APPENDIX A

Introduction and Application HEC-ResSim3.1 Model

HEC-ResSim program is abbreviated Hydrologic Engineering Center's Reservoir System Simulation. HEC-ResSim was developed from the HEC-5, 1998 program (Simulation of Flood Control and Conservation System). HEC-ResSim is included of a graphical user interface (GUI), which computational program to simulate the reservoirs operation, management capability, data storage, and facility for the graphics and reporting. HEC-DSS was abbreviated from Hydrology Engineering Center's Data Storage System (HEC, 1995 and HEC, 2009) that is used for storage and revising of input and output time-series data.

HEC-ResSim3.1 simulation model is a software in the simulation-operation for the reservoir management, flood or low flow augmentation. The objective is for using hydropower plants, irrigation, water supply, reservoir regulation investigation and real-time decision supports tools for application. The HEC-ResSim can represent both large and small scale reservoirs, one or more reservoirs in the operation management. The reservoir systems can be made a network of elements (River, junctions, routing reaches, diversion and basin). Also the software can be simulated for a full period or record using available time steps. In which the features of HEC-ResSim software was shown as below:

- The define use time for solution (time steps) that can be set for 15 minutes to one day.
- It can be used the base map to easy in the operation and planning.
- It can be constrained for operational planning in performance of reservoirs.
- Used simulation model HEC-DSSVue (data storage system) with this program.
- Operation and result can be indicated in the window which perform easy.

- Data addition is important to the reservoir relation, such as: dam, spillway, tunnel, and water data.
- It can be managed the multi-reservoir operation in a project.

Furthermore, HEC-ResSim 3.1 software can be defined condition in the reservoir operation management, which was comprised as below:

* Can be defined water releases to downstream.
* Can be controlled water quantity at upstream, downstream.
* Can be defining the water level or condition when water volume was changed, which depend on water inflow to reservoir.
* Can be the water volume for electricity power generation.
* Can be controlled spillway release on during water flood.

HEC-ResSim3.1 program was consisted of three modules: first module is Watershed setup that configure any elements, second module is Reservoir network that add the any conditions of software, and third module is Simulation that use in run program. Each module has the different objective and related with set of function that accessible through menus, toolbars, and schematic elements. For example the feature of basic model in each modules, which was shown in figure A.1.

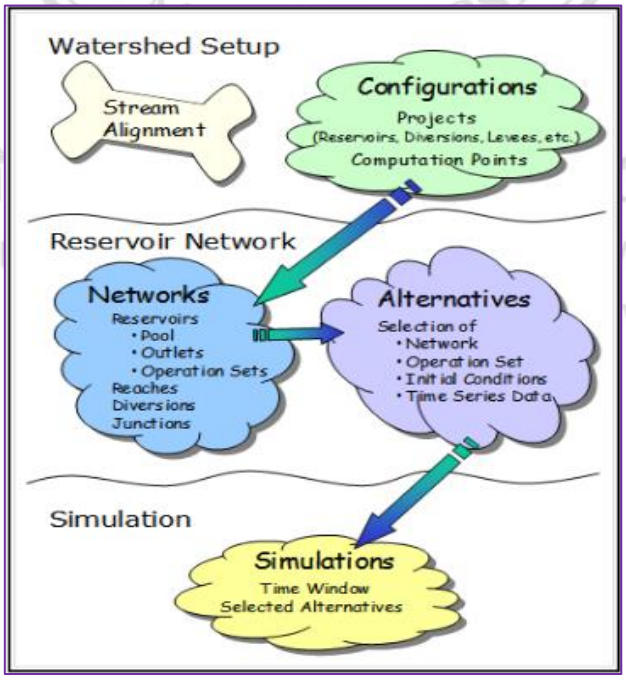

Figure A.1 HEC-ResSim3.1 modules concepts.

Before begin working with the each modules of HEC-ResSim3.1, You will need to understand the concepts that will help you to develop, access, and interact with watersheds in HEC-ResSim3.1 software.

A.1 Watershed setup module

The objective of the Watershed Setup module is to provide a common framework for watershed creation and definition among different modeling applications. The watershed is related with a geographic region for which area coverage can be configured several volume for multiple models. The watershed setup module will consist of all elements such as: Projects (reservoirs, dam, stream, reach, levees, and etc.), size location of project, time-series, hydrologic and hydraulic data of projects. Once the new watershed has created in watershed setup module, which will able to import maps from the external sources. It would able to specify the units of measure, add layers, create a common stream alignment and configure elements in watershed setup module, and project can be added and created the time-series icons within the watershed setup module.

A.1.1 Starting HEC-ResSim3.1 program

Before begin working, we must start HEC-ResSim program by double-click the **HEC-ResSim** icon on your PC's desktop, or one method is from click the button **Start**, select **Programs→ HEC-ResSim3.1**. Once we started HEC-ResSim, which an information screen was shown in Figure A.1. Then main window of HEC-ResSim will open the dialog box which was shown in figure A.2 and A.3 as following.

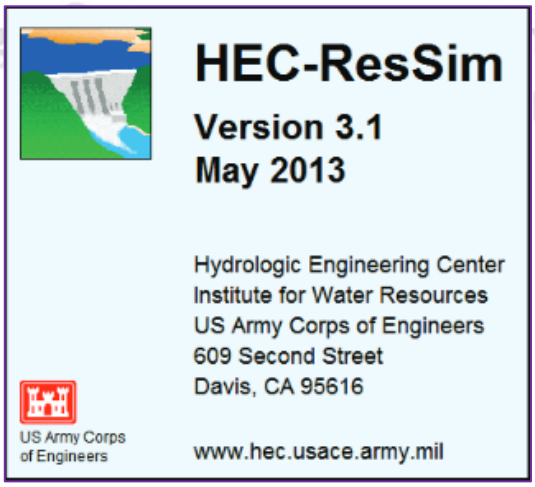

Figure A.2 HEC-ResSim3.1 information screen.

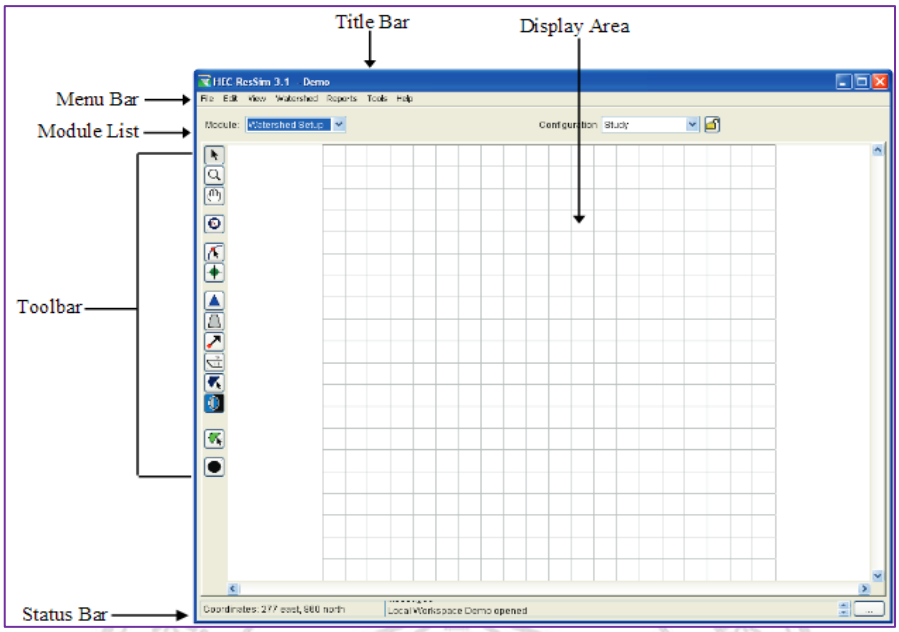

Figure A.3 HEC-ResSim3.1 main window.

A.1.2 Watershed setup module creating

The Watershed Setup module is used to create and setup a watershed, which choose from the **Module list** by select **Watershed Setup**. The main window and **Watershed Setup** module have different components for tools tab and function, which was shown in figure A.4 that explains the elements of watershed setup module.

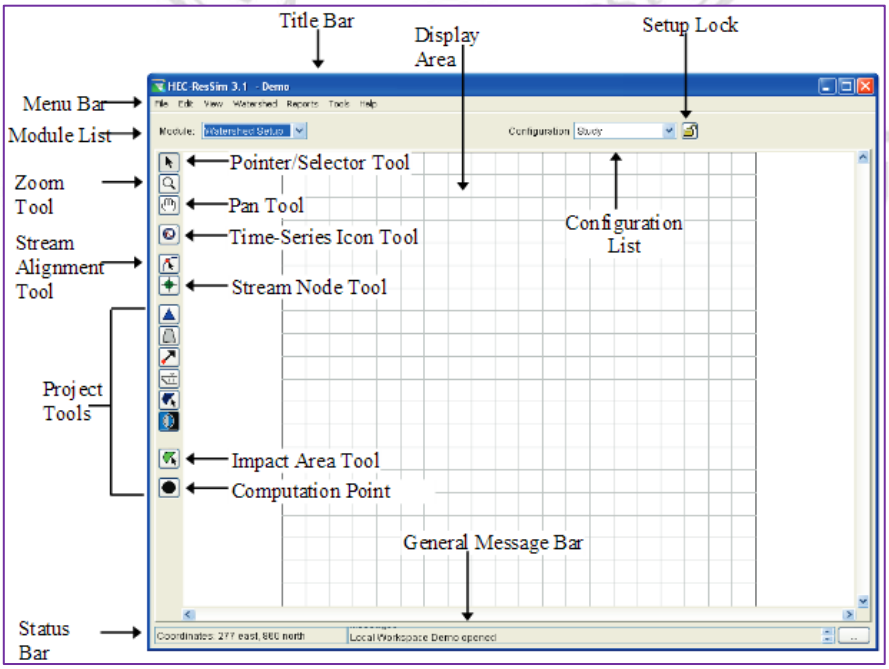

Figure A.4 Watershed setup module.

A.1.3 Definition a watershed location

Before we will create or open the watershed setup module, we must be defined at least one watershed location. Detail defining of the adding location is selected the **Tools** on **Tab Menu**, choose the **Options**. The Options dialog box will open, which was shown in figure A.5.

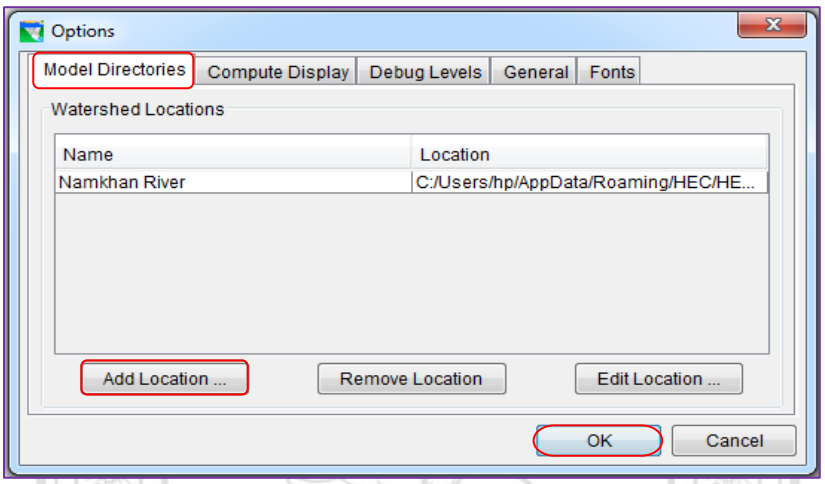

Figure A.5 HEC-ResSim3.1 options dialog box.

To create a new location, click the **Model Directories** in the options, which will appear the dialog box that has the **Name** and **Location**. Next, clicks the button **Add Location…** to add a location into the option list. Then, **Add Watershed Location** dialog box will open that was shown in figure A.6.

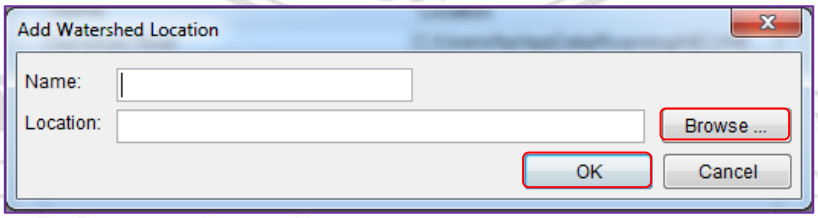

Figure A.6 Addition the watershed location in watershed module.

Entered a location name for the defining a new location. Next, click the button **Browse...** to choose the folder where we want to save of us watershed. Then clicks **OK** to close and save of **Add Watershed Location** dialog box.

A.1.4 New watershed creation

Once we have defined the watershed location completely for working directory in **Watershed Module**. We can create the new watershed by select **New Watershed** in

the **File** on the **Menu** bar. Click the **Create New Watershed** then will appear the **Create New Watershed** dialog box that was shown in figure A.7.

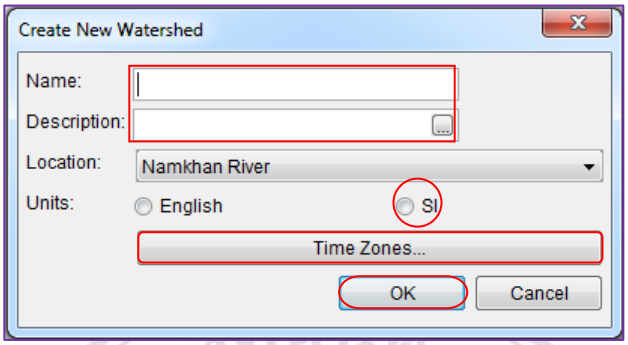

Figure A.7 Create new watershed dialog box.

Name defining cannot be setting over than 32 characters and cannot using symbol any such as: **/:*?"<>-\.** Choose a place for watershed creation in the zone list of available location. Choose a units **U.S Time Zone** (**U.S** customary units) or **International Time Zone** (**S.I** System international) and we will cannot to change the time zone after clicked **OK**. This simulation is specify the international time zone that is **Asia/Bangkok (GMT+7:00)**, which was shown in figure A.8. Then, click **Apply** and **OK** to select a time zone for creating **New Watershed**.

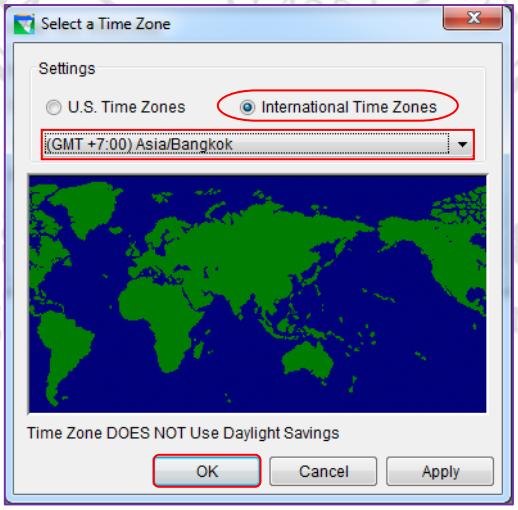

Figure A.8 Select Time Zone dialog box.

A.1.5 Importing maps into HEC-ResSim3.1 program

The background map can be imported from the sources outside of HEC-ResSim3.1 to add the map file into the watershed, using map should be appropriate files

to the watershed module. HEC-ResSim3.1 software does not operation in the coordinate changing for maps layer. Therefore, the map in a watershed should be had the same coordinate system. Table A.1 was shown the file formats HEC-ResSim3.1 that supports to background maps in watershed setup module.

Table A.1 Map layer formats supported by HEC-ResSim3.1 program.

Description	**Common File Name Extension**
Arc View ® Shape file	.shp
Auto CAD ® DXF	.dxf
Raster image	.img, .gif, .jpg
USGS* Digital Line Graph	.dlg
USGS* Digital Elevation Model	.dem
ASCII Net TIN	.net
ArcInfo® DEM	.asc
*US Geological Survey	

To add a map into watershed, first select the **Layers...** from a **View** in **Menu** bar. After that will appear The **Layer Selector** dialog box, which was shown in figure A.9. Second, select the **Allow Layer Editing** in **Edit** on menu bar. Then, select the **Add Map Layer** from the **Maps** menu bar.

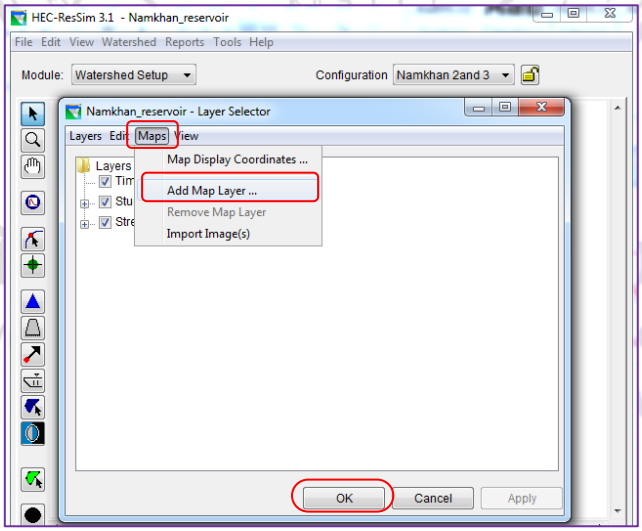

Figure A.9 Layer selector dialog box.

Once selected the **Add Map Layer** will appear the dialog box, which we want to choose any map files (following format above) to add into watershed. After we have selected the map file, click the button OK to add map we wish use, which was shown in figure A.10.

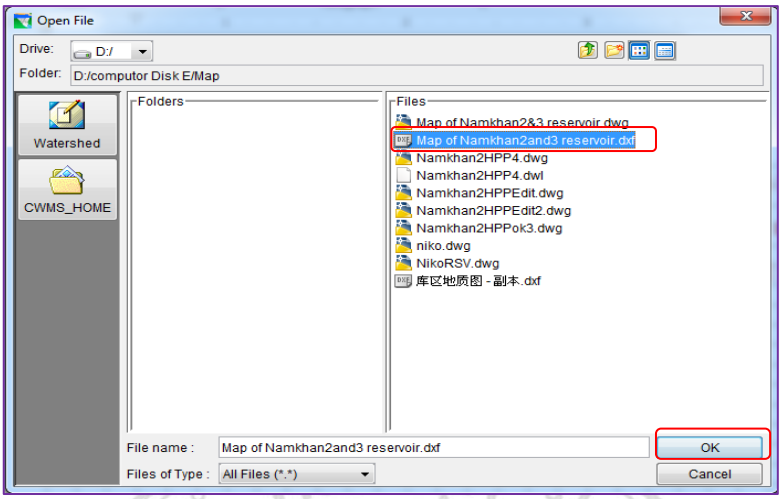

Figure A.10 Selection file for add map layer in Open file dialog box.

We should be selected the geographic scope of our watershed meticulously to insure that map will can setup all conditions in watershed model. The scope and the coordinate system that we use must be corresponding for all conditions in the watershed. We should check the coordinate system of map layer before that uses in watershed module.

A.1.5 Configuration editor

Before, movement the reservoir network module, must define the **Configuration Editor** in watershed setup module. The configuration editor is defined by **Watershed** from **Menu** bar. After, configuration editor will appear as figure A.11. Click a configuration from menu bar to select **New**, after that defines a **Name**, **Description**, and **Base Date**. Then click the button **OK** to create the configuration editor of us project.

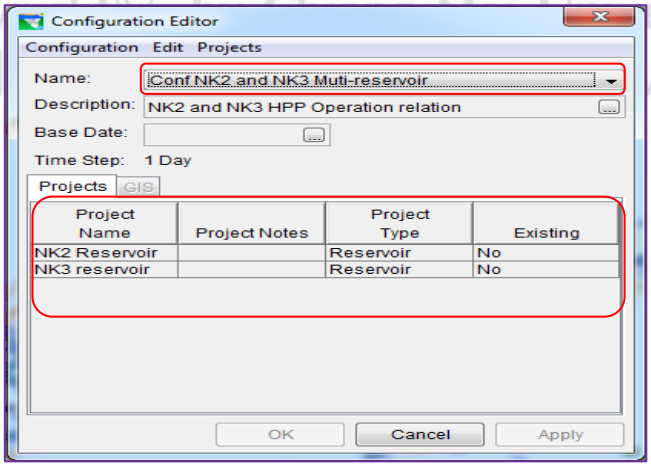

Figure A.11 Configuration editor in watershed module.

A.1.6 Creation a new stream alignment

To create a stream alignment, we must be in the **Watershed Setup Module**. Select **Watershed Setup** from the **Module** list. Press the Stream Alignment Tool on the map toolbar, which was shown in figure A.12.

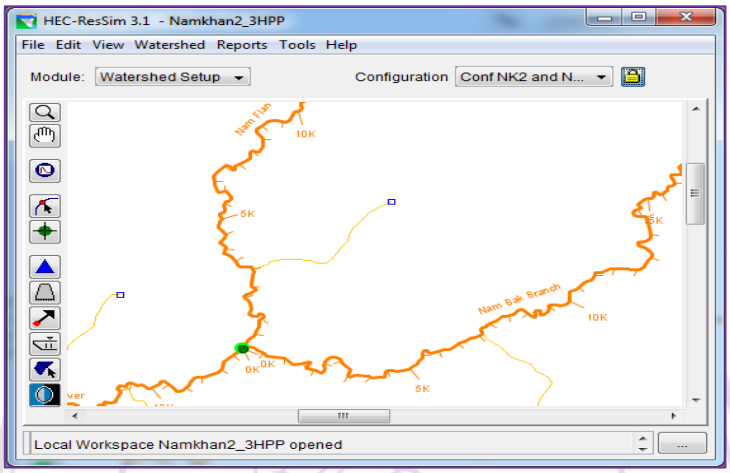

Figure A.12 Stream element drawing.

Drawing the stream element by clicking the left mouse button at each vertex point, which determine the upstream location where we want to start of stream element. While continuing to press the **CTRL** key can be drawing a stream and once last point is release the **CTRL** key, then click the left mouse to stop a drawing. Then, **Create New Stream** dialog box will appear, which can enter a new name or accept the default name. Click **OK** to create and close the **New Stream** alignment dialog box. Once we have completed the creation of us stream alignment. Finally, select **Save Watershed** from **File** menu will to be saved.

A.1.7 Creation a reservoir

Reservoir creating in the watershed module is placed on the stream alignment by started at the upstream to downstream of river. Choose the **Reservoir Tool** in display area, while click to draw a reservoir on the stream alignment should be pressed the **CTRL** key to continually drawing the reservoir. After drawn the new reservoir finish. Release the **CTRL** key then left-click in the stream alignment at last point of reservoir. Once we release the mouse button after creating, the **Name New Reservoir** dialog box appear as figure A.13.

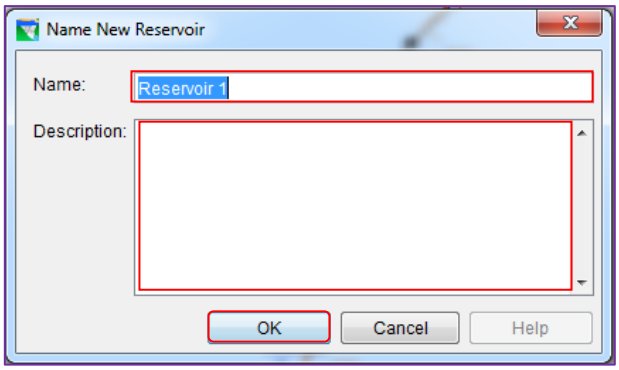

Figure A.13 Name New Reservoir.

After the reservoir has been created, we can enter New Nam Reservoir following by us name reservoir. Optionally, we can be entered in the description explaining about the reservoir feature. Click the button **OK** to done, then new reservoir element dialog box will appear as figure A.14.

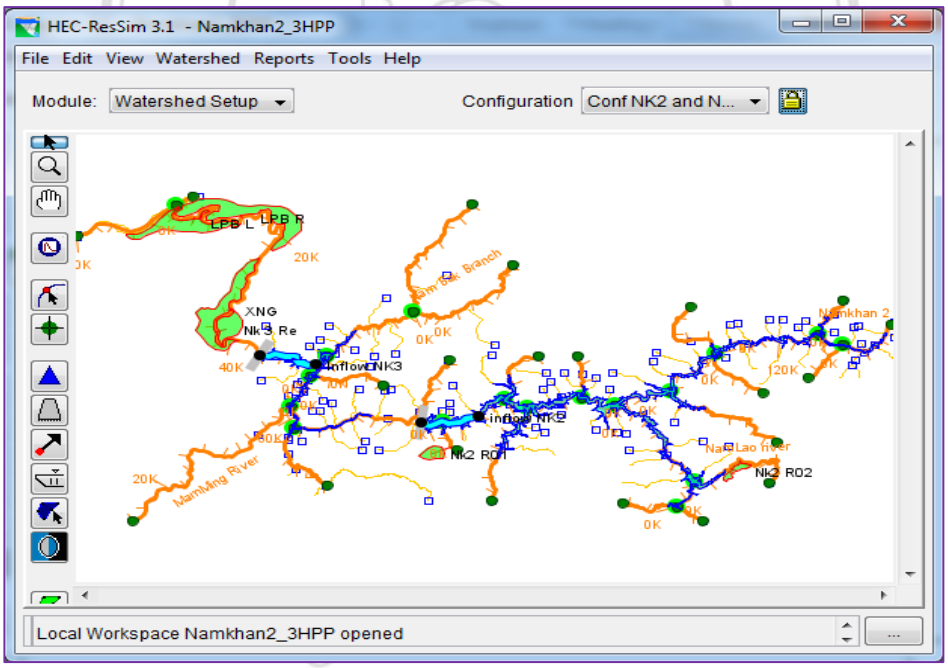

Figure A.14 Reservoir elements in watershed setup module.

A.2 Reservoir network module

The objective of this reservoir network module is to separate in the reservoir development model. The reservoir network module was into divided two sections as: **Networks** and **Alternatives**, which **Network** section will consist of pool, outlet, operational sets, reaches, diversion, and junctions and **Alternative** section will consist

of selection of network, operation set, initial condition, time series data. In the reservoir network module, we will build our network schematic, physical describe, and operational element and development alternative that we want to analyze the model. Using configuration alignment that is created in the watershed module. We can create the reservoir network and then defining reaches and other network element to complete the connection of the network schematic. The reservoir network module provides the tool that creating to develop the reservoir network as well as enter and edit physical and operation set, which was shown in figure A.15. What follows is a features of reservoir network module.

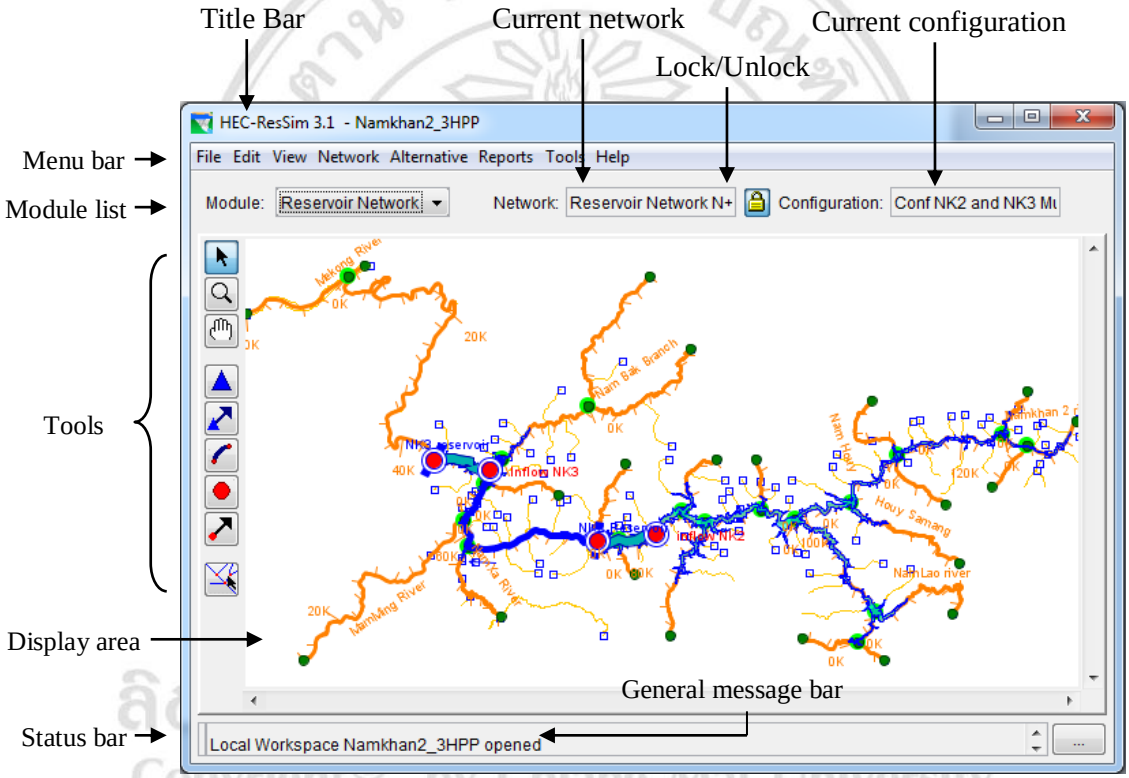

Figure A.15 Reservoir network module main window.

In which tools will include by **Pointer**, **Zoom**, **Pan**, **Reservoir**, **Diverted Outlet**, **Reach**, **Junction**, **Diversion** and **Network Connectivity** . For detail and feature should be read user' manual of HEC-ResSim3.1 program.

A.2.1 New reservoir network creation

Reservoir network creation is created by select New... from the Network menu bar, after create New Reservoir Network will appear. Then, enter Name,

Description and choose a configuration from the configuration list. Click the button New to create and close, which was shown in figure A.16 as below.

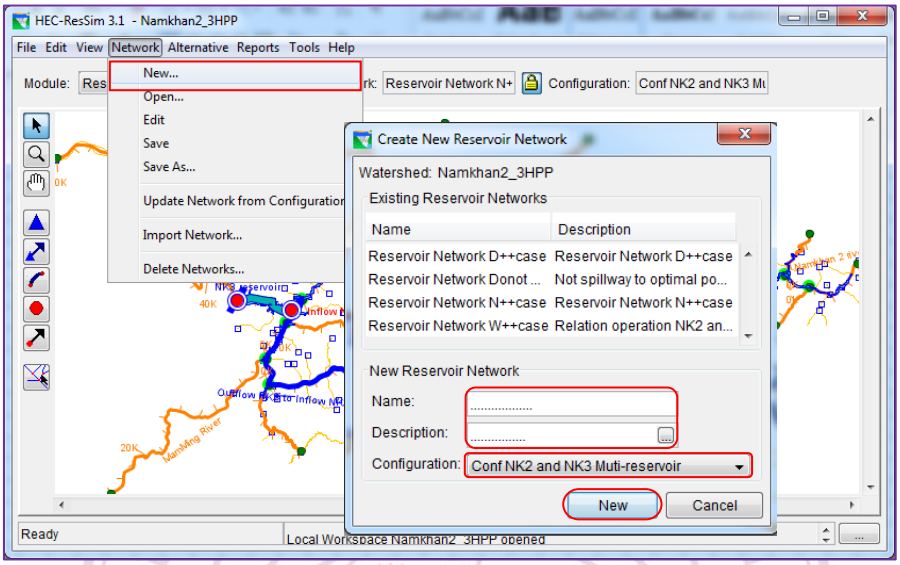

Figure A.16 New reservoir network creation.

A.2.2 Update a reservoir network

Once in watershed setup module, if we make change the other elements to the watershed configuration our network is base on, which must update our reservoir network by **Save Configuration** in the **Watershed Setup** module from the **Watershed** menu. Then, select **Update Network from Configuration** in the **Reservoir Network** module from the **Network** menu, which were shown in figure A.17 and figure A.18. Remark, we will need to update the reservoir network that is based on the revised **Watershed** configuration.

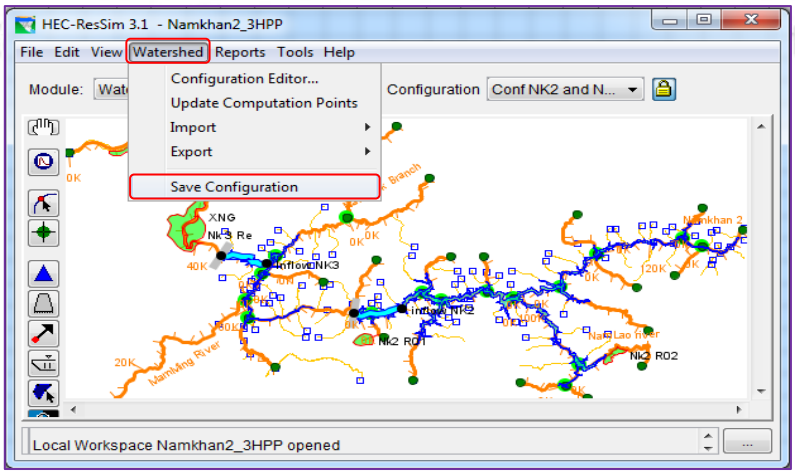

Figure A.17 Saving configuration before updating network.

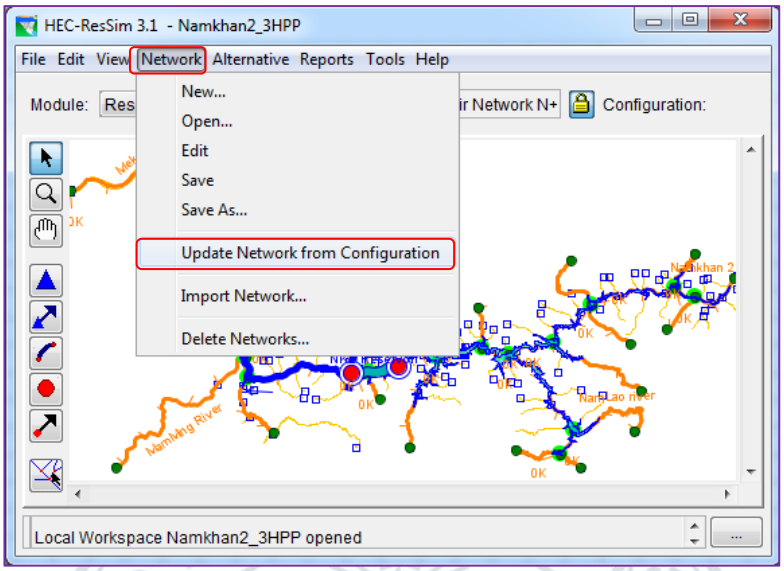

Figure A.18 Update network from configuration.

A.2.2 Edit junction in reservoir schematic

To define the junction in schematic, select a junction tool in display area, next right-click at junction on reservoir schematic. Then, select Edit Junction Properties, after **Junction Editor** Dialog box will appear as figure A.19. In **Junction Editor** Dialog box will consist by the junction information, local flow, rating curve and observed data. All four sections, we should enter a data and choose the condition that appropriate with us reservoir network. Specially, Local flow section is defined by two models as: if inflow junction, we should set the factor is 1.000 and if outflow junction, we should set the factor is 0.000 for multi-reservoir and serial case.

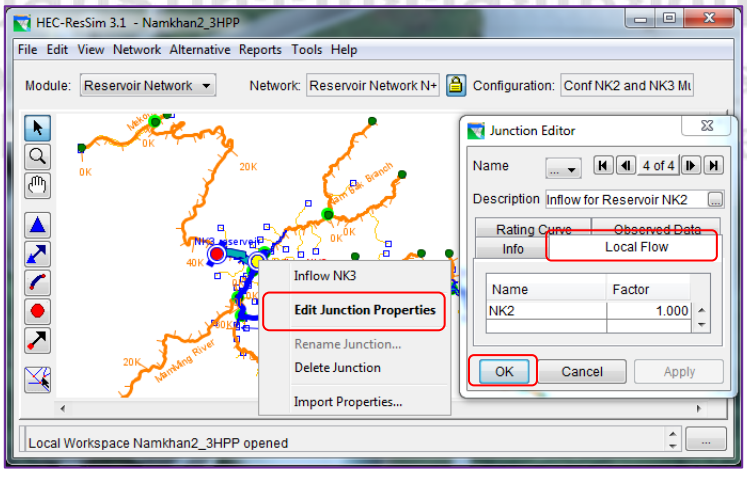

Figure A.19 Edit junction in reservoir schematic.

A.2.3 Editing reach in reservoir schematic

Reach is a tool to draw a river that connectivity outflow of dam at upstream to reservoir at downstream. The reach using in reservoir schematic is created by reach tool, which left-click on outflow junction, then left-click on inflow junction to connect between both dams that serial together. Furthermore, we can be edited the **Routing Reach** from selection the right-click the routing reach. Then, select the **Edit Reach Properties**, after the **Reach Editor** dialog box will appear that shown in figure A.20.

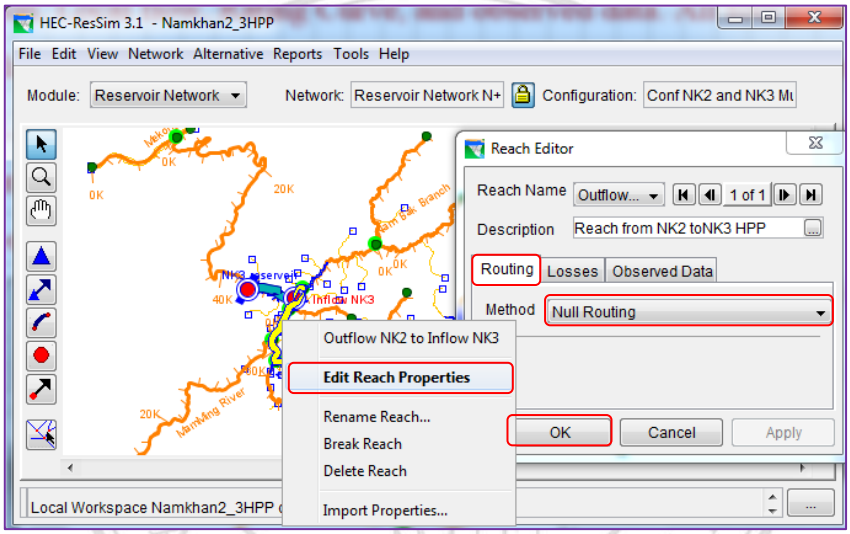

Figure A.20 Creating and editing reach in reservoir schematic.

A.2.4 Determination of reservoir feature

Determination of reservoir feature can be defined by right-click on any reservoir to enter among conditions that relate with reservoir schematic, which was shown in figure A.21.

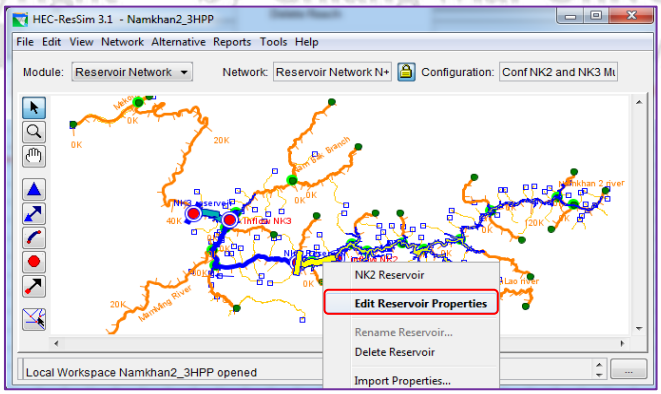

Figure A.21 Reservoir editor opening to define reservoir schematic.

A.2.4 Reservoir editor to define physical components

In determination of reservoir editor was divided two sections as: **Pool** and **Dam**. The pool elements is consist of pool evaporation and pool seepage. The dam element is consist of tail water elevation, leakage, controlled outlet, uncontrolled outlet, outlet group, power plant, and pump. Each section should be enter a data to software to simulate a modeling of reservoir operation, which some data was shown in reservoir editor main window in figure A.22.

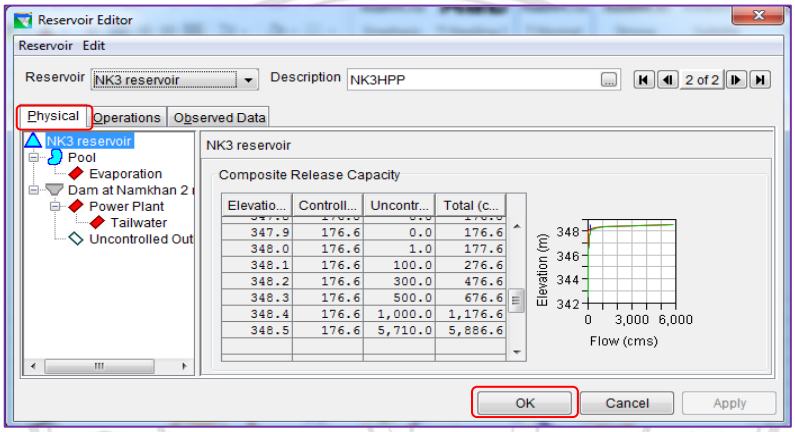

Figure A.22 Reservoir editor of physical tab.

The pool determination is selected by click the **Pool**, after **Reservoir-pool** will appear. Reservoir-pool consist of elevation of reservoir (masl), water storage in reservoir (cubic meter) and reservoir area (ha). In which entering data has two methods as: **Linear Interpolation** and **Conic Interpolation**. For this paper is used by the linear interpolation that was shown in figure A.23.

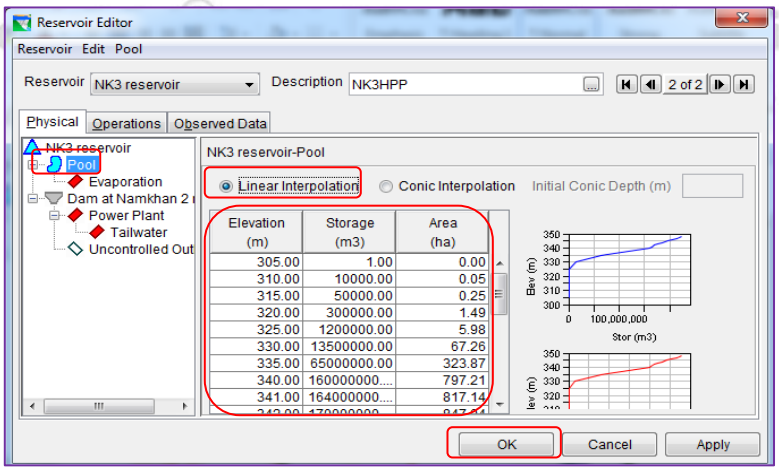

Figure A.23 Reservoir-pool entering of physical tab.

To create the pool-evaporation, select the pool evaporation from right click the Pool. Evaporation dataset is monthly data since January to December that evaporation unit is mm, which was shown in figure A.24.

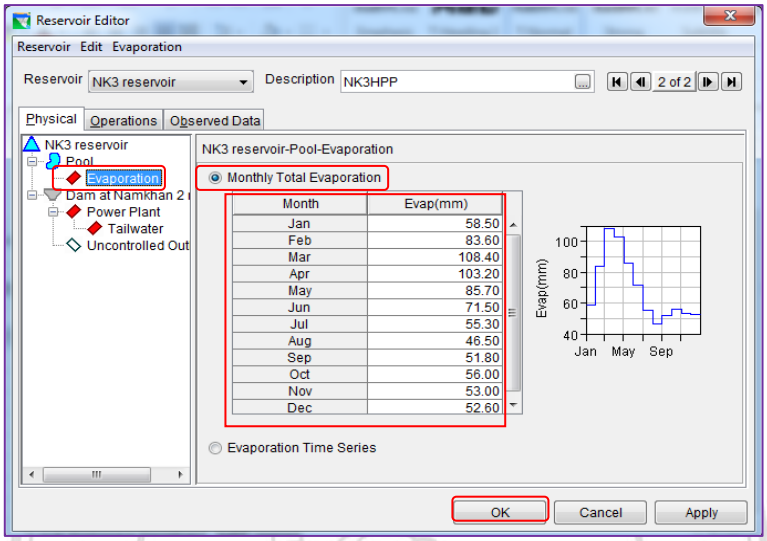

Figure A.24 Pool evaporation of physical tab.

To define the dam at **Namkhan River**, click the **Dam at...** from the **physical** section will appear the **NK Reservoir-Dam at Namkhan River**. This dialog box will consist of **Elevation at top of dam (m)**, **Length at top of dam (m)**, and **Composite release capacity**. We should be entered the condition data into a software to be simulated the model, which detail was shown in figure A.25.

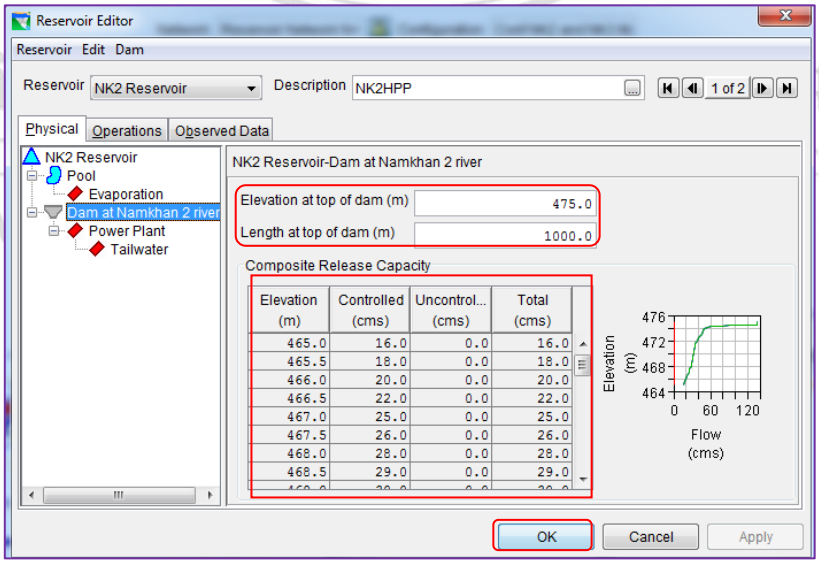

Figure A.25 Dam at Namkhan River of physical tab.

To create the power plant mode is selected Power Plant by right-click at the Dam, then choose the **Add Power Plant**. In which power plant dialog box will consist of the **Outlet**, **Capacity**, **Efficiency**, **Station Use**, and **Hyd..Losses**. In among elements have important that effect to be simulated model. Therefore, we should be entered the condition data for software to complete which was shown in figure A.26.

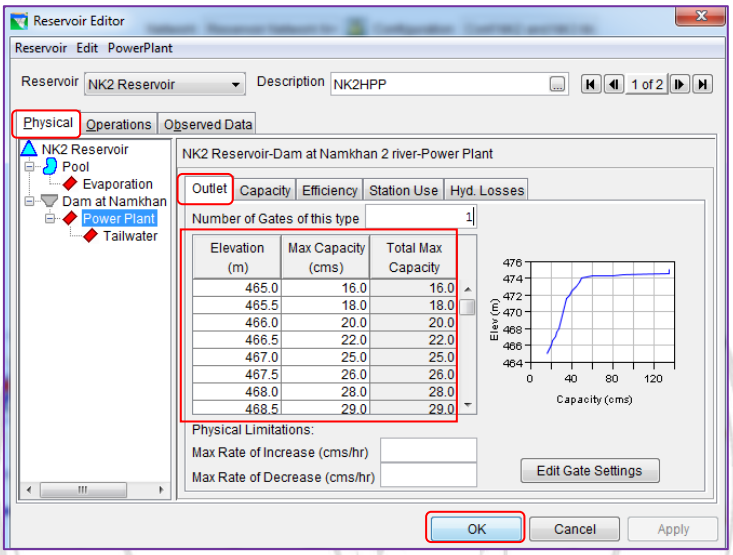

Figure A.26 Power plant creating of physical tab.

To define the tail water elevation is selected a **Tail-Water** by right-click at the power plant, then choose **Add Tail Water Elevation**, which will appear as figure A.27. This mode has the **Stage** (m) and **Discharge** (cms) of rating curve that should be entered the tail water elevation data into software to simulate a model.

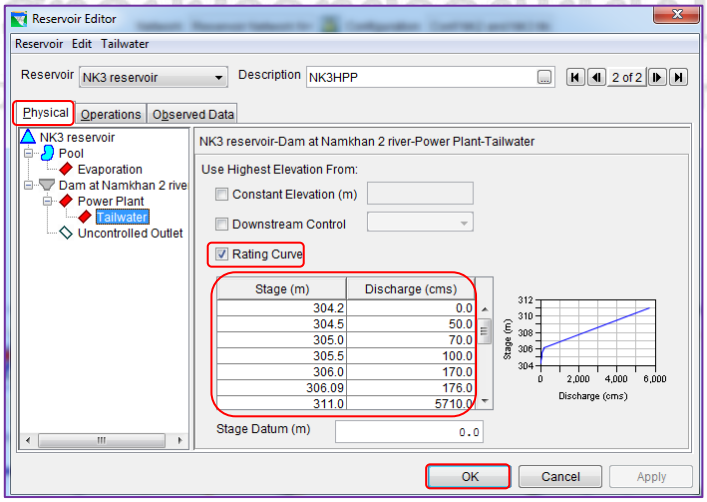

Figure A.27 Tail-water elevation creating of physical tab.

Uncontrolled outflow is created to define the water release that can't storage in reservoir, which we can be created by select the **Uncontrolled Outflow** from right-click at **Dam**. This research is chosen by using the **Elevation** between **Outflow** which should be entered the relation data as water elevation with water release through spillway and detail was shown in figure A.28.

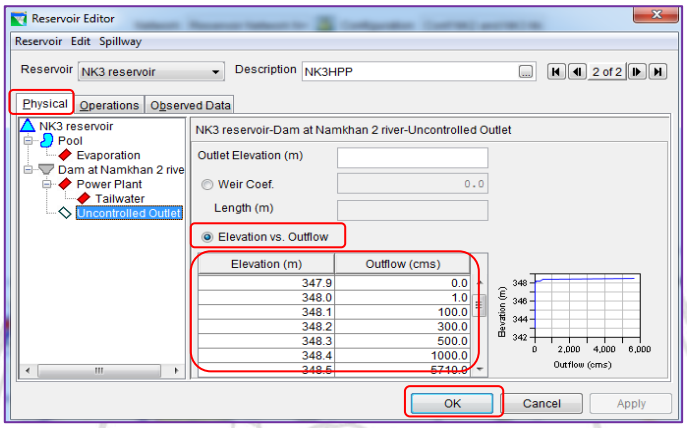

Figure A.28 Uncontrolled outflow creating of physical tab.

A.2.5 Reservoir editor to define the operational set

The operation set is one section that important in the determination of the model operation. Once opened the operations will appear the **Zone-Rule** as: **Flood control**, **Conservation**, and **Inactive**. For, upper and lower rule curves (**URC**, **LRC**. respectively) can be created by click the **Zone** on **Menu** bar, then select **New...** After that, operational dialog box will open as figure A.29 which should be defined the URC and LRC to appropriate of each reservoirs.

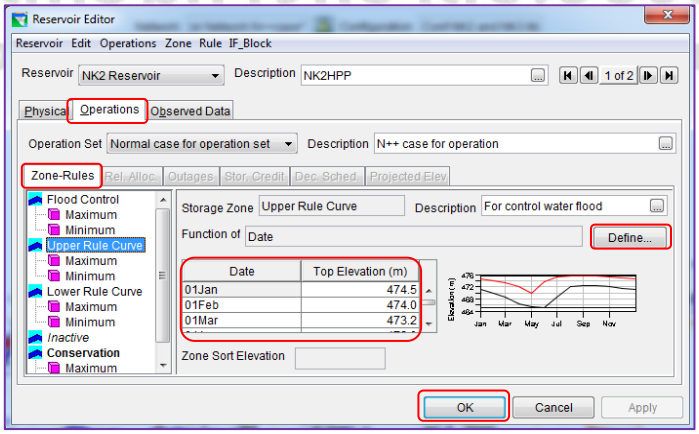

Figure A.29 Uncontrolled outflow creating of physical tab.

Maximum and minimum switching line is defined from the storage capacity of each reservoirs. Maximum and minimum switching line were created by select the **New...** from the **Rule** on **Menu** bar. After, it will appear the dialog box for setting name, then, we should be entered the limited data of each reservoirs. The detail was shown in figure A.30 as below. Remark, detail determination of the operational set is explained and illustrated in **User's Manual** for HEC-ResSim3.1 program, version 3.1 May 2013.

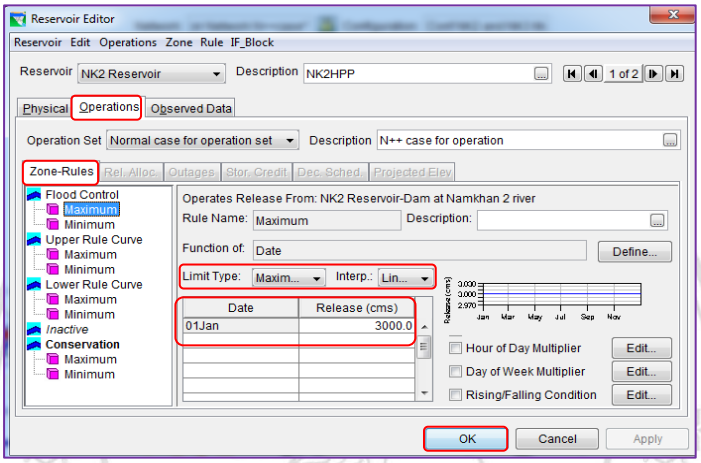

Figure A.30 Maximum and minimum determination of physical tab.

A.2.6 Observed data in reservoir editor

The observed data has objective comparison between actual and simulation data. If we checked the observed box in the dialog box, which need be added the observed data in Time-series of Alternative. For detail was shown in figure A.31. After, click the button Apply and select another reservoir, then click the button OK to define and close of the observed data tab.

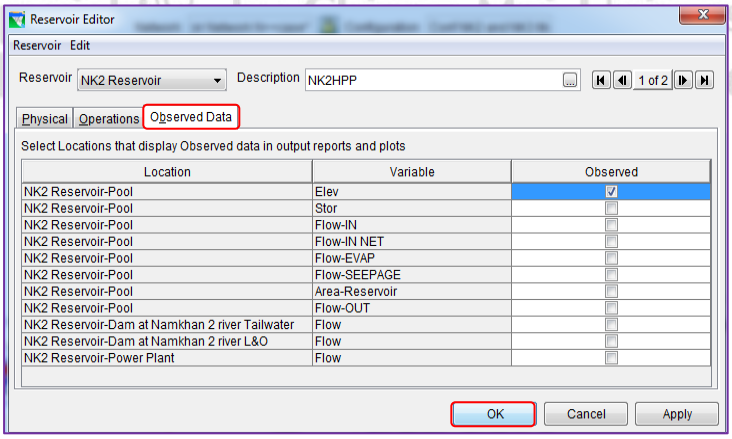

Figure A.31 Observed data tab in reservoir editor.

A.2.7 Defining Alternatives

To create the alternative editor, select **New...** by choose the **Edit…** from the **Alternative** on the **Menu** bar in **Reservoir Network Module**. After **ResSim Alternative Editor** Dialog box will appear as figure A.32. Once we ever created the alternative editor. It will shows the alternative existing on the list name and if never creating will don't have the alternative in the list name dialog box.

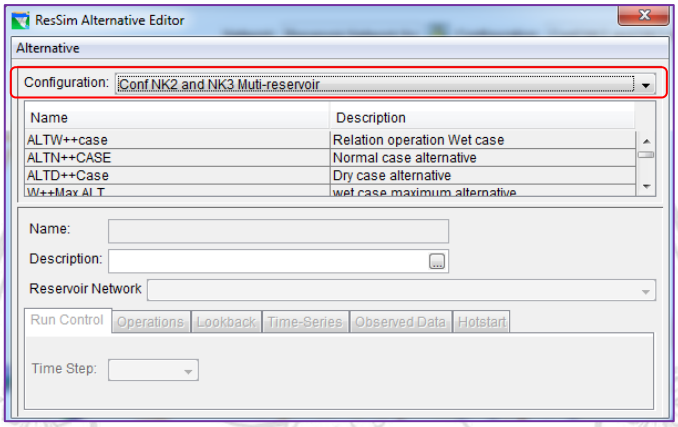

Figure A.32 Alternative editor.

To create the new alternative, select **New...** from the **Alternative** on the menu bar in the **ResSim Alternative Editor**. After that, **New Alternative** dialog box will appear as figure A.33 for to give the **Name**, **Description**, and to choose the reservoir network that we want to use. Then, click **OK** to close the **New Alternative**.

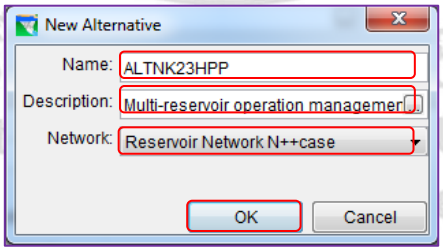

Figure A.33 New alternative.

In alternative determination was consists of six sections as: run control, operations, look back, time series, observed data, and hot start. For run control section has a time steps, flow computation method, and log level. Which defining detail was shown in figure A.34.

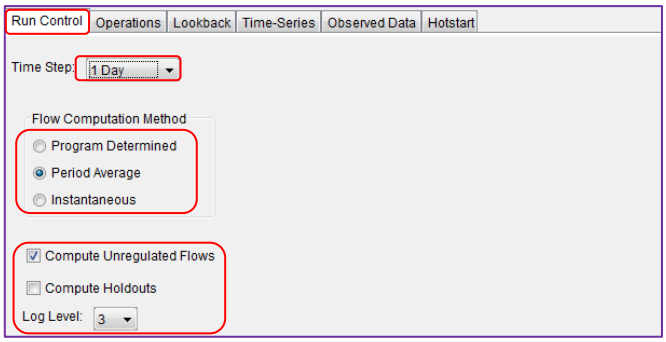

Figure A.34 Run control tab in alternative editor.

The operations choosing depend on operational set creation in the operational determination. If we have two reservoirs as well as operation set will have two sets, which each set will have less or more alternative that depend on the operational creation of each reservoir. The operations choosing was shown in figure A.35.

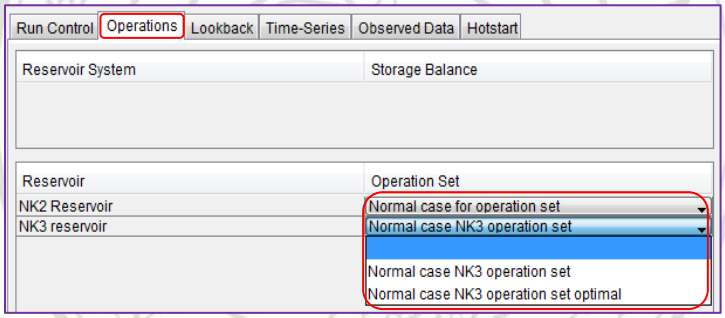

Figure A.35 Operations tab in alternative editor.

The selection **Look Back Type** is specifying the type and default value in the look back section. A type in the look back has two as: constraint and computed, which if choose a constraint must be enter data at the default value box, and if choose a computed must be linked the Time-series dss file into the **Time-Series** section. Defining detail was shown in figure A.36.

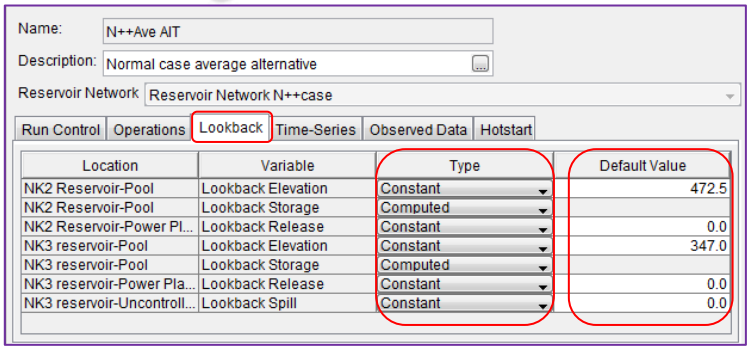

Figure A.36 Look back tab in alternative editor.

This paper was used by Entering Time Series Data Manually method that easy for data importing because we have existing data in **Microsoft Excel**. First, clicks the button **Select DSS Plath...**then will appear the dialog box to open the DSS files. Second, select your cursor on **Time-Series** box for wanted to files use then clicks the button **Set Pathname** to paste a DSS files until completely. The detail is shown in Figure A.37.

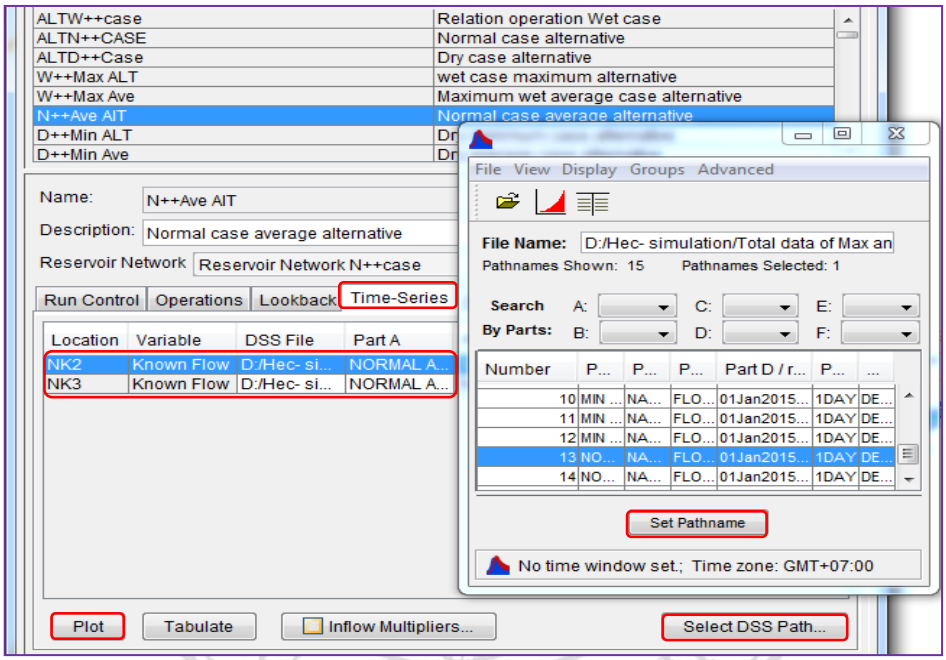

Figure A.37 DSS Files Importing Into HEC-ResSim3.1 Model.

Defining observed data has specifying to check the appropriate box. In the observed tab within each element's editor in the reservoir network module. For hot start option is the data saving to "**Hotstart**" file that we want to save a data, while run the simulation model. After completely data enter of the full conditions, click the **Alternative** on menu bar then choose **Save as...** to save the new alternative.

A.3 Simulation Module

Once we have entered all required data and have defined the alternatives, which are ready to perform a simulation. A simulation should be specified the time window and time interval parameter for alternatives. Furthermore, we can analyze the results, make revision and perform additions simulation to better evaluate of the reservoir operation in the model development process.

A.3.1 Create simulation case

To define the new simulation, choose a **New...** from a **Simulation** on **Menu Bar** in the **Simulation Module**. After the **Simulation Period** dialog box will appear as figure A.38.

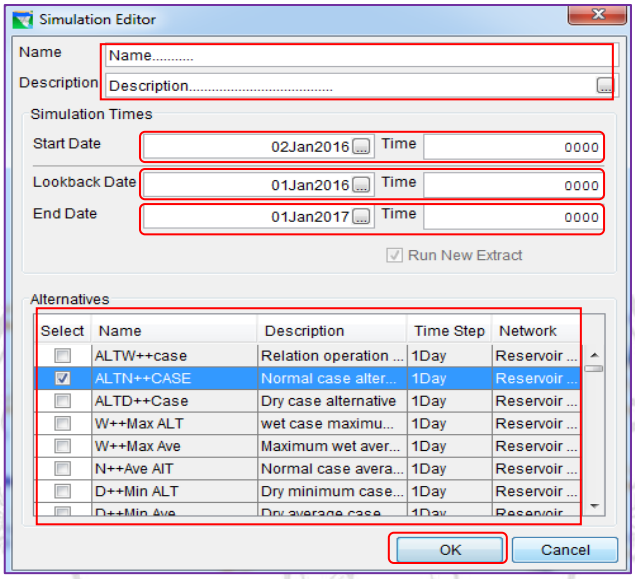

Figure A.38 DSS Files Importing Into HEC-ResSim3.1 Model.

A **Name** and **Description** determination can define to appropriate but **Start Date** and **Time** should be specified when we want the simulation to begin, which must occur after the lookback date. Entering a **Lookback Date** and **Time** should be entered a date before the start date. For **End Date** and **Time** is defining when we want the simulation to conclude. Next, choose the **Alternatives** in the table that has defined the reservoir network module. Then, click **OK** to close and simulate the model as well as the creating simulation dialog box will appear as figure A.39.

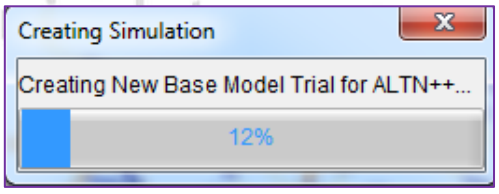

Figure A.39 Created simulation window.

A.3.2 Compute simulation

Once we have opened a simulation that will show all of the selected alternative for the simulation of we have chosen. Checked the checkbox but it can be

checked a one checkbox only. Next, select the **Set As Active** by right-click on the alternative to set the active alternative or click the button **Compute**. Main window of simulation module after completely computed, which was shown in figure A.40.

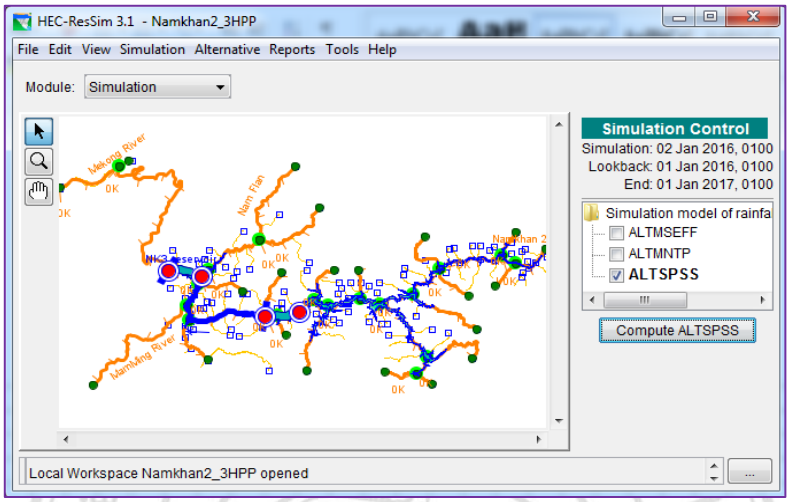

Figure A.40 Simulation control panel window.

A.3.3 Using plots and tables

To access the plots and tables from the display area, right-click on the model element in the map display. It will appear the dialog box that shown in figure A.41.

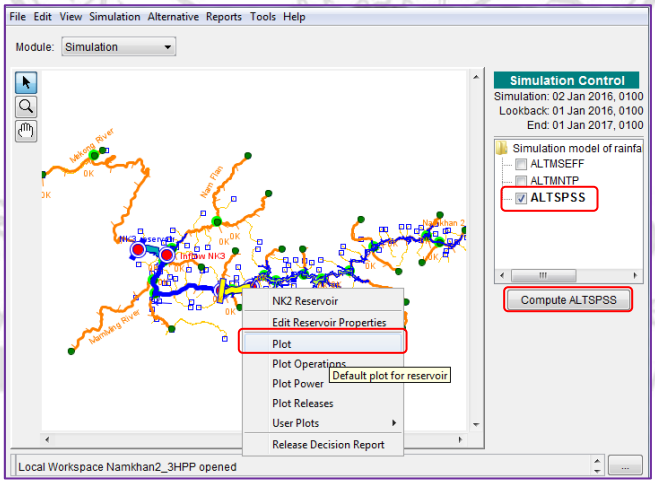

Figure A.41 Reservoir shortcut menu.

A.3.4 Feature of plots

HEC-ResSim plots offer a variety of information that will assist you with reviewing the results of a simulation. Some default plot style illustration of reservoir results from simulation model is shown in figure A.42.

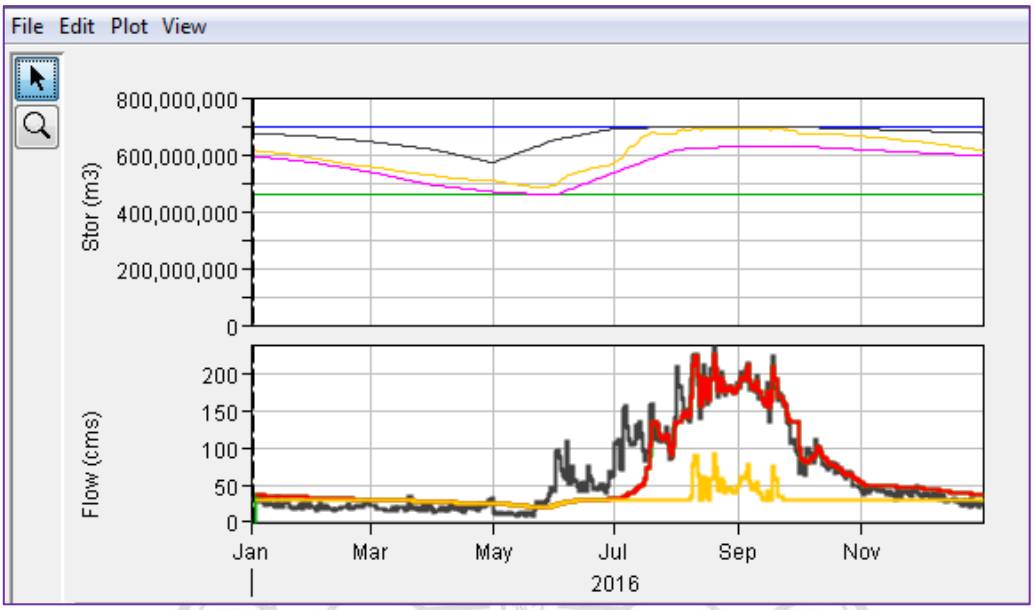

Figure A.42 Sample plot of reservoir result.

A.3.5 Viewing summary report

To view some summary reports, select summary name that we want the report from the reports on menu bar. For example, viewing the summary reservoir report of the simulation model, which was shown in figure A.43 as below.

Reservoir Summary Report

File Options

Simulation: Simulation model of rainfall forecasting on 2016
Alternative:ALTSPSS

Lookback: 02 Jan 2016 24:00
Start Time: 03 Jan 2016 24:00
End Time: 01 Jan 2017 24:00

Location/Parameter	Average	Maximum	Minimum
NK2 Reservoir			
Storage (m3)	603225472.74	689728551.33	484778218.81
Elevation (m)	471.38	475.15	466.21
Controlled Release (cms)	57.15	135.00	0.00
Uncontrolled Spill (cms)	0.00	0.00	0.00
NK3 reservoir			
Storage (m3)	204154124.82	225144010.83	177793711.79
Elevation (m)	345.93	348.12	343.19
Controlled Release (cms)	76.98	176.60	0.00
Uncontrolled Spill (cms)	9.80	128.05	0.00

Figure A.43 Reservoir summary report of reservoir result.

A.3.6 Managed simulation data

HEC-ResSim will advocates in saving and sharing of simulation data. Both modules have operations involved in a management of the simulation data. Furthermore, we can considering and checking the result simulation data that have appropriate with reservoir development process? And if results from the simulation data is not the result appropriate, we can modify the conditions in the reservoir network module to appropriate with us model or we want. Interlacing between reservoir network and simulation module was shown in figure A.44 that illustrated the relationship between modules for managing simulation data.

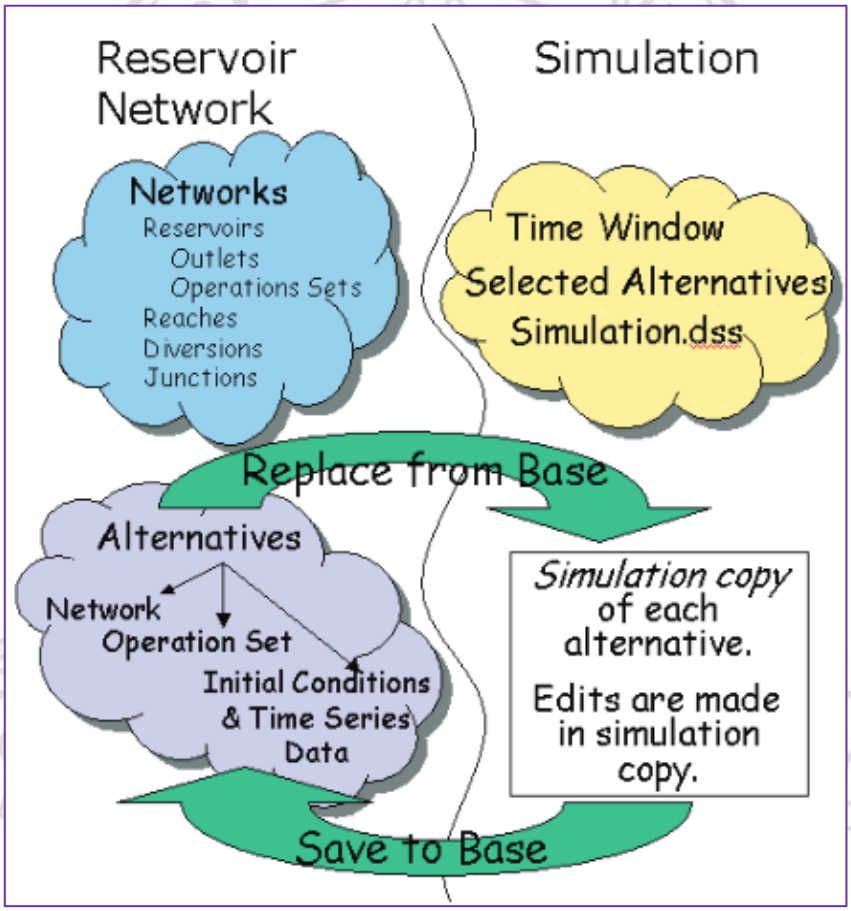

Figure A.44 Relationship between reservoir network and simulation modules for managing simulation data.

APPENDIX B

Introduction and Using HEC-DSSVue 2.0.1

HEC-DSSVue is abbreviated from Hydrologic Engineering Center's Data Storage System Visual Utility Engine, which is interface program of graphical user for management, viewing, and editing data in the HEC Data Storage System (HEC-DSS) that database files for the system analysis. HEC-DSSVue2.0 program can be planed, edited, and linked the datasets. Furthermore, data management has over fifty of the mathematical functions, which these functions is into a database that can rename dataset names, copy datasets files to other HEC-DSS, and delete datasets.

Normally, datasets will be selected from a storage in a HEC-DSSVue2.0 by filtered list of names to links with others programs, which main screen of software was shown in figure B.1. Also, HEC-DSSVue consists of the standard scripting language that help to identify a usual sequence of steps in a text mode and then execute the sequence from a user defined button or a "batch" process.

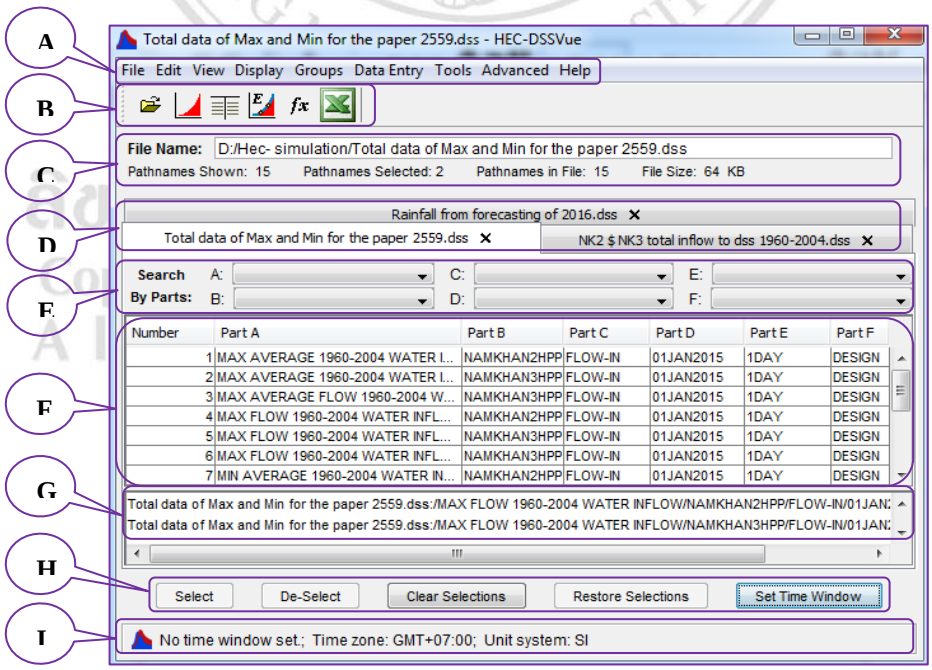

Figure B.1 HEC-DssVue2.0.1 Main Screen.

These mean for **A** is menu bar; **B** is tool bar; **C** is current file; **D** is file tabs; **E** is search boxes; **F** is DSS pathnames**; G** is selection area; **H** is selection buttons**; I** is message bar. Furthermore, HEC-DSSVue2.0 program is written by the Java programming language that helps to be run under the diversity of different operating systems. The system fully supported comprises Microsoft Windows, Sun Solaris (UNIX), Red Had Linux and other systems.

B.1 Create DSS files in HEC-DSSVue2.0 software

HEC-DssVue 2.0 can be opened from the HEC-ResSim3.1 program, which chooses HEC-DssVue 2.0 files in the HEC-ResSim from the tools menu. When HEC-DSSVue was selected from the tools menu in the reservoir network module, which opened and linked "datasets. dss" to network alternative in HEC-ResSim3.1 software. Beginning of building the dataset files should be known about software criteria, which pathnames was separated into six parts (delimited by slashes "/") labeled "A" to "F", which shown in figure B.2. For "regular" time-series records, the naming conventions for describing the contents was consisted the six pathname parts as below:

A. Project name is name of among project or river name that will be research. Example: NAMKHAN 2 AND 3 HYDROPOWER PLANTS, RIVER, RESERVOIR…

B. Location is project zone that construction, operation projects such as: Northern of Laos, Luangphabang province…

Example: LUANGPHABANG, VIENTIANE, CHUMPASUCK…

C. Data parameter is any parameter that identify characteristic of variable such as: water flow, reservoir elevation, water storage…

Example: FLOW, ELEV-RES, STORAGE, FLOW-IN, FLOW-OUT…

D. Starting date of block is identify about time, which in a nine-character military format.

Example: 01JAN2015, 25SEP2015, 02JAN2016, 31DEC2017…

E. Time interval defines the time interval for regular-interval data Such as: 1min, 10min, 30min, 1hour, 12hour, 1day…

Example: MIN, HOUR, 12HOUR, DAY, WEEK, MONTH, SEMI-MONTH,YEAR...

F. General descriptor or additional user-defined descriptive information identifies a unique descriptor of the data such as: forecast, existing, flood proof plan, management, electricity production

Example: FLOOD PLANING, RESERVOIR MANAGE, RELEASE…

Remark: Setting name must be capital letter and it must have slashes before and ending of each project name.

Example:/NAMKHANII/LUANGPHABANG/FLOW/01jan2015/DAY/FORECAST/.

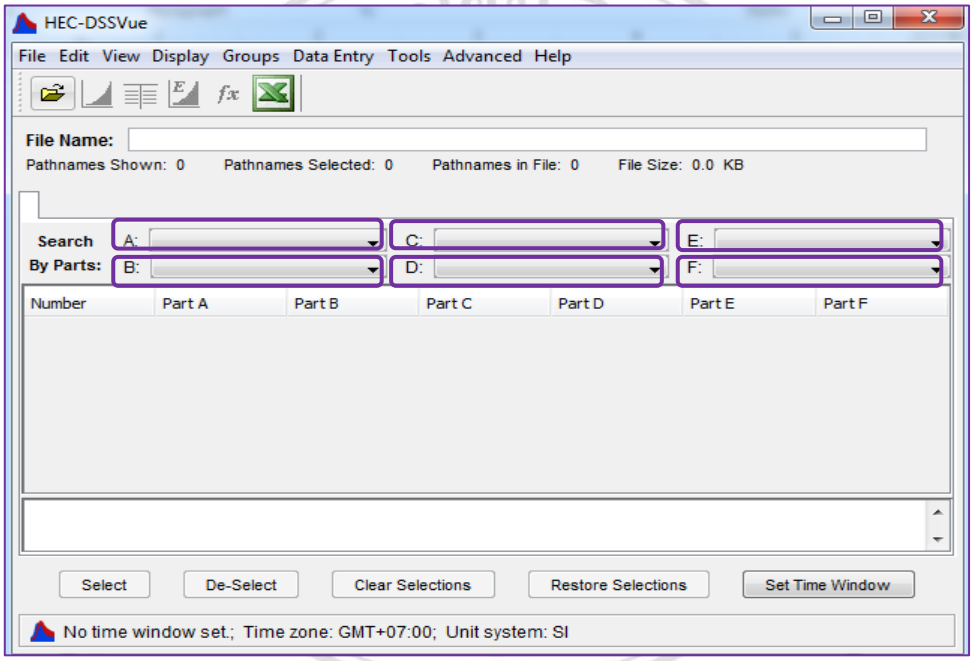

Figure B.2 Pathnames of HEC-DSSVue2.0 Software.

B.1.1 New file creating in HEC-DSSVue

To create a new file in this program is started from the **File** menu, selected **New** or **Crtl+N**. Then will appear a **Create New HEC-DSS** file dialog box. After that, choose any folder for saved files, specify a **Name** for the file and selected a **files of type "".dss"**. Click the button **Create** to build a new file, which steps detail was shown in Figure B.3.

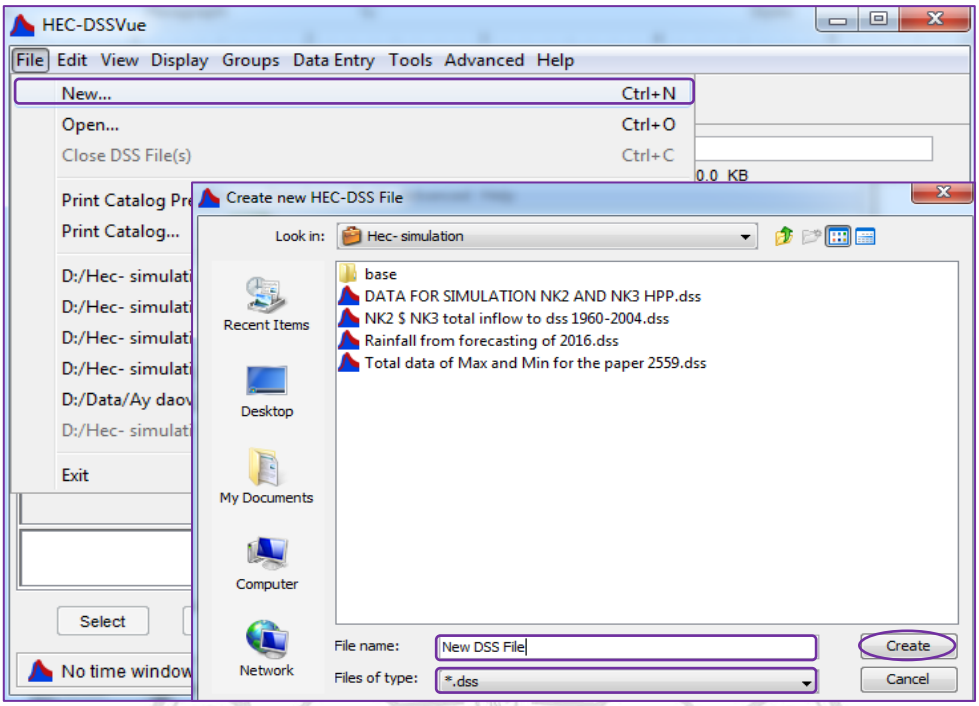

Figure B.3 created new files on HEC-DSSVue2.0 program.

B.1.2 Data entry creating

To create a new data base is begin from the **Data Entry** in a **Menu Bar**, selected the **Manual Time Series** then will appear a dialog box **"Time Series Data Entry"**, which was shown in Figure B.4.

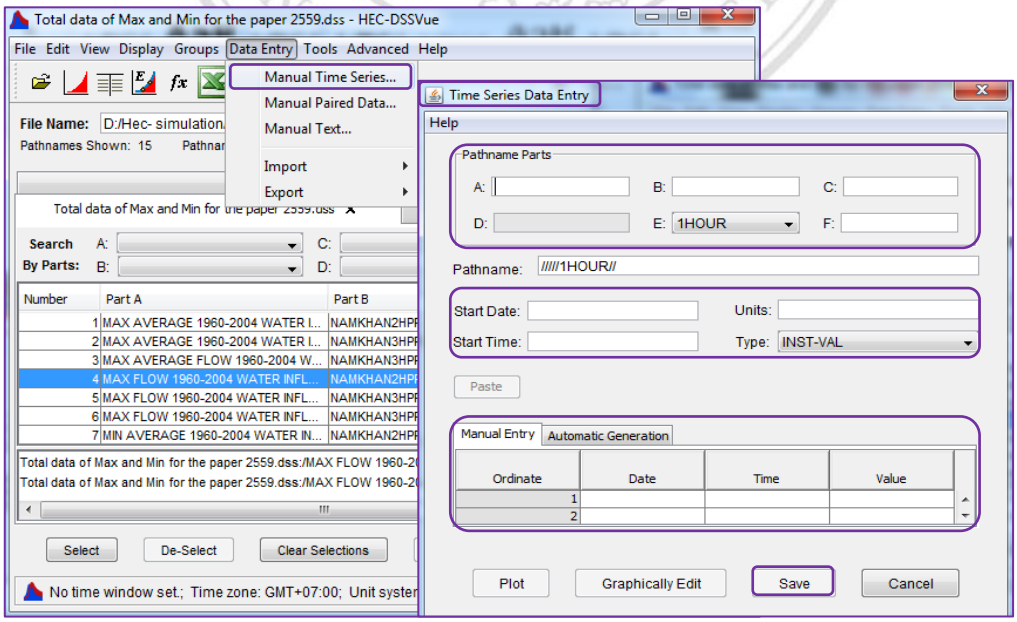

Figure B.4 Create File Database on HEC-DSSVue2.0 Programs

B.1.3 Addition data in Time Series Data Entry

To add a data to Time-Series data manually is begin from define the new names for parameter **A to F.** Parameter **A** is specified the name of project and parameter **B** is specified the location of project. But parameter **C** is the variable type, which must choose type to appropriate such as **FLOW-IN**, **ELEV-RES** and **STORAGE**. Parameter **D** is defined the starting date, start time, units, and type of graphic model. Parameter **E** is defined a **Time Interval** such as: **1day, month,** and **year.** Parameter **F** is an additional user-defined descriptive information.

For example, a started date is designated by 01Jan2015 model and start time is 00:00. Due among units has difference of each parameter such as: if water inflow, release units are cms, if reservoir elevation units is masl, and if water storage units is MCM. For showing graphical was selected PER-AVER in the parameter D mode. Data adding can be added in two models as: Manual Entry and Automatic Generation, in which was added by Manual Entry. Data entry is copied data from Microsoft Excel files (Figure B.5) that easy for data entry or existing data. Then paste the value at column in the DSS file by Click the button paste to entries. For ordinate, date, time, program will define auto in the column. After **Click** the button Save to take the data base in the dialog box, which was shown in Figure B.6.

Date	Namkhan 2 HPP water Inflow (cms)				
	Max Wet	Wet Ave	Normal	Min dry	Dry Ave
01-Jan	29.05	29.34	27.99	24.29	21.57
02-Jan	28.65	28.95	28.91	30.89	27.43
03-Jan	32.75	33.09	24.13	22.88	20.31
04-Jan	24.81	25.06	26.45	31.43	27.91
05-Jan	28.39	28.68	31.07	27.05	24.02
06-Jan	28.12	28.41	25.49	22.52	19.99
07-Jan	23.87	24.11	32.56	32.74	29.08
08-Jan	27.38	27.65	20.18	31.95	28.37
09-Jan	28.78	29.07	27.00	28.86	25.63
10-Jan	29.95	30.26	22.16	24.10	21.40
11-Jan	23.27	23.51	22.43	24.54	21.79
12-Jan	25.09	25.34	21.76	26.56	23.58
13-Jan	25.27	25.53	18.37	21.90	19.45
14-Jan	24.05	24.29	32.35	25.20	22.38
15-Jan	29.75	30.06	22.61	24.34	21.61
16-Jan	27.56	27.84	19.36	22.43	19.92
17-Jan	23.91	24.16	24.98	24.93	22.14

Figure B.5 Data Preparation in Excel File for using in dss files.

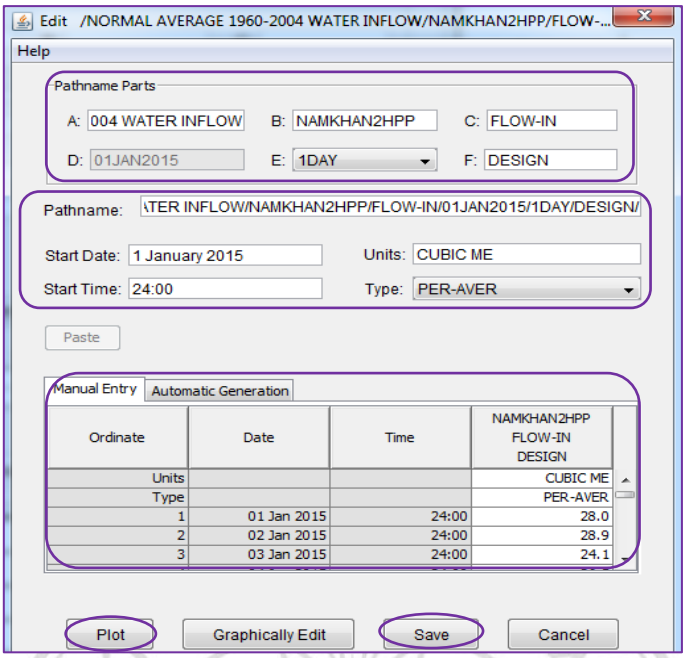

Figure B.6 Create Database on HEC-DSSVue2.0 Programs.

B.1.4 Plot and graphical editor

To plots a new graph in **HEC-DSSVue**: By selection the files in list of dialog box that want to plot. The selection is **Click** the button **Select** to select the files and if want delete files **click** the button **De-Select** or **Clear Selection**. Then Click the button  to plots the graphic, which was shown in Figure B.7.

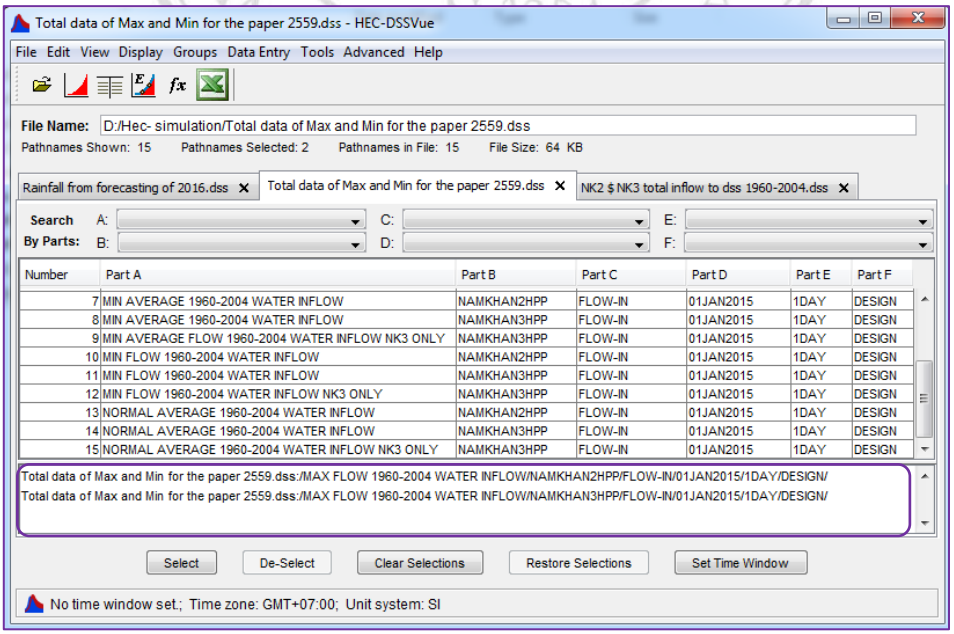

Figure B.7 DSS Files Overview on HEC-DSSVue2.0 Programs.

To plots the graphic editor: After selected the files, then Click the button  in dialog box will appear in Figure B.8. After that we can be changed or revised the data in dialog box as below.

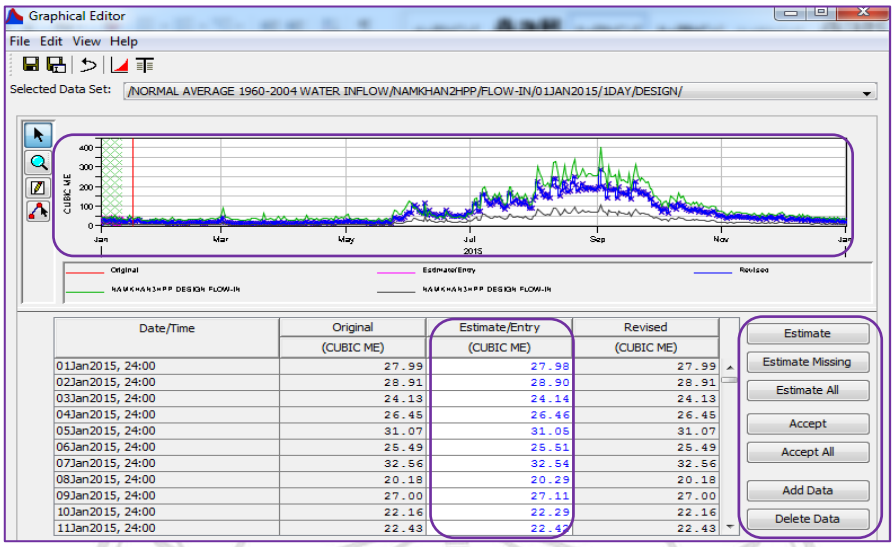

Figure B.8 Graphical Editor on HEC-DSSVue2.0 Programs.

B.2 DSS dataset Importing to HEC-ResSim3.1 Model

After opened the HEC-ResSim3.1 program will appear the dialog box of the main window. First, we must opened the project by select from the **Files,** next **choose** the **opened watershed** for file project to open. Then choose module from the **choice** to choose the **Reservoir Network** module, which was shown in figure B.9.

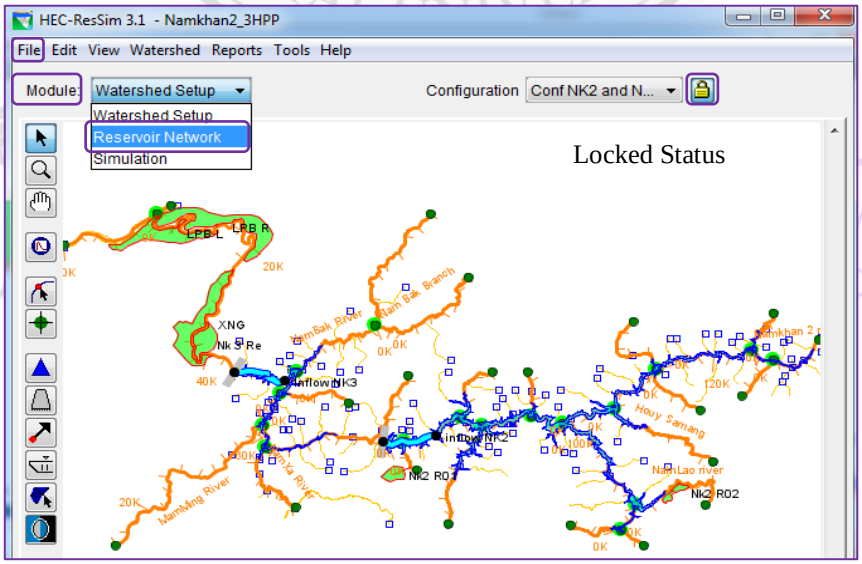

Figure B.9 Reservoir Network Opening in HEC-ResSim3.1 Model

B.2.1 Reservoir network opening in HEC-ResSim3.1 model

HEC-ResSim3.1 model was consisted by three modules, in which module for data importing is a **Reservoir Network Module.** First, clicks the **Network** from **Menu Bar** to open the reservoir network that we saved in a software. Second, select the existing reservoir network for choosing the network case to open the **Reservoir Network**. Then Click the button **Open** will be appeared the dialog box, which derail was shown in figure B.10.

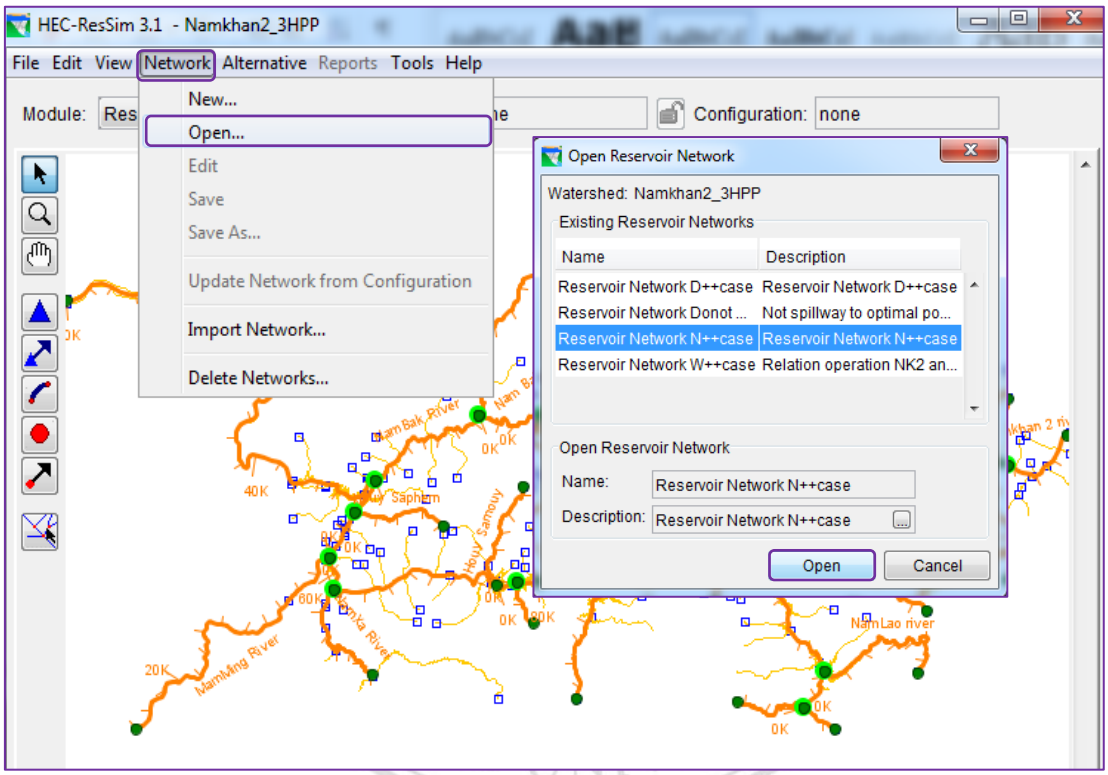

Figure B.10 Reservoir Network in HEC-ResSim3.1 Model.

B.2.2 Alternative creating in Reservoir network module

One an important thing is network should be locked status to create a new alternative in reservoir network. First, Clicks the Alternative in a **Menu Bar** and click the **Editor**, which will appear the **ResSim Alternative Editor**. Second, clicks the **new…**to create the **New Alternative** and it will appear the dialog box for name setting. Third, sets the **Name**, **Description** and choose the **Network** that we have configured in reservoir network. Then Clicks the button **OK** to create the alternative, which was shown in Figure B.11.

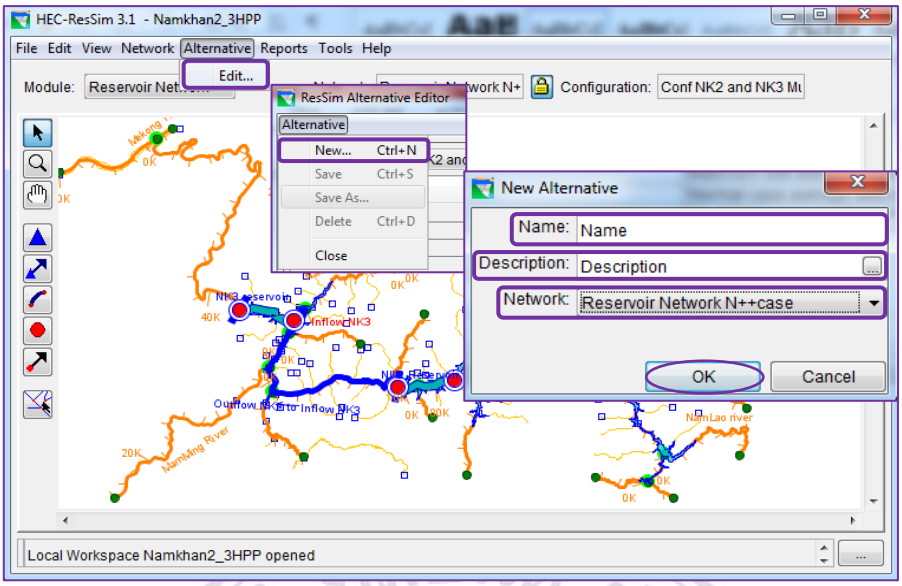

Figure B.11 ResSim Alternative Editor in HEC-ResSim3.1Model

B.2.3 ResSim Alternative Editor

When opened the **HEC-ResSim3.1 Alternative** browser window, select name alternative (**Conf NK2 and NK3 Multi-reservoir**). Choose **Time series** and clicks cursor in the row of **DSS files** that want to import a data from the time series of HEC-DSSVue, then click the button **Select DSS Path…**. It will appear dialog box, which was shown in Figure B.12.

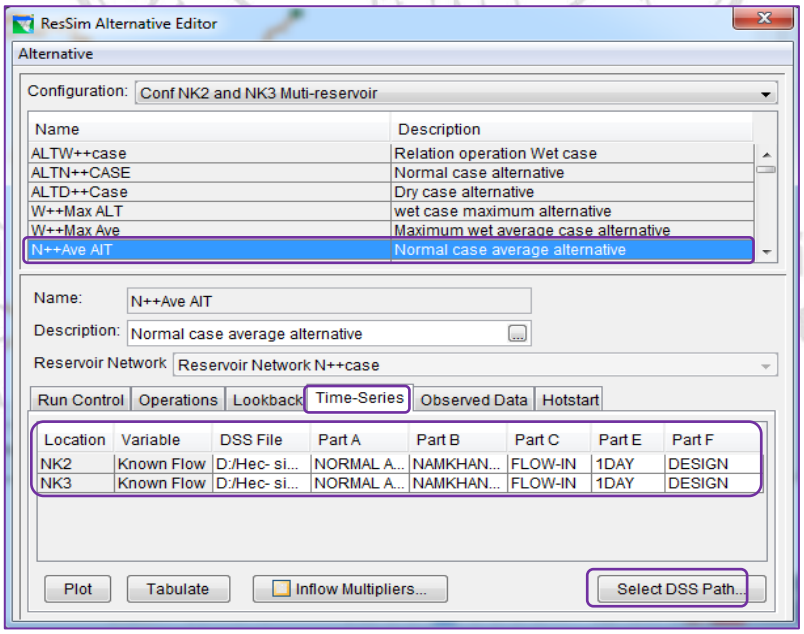

Figure B.12 DSS Files Importing Into HEC-ResSim Alternative Editor.

B.2.4 Entering Time Series Data Manually

After name, among conditions were configured completely in HEC-ResSim 3.1 software. Next step is a data entry, which was divided two methods: **Entering Data Manually** and **Entering Time Series Data Manually**. For this paper was used by Entering Time Series Data Manually method that easy for data importing because we have existing data in **Microsoft Excel**. First, clicks the button **Select DSS Plath...**then will appear the dialog box to open the DSS files. Second, select your cursor on **Time-Series** box for wanted files then clicks the button **Set Pathname** to paste a DSS files until completely. After dataset added completely, we can be plotted the graphic by click the button **Plot** to shows a dataset graphic, which detail above was shown in figure B13.

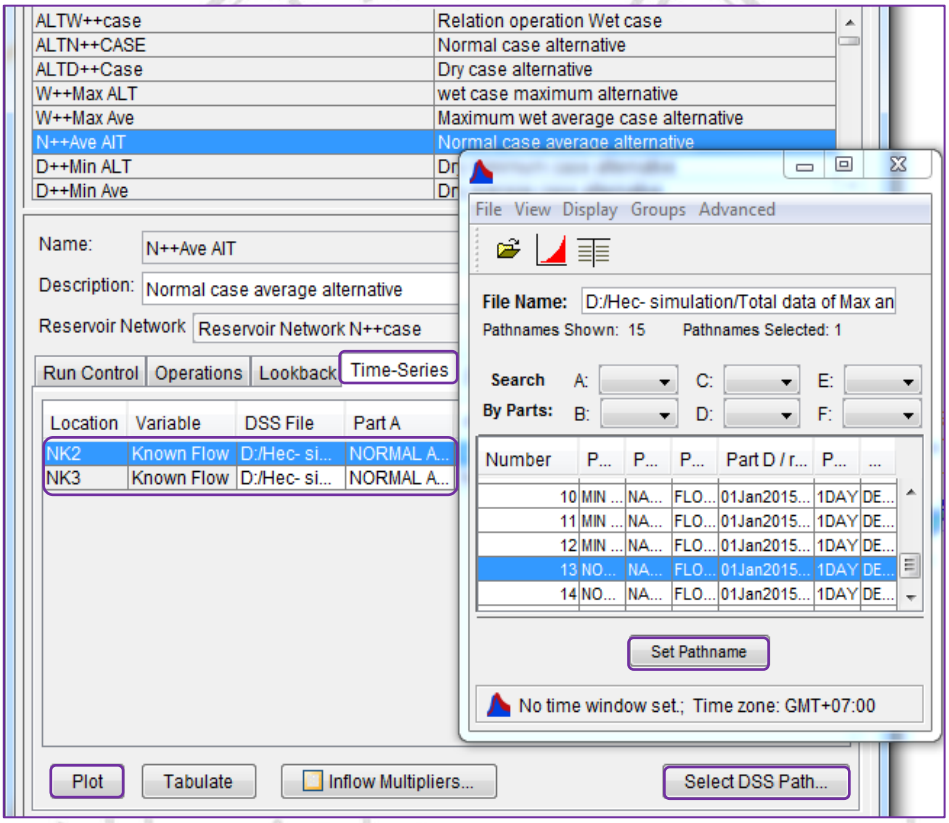

Figure B.13 HEC-DSSVue2.0 Files Importing Into HEC-ResSim3.1 Model.

After clicking **Selected DSS Path…**button. Next, click the **Alternative** in Manu bar, then click save as to create the reservoir alternative that completely created.

APPENDIX C

Software Calibration

HEC-ResSim simulation model is software in the operating simulation for the reservoir management, flood or low flow augmentation. The objective used for hydropower plants, irrigation, water supply, reservoir regulation investigation and real-time decision supports tools for application. The HEC-ResSim3.1 can represent large and small scale reservoir, one or more reservoirs in the operation management. Furthermore, HEC-ResSim3.1 software can be simulated for a full period or record of available time steps. The simulation results from HEC-ResSim3.1 model should be checked before the actual utilization which consider from accuracy index. The accuracy index in this research is considered by only three index that consist of Root Mean Square Error (RMSE), Pearson Correlation Coefficient (r), and Efficiency Index (EI). The reservoir elevation and energy generation are used with calibration which methodology and formulation detail is described on below for finding the accuracy index. Furthermore, in figure C.1 was shown the calibration process to explain methodology steps.

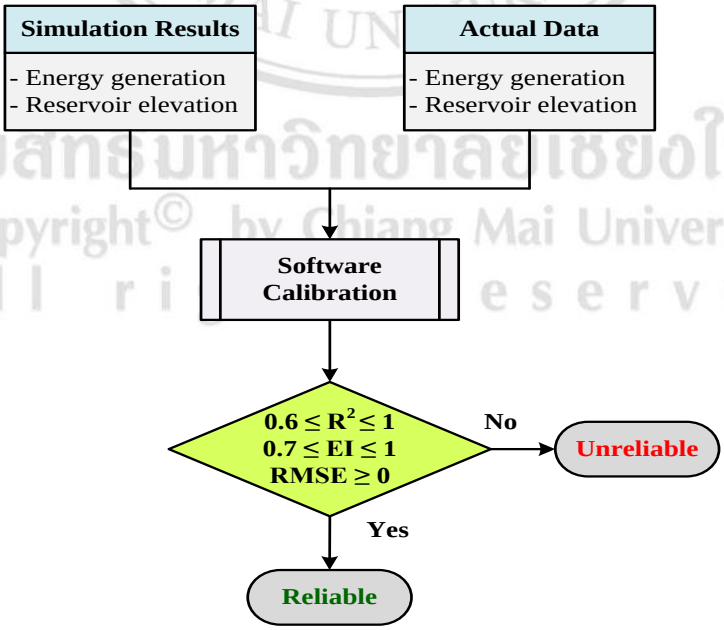

Figure C.1 Software calibration process.

✦ Root mean square error (RMSE)

RMSE or also called the root mean square deviation (RMSD). RMSE is used check of the difference values between forecasted value from a model and actual values from an operation. [16]

$$RMSE = \sqrt{\frac{\sum_{i=1}^{n}(X_{obs,i} - X_{model,i})^2}{n}} \quad \text{(C.1)}$$

RMSE = 0 the simulation test is high reliable

Where: X_{obs} _ is observed values at consider *i*,

X_{model} _ is modelled values at consider *i*, and

n _ is data number,

✦ Pearson correlation coefficient (r)

The square of the Pearson correlation coefficient (r^2), or called the coefficient of definiteness, which explain the variance between actual data and model data (two variables). It has equation as below. [16]

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x}) \cdot (y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \cdot \sum_{i=1}^{n}(y_i - \bar{y})^2}} \quad \text{(C.2)}$$

r^2 =1 the simulation test is high reliable and it should be more than 0.6

Where: x_i, y_i _ is variable at consider (*i*), and

x, y _ is variable average values at consider (*i*),

✦ Efficiency index (EI)

Efficiency index is generally used to evaluate the forecasted of simulation results of models. Which EI values is shown the accurate of prediction and has equation as below. [16]

$$EI = 1 - \frac{\sum_{i=1}^{n}(X_{obs,i} - X_{model,i})^2}{\sum_{i=1}^{n}(X_{obs,i} - \overline{X_{obs}})^2} \quad \text{(C.3)}$$

EI = 1 the simulation test is high reliable and it should be more than 0.7

Where: X_{obs} _ is actual data that considers *i*,

X_{model} _ is model results that considers *i*, and

$\overline{X_{obs}}$ _ is average value of actual data,

This appendix is used the simulation data of Namkhan 2 hydropower plant to calibrate software which used Normal watery criterion. The simulation results from HEC-ResSim 3.1 has a lot of data which chose the using reservoir elevation and energy generation for checking. To pull data from HEC-ResSim 3.1 program after plotted is choose the Tabulate from the File at menu bar. Then dialog box of result data will appear which is shown in figure C.2 as below.

Ordinate	Date / Time	NK2 RESER... POWER N++A++OPT-0	NK2 RESER... POWER-CAP... N++A++OPT-0	NK2 RESER... FLOW-IN N++A++OPT-0	NK2 RESER... FLOW-OUT N++A++OPT-0	NK2 RESER... FLOW-QPO... N++A++OPT-0
Units		mw	mw	cms	cms	cms
Type		PER-AVER	PER-AVER	PER-AVER	PER-AVER	PER-AVER
1	01 Jan 2015, 24:00			27.99	0.00	
2	02 Jan 2015, 24:00			28.91	0.00	
3	03 Jan 2015, 24:00	47.43	47.44	24.13	44.44	43.34
4	04 Jan 2015, 24:00	46.29	46.31	26.45	43.42	42.32
5	05 Jan 2015, 24:00	45.41	45.44	31.07	42.63	41.53
6	06 Jan 2015, 24:00	44.55	44.58	25.49	41.86	40.76
7	07 Jan 2015, 24:00	43.77	43.81	32.56	41.16	40.06
8	08 Jan 2015, 24:00	42.88	42.93	20.18	40.36	39.26
9	09 Jan 2015, 24:00	41.88	41.94	27.00	39.46	38.36
10	10 Jan 2015, 24:00	40.99	41.05	22.16	38.66	37.56
11	11 Jan 2015, 24:00	40.15	40.18	22.43	37.90	36.80
12	12 Jan 2015, 24:00	39.73	39.76	21.76	37.53	36.43
13	13 Jan 2015, 24:00	39.26	39.30	18.37	37.13	36.03
14	14 Jan 2015, 24:00	38.94	38.98	32.35	36.85	35.75
15	15 Jan 2015, 24:00	38.69	38.73	22.61	36.62	35.52
16	16 Jan 2015, 24:00	38.27	38.32	19.36	36.26	35.16
17	17 Jan 2015, 24:00	37.89	37.94	24.98	35.92	34.82
18	18 Jan 2015, 24:00	37.62	37.67	26.94	35.69	34.59
19	19 Jan 2015, 24:00	37.37	37.42	25.93	35.46	34.36
20	20 Jan 2015, 24:00	37.02	37.08	18.90	35.15	34.05
21	21 Jan 2015, 24:00	36.66	36.70	18.27	34.84	33.74
22	22 Jan 2015, 24:00	36.35	36.39	17.18	34.58	33.48
23	23 Jan 2015, 24:00	36.03	36.07	15.94	34.30	33.20
24	24 Jan 2015, 24:00	35.72	35.77	19.12	34.03	32.93
25	25 Jan 2015, 24:00	35.48	35.52	21.93	33.82	32.72
26	26 Jan 2015, 24:00	35.22	35.27	17.23	33.60	32.50
27	27 Jan 2015, 24:00	34.98	35.04	24.39	33.40	32.30

Figure C.2 Power generation of result data from HEC-ResSim 3.1 software.

The simulation results from HEC-ResSim 3.1 has a lot of data which use the reservoir elevation for checking. To pull data from HEC-ResSim 3.1 program after

plotted is choose the Tabulate from the File at menu bar. Then dialog box of result data will appear which is shown in figure C.3 as below.

Ordin...	Date / Time	NK2 RES... ELEV-ZO... N++A++...	NK2 RES... ELEV-ZO... N++A++...	NK2 RES... ELEV-ZO... N++A++...	NK2 RES... ELEV-ZO... N++A++...	NK2 RES... ELEV-ZO... N++A++...	NK2 RES... ELEV N++A++...	NK2 RES... FLOW-IN N++A++O...	NK2 RES... FLOW-O... N++A++...
Units		m	m	m	m	m	m	cms	cms
Type		INST-VAL	INST-VAL	INST-VAL	INST-VAL	INST-VAL	INST-VAL	PER-AVER	PER-AVER
1	01 Jan 2015, 2...	475.50	-Infinity	465.00	474.48	469.97	471.50	27.99	0.00
2	02 Jan 2015, 2...	475.50	-Infinity	465.00	474.47	469.94	471.50	28.91	0.00
3	03 Jan 2015, 2...	475.50	-Infinity	465.00	474.45	469.90	471.42	24.13	44.44
4	04 Jan 2015, 2...	475.50	-Infinity	465.00	474.44	469.87	471.35	26.45	43.42
5	05 Jan 2015, 2...	475.50	-Infinity	465.00	474.42	469.84	471.31	31.07	42.63
6	06 Jan 2015, 2...	475.50	-Infinity	465.00	474.40	469.81	471.24	25.49	41.86
7	07 Jan 2015, 2...	475.50	-Infinity	465.00	474.39	469.77	471.21	32.56	41.16
8	08 Jan 2015, 2...	475.50	-Infinity	465.00	474.37	469.74	471.13	20.18	40.36
9	09 Jan 2015, 2...	475.50	-Infinity	465.00	474.35	469.71	471.08	27.00	39.46
10	10 Jan 2015, 2...	475.50	-Infinity	465.00	474.34	469.68	471.01	22.16	38.66
11	11 Jan 2015, 2...	475.50	-Infinity	465.00	474.32	469.65	470.95	22.43	37.90
12	12 Jan 2015, 2...	475.50	-Infinity	465.00	474.31	469.61	470.89	21.76	37.53
13	13 Jan 2015, 2...	475.50	-Infinity	465.00	474.29	469.58	470.82	18.37	37.13
14	14 Jan 2015, 2...	475.50	-Infinity	465.00	474.27	469.55	470.80	32.35	36.85
15	15 Jan 2015, 2...	475.50	-Infinity	465.00	474.26	469.52	470.74	22.61	36.62
16	16 Jan 2015, 2...	475.50	-Infinity	465.00	474.24	469.48	470.68	19.36	36.26
17	17 Jan 2015, 2...	475.50	-Infinity	465.00	474.23	469.45	470.63	24.98	35.92
18	18 Jan 2015, 2...	475.50	-Infinity	465.00	474.21	469.42	470.60	26.94	35.69
19	19 Jan 2015, 2...	475.50	-Infinity	465.00	474.19	469.39	470.56	25.93	35.46
20	20 Jan 2015, 2...	475.50	-Infinity	465.00	474.18	469.35	470.49	18.90	35.15
21	21 Jan 2015, 2...	475.50	-Infinity	465.00	474.16	469.32	470.43	18.27	34.84
22	22 Jan 2015, 2...	475.50	-Infinity	465.00	474.15	469.29	470.36	17.18	34.58
23	23 Jan 2015, 2...	475.50	-Infinity	465.00	474.13	469.26	470.29	15.94	34.30
24	24 Jan 2015, 2...	475.50	-Infinity	465.00	474.11	469.23	470.23	19.12	34.03
25	25 Jan 2015, 2...	475.50	-Infinity	465.00	474.10	469.19	470.18	21.93	33.82
26	26 Jan 2015, 2...	475.50	-Infinity	465.00	474.08	469.16	470.12	17.23	33.60
27	27 Jan 2015, 2...	475.50	-Infinity	465.00	474.06	469.13	470.08	24.39	33.40

Figure C.3 Reservoir elevation of result data from HEC-ResSim 3.1 software.

The water statistic and energy generation of Namkhan 2 hydropower plant is shown in figure C.3 which was exampled for the some month of the electricity production.

Note: Qt _ Water discharge turbine (m^3/s)

Qs _ Water release from spillway (m^3/s)

Qin _ Water inflow (m^3/s)

Pmax _ Maximum power generation (m^3/s)

Pmin _ Minimum power generation (m^3/s)

Namkhan 2 Hydropower Plant								
Water statistic and energy generation on August 2016								
Date	Water level		Discharge	Spill Water	Inflow	Pmax	Pmin	Sending Total
	Up	Down	Qt	Qs	Qin			
	masl	masl	m^3/s	m^3/s	m^3/s	MW	MW	KWh
1	466.38	357.17	38.29	0.00	40.94	40.79	34.64	880,944
2	466.43	355.67	13.63	0.00	26.89	35.50	35.35	316,590
3	466.46	357.10	23.57	0.00	31.52	36.23	35.13	542,414
4	466.44	357.36	45.88	0.00	40.58	50.25	35.27	1,059,971
5	466.41	357.27	50.47	0.00	42.52	50.25	35.27	1,166,996
6	466.40	357.19	42.64	0.00	39.99	51.08	35.63	985,819
7	466.50	355.64	13.08	0.00	39.60	40.43	40.26	304,544
8	466.63	357.11	15.46	0.00	49.93	36.53	34.88	357,814
9	466.66	357.12	38.74	0.00	46.69	45.92	35.09	897,187
10	466.70	357.12	41.01	0.00	51.61	45.63	35.19	950,922
11	466.80	355.95	37.55	0.00	64.07	45.97	40.50	870,579
12	467.80	356.60	0.00	0.00	265.16	0.00	0.00	161
13	468.75	357.55	20.54	0.00	272.45	40.66	34.86	471,077
14	471.38	357.04	2.66	0.00	700.03	34.59	34.52	61,180
15	473.60	361.01	24.06	314.09	926.81	45.66	33.70	553,985
16	473.72	360.22	42.24	378.68	452.74	55.40	33.85	976,979
17	473.20	360.81	46.24	383.90	292.26	60.17	33.04	1,068,708
18	472.85	360.33	51.37	155.58	114.15	65.40	41.15	1,189,414
19	474.98	363.96	43.31	1,114.81	1722.91	50.82	38.62	1,000,885
20	472.58	364.54	38.65	1,606.29	1008.54	40.64	35.43	893,885
21	472.54	364.50	37.11	253.26	279.76	40.91	33.95	859,090
22	472.62	363.71	38.36	208.69	268.26	40.41	35.26	888,307

Figure C.4 Water statistic and energy generation of actual data of Namkan 2 HPP.

The comfortable for accuracy index calculation, I was created the formulation in the Microsoft Excel to compare between simulation result and actual data which consider from RMSE, r^2 and EI value. The formulation detail is shown in figure C.5 for the calculating illustration by using the energy generation.

If RMSE = 0 the simulation model is highly reliable

$r^2 = 1$ the simulation model is highly reliable

EI = 1 the simulation model is highly reliable

Note: Obs is the observe data

Sim is the simulation results

AverObs is the average observe

AverSim is the average of simulation results

					Calibration			
					START			
Calibration		Month/Date	Simulated	Observed	(Ob-AverOb)	(Obs-Sim)	(Ob-AverOb)^2	(Obs-Sim)^2
R^2	0.9914	1/1	0.59	0.43	-0.15	-0.16	0.02	0.03
EI	0.7109	1/2	0.58	0.43	-0.16	-0.16	0.02	0.02
RMSE	0.21	1/3	0.58	0.42	-0.16	-0.16	0.03	0.02
		1/4	0.57	0.42	-0.16	-0.16	0.03	0.02
		1/5	0.57	0.42	-0.17	-0.15	0.03	0.02
		1/6	0.56	0.41	-0.17	-0.15	0.03	0.02
		1/7	0.56	0.41	-0.17	-0.15	0.03	0.02
		1/8	0.56	0.41	-0.18	-0.15	0.03	0.02
		1/9	0.55	0.40	-0.18	-0.15	0.03	0.02
		1/10	0.55	0.40	-0.18	-0.15	0.03	0.02
		1/11	0.54	0.40	-0.19	-0.15	0.03	0.02
		1/12	0.54	0.39	-0.19	-0.15	0.04	0.02
		1/13	0.53	0.39	-0.19	-0.14	0.04	0.02
		1/14	0.53	0.38	-0.20	-0.14	0.04	0.02
		1/15	0.52	0.38	-0.20	-0.14	0.04	0.02
		1/16	0.52	0.38	-0.20	-0.14	0.04	0.02
		1/17	0.51	0.37	-0.21	-0.14	0.04	0.02
		1/18	0.51	0.37	-0.21	-0.14	0.04	0.02
		1/19	0.51	0.37	-0.21	-0.14	0.04	0.02
		1/20	0.50	0.37	-0.21	-0.14	0.05	0.02
		1/21	0.50	0.36	-0.22	-0.13	0.05	0.02
		1/22	0.49	0.36	-0.22	-0.13	0.05	0.02
		1/23	0.49	0.35	-0.23	-0.13	0.05	0.02
		1/24	0.48	0.35	-0.23	-0.13	0.05	0.02

Figure C.5 The formulation detail for the calculating illustration.

This test is used by energy generation from the simulation results with actual data to compare an accuracy. In which consider from Root Mean Square Error (RMSE), Pearson Correlation Coefficient (r), and Efficiency Index (EI). Accuracy index get details as following items: RMSE = 0.21, r^2 = 0.99 and EI = 0.71 that show simulation model have reliability. Figure C.6 was shown the Comparing energy generation for simulation and actual data.

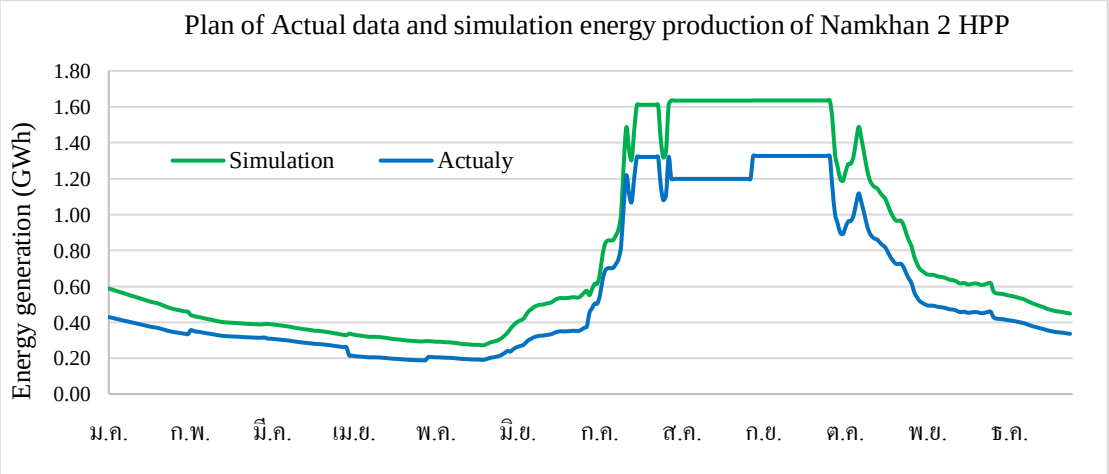

Figure C.6 Comparison the energy generation for simulation and actual data.

This calibration is used by reservoir elevation of Namkhan 2 HPP from the simulation results with actual data to compare an accuracy. In which consider from Root Mean Square Error (RMSE), Pearson Correlation Coefficient (r), and Efficiency Index (EI). Accuracy index get details as following items: RMSE = 1.84, r^2 = 0.76 and EI = 0.61 that show simulation model have reliability. Figure C.7 and C.8 were shown the Comparing reservoir elevation for simulation and actual data.

						Calibration			
						START			
Calibration			Month/Date	Simulated	Observed	(Ob-AverOb)	(Obs-Sim)	(Ob-AverOb)^2	(Obs-Sim)^2
R^2	0.7619	1	1/1	472.38	472.38	2.35	0.00	5.51	-
EI	0.6166	2	1/2	472.38	472.37	2.34	-0.01	5.46	0.00
RMSE	1.84	3	1/3	472.06	472.36	2.33	0.30	5.41	0.09
		4	1/4	471.81	472.31	2.28	0.50	5.18	0.25
		5	1/5	471.62	472.28	2.25	0.66	5.05	0.44
		6	1/6	471.54	472.38	2.35	0.84	5.51	0.71
		7	1/7	471.48	472.36	2.33	0.88	5.41	0.77
		8	1/8	471.36	472.34	2.31	0.98	5.32	0.96
		9	1/9	471.26	472.33	2.30	1.07	5.27	1.14
		10	1/10	471.16	472.31	2.28	1.15	5.18	1.32
		11	1/11	471.08	472.31	2.28	1.23	5.18	1.51
		12	1/12	471.00	472.30	2.27	1.30	5.14	1.69
		13	1/13	470.92	472.29	2.26	1.37	5.09	1.88
		14	1/14	470.84	472.28	2.25	1.44	5.05	2.07
		15	1/15	470.76	472.28	2.25	1.52	5.05	2.31
		16	1/16	470.70	472.26	2.23	1.56	4.96	2.43

Figure C.7 Calibration is used by the reservoir elevation Namkhan 2 HPP.

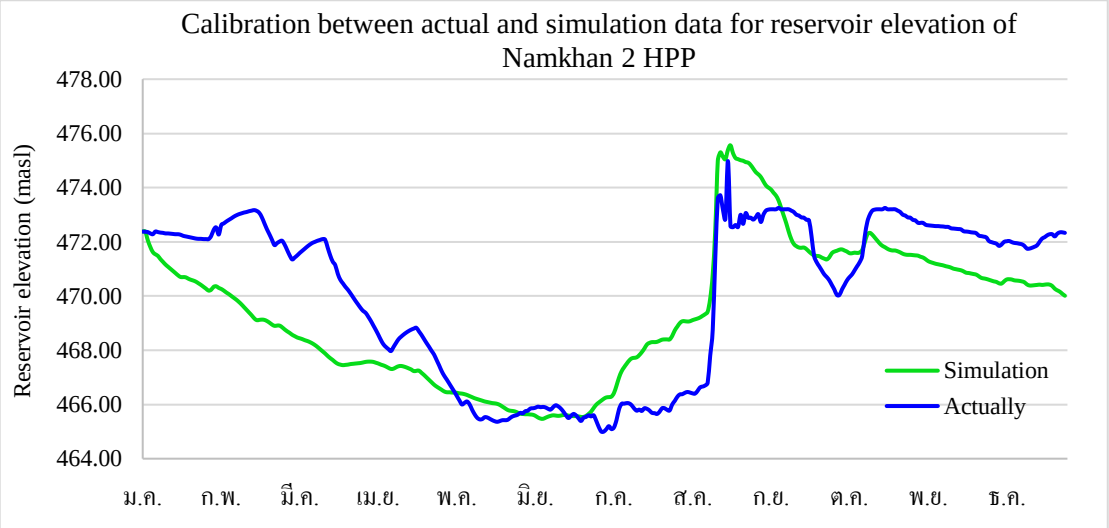

Figure C.7 Comparison the reservoir elevation between simulation and actual data of Namkhan 2 hydropower plant.

This comparison is used by reservoir elevation from the simulation results of before and after revised. In which consider from Root Mean Square Error (RMSE), Pearson Correlation Coefficient (r), and Efficiency Index (EI). Accuracy index get details as following items: RMSE = 1.26, r^2 = 0.94 and EI = 0.87 for Namkhan 2 HPP. Figure C.9 and C.10 of Namkhan 2 and 3 HPP respectively which were shown the Comparing reservoir elevation for simulation results.

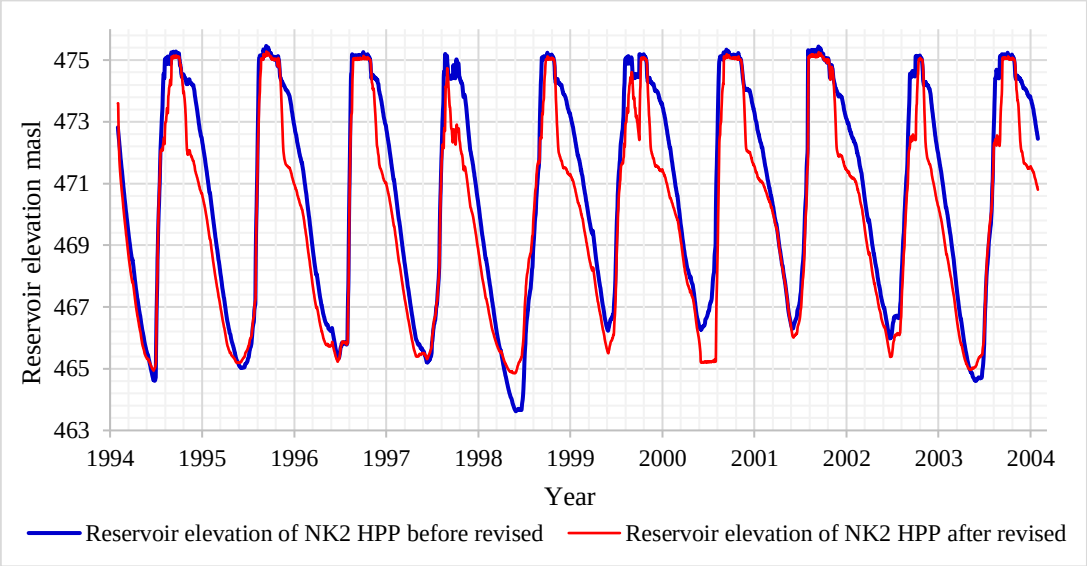

Figure C.9 Comparison for reservoir elevation of Namkhan 2 hydropower plant.

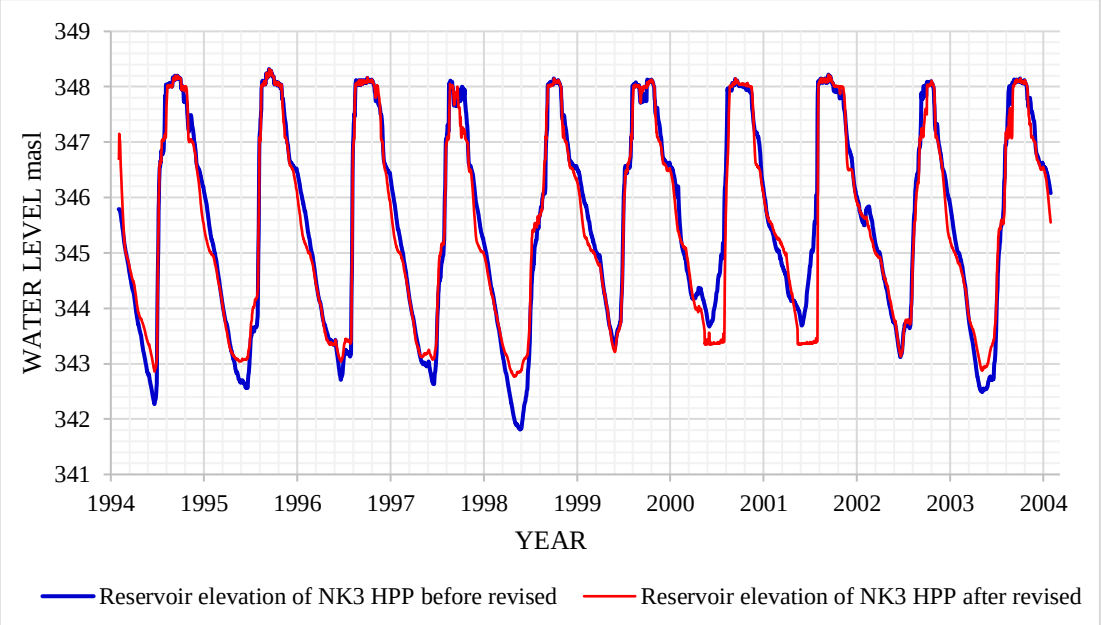

Figure C.10 Comparison for reservoir elevation of Namkhan 2 hydropower plant.

APPENDIX D

Result Simulation Data

This research was studied the five case as: very watery criterion, watery criterion that very rather, normal watery criterion, watery criterion that less rather, and little watery criterion. In which data were recorded since 1960-2009 (water inflow) to analyze and use in the simulation model for the operation management in all cases. Specially, this appendix D is shown in the three case only: very watery criterion, normal watery criterion, and little watery criterion. The result is consisted of the reservoir elevation (REev), water inflow (Qin), energy generation (EG), and water release from spillway (Qs) of both hydropower plants. These simulation result are the results after using the optimization technique which result data was obtained from the HEC-ResSim3.1 model for the reservoir operation management of Namkhan 2 and 3 hydropower plants. The detail data were shown in table D.1, D.2, and D.3 for the wet case, normal case, and drought case, respectively.

Table D.1 Result simulation data of watery criterion that very rather (wet)

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
01-Jan	472.00	29.05	2.24	-	346.00	97.82	0.69	-
02-Jan	472.00	28.65	2.24	-	346.00	99.68	0.69	-
03-Jan	471.79	32.75	2.24	-	346.20	98.96	0.69	-
04-Jan	471.64	24.81	1.68	-	346.15	74.48	0.74	-
05-Jan	471.55	28.39	1.31	-	346.03	61.50	0.68	-
06-Jan	471.49	28.12	1.09	-	345.88	52.93	0.63	-
07-Jan	471.43	23.87	1.02	-	345.72	48.89	0.60	-
08-Jan	471.38	27.38	1.02	-	345.60	50.20	0.57	-
09-Jan	471.33	28.78	1.02	-	345.51	50.72	0.55	-
10-Jan	471.29	29.95	1.02	-	345.43	51.16	0.54	-
11-Jan	471.23	23.27	1.02	-	345.35	48.67	0.52	-
12-Jan	471.17	25.09	1.02	-	345.28	49.35	0.51	-
13-Jan	471.11	25.27	1.02	-	345.23	49.42	0.50	-
14-Jan	471.05	24.05	1.02	-	345.18	48.96	0.49	-
15-Jan	471.01	29.75	1.02	-	345.16	51.09	0.48	-
16-Jan	470.96	27.56	1.01	-	345.13	50.09	0.48	-
17-Jan	470.90	23.91	1.00	-	345.09	48.18	0.47	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
18-Jan	470.85	26.83	0.98	-	345.07	48.73	0.46	-
19-Jan	470.79	23.11	0.97	-	345.03	46.80	0.46	-
20-Jan	470.74	25.99	0.96	-	345.00	47.34	0.45	-
21-Jan	470.68	21.95	0.94	-	344.96	45.31	0.44	-
22-Jan	470.64	26.60	0.93	-	344.93	46.54	0.44	-
23-Jan	470.59	23.35	0.92	-	344.90	44.87	0.43	-
24-Jan	470.54	23.48	0.90	-	344.87	44.42	0.43	-
25-Jan	470.54	34.07	0.89	-	344.87	48.09	0.42	-
26-Jan	470.47	19.64	0.89	-	344.83	42.37	0.42	-
27-Jan	470.45	28.13	0.88	-	344.82	45.48	0.41	-
28-Jan	470.40	22.48	0.88	-	344.79	43.38	0.41	-
29-Jan	470.36	25.84	0.88	-	344.78	44.63	0.41	-
30-Jan	470.33	27.03	0.88	-	344.77	45.07	0.41	-
31-Jan	470.32	33.59	0.88	-	344.79	47.52	0.41	-
01-Feb	470.25	16.80	0.88	-	344.75	41.26	0.40	-
02-Feb	470.19	22.40	0.88	-	344.73	43.35	0.40	-
03-Feb	470.13	19.72	0.88	-	344.71	42.35	0.40	-
04-Feb	470.05	15.65	0.88	-	344.68	40.84	0.39	-
05-Feb	469.98	17.18	0.88	-	344.66	41.41	0.39	-
06-Feb	469.96	29.96	0.87	-	344.68	45.90	0.39	-
07-Feb	469.91	22.25	0.86	-	344.67	42.67	0.39	-
08-Feb	469.86	21.34	0.85	-	344.65	41.83	0.38	-
09-Feb	469.80	17.90	0.84	-	344.63	39.98	0.38	-
10-Feb	469.73	15.33	0.82	-	344.59	38.38	0.37	-
11-Feb	469.69	23.41	0.80	-	344.58	40.86	0.37	-
12-Feb	469.62	11.92	0.79	-	344.53	36.01	0.36	-
13-Feb	469.57	20.28	0.77	-	344.51	38.51	0.36	-
14-Feb	469.53	20.99	0.76	-	344.49	38.35	0.35	-
15-Feb	469.49	20.21	0.75	-	344.47	37.66	0.35	-
16-Feb	469.44	16.26	0.75	-	344.44	36.06	0.35	-
17-Feb	469.38	15.56	0.75	-	344.40	35.80	0.34	-
18-Feb	469.33	19.01	0.75	-	344.38	37.09	0.34	-
19-Feb	469.27	12.76	0.75	-	344.34	34.76	0.34	-
20-Feb	469.20	14.63	0.75	-	344.32	35.46	0.34	-
21-Feb	469.16	19.10	0.75	-	344.30	37.12	0.33	-
22-Feb	469.12	19.26	0.75	-	344.29	37.18	0.33	-
23-Feb	469.06	17.18	0.75	-	344.28	36.41	0.33	-
24-Feb	469.02	18.02	0.74	-	344.27	36.72	0.33	-
25-Feb	468.95	14.06	0.74	-	344.24	35.24	0.33	-
26-Feb	468.90	17.91	0.74	-	344.23	36.68	0.33	-
27-Feb	468.90	29.40	0.74	-	344.26	40.96	0.33	-
28-Feb	468.83	14.08	0.74	-	344.24	35.25	0.33	-
01-Mar	468.77	15.67	0.74	-	344.22	35.84	0.33	-
02-Mar	468.71	14.08	0.74	-	344.20	35.28	0.32	-
03-Mar	468.64	13.64	0.74	-	344.18	35.12	0.32	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
04-Mar	468.58	14.58	0.74	-	344.17	35.47	0.32	-
05-Mar	468.52	14.65	0.74	-	344.15	35.50	0.32	-
06-Mar	468.45	11.60	0.74	-	344.13	34.35	0.32	-
07-Mar	468.37	12.13	0.74	-	344.11	34.55	0.32	-
08-Mar	468.31	13.50	0.74	-	344.10	35.07	0.31	-
09-Mar	468.23	11.74	0.74	-	344.08	34.40	0.31	-
10-Mar	468.17	13.95	0.74	-	344.08	35.24	0.31	-
11-Mar	468.10	12.83	0.74	-	344.06	34.82	0.31	-
12-Mar	468.05	16.27	0.74	-	344.07	36.11	0.31	-
13-Mar	468.00	18.92	0.74	-	344.07	37.10	0.31	-
14-Mar	467.95	19.21	0.74	-	344.08	37.21	0.31	-
15-Mar	467.89	14.33	0.74	-	344.08	35.38	0.31	-
16-Mar	467.83	14.53	0.74	-	344.07	35.45	0.31	-
17-Mar	467.77	15.20	0.74	-	344.07	35.71	0.31	-
18-Mar	467.71	15.94	0.74	-	344.07	35.98	0.31	-
19-Mar	467.66	17.26	0.74	-	344.07	36.48	0.31	-
20-Mar	467.60	15.92	0.74	-	344.07	35.97	0.31	-
21-Mar	467.53	11.82	0.74	-	344.04	33.17	0.31	-
22-Mar	467.49	20.52	0.73	-	344.06	37.70	0.31	-
23-Mar	467.47	26.46	0.73	-	344.09	39.93	0.31	-
24-Mar	467.44	23.31	0.73	-	344.12	38.75	0.31	-
25-Mar	467.38	13.30	0.73	-	344.10	34.99	0.31	-
26-Mar	467.30	12.21	0.73	-	344.09	34.58	0.31	-
27-Mar	467.23	10.46	0.73	-	344.07	33.93	0.31	-
28-Mar	467.17	16.92	0.73	-	344.07	36.35	0.31	-
29-Mar	467.12	16.37	0.73	-	344.07	36.14	0.31	-
30-Mar	467.06	16.42	0.73	-	344.07	36.16	0.31	-
31-Mar	467.01	17.54	0.73	-	344.08	36.58	0.31	-
01-Apr	466.97	20.18	0.73	-	344.09	37.49	0.31	-
02-Apr	466.91	13.39	0.72	-	344.07	34.48	0.31	-
03-Apr	466.84	11.84	0.70	-	344.05	33.23	0.31	-
04-Apr	466.79	16.07	0.69	-	344.03	34.25	0.31	-
05-Apr	466.73	11.84	0.67	-	344.00	32.09	0.31	-
06-Apr	466.67	13.49	0.66	-	343.97	32.12	0.30	-
07-Apr	466.61	10.49	0.64	-	343.94	30.38	0.30	-
08-Apr	466.55	11.27	0.63	-	343.90	30.07	0.29	-
09-Apr	466.50	11.94	0.61	-	343.87	29.77	0.29	-
10-Apr	466.44	11.04	0.60	-	343.83	29.00	0.28	-
11-Apr	466.39	13.53	0.59	-	343.80	29.64	0.28	-
12-Apr	466.35	13.10	0.59	-	343.78	29.21	0.27	-
13-Apr	466.30	11.21	0.58	-	343.75	28.20	0.27	-
14-Apr	466.26	15.36	0.57	-	343.71	26.82	0.26	-
15-Apr	466.21	10.28	0.57	-	343.68	27.31	0.26	-
16-Apr	466.16	11.84	0.56	-	343.49	27.61	0.42	-
17-Apr	466.11	10.29	0.55	-	343.50	26.73	0.21	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
18-Apr	466.08	15.68	0.55	-	343.53	28.53	0.21	-
19-Apr	466.04	12.25	0.54	-	343.49	27.02	0.27	-
20-Apr	466.02	17.53	0.54	-	343.52	28.84	0.21	-
21-Apr	465.99	15.37	0.53	-	343.55	27.87	0.20	-
22-Apr	465.96	14.01	0.53	-	343.48	27.32	0.30	-
23-Apr	465.92	13.58	0.53	-	343.49	27.16	0.21	-
24-Apr	465.89	15.10	0.53	-	343.52	27.73	0.21	-
25-Apr	465.85	12.55	0.53	-	343.54	26.77	0.20	-
26-Apr	465.81	12.13	0.53	-	343.48	26.61	0.28	-
27-Apr	465.77	12.45	0.53	-	343.50	26.73	0.21	-
28-Apr	465.74	15.32	0.53	-	343.52	27.82	0.21	-
29-Apr	465.72	16.16	0.53	-	343.55	28.14	0.21	-
30-Apr	465.68	13.80	0.53	-	343.48	27.24	0.30	-
01-May	465.65	15.18	0.53	-	343.50	27.76	0.21	-
02-May	465.63	15.72	0.53	-	343.52	27.87	0.21	-
03-May	465.60	15.90	0.53	-	343.49	27.93	0.27	-
04-May	465.58	17.98	0.53	-	343.52	28.71	0.21	-
05-May	465.55	14.36	0.53	-	343.54	27.36	0.21	-
06-May	465.54	20.59	0.53	-	343.58	29.68	0.21	-
07-May	465.54	21.87	0.53	-	343.49	30.16	0.35	-
08-May	465.53	20.66	0.53	-	343.53	29.71	0.21	-
09-May	465.52	18.61	0.53	-	343.49	28.94	0.29	-
10-May	465.50	19.22	0.53	-	343.52	29.17	0.21	-
11-May	465.25	18.92	2.08	-	343.51	92.19	0.79	-
12-May	465.20	21.85	0.82	-	343.67	42.00	0.20	-
13-May	465.20	20.59	0.48	-	343.48	27.67	0.42	-
14-May	465.20	19.47	0.48	-	343.50	27.21	0.21	-
15-May	465.18	17.32	0.47	-	343.50	26.20	0.21	-
16-May	465.19	22.09	0.47	-	343.55	27.91	0.19	-
17-May	465.18	17.68	0.47	-	343.47	26.22	0.29	-
18-May	465.17	18.68	0.46	-	343.49	26.39	0.21	-
19-May	465.19	24.57	0.47	-	343.52	28.72	0.21	-
20-May	465.21	25.07	0.48	-	343.56	29.26	0.20	-
21-May	465.22	35.55	0.75	-	343.48	44.41	0.46	-
22-May	465.20	26.53	0.72	-	343.61	39.69	0.21	-
23-May	465.20	21.83	0.53	-	343.48	30.30	0.38	-
24-May	465.20	21.79	0.50	-	343.52	29.13	0.21	-
25-May	465.20	23.45	0.53	-	343.57	30.65	0.21	-
26-May	465.20	21.34	0.51	-	343.49	29.44	0.33	-
27-May	465.21	24.45	0.53	-	343.54	31.26	0.21	-
28-May	465.20	23.94	0.58	-	343.48	33.05	0.34	-
29-May	465.20	23.79	0.55	-	343.54	31.91	0.21	-
30-May	465.21	27.95	0.60	-	343.48	35.58	0.36	-
31-May	465.20	25.03	0.63	-	343.58	35.37	0.21	-
01-Jun	465.22	33.66	0.69	-	343.49	41.19	0.43	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
02-Jun	465.25	58.63	1.23	-	343.65	72.24	0.47	-
03-Jun	465.23	51.46	1.38	-	344.04	75.43	0.28	-
04-Jun	465.22	45.37	1.12	-	344.27	62.89	0.32	-
05-Jun	465.25	59.67	1.26	-	344.58	73.89	0.35	-
06-Jun	465.25	76.50	1.85	-	345.09	104.00	0.42	-
07-Jun	465.25	73.40	1.80	-	345.49	100.63	0.50	-
08-Jun	465.26	78.73	1.85	-	345.86	104.49	0.58	-
09-Jun	465.24	63.25	1.66	-	346.05	90.93	0.63	-
10-Jun	465.24	67.22	1.58	-	346.17	89.41	0.70	-
11-Jun	465.24	62.14	1.56	-	346.21	86.65	0.74	-
12-Jun	465.23	50.19	1.28	-	346.13	70.80	0.73	-
13-Jun	465.24	58.00	1.31	-	346.11	74.84	0.70	-
14-Jun	465.24	66.09	1.61	-	346.20	90.05	0.72	-
15-Jun	465.24	67.80	1.63	-	346.26	91.32	0.77	-
16-Jun	465.26	80.29	1.83	-	346.39	104.02	0.82	-
17-Jun	465.30	109.92	2.48	-	346.72	141.13	0.96	-
18-Jun	465.27	96.82	2.56	-	346.75	139.57	1.25	-
19-Jun	465.28	105.27	2.48	-	346.75	139.31	1.27	-
20-Jun	465.29	116.93	2.85	-	346.86	158.45	1.34	-
21-Jun	465.27	95.57	2.48	-	346.76	135.61	1.35	-
22-Jun	465.25	82.38	2.10	-	346.64	115.15	1.18	-
23-Jun	465.25	75.37	1.89	-	346.55	104.11	1.04	-
24-Jun	465.24	68.53	1.72	-	346.48	94.71	0.94	-
25-Jun	465.25	75.48	1.77	-	346.48	99.17	0.91	-
26-Jun	465.40	146.41	2.64	-	346.83	160.01	1.11	-
27-Jun	465.98	175.36	0.54	-	346.52	86.81	1.12	-
28-Jun	466.26	96.82	0.56	-	346.22	58.49	0.84	-
29-Jun	466.50	88.94	0.60	-	346.04	57.13	0.71	-
30-Jun	466.71	83.16	0.65	-	345.92	56.78	0.63	-
01-Jul	466.98	101.70	0.71	-	345.90	66.06	0.62	-
02-Jul	468.15	340.73	0.75	-	346.90	202.40	0.83	-
03-Jul	469.23	316.28	0.76	-	347.05	190.03	1.44	-
04-Jul	470.09	262.38	0.80	-	346.96	164.38	1.44	-
05-Jul	470.74	205.65	0.90	-	346.80	139.06	1.43	-
06-Jul	471.30	187.52	1.02	-	346.74	134.34	1.30	-
07-Jul	471.99	239.74	1.45	-	346.97	177.16	1.40	-
08-Jul	472.38	218.93	2.96	-	347.39	223.80	1.44	-
09-Jul	472.80	245.00	3.12	-	348.12	257.88	1.44	-
10-Jul	473.51	323.55	3.12	-	348.02	298.71	1.44	-
11-Jul	474.01	267.96	3.12	-	348.03	270.58	1.44	-
12-Jul	474.55	279.34	3.12	-	348.03	276.34	1.44	11.25
13-Jul	475.10	307.77	3.12	-	348.05	316.97	1.44	7.88
14-Jul	475.13	333.39	3.12	-	348.12	494.03	1.44	8.47
15-Jul	475.13	348.59	3.12	1.58	348.12	522.30	1.44	11.73
16-Jul	475.09	273.40	3.12	10.45	348.07	422.26	1.44	26.05

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
17-Jul	475.08	251.19	3.12	11.40	348.07	380.74	1.44	28.94
18-Jul	475.08	252.08	3.12	8.47	348.07	378.67	1.44	21.12
19-Jul	475.13	347.90	3.12	6.98	348.12	508.75	1.44	17.30
20-Jul	475.08	260.66	3.12	6.85	348.07	405.26	1.44	17.05
21-Jul	475.08	248.52	3.12	10.78	348.06	375.14	1.44	27.38
22-Jul	475.08	249.71	3.12	7.95	348.06	375.08	1.44	19.77
23-Jul	475.14	354.57	3.12	6.76	348.12	517.48	1.44	16.79
24-Jul	475.11	315.11	3.12	6.73	348.10	480.00	1.44	16.76
25-Jul	475.11	309.44	3.12	11.02	348.09	465.90	1.44	28.03
26-Jul	475.12	319.60	3.12	10.22	348.10	479.04	1.44	25.76
27-Jul	475.09	276.32	3.12	9.70	348.08	422.02	1.44	24.36
28-Jul	475.09	265.59	3.12	10.08	348.07	400.69	1.44	25.37
29-Jul	475.08	251.64	3.12	8.40	348.06	380.39	1.44	20.91
30-Jul	475.09	267.24	3.12	7.61	348.07	399.21	1.44	18.93
31-Jul	475.06	220.56	3.12	6.95	348.05	339.10	1.44	17.28
01-Aug	475.14	352.36	3.12	7.50	348.12	509.42	1.44	18.69
02-Aug	475.20	476.66	3.12	5.62	348.15	593.11	1.44	14.00
03-Aug	475.15	389.12	3.12	10.69	348.11	509.78	1.44	27.21
04-Aug	475.13	350.63	3.12	16.32	348.09	453.16	1.44	34.40
05-Aug	475.11	312.40	3.12	13.83	348.07	404.63	1.44	28.37
06-Aug	475.12	330.95	3.12	11.81	348.08	420.03	1.44	23.46
07-Aug	475.11	304.79	3.12	10.07	348.07	393.47	1.44	19.37
08-Aug	475.17	418.86	3.12	10.55	348.12	519.01	1.44	20.44
09-Aug	475.17	421.97	3.12	9.64	348.13	539.58	1.44	18.41
10-Aug	475.14	356.15	3.12	13.86	348.09	464.35	1.44	28.19
11-Aug	475.13	340.36	3.12	14.72	348.08	436.96	1.44	30.33
12-Aug	475.15	372.42	3.12	12.24	348.10	471.35	1.44	24.56
13-Aug	475.28	645.24	3.12	11.20	348.24	790.47	1.44	21.96
14-Aug	475.22	533.29	3.12	12.35	348.18	696.55	1.44	24.67
15-Aug	475.18	449.30	3.12	22.28	348.14	584.91	1.44	49.48
16-Aug	475.15	385.92	3.12	19.88	348.10	501.56	1.44	43.48
17-Aug	475.16	391.21	3.12	16.31	348.11	499.06	1.44	34.34
18-Aug	475.22	520.61	3.12	13.51	348.18	648.60	1.44	27.63
19-Aug	475.21	500.21	3.12	13.34	348.17	642.70	1.44	27.03
20-Aug	475.21	513.53	3.12	18.10	348.18	654.86	1.44	38.43
21-Aug	475.24	558.87	3.12	18.10	348.20	708.97	1.44	38.75
22-Aug	475.16	413.41	3.12	18.44	348.12	547.56	1.44	39.54
23-Aug	475.19	456.06	3.12	20.09	348.15	576.72	1.44	43.74
24-Aug	475.16	410.96	3.12	15.15	348.12	531.71	1.44	31.73
25-Aug	475.14	368.89	3.12	15.89	348.10	477.14	1.44	33.15
26-Aug	475.13	338.26	3.12	14.52	348.08	436.52	1.44	29.95
27-Aug	475.12	326.71	3.12	12.65	348.08	419.02	1.44	25.50
28-Aug	475.11	312.73	3.12	11.21	348.07	401.65	1.44	22.01
29-Aug	475.11	299.56	3.12	10.55	348.07	384.70	1.44	20.48
30-Aug	475.11	300.56	3.12	9.93	348.07	383.86	1.44	19.04

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
31-Aug	475.12	316.14	3.12	9.30	348.07	401.70	1.44	17.62
01-Sep	475.11	304.67	3.12	9.24	348.07	391.01	1.44	17.49
02-Sep	475.12	319.95	3.12	9.88	348.09	436.26	1.44	18.93
03-Sep	475.11	310.94	3.12	9.53	348.08	427.59	1.44	18.15
04-Sep	475.11	300.36	3.12	10.06	348.08	413.22	1.44	21.68
05-Sep	475.12	328.55	3.12	9.81	348.09	446.09	1.44	21.23
06-Sep	475.10	288.28	3.12	9.31	348.07	401.34	1.44	19.99
07-Sep	475.11	306.39	3.12	10.36	348.08	417.01	1.44	22.56
08-Sep	475.09	269.62	3.12	8.96	348.06	375.21	1.44	19.15
09-Sep	475.13	348.00	3.12	9.39	348.10	465.15	1.44	20.16
10-Sep	475.14	359.33	3.12	8.03	348.10	491.36	1.44	16.96
11-Sep	475.14	356.28	3.12	10.90	348.10	488.93	1.44	23.90
12-Sep	475.12	329.99	3.12	11.91	348.09	456.18	1.44	26.41
13-Sep	475.11	305.05	3.12	11.85	348.08	421.68	1.44	26.26
14-Sep	475.10	291.84	3.12	10.81	348.07	401.81	1.44	23.65
15-Sep	475.07	231.60	3.12	9.63	348.04	326.77	1.44	20.76
16-Sep	475.11	295.96	3.12	8.92	348.08	395.20	1.44	19.05
17-Sep	475.13	337.05	3.12	6.29	348.09	456.20	1.44	12.98
18-Sep	475.12	319.76	3.12	8.52	348.08	441.05	1.44	18.13
19-Sep	475.10	296.79	3.12	10.69	348.07	410.20	1.44	23.37
20-Sep	475.13	343.86	3.12	10.28	348.10	464.25	1.44	22.37
21-Sep	475.11	307.13	3.12	9.23	348.08	426.66	1.44	19.79
22-Sep	475.10	286.95	3.12	10.94	348.07	396.08	1.44	23.98
23-Sep	475.07	242.54	3.12	9.83	348.05	339.26	1.44	21.27
24-Sep	475.08	258.86	3.12	8.73	348.06	351.87	1.44	18.58
25-Sep	475.06	221.98	3.12	6.73	348.04	310.19	1.44	13.96
26-Sep	475.06	215.12	3.12	7.06	348.04	295.62	1.44	14.72
27-Sep	475.05	209.01	3.12	5.62	348.04	287.29	1.44	11.50
28-Sep	475.06	223.07	3.12	4.97	348.04	303.13	1.44	10.10
29-Sep	475.18	432.14	3.12	4.64	348.15	561.78	1.44	9.42
30-Sep	475.11	312.71	3.12	5.22	348.08	446.25	1.44	10.66
01-Oct	475.09	264.77	3.12	13.78	348.06	369.67	1.44	31.18
02-Oct	475.04	197.36	3.12	10.63	348.03	281.20	1.44	23.34
03-Oct	475.03	170.06	3.12	7.84	348.02	237.50	1.44	16.51
04-Oct	475.01	153.62	3.12	4.54	348.01	213.38	1.44	9.16
05-Oct	475.02	157.03	3.12	2.62	348.01	214.11	1.44	5.27
06-Oct	475.01	144.59	3.12	1.49	348.01	200.44	1.44	3.20
07-Oct	475.01	144.03	3.12	1.46	348.01	197.11	1.44	3.17
08-Oct	475.01	152.54	3.12	0.85	348.01	206.86	1.44	2.09
09-Oct	474.98	126.76	3.12	0.63	348.00	182.29	1.44	1.74
10-Oct	474.96	130.44	3.12	1.09	348.00	183.66	1.44	2.54
11-Oct	474.89	117.19	3.12	-	348.00	178.71	1.44	0.57
12-Oct	474.82	118.22	3.12	-	348.00	179.10	1.44	0.56
13-Oct	474.75	115.00	3.12	-	348.00	177.90	1.44	0.19
14-Oct	474.66	112.24	3.12	-	348.00	176.87	1.44	0.19

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
15-Oct	474.55	108.01	3.12	-	347.99	175.29	1.44	0.10
16-Oct	474.48	115.06	3.12	-	348.00	177.92	1.44	0.00
17-Oct	474.34	101.20	3.12	-	347.96	172.75	1.44	-
18-Oct	474.18	92.40	3.12	-	347.89	169.47	1.44	-
19-Oct	474.01	90.18	3.12	-	347.82	168.64	1.44	-
20-Oct	473.82	85.68	3.12	-	347.73	166.96	1.44	-
21-Oct	473.65	90.60	3.12	-	347.66	168.80	1.44	-
22-Oct	473.44	79.65	3.12	-	347.55	164.71	1.44	-
23-Oct	473.22	76.84	3.12	-	347.43	163.66	1.44	-
24-Oct	473.01	80.31	3.12	-	347.32	164.96	1.44	-
25-Oct	472.80	79.98	3.12	-	347.22	164.83	1.44	-
26-Oct	472.57	75.47	3.12	-	347.09	163.15	1.44	-
27-Oct	472.36	74.44	3.12	-	346.95	159.26	1.44	-
28-Oct	472.17	70.52	3.06	-	346.83	144.59	1.44	-
29-Oct	472.03	68.63	2.76	-	346.74	132.44	1.31	-
30-Oct	471.94	73.90	2.52	-	346.68	124.88	1.21	-
31-Oct	471.88	76.22	2.30	-	346.63	117.52	1.13	-
01-Nov	471.83	69.23	2.14	-	346.57	108.60	1.05	-
02-Nov	471.89	100.36	2.15	-	346.63	120.83	1.05	-
03-Nov	471.92	97.18	2.30	-	346.66	125.12	1.12	-
04-Nov	471.94	98.60	2.38	-	346.68	128.75	1.16	-
05-Nov	471.96	100.49	2.44	-	346.70	132.01	1.19	-
06-Nov	471.94	87.10	2.43	-	346.68	126.45	1.18	-
07-Nov	471.93	92.02	2.38	-	346.67	126.48	1.17	-
08-Nov	471.91	83.68	2.33	-	346.65	121.47	1.14	-
09-Nov	471.93	97.04	2.33	-	346.67	126.30	1.14	-
10-Nov	471.93	93.88	2.37	-	346.67	126.88	1.16	-
11-Nov	471.93	90.00	2.37	-	346.67	125.22	1.16	-
12-Nov	471.90	83.85	2.32	-	346.64	120.87	1.13	-
13-Nov	471.93	96.95	2.32	-	346.66	125.86	1.13	-
14-Nov	471.88	76.35	2.28	-	346.62	116.70	1.11	-
15-Nov	471.85	76.74	2.16	-	346.59	112.34	1.06	-
16-Nov	471.83	74.73	2.08	-	346.56	108.41	1.02	-
17-Nov	471.82	77.32	2.03	-	346.55	107.53	1.00	-
18-Nov	471.80	73.23	1.99	-	346.53	104.47	0.97	-
19-Nov	471.77	67.43	1.92	-	346.50	99.50	0.94	-
20-Nov	471.79	78.43	1.90	-	346.52	102.90	0.93	-
21-Nov	471.74	58.08	1.84	-	346.46	92.93	0.91	-
22-Nov	471.72	62.75	1.73	-	346.41	90.53	0.88	-
23-Nov	471.71	63.93	1.69	-	346.37	89.38	0.85	-
24-Nov	471.73	71.01	1.70	-	346.37	92.49	0.85	-
25-Nov	471.72	66.68	1.72	-	346.37	91.69	0.84	-
26-Nov	471.70	59.14	1.68	-	346.33	87.13	0.83	-
27-Nov	471.72	72.94	1.68	-	346.35	92.45	0.83	-
28-Nov	471.68	54.34	1.66	-	346.30	84.59	0.82	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
29-Nov	471.72	73.80	1.65	-	346.33	91.61	0.81	-
30-Nov	471.68	55.43	1.65	-	346.29	84.65	0.81	-
01-Dec	471.70	66.73	1.62	-	346.29	87.64	0.80	-
02-Dec	471.69	61.41	1.62	-	346.28	85.91	0.80	-
03-Dec	471.68	60.41	1.60	-	346.26	84.53	0.79	-
04-Dec	471.66	54.51	1.55	-	346.22	80.37	0.77	-
05-Dec	471.65	56.13	1.50	-	346.19	79.05	0.75	-
06-Dec	471.60	44.55	1.41	-	346.12	71.52	0.72	-
07-Dec	471.64	65.01	1.41	-	346.13	78.96	0.71	-
08-Dec	471.64	55.58	1.46	-	346.13	77.30	0.71	-
09-Dec	471.65	60.48	1.46	-	346.14	79.43	0.71	-
10-Dec	471.66	63.38	1.51	-	346.16	82.15	0.72	-
11-Dec	471.61	43.97	1.45	-	346.11	72.75	0.72	-
12-Dec	471.62	55.67	1.39	-	346.10	74.61	0.70	-
13-Dec	471.58	40.86	1.32	-	346.03	66.68	0.67	-
14-Dec	471.55	41.15	1.22	-	345.96	62.75	0.64	-
15-Dec	471.58	57.73	1.23	-	345.96	69.50	0.63	-
16-Dec	471.59	53.14	1.30	-	345.97	70.33	0.63	-
17-Dec	471.58	46.54	1.28	-	345.95	67.36	0.63	-
18-Dec	471.60	57.17	1.30	-	345.97	71.81	0.63	-
19-Dec	471.58	44.88	1.30	-	345.95	67.14	0.63	-
20-Dec	471.61	60.39	1.31	-	345.99	73.57	0.63	-
21-Dec	471.58	43.49	1.31	-	345.97	67.31	0.63	-
22-Dec	471.56	44.30	1.24	-	345.93	64.76	0.63	-
23-Dec	471.58	52.83	1.24	-	345.92	67.86	0.62	-
24-Dec	471.58	50.70	1.27	-	345.92	68.17	0.62	-
25-Dec	471.56	45.28	1.25	-	345.89	65.42	0.62	-
26-Dec	471.58	53.18	1.25	-	345.89	68.42	0.62	-
27-Dec	471.61	59.61	1.32	-	345.94	73.47	0.62	-
28-Dec	471.61	53.03	1.36	-	345.97	72.68	0.63	-
29-Dec	471.59	48.91	1.34	-	345.97	70.18	0.63	-
30-Dec	471.57	45.14	1.28	-	345.95	66.70	0.63	-
31-Dec	471.55	42.86	1.22	-	345.90	63.45	0.62	-

Table D.2 Result simulation data of normal watery criterion (Normal)

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
01-Jan	471.50	27.99	1.14	-	345.50	10.44	0.46	-
02-Jan	471.50	28.91	1.14	-	345.50	10.78	0.46	-
03-Jan	471.42	24.13	1.14	-	345.53	53.44	0.46	-
04-Jan	471.35	26.45	1.11	-	345.55	53.28	0.46	-
05-Jan	471.31	31.07	1.09	-	345.57	54.22	0.47	-
06-Jan	471.24	25.49	1.07	-	345.57	51.36	0.47	-
07-Jan	471.21	32.56	1.05	-	345.58	53.30	0.47	-
08-Jan	471.13	20.18	1.03	-	345.55	47.89	0.47	-
09-Jan	471.08	27.00	1.01	-	345.54	49.53	0.46	-
10-Jan	471.01	22.16	0.98	-	345.50	46.92	0.46	-
11-Jan	470.95	22.43	0.96	-	345.47	46.26	0.45	-
12-Jan	470.89	21.76	0.95	-	345.43	45.65	0.45	-
13-Jan	470.82	18.37	0.94	-	345.39	43.98	0.44	-
14-Jan	470.80	32.35	0.93	-	345.39	48.91	0.44	-
15-Jan	470.74	22.61	0.93	-	345.36	45.05	0.44	-
16-Jan	470.68	19.36	0.92	-	345.32	43.48	0.43	-
17-Jan	470.63	24.98	0.91	-	345.30	45.24	0.43	-
18-Jan	470.60	26.94	0.90	-	345.29	45.74	0.42	-
19-Jan	470.56	25.93	0.90	-	345.27	45.13	0.42	-
20-Jan	470.49	18.90	0.89	-	345.23	42.20	0.42	-
21-Jan	470.43	18.27	0.88	-	345.19	41.65	0.41	-
22-Jan	470.36	17.18	0.87	-	345.15	40.99	0.41	-
23-Jan	470.29	15.94	0.86	-	345.10	40.24	0.40	-
24-Jan	470.23	19.12	0.86	-	345.07	41.16	0.40	-
25-Jan	470.18	21.93	0.85	-	345.05	42.00	0.39	-
26-Jan	470.12	17.23	0.85	-	345.02	40.02	0.39	-
27-Jan	470.08	24.39	0.84	-	345.01	42.50	0.39	-
28-Jan	470.03	19.79	0.83	-	344.99	40.60	0.38	-
29-Jan	469.97	18.04	0.83	-	344.96	39.73	0.38	-
30-Jan	469.93	24.71	0.83	-	344.96	42.21	0.38	-
31-Jan	469.88	19.52	0.83	-	344.94	40.28	0.38	-
01-Feb	469.82	16.61	0.83	-	344.91	39.19	0.37	-
02-Feb	469.73	12.14	0.83	-	344.88	37.52	0.37	-
03-Feb	469.67	16.38	0.83	-	344.86	39.10	0.36	-
04-Feb	469.62	22.40	0.83	-	344.86	41.35	0.36	-
05-Feb	469.55	14.16	0.83	-	344.84	38.28	0.36	-
06-Feb	469.48	14.79	0.83	-	344.82	38.51	0.36	-
07-Feb	469.42	17.89	0.82	-	344.81	39.57	0.36	-
08-Feb	469.35	16.83	0.82	-	344.80	39.04	0.35	-
09-Feb	469.28	14.74	0.81	-	344.78	38.13	0.35	-
10-Feb	469.21	14.49	0.81	-	344.77	37.90	0.35	-
11-Feb	469.14	13.76	0.81	-	344.75	37.48	0.35	-
12-Feb	469.07	15.80	0.80	-	344.74	38.10	0.35	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
13-Feb	469.01	15.64	0.80	-	344.73	37.91	0.34	-
14-Feb	468.94	15.65	0.79	-	344.72	37.73	0.34	-
15-Feb	468.88	15.99	0.79	-	344.71	37.61	0.34	-
16-Feb	468.82	17.24	0.78	-	344.70	37.83	0.34	-
17-Feb	468.76	15.96	0.77	-	344.69	37.12	0.34	-
18-Feb	468.72	20.70	0.77	-	344.69	38.67	0.34	-
19-Feb	468.66	15.19	0.76	-	344.67	36.41	0.34	-
20-Feb	468.59	14.84	0.76	-	344.66	36.03	0.33	-
21-Feb	468.54	17.01	0.75	-	344.65	36.61	0.33	-
22-Feb	468.49	16.50	0.74	-	344.63	36.20	0.33	-
23-Feb	468.44	19.30	0.74	-	344.63	37.05	0.33	-
24-Feb	468.40	18.86	0.73	-	344.62	36.71	0.33	-
25-Feb	468.35	17.02	0.73	-	344.61	35.83	0.33	-
26-Feb	468.31	20.46	0.72	-	344.61	36.94	0.32	-
27-Feb	468.29	23.35	0.72	-	344.62	37.89	0.33	-
28-Feb	468.26	24.37	0.72	-	344.63	38.18	0.33	-
01-Mar	468.32	45.54	0.72	-	344.70	46.14	0.33	-
02-Mar	468.27	16.39	0.72	-	344.67	35.28	0.34	-
03-Mar	468.22	16.19	0.71	-	344.65	35.00	0.33	-
04-Mar	468.16	15.87	0.71	-	344.62	34.67	0.33	-
05-Mar	468.10	13.34	0.70	-	344.59	33.50	0.32	-
06-Mar	468.04	12.17	0.70	-	344.55	32.81	0.32	-
07-Mar	467.97	12.49	0.69	-	344.52	32.67	0.31	-
08-Mar	467.91	13.19	0.69	-	344.50	32.80	0.31	-
09-Mar	467.85	11.80	0.68	-	344.47	32.17	0.31	-
10-Mar	467.78	11.02	0.68	-	344.44	31.73	0.30	-
11-Mar	467.72	11.08	0.68	-	344.41	31.63	0.30	-
12-Mar	467.65	10.79	0.67	-	344.38	31.39	0.30	-
13-Mar	467.60	13.80	0.67	-	344.37	32.39	0.30	-
14-Mar	467.53	10.55	0.66	-	344.34	31.06	0.30	-
15-Mar	467.48	13.93	0.66	-	344.32	32.20	0.29	-
16-Mar	467.42	14.16	0.66	-	344.31	32.07	0.29	-
17-Mar	467.38	14.73	0.65	-	344.29	32.08	0.29	-
18-Mar	467.32	13.82	0.65	-	344.27	31.54	0.29	-
19-Mar	467.26	10.62	0.64	-	344.24	30.12	0.29	-
20-Mar	467.21	13.37	0.63	-	344.22	30.92	0.29	-
21-Mar	467.20	24.14	0.63	-	344.23	34.81	0.29	-
22-Mar	467.15	12.76	0.63	-	344.21	30.44	0.29	-
23-Mar	467.10	12.93	0.62	-	344.18	30.30	0.29	-
24-Mar	467.05	14.10	0.62	-	344.16	30.54	0.29	-
25-Mar	467.00	13.01	0.61	-	344.13	29.95	0.29	-
26-Mar	466.95	11.87	0.61	-	344.09	29.31	0.29	-
27-Mar	466.90	12.86	0.60	-	344.06	29.48	0.28	-
28-Mar	466.87	18.82	0.60	-	344.05	31.55	0.28	-
29-Mar	466.82	12.00	0.59	-	344.01	28.86	0.28	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
30-Mar	466.79	15.49	0.59	-	343.98	29.98	0.28	-
31-Mar	466.76	18.32	0.59	-	343.96	30.91	0.28	-
01-Apr	466.72	13.74	0.58	-	343.93	29.07	0.28	-
02-Apr	466.67	11.78	0.58	-	343.89	28.16	0.28	-
03-Apr	466.62	12.94	0.57	-	343.85	28.41	0.28	-
04-Apr	466.58	11.88	0.57	-	343.80	27.83	0.28	-
05-Apr	466.53	13.02	0.56	-	343.76	28.08	0.28	-
06-Apr	466.51	16.80	0.56	-	343.73	29.34	0.28	-
07-Apr	466.46	12.34	0.56	-	343.69	27.57	0.28	-
08-Apr	466.43	14.26	0.55	-	343.65	28.21	0.28	-
09-Apr	466.39	13.67	0.55	-	343.61	27.92	0.28	-
10-Apr	466.37	17.81	0.55	-	343.47	29.39	0.38	-
11-Apr	466.36	23.40	0.55	-	343.48	31.46	0.25	-
12-Apr	466.33	14.13	0.55	-	343.46	27.96	0.25	-
13-Apr	466.31	18.22	0.55	-	343.46	29.43	0.25	-
14-Apr	466.28	15.37	0.55	-	343.45	28.32	0.25	-
15-Apr	466.24	13.81	0.54	-	343.43	27.67	0.25	-
16-Apr	466.21	16.24	0.54	-	343.42	28.51	0.25	-
17-Apr	466.17	11.78	0.54	-	343.39	26.77	0.25	-
18-Apr	466.14	15.80	0.54	-	343.38	28.20	0.25	-
19-Apr	466.12	16.49	0.54	-	343.38	28.41	0.24	-
20-Apr	466.09	16.57	0.54	-	343.37	28.39	0.24	-
21-Apr	466.06	16.25	0.53	-	343.36	28.22	0.24	-
22-Apr	466.04	15.41	0.53	-	343.35	27.85	0.24	-
23-Apr	466.01	17.47	0.53	-	343.35	28.56	0.24	-
24-Apr	465.98	13.71	0.53	-	343.34	27.10	0.24	-
25-Apr	465.97	21.02	0.53	-	343.34	29.78	0.24	-
26-Apr	465.95	16.46	0.53	-	343.34	28.04	0.24	-
27-Apr	465.93	17.26	0.53	-	343.33	28.28	0.24	-
28-Apr	465.92	20.38	0.53	-	343.34	29.41	0.24	-
29-Apr	465.90	17.80	0.52	-	343.34	28.41	0.24	-
30-Apr	465.91	24.52	0.52	-	343.36	30.90	0.24	-
01-May	465.92	26.30	0.52	-	343.38	31.59	0.24	-
02-May	465.91	21.01	0.53	-	343.38	29.63	0.25	-
03-May	465.90	17.82	0.52	-	343.38	28.41	0.25	-
04-May	465.88	17.05	0.52	-	343.37	28.08	0.24	-
05-May	465.87	20.83	0.52	-	343.37	29.45	0.24	-
06-May	465.86	20.02	0.52	-	343.37	29.13	0.24	-
07-May	465.84	17.87	0.52	-	343.37	28.29	0.24	-
08-May	465.82	16.84	0.52	-	343.36	27.86	0.24	-
09-May	465.81	19.34	0.52	-	343.36	28.75	0.24	-
10-May	465.80	19.81	0.52	-	343.36	28.91	0.24	-
11-May	465.77	15.02	0.52	-	343.34	27.07	0.24	-
12-May	465.75	16.41	0.52	-	343.33	27.53	0.24	-
13-May	465.73	15.18	0.51	-	343.32	27.01	0.24	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
14-May	465.69	11.93	0.51	-	343.29	25.72	0.24	-
15-May	465.66	15.58	0.51	-	343.28	27.00	0.24	-
16-May	465.66	20.54	0.51	-	343.29	28.81	0.24	-
17-May	465.64	15.86	0.51	-	343.28	27.04	0.24	-
18-May	465.60	13.56	0.51	-	343.26	26.11	0.23	-
19-May	465.55	18.81	0.82	-	343.37	40.77	0.24	-
20-May	465.40	21.54	1.44	-	343.71	66.89	0.25	-
21-May	465.38	15.70	0.49	-	343.65	26.34	0.28	-
22-May	465.35	13.02	0.49	-	343.59	25.32	0.27	-
23-May	465.37	26.45	0.49	-	343.48	30.31	0.36	-
24-May	465.45	42.91	0.49	-	343.54	36.49	0.26	-
25-May	465.42	40.52	1.15	-	343.49	62.47	0.58	-
26-May	465.41	31.49	0.81	-	343.63	45.31	0.26	-
27-May	465.41	31.37	0.74	-	343.72	42.38	0.28	-
28-May	465.43	40.21	0.85	-	343.87	49.94	0.28	-
29-May	465.43	44.90	1.08	-	344.13	61.29	0.28	-
30-May	465.45	57.00	1.22	-	344.47	71.31	0.29	-
31-May	465.46	68.78	1.62	-	344.95	91.94	0.34	-
01-Jun	465.45	62.41	1.57	-	345.33	87.52	0.40	-
02-Jun	465.52	101.54	1.98	-	345.93	119.73	0.48	-
03-Jun	465.49	104.06	2.72	-	346.72	150.58	0.58	-
04-Jun	465.48	94.50	2.38	-	346.66	133.01	1.28	-
05-Jun	465.46	75.36	1.98	-	346.60	109.21	1.06	-
06-Jun	465.45	68.38	1.72	-	346.57	96.07	0.91	-
07-Jun	465.45	62.41	1.57	-	346.55	87.42	0.82	-
08-Jun	465.55	118.09	2.19	-	346.76	134.02	1.01	-
09-Jun	465.44	56.39	2.10	-	346.60	106.64	1.14	-
10-Jun	465.49	82.10	1.73	-	346.59	101.49	0.95	-
11-Jun	465.45	60.49	1.75	-	346.57	93.83	0.88	-
12-Jun	465.44	60.27	1.48	-	346.54	83.01	0.79	-
13-Jun	465.44	52.33	1.33	-	346.52	74.02	0.70	-
14-Jun	465.43	45.09	1.15	-	346.49	63.82	0.62	-
15-Jun	465.45	55.37	1.22	-	346.53	70.68	0.61	-
16-Jun	465.44	57.15	1.44	-	346.54	79.89	0.73	-
17-Jun	465.43	44.24	1.17	-	346.50	64.29	0.63	-
18-Jun	465.50	81.41	1.53	-	346.63	92.93	0.72	-
19-Jun	465.45	65.21	1.91	-	346.59	101.82	0.98	-
20-Jun	465.45	61.28	1.54	-	346.55	85.55	0.82	-
21-Jun	465.43	48.25	1.27	-	346.51	69.85	0.68	-
22-Jun	465.43	46.87	1.15	-	346.50	64.58	0.61	-
23-Jun	465.44	50.39	1.19	-	346.51	67.19	0.60	-
24-Jun	465.43	48.13	1.21	-	346.50	67.21	0.63	-
25-Jun	465.44	54.60	1.26	-	346.52	71.52	0.64	-
26-Jun	465.43	46.89	1.23	-	346.51	67.69	0.64	-
27-Jun	465.43	43.85	1.09	-	346.47	60.90	0.60	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
28-Jun	465.44	52.56	1.18	-	346.49	67.54	0.60	-
29-Jun	465.47	74.53	1.63	-	346.64	94.17	0.71	-
30-Jun	465.45	65.78	1.77	-	346.57	96.09	0.95	-
01-Jul	465.46	69.93	1.68	-	346.57	94.22	0.87	-
02-Jul	465.53	112.05	2.28	-	346.74	132.19	1.04	-
03-Jul	465.51	116.74	3.07	-	346.76	165.74	1.44	-
04-Jul	465.47	77.26	2.21	-	346.62	116.67	1.21	-
05-Jul	465.46	74.01	1.87	-	346.59	101.82	0.97	-
06-Jul	465.98	158.57	0.52	-	346.53	79.06	0.78	-
07-Jul	466.51	165.40	0.56	-	346.55	83.02	0.75	-
08-Jul	466.93	134.48	0.59	-	346.52	73.09	0.70	-
09-Jul	467.27	115.68	0.63	-	346.51	67.72	0.64	-
10-Jul	467.57	108.15	0.67	-	346.50	66.26	0.61	-
11-Jul	467.89	111.67	0.69	-	346.51	68.32	0.62	-
12-Jul	468.29	136.87	0.71	-	346.55	78.44	0.68	-
13-Jul	468.63	119.45	0.75	-	346.52	73.56	0.71	-
14-Jul	469.04	141.01	0.79	-	346.56	82.94	0.72	-
15-Jul	469.38	123.10	0.82	-	346.53	77.47	0.75	-
16-Jul	469.63	101.81	0.83	-	346.51	70.26	0.67	-
17-Jul	469.84	87.28	0.84	-	346.50	64.94	0.61	-
18-Jul	470.08	99.47	0.84	-	346.52	69.40	0.62	-
19-Jul	470.58	164.99	0.87	-	346.62	94.69	0.77	-
20-Jul	471.06	165.78	0.94	-	346.58	97.59	0.94	-
21-Jul	471.35	116.90	1.05	-	346.54	83.64	0.80	-
22-Jul	471.65	125.48	1.16	-	346.58	90.84	0.80	-
23-Jul	471.92	138.30	1.68	-	346.66	115.62	0.98	-
24-Jul	472.05	113.26	2.05	-	346.63	120.47	1.13	-
25-Jul	472.16	120.76	2.37	-	346.70	135.61	1.17	-
26-Jul	472.20	113.01	2.59	-	346.68	141.31	1.31	-
27-Jul	472.30	134.44	2.79	-	346.74	157.05	1.38	-
28-Jul	472.30	111.82	2.93	-	346.72	153.83	1.43	-
29-Jul	472.22	88.65	2.80	-	346.68	140.58	1.33	-
30-Jul	472.18	91.35	2.64	-	346.66	135.23	1.25	-
31-Jul	472.28	131.49	2.72	-	346.74	153.03	1.32	-
01-Aug	472.39	147.33	3.02	-	346.79	170.43	1.44	-
02-Aug	472.73	223.45	3.12	-	347.15	216.33	1.44	-
03-Aug	472.95	195.42	3.12	-	347.42	207.73	1.44	-
04-Aug	473.11	176.86	3.12	-	347.64	200.82	1.44	-
05-Aug	473.18	155.63	3.12	-	347.79	192.92	1.44	-
06-Aug	473.23	149.08	3.12	-	347.91	190.49	1.44	-
07-Aug	473.34	162.95	3.12	-	348.02	195.65	1.44	-
08-Aug	473.37	144.01	3.12	-	348.01	188.60	1.44	-
09-Aug	473.63	204.26	3.12	-	348.03	211.02	1.44	0.59
10-Aug	474.01	238.03	3.12	-	348.04	223.59	1.44	1.07
11-Aug	474.41	241.21	3.12	-	348.05	224.77	1.44	2.62

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
12-Aug	474.65	197.97	3.12	-	348.03	208.68	1.44	3.74
13-Aug	474.70	150.28	3.12	-	348.01	190.93	1.44	3.93
14-Aug	474.86	176.85	3.12	-	348.02	200.82	1.44	2.78
15-Aug	475.06	225.82	3.12	-	348.07	251.77	1.44	1.34
16-Aug	475.05	197.02	3.12	-	348.09	274.92	1.44	1.91
17-Aug	475.03	170.72	3.12	2.08	348.06	239.48	1.44	5.64
18-Aug	475.03	176.71	3.12	4.21	348.06	240.43	1.44	7.69
19-Aug	475.06	221.62	3.12	2.73	348.11	293.83	1.44	5.40
20-Aug	475.08	250.32	3.12	2.66	348.13	337.16	1.44	5.15
21-Aug	475.05	211.23	3.12	4.75	348.10	297.26	1.44	8.95
22-Aug	475.03	179.88	3.12	6.48	348.07	252.86	1.44	12.69
23-Aug	475.04	190.57	3.12	5.15	348.08	258.44	1.44	9.85
24-Aug	475.06	215.47	3.12	3.32	348.10	289.75	1.44	6.45
25-Aug	475.04	194.41	3.12	3.42	348.09	270.68	1.44	6.53
26-Aug	475.04	182.91	3.12	4.66	348.07	252.88	1.44	8.79
27-Aug	475.05	196.18	3.12	4.03	348.08	265.59	1.44	7.69
28-Aug	475.04	194.56	3.12	3.26	348.08	266.76	1.44	6.29
29-Aug	475.04	186.67	3.12	3.71	348.07	257.27	1.44	7.03
30-Aug	475.04	186.16	3.12	3.81	348.07	254.90	1.44	7.23
31-Aug	475.04	187.77	3.12	3.43	348.07	256.66	1.44	6.58
01-Sep	475.05	201.06	3.12	3.31	348.09	272.30	1.44	6.33
02-Sep	475.10	287.42	3.12	3.37	348.15	376.32	1.44	6.43
03-Sep	475.05	204.45	3.12	3.98	348.10	296.40	1.44	7.54
04-Sep	475.04	191.29	3.12	7.76	348.08	264.36	1.44	15.49
05-Sep	475.00	140.57	3.12	5.23	348.02	204.19	1.44	10.03
06-Sep	475.06	216.59	3.12	3.75	348.10	278.69	1.44	7.21
07-Sep	475.03	181.51	3.12	1.20	348.07	255.98	1.44	2.78
08-Sep	475.04	182.40	3.12	3.99	348.07	249.23	1.44	7.52
09-Sep	475.04	188.13	3.12	3.47	348.07	256.04	1.44	6.60
10-Sep	475.01	142.27	3.12	3.06	348.02	205.37	1.44	5.91
11-Sep	475.05	199.74	3.12	3.34	348.08	259.79	1.44	6.34
12-Sep	475.03	167.45	3.12	1.24	348.05	236.21	1.44	2.81
13-Sep	475.03	169.04	3.12	3.28	348.05	230.75	1.44	6.22
14-Sep	475.02	161.86	3.12	2.61	348.04	223.05	1.44	5.05
15-Sep	475.02	159.23	3.12	2.25	348.04	218.33	1.44	4.44
16-Sep	475.04	191.22	3.12	1.93	348.07	254.16	1.44	3.86
17-Sep	475.00	136.83	3.12	1.70	348.02	200.14	1.44	3.45
18-Sep	475.04	182.63	3.12	3.15	348.06	238.52	1.44	5.95
19-Sep	475.06	226.70	3.12	1.01	348.11	300.87	1.44	2.42
20-Sep	475.04	183.40	3.12	2.40	348.08	260.16	1.44	4.67
21-Sep	475.02	165.08	3.12	5.04	348.05	229.83	1.44	9.48
22-Sep	475.03	175.23	3.12	3.67	348.06	237.22	1.44	7.01
23-Sep	475.03	170.98	3.12	2.28	348.05	234.85	1.44	4.58
24-Sep	475.02	158.26	3.12	2.50	348.04	219.39	1.44	4.85
25-Sep	475.02	160.71	3.12	2.45	348.04	219.08	1.44	4.76

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
26-Sep	475.00	137.26	3.12	1.78	348.01	193.66	1.44	3.63
27-Sep	475.00	134.80	3.12	1.71	348.01	185.36	1.44	3.47
28-Sep	474.89	108.11	3.12	0.57	347.98	175.18	1.44	1.64
29-Sep	474.80	111.63	3.12	0.02	347.97	176.48	1.44	0.79
30-Sep	474.66	98.53	3.12	-	347.92	171.61	1.44	0.12
01-Oct	474.50	92.21	3.12	-	347.85	169.26	1.44	0.06
02-Oct	474.25	70.77	3.12	-	347.72	161.29	1.44	0.04
03-Oct	474.07	86.97	3.12	-	347.63	167.31	1.44	-
04-Oct	473.89	87.58	3.12	-	347.55	167.53	1.44	-
05-Oct	473.63	66.58	3.12	-	347.39	159.73	1.44	-
06-Oct	473.51	105.50	3.12	-	347.37	174.19	1.44	-
07-Oct	473.37	98.60	3.12	-	347.32	171.63	1.44	-
08-Oct	473.22	95.70	3.12	-	347.27	170.55	1.44	-
09-Oct	473.04	85.96	3.12	-	347.18	166.93	1.44	-
10-Oct	472.97	118.02	3.12	-	347.20	178.84	1.44	-
11-Oct	472.84	101.30	3.12	-	347.16	172.63	1.44	-
12-Oct	472.73	107.91	3.12	-	347.14	175.09	1.44	-
13-Oct	472.58	94.89	3.12	-	347.08	170.25	1.44	-
14-Oct	472.39	83.20	3.12	-	346.96	163.18	1.44	-
15-Oct	472.26	80.32	2.99	-	346.72	145.35	1.44	-
16-Oct	472.15	75.37	2.65	-	346.65	130.45	1.27	-
17-Oct	472.12	84.86	2.45	-	346.64	126.27	1.17	-
18-Oct	472.07	79.01	2.33	-	346.63	119.47	1.11	-
19-Oct	472.06	84.89	2.26	-	346.63	118.71	1.09	-
20-Oct	472.01	70.25	2.16	-	346.60	109.64	1.03	-
21-Oct	472.01	82.92	2.10	-	346.61	111.85	1.02	-
22-Oct	471.98	72.31	2.06	-	346.60	106.61	0.99	-
23-Oct	471.95	70.03	2.01	-	346.59	103.59	0.96	-
24-Oct	471.92	68.07	1.95	-	346.58	100.72	0.93	-
25-Oct	471.88	61.97	1.88	-	346.57	95.84	0.89	-
26-Oct	471.88	71.94	1.84	-	346.58	98.05	0.89	-
27-Oct	471.88	72.44	1.84	-	346.58	98.28	0.91	-
28-Oct	471.86	67.97	1.83	-	346.57	96.20	0.89	-
29-Oct	471.80	52.04	1.76	-	346.55	87.51	0.82	-
30-Oct	471.75	51.52	1.66	-	346.54	83.34	0.78	-
31-Oct	471.72	52.96	1.58	-	346.54	80.95	0.75	-
01-Nov	471.68	48.59	1.51	-	346.53	76.71	0.72	-
02-Nov	471.62	42.28	1.43	-	346.51	71.11	0.67	-
03-Nov	471.57	37.57	1.33	-	346.50	65.59	0.62	-
04-Nov	471.55	44.95	1.26	-	346.50	65.81	0.61	-
05-Nov	471.55	50.08	1.25	-	346.51	67.19	0.61	-
06-Nov	471.53	41.68	1.23	-	346.49	63.29	0.60	-
07-Nov	471.52	46.86	1.20	-	346.48	64.24	0.60	-
08-Nov	471.53	48.69	1.20	-	346.48	65.00	0.60	-
09-Nov	471.53	48.31	1.21	-	346.48	65.08	0.60	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
10-Nov	471.52	43.71	1.20	-	346.46	62.95	0.60	-
11-Nov	471.51	44.22	1.18	-	346.44	62.35	0.60	-
12-Nov	471.51	45.77	1.17	-	346.43	62.57	0.60	-
13-Nov	471.50	42.58	1.16	-	346.39	60.91	0.59	-
14-Nov	471.48	42.02	1.15	-	346.36	60.46	0.59	-
15-Nov	471.45	37.86	1.14	-	346.32	58.63	0.59	-
16-Nov	471.45	44.07	1.14	-	346.29	60.72	0.58	-
17-Nov	471.43	38.38	1.13	-	346.25	58.40	0.58	-
18-Nov	471.40	37.27	1.12	-	346.21	57.64	0.57	-
19-Nov	471.35	31.38	1.11	-	346.15	54.92	0.57	-
20-Nov	471.36	45.78	1.10	-	346.13	60.00	0.56	-
21-Nov	471.34	36.81	1.10	-	346.09	56.55	0.56	-
22-Nov	471.30	33.70	1.08	-	346.04	54.97	0.56	-
23-Nov	471.30	43.12	1.08	-	346.02	58.23	0.55	-
24-Nov	471.30	41.56	1.08	-	345.99	57.62	0.55	-
25-Nov	471.29	42.49	1.08	-	345.97	57.93	0.55	-
26-Nov	471.28	38.82	1.07	-	345.95	56.46	0.54	-
27-Nov	471.25	35.63	1.07	-	345.91	54.99	0.54	-
28-Nov	471.27	44.95	1.06	-	345.91	58.34	0.53	-
29-Nov	471.27	43.05	1.07	-	345.91	57.73	0.53	-
30-Nov	471.29	49.37	1.07	-	345.92	60.28	0.53	-
01-Dec	471.28	38.45	1.07	-	345.90	56.29	0.53	-
02-Dec	471.23	29.99	1.06	-	345.86	52.66	0.53	-
03-Dec	471.21	35.21	1.05	-	345.83	54.10	0.52	-
04-Dec	471.19	38.05	1.04	-	345.81	54.89	0.52	-
05-Dec	471.18	36.48	1.04	-	345.79	54.10	0.51	-
06-Dec	471.15	32.79	1.03	-	345.76	52.39	0.51	-
07-Dec	471.11	31.11	1.01	-	345.73	51.31	0.50	-
08-Dec	471.10	38.12	1.01	-	345.72	53.61	0.50	-
09-Dec	471.07	30.34	1.00	-	345.69	50.43	0.49	-
10-Dec	471.06	38.23	0.99	-	345.68	53.06	0.49	-
11-Dec	471.02	28.57	0.98	-	345.64	49.17	0.48	-
12-Dec	471.01	35.20	0.97	-	345.63	51.25	0.48	-
13-Dec	470.99	32.69	0.97	-	345.60	50.09	0.48	-
14-Dec	470.94	27.31	0.96	-	345.57	47.90	0.47	-
15-Dec	470.90	26.36	0.95	-	345.53	47.29	0.46	-
16-Dec	470.86	28.46	0.95	-	345.51	47.82	0.46	-
17-Dec	470.83	27.99	0.94	-	345.48	47.43	0.45	-
18-Dec	470.80	30.44	0.94	-	345.47	48.15	0.45	-
19-Dec	470.76	26.49	0.93	-	345.44	46.48	0.45	-
20-Dec	470.73	29.00	0.92	-	345.42	47.20	0.44	-
21-Dec	470.69	26.05	0.92	-	345.40	45.89	0.44	-
22-Dec	470.63	20.81	0.91	-	345.35	43.65	0.44	-
23-Dec	470.60	29.34	0.90	-	345.34	46.55	0.43	-
24-Dec	470.55	22.27	0.90	-	345.30	43.70	0.43	-

25-Dec	470.52	28.27	0.89	-	345.29	45.68	0.43	-
26-Dec	470.46	20.13	0.88	-	345.25	42.42	0.42	-
27-Dec	470.44	30.34	0.88	-	345.24	46.04	0.42	-
28-Dec	470.39	20.87	0.88	-	345.21	42.39	0.42	-
29-Dec	470.34	23.04	0.87	-	345.18	43.00	0.41	-
30-Dec	470.31	26.02	0.86	-	345.17	43.94	0.41	-
31-Dec	470.25	19.32	0.86	-	345.13	41.28	0.40	-

Table D.3 Result simulation data of little watery criterion (drought)

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
01-Jan	472.00	24.29	0.90	-	346.50	39.07	0.38	-
02-Jan	472.00	30.89	0.90	-	346.50	41.53	0.38	-
03-Jan	471.95	22.88	0.90	-	346.53	43.30	0.38	-
04-Jan	471.94	31.43	0.89	-	346.58	46.18	0.38	-
05-Jan	471.91	27.05	0.88	-	346.61	44.32	0.38	-
06-Jan	471.86	22.52	0.87	-	346.62	42.25	0.38	-
07-Jan	471.86	32.74	0.87	-	346.66	45.82	0.39	-
08-Jan	471.85	31.95	0.86	-	346.69	45.44	0.39	-
09-Jan	471.83	28.86	0.86	-	346.71	44.15	0.39	-
10-Jan	471.79	24.10	0.85	-	346.71	42.09	0.39	-
11-Jan	471.76	24.54	0.84	-	346.71	41.91	0.39	-
12-Jan	471.73	26.56	0.84	-	346.72	42.37	0.39	-
13-Jan	471.69	21.90	0.83	-	346.70	40.30	0.39	-
14-Jan	471.66	25.20	0.82	-	346.70	41.18	0.39	-
15-Jan	471.64	24.34	0.81	-	346.69	40.58	0.39	-
16-Jan	471.60	22.43	0.80	-	346.67	39.54	0.39	-
17-Jan	471.57	24.93	0.79	-	346.66	40.17	0.39	-
18-Jan	471.55	24.32	0.79	-	346.64	39.68	0.39	-
19-Jan	471.52	23.17	0.78	-	346.62	38.98	0.39	-
20-Jan	471.50	24.64	0.77	-	346.60	39.26	0.38	-
21-Jan	471.49	28.75	0.77	-	346.60	40.69	0.38	-
22-Jan	471.50	33.55	0.77	-	346.61	42.49	0.38	-
23-Jan	471.52	36.61	0.77	-	346.64	43.76	0.39	-
24-Jan	471.51	28.80	0.77	-	346.63	40.92	0.39	-
25-Jan	471.49	24.80	0.77	-	346.61	39.28	0.39	-
26-Jan	471.48	28.36	0.77	-	346.61	40.52	0.38	-
27-Jan	471.46	24.10	0.77	-	346.59	38.87	0.38	-
28-Jan	471.41	18.47	0.76	-	346.55	36.63	0.38	-
29-Jan	471.38	21.98	0.76	-	346.53	37.78	0.38	-
30-Jan	471.37	26.21	0.76	-	346.52	39.27	0.38	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
31-Jan	471.33	21.24	0.75	-	346.49	37.31	0.37	-
01-Feb	471.27	14.68	0.75	-	346.44	34.69	0.37	-
02-Feb	471.25	23.99	0.74	-	346.42	37.99	0.37	-
03-Feb	471.20	16.68	0.74	-	346.38	35.12	0.37	-
04-Feb	471.16	18.89	0.73	-	346.34	35.77	0.37	-
05-Feb	471.12	19.00	0.73	-	346.31	35.64	0.37	-
06-Feb	471.07	15.28	0.72	-	346.26	34.06	0.36	-
07-Feb	471.04	22.31	0.72	-	346.23	36.53	0.36	-
08-Feb	471.01	20.71	0.72	-	346.20	35.82	0.36	-
09-Feb	470.97	18.86	0.71	-	346.17	35.01	0.36	-
10-Feb	470.94	20.66	0.71	-	346.13	35.61	0.36	-
11-Feb	470.90	19.03	0.71	-	346.10	34.93	0.36	-
12-Feb	470.85	15.05	0.71	-	346.05	33.35	0.35	-
13-Feb	470.83	23.13	0.71	-	346.03	36.30	0.35	-
14-Feb	470.80	21.77	0.70	-	346.01	35.74	0.35	-
15-Feb	470.77	19.53	0.70	-	345.98	34.84	0.35	-
16-Feb	470.73	19.27	0.70	-	345.95	34.68	0.35	-
17-Feb	470.70	19.46	0.70	-	345.92	34.68	0.35	-
18-Feb	470.64	13.18	0.70	-	345.87	32.25	0.34	-
19-Feb	470.61	20.51	0.69	-	345.84	34.89	0.34	-
20-Feb	470.58	19.87	0.69	-	345.82	34.59	0.34	-
21-Feb	470.54	17.31	0.69	-	345.79	33.57	0.34	-
22-Feb	470.51	20.78	0.69	-	345.77	34.79	0.34	-
23-Feb	470.46	15.88	0.69	-	345.73	32.89	0.34	-
24-Feb	470.41	13.13	0.68	-	345.69	31.77	0.33	-
25-Feb	470.35	12.37	0.68	-	345.64	31.37	0.33	-
26-Feb	470.32	19.80	0.68	-	345.62	34.05	0.33	-
27-Feb	470.31	24.16	0.68	-	345.62	35.63	0.33	-
28-Feb	470.27	18.72	0.67	-	345.60	33.55	0.33	-
01-Mar	470.24	19.09	0.67	-	345.58	33.62	0.32	-
02-Mar	470.19	13.45	0.67	-	345.54	31.43	0.32	-
03-Mar	470.14	15.69	0.67	-	345.51	32.16	0.32	-
04-Mar	470.11	18.46	0.66	-	345.49	33.12	0.32	-
05-Mar	470.05	13.60	0.66	-	345.45	31.23	0.32	-
06-Mar	470.01	14.61	0.66	-	345.42	31.50	0.32	-
07-Mar	469.95	11.88	0.66	-	345.38	30.43	0.31	-
08-Mar	469.92	19.58	0.66	-	345.36	33.29	0.31	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
09-Mar	469.87	14.31	0.66	-	345.33	31.33	0.31	-
10-Mar	469.85	21.01	0.66	-	345.32	33.83	0.31	-
11-Mar	469.79	12.00	0.66	-	345.29	30.47	0.31	-
12-Mar	469.75	14.99	0.66	-	345.26	31.59	0.31	-
13-Mar	469.70	14.82	0.66	-	345.23	31.52	0.31	-
14-Mar	469.66	16.04	0.66	-	345.21	31.98	0.31	-
15-Mar	469.63	18.61	0.66	-	345.20	32.93	0.31	-
16-Mar	469.58	14.52	0.66	-	345.18	31.41	0.31	-
17-Mar	469.52	12.29	0.66	-	345.15	30.58	0.30	-
18-Mar	469.46	11.91	0.65	-	345.12	30.42	0.30	-
19-Mar	469.41	11.78	0.65	-	345.08	30.26	0.30	-
20-Mar	469.34	9.91	0.65	-	345.05	29.44	0.30	-
21-Mar	469.30	14.30	0.64	-	345.02	30.97	0.30	-
22-Mar	469.23	9.94	0.64	-	344.98	29.23	0.30	-
23-Mar	469.21	19.36	0.64	-	344.98	32.65	0.30	-
24-Mar	469.16	13.91	0.64	-	344.96	30.54	0.29	-
25-Mar	469.11	13.09	0.63	-	344.93	30.14	0.29	-
26-Mar	469.05	11.83	0.63	-	344.90	29.57	0.29	-
27-Mar	469.00	12.03	0.63	-	344.87	29.53	0.29	-
28-Mar	468.94	9.15	0.63	-	344.83	28.34	0.29	-
29-Mar	468.89	12.08	0.62	-	344.81	29.32	0.29	-
30-Mar	468.86	18.23	0.62	-	344.80	31.53	0.28	-
31-Mar	468.82	16.09	0.62	-	344.79	30.66	0.28	-
01-Apr	468.77	12.78	0.62	-	344.76	29.36	0.28	-
02-Apr	468.72	12.30	0.61	-	344.74	29.08	0.28	-
03-Apr	468.66	10.25	0.61	-	344.71	28.20	0.28	-
04-Apr	468.61	10.51	0.61	-	344.68	28.19	0.28	-
05-Apr	468.55	10.37	0.60	-	344.65	28.02	0.28	-
06-Apr	468.49	8.45	0.60	-	344.61	27.18	0.27	-
07-Apr	468.43	10.71	0.60	-	344.58	27.91	0.27	-
08-Apr	468.39	12.80	0.59	-	344.56	28.59	0.27	-
09-Apr	468.34	11.24	0.59	-	344.54	27.91	0.27	-
10-Apr	468.30	14.49	0.59	-	344.52	29.03	0.27	-
11-Apr	468.27	18.27	0.59	-	344.52	30.38	0.27	-
12-Apr	468.22	11.13	0.58	-	344.50	27.64	0.27	-
13-Apr	468.18	12.84	0.58	-	344.48	28.19	0.27	-
14-Apr	468.13	9.97	0.58	-	344.45	27.02	0.26	-
15-Apr	468.07	9.45	0.58	-	344.42	26.71	0.26	-
16-Apr	468.01	9.08	0.57	-	344.39	26.47	0.26	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
17-Apr	467.95	8.81	0.57	-	344.36	26.24	0.26	-
18-Apr	467.90	10.70	0.57	-	344.33	26.85	0.26	-
19-Apr	467.87	15.69	0.56	-	344.32	28.62	0.26	-
20-Apr	467.83	13.11	0.56	-	344.30	27.59	0.26	-
21-Apr	467.79	11.65	0.56	-	344.28	26.96	0.26	-
22-Apr	467.75	12.66	0.56	-	344.26	27.25	0.26	-
23-Apr	467.70	10.51	0.56	-	344.23	26.36	0.25	-
24-Apr	467.66	14.05	0.55	-	344.22	27.60	0.25	-
25-Apr	467.61	8.37	0.55	-	344.18	25.38	0.25	-
26-Apr	467.56	10.94	0.55	-	344.16	26.24	0.25	-
27-Apr	467.51	9.19	0.55	-	344.13	25.49	0.25	-
28-Apr	467.47	12.22	0.54	-	344.11	26.53	0.25	-
29-Apr	467.43	13.77	0.54	-	344.09	27.02	0.25	-
30-Apr	467.40	13.71	0.54	-	344.07	26.93	0.25	-
01-May	467.33	4.44	0.54	-	344.03	23.17	0.25	-
02-May	467.26	4.30	0.53	-	343.98	22.98	0.24	-
03-May	467.20	5.43	0.53	-	343.94	23.51	0.24	-
04-May	467.13	4.18	0.52	-	343.89	22.67	0.24	-
05-May	467.07	5.40	0.52	-	343.85	23.24	0.24	-
06-May	467.01	6.25	0.52	-	343.81	23.44	0.24	-
07-May	466.94	5.17	0.51	-	343.77	22.91	0.24	-
08-May	466.88	4.31	0.51	-	343.72	22.03	0.23	-
09-May	466.82	4.63	0.51	-	343.68	22.45	0.23	-
10-May	466.75	4.35	0.50	-	343.64	21.98	0.23	-
11-May	466.69	4.28	0.50	-	343.59	21.82	0.23	-
12-May	466.62	4.56	0.50	-	343.55	22.04	0.23	-
13-May	466.58	9.59	0.49	-	343.53	23.84	0.23	-
14-May	466.52	4.36	0.49	-	343.49	21.76	0.22	-
15-May	466.47	7.95	0.49	-	343.46	23.01	0.22	-
16-May	466.42	7.17	0.49	-	343.43	22.61	0.22	-
17-May	466.38	9.21	0.48	-	343.41	23.29	0.21	-
18-May	466.33	9.42	0.48	-	343.40	23.29	0.21	-
19-May	466.29	7.47	0.48	-	343.38	22.46	0.21	-
20-May	466.24	8.01	0.48	-	343.36	22.56	0.21	-
21-May	466.20	9.55	0.47	-	343.34	23.06	0.21	-
22-May	466.15	8.01	0.47	-	343.33	22.39	0.20	-
23-May	466.12	10.47	0.47	-	343.32	23.25	0.20	-
24-May	466.07	6.73	0.47	-	343.30	21.74	0.20	-
25-May	466.04	11.70	0.46	-	343.30	23.55	0.20	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
26-May	466.00	8.94	0.46	-	343.28	22.43	0.20	-
27-May	465.96	9.69	0.46	-	343.27	22.63	0.20	-
28-May	465.92	8.86	0.46	-	343.26	22.24	0.20	-
29-May	465.88	10.66	0.46	-	343.26	22.84	0.20	-
30-May	465.86	13.49	0.45	-	343.26	23.87	0.20	-
31-May	465.84	13.30	0.45	-	343.27	23.75	0.20	-
01-Jun	465.86	25.97	0.45	-	343.31	28.38	0.20	-
02-Jun	465.84	14.09	0.45	-	343.31	23.95	0.20	-
03-Jun	465.80	9.03	0.45	-	343.29	22.01	0.20	-
04-Jun	465.78	13.83	0.45	-	343.29	23.74	0.20	-
05-Jun	465.76	13.61	0.45	-	343.29	23.61	0.20	-
06-Jun	465.75	16.65	0.45	-	343.30	24.72	0.20	-
07-Jun	465.72	12.11	0.45	-	343.29	22.99	0.20	-
08-Jun	465.69	11.14	0.45	-	343.28	22.57	0.20	-
09-Jun	465.68	14.07	0.44	-	343.28	23.62	0.20	-
10-Jun	465.64	9.12	0.44	-	343.27	21.71	0.20	-
11-Jun	465.60	7.59	0.44	-	343.24	21.06	0.20	-
12-Jun	465.57	12.14	0.44	-	343.24	22.69	0.19	-
13-Jun	465.54	9.89	0.44	-	343.23	21.79	0.19	-
14-Jun	465.50	8.02	0.44	-	343.21	21.02	0.19	-
15-Jun	465.48	14.54	0.43	-	343.22	23.35	0.19	-
16-Jun	465.46	13.13	0.43	-	343.22	22.72	0.19	-
17-Jun	465.45	15.53	0.43	-	343.22	23.52	0.19	-
18-Jun	465.45	18.94	0.43	-	343.24	24.77	0.19	-
19-Jun	465.43	11.88	0.43	-	343.23	22.07	0.19	-
20-Jun	465.40	10.99	0.42	-	343.22	21.59	0.19	-
21-Jun	465.37	9.88	0.42	-	343.20	20.99	0.19	-
22-Jun	465.37	16.89	0.41	-	343.21	23.51	0.19	-
23-Jun	465.37	18.53	0.41	-	343.22	24.12	0.19	-
24-Jun	465.38	20.71	0.41	-	343.24	24.96	0.19	-
25-Jun	465.38	17.72	0.42	-	343.24	23.88	0.19	-
26-Jun	465.38	16.99	0.42	-	343.25	23.59	0.19	-
27-Jun	465.37	17.50	0.41	-	343.25	23.77	0.20	-
28-Jun	465.38	18.33	0.41	-	343.26	24.09	0.20	-
29-Jun	465.40	23.15	0.42	-	343.28	25.94	0.20	-
30-Jun	465.41	22.75	0.42	-	343.30	25.90	0.20	-
01-Jul	465.54	52.42	0.43	-	343.42	37.40	0.21	-
02-Jul	465.74	71.54	0.44	-	343.59	44.95	0.22	-
03-Jul	465.91	64.33	0.45	-	343.73	42.63	0.23	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
04-Jul	466.02	48.60	0.46	-	343.82	37.05	0.23	-
05-Jul	466.11	43.59	0.46	-	343.89	35.38	0.24	-
06-Jul	466.17	35.79	0.47	-	343.93	32.62	0.24	-
07-Jul	466.29	50.75	0.47	-	344.02	38.37	0.24	-
08-Jul	466.35	37.48	0.48	-	344.07	33.61	0.25	-
09-Jul	466.44	44.30	0.48	-	344.14	36.31	0.25	-
10-Jul	466.49	33.58	0.49	-	344.17	32.45	0.25	-
11-Jul	466.59	47.34	0.49	-	344.25	37.73	0.25	-
12-Jul	466.68	44.46	0.50	-	344.32	36.85	0.26	-
13-Jul	466.78	47.21	0.50	-	344.39	38.06	0.26	-
14-Jul	466.83	32.93	0.51	-	344.42	32.88	0.26	-
15-Jul	466.89	37.05	0.51	-	344.46	34.52	0.26	-
16-Jul	466.91	29.17	0.51	-	344.48	31.68	0.26	-
17-Jul	466.98	38.28	0.51	-	344.52	35.16	0.27	-
18-Jul	467.22	86.06	0.52	-	344.72	53.27	0.27	-
19-Jul	467.37	61.80	0.53	-	344.84	44.63	0.28	-
20-Jul	467.49	55.11	0.54	-	344.93	42.41	0.29	-
21-Jul	467.56	39.17	0.54	-	344.96	36.66	0.29	-
22-Jul	467.66	50.14	0.55	-	345.03	40.91	0.30	-
23-Jul	467.95	101.23	0.56	-	345.27	60.35	0.30	-
24-Jul	468.24	100.78	0.58	-	345.50	60.76	0.31	-
25-Jul	468.47	83.04	0.59	-	345.67	54.67	0.32	-
26-Jul	468.55	46.12	0.60	-	345.72	41.20	0.33	-
27-Jul	468.66	55.15	0.60	-	345.79	44.76	0.34	-
28-Jul	468.78	55.88	0.61	-	345.86	45.27	0.34	-
29-Jul	468.89	54.27	0.62	-	345.93	44.89	0.34	-
30-Jul	469.01	58.56	0.62	-	346.01	46.73	0.35	-
31-Jul	469.22	80.88	0.63	-	346.16	55.39	0.36	-
01-Aug	469.33	54.48	0.64	-	346.22	45.86	0.36	-
02-Aug	469.43	55.04	0.65	-	346.29	46.29	0.36	-
03-Aug	469.55	58.40	0.65	-	346.36	47.76	0.37	-
04-Aug	469.65	50.86	0.66	-	346.41	44.97	0.37	-
05-Aug	469.72	45.78	0.66	-	346.44	43.07	0.37	-
06-Aug	469.82	54.36	0.66	-	346.49	46.27	0.37	-
07-Aug	469.90	48.29	0.66	-	346.53	44.01	0.38	-
08-Aug	469.99	48.26	0.66	-	346.56	44.00	0.38	-
09-Aug	470.08	52.42	0.66	-	346.60	45.61	0.38	-
10-Aug	470.20	57.35	0.67	-	346.66	47.67	0.39	-
11-Aug	470.36	69.71	0.67	-	346.76	52.55	0.39	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
12-Aug	470.46	52.87	0.68	-	346.79	46.53	0.40	-
13-Aug	470.55	52.94	0.69	-	346.83	46.75	0.40	-
14-Aug	470.62	45.30	0.69	-	346.84	44.06	0.40	-
15-Aug	470.69	45.34	0.70	-	346.85	44.21	0.40	-
16-Aug	470.80	58.02	0.70	-	346.90	49.12	0.41	-
17-Aug	470.94	65.30	0.71	-	346.98	52.09	0.41	-
18-Aug	471.09	68.59	0.72	-	347.06	53.64	0.42	-
19-Aug	471.19	54.67	0.73	-	347.10	48.95	0.43	-
20-Aug	471.27	52.30	0.74	-	347.12	48.43	0.43	-
21-Aug	471.34	48.36	0.75	-	347.13	47.26	0.44	-
22-Aug	471.44	53.99	0.76	-	347.15	49.70	0.45	-
23-Aug	471.60	74.18	0.77	-	347.23	57.83	0.47	-
24-Aug	471.74	69.39	0.82	-	347.26	57.57	0.52	-
25-Aug	472.03	111.03	0.87	-	347.38	75.25	0.59	-
26-Aug	472.16	72.15	0.93	-	347.35	62.87	0.63	-
27-Aug	472.22	51.99	0.96	-	347.30	56.29	0.59	-
28-Aug	472.26	48.44	0.97	-	347.27	55.44	0.56	-
29-Aug	472.30	49.04	0.98	-	347.26	56.06	0.54	-
30-Aug	472.39	62.76	1.00	-	347.30	61.83	0.55	-
31-Aug	472.51	71.33	1.03	-	347.34	66.06	0.59	-
01-Sep	472.50	38.67	1.04	-	347.28	54.44	0.58	-
02-Sep	472.47	32.41	1.04	-	347.24	51.92	0.53	-
03-Sep	472.50	50.37	1.04	-	347.27	58.65	0.53	-
04-Sep	472.60	66.09	1.06	-	347.32	65.17	0.57	-
05-Sep	472.67	61.19	1.08	-	347.33	64.17	0.60	-
06-Sep	472.77	70.07	1.10	-	347.36	68.36	0.62	-
07-Sep	472.80	51.42	1.12	-	347.34	62.06	0.62	-
08-Sep	472.79	39.01	1.12	-	347.30	57.49	0.59	-
09-Sep	472.77	39.26	1.12	-	347.28	57.42	0.56	-
10-Sep	472.80	51.59	1.12	-	347.31	62.09	0.57	-
11-Sep	472.82	49.17	1.13	-	347.31	61.45	0.58	-
12-Sep	472.84	50.02	1.13	-	347.31	61.98	0.58	-
13-Sep	472.88	52.85	1.14	-	347.32	63.31	0.59	-
14-Sep	472.90	51.46	1.15	-	347.33	63.08	0.60	-
15-Sep	472.89	42.54	1.15	-	347.31	59.84	0.59	-
16-Sep	472.87	37.98	1.15	-	347.29	57.98	0.57	-
17-Sep	472.82	32.30	1.14	-	347.27	55.51	0.55	-
18-Sep	472.81	39.72	1.13	-	347.27	57.98	0.55	-
19-Sep	472.80	40.14	1.13	-	347.28	58.00	0.55	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
20-Sep	472.77	36.00	1.12	-	347.27	56.24	0.55	-
21-Sep	472.71	28.11	1.11	-	347.24	52.88	0.53	-
22-Sep	472.66	29.45	1.09	-	347.23	52.85	0.51	-
23-Sep	472.61	27.32	1.08	-	347.22	51.54	0.50	-
24-Sep	472.56	30.19	1.07	-	347.22	52.12	0.50	-
25-Sep	472.50	24.11	1.05	-	347.20	49.32	0.49	-
26-Sep	472.44	24.84	1.03	-	347.19	48.98	0.48	-
27-Sep	472.40	27.94	1.02	-	347.19	49.63	0.47	-
28-Sep	472.35	25.44	1.01	-	347.18	48.20	0.47	-
29-Sep	472.28	21.59	0.99	-	347.16	46.19	0.46	-
30-Sep	472.21	18.53	0.97	-	347.13	44.35	0.45	-
01-Oct	472.20	36.57	0.96	-	347.16	50.69	0.45	-
02-Oct	472.18	32.54	0.96	-	347.17	49.07	0.46	-
03-Oct	472.15	28.10	0.95	-	347.16	47.14	0.46	-
04-Oct	472.13	31.89	0.94	-	347.16	48.29	0.46	-
05-Oct	472.14	40.96	0.94	-	347.18	51.65	0.46	-
06-Oct	472.24	62.18	0.96	-	347.26	60.09	0.49	-
07-Oct	472.33	63.80	0.98	-	347.29	61.64	0.55	-
08-Oct	472.40	57.35	1.01	-	347.30	60.04	0.57	-
09-Oct	472.43	48.09	1.02	-	347.28	57.09	0.56	-
10-Oct	472.45	44.62	1.03	-	347.27	56.04	0.55	-
11-Oct	472.44	37.38	1.03	-	347.25	53.37	0.53	-
12-Oct	472.41	32.17	1.02	-	347.22	51.23	0.51	-
13-Oct	472.38	32.30	1.01	-	347.21	50.99	0.50	-
14-Oct	472.36	33.48	1.01	-	347.21	51.18	0.49	-
15-Oct	472.33	32.69	1.00	-	347.21	50.65	0.49	-
16-Oct	472.29	26.83	0.99	-	347.19	48.13	0.48	-
17-Oct	472.24	26.12	0.98	-	347.17	47.40	0.47	-
18-Oct	472.20	25.53	0.97	-	347.16	46.72	0.46	-
19-Oct	472.14	22.37	0.95	-	347.13	45.03	0.45	-
20-Oct	472.10	24.70	0.94	-	347.12	45.38	0.44	-
21-Oct	472.03	20.06	0.92	-	347.10	43.12	0.43	-
22-Oct	471.99	24.10	0.91	-	347.09	44.10	0.43	-
23-Oct	471.93	18.14	0.89	-	347.06	41.34	0.43	-
24-Oct	471.87	21.14	0.88	-	347.03	41.88	0.42	-
25-Oct	471.82	19.78	0.86	-	347.00	40.85	0.42	-
26-Oct	471.77	20.79	0.85	-	346.97	40.71	0.42	-
27-Oct	471.72	19.86	0.84	-	346.93	39.87	0.41	-
28-Oct	471.67	18.05	0.82	-	346.89	38.66	0.41	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
29-Oct	471.62	20.33	0.81	-	346.85	39.02	0.41	-
30-Oct	471.56	16.07	0.79	-	346.80	36.91	0.40	-
31-Oct	471.52	20.21	0.78	-	346.76	37.96	0.40	-
01-Nov	471.52	29.38	0.77	-	346.75	41.14	0.40	-
02-Nov	471.52	31.85	0.77	-	346.75	42.05	0.40	-
03-Nov	471.49	23.90	0.77	-	346.72	38.98	0.39	-
04-Nov	471.47	24.03	0.77	-	346.69	38.88	0.39	-
05-Nov	471.46	27.38	0.76	-	346.68	40.06	0.39	-
06-Nov	471.45	28.09	0.76	-	346.67	40.28	0.39	-
07-Nov	471.43	25.81	0.76	-	346.65	39.38	0.39	-
08-Nov	471.42	26.89	0.76	-	346.63	39.73	0.39	-
09-Nov	471.40	25.37	0.76	-	346.61	39.09	0.39	-
10-Nov	471.37	22.44	0.76	-	346.59	37.90	0.38	-
11-Nov	471.35	23.90	0.75	-	346.56	38.34	0.38	-
12-Nov	471.31	20.91	0.75	-	346.53	37.12	0.38	-
13-Nov	471.27	18.56	0.75	-	346.49	36.08	0.38	-
14-Nov	471.23	19.33	0.74	-	346.46	36.21	0.37	-
15-Nov	471.21	23.10	0.74	-	346.44	37.48	0.37	-
16-Nov	471.18	22.36	0.74	-	346.41	37.11	0.37	-
17-Nov	471.12	13.63	0.73	-	346.36	33.68	0.37	-
18-Nov	471.11	24.94	0.73	-	346.34	37.75	0.37	-
19-Nov	471.07	18.32	0.72	-	346.30	35.17	0.37	-
20-Nov	471.03	18.44	0.72	-	346.26	35.05	0.36	-
21-Nov	470.99	18.18	0.72	-	346.22	34.80	0.36	-
22-Nov	470.96	21.70	0.71	-	346.20	36.03	0.36	-
23-Nov	470.92	18.14	0.71	-	346.16	34.64	0.36	-
24-Nov	470.88	17.95	0.71	-	346.12	34.49	0.36	-
25-Nov	470.83	15.76	0.71	-	346.07	33.59	0.36	-
26-Nov	470.79	15.51	0.70	-	346.03	33.40	0.35	-
27-Nov	470.75	18.99	0.70	-	346.00	34.61	0.35	-
28-Nov	470.72	20.18	0.70	-	345.97	34.99	0.35	-
29-Nov	470.69	18.65	0.70	-	345.94	34.35	0.35	-
30-Nov	470.66	20.62	0.70	-	345.91	35.03	0.35	-
01-Dec	470.65	26.17	0.69	-	345.91	37.07	0.35	-
02-Dec	470.63	23.24	0.69	-	345.89	35.94	0.34	-
03-Dec	470.61	22.47	0.69	-	345.88	35.62	0.34	-
04-Dec	470.61	27.02	0.69	-	345.87	37.29	0.34	-
05-Dec	470.59	22.50	0.69	-	345.86	35.59	0.34	-
06-Dec	470.57	22.80	0.69	-	345.84	35.66	0.34	-

Month and Date	Namkhan 2 hydropower plant				Namkhan 3 hydropower plant			
	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)	REev (m.a.s.l)	Qin (cms)	EG (GWh)	Qs (MCM)
07-Dec	470.54	19.78	0.69	-	345.82	34.48	0.34	-
08-Dec	470.51	20.19	0.69	-	345.80	34.58	0.34	-
09-Dec	470.47	16.42	0.69	-	345.76	33.10	0.34	-
10-Dec	470.47	27.98	0.68	-	345.77	37.37	0.34	-
11-Dec	470.45	20.61	0.68	-	345.75	34.60	0.34	-
12-Dec	470.42	19.85	0.68	-	345.73	34.26	0.33	-
13-Dec	470.40	22.22	0.68	-	345.71	35.10	0.33	-
14-Dec	470.38	22.77	0.68	-	345.70	35.26	0.33	-
15-Dec	470.34	15.43	0.68	-	345.67	32.46	0.33	-
16-Dec	470.31	19.81	0.68	-	345.65	34.03	0.33	-
17-Dec	470.28	21.08	0.67	-	345.64	34.45	0.33	-
18-Dec	470.27	22.53	0.67	-	345.63	34.95	0.33	-
19-Dec	470.27	28.02	0.67	-	345.64	36.98	0.33	-
20-Dec	470.26	24.35	0.67	-	345.63	35.61	0.33	-
21-Dec	470.25	25.40	0.67	-	345.63	35.98	0.33	-
22-Dec	470.23	21.77	0.67	-	345.62	34.60	0.33	-
23-Dec	470.22	22.15	0.67	-	345.61	34.70	0.33	-
24-Dec	470.18	18.43	0.67	-	345.59	33.26	0.33	-
25-Dec	470.17	22.55	0.67	-	345.58	34.75	0.32	-
26-Dec	470.15	22.28	0.67	-	345.57	34.62	0.32	-
27-Dec	470.12	18.76	0.67	-	345.55	33.25	0.32	-
28-Dec	470.10	21.15	0.66	-	345.54	34.10	0.32	-
29-Dec	470.05	13.65	0.66	-	345.50	31.23	0.32	-
30-Dec	470.03	22.68	0.66	-	345.49	34.53	0.32	-
31-Dec	470.00	17.69	0.66	-	345.47	32.63	0.32	-

APPENDIX E

Actual Production Data

These data are recorded from the actual production of Namkhan 2 and 3 hydropower plants. Namkhan 2 HPP was started the electricity production on October 2015 and Namkhan 3 was started the electricity production on August 2016. In which data are consisted of the reservoir elevation (REev), average water inflow (AWI or Qin), average water discharge turbine (AWDT or Qt), and average water release from spillway (AWRS or Qs), max power production (Pmax), min power production (Pmin), and energy generation (EG). These data are used in the HEC-ResSim 3.1 software to simulate the multi-reservoir operation management of Namkhan case and it is used to calibrate software in Appendix C. the Table E.1 and E.2 were shown the data detail for the actual data of Namkhan 2 and 3 hydropower plants, respectively.

Table E.1 Actual production data of Namkhan 2 hydropower plant

Date/Month/Year	REev (m.a.s.l)	Qin (cms)	Qt (cms)	Qs (cms)	Pmax (MW)	Pmin (MW)	EG (GWh)
1 Oct 2015	470.04	74.52	59.14	0.00	65.00	31.68	1.294
2 Oct 2015	470.24	53.03	0	0.00	0.00	0.00	-
3 Oct 2015	470.41	45.08	0	0.00	0.00	0.00	-
4 Oct 2015	470.58	45.08	0	0.00	0.00	0.00	-
5 Oct 2015	470.70	31.82	0	0.00	0.00	0.00	-
6 Oct 2015	470.80	72.08	45.56	0.00	33.31	30.13	0.413
7 Oct 2015	470.95	39.77	0	0.00	0.00	0.00	-
8 Oct 2015	471.10	59.99	45.56	0.00	40.91	30.71	0.525
9 Oct 2015	471.25	59.11	45.56	0.00	41.15	29.68	0.545
10 Oct 2015	471.48	97.47	36.48	0.00	71.42	43.55	0.967
11 Oct 2015	472.20	190.92	0	0.00	0.00	0.00	-
12 Oct 2015	472.73	151.04	25.2	0.00	42.30	31.65	0.427
13 Oct 2015	473.00	105.95	36.65	0.00	30.29	29.03	0.394
14 Oct 2015	473.15	83.85	44.08	0.00	64.00	49.08	1.116
15 Oct 2015	473.19	66.43	0	0.00	64.00	49.68	1.474
16 Oct 2015	473.20	53.48	50.83	0.00	65.00	49.97	1.404

Date/Month/Year	REev (m.a.s.l)	Qin (cms)	Qt (cms)	Qs (cms)	Pmax (MW)	Pmin (MW)	EG (GWh)
17 Oct 2015	473.20	51.11	51.11	0.00	65.00	48.07	1.422
18 Oct 2015	473.20	51.11	51.11	0.00	65.00	48.01	1.498
19 Oct 2015	473.25	55.83	42.57	0.00	63.49	30.11	1.133
20 Oct 2015	473.20	45.01	58.27	0.00	64.72	40.11	1.557
21 Oct 2015	473.20	53.28	53.28	0.00	63.09	38.89	1.372
22 Oct 2015	473.20	57.09	57.09	0.00	65.00	30.80	1.538
23 Oct 2015	473.20	58.43	58.43	0.00	63.34	33.99	1.011
24 Oct 2015	473.15	40.36	53.62	0.00	64.56	30.81	1.440
25 Oct 2015	473.10	44.67	57.93	0.00	65.00	29.59	1.544
26 Oct 2015	473.00	31.23	57.75	0.00	65.00	30.44	1.539
27 Oct 2015	472.97	49.78	57.73	0.00	65.00	29.96	1.539
28 Oct 2015	472.90	39.02	57.58	0.00	65.00	31.20	1.536
29 Oct 2015	472.89	55.99	57.32	0.00	65.00	31.20	1.531
30 Oct 2015	472.81	34.73	57.27	0.00	65.00	38.40	1.525
31 Oct 2015	472.79	53.27	57.25	0.00	65.00	32.50	1.535
1 Nov 2015	472.70	32.18	57.37	0.00	38.12	30.68	0.968
2 Nov 2015	472.70	37.14	37.14	0.00	43.48	30.21	0.970
3 Nov 2015	472.70	36.68	36.68	0.00	43.13	30.12	0.971
4 Nov 2015	472.63	18.13	36.69	0.00	43.75	30.50	0.971
5 Nov 2015	472.61	31.32	36.62	0.00	43.15	31.09	0.967
6 Nov 2015	472.60	33.97	36.62	0.00	43.31	31.13	0.969
7 Nov 2015	472.59	33.46	36.11	0.00	43.68	29.55	0.973
8 Nov 2015	472.58	33.85	36.50	0.00	43.91	31.71	0.971
9 Nov 2015	472.58	36.85	36.58	0.00	44.15	29.68	0.971
10 Nov 2015	472.57	33.93	36.58	0.00	43.42	29.55	0.970
11 Nov 2015	472.57	35.20	36.53	0.00	43.85	31.26	0.970
12 Nov 2015	472.55	32.51	36.49	0.00	42.30	31.65	0.970
13 Nov 2015	472.55	36.66	36.66	0.00	43.29	29.03	0.967
14 Nov 2015	472.50	23.28	36.54	0.00	43.12	29.08	0.965
15 Nov 2015	472.49	33.82	36.47	0.00	42.95	29.68	0.967
16 Nov 2015	472.48	33.71	36.36	0.00	43.27	29.97	0.965
17 Nov 2015	472.47	33.70	36.35	0.00	43.10	28.07	0.965
18 Nov 2015	472.46	33.81	36.46	0.00	43.59	28.01	0.965
19 Nov 2015	472.39	18.17	36.73	0.00	42.99	30.11	0.965
20 Nov 2015	472.38	33.97	36.62	0.00	42.99	30.11	0.963
21 Nov 2015	472.37	33.75	36.40	0.00	42.83	31.76	0.962
22 Nov 2015	472.35	31.16	36.46	0.00	37.85	30.80	0.960

Date/Month/Year	REev (m.a.s.l)	Qin (cms)	Qt (cms)	Qs (cms)	Pmax (MW)	Pmin (MW)	EG (GWh)
23 Nov 2015	472.34	33.57	36.22	0.00	41.29	23.99	0.956
24 Nov 2015	472.32	31.11	36.41	0.00	41.86	30.81	0.956
25 Nov 2015	472.23	12.73	36.59	0.00	40.82	29.59	0.956
26 Nov 2015	472.21	31.15	36.45	0.00	41.59	30.44	0.967
27 Nov 2015	472.19	31.23	36.53	0.00	41.12	29.96	0.973
28 Nov 2015	472.16	28.73	36.68	0.00	41.70	31.20	0.972
29 Nov 2015	472.03	29.50	37.42	0.00	43.70	31.20	0.973
30 Nov 2015	471.99	26.59	37.20	0.00	43.60	31.40	0.970
1 Dec 2015	471.96	28.88	36.83	0.00	32.12	31.68	0.469
2 Dec 2015	471.93	29.36	37.31	0.00	31.48	30.21	0.469
3 Dec 2015	471.85	16.24	37.45	0.00	31.30	30.12	0.455
4 Dec 2015	471.90	50.66	37.40	0.00	31.75	30.50	0.487
5 Dec 2015	472.00	63.72	37.20	0.00	32.15	31.09	0.437
6 Dec 2015	472.02	42.55	37.25	0.00	33.31	31.13	0.469
7 Dec 2015	472.03	39.86	37.21	0.00	33.68	29.55	0.448
8 Dec 2015	471.99	26.83	37.44	0.00	31.91	31.71	0.463
9 Dec 2015	471.96	29.61	37.56	0.00	40.15	29.68	0.469
10 Dec 2015	471.95	34.25	36.90	0.00	31.42	29.55	0.469
11 Dec 2015	471.93	32.06	37.36	0.00	31.85	31.26	0.469
12 Dec 2015	471.91	31.55	36.85	0.00	32.30	31.65	0.455
13 Dec 2015	471.85	21.47	37.38	0.00	30.29	29.03	0.455
14 Dec 2015	471.75	10.04	36.56	0.00	30.12	29.08	0.413
15 Dec 2015	471.75	36.88	36.88	0.00	30.95	29.68	0.437
16 Dec 2015	471.78	35.51	27.56	0.00	31.27	29.97	0.737
17 Dec 2015	471.82	37.73	27.12	0.00	80.10	28.07	1.293
18 Dec 2015	471.87	40.36	27.10	0.00	31.59	28.01	0.651
19 Dec 2015	472.00	34.47	30.78	0.00	31.99	30.11	0.734
20 Dec 2015	472.12	31.82	30.74	0.00	31.99	30.11	0.733
21 Dec 2015	472.17	44.39	30.17	0.00	31.83	28.89	0.725
22 Dec 2015	472.24	31.25	30.45	0.00	31.85	30.80	0.731
23 Dec 2015	472.28	30.91	29.63	0.00	31.29	23.99	0.442
24 Dec 2015	472.28	12.53	30.07	0.00	31.86	30.81	0.431
25 Dec 2015	472.20	19.22	28.78	0.00	30.82	29.59	0.321
26 Dec 2015	472.30	26.52	29.34	0.00	31.59	30.44	0.532
27 Dec 2015	472.35	33.26	29.01	0.00	31.12	29.96	0.450
28 Dec 2015	472.35	32.60	30.23	0.00	31.70	31.20	0.474
29 Dec 2015	472.33	26.85	29.17	0.00	31.70	31.20	0.443
30 Dec 2015	472.33	12.53	30.08	0.00	31.60	18.40	0.304
31 Dec 2015	472.30	12.53	0.00	0.00	0.00	0.00	0.000

Date/Month/Year	REev (m.a.s.l)	Qin (cms)	Qt (cms)	Qs (cms)	Pmax (MW)	Pmin (MW)	EG (GWh)
1 Jan 2016	472.38	20.19	20.19	0.00	32.12	31.68	0.469
2 Jan 2016	472.37	17.54	20.19	0.00	31.48	30.21	0.469
3 Jan 2016	472.36	16.94	19.59	0.00	31.30	30.12	0.455
4 Jan 2016	472.31	7.70	20.96	0.00	31.75	30.50	0.487
5 Jan 2016	472.28	10.86	18.82	0.00	32.15	31.09	0.437
6 Jan 2016	472.38	46.70	20.19	0.00	33.31	31.13	0.469
7 Jan 2016	472.36	13.95	19.25	0.00	33.68	29.55	0.448
8 Jan 2016	472.34	14.63	19.93	0.00	31.91	31.71	0.463
9 Jan 2016	472.33	17.54	20.19	0.00	40.15	29.68	0.469
10 Jan 2016	472.31	14.88	20.19	0.00	31.42	29.55	0.469
11 Jan 2016	472.31	20.18	20.18	0.00	31.85	31.26	0.469
12 Jan 2016	472.30	16.94	19.59	0.00	32.30	31.65	0.455
13 Jan 2016	472.29	16.93	19.59	0.00	30.29	29.03	0.455
14 Jan 2016	472.28	15.11	17.77	0.00	30.12	29.08	0.413
15 Jan 2016	472.28	18.81	18.81	0.00	30.95	29.68	0.437
16 Jan 2016	472.26	26.45	31.76	0.00	31.27	29.97	0.737
17 Jan 2016	472.22	45.18	55.79	0.00	80.10	28.07	1.293
18 Jan 2016	472.20	22.77	28.07	0.00	31.59	28.01	0.651
19 Jan 2016	472.18	26.36	31.66	0.00	31.99	30.11	0.734
20 Jan 2016	472.16	26.32	31.62	0.00	31.99	30.11	0.733
21 Jan 2016	472.14	25.95	31.25	0.00	31.83	28.89	0.725
22 Jan 2016	472.12	26.23	31.53	0.00	31.85	30.80	0.731
23 Jan 2016	472.11	16.43	19.08	0.00	31.29	23.99	0.442
24 Jan 2016	472.11	18.54	18.54	0.00	31.86	30.81	0.431
25 Jan 2016	472.10	14.36	17.01	0.00	30.82	29.59	0.321
26 Jan 2016	472.10	18.13	20.78	0.00	31.59	30.44	0.532
27 Jan 2016	472.10	16.70	19.35	0.00	31.12	29.96	0.450
28 Jan 2016	472.21	68.49	39.32	0.00	31.70	31.20	0.474
29 Jan 2016	472.44	60.99	38.21	0.00	31.70	31.20	0.443
30 Jan 2016	472.53	15.97	23.07	0.00	31.60	18.40	0.304
31 Jan 2016	472.27	23.19	0.00	0.00	0.00	0.00	0.000
1 Feb 2016	472.62	23.86	0.00	0.00	0.00	0.00	0.00
2 Feb 2016	472.68	15.91	0.00	0.00	0.00	0.00	0.00
3 Feb 2016	472.75	18.56	0.00	0.00	0.00	0.00	0.00
4 Feb 2016	472.81	15.91	0.00	0.00	0.00	0.00	0.00
5 Feb 2016	472.87	15.91	0.00	0.00	0.00	0.00	0.00
6 Feb 2016	472.93	15.91	0.00	0.00	0.00	0.00	0.00
7 Feb 2016	472.98	13.26	0.00	0.00	0.00	0.00	0.00
8 Feb 2016	473.02	13.26	0.00	0.00	0.00	0.00	0.00
9 Feb 2016	473.05	7.95	0.00	0.00	0.00	0.00	0.00

Date/Month/Year	REev (m.a.s.l)	Qin (cms)	Qt (cms)	Qs (cms)	Pmax (MW)	Pmin (MW)	EG (GWh)
10 Feb 2016	473.08	7.95	0.00	0.00	0.00	0.00	0.00
11 Feb 2016	473.10	5.30	0.00	0.00	0.00	0.00	0.00
12 Feb 2016	473.13	7.95	0.00	0.00	0.00	0.00	0.00
13 Feb 2016	473.15	5.30	0.00	0.00	0.00	0.00	0.00
14 Feb 2016	473.17	5.30	0.00	0.00	0.00	0.00	0.00
15 Feb 2016	473.14	22.94	30.89	0.00	64.94	64.21	0.728
16 Feb 2016	473.07	47.00	65.56	0.00	64.79	64.61	1.538
17 Feb 2016	472.91	29.43	71.85	0.00	129.69	64.25	1.655
18 Feb 2016	472.69	28.61	86.94	0.00	129.16	65.33	2.048
19 Feb 2016	472.47	17.14	75.48	0.00	95.51	94.16	1.756
20 Feb 2016	472.28	16.20	66.58	0.00	64.61	64.41	1.548
21 Feb 2016	472.08	15.41	68.45	0.00	96.22	64.34	1.592
22 Feb 2016	471.88	23.11	76.14	0.00	104.96	64.88	1.771
23 Feb 2016	471.95	47.57	29.01	0.00	104.78	40.75	0.665
24 Feb 2016	472.01	15.91	0.00	0.00	0.00	0.00	0.000
25 Feb 2016	472.04	15.03	7.08	0.00	40.60	36.32	0.157
26 Feb 2016	471.90	11.51	48.64	0.00	64.86	36.10	1.124
27 Feb 2016	471.70	14.13	67.17	0.00	65.34	54.67	1.556
28 Feb 2016	471.50	13.82	66.85	0.00	65.35	65.12	1.549
29 Feb 2016	471.35	14.84	54.61	0.00	65.20	39.41	1.263
1 Mar 2016	471.42	18.68	0.12	0.00	32.50	0.00	0.005
2 Mar 2016	471.50	21.21	0.00	0.00	0.00	0.00	0.000
3 Mar 2016	471.59	23.86	0.00	0.00	0.00	0.00	0.000
4 Mar 2016	471.67	21.21	0.00	0.00	0.00	0.00	0.000
5 Mar 2016	471.75	21.21	0.00	0.00	0.00	0.00	0.000
6 Mar 2016	471.83	21.21	0.00	0.00	0.00	0.00	0.000
7 Mar 2016	471.90	18.56	0.00	0.00	0.00	0.00	0.000
8 Mar 2016	471.96	15.91	0.00	0.00	0.00	0.00	0.000
9 Mar 2016	472.00	10.61	0.00	0.00	0.00	0.00	0.000
10 Mar 2016	472.04	10.61	0.00	0.00	0.00	0.00	0.000
11 Mar 2016	472.07	7.95	0.00	0.00	0.00	0.00	0.000
12 Mar 2016	472.10	7.95	0.00	0.00	0.00	0.00	0.000
13 Mar 2016	472.08	5.85	11.16	0.00	66.35	57.54	0.260
14 Mar 2016	471.79	7.36	84.25	0.00	101.05	65.06	1.951
15 Mar 2016	471.50	7.66	84.56	0.00	100.9	65.00	1.962
16 Mar 2016	471.27	8.60	69.58	0.00	116.39	65.02	1.591
17 Mar 2016	471.14	6.24	40.71	0.00	131.05	65.05	0.948
18 Mar 2016	470.82	18.20	103.05	0.00	130.31	65.01	2.396
19 Mar 2016	470.60	22.68	81.01	0.00	101.13	62.25	1.883
20 Mar 2016	470.47	24.98	59.45	0.00	60.37	50.15	1.371

Date/Month/Year	REev (m.a.s.l)	Qin (cms)	Qt (cms)	Qs (cms)	Pmax (MW)	Pmin (MW)	EG (GWh)
21 Mar 2016	470.34	31.01	65.48	0.00	65.17	50.64	1.520
22 Mar 2016	470.23	33.14	62.31	0.00	65.23	50.70	1.444
23 Mar 2016	470.10	32.38	66.85	0.00	65.13	64.94	1.545
24 Mar 2016	469.96	29.69	66.82	0.00	65.24	64.73	1.546
25 Mar 2016	469.82	29.48	66.60	0.00	65.17	64.88	1.547
26 Mar 2016	469.69	32.34	66.81	0.00	65.49	64.70	1.543
27 Mar 2016	469.56	32.25	66.72	0.00	65.28	64.93	1.543
28 Mar 2016	469.45	33.06	62.23	0.00	65.28	50.81	1.451
29 Mar 2016	469.38	32.73	51.29	0.00	65.18	50.30	1.185
30 Mar 2016	469.24	29.58	66.70	0.00	65.34	64.85	1.544
31 Mar 2016	469.09	26.92	66.69	0.00	65.24	64.79	1.543
1 Apr 2016	468.92	23.00	68.08	0.00	65.85	64.68	1.58
2 Apr 2016	468.75	20.85	65.92	0.00	65.50	64.87	1.53
3 Apr 2016	468.57	19.06	66.79	0.00	65.85	64.81	1.55
4 Apr 2016	468.38	16.48	66.86	0.00	65.26	64.17	1.54
5 Apr 2016	468.22	21.82	64.25	0.00	65.19	53.89	1.49
6 Apr 2016	468.12	14.15	40.66	0.00	64.98	64.41	0.94
7 Apr 2016	468.04	12.18	33.39	0.00	64.68	40.21	0.77
8 Apr 2016	467.97	21.88	40.44	0.00	64.71	50.14	0.94
9 Apr 2016	468.12	39.77	0.00	0.00	0.00	0.00	0.00
10 Apr 2016	468.27	39.77	0.00	0.00	0.00	0.00	0.00
11 Apr 2016	468.41	37.12	0.00	0.00	65.26	64.17	0.97
12 Apr 2016	468.50	23.86	0.00	0.00	0.00	0.00	0.00
13 Apr 2016	468.58	21.21	0.00	0.00	0.00	0.00	0.00
14 Apr 2016	468.65	18.56	0.00	0.00	0.00	0.00	0.00
15 Apr 2016	468.71	15.91	0.00	0.00	0.00	0.00	0.00
16 Apr 2016	468.76	13.26	0.00	0.00	0.00	0.00	0.00
17 Apr 2016	468.80	10.61	0.00	0.00	0.00	0.00	0.00
18 Apr 2016	468.83	50.04	42.08	0.00	65.26	64.17	0.97
19 Apr 2016	468.70	7.09	41.56	0.00	65.26	64.87	0.96
20 Apr 2016	468.57	7.85	42.32	0.00	64.47	64.24	0.98
21 Apr 2016	468.42	1.95	41.73	0.00	64.28	64.06	0.97
22 Apr 2016	468.27	0.93	40.70	0.00	64.94	59.99	0.94
23 Apr 2016	468.13	2.43	39.55	0.00	60.45	60.20	0.91
24 Apr 2016	467.98	0.75	40.52	0.00	60.37	60.14	0.90
25 Apr 2016	467.84	3.57	40.69	0.00	59.97	59.42	0.94
26 Apr 2016	467.64	8.68	61.72	0.00	60.10	59.66	1.43
27 Apr 2016	467.44	8.54	61.57	0.00	60.13	50.95	1.43
28 Apr 2016	467.23	6.04	61.73	0.00	60.24	50.58	1.43
29 Apr 2016	467.06	10.93	56.01	0.00	60.12	60.01	1.30

Date/Month/Year	REev (m.a.s.l)	Qin (cms)	Qt (cms)	Qs (cms)	Pmax (MW)	Pmin (MW)	EG (GWh)
30 Apr 2016	466.92	24.04	61.16	0.00	60.33	58.90	1.41
1 May 2016	466.77	21.65	61.42	0.00	60.30	60.02	1.421
2 May 2016	466.62	21.36	61.13	0.00	60.67	59.86	1.419
3 May 2016	466.47	22.36	62.13	0.00	60.55	60.29	1.442
4 May 2016	466.31	19.75	62.18	0.00	60.48	60.18	1.443
5 May 2016	466.15	19.14	61.56	0.00	0.00	0.00	0.000
6 May 2016	466.00	22.68	62.46	0.00	0.00	0.00	0.000
7 May 2016	466.06	15.91	0.00	0.00	60.38	59.96	1.449
8 May 2016	466.11	13.26	0.00	0.00	0.00	0.00	0.000
9 May 2016	466.01	14.31	40.82	0.00	60.38	60.01	0.941
10 May 2016	465.81	9.02	62.06	0.00	60.38	60.01	1.434
11 May 2016	465.64	16.33	61.41	0.00	60.71	60.10	1.425
12 May 2016	465.51	16.38	50.85	0.00	60.60	30.47	1.180
13 May 2016	465.45	14.35	30.26	0.00	31.44	30.18	0.699
14 May 2016	465.46	12.92	10.27	0.00	30.35	30.00	0.238
15 May 2016	465.53	18.56	0.00	0.00	0.00	0.00	0.000
16 May 2016	465.52	16.34	18.99	0.00	30.79	30.00	0.437
17 May 2016	465.47	18.30	31.55	0.00	30.73	30.45	0.729
18 May 2016	465.42	17.99	31.25	0.00	30.65	30.35	0.723
19 May 2016	465.38	20.63	31.23	0.00	30.56	30.28	0.721
20 May 2016	465.36	16.14	21.45	0.00	31.23	30.31	0.495
21 May 2016	465.39	7.95	0.00	0.00	0.00	0.00	0.000
22 May 2016	465.42	7.95	0.00	0.00	0.00	0.00	0.000
23 May 2016	465.42	5.42	5.42	0.00	31.36	31.18	0.125
24 May 2016	465.43	8.00	5.34	0.00	31.28	31.22	0.123
25 May 2016	465.50	18.56	0.00	0.00	0.00	0.00	0.000
26 May 2016	465.56	21.25	5.34	0.00	30.86	30.54	0.122
27 May 2016	465.59	13.38	5.43	0.00	31.21	31.27	0.124
28 May 2016	465.62	7.95	0.00	0.00	0.00	0.00	0.000
29 May 2016	465.69	18.56	0.00	0.00	0.00	0.00	0.000
30 May 2016	465.67	18.92	24.22	0.00	40.44	40.25	0.562
31 May 2016	465.75	21.21	0.00	0.00	0.00	0.00	0.000
1 Jun 2016	465.77	18.55	13.25	0.00	40.84	39.88	0.306
2 Jun 2016	465.85	21.21	0.00	0.00	0.00	0.00	0.000
3 Jun 2016	465.86	16.26	13.61	0.00	40.93	40.39	0.315
4 Jun 2016	465.88	5.30	0.00	0.00	0.00	0.00	0.000
5 Jun 2016	465.92	10.61	0.00	0.00	0.00	0.00	0.000
6 Jun 2016	465.90	11.18	16.48	0.00	40.52	35.13	0.382
7 Jun 2016	465.91	26.26	23.61	0.00	40.78	40.61	0.546
8 Jun 2016	465.89	36.16	41.46	0.00	40.74	40.39	0.953

Date/Month/Year	REev (m.a.s.l)	Qin (cms)	Qt (cms)	Qs (cms)	Pmax (MW)	Pmin (MW)	EG (GWh)
9 Jun 2016	465.84	28.55	41.81	0.00	40.59	40.27	0.967
10 Jun 2016	465.81	30.14	38.10	0.00	40.58	40.60	0.882
11 Jun 2016	465.90	23.86	0.00	0.00	0.00	0.00	0.000
12 Jun 2016	465.97	18.56	0.00	0.00	0.00	0.00	0.000
13 Jun 2016	465.93	19.03	29.64	0.00	50.24	50.11	0.682
14 Jun 2016	465.85	30.76	51.97	0.00	50.79	49.97	1.200
15 Jun 2016	465.74	23.04	52.21	0.00	50.84	50.51	1.201
16 Jun 2016	465.61	17.70	52.17	0.00	50.96	50.00	1.202
17 Jun 2016	465.50	18.90	48.07	0.00	50.72	50.48	1.114
18 Jun 2016	465.57	18.56	0.00	0.00	0.00	0.00	0.000
19 Jun 2016	465.65	21.21	0.00	0.00	0.00	0.00	0.000
20 Jun 2016	465.60	18.23	31.48	0.00	50.30	49.99	0.731
21 Jun 2016	465.49	21.96	51.13	0.00	50.05	49.84	1.181
22 Jun 2016	465.39	12.36	38.87	0.00	50.59	14.89	0.902
23 Jun 2016	465.51	31.82	0.00	0.00	0.00	0.00	0.000
24 Jun 2016	465.54	32.88	24.93	0.00	50.56	50.02	0.579
25 Jun 2016	465.60	45.87	29.96	0.00	50.74	40.29	0.695
26 Jun 2016	465.56	47.70	58.31	0.00	63.75	63.43	1.363
27 Jun 2016	465.60	65.41	54.81	0.00	100.77	59.81	1.267
28 Jun 2016	465.40	43.11	96.15	0.00	100.74	91.08	2.229
29 Jun 2016	465.17	43.32	104.31	0.00	101.56	99.70	2.406
30 Jun 2016	465.00	40.20	85.28	0.00	101.81	100.62	1.976
1 Jul 2016	465.00	44.81	44.81	0.00	60.84	60.24	1.041
2 Jul 2016	465.09	23.86	0.00	0.00	0.00	0.00	0.000
3 Jul 2016	465.20	29.17	0.00	0.00	0.00	0.00	0.000
4 Jul 2016	465.09	29.30	58.47	0.00	60.39	60.03	1.354
5 Jul 2016	465.15	83.22	67.31	0.00	60.39	33.60	1.558
6 Jul 2016	465.42	106.34	34.75	0.00	40.69	35.35	0.801
7 Jul 2016	465.82	106.06	0.00	0.00	0.00	0.00	0.000
8 Jul 2016	466.02	68.20	15.17	0.00	63.21	60.30	0.353
9 Jul 2016	466.03	60.71	58.06	0.00	60.32	50.15	1.337
10 Jul 2016	466.05	63.57	58.27	0.00	60.86	49.74	1.347
11 Jul 2016	466.04	56.31	58.96	0.00	60.60	50.39	1.368
12 Jul 2016	465.97	42.82	61.38	0.00	60.50	59.63	1.423
13 Jul 2016	465.85	25.74	57.56	0.00	60.40	50.55	1.336
14 Jul 2016	465.77	37.04	58.25	0.00	60.40	45.00	1.354
15 Jul 2016	465.81	65.30	54.70	0.00	60.62	45.00	1.266
16 Jul 2016	465.76	45.10	58.35	0.00	60.54	55.00	1.350
17 Jul 2016	465.86	83.28	56.77	0.00	60.10	50.32	1.312
18 Jul 2016	465.84	53.15	58.45	0.00	60.64	54.57	1.351

Date/Month/Year	REev (m.a.s.l)	Qin (cms)	Qt (cms)	Qs (cms)	Pmax (MW)	Pmin (MW)	EG (GWh)
19 Jul 2016	465.78	41.87	57.78	0.00	60.58	54.91	1.344
20 Jul 2016	465.69	28.32	52.18	0.00	56.51	34.11	1.203
21 Jul 2016	465.68	34.68	37.33	0.00	41.19	34.04	0.864
22 Jul 2016	465.65	29.11	37.06	0.00	45.38	35.00	0.868
23 Jul 2016	465.73	49.77	28.55	0.00	35.65	35.49	0.634
24 Jul 2016	465.86	34.47	0.00	0.00	0.00	0.00	0.000
25 Jul 2016	465.86	30.82	30.82	0.00	60.35	35.56	0.709
26 Jul 2016	465.80	27.69	43.60	0.00	50.07	35.41	1.008
27 Jul 2016	465.78	33.21	38.51	0.00	35.20	45.30	0.889
28 Jul 2016	466.00	96.37	38.03	0.00	45.63	35.03	0.878
29 Jul 2016	466.13	71.83	37.36	0.00	40.63	35.36	0.861
30 Jul 2016	466.28	67.70	27.92	0.00	40.79	35.23	0.645
31 Jul 2016	466.37	63.03	39.16	0.00	41.31	34.53	0.906
1 Aug 2016	466.38	40.94	38.29	0.00	40.79	34.64	0.881
2 Aug 2016	466.43	26.89	13.63	0.00	35.50	35.35	0.317
3 Aug 2016	466.46	31.52	23.57	0.00	36.23	35.13	0.542
4 Aug 2016	466.44	40.58	45.88	0.00	50.25	35.27	1.060
5 Aug 2016	466.41	42.52	50.47	0.00	50.25	35.27	1.167
6 Aug 2016	466.40	39.99	42.64	0.00	51.08	35.63	0.986
7 Aug 2016	466.50	39.60	13.08	0.00	40.43	40.26	0.305
8 Aug 2016	466.63	49.93	15.46	0.00	36.53	34.88	0.358
9 Aug 2016	466.66	46.69	38.74	0.00	45.92	35.09	0.897
10 Aug 2016	466.70	51.61	41.01	0.00	45.63	35.19	0.951
11 Aug 2016	466.80	64.07	37.55	0.00	45.97	40.50	0.871
12 Aug 2016	467.80	265.16	0.00	0.00	0.00	0.00	0.000
13 Aug 2016	468.75	272.45	20.54	0.00	40.66	34.86	0.471
14 Aug 2016	471.38	700.03	2.66	0.00	34.59	34.52	0.061
15 Aug 2016	473.60	926.81	338.15	314.09	45.66	33.70	0.554
16 Aug 2016	473.72	452.74	420.92	378.68	55.40	33.85	0.977
17 Aug 2016	473.20	292.26	430.15	383.90	60.17	33.04	1.069
18 Aug 2016	472.85	114.15	206.96	155.58	65.40	41.15	1.189
19 Aug 2016	474.98	1722.91	1158.12	1,114.81	50.82	38.62	1.001
20 Aug 2016	472.58	1008.54	1644.93	1,606.29	40.64	35.43	0.894
21 Aug 2016	472.54	279.76	290.37	253.26	40.91	33.95	0.859
22 Aug 2016	472.62	268.26	247.05	208.69	40.41	35.26	0.888
23 Aug 2016	472.55	146.27	164.83	130.27	36.70	34.57	0.800
24 Aug 2016	473.00	156.61	37.29	0.00	40.80	35.13	0.860
25 Aug 2016	472.66	104.42	194.57	156.17	40.95	34.12	0.889
26 Aug 2016	473.06	143.49	37.43	0.00	40.93	35.30	0.855
27 Aug 2016	472.89	115.63	160.71	117.23	51.18	35.82	1.008

Date/Month/Year	REev (m.a.s.l)	Qin (cms)	Qt (cms)	Qs (cms)	Pmax (MW)	Pmin (MW)	EG (GWh)
28 Aug 2016	472.89	105.97	105.97	69.31	35.92	34.92	0.842
29 Aug 2016	472.82	97.95	116.51	79.21	36.80	35.77	0.863
30 Aug 2016	472.91	104.22	80.35	42.78	36.73	35.99	0.869
31 Aug 2016	473.02	122.95	93.78	56.35	36.87	36.27	0.864
1 Sep 2016	472.42	39.42	37.52	161.00	35.76	36.35	0.867
2 Sep 2016	472.00	83.45	36.26	158.56	36.06	35.53	0.835
3 Sep 2016	472.00	81.80	36.83	44.98	36.21	35.30	0.850
4 Sep 2016	472.42	141.07	29.70	0.00	36.27	34.93	0.683
5 Sep 2016	473.14	370.17	36.21	143.04	36.16	34.71	0.835
6 Sep 2016	472.01	114.69	36.81	377.52	35.97	35.46	0.852
7 Sep 2016	472.22	192.98	36.28	101.02	40.79	35.13	0.834
8 Sep 2016	472.42	118.84	36.70	29.11	36.94	34.66	0.847
9 Sep 2016	472.82	143.63	37.56	0.00	36.58	36.21	0.866
10 Sep 2016	472.58	144.52	37.10	171.05	36.58	35.71	0.852
11 Sep 2016	472.35	364.12	36.42	388.69	35.95	35.46	0.842
12 Sep 2016	471.97	158.06	36.73	222.09	36.46	35.43	0.847
13 Sep 2016	471.48	310.18	36.47	403.63	36.17	35.01	0.843
14 Sep 2016	471.64	213.25	37.19	133.64	35.60	35.01	0.834
15 Sep 2016	471.90	250.61	36.48	145.19	35.69	34.95	0.844
16 Sep 2016	471.30	218.46	36.47	341.08	36.59	35.11	0.844
17 Sep 2016	471.63	256.06	35.24	133.32	36.94	36.04	0.815
18 Sep 2016	471.80	216.04	36.53	134.44	36.79	36.25	0.844
19 Sep 2016	472.00	226.17	38.05	135.09	36.98	36.31	0.880
20 Sep 2016	471.98	168.71	37.78	136.24	37.22	36.39	0.865
21 Sep 2016	472.00	195.48	37.61	152.57	37.41	36.45	0.870
22 Sep 2016	472.20	155.76	37.84	64.88	37.49	36.75	0.873
23 Sep 2016	472.40	88.96	35.93	0.00	37.34	35.25	0.829
24 Sep 2016	472.58	84.59	36.86	0.00	35.38	35.68	0.851
25 Sep 2016	472.63	116.19	36.62	66.31	35.76	35.02	0.844
26 Sep 2016	472.67	149.16	36.07	102.49	35.82	35.04	0.832
27 Sep 2016	472.80	71.38	36.90	0.00	35.91	35.02	0.852
28 Sep 2016	472.38	192.80	36.47	267.69	35.95	35.06	0.842
29 Sep 2016	472.46	84.69	36.41	27.06	35.94	35.09	0.840
30 Sep 2016	472.58	304.60	36.62	236.17	35.91	35.20	0.843
1 Oct 2016	472.59	194.18	36.17	155.36	35.27	35.60	0.835
2 Oct 2016	472.48	118.49	36.25	111.40	35.60	35.08	0.838
3 Oct 2016	472.40	137.37	36.86	137.63	35.44	35.08	0.845
4 Oct 2016	472.22	125.24	36.00	136.96	35.90	35.03	0.832
5 Oct 2016	472.33	66.59	37.42	0.00	36.64	36.22	0.861
6 Oct 2016	472.52	88.03	37.65	0.00	36.68	36.29	0.867

Date/Month/Year	REev (m.a.s.l)	Qin (cms)	Qt (cms)	Qs (cms)	Pmax (MW)	Pmin (MW)	EG (GWh)
7 Oct 2016	472.58	50.92	35.01	0.00	36.69	35.43	0.807
8 Oct 2016	472.74	76.75	34.33	0.00	35.94	35.46	0.784
9 Oct 2016	472.80	53.15	37.24	0.00	36.08	35.80	0.859
10 Oct 2016	472.74	123.50	36.51	102.91	35.99	35.20	0.842
11 Oct 2016	472.54	109.47	36.04	126.46	35.54	35.04	0.830
12 Oct 2016	472.40	67.85	35.86	69.11	35.53	35.31	0.827
13 Oct 2016	472.36	95.23	36.57	69.27	35.44	35.12	0.842
14 Oct 2016	472.40	56.70	16.01	30.09	35.37	35.15	0.368
15 Oct 2016	472.38	64.94	10.50	59.75	35.82	36.91	0.240
16 Oct 2016	472.43	51.69	38.44	0.00	36.43	36.12	0.887
17 Oct 2016	472.47	46.64	36.03	0.00	36.42	36.16	0.834
18 Oct 2016	472.59	68.98	37.16	0.00	36.46	36.17	0.860
19 Oct 2016	472.60	39.91	37.26	0.00	36.44	36.15	0.862
20 Oct 2016	472.74	50.08	12.96	0.00	36.38	36.21	0.301
21 Oct 2016	472.84	26.52	0.00	0.00	0.00	0.00	0.000
22 Oct 2016	472.90	52.64	0.00	36.73	0.00	0.00	0.000
23 Oct 2016	472.89	81.80	0.00	84.45	0.00	0.00	0.000
24 Oct 2016	472.96	102.89	0.00	84.32	0.00	0.00	0.000
25 Oct 2016	473.10	37.12	0.00	0.00	0.00	0.00	0.000
26 Oct 2016	473.22	48.43	16.61	0.00	36.37	34.36	0.385
27 Oct 2016	473.32	63.71	37.19	0.00	36.44	35.91	0.854
28 Oct 2016	473.36	44.82	34.22	0.00	36.27	35.05	0.789
29 Oct 2016	473.38	42.25	36.95	0.00	40.16	35.09	0.854
30 Oct 2016	473.38	51.59	51.59	0.00	65.40	36.37	1.189
31 Oct 2016	473.34	56.68	67.29	0.00	65.50	65.11	1.557
1 Nov 2016	473.28	51.05	66.96	0.00	65.50	65.13	1.55
2 Nov 2016	473.20	46.07	67.28	0.00	65.56	65.13	1.56
3 Nov 2016	473.12	46.08	67.29	0.00	65.22	65.08	1.56
4 Nov 2016	473.02	39.72	66.24	0.00	65.31	65.10	1.53
5 Nov 2016	472.98	56.44	67.05	0.00	65.94	65.10	1.55
6 Nov 2016	472.90	46.40	67.62	0.00	65.47	65.19	1.56
7 Nov 2016	472.80	40.17	66.69	0.00	65.42	65.18	1.55
8 Nov 2016	472.79	64.44	67.09	0.00	65.27	65.11	1.55
9 Nov 2016	472.77	55.18	60.49	0.00	65.28	50.22	1.39
10 Nov 2016	472.77	52.01	52.01	0.00	58.28	50.64	1.20
11 Nov 2016	472.75	49.98	55.28	0.00	65.24	50.76	1.28
12 Nov 2016	472.70	43.10	56.36	0.00	65.07	50.51	1.30
13 Nov 2016	472.73	37.81	29.86	0.00	64.99	49.44	0.69
14 Nov 2016	472.81	21.21	0.00	0.00	0.00	0.00	0.00
15 Nov 2016	472.82	22.49	19.84	0.00	41.97	37.01	0.46

Date/Month/Year	REev (m.a.s.l)	Qin (cms)	Qt (cms)	Qs (cms)	Pmax (MW)	Pmin (MW)	EG (GWh)
16 Nov 2016	472.80	36.68	41.98	0.00	42.38	39.54	0.97
17 Nov 2016	472.80	41.66	41.66	0.00	41.29	39.48	0.96
18 Nov 2016	472.79	39.64	42.29	0.00	41.53	40.78	0.98
19 Nov 2016	472.80	44.72	42.07	0.00	41.30	40.97	0.98
20 Nov 2016	472.78	37.13	42.43	0.00	41.37	40.83	0.98
21 Nov 2016	472.76	37.03	42.33	0.00	41.25	40.48	0.98
22 Nov 2016	472.72	32.59	43.19	0.00	45.80	40.30	1.00
23 Nov 2016	472.65	28.44	47.00	0.00	45.89	45.30	1.09
24 Nov 2016	472.60	33.44	46.70	0.00	45.85	45.53	1.08
25 Nov 2016	472.63	27.07	19.11	0.00	45.89	45.55	0.44
26 Nov 2016	472.50	42.33	76.81	0.00	64.49	62.19	1.78
27 Nov 2016	472.60	26.52	0.00	0.00	0.00	0.00	0.00
28 Nov 2016	472.60	33.95	33.95	0.00	60.96	54.25	0.78
29 Nov 2016	472.51	42.23	66.09	0.00	65.87	60.11	1.53
30 Nov 2016	472.39	35.14	66.96	0.00	65.23	65.02	1.55
1 Dec 2016	472.31	45.70	66.91	0.00	65.22	65.03	1.55
2 Dec 2016	472.20	37.63	66.79	0.00	65.16	64.99	1.55
3 Dec 2016	472.04	24.25	66.68	0.00	65.10	64.85	1.54
4 Dec 2016	471.89	26.73	66.51	0.00	65.05	64.72	1.55
5 Dec 2016	471.78	37.37	66.54	0.00	64.99	64.64	1.53
6 Dec 2016	471.67	37.59	66.76	0.00	64.84	64.50	1.55
7 Dec 2016	471.60	47.31	65.88	0.00	64.70	64.35	1.52
8 Dec 2016	471.61	20.61	17.96	0.00	64.58	64.22	0.42
9 Dec 2016	471.77	13.26	0.00	0.00	0.00	0.00	0.00
10 Dec 2016	471.80	7.95	0.00	0.00	0.00	0.00	0.00
11 Dec 2016	471.84	10.61	0.00	0.00	0.00	0.00	0.00
12 Dec 2016	471.89	13.26	0.00	0.00	0.00	0.00	0.00
13 Dec 2016	471.99	26.52	0.00	0.00	0.00	0.00	0.00
14 Dec 2016	472.00	2.65	0.00	0.00	0.00	0.00	0.00
15 Dec 2016	472.01	2.65	0.00	0.00	0.00	0.00	0.00
16 Dec 2016	472.09	21.21	0.00	0.00	0.00	0.00	0.00
17 Dec 2016	472.21	31.82	0.00	0.00	0.00	0.00	0.00
18 Dec 2016	472.25	10.61	0.00	0.00	0.00	0.00	0.00
19 Dec 2016	472.30	13.26	0.00	0.00	0.00	0.00	0.00
20 Dec 2016	472.34	21.87	11.26	0.00	42.59	41.37	0.26
21 Dec 2016	472.30	32.60	43.21	0.00	42.61	40.68	1.00
22 Dec 2016	472.24	26.66	42.57	0.00	42.26	40.19	0.99
23 Dec 2016	472.26	23.53	18.22	0.00	42.14	40.17	0.42
24 Dec 2016	472.21	29.39	42.65	0.00	41.78	40.85	0.98
25 Dec 2016	472.16	29.16	42.42	0.00	41.64	40.04	0.98

Date/Month/Year	REev (m.a.s.l)	Qin (cms)	Qt (cms)	Qs (cms)	Pmax (MW)	Pmin (MW)	EG (GWh)
26 Dec 2016	472.22	27.23	11.32	0.00	40.55	40.15	0.26
27 Dec 2016	472.28	15.91	0.00	0.00	0.00	0.00	0.00
28 Dec 2016	472.33	13.26	0.00	0.00	0.00	0.00	0.00
29 Dec 2016	472.37	10.61	0.00	0.00	0.00	0.00	0.00
30 Dec 2016	472.41	10.61	0.00	0.00	0.00	0.00	0.00
31 Dec 2016	472.45	10.61	0.00	0.00	0.00	0.00	0.00

Table E.2 Annual and Monthly average inflow reservoir's discharge data (m^3/s) of Namkhan 2 hydropower plant

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1960	18.1	14.5	11.4	9.4	12.8	17.86	62.04	242.79	150.33	56.04	34.16	26.04
1961	20.61	17.93	14.33	14.19	19.06	74.81	94.57	99.51	259.73	122.81	52.37	30.98
1962	28.02	24.35	16.73	17.79	19.06	94.57	105.16	189.15	113.63	69.59	40.3	29.64
1963	26.54	18.56	15.67	13.27	21.95	82.58	380.41	300.66	297.13	107.98	78.34	51.95
1964	39.52	32.4	27.88	27.24	39.52	55.4	152.45	223.03	206.79	110.81	63.59	47.15
1965	37.97	34.58	27.1	27.53	33.38	104.46	182.09	157.39	139.74	78.34	55.4	42.98
1966	33.77	22.14	14.95	23.22	39.74	81.87	117.86	283.72	208.2	72.7	51.52	39.24
1967	30.98	26.11	21.88	24.63	23.29	56.25	80.46	148.21	228.67	81.87	41.85	30.14
1968	25.34	21.74	18.63	23.5	23.93	33.52	41.22	141.16	86.81	41.36	29.29	21.46
1969	18.21	15.53	12.7	15.24	17.29	85.4	144.68	191.97	106.57	60.13	43.05	25.55
1970	20.47	18.63	12.63	19.13	44.61	141.16	165.15	193.38	239.26	79.75	41.36	30.14
1971	22.16	17.72	14.96	14.96	21.6	39.38	217.38	297.13	115.04	54.34	33.6	27.88
1972	19.76	13.34	9.81	15.24	15.53	30.28	91.75	357.12	175.74	129.86	58.01	34.09
1973	22.87	20.82	17.01	12.7	18.63	22.73	124.92	267.49	393.82	129.16	65.78	41.92
1974	35.22	27.88	21.1	28.65	44.89	78.34	83.28	164.45	150.33	128.45	48.49	31.9
1975	29.64	19.55	16.09	14.54	18.28	52.23	109.4	211.03	283.02	115.04	58.23	38.25
1976	28.58	24.63	19.62	15.39	20.47	35.29	66.13	225.14	107.98	79.05	43.55	28.65
1977	24.56	17.36	15.03	18.14	17.86	15.93	68.18	76.22	124.92	56.96	32.96	26.89
1978	21.6	17.5	12.21	12.99	28.44	72.7	77.64	249.85	220.2	103.75	51.59	32.32
1979	26.18	19.76	11.65	12.92	33.88	63.8	90.34	153.86	120.69	44.82	29.15	28.16
1980	15.03	10.02	8.54	10.59	13.2	49.55	103.04	118.57	259.73	68.88	35.85	25.83
1981	28.02	13.27	8.19	11.5	36.63	105.16	197.62	209.62	178.56	127.04	49.97	30.21
1982	23.43	23.43	15.03	12.85	17.64	76.93	87.52	326.07	209.62	177.86	38.61	32.04
1983	25.76	24.14	27.74	16.3	26.04	27.45	75.52	140.45	113.63	58.09	28.58	19.76
1984	19.83	11.08	7.41	9.88	25.9	29.43	89.63	170.63	167.98	90.34	51.04	30.72
1985	20.26	14.68	7.69	19.97	24	48.91	76.93	242.79	223.73	57.31	42.35	34.02
1986	21.95	16.66	15.39	16.44	81.87	111.51	141.16	141.16	114.34	50.46	42.56	26.89

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1987	23.36	17.01	12.92	13.97	11.08	23.15	30.28	91.15	88.22	43.12	43.55	20.47
1988	16.8	14.75	7.76	9.88	16.49	18.94	36.77	123.51	77.64	36.63	23.57	19.06
1989	17.15	12.77	11.57	10.37	23.93	82.58	95.28	181.38	106.57	80.46	40.86	26.18
1990	22.37	22.58	17.08	15.32	21.95	54.2	140.45	140.45	154.57	93.87	43.83	30.14
1991	27.67	18.63	10.3	12.28	17.79	59.71	70.37	172.21	122.1	67.26	29.85	21.39
1992	26.18	18.07	14.47	11.29	7.48	18.21	54.42	58.16	39.66	30.91	21.81	21.67
1993	21.79	17.35	11.64	12.36	11.05	30.23	146.88	111.51	100.22	51.1	38.55	22.57
1994	18	12.77	13.9	16.16	25.34	72.7	160.21	386.77	307.01	182.09	105.16	45.73
1995	14.41	15.2	11.47	9.7	10.87	121.88	152.24	295.14	112.22	68.51	32.01	21.3
1996	15.29	13.14	11.35	11.78	19.14	37.16	189.8	404.27	165.67	74.43	39.33	28.99
1997	17.97	14.3	14.24	19.11	12.39	22.92	195.22	190.81	204.37	98.99	36.69	23.1
1998	15.96	12.98	10.28	16.08	17.77	59.37	150.64	113.15	109.21	29.03	21.69	15.13
1999	12.92	9.39	6.64	10.3	25.9	52.51	65.78	165.86	191.97	68.46	42.42	30.42
2000	24.0	22.44	13.76	12.21	45.17	78.34	153.86	116.45	204.68	74.11	45.73	31.76
2001	27.1	15.46	23.01	15.67	30.14	49.9	170.09	285.13	219.5	109.4	62.11	38.32
2002	30.21	24.21	16.44	14.68	35.85	76.93	358.54	376.89	139.74	92.46	56.39	41.57
2003	28.73	20.33	17.15	15.88	15.88	27.74	74.11	127.75	172.21	58.58	26.75	19.83
2004	16.44	9.18	7.01	12.49	26.89	68.1	123.0	214.0	190	92.1	49.0	34.2
Avr	23.7	18.51	14.55	15.64	25.09	60.08	122.89	201.27	170.72	82.1	44.36	30.06
Max	39.52	34.58	27.88	28.65	81.87	141.16	380.41	404.27	393.82	182.09	105.16	51.95
Min	12.92	9.18	6.64	9.70	7.48	15.39	30.28	58.16	39.66	29.03	21.69	15.13

Table E.3 Annual and Monthly average inflow reservoir's discharge data (m^3/s) of Namkhan 3 hydropower plant, after Namkhan 2 HPP regulate and compensate for the runoff of Namkhan 3 hydropower plant

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1960	32.31	39.08	36.72	43.26	47.14	51.01	81.66	186.87	206.4	76.94	46.9	36.37
1961	34.93	34.38	33.63	33.89	39.18	84.63	102.71	131.59	348.43	168.6	71.9	42.54
1962	38.47	40.75	39.5	38.19	46.96	84.63	144.38	246.49	156.01	95.54	55.33	40.7
1963	36.5	34.41	37.37	34.02	47.92	68.15	509.08	412.79	407.95	148.26	107.56	71.32
1964	54.26	51.22	51.49	47.96	82.17	53.32	187.51	292.32	283.92	152.13	87.31	64.73
1965	52.13	54.22	50.42	48.35	73.74	98.19	236.8	216.09	191.86	107.56	76.07	59.01
1966	46.36	38.32	37.36	42.16	77.91	67.18	161.82	376.34	285.85	99.81	70.74	53.88
1967	42.54	42.73	44.94	44.79	57.66	53.39	90.51	188.86	313.95	112.4	57.46	41.38
1968	36.19	36.89	40.69	43	56.99	46.2	43.82	156.14	122.48	55.33	40.21	35.15
1969	34.42	33.9	33.44	34.44	30.56	68.83	185.56	261.07	146.32	82.56	59.11	36.24

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1970	34.91	34.56	33.19	35.21	77.89	148.58	213.55	265.5	328.49	109.5	56.78	41.38
1971	35.33	34.25	33.76	34.02	46.54	45.35	248.75	407.95	157.95	74.61	46.12	38.28
1972	34.72	33.18	32.42	34.42	34.76	34.15	78.84	475.65	241.28	178.29	79.65	46.8
1973	35.52	35.06	37.65	33.54	43	36.67	122.27	352.6	540.7	177.33	90.31	57.56
1974	48.35	45.02	44.26	48.87	88.48	69.12	107.56	212.58	206.4	176.36	66.57	43.8
1975	40.7	35.54	38	35.17	43.7	51.48	126.63	275.1	388.57	157.95	79.94	52.52
1976	39.24	41.11	42.43	36.75	48.11	43.38	60.01	286.55	148.26	108.53	59.79	39.34
1977	35.97	34.12	34.42	37.27	44.25	34.79	62.19	72.15	164.79	76.75	45.25	36.92
1978	35.2	34.24	33.05	33.6	49.64	63.03	99.64	328.34	302.33	142.44	70.83	44.38
1979	36.39	35.4	33.52	33.45	62.96	78.81	87.6	198.05	165.7	61.53	40.02	38.66
1980	33.47	32.44	32.43	33.41	29.77	45.75	95.63	156.32	348.42	94.57	49.22	36.32
1981	38.47	33.01	31.99	33.32	54.79	99.16	258.13	287.79	245.16	174.42	68.6	41.47
1982	35.68	37.18	37.03	33.66	41.7	65.3	116.75	432.98	287.79	244.19	53	43.99
1983	36.29	39.88	50.68	38.71	57.59	37.89	64.52	181.52	149.31	78.3	39.24	34.72
1984	34.89	32.76	32.18	28.6	35.56	33.93	74.36	219.58	230.62	124.03	70.08	42.18
1985	34.82	33.54	31.98	35.6	41.38	49.92	79.06	318.71	307.17	78.68	58.14	46.71
1986	35.28	34	33.9	34.58	129.77	107.88	180.72	193.69	156.98	69.28	58.43	36.92
1987	35.65	34.04	33.2	33.8	33.38	32.17	34.04	78.77	114.39	57.76	59.79	34.89
1988	34.06	33.77	32.22	28.57	31.07	30.78	40.77	106.41	99.83	48.84	35.7	34.57
1989	34.26	33.36	33.38	28.76	32.85	64.2	124.34	234.4	146.32	110.47	56.1	36.39
1990	35.42	35.57	38.27	35.84	49.21	52.42	171.1	184.11	206.24	128.88	60.17	41.38
1991	37.98	34.54	32.43	33.32	39.13	55.72	79.11	221.78	167.64	92.35	40.99	35.13
1992	36.53	34.39	33.64	33.12	27.85	30.95	49.68	50.02	40.83	40.06	35.25	35.3
1993	35.46	34.43	33.14	29.05	28.93	34.13	153.71	146.56	130.9	68.71	52.93	35.45
1994	34.34	33.16	33.81	34.69	37.31	62.83	197.51	531.01	421.51	250	144.38	62.79
1995	33.31	33.78	33.08	33.01	29.03	102.97	195.81	405.21	154.07	94.06	43.95	35.1
1996	33.67	33.36	33.23	33.71	31.26	41.42	203.93	547.28	227.45	102.19	53.99	39.8
1997	34.22	33.47	33.74	35.31	33.76	36.84	207.01	254.23	280.59	135.91	50.37	35.59
1998	33.8	33.26	32.9	34.78	30.77	53.18	180.74	148.88	143.2	38.4	35.23	33.6
1999	33.29	32.72	27.75	29.04	35.56	52.75	53.56	196.62	263.57	93.99	58.24	41.76
2000	35.81	36.57	35.69	33.27	78.52	64.04	196.35	159.88	281.01	101.74	62.79	43.6
2001	37.21	33.58	42.49	36.76	61.3	50.36	194.3	390.42	301.36	150.19	85.27	52.62
2002	41.47	40.65	39.16	35.57	68.22	65.3	474.16	517.44	191.86	126.94	77.42	57.07
2003	39.44	36.36	39.23	36.5	41.37	37.98	63.12	163.88	228.25	80.43	36.72	34.72
2004	33.99	32.34	32.2	29.4	36.92	58.38	145.67	262.97	232.32	112.43	61.22	43.02
Avr	37.29	36.17	36.39	35.49	49.31	58.38	145.67	262.97	232.32	112.43	61.22	43.02
Max	54.26	54.22	51.49	48.87	129.77	148.58	509.08	549.28	540.70	250.00	144.38	71.32
Min	33.29	32.34	27.75	28.57	27.85	30.78	34.04	50.02	40.83	38.40	35.23	33.60

CURRICULUM VITAE

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