering
389 greenhouse gas emissions. The remote functionality of AMI might also eliminate field visits to
390 disconnect or reconnect electrical service, lowering ambient air pollution levels by removing
391 trucks and their related emissions from the road.

392

393 **V: DESCRIPTION OF THE COMED AMI HIA ASSESSMENT'S SYSTEMATIC DATA**
 394 **REVIEW**

395
 396 **Q. WHAT RESEARCH QUESTIONS GUIDED THE HIA ANALYSIS?**

397 A. The HIA team developed three sets of research questions, based on the hypotheses
 398 described in the HIA scoping pathways and input from stakeholders. The questions are as
 399 follows:

400 1. How will the cost of AMI deployment impact health outcomes in general? How much
 401 greater will the impact be on vulnerable populations as a result of AMI deployment?

402 2. Will dynamic pricing programs result in decreased usage and/or a shift in usage, or
 403 will it not have any impact on usage?

404 3. How will digital metering technology affect reliability of service and how will it
 405 impact the number of remote disconnections? How will the ability to disconnect for non-
 406 payment affect the number of disconnections and how will that impact vulnerable populations?

407

408 **Q. WHAT DATA SOURCES AND METHODS ARE USED IN THE COMED AMI**
 409 **HIA ANALYSIS?**

410 A. The ComEd AMI HIA employed both qualitative and quantitative methods, including
 411 original literature reviews focusing on digital metering and AMI, as well as the biomedical and
 412 social scientific literature related to fuel poverty, temperature exposure, and access to residential
 413 utility service. The review of the energy literature included an analysis of legislation and
 414 regulatory cases in Illinois and other states related to AMI and to health and safety-based
 415 regulated consumer protections.

416 The ComEd AMI HIA included analysis of two reports produced in connection with
 417 ComEd's AMI pilot. The first was an evaluation of the AMI pilot's Customer Applications Pilot

418 of the 8,000 households, developed by the Electric Power Research Institute (EPRI). The second
419 was an evaluation of the costs and benefits predicted for AMI deployment, based on the
420 operational performance of the technology in ComEd's pilot, developed by the consulting firm
421 Black & Veatch as a part of the ComEd AMI Pilot.

422 The project team also conducted an original analysis of existing data, including a health
423 profile for the geographic areas included in the HIA. To characterize the population of
424 households served by Commonwealth Edison in both the AMI pilot footprint and ComEd's
425 service territory, the HIA team used eight existing data sources to create an approximate county-
426 level profile of specific risk factors identified through the scoping process and from the literature
427 reviews.⁸

428 There also was an original re-analysis of existing data. Under an agreement negotiated
429 with Commonwealth Edison, the HIA team gained access to pilot program data, including
430 demographic information from a survey of customers participating in the pilot program, the
431 number of bills eligible for disconnection and plans for evaluation. The HIA team used these
432 data to:

- 433 • estimate bill impacts of AMI for pilot households, compared with system-wide averages,
- 434 • develop estimates of the numbers of households at-risk for disconnection during the pilot
435 period;
- 436 • identify demographic and socioeconomic characteristics that correlate with self-reported
437 changes in energy use behavior by pilot participant households; and

⁸ These datasets include the U.S. Census Bureau's American Housing Survey; the U.S. Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance Survey, the National Energy Assistance Directors' Association's annual national telephone sample survey of LIHEAP recipient households in selected states; U.S. Department of Agriculture data on food insecurity; data and selected indicators on Illinois from The County Health Rankings Project housed at the University of Wisconsin Population Health Institute; vital statistics on leading causes of death for Illinois collected and reported by the State Department of Public Health; and Claritus data, a commercial product based on U.S. Census data, provided to the HIA team by Commonwealth Edison.

- 438 • predict impacts of AMI deployment on greenhouse gas emissions.

439 The team also developed an analysis of new survey data. The HIA team commissioned
440 two original surveys designed as convenience (non-representative) samples to capture the
441 experiences of low-income household electrical consumers with AMI during the ComEd pilot
442 period:

- 443 • **Survey of LIHEAP applicants.** HIA principals developed an online survey that was
444 administered, either in paper format or online, to a sample of ComEd customers in the
445 pilot territory who were applying for LIHEAP. The survey was administered by the South
446 Austin Coalition, Age Options, and the Community and Economic Development
447 Association of Cook County (CEDA). The objective was to capture household
448 experiences with trade-offs between energy costs and basic needs.
- 449 • **Loyola University Medical Center survey of Maywood neighborhood residents.** A
450 field epidemiological group based at Loyola University of Chicago's Stritch School of
451 Medicine's Department of Preventive Medicine and Epidemiology designed and
452 administered a small-scale, illustrative survey of AMI pilot households about health
453 status, energy use behavior, and perceived trade-offs related to the cost of electric service,
454 as part of a series of neighborhood surveys related to unemployment, poverty, and health
455 among Hispanic residents. The Maywood survey sampling frame was designed to capture
456 the experiences of ComEd AMI pilot households that included African Americans and
457 elders, on the basis of findings from the HIA literature review.

458

459

**VI: AMI'S IMPACT ON FUEL POVERTY AND THE RISK OF RAPID
DISCONNECTIONS FOR NONPAYMENT**

460
461
462

463 **Q. WHAT DID THE COMED AMI HIA FIND ABOUT THE HEALTH IMPACT OF**
464 **ELECTRIC RATES?**

465 A. Significant proportions of Illinois residents have characteristics that put them at greater than
466 average risk of adverse health impacts if they have less access to electrical service, or
467 characteristics that indicate a heightened health risk, including:

- 468 • difficulties paying for housing, health care, and food;
- 469 • problems heating or cooling their homes due to cost (including a lack of access to central
470 air-conditioning, the single strongest protection against heat-related illness);
- 471 • reliance on electricity for heat or to power medical devices; and
- 472 • sub-standard housing quality.

473 Across Illinois, almost 1 million households (924,152) are income-eligible to receive energy
474 assistance and are at risk of adverse health outcomes related to fuel poverty, substandard
475 housing, or temperature exposure. Particularly vulnerable are households that include a senior
476 (33.8%), a young child (21.4%), or someone living with a disabling condition (10.7%). ComEd's
477 31 county service territory includes most of these households, as it encompasses about 79% of
478 the state's population.

479 Cook County was used as a proxy for analyzing the prevalence of vulnerable populations
480 of the AMI pilot. Cook County is home to a higher proportion of people within the ComEd AMI
481 HIA's definition of "vulnerable populations." The Chicago region's population lives with a
482 burden of chronic ailments including asthma (14.5% of all children), heart disease (28.9% of all
483 adults), and diabetes (8% of adults). These illnesses, as well as kidney (renal) disease,

484 neurologic diseases like Parkinson’s and other respiratory conditions (influenza, pneumonia,
485 asthma, and chronic obstructive pulmonary disorder) are made worse by exposure to excessive or
486 inadequate temperatures, as well as by increased indoor humidity linked to inadequate home
487 heating or cooling, and higher indoor levels of nitrogen dioxide from stoves or ovens used for
488 heat.

489 The literature reviewed in the ComEd AMI HIA⁹ finds that fuel poverty is tied to the
490 diminished capacity of households to purchase basic necessities such as food and clothing, less
491 access to health care and prescription medications, greater likelihood of involuntary loss of
492 utility service for nonpayment, and greater hunger among seniors and young children. Fuel-poor
493 households close off parts of their home to reduce energy bills and leave home for part of the
494 day, incurring stress that can lead to criminal activity among teenagers and increased social
495 isolation among adults. Even for seniors who are not low-income, sensitivity to the perceived
496 price of electrical service can influence a decision not to use air-conditioning during summer
497 heat.

498 Among vulnerable populations such as Cook County LIHEAP applicants, a computer-
499 assisted survey administered on an opt-in (voluntary) basis found greater stress related to paying
500 utility bills and to making bill related trade-offs that put health and safety at risk, compared with
501 energy assistance recipients nationally. Compared with all households in the ComEd pilot
502 footprint, respondents are much more likely to report a household member with a temperature-
503 sensitive condition including asthma, chronic obstructive pulmonary disorder, and heart disease.
504 A survey within one pilot footprint neighborhood (Maywood) highlights risks related to fuel
505 poverty and the prevalence of temperature-sensitive conditions. Interview respondents reported

⁹ See Appendix 1.3 for full set of references.

506 being half as likely to use electricity for heating as pilot footprint customers, and therefore were
507 buffered somewhat against the cost for fuel in winter, but also less likely to have access to
508 central air-conditioning, presenting a potential health threat in summer. Many reported trouble
509 paying household bills and turning down the air-conditioning in summertime in response to
510 energy bills. The health status of this group is markedly worse than that of ComEd pilot footprint
511 customers overall: 13.7% are homebound, 33.3% have asthma or chronic obstructive pulmonary
512 disorder and 70.6% have high blood pressure or heart disease, all risk factors for adverse
513 outcomes related to temperature exposure. About one-quarter report health problems related to
514 cold weather (25.5%) and 41.2% report health problems related to the heat.

515 The Loyola Medical Center and LIHEAP applicant surveys found that customers faced with
516 making decisions regarding trade-offs, especially trade-offs that would put their health and safety
517 at risk, experience greater stress related to paying utility bills when compared with energy
518 assistance recipients across the nation.

519

520 **Q. WHAT DID THE COMED AMI HIA FIND ABOUT THE COST OF AMI?**

521 A. The ComEd AMI HIA literature review¹⁰ found that AMI deployment in other
522 jurisdictions indicates that investment in AMI equipment is expected to cost residential
523 customers \$2 to \$3 more per month.

524 Based on this information, the ComEd AMI HIA concluded that the costs for deploying
525 AMI could lead to increased delivery services rates to pay for AMI prior to the realization of any
526 benefits in the form of potential reductions in utility costs. Given the large body of literature
527 connecting fuel poverty and trade-offs between food, rent and medicine, it was concluded that

528 even small increases in customer bills will exacerbate the health impact of higher prices to pay
529 for AMI for vulnerable customers, particularly low income customers, but also other vulnerable
530 customers as well.

531

532 **Q. WHAT DID THE HIA FIND ABOUT THE HEALTH IMPACT OF PRICING**
533 **PROGRAMS ON VULNERABLE CUSTOMERS?**

534 A. The ComEd AMI HIA found that changes to pricing programs that charge much higher
535 prices during certain times of day can cause some customers to reduce usage to avoid higher or
536 unaffordable bills, resulting in under-usage of electricity resulting in extremes in temperatures
537 indoors. Exposure to temperatures outside of a moderate range increases the likelihood of
538 hospital emergency department visits, hospitalizations, and premature death. ComEd's
539 residential customers include households with young children (7.2%) and seniors (11.2%), all
540 more likely to develop symptoms of heat- and cold-related illness such as hypothermia or heat
541 stroke. Persons who are socially isolated (an eightfold greater risk for death during a heat wave),
542 those with a temperature-sensitive condition such as asthma (13.4% of adults in ComEd's service
543 territory and 14.5% of children), diabetes (8% of adults in ComEd's service territory), and heart
544 disease (28.9% of adults with high blood pressure or cardiovascular disease in ComEd's service
545 territory), and those living with a mobility-limiting disability (nearly six times the risk of death
546 during a heat wave) are also at greater risk.

547 The ComEd AMI HIA's re-analysis of ComEd survey data of self-reported energy use
548 among pilot participants finds that the three identifiable at-risk groups (households including an
549 elder or a minor child, or a low-income household) have very little capacity to change their
550 energy usage by, for example, asking other household members to use less electricity or use

551 more efficient household items such as light bulbs or appliances. Even more troubling is the
552 statistically robust finding that elder respondents are more likely to set their thermostats to 78
553 degrees Fahrenheit or higher, representing a potential health hazard during the summer.

554

555 **Q. WHAT DID THE COMED AMI HIA FIND ABOUT THE HEALTH IMPACT OF**
556 **REMOTE CONNECTION AND DISCONNECTION OF ELECTRIC SERVICE?**

557 A. AMI's two-way functionality enables remote disconnection of service for nonpayment.

558 Interruptions or loss of service jeopardizes the safety of those who rely on electrically-powered
559 medical devices such as nebulizers, and sleep apnea devices (CPAP). In addition, carbon
560 monoxide poisonings, residential fire injuries, and related deaths are much more likely in homes
561 where electricity has been disconnected for nonpayment.

562 There were no measurements of actual outage duration and response time during the
563 ComEd pilot, though the new system was deemed to be able to provide such data in the future.
564 As a result, the HIA did not draw specific conclusions on service improvements associated with
565 the deployment of AMI.

566 Remote connection and disconnection of service was not tested in the ComEd pilot,
567 although ComEd's business case for AMI depends on implementation of remote disconnection
568 and calculates potential cost savings in avoiding premise visits for this function. If this
569 functionality disconnects customers remotely for nonpayment, current consumer protections
570 associated with a premise visit and attempted contact may be threatened. Analysis of ComEd
571 billing records from 2009 (the year before the pilot) and 2010 (the pilot year) for customers
572 enrolled in the CAP (dynamic pricing rate design) component of the ComEd pilot indicates

573 increasing numbers of households that would be eligible for disconnection in 2010, compared
574 with 2009.

575 **VII: AMI DEPLOYMENT AND THE THREAT TO HEALTH AND SAFETY OF**
576 **VULNERABLE CUSTOMERS**
577

578 **Q. WHAT CONCLUSIONS DOES THE HIA DRAW, BASED ON ITS FINDINGS?**

579 A. AG/AARP Exhibit 1.1 is the summary table for the ComEd AMI Health Impact
580 Assessment. It lists four major ways in which AMI deployment is likely to affect health, based
581 on the ComEd AMI HIA's assessment of evidence from the ComEd AMI pilot; published
582 literature on AMI, energy and health; the health profile of the population residing in ComEd's
583 service territory, and the original data collection and analyses performed as part of the ComEd
584 AMI HIA. The four potential impacts include:

- 585 • Fuel poverty from higher electricity costs;
- 586 • Health impacts related to the AMI technology itself;
- 587 • Unintentional injuries and premature deaths from disconnected service; and
- 588 • Temperature-sensitive conditions made worse by exposure to heat or cold

589 For each of the four potential impacts, a detailed summary in the ComEd AMI HIA includes
590 estimates of the size of the populations at risk, the predicted severity or likelihood of the health
591 impact, and the quality of the evidence.

592

593 **Q. WHAT ARE THE PREDICTED HEALTH IMPACTS RELATED TO FUEL**
594 **POVERTY FROM HIGHER ELECTRICITY COSTS?**

595 A. The ComEd AMI HIA identifies greater energy insecurity or fuel poverty as a likely
596 health impact, due to higher electricity costs during the first five to seven years of AMI

597 deployment. The financial pressures of trying to pay high home energy bills, and related
598 decisions not to use needed electricity in order to avoid high bills, leads to trade-offs among
599 household budget items that are often labeled “heat or eat.” In response to high home energy
600 bills, 72% of energy assistance recipients surveyed reduced expenses for household basics, 24%
601 report going without food for at least one day, 37% report going without needed medical or
602 dental services, and 34% go without the appropriate dose of a prescribed medication. The
603 ComEd HIA literature review¹¹ identified studies that link fuel poverty to greater food insecurity
604 for young children and for seniors and to negative impacts on the early growth and development
605 of young children. It is also directly related to the disconnection of service for nonpayment.¹²

606 As noted earlier, the ComEd AMI HIA includes two convenience sample surveys, one
607 survey of LIHEAP applicants and one in-depth qualitative interview with AMI pilot participants,
608 to capture observations concerning behavioral responses to energy prices and to perceptions of
609 cost. Energy assistance (LIHEAP) applicants reported responses to high energy bills on almost a
610 monthly basis that would compromise health or safety:

- 611 • 54% reduced purchases of household basics;
- 612 • 31% closed off part of their home in the face of heating or cooling expenses;
- 613 • 28% kept their home at an unsafe or unhealthy temperature;
- 614 • 11% left their homes for part of the day because it was too hot or too cold;
- 615 • 18% used their kitchen stove or oven to heat; 8% reported using candles for light;

¹¹ See Appendix of Exhibit 2.3.

¹² See Appendix 6 in the full report (AG/ARP Exhibit 2.3).

- 616 • 40% of respondents indicated that a household member had gone without medical or
617 dental care, failed to refill a prescription, or took less than a prescribed dose of
618 medication because of their increased energy bills; and
- 619 • 33% indicated that a household member became ill because the home was either too hot
620 or too cold.

621 In the Maywood survey, 41.2% of respondents reported trouble paying household bills.

622 Informants addressed home energy bills in part by leaving home for part of the day to avoid heat
623 or cold (17.7% of respondents) and also by turning down the air-conditioning in summer (74.5%
624 of respondents).

625

626 **Q. WHAT ARE THE POTENTIAL HEALTH IMPACTS RELATED TO AMI**
627 **TECHNOLOGY?**

628 A. The ComEd AMI HIA identifies potential health impacts related to the functioning of the
629 digital metering technology, including the potential to minimally lower greenhouse gas
630 emissions through consumer energy use behavior change (reduction in peak load demand) and
631 through the elimination of the use of motor vehicles for field visits (to connect and disconnect
632 service), the capacity for remote connection and disconnection itself, and the uncertain impact of
633 exposure to non-ionizing radiation from the meter's radio transmitters. Particularly pertinent to
634 this proceeding is the capability in AMI for remote connection and disconnection.

635 The capacity of digital meters for remote reconnection may protect health and safety, if
636 service reliability is improved, for example, through detection of outages more quickly and
637 accurately for faster restoration of service. The ComEd AMI HIA literature review did not

638 identify studies in this area, nor did the ComEd AMI pilot test this aspect of metering
639 technology.

640 Remote disconnection for nonpayment, however, presents a clear threat to health and
641 safety if current consumer protections associated with a premise visit and attempted contact are
642 threatened -- especially for the Chicago metropolitan area residents who are at greater risk of
643 falling into arrears on their electricity bill, and who then are subject to making trade-offs for
644 food, utility and medicine costs.

645 **Q. WHAT ARE THE PREDICTED HEALTH IMPACTS RELATED TO**
646 **UNINTENTIONAL INJURIES AND PREMATURE DEATHS FROM DISCONNECTED**
647 **SERVICE?**

648 A. The HIA identifies two negative outcomes associated with disconnection of service for
649 nonpayment. The first is that posed by the loss of power to electrically powered medical devices
650 such as nebulizers and sleep apnea machines, used by an estimated 25% of the low-income
651 households in ComEd's service territory.¹³ Disconnection, especially without regard to consumer
652 protections regarding advance notification and in-person contact with the consumer, presents a
653 danger to medically frail household members dependent on these devices.

654 The second negative health impact highlighted in the HIA is the use of alternative, risky
655 sources for heating and light and relates to the risks of residential fires (particularly from
656 candles), exposure to nitrogen dioxide, elevated moisture levels, and carbon monoxide
657 poisoning, linked to the use of cook stoves for heat, portable non-electric space heaters
658 (especially those that are unvented), and inadequate heating or cooling. The heightened risk of

¹³ This estimate is based on a national sample survey of LIHEAP recipient households, as discussed in Appendix 6 in the full report (AG/ARP Exhibit 2.3)..

659 disconnection for nonpayment among low-income households, and the quicker pace of
660 disconnections anticipated with AMI deployment, make these households acutely vulnerable.

- 661 • One study¹⁴ of single-family house fires finds that heating equipment is the single most
662 common cause of fires and that space heaters (mostly kerosene) cause 58% of fatal fires
663 and 30% of non-fatal fires.
- 664 • Indoor nitrogen dioxide levels are raised by the use of natural gas-fired appliances such
665 as ovens or range tops for heat. Young children are 80% more likely to have asthma
666 when they live in homes where a gas stove, oven, or space heater is used for heat,
667 reflecting exposure to higher levels of nitrogen dioxide.¹⁵
- 668 • Inadequately cooled or heated homes are more likely to trap moisture and result in mold
669 growth; a meta-analysis of studies derives estimates of more than twice the likelihood
670 that children will develop asthma when household dampness is present and almost two-
671 and-one-half-times the likelihood where mold is present.¹⁶
- 672 • Using gasoline-fueled generators to provide electricity or heat presents the threat of
673 poisoning or death from carbon monoxide (CO), an invisible, deadly gas. Exposure to
674 carbon monoxide can cause effects ranging from headache and nausea to coma and death,
675 with long-term neurological effects for those who survive exposure. Pregnant women,

¹⁴ Runyon et al Risk factors for fatal residential fires. *New England Journal of Medicine* 327 no 12 859-863

¹⁵ Lanphaer et al 2001. Residential Exposures Associated with asthma in U.S. Children. *Pediatrics* 107 no.3: 505-511

¹⁶ Braubach et al 2011 Environmental Burden of disease associated with inadequate housing. Methods for quantifying health impacts of selected housing risks in the WHO European region. Copenhagen, Denmark; World Health Organization regional Office for Europe.

676 young children, elders, and people with cardiovascular or respiratory disease are more
677 sensitive than average to the effects of CO.¹⁷

678

679 **Q. WHAT ARE THE PREDICTED HEALTH IMPACTS RELATED TO**
680 **TEMPERATURE-SENSITIVE CONDITIONS MADE WORSE BY EXPOSURE TO**
681 **HEAT OR COLD?**

682 A. Less access to adequate heating or cooling, whether due to a customer's decision to use
683 less energy in the face of higher costs or because a household has been disconnected for
684 nonpayment, can threaten health through exposure of at-risk individuals to temperature extremes
685 that can result in illness, hospitalization, or premature death related to hyperthermia (heat
686 exposure), hypothermia (cold exposure), or the aggravation of existing health conditions that are
687 temperature-sensitive. The ComEd AMI HIA literature review includes dozens of peer-reviewed
688 studies that link heat exposure and heat waves to elevated rates of hospitalization and premature
689 deaths: one review identifies 29 studies¹⁸ where short-term increases in outdoor temperature are
690 associated with greater risk or likelihood of premature death. A meta-analysis of studies¹⁹ linking
691 winter outdoor temperatures to excess cardiovascular and respiratory disease deaths concludes
692 that between 30% and 50% of premature deaths in winter reflect exposures to indoor cold. For
693 older adults, these otherwise avoidable deaths are associated with lower temperatures in
694 bedrooms and living rooms.

¹⁷ Centers for Disease Control and Prevention 2005 Unintentional non fire related carbon monoxide exposures-United States 2001-2003 Morbidity and Mortality Weekly report 54:36-39

¹⁸ Basu et al 2008 Characterizing temperature and mortality in nine California counties. Epidemiology 19: 138-145

¹⁹ Rudge et al 2011 Indoor cold and mortality in Braunbach et al 2011 Environmental Burden of disease associated with inadequate housing. Methods for quantifying health impacts of selected housing risks in the WHO European region. Copenhagen, Denmark; World Health Organization regional Office for Europe.

695 Within the general population, specific groups of ComEd customers are at greater than
 696 average risk for heat and cold-related illnesses, including the very young (7.2% of households
 697 include a child younger than 5 years); older residents (11.2% of households include someone at
 698 least 65 years of age) and especially those more likely to be socially isolated (the 31.6% of all
 699 low-income seniors in the Chicago region who live independently); and those who live with a
 700 mobility-limiting disability. As outlined in the ComEd AMI HIA literature review, dozens of
 701 conditions across the body’s major organ systems are made worse by exposure to excessive heat
 702 or cold, from chronic obstructive pulmonary disorder (COPD) and asthma to kidney disease and
 703 Parkinson’s Disease. If electricity prices increase with the deployment of AMI, these at-risk
 704 populations may not be able to cool or heat their home adequately, putting them at risk of
 705 exposure to extreme temperatures.

706

707 **VIII: COMED AMI HIA RECOMMENDATIONS**

708

709 **Q. WHAT DOES THE COMED AMI HIA RECOMMEND THE COMMISSION DO**
 710 **IN TERMS OF ITS EVALUATION OF COMED’S AMI DEPLOYMENT PLAN?**

711 A. The HIA makes five recommendations concerning anticipated AMI deployment of digital
 712 metering:

713 **Recommendation One:** **Analyze proposed terms of deployment with respect to clearly**
 714 **defined groups and at-risk residential customers, including an analysis of the likely impacts**
 715 **on health and safety.**

716 Regulators and policy makers should carefully review and evaluate the costs and the benefits of
717 AMI from the perspective of vulnerable customers and include a consideration of health impacts
718 for not only the average customers, but those most vulnerable to higher prices for essential
719 electricity service. This analysis should focus on ensuring that AMI deployment delivers the
720 expected customer benefits in the form of reduced operational costs, within the period of AMI
721 deployment, and review of any proposed cost recovery mechanism to determine the adverse
722 implications of higher bills for vulnerable customers.

723 In addition, data must be collected about characteristics or indicators of vulnerability for
724 residential customers, to permit designation of their accounts for analysis of AMI impacts. Data
725 parameters should include indications of hardship, such as missed payments, delayed payments,
726 or non-payments and should be reported regularly to the ICC. Applications for utility financial
727 assistance should also be considered an indicator of vulnerability, as should any appeal made by
728 a residential customer to the utility company for assistance, including application for medical
729 considerations including, but not limited to, the submission of a 30 day Certificate of Illness in
730 accordance with Illinois Administrative Code Part 280.130(j) or an application for the Life
731 Support Registry in accordance with the Public Utilities Act (220 ILCS 5/8-204) (from Ch. 111
732 2/3, par. 8-204). Periodic surveying of residents should take place to determine the prevalence of
733 disease among utility customers, changes in the disease status, and the presence of increased
734 hardship such as food insecurity and energy insecurity across the board. Surveys should also be
735 used to determine whether there has been any widespread changes in the general population
736 (including job status, health developments among children, or any new injuries/disabilities) to
737 determine if cost recovery practices are appropriate for these vulnerable populations specifically.

738 **Recommendation Two: Proposed cost recovery from electric customers should link benefits**
739 **and costs for vulnerable customers specifically, in addition to linking benefits that are**
740 **documented and realized for all customers.**

741 Costs should not be imposed on vulnerable customers unless the benefits are realized at the time
742 that costs are imposed. The cost recovery method should consider the potential for eliminating
743 rate increases to pay for AMI for low income customers if the benefits cannot be delivered at the
744 time of imposing the costs. Utilities should be required to make enforceable commitments
745 concerning costs and benefit estimates and penalized for the failure to meet specific performance
746 requirements during AMI deployment. Utilities should be required to enhance and further
747 develop their ability to identify and respond to the needs of their vulnerable populations by
748 specifically identifying and tracking these populations at time of enrollment and regularly, such
749 as using but not limited to applications for medical certifications, applications for energy
750 assistance and surveys of customers. Specific cost indicators should be monitored throughout the
751 first years of deployment, such as reporting on utility bill impacts for vulnerable customers.

752 **Recommendation Three: Proposed time-based pricing programs for AMI should offer**
753 **incentives for vulnerable households to optimize their use of electricity from the**
754 **perspectives of health as well as of energy efficiency.**

- 755 • All dynamic pricing programs should be offered on an opt-in basis to improve customer
756 response.
- 757 • A Peak Time Rebate program should be offered to all customers. Any other time-based
758 pricing programs should be offered as an option and not imposed on customers as a
759 mandatory or “default” price design.

- 760 • Customers must be allowed to revert back to flat rate pricing at any time without penalty.
- 761 • Customers on a dynamic pricing plan must be given timely information regarding their
- 762 cost and usage status, including insight as to what their bill would be if they were on an
- 763 alternative plan offered by that utility.

764 **Recommendation Four: The remote connection and disconnection functionality of AMI,**
 765 **especially in the case of involuntary loss of service for nonpayment, must be deployed to**
 766 **promote and not endanger the health and safety of vulnerable customers.**

767 The HIA analysis of the ComEd pilot documented a potential for an increase in the
 768 incidence of disconnection for nonpayment among the households eligible for disconnection for
 769 nonpayment during the pilot period. It is likely that greater numbers of low-income households
 770 will lose their access to electrical service more quickly if a utility uses remote disconnection for
 771 nonpayment because (1) bills will be higher to pay for the new AMI and smart grid investments
 772 in the early years of deployment; and (2) the elimination of the need for a truck and field
 773 personnel to disconnect will mean that larger numbers of customers with overdue bills can be
 774 disconnected earlier in the collection cycle.

775 Currently in Illinois there are limited temperature-based proscriptions on utility shut-offs
 776 (220 ILCS 5/8-205) (from Ch. 111 2/3, par. 8-205) and a date-based proscription on shutoffs for
 777 LIHEAP recipients (280.136). This represents an inadequate patchwork of consumer protections
 778 that allow vulnerable households to suffer disconnects during dangerous temperature conditions
 779 even under traditional circumstances.

780 While the Citizens Utility Board, as one of the participants in the ComEd AMI HIA, did
 781 not agree that a premise visit would continue to be necessary, it is my recommendation as a
 782 physician and public health professional that a premise visit and attempted customer contact

783 should be retained. The extreme negative health risks related to disconnection for nonpayment
784 outweigh any lesser risks related to increased costs that may result from these customers
785 remaining connected. It is imperative that these vulnerable customers, particularly the elderly,
786 receive a premise visit and customer contact for health and safety reasons.

787 Based on the ComEd AMI HIA literature reviews, there are documented risks for fires,
788 deaths, and severe morbidity such as unnecessary hospitalization related to loss of electricity
789 from remote disconnection for nonpayment. Though fuel poverty from higher bills is also a
790 potential negative health impact for some customers, it is not as severe a health risk as the risk of
791 hospitalization, fires or death related to loss of electricity for non-payment.

792 Remote disconnection for nonpayment presents a clear threat to health and safety if
793 consumer protections are not retained, specifically with regard to the current consumer
794 protection that requires a premise visit and attempted in-person contact with someone at the
795 residence at the time of disconnection. This consideration is especially important for consumers
796 who are at greater risk of falling into arrears on their electricity bill. In my opinion as a medical
797 health professional, both the premise visit and the attempted contact with the utility customer are
798 important for health and safety, given the severe health consequences from loss of electricity.
799

800 **Recommendation Five: Any AMI deployment and programs that seek customer**
801 **engagement to make use of the new metering and communication system should be**
802 **accompanied by robust consumer education and outreach to customers to obtain their**
803 **awareness of and participation in approved programs.**

804 An approval of AMI deployment should require the development of a Customer Education Plan
805 that focuses on AMI-enabled programs with the input of stakeholders and include specific

806 performance requirements to measure the utility’s implementation of the approved plan,
807 including the following requirements:

808 a. Outreach and education for any specific pricing or conservation program should
809 target groups at higher than average risk for adverse impacts, including seniors
810 during the summer months and low-income households that rely on electricity for
811 their primary heating fuel in wintertime. The Customer Education Plan should be
812 coordinated with the City of Chicago’s heat health response plan, to ensure that
813 access to adequate home cooling, or a centrally air-conditioned environment, is
814 maintained for seniors within ComEd’s service territory. This plan should include
815 tutorials describing how new pricing programs and conservation initiatives can be
816 helpful to such customers. Additionally, the utility’s outreach program could
817 include replacing old, inefficient air conditioners with new energy efficient ones for
818 vulnerable households, enrollment in energy saver plans and referrals to
819 weatherization agencies.

820 b. This education and outreach should include participation and delivery of educational
821 messages and information by local and neighborhood organizations that are most
822 likely to interact with vulnerable customers. These organizations could include
823 utility assistance locations, healthcare practices, legal aid and governmental offices.
824 By having this information available, these organization will be able to offer advice
825 for vulnerable customers, and resources should they require assistance with the any
826 new programs that take advantage of the AMI technology.

827 **Q. PLEASE SUMMARIZE YOUR CONCLUSIONS.**

828 A. Less access to adequate heating or cooling, whether due to a customer's decision to use less
829 energy in the face of higher costs or because a household has been disconnected for nonpayment,
830 can threaten health through exposure of at-risk individuals to temperature extremes that can
831 result in illness, hospitalization, or premature death related to hyperthermia (heat exposure),
832 hypothermia (cold exposure), or the aggravation of existing health conditions that are
833 temperature-sensitive. Regulators and policy makers should carefully review and evaluate the
834 costs and the benefits of AMI from the perspective of vulnerable customers and include a
835 consideration of health impacts for not only the average customers, but those most vulnerable to
836 higher prices for essential electricity service. I believe that the ComEd AMI HIA contains
837 important research and recommendations that should be considered by the Commission as it
838 reviews ComEd's AMI filing. Remote disconnection for nonpayment presents a clear threat to
839 health and safety if consumer protections are not retained, specifically with regard to the current
840 consumer protection that requires a premise visit and attempted in-person contact with someone
841 at the residence at the time of disconnection. This consideration is especially important for
842 consumers who are at greater risk of falling into arrears on their electricity bill.
843 In my opinion as a medical health professional, both the premise visit and the attempted contact
844 with the utility customer are important for health and safety, given the severe health
845 consequences from loss of electricity.

846 **Q. DOES THIS COMPLETE YOUR TESTIMONY AT THIS TIME?**

847 A. Yes.