The following energy source is a geothermal. The most widely developed type of geothermal power plant (known as hydrothermal plants) are located near geologic “hot spots” where hot molten rock is close to the earth’s crust and produces hot water. In other regions enhanced geothermal systems (or hot dry rock geothermal), which involve drilling into Earth’s surface to reach deeper geothermal resources, can allow broader access to geothermal energy.

Geothermal plants also differ in terms of the technology they use to convert the resource to electricity (direct steam, flash, or binary) and the type of cooling technology they use (water-cooled and air-cooled). Environmental impacts will differ depending on the conversion and cooling technology used.

In open-loop geothermal systems, approximately 10 percent of the air emissions are carbon dioxide, and a smaller amount of emissions are methane, a more potent global warming gas. Estimates of global warming emissions for open-loop systems are approximately 0.1 pounds of carbon dioxide equivalent per kilowatt-hour. In closed-loop systems, these gases are not released into the atmosphere, but there are a still some emissions associated with plant construction and surrounding infrastructure. [3]

Enhanced geothermal systems, which require energy to drill and pump water into hot rock reservoirs, have life-cycle global warming emission of approximately 0.2 pounds of carbon dioxide equivalent per kilowatt-hour.

To put this into context, estimates of life-cycle global warming emissions for natural gas generated electricity are between 0.6 and 2 pounds of carbon dioxide equivalent per kilowatt-hour and estimates for coal-generated electricity are 1.4 and 3.6 pounds of carbon dioxide equivalent per kilowatt-hour.

And the last source is a Hydroelectric power. Hydroelectric power includes both massive hydroelectric dams and small run-of-the-river plants. Large-scale hydroelectric dams continue to be built in many parts of the world (including China and Brazil), but it is unlikely that new facilities will be added to the existing U.S. fleet in the future.

Instead, the future of hydroelectric power in the United States will likely involve increased capacity at current dams and new run-of-the-river projects. There are environmental impacts at both types of plants.

Global warming emissions are produced during the installation and dismantling of hydroelectric power plants, but recent research suggests that emissions during a facility’s operation can also be significant. Such emissions vary greatly depending on the size of the reservoir and the nature of the land that was flooded by the reservoir.

Small run-of-the-river plants emit between 0.01 and 0.03 pounds of carbon dioxide equivalent per kilowatt-hour. Life-cycle emissions from large-scale hydroelectric plants built in semi-arid regions are also modest: approximately 0.06 pounds of carbon dioxide equivalent per kilowatt-hour.[4]

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DATA WAREHOUSE MODELING

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Nowadays one of the most important assets of any organization is its information. This asset is usually used for two purposes: operational record keeping and analytical decision-making. The operational system is preliminarily adapted to input data. The Business Intelligence system is designed to extract useful information from the data, which will be used to support strategic and decision making.

Data warehouse can be defined as subject-oriented, integrated, time-varying, non-volatile collection of data that is used primarily in organizational decision making [1]. Nowadays, data warehousing became an important strategy to integrate heterogeneous information sources in organizations, and to enable On-Line Analytic Processing (OLAP).

Data warehouse architecture Ralph Kimball formulated the basic requirements for data warehouses. According to them a DW system [2]:

must make information easily accessible;
must present information consistently;
must be adaptive and resilient to change;
must present information in a timely way;
must be a secure bastion that protects the information assets;
must serve as the foundation for improved decision making.

Different data warehousing systems have different structures. Some may have an ODS (operational data store), while some may have multiple data marts. In view of this, it is far more reasonable to present the different layers of a data warehouse architecture. In Figure 1.1, a data warehouse layers are depicted.

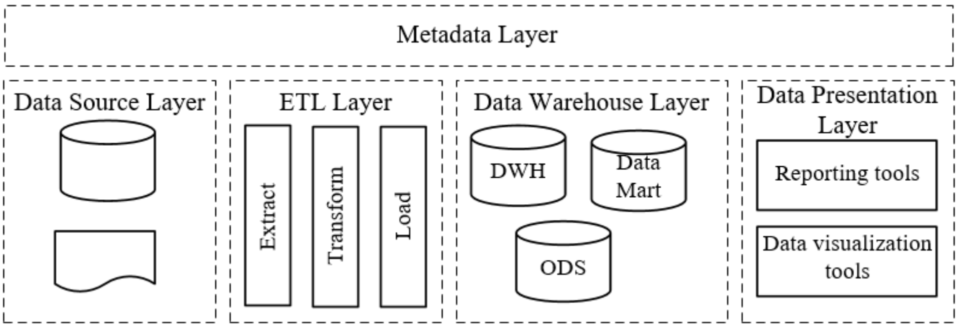

Figure 1.1 – Data warehouse layers

A data warehouse architecture exhibits various layers of data in which data from one layer is derived from data of the lower layer. The lowest layer is a Data Source Layer. This represents the different data sources that feed data into the data warehouse. The data source can be of any format -- plain text file, relational database, other types of database, Excel file, etc. The second layer is an ETL (Extract-Transform-Load) Layer. Data is pulled from the data source into a Data Warehouse Layer by means of ETL process. There are three components in the data warehouse layer, namely operational data store, data warehouse, and data marts. Data flows from operational data store to data warehouse and subsequently to data mart. A Metadata Layer stores information (metadata) that refers to data about data. It describes where data are being used and stored, the source of data, what changes have been made to the data, and how one piece of data relates to other information. The highest layer is an End User Layer consists of tools that display information in different formats to different users. This can be in a form of a tabular / graphical report in a browser, an emailed report that gets automatically generated and sent everyday, or an alert that warns users of exceptions, among others.

Large organizations today need flexible access to various kind of information that is present in its operational systems. The data warehousing technology facilitates creation of integrated and subject-wise history data, and provides flexible ways to access, aggregate and visualize the information. This paper introduced basic layers for building a data warehouse.

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EFFECTIVE MICROSERVICES

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For several years, monolithic architecture has been the widely-used architecture for building web and mobile applications. These applications were mostly characterized by individual programs handling multiple functionalities. Though monolithic applications were known to be easier to operate, as the systems grew bigger, they introduced complexity for both the coding and deployment stages of software development life cycle. Single point of failure, technology lock-in, and limited scalability are a few other drawbacks of monolithic applications. Recently past, microservices architecture has evolved as a paradigm shift in decomposing large monolithic applications into smaller manageable pieces with their own code base and deployment infrastructure. Considering practical business applications, multiple microservices are required to fulfill one single case of usage, still we can describe microservices as simple and stateless.