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**The Ahuachapán Geothermal Field, El Salvador:
Exploitation Model, Performance Predictions, Economic Analysis**

Volume II: Appendices A through G

M. Ripperda, G.S. Bodvarsson, M.J. Lippmann, C. Goranson,
and P.A. Witherspoon

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Volume II: Appendices A through G

by

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MASTER

XBL 9012-5983

Location of new (hypothetical) production and injection wells assumed in the Field Performance Prediction studies (Vol. I, Sect. 7). Note that in Cases 15 and 18 more than one of the new production wells were assigned to some of the larger elements of the computational mesh. It was assumed that well AH-52 replaced AH-32.

Appendix A: Natural State Model

Comparison between observed and calculated temperature profiles

11

Appendix B: Case 1

(declining power generation; no injection)

Predicted

- **Electrical power generation**
- **Total flow rates and average enthalpies**
- **Flow rates and enthalpies for existing production wells**

Case 1. Predicted electric power generation—existing production wells.

Case 1. Predicted total flow rates and average enthalpies—existing production wells.

Case 1. Predicted flow rates and enthalpies for well AH-1.

Case 1. Predicted flow rates and enthalpies for well AH-6.

Case 1. Predicted flow rates and enthalpies for well AH-7.

Case 1. Predicted flow rates and enthalpies for well AH-17.

Case 1. Predicted flow rates and enthalpies for well AH-19.

Case 1. Predicted flow rates and enthalpies for well AH-20.

Case 1. Predicted flow rates and enthalpies for well AH-21.

Case 1. Predicted flow rates and enthalpies for well AH-22.

Case 1. Predicted flow rates and enthalpies for well AH-23.

Case 1. Predicted flow rates and enthalpies for well AH-24.

Case 1. Predicted flow rates and enthalpies for well AH-26.

Case 1. Predicted flow rates and enthalpies for well AH-27.

Case 1. Predicted flow rates and enthalpies for well AH-28.

Case 1. Predicted flow rates and enthalpies for well AH-31.

Appendix C: Case 6

(50 MW_e; no injection)

Predicted

- **Electrical power generation**
- **Total flow rates and average enthalpies**
- **Flow rates and enthalpies for typical production wells**
- **Year 2020 temperature distributions in layers AA, A, B and C.**

Case 6. Predicted electric power generation—all wells.

Case 6. Predicted electric power generation—existing production wells.

Case 6. Predicted electric power generation—new production wells.

Case 6. Predicted total flow rates and average enthalpies—all wells.

Case 6. Predicted total flow rates and average enthalpies—existing production wells.

Case 6. Predicted total flow rates and average enthalpies—new production wells.

Case 6. Predicted flow rates and enthalpies for well AH-1.

Case 6. Predicted flow rates and enthalpies for well AH-6.

Case 6. Predicted flow rates and enthalpies for well AH-7.

Case 6. Predicted flow rates and enthalpies for well AH-17.

Case 6. Predicted flow rates and enthalpies for well AH-19.

Case 6. Predicted flow rates and enthalpies for well AH-20.

Case 6. Predicted flow rates and enthalpies for well AH-21.

Case 6. Predicted flow rates and enthalpies for well AH-22.

Case 6. Predicted flow rates and enthalpies for well AH-23.

Case 6. Predicted flow rates and enthalpies for well AH-24.

Case 6. Predicted flow rates and enthalpies for well AH-26.

Case 6. Predicted flow rates and enthalpies for well AH-27.

Case 6. Predicted flow rates and enthalpies for well AH-28.

Case 6. Predicted flow rates and enthalpies for well AH-31.

Case 6. Predicted flow rates and enthalpies for well AH-50.

Case 6. Predicted flow rates and enthalpies for well AH-51.

Case 6. Predicted flow rates and enthalpies for well AH-52.

Case 6. Predicted flow rates and enthalpies for well AH-53.

Case 6. Predicted flow rates and enthalpies for well AH-87.

XBL 8911-7838

Case 6. Predicted year 2020 temperature distribution (in °C) in the AA layer.

XBL 8911-7839

Case 6. Predicted year 2020 temperature distribution (in °C) in the A layer.

XBL 8911-7840

Case 6. Predicted year 2020 temperature distribution (in °C) in the B layer.

XBL 8911-7841

Case 6. Predicted year 2020 temperature distribution (in °C) in the C layer.

Appendix D: Case 10

(50 MW_e; 60% injection, 150°C)

Predicted

- **Electrical power generation**
- **Total flow rates and average enthalpies**
- **Flow rates and enthalpies for typical production wells**
- **Year 2020 temperature distributions in layers AA, A, B and C.**

Case 10. Predicted electric power generation—all wells.

Case 10. Predicted electric power generation—existing production wells.

Case 10. Predicted electric power generation—new production wells.

Case 10. Predicted total flow rates and average enthalpies—all wells.

Case 10. Predicted total flow rates and average enthalpies—existing production wells.

Case 10. Predicted total flow rates and average enthalpies—new production wells.

Case 10. Predicted flow rates and enthalpies for well AH-1.

Case 10. Predicted flow rates and enthalpies for well AH-6.

Case 10. Predicted flow rates and enthalpies for well AH-7.

Case 10. Predicted flow rates and enthalpies for well AH-17.

Case 10. Predicted flow rates and enthalpies for well AH-19.

Case 10. Predicted flow rates and enthalpies for well AH-20.

Case 10. Predicted flow rates and enthalpies for well AH-21.

Case 10. Predicted flow rates and enthalpies for well AH-22.

Case 10. Predicted flow rates and enthalpies for well AH-23.

Case 10. Predicted flow rates and enthalpies for well AH-24.

Case 10. Predicted flow rates and enthalpies for well AH-26.

Case 10. Predicted flow rates and enthalpies for well AH-27.

Case 10. Predicted flow rates and enthalpies for well AH-28.

Case 10. Predicted flow rates and enthalpies for well AH-31.

Case 10. Predicted flow rates and enthalpies for well AH-50.

Case 10. Predicted flow rates and enthalpies for well AH-51.

Case 10. Predicted flow rates and enthalpies for well AH-52.

Case 10. Predicted flow rates and enthalpies for well AH-53.

XBL 8911-7834

Case 10. Predicted year 2020 temperature distribution (in °C) in the AA layer.

XBL 8911-7835

Case 10. Predicted year 2020 temperature distribution (in °C) in the A layer.

XBL 8911-7836

Case 10. Predicted year 2020 temperature distribution (in °C) in the B layer.

XBL 8911-7837

Case 10. Predicted year 2020 temperature distribution (in °C) in the C layer.

Appendix E: Case 11

(75 MW_e; no injection)

Predicted

- **Electrical power generation**
- **Total flow rates and average enthalpies**
- **Flow rates and enthalpies for typical production wells**
- **Year 2020 temperature distributions in layers AA, A, B and C.**

Case 11. Predicted electric power generation—all wells.

Case 11. Predicted electric power generation—existing production wells.

Case 11. Predicted electric power generation—new production wells.

Case 11. Predicted total flow rates and average enthalpies—all wells.

Case 11. Predicted total flow rates and average enthalpies—existing production wells.

Case 11. Predicted total flow rates and average enthalpies—new production wells.

Case 11. Predicted flow rates and enthalpies for well AH-1.

Case 11. Predicted flow rates and enthalpies for well AH-6.

Case 11. Predicted flow rates and enthalpies for well AH-7.

Case 11. Predicted flow rates and enthalpies for well AH-17.

Case 11. Predicted flow rates and enthalpies for well AH-19.

Case 11. Predicted flow rates and enthalpies for well AH-20.

Case 11. Predicted flow rates and enthalpies for well AH-21.

Case 11. Predicted flow rates and enthalpies for well AH-22.

Case 11. Predicted flow rates and enthalpies for well AH-23.

Case 11. Predicted flow rates and enthalpies for well AH-24.

Case 11. Predicted flow rates and enthalpies for well AH-26.

Case 11. Predicted flow rates and enthalpies for well AH-27.

Case 11: Predicted flow rates and enthalpies for well AH-28.

Case 11. Predicted flow rates and enthalpies for well AH-31.

Case 11. Predicted flow rates and enthalpies for well AH-35.

Case 11. Predicted flow rates and enthalpies for well AH-36.

Case 11. Predicted flow rates and enthalpies for well AH-43.

Case 11. Predicted flow rates and enthalpies for well AH-44.

Case 11. Predicted flow rates and enthalpies for well AH-45.

Case 11. Predicted flow rates and enthalpies for well AH-50.

Case 11. Predicted flow rates and enthalpies for well AH-51.

Case 11. Predicted flow rates and enthalpies for well AH-52.

Case 11. Predicted flow rates and enthalpies for well AH-53.

Case 11. Predicted flow rates and enthalpies for well AH-54.

Case 11. Predicted flow rates and enthalpies for well AH-55.

Case 11. Predicted flow rates and enthalpies for well AH-56.

Case 11. Predicted flow rates and enthalpies for well AH-72.

Case 11. Predicted flow rates and enthalpies for well AH-73.

Case 11. Predicted flow rates and enthalpies for well AH-74.

Case 11. Predicted flow rates and enthalpies for well AH-86.

Case 11. Predicted flow rates and enthalpies for well AH-87.

XBL 8911-7826

Case 11. Predicted year 2020 temperature distribution (in °C) in the AA layer.

XBL 8911-7827

Case 11. Predicted year 2020 temperature distribution (in °C) in the A layer.

XBL 8911-7828

Case 11. Predicted year 2020 temperature distribution (in °C) in the B layer.

XBL 8911-7829

Case 11. Predicted year 2020 temperature distribution (in °C) in the C layer.

Appendix F: Case 15

(75 MW_e; 60% injection, 150°C)

Predicted

- **Electrical power generation**
- **Total flow rates and average enthalpies**
- **Flow rates and enthalpies for typical production wells**
- **Year 2020 temperature distributions in layers AA, A, B and C.**
- **Year 2020 pressure distributions in layers A, B and C**

Case 15. Predicted electric power generation—all wells.

Case 15. Predicted electric power generation—existing production wells.

Case 15. Predicted electric power generation—new production wells.

Case 15. Predicted total flow rates and average enthalpies—all wells.

Case 15. Predicted total flow rates and average enthalpies—existing production wells.

Case 15. Predicted total flow rates and average enthalpies—new production wells.

Case 15. Predicted flow rates and enthalpies for well AH-1.

Case 15. Predicted flow rates and enthalpies for well AH-6.

Case 15. Predicted flow rates and enthalpies for well AH-7.

Case 15. Predicted flow rates and enthalpies for well AH-17.

Case 15. Predicted flow rates and enthalpies for well AH-19.

Case 15. Predicted flow rates and enthalpies for well AH-20.

Case 15. Predicted flow rates and enthalpies for well AH-21.

Case 15. Predicted flow rates and enthalpies for well AH-22.

Case 15. Predicted flow rates and enthalpies for well AH-23.

Case 15. Predicted flow rates and enthalpies for well AH-24.

Case 15. Predicted flow rates and enthalpies for well AH-26.

Case 15. Predicted flow rates and enthalpies for well AH-27.

Case 15. Predicted flow rates and enthalpies for well AH-28.

Case 15. Predicted flow rates and enthalpies for well AH-31.

Case 15. Predicted flow rates and enthalpies for well AH-36.

Case 15. Predicted flow rates and enthalpies for well AH-50.

Case 15. Predicted flow rates and enthalpies for well AH-51.

Case 15. Predicted flow rates and enthalpies for well AH-52.

Case 15. Predicted flow rates and enthalpies for well AH-53.

Case 15. Predicted flow rates and enthalpies for well AH-54.

Case 15. Predicted flow rates and enthalpies for well AH-55.

Case 15. Predicted flow rates and enthalpies for well AH-56.

Case 15. Predicted flow rates and enthalpies for well AH-72.

Case 15. Predicted flow rates and enthalpies for well AH-73.

Case 15. Predicted flow rates and enthalpies for well AH-74.

Case 15. Predicted flow rates and enthalpies for well AH-86.

Case 15. Predicted flow rates and enthalpies for well AH-87.

XBL 8911-7830

Case 15. Predicted year 2020 temperature distribution (in °C) in the AA layer.

XBL 8911-7831

Case 15. Predicted year 2020 temperature distribution (in °C) in the A layer.

XBL 8911-7832

Case 15. Predicted year 2020 temperature distribution (in °C) in the B layer.

XBL 8911-7833

Case 15. Predicted year 2020 temperature distribution (in °C) in the C layer.

XBL 8910-7811
T.I.D. Illus.88

Case 15. Predicted year 2020 pressure distribution (in bars) in the A layer.

XBL 8910-7812

Case 15. Predicted year 2020 pressure distribution (in bars) in the B layer.

XBL 8910-7813

Case 15. Predicted year 2020 pressure distribution (in bars) in the C layer.

Appendix G: Case 18

(90 MW_e; 30% injection, 150°C)

Predicted

- **Electrical power generation**
- **Total flow rates and average enthalpies**
- **Flow rates and enthalpies for typical production wells**
- **Year 2020 temperature distributions in layers AA, A, B and C.**
- **Year 2020 pressure distributions in layers A, B and C**

Case 18. Predicted electric power generation—all wells.

Case 18. Predicted electric power generation—existing production wells.

Case 18. Predicted electric power generation—new production wells.

Case 18. Predicted total flow rates and average enthalpies—all wells.

Case 18. Predicted total flow rates and average enthalpies—existing production wells.

Case 18. Predicted total flow rates and average enthalpies—new production wells.

Case 18. Predicted flow rates and enthalpies for well AH-1.

Case 18. Predicted flow rates and enthalpies for well AH-6.

Case 18. Predicted flow rates and enthalpies for well AH-7.

Case 18. Predicted flow rates and enthalpies for well AH-17.

Case 18. Predicted flow rates and enthalpies for well AH-19.

Case 18. Predicted flow rates and enthalpies for well AH-20.

Case 18. Predicted flow rates and enthalpies for well AH-21.

Case 18. Predicted flow rates and enthalpies for well AH-22.

Case 18. Predicted flow rates and enthalpies for well AH-23.

Case 18. Predicted flow rates and enthalpies for well AH-24.

Case 18. Predicted flow rates and enthalpies for well AH-26.

Case 18. Predicted flow rates and enthalpies for well AH-27.

Case 18. Predicted flow rates and enthalpies for well AH-28.

Case 18. Predicted flow rates and enthalpies for well AH-31.

Case 18. Predicted flow rates and enthalpies for well AH-35.

Case 18. Predicted flow rates and enthalpies for well AH-36.

Case 18. Predicted flow rates and enthalpies for well AH-43.

Case 18. Predicted flow rates and enthalpies for well AH-44.

Case 18. Predicted flow rates and enthalpies for well AH-45.

Case 18. Predicted flow rates and enthalpies for well AH-50.

Case 18. Predicted flow rates and enthalpies for well AH-51.

Case 18. Predicted flow rates and enthalpies for well AH-52.

Case 18. Predicted flow rates and enthalpies for well AH-53.

Case 18. Predicted flow rates and enthalpies for well AH-54.

Case 18. Predicted flow rates and enthalpies for well AH-55.

Case 18. Predicted flow rates and enthalpies for well AH-56.

Case 18. Predicted flow rates and enthalpies for well AH-72.

Case 18. Predicted flow rates and enthalpies for well AH-73.

Case 18. Predicted flow rates and enthalpies for well AH-74.

Case 18. Predicted flow rates and enthalpies for well AH-86.

Case 18. Predicted flow rates and enthalpies for well AH-87.

XBL 8910-7820

Case 18. Predicted year 2020 temperature distribution (in °C) in the AA layer.

XBL 8911-7823

Case 18. Predicted year 2020 temperature distribution (in °C) in the A layer.

XBL 8911-7824

Case 18. Predicted year 2020 temperature distribution (in °C) in the B layer.

XBL 8911-7825

Case 18. Predicted year 2020 temperature distribution (in °C) in the C layer.

XBL 8910-7808
T.I.D. Ilus.88

Case 18. Predicted year 2020 pressure distribution (in bars) in the A layer.

XBL 8910-7809
T.I.D. Ilus.88

Case 18. Predicted year 2020 pressure distribution (in bars) in the B layer.

XBL 8910-7810
T.I.D. Iius.88

Case 18. Predicted year 2020 pressure distribution (in bars) in the C layer.