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## 电力系统

### 电力系统地震灾害预防技术综述

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#### 摘要:

唐山地震之后, 电力系统地震预防研究取得了极大进展, 但由于地震预防的复杂性, 目前还没有电力系统灾害预防研究的成熟成果。文中分析了电力系统地震预防的基本原则和方法, 比较了最近几次亚洲大地震(唐山、阪神和汶川)对电力系统的破坏情况, 总结了地震预防经验, 最后讨论了如何在电力系统工程中实施地震预防。

#### 关键词:

An Overview on Prevention Technology of Earthquake Disaster for Power Grids

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#### Abstract:

Since the earthquake occurred in Tangshan, China in 1976, the research on earthquake disaster prevention for power grids obtains obvious progress, however due to the complexity of earthquake prevention, at present there is not yet mature research results in this field. Basic principle and methods to prevent earthquake damage in power system are analyzed and the damage of power grids due to the earthquakes occurred in Tangshan and Wenchuan in China as well as that due to the earthquake occurred in Osaka-Kobe in Japan are compared, then the experiences to prevent earthquake damage are summarized. Finally, how to implement earthquake prevention in power system projects is discussed.

#### Keywords:

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#### 参考文献:

- [1] Shiozaki Y, Nishikawa E, Deguchi T. Lessons from the great Hanshin earthquake[M]. Kyoto : Creates-Kamogawa Publishers, 2005: 6.
- [2] 赵成刚. 生命线地震工程[M]. 北京: 地震出版社, 1994: 167.
- [3] Shumuta Y, Yang S Y, Tohma J, et al. Long-term infrastructure renewal and new construction planning with a focus on power lifelines-part I: framework[C]. 3rd EQTAP International Workshop, Manila, Philippine, 2000.
- [4] Chen W F, Scawthorn C. Earthquake engineering handbook[M]. Florence : CRC Press, 2003: 23-25.
- [5] USA Department of the Interior, USA Geological Survey. The richter magnitude scale[EB/OL]. [2009-10-27]. <http://earthquake.usgs.gov/learn/topics/richter.php>.
- [6] A Department of the Interior, USA Geological Survey. Earthquake glossary- intensity[EB/OL]. [2009-06-03]. <http://earthquake.usgs.gov/learn/glossary/?term=intensity>.
- [7] W H Freeman and Company. Modified mercalli intensity scale [EB/OL]. [2003-10-15]. <http://www.abag.ca.gov/bayarea/eqmaps/doc/mmi.html>.
- [8] 杨理华, 陈国林. 唐山地震的宏观烈度分布[J]. 地震工程与工程振动, 1981, 2(1) : 2-7.
- [9] Yang Lihua, Chen Guolin. Intensity distribution of the Tangshan earthquake[J]. Earthquake Engineering and Engineering Vibration, 1981, 2(1): 2-7(in Chinese).
- [10] Yang S, Fan M, Hu X. Optimization planning of urban power

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system based on the assessment of seismic risk[C]. International Conference on Electrical Engineering, Xi'an, China, 2001. [10] Liu H, Housner G W, Xie L, et al. The great Tangshan earthquake of 1976[M]. California: California Institute of Technology, 2002: 444-872. [11] Kinki Regional Development Bureau, Ministry of Land, Infrastructure and Transport. Great Hanshin earthquake restoration[EB/OL]. [2001-12-27]. [http://www.kkr.mlit.go.jp/en/topics\\_hanshin.html](http://www.kkr.mlit.go.jp/en/topics_hanshin.html).

[12] 陈运泰, 许力生, 张勇, 等. 2008年5月12日汶川特大地震震源特性分析报告[R]. 北京: 中国地震局地球物理所, 2008. [13] Bardet J P, Oka F, Sugito M, et al. The great Hanshin earthquake disaster [R]. Los Angeles: University of Southern California, 1995. [14] 日本内阁府. 我が国で発生する地震[EB/OL]. [2007-6-30]. [http://www.bousai.go.jp/jishin/chubou/taisaku\\_gaiyou/gaiyou\\_top.html](http://www.bousai.go.jp/jishin/chubou/taisaku_gaiyou/gaiyou_top.html). [15] 新华网. 5月12日四川汶川发生里氏8.0级特大地震[EB/OL]. [2009-05-12]. [http://news.xinhuanet.com/world/2009-05/12/content\\_11370800.htm](http://news.xinhuanet.com/world/2009-05/12/content_11370800.htm). [16] Noda M. Disaster and restoration of electricity supply system by Hanshin-Awaji earthquake[C]. APEC Seminar on Earthquake Disaster Management of Energy Supply Systems, Taipei, China, 2001. [17] Fan M T, Yang S Y, Hu X H. Long-term infrastructure renewal and new construction planning with a focus on power lifelines: comparison of Tianjin and Kobe[C]. Joint Seminar on Urban Disaster Management, Beijing, China, 2000. [18] 日本气象厅. 震度と加速度[EB/OL]. [2003-09-26]. <http://www.seisvol.kishou.go.jp/eq/kyoshin/kaisetsu/comp.htm>.

[19] 于永清, 李光范, 李鹏, 等. 四川电网汶川地震电力设施受灾调研分析[J]. 电网技术, 2008, 32(11): T1-T6. Yu Yongqing, Li Guangfan, Li Peng, et al. Investigation and analysis of electric equipment damage in Sichuan power grid caused by Wenchuan earthquake[J]. Power System Technology, 2008, 32(11): T1-T6(in Chinese). [20] 吴锦瑜, 徐寿松. 汶川大地震震中映秀镇恢复电网供电[EB/OL]. [2008-07-24]. <http://finance.baidu.com/guonei/2008-07-24/181311160974.html>.

[21] 马文涛, 李海鸥, 杨主恩, 等. 汶川Ms 8.0地震对四川省水电水利工程场地安全性评价结果的检验[J]. 地震地质, 2008, 30(3): 797-803. Ma Wentao, Li Haiou, Yang Zhuen, et al. Verifying the reservoir seismic safety assessments in Sichuan province with the Ms8.0 Wenchuan earthquake[J]. Seismology and Geology, 2008, 30(3): 797-803(in Chinese). [22] 中国地震局. GB 18306—2001中国地震动参数区划图[S]. 北京: 地震出版社, 2001. [23] 网易. 1933年四川茂县发生7.5级大地震始末[EB/OL]. [2008-05-13]. [http://www.cq.xinhuanet.com/news/2008-05/13/content\\_13245050.htm](http://www.cq.xinhuanet.com/news/2008-05/13/content_13245050.htm).

[24] Bommer J, Abrahamson N. Why do modern probabilistic seismic-hazard analyses often lead to increased hazard estimates? [J]. Bulletin of the Seismological Society of America, 2006, 96(6): 1967. [25] Noda M. Robust electric power supply system against disasters[C]. APEC Seminar on Earthquake Disaster Management of Energy Supply Systems, Taipei, China, 2001. [26] Schiff A. Hyogoken-Nanbu (Kobe) earthquake of January 17, 1995: lifeline performance[M]. Reston, VA: Amer Society of Civil Engineers, 1999: 224-235. [27] Murosaki Y. The great Hanshin earthquake and fire[J]. Journal of Disaster Research, 2007, 2(4): 298-302. [28] Personal Insurance Federation of California. 2005 Insurance Reference Manual[EB/OL]. [2005-08-12]. [http://picf.org/\\_insurance\\_manual/09\\_earthquake\\_northridge\\_factshandling.html](http://picf.org/_insurance_manual/09_earthquake_northridge_factshandling.html).

[29] 伍磊, 袁越, 季侃, 等. 微型电网及其在防震减灾中的应用[J]. 电网技术, 2008, 32(16): 32-36. Wu Lei, Yuan Yue, Ji Kan, et al. Microgrid and its application in earthquake prevention and disaster reduction[J]. Power System Technology, 2008, 32(16): 32-36(in Chinese). [30] 曹枚根, 周福霖, 徐忠根, 等. 大跨越输电塔线体系减震控制分析研究[J]. 电网技术, 2007, 31(14): 45-51. Cao Meiyin, Zhou Fulin, Xu Zhonggen, et al. Research on seismic control of large crossing transmission towers for transmission lines[J]. Power System Technology, 2007, 31(14): 45-51(in Chinese). [31] 程永锋, 朱全军, 卢智成. 变电站电力设施抗震措施研究现状与发展趋势[J]. 电网技术, 2008, 32(22): 84-89. Cheng Yongfeng, Zhu Quanjun, Lu Zhicheng. Progress and development trend on seismic measures of electric power equipments in transformer substation[J]. Power System Technology, 2008, 32(22): 84-89 (in Chinese). [32] 岳茂光, 李宏男, 王东升, 等. 行波激励下输电塔-导线体系纵向地震反应分析[J]. 中国电机工程学报, 2006, 26(23): 145-150. Yue Maoguang, Li Hongnan, Wang Dongsheng, et al. Longitudinal response of the power transmission tower-cable system under traveling seismic wave excitations[J]. Proceedings of the CSEE, 2006, 26(23): 145-150(in Chinese). [33] 田利, 李宏男, 黄连壮. 多点激励下输电塔-导线体系的侧向地震反应分析[J]. 中国电机工程学报, 2008, 28(16): 108-114. Tian Li, Li Hongnan, Huang Lianzhuang. Longitudinal response of a power transmission tower-cable system under multi-support excitations[J]. Proceedings of the CSEE, 2008, 28(16): 108-114 (in Chinese).

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