
A user's guide to the partial equilibrium models of the urban water sectors in Melbourne and Perth

The Commission has undertaken modelling to assist it in evaluating the case for microeconomic reform and to identify priorities for reform in Australia's urban water sector. Details of the modelling work are documented in technical supplement 1 to the inquiry report (www.pc.gov.au/projects/inquiry/urban-water/report). The Commission is also making publicly available the computer files to run the models under the conditions set out in box 1. The Commission will not provide users of these programs with any support.

Box 1	Productivity Commission conditions for using the computer files
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| | <ol style="list-style-type: none">1. The Commission will not provide users of these programs with any support.2. The Commission accepts no liability for any errors in the programs.3. Users of the programs, including users that derive new variations of the model, should acknowledge the Productivity Commission. The appropriate citation is:
Productivity Commission 2011, <i>Australia's Urban Water Sector</i>, Report no. 55, Canberra. <p>In downloading these programs, you are accepting these conditions.</p> |

System requirements

Users of these programs require licensed software to be able to run and solve the models, including:

- A compiler for C++ programs (for example, Microsoft Visual Studio 2010).
- GAMS software and an associated large scale, mixed integer programming solver licensed under GAMS, such as GUROBI (available at www.gams.com).

Additionally, to run the full ten period model, sufficient computing power and memory is required. Alternatively, a shorter time horizon model can be run.¹

¹ The number of time periods is defined in the input module.

Download and install

Download the urban water models from www.pc.gov.au/projects/inquiry/urban-water/report/model. Unzip the file in a directory.

File structure

The following models are included (in separate directories):

- Melbourne 10 year historic model
- Melbourne 20 year historic model
- Perth 10 year historic model
- Perth 20 year historic model.

Each directory contains three model components — an input module (C++), a database file (GAMS), and model files (GAMS). A description of each component of the model is provided in box 2. There are separate model files for the basecase and each policy simulation²:

- The basecase model file
- The water restrictions model file
- The policy bans and mandated investment model file
- The uniform pricing model file
- The cost minimisation model file
- The two-stage cost-minimisation model file

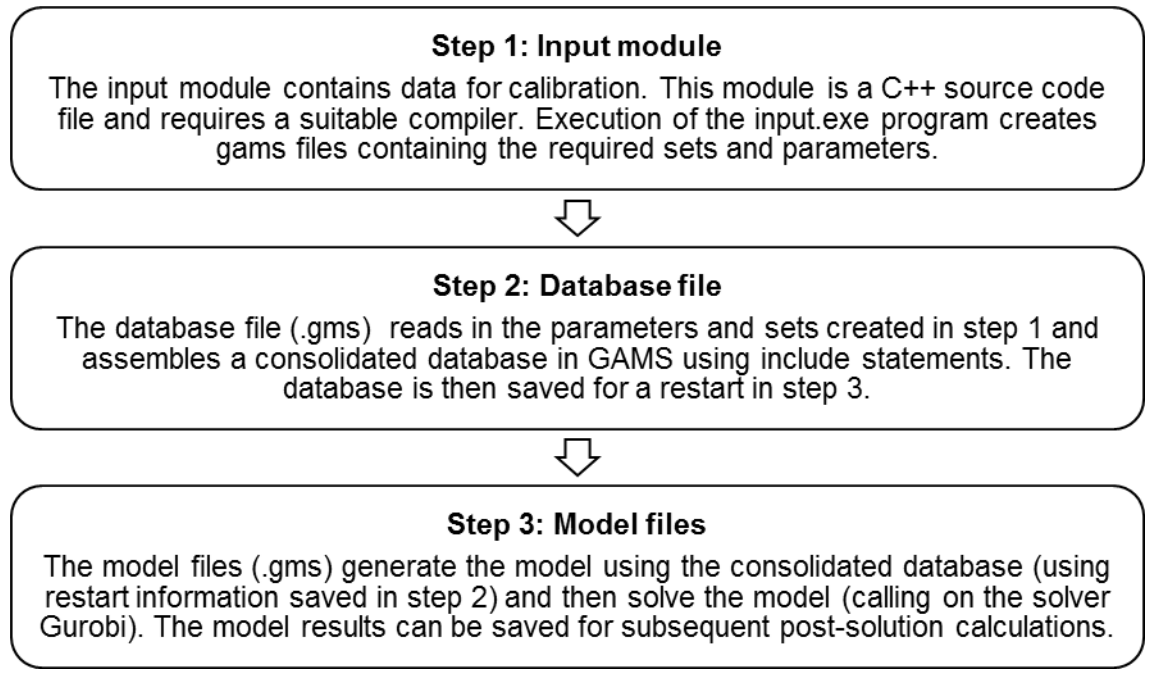
Additionally, the `gurobi.opt` solver option file is included in each directory. This option file will be read automatically by the Gurobi solver.

All files for a given model are saved in the same directory. It is important to retain this directory structure when generating and solving each model.

² Not all policy simulations apply to the 20 year models.

Box 2 **Structure of the model**

Each model has three components that should be run sequentially. The model development is structured in this way to reduce the total run time. The C++ program quickly generates parameters and sets, and GAMS is able to quickly read in and consolidate the files created by the input module. The diagram below describes each component of the model and the relation to other components.



Running the model

1. Compile and execute the input.cpp file. Execution of the input.exe program creates gams files (*.gms) to be used by GAMS in step 2 and text files (*.txt)³. The gams files are used to form the consolidated database in step 2.
2. Run the database.gms file in GAMS. Save the work file using the save feature in the command line. This will allow the database to be retrieved using restart when generating and solving the model in step 3.
3. Run the model.gms file using restart in the command line (to retrieve the saved database work file). The basecase model file should always be run before the policy simulation model files. This is because the basecase model solution is used as an initial solution for the policy simulation models (using the GDX

³ The .txt files were used for post solution manipulation and report writing of results in SAS. The SAS program files are not available.

facilities to save and retrieve the model solution). It may also be useful to save the results to a GDX file for ease in examining the model solution.

Results may vary

Model results may vary (in particular, models with binary variables) due to a number of factors including the:

- solver used
- solver option file configuration (for example, optimality tolerance)
- computer hardware (machine precision)
- use of an advance basis to run a simulation (for example using GDX facilities to save and retrieve model solutions).